Part Number: 197634-1CD
Revision: 0

YASKAWA

MOTOMAN-HC30PL
Dust-Proof/Drip-Proof Specification
Quick Start Guide
Using the Smart Pendant

- Manipulator Type: YR-1-06VXCP30-B00
  (Built-In Air Hoses, Ethernet and I/O Cables Specification)
- Applicable Robot Controllers: YRC1000/YRC1000micro
- Smart Pendant Type: JZRCR-APP30-1

Have the following information available when contacting the YASKAWA Representative:

- System
- Primary Application
- Software Version *(Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version})*
- Warranty ID *(Located on Robot Controller)*
- Robot Serial Number *(Located on Manipulator data plate)*
- Robot Sales Order Number *(Located on Robot controller data plate)*

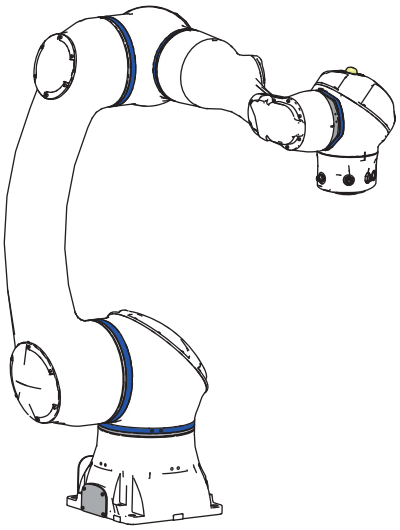


Table of Contents

Before Using the Product

i.1 Introduction to This Manual

i.1.1 Intended Audience

This manual is for customers who are using a YASKAWA collaborative robot for the first time.

This manual describes the necessary operations in order, from installing the collaborative robot to teaching palletization and depalletization.

Read and understand this manual to ensure the correct usage of the product. Keep this manual in a safe place so that it can be referred to whenever necessary.

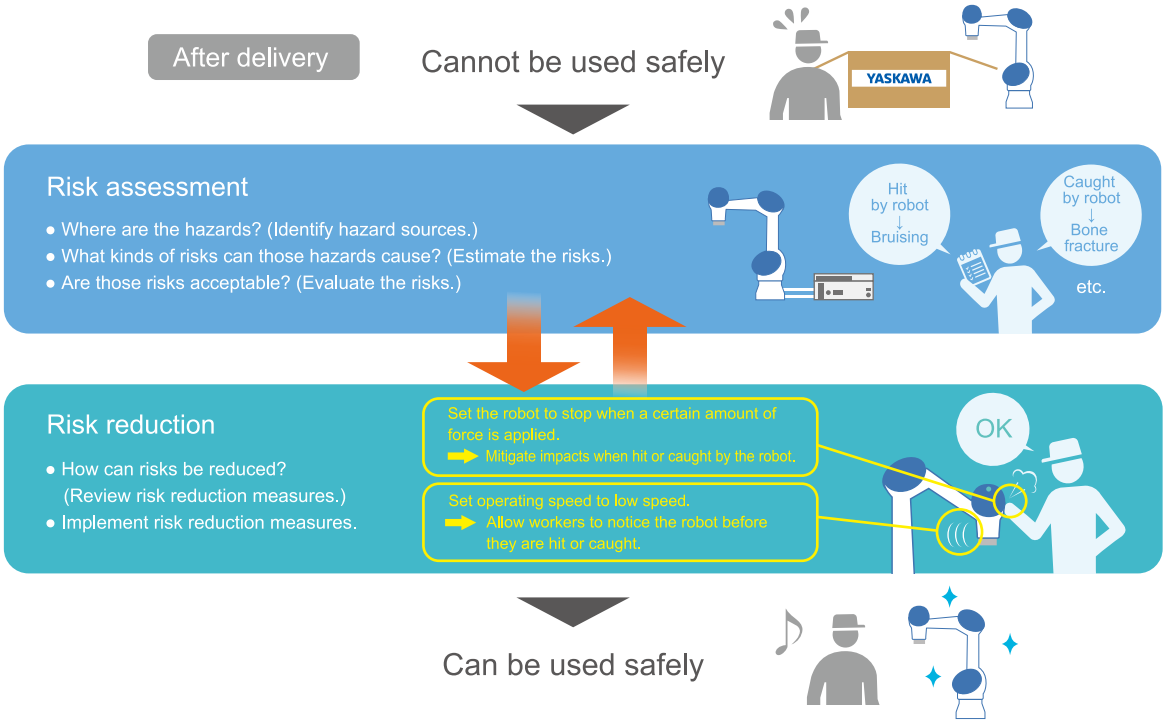
Note:

Assume that items not described in this manual are either prohibited or not possible.

General items related to safety are described in chapter 1 "Safety" in the instructions for the robot controller that will be used. Carefully read and understand the instructions before reading this manual and use the product correctly.

i.1.2 Precautions for Safely Using a Collaborative Robot

A collaborative robot cannot be used safely as-is and without a safety fence when delivered. The customer (including the system integrator) must conduct risk assessments and implement risk reduction measures on their own, and then check if potential hazards have been eliminated.



i.1.3 Applicable Products

This manual describes the following products.

Product		Type	Specifications
Robot controller	YRC1000	ERAR-1000-06VXH25-***	–
	YRC1000micro	ERBR-100-06VXH12-***	–
Manipulator		YR-1-06VXCP30-B00	Built-in air hoses, Ethernet and I/O cables specification
Smart Pendant		JZRCR-APP30-1	–

i.1.4 Related Manuals

The following manuals describe the precautions, control functions, usage procedures, and troubleshooting procedures when using a robot in detail.

Refer to these manuals for detailed procedures on using the product.

Category	Manual Name	Overview	Manual No. *1	
			YRC1000	YRC1000 micro
Manipulator	MOTOMAN-HC30PL Instructions Dust-Proof/Drip-Proof Specification	Describes information about the manipulator, such as basic specifications, installation, and spare parts.	HW2480886	
	MOTOMAN-HC30PL Maintenance Manual Dust-Proof/Drip-Proof Specification	Describes the maintenance procedures for the manipulator, such as precautions for inspections and procedures for replacing parts.	HW2480888	
	MOTOMAN-HC30PL Setup Guide	Describes the setup procedures and manuals for users to refer to when installing the manipulator for the first time after the product has been delivered.	HW2380727	
Robot Controller	YRC1000/YRC1000micro Collaborative Operation Instructions	Describes information on collaborative operation functions and configuration procedures.	HW1484764	
	YRC1000/YRC1000micro Supplementary Instructions for HC Series	Describes the differences between standard robots and collaborative robots in the following main robot controller manuals. • Instructions • Maintenance Manual • Instructions for Functional Safety Function	HW1484756	HW1485285
	YRC1000/YRC1000micro Notes for Safe Operation	Describes the residual risks and safety precautions when using a robot.	R-AN-A308	R-AN-A309
	YRC1000/YRC1000micro Maintenance Manual	Describes the maintenance procedures for the robot controller, such as periodic inspections and procedures for replacing parts.	RE-CHO-A114	RE-CHO-A115
	YRC1000/YRC1000micro Options Instructions for Inform Language	Describes the instructions used by the robot controller.	RE-CKI-A466	RE-CKI-A468
	YRC1000/YRC1000micro Options Instructions for Concurrent I/O	Describes concurrent I/O, which is an I/O control function in the robot controller.	RE-CKI-A467	RE-CKI-A469
	YRC1000/YRC1000micro Instructions	Describes the following items in details: • Robot safety precautions • Robot controller specifications, installation, and wiring • Robot control functions	RE-CTO-A221	RE-CTO-A222
	YRC1000/YRC1000micro Alarm Codes (Major Alarms) (Minor Alarms)	Describes the causes of and corrective actions for alarms.	RE-CER-A600	RE-CER-A601
	YRC1000/YRC1000micro Instructions for Smart Pendant	Describes detailed information on Smart Pendant functions and operating procedures.	HW1485509	

*1 Read the manual for the robot controller that will be used.

i.2 Notes for Safe Operation

i.2.1 Safety Information

To prevent personal injury and equipment damage in advance, the following signal words are used to indicate safety precautions in this manual. The signal words are used to classify the hazards and the degree of damage or injury that may occur if a product is used incorrectly. Information marked as shown below is important for safety. Always read this information and heed the precautions that are provided.

⚠ DANGER

Indicates precautions that, if not heeded, are likely to result in loss of life, serious injury, or fire.

⚠ WARNING

Indicates precautions that, if not heeded, could result in loss of life, serious injury, or fire.

⚠ CAUTION

Indicates precautions that, if not heeded, could result in relatively serious or minor injury, or in fire.

NOTICE

Indicates precautions that, if not heeded, could result in property damage.

i.2.2 Visual Aids

The following aids are used to indicate certain types of information for easier reference.

Important

Indicates precautions or restrictions that must be observed. Also indicates alarm displays and other precautions that will not result in machine damage.

Term

Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

Information Indicates supplemental information to deepen understanding or useful information.

i.2.3 General Precautions

- Figures provided in this manual are typical examples or conceptual representations. There may be differences between them and actual wiring, circuits, and products.
- The products shown in illustrations in this manual are sometimes shown with their covers or protective guards removed to illustrate detail. Always replace all covers and protective guards before the product is used.
- If a new copy of this manual is required because it has been lost or damaged, contact your nearest YASKAWA representative or one of the offices, and inform them of the manual number.
- This manual is subject to change without notice for product improvements, specifications changes, and improvements to the manual itself. The manual number of this manual will be updated and revisions issued when changes are made.
- Any and all quality guarantees provided by YASKAWA are null and void if the customer modifies the product in any way. YASKAWA disavows any responsibility for damages or losses that are caused by modified products.

i.3 Using This Manual

i.3.1 Terms

"MOTOMAN" is the product name for industrial robots manufactured by YASKAWA.

MOTOMAN consists of a manipulator, which is the robot itself, a robot control panel, a Smart Pendant, and a manipulator cable.

Interpret the devices described in this manual as shown below.

Device	Name in This Manual
Robot	Manipulator
Robot control panel	Robot controller

i.3.2 Trademarks

The product names and company names used in this manual are the trademarks or registered trademarks of the respective company. TM and the ® mark do not appear with product or company names in this manual.

1

Unpacking and Checking the Product

1.1 Unpacking the Shipping Crate

NOTICE

When the manipulator and controller are received in a shipping crate, unpack them in a level location near the installation location of the manipulator.

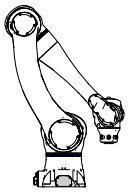
If the products are unpacked in an unstable location, there is a risk the manipulator and robot controller may fall over and be damaged.

The Smart Pendant may also be dropped and damaged.

1.2 Checking the Received Products

Confirm that all of the ordered products have been received.

1.2.1 Components in a Basic Robot System

Name		Standard/Option	Remarks
Manipulator		Standard component	Includes accessories.
Robot controller YRC1000 or YRC1000micro	YRC1000 	Standard component	Includes spare parts.
	YRC1000micro 	Standard component	Includes spare parts.
Smart Pendant		Standard component	Mode selector key (2 keys)
Manipulator cables (3 types)		Standard component	Connects the manipulator and robot controller. • Manipulator cable • Torque sensor cable (TQ) • Switch/lamp cable (SW)
CD-ROM (connected to a USB port)		Standard component	Contains PDF copies of the manuals.

1.2.2 Manipulator Accessories

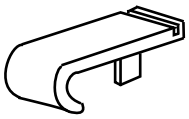
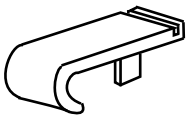
Purpose	Name	Type/Specifications		Quantity
Installing the manipulator	Hexagon socket head cap screw *trivalent chromate*	M16 (length: 50 mm)		4
	Spring washer *stainless steel*	M16		4
	Washer *stainless steel*	M16		4
Grease replenishment for the manipulator	Union	KQ2F06-01N		6

1.2.3 YRC1000 Robot Controller Accessories

1. **Replacement Fuses**

Name	Quantity	Specifications	Type
10-A fuse	2	10 A, 500 VAC	FNQ-10 10A, 500VAC
		10 A, 600 VAC	SC-10 10A, 600VAC
Glass cartridge fuse	1	3.15 A, 250 V	02173.15P 3.15A, 250V
Micro fuse	1	1.0 A, 250 V	HM10 1.0A, 250V

2. **Tools for Wiring**

Name		Quantity	Type
Wiring tool for WAGO connectors		2	231-131
Wiring tool for WAGO connectors		1	734-230
Wiring tool for WAGO terminal block		1	210-119SB

Information

1. The fuses are replacement parts. Refer to the following manual for details on replacement procedures.
   YRC1000 Maintenance Manual (Manual No.: RE-CHO-A114)
2. Use the wiring tool for WAGO connectors when connecting wires to the control power supply unit and general-purpose I/O circuit board in the robot controller. Refer to the following manual for details on wiring procedures.
   YRC1000 Instructions (Manual No.: RE-CTO-A221)

1.2.4 YRC1000micro Robot Controller Accessories

1. Parts for Connecting the Primary Power Supply

Important

Cable clamps, power outlet plugs, and power wires (cables) are not included with the product. The customer is responsible for these parts.

Name		Quantity	Type
L-shaped angled plug for the primary power supply cable		1	CE05-8A-18-10SD-D-BAS(R1)
End bell		1	CE3057-10A-1-D

2. Part for Short-Circuiting the Safety Signals

Name		Quantity	Type
Dummy connector (Safety) for short-circuiting the safety signals		1	CBL-AR001

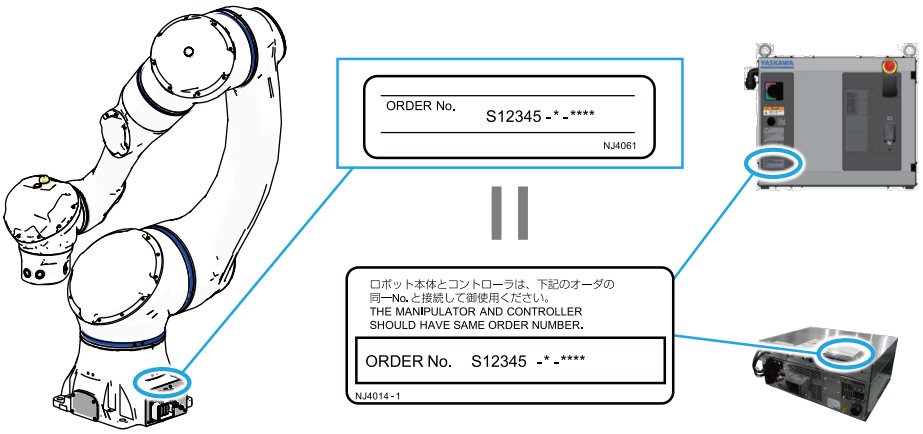
1.2.5 Verifying the Order Numbers

WARNING

Verify the order numbers on the robot and robot controller are the same. Each robot was configured with unique home data at the factory. Use extra caution when installing multiple robots.

There is a risk of injury or damage due to malfunction.

Verify that the order numbers on the nameplates of the manipulator and robot controller match.



2

Transportation and Installation

2.1 Transporting the Manipulator

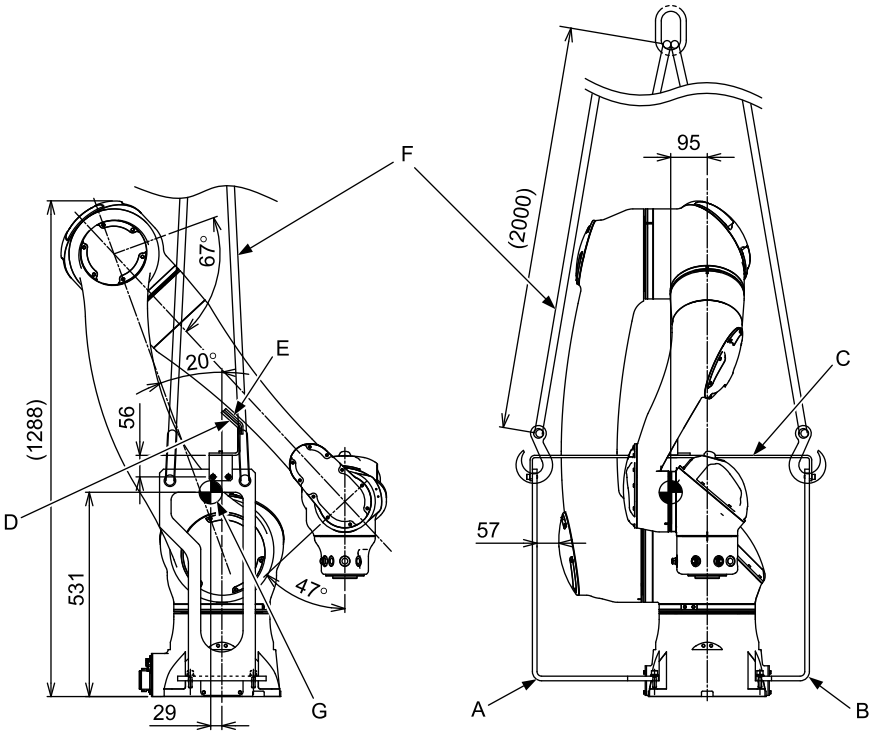
The mass of the manipulator and shipping brackets (4 brackets) together is approximately 160 kg. As a basic rule, use a crane when transporting the manipulator.

Table 2.1 Required Items

Name	Remarks
Hex key	For removing the shipping bracket.
Torque wrench	For mounting the shipping brackets. However, this is not necessary because the shipping brackets are mounted to the manipulator when shipped from the factory.
Hanging tool	Example: Wire or nylon sling. Be sure to use a hanging tool for a four-wire sling with a length of 2000 mm or longer.
Shipping bracket (4 brackets)	Included with the manipulator. The manipulator is shipped from the factory with these parts mounted as the transportation parts.
Hexagon socket head cap screw • M10 (length: 35 mm) (4 screws) • M8 (length: 20 mm) (4 screws) • M4 (length: 16 mm) (2 screws)	
Spring washer M10 (4 washers)	
Washer M10 (4 washers)	
Conical spring washer • M8 (4 washers) • M4 (2 washers)	

Important

When moving the manipulator to another location, such as when changing the production line, set the manipulator to the following transportation posture.



A	Shipping bracket 1 (type: HW1308958-1)	E	LIGHTLON #510 (single-sided adhesive processing, 50 mm × 90 mm) Two sheets pasted on top of each other on shipping bracket 4.
B	Shipping bracket 2 (type: HW1308959-1)	F	Hanging tool (for four-wire sling with a length of 2000 mm or longer)

Continued on next page.

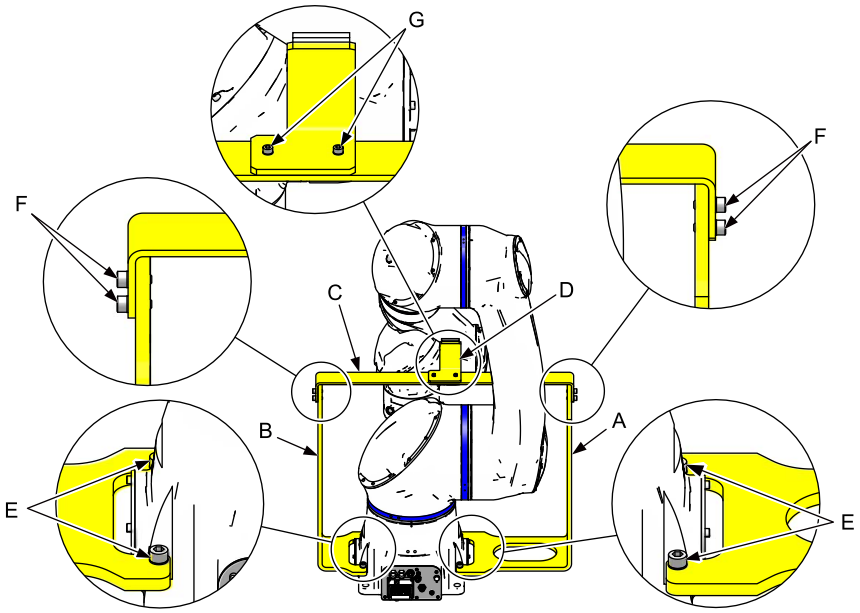
Continued from previous page.

C	Shipping bracket 3 (type: HW1308960-2)	G	Position of the center of gravity
D	Shipping bracket 4 (type: HW2401666-1)	-	-

Table 2.2 Angle and Pulses of Each Axis When Shipped from the Factory

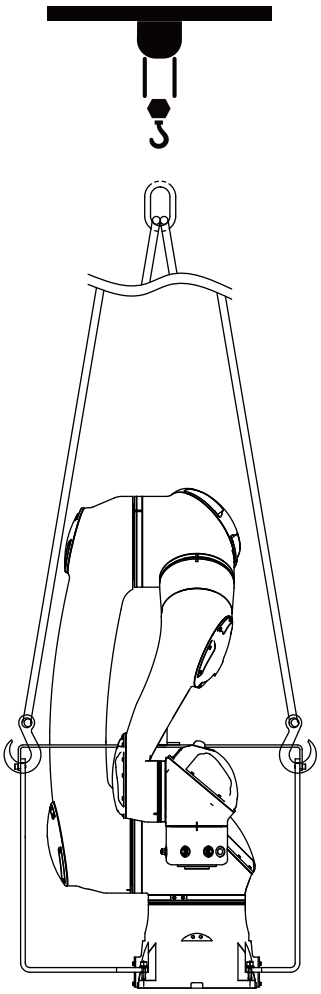
Axis	Pulses	Angle
S	0	0°
L	-76585	-20°
U	-186473	-67°
R	0	0°
B	110328	47°
T	0	0°

1. **The transportation parts (shipping brackets, hexagon socket head cap screws, spring washers, washers, and conical spring washers) are mounted to the manipulator when it is shipped from the factory. Check again that the hexagon socket head cap screws have been fastened before transporting the manipulator.**



A	Shipping bracket 1 (type: HW1308958-1)	E	• Hexagon socket head cap screw M10 (length: 35 mm) (2 screws) • Spring washer M10 (2 washers) • Washer M10 (2 washers) Tightening torque: 48 N·m (4.9 kgf·m)
B	Shipping bracket 2 (type: HW1308959-1)	F	• Hexagon socket head cap screw M8 (length: 20 mm) (2 screws) • Conical spring washer M8 (2 washers) Tightening torque: 24.5 N·m (2.5 kgf·m)
C	Shipping bracket 3 (type: HW1308960-2)	G	• Hexagon socket head cap screw M4 (length: 16 mm) (2 screws) • Conical spring washer M4 (2 washers) Tightening torque: 2.8 N·m (0.29 kgf·m)
D	Shipping bracket 4 (type: HW2401666-1)	-	-

2. **Pass the hook of the hanging tool through the holes in each of the two places on shipping bracket 1 and shipping bracket 2, hoist the manipulator with a crane, and transport it to the installation location.**



3. **Remove the shipping brackets.**

> Important
> Carefully store the transportation parts (shipping brackets, hexagon socket head cap screws, spring washers, washers, and conical spring washers) that were removed. The transportation parts are required when moving and transporting the manipulator again.

2.2 Installing the Manipulator

⚠ WARNING

Do not use the manipulator when it is not fixed to the installation surface with bolts.

The manipulator may fall over and cause injury or damage.

2.2.1 Required Items

Name	Type/Specifications		Quantity
Hexagon socket head cap screw *trivalent chromate* *1	M16 (length: 50 mm)		4
Spring washer *stainless steel* *1	M16		4
Washer *stainless steel* *1	M16		4
Baseplate *2	A thickness of 40 mm or greater is recommended.		1
Anchor bolt *2	M16 or larger is recommended.		4

*1 Included with the manipulator.
*2 Not provided by YASKAWA.

2.2.2 Strength of the Installation Surface

The installation of the manipulator is critical for maintaining appropriate functionality. Design and construct a base that can fully withstand the maximum reaction force of the manipulator.

Important

Ensure the installation surface of the manipulator has a flatness of 0.5 mm or lower. If the flatness of the installation surface is poor, the manipulator may deform and lose appropriate functionality.

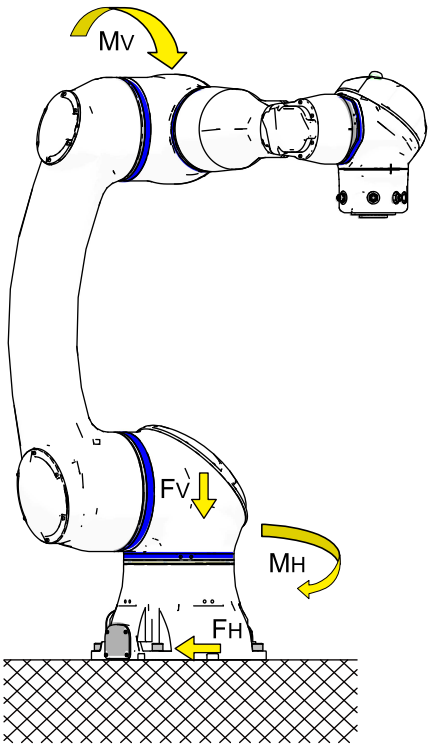
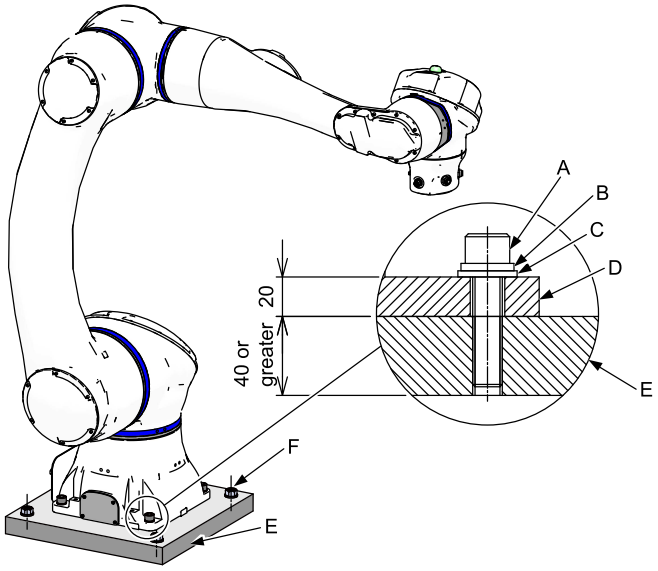


Table 2.3 Manipulator Installation Reaction Force/Torque

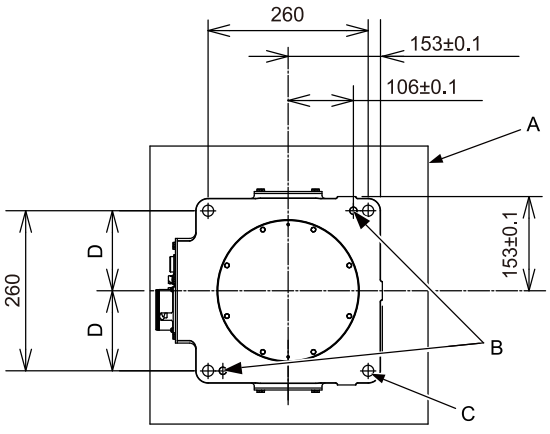
	When Rotating Horizontally		When Rotating Vertically	
	Reaction Force F_H	Torque M_H	Reaction Force F_V	Torque M_V
During an emergency stop	4610 N (470 kgf)	4591 N·m (468 kgf·m)	3090 N (315 kgf)	6121 N·m (624 kgf·m)
During acceleration/ deceleration	1421 N (145 kgf)	1373 N·m (140 kgf·m)	980 N (100 kgf)	2296 N·m (234 kgf·m)

2.2.3 Fixing the Manipulator to the Floor

1. **Fix the baseplate to the floor with the anchor bolts.**
2. **Fix the manipulator to the baseplate with the hexagon socket head cap screws. (4 screws) Tightening torque: 206 N·m (21 kgf·m)**



A	Hexagon socket head cap screw M16 *trivalent chromate* (length: 50 mm) (4 screws)	D	Manipulator base
B	Spring washer M16 *stainless steel* (4 washers)	E	Baseplate (with a thickness of 40 mm or greater is recommended)
C	Washer M16 *stainless steel* (4 washers)	F	Anchor bolt (M16 or larger is recommended)



Unit: mm

A	Baseplate	C	Hole for mounting body: 18 dia. (4 places)
B	Reference hole: 12 $^{+0.018}_{0}$ dia. Reamed hole depth: 12	D	130 ±0.1 (tolerance is applied to reamed hole)

2.2.4 Grounding the Manipulator

Ground the manipulator to a ground resistance of 100 Ω or less in accordance with all relevant local and national electrical codes. Connect the manipulator directly to the ground wire.

Table 2.4 Required Items

Name	Remarks
5.5 mm² or larger ground wire	This part is not provided by YASKAWA.
Spanner/wrench	For tightening the grounding bolt.

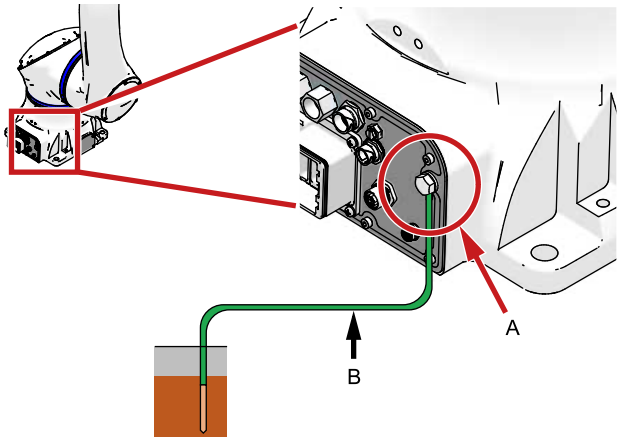
Important

- Do not share the ground wire for the manipulator with any other ground wires or grounding electrodes, such as those for electrical power, motors, or welders.
- Ground the manipulator in accordance with all relevant local and national electrical codes when using metallic ducts, metallic conduits, or cable trays to install cables.

⚠ WARNING

Always connect the ground terminal to a grounding electrode with a resistance of 100 Ω or less.

There is a risk of fire or electric shock.



A	Bolt M8 (for grounding) Included on the manipulator.	B	Ground wire (5.5 mm² or larger)

2.3 Transporting the YRC1000 Robot Controller

The mass of the YRC1000 robot controller depends on the model as given below.

Table 2.5 YRC1000 Robot Controller Mass

YRC1000 Robot Controller Model	Specifications	Approx. Mass (kg)
Small-capacity model	Specification for Japan	60
	Specification for Asia, North America, and Europe	70

As a basic rule, use a crane when transporting the YRC1000 robot controller.

NOTICE

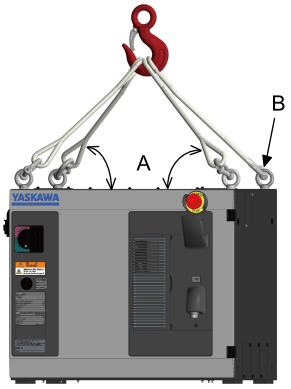
Transport the product so that it is not exposed to excessive vibration or shock.

Performance will be affected because this product is a precision machine.

Table 2.6 Required Items

Name	Remarks
Eye bolt	Included with the robot controller when shipped from the factory.
Hanging tool	This part is not provided by YASKAWA. Select a wire or nylon sling according to the mass of the robot controller.

1. **The eye bolts are attached to the robot controller when shipped from the factory. Check again that the eye bolts have been fastened before transporting the manipulator.**
2. **Pass the hanging tool through the eye bolts, hoist the robot controller with a crane, and transport it to the installation location.**



A	45° or wider	B	Eye bolt M12 (4 bolts)

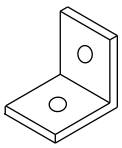
2.4 Installing the YRC1000 Robot Controller

A bracket for fixing the robot controller is not provided by YASKAWA. The recommended bracket is given below.

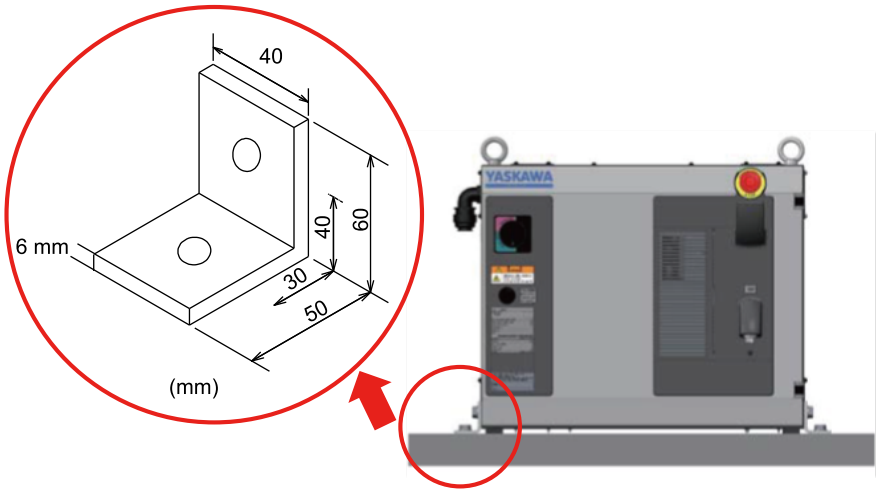
Information Refer to the following manual for details on the installation environment of the robot controller.

YRC1000 Instructions (Manual No.: RE-CTO-A221)

Table 2.7 Required Items (Recommended Items)

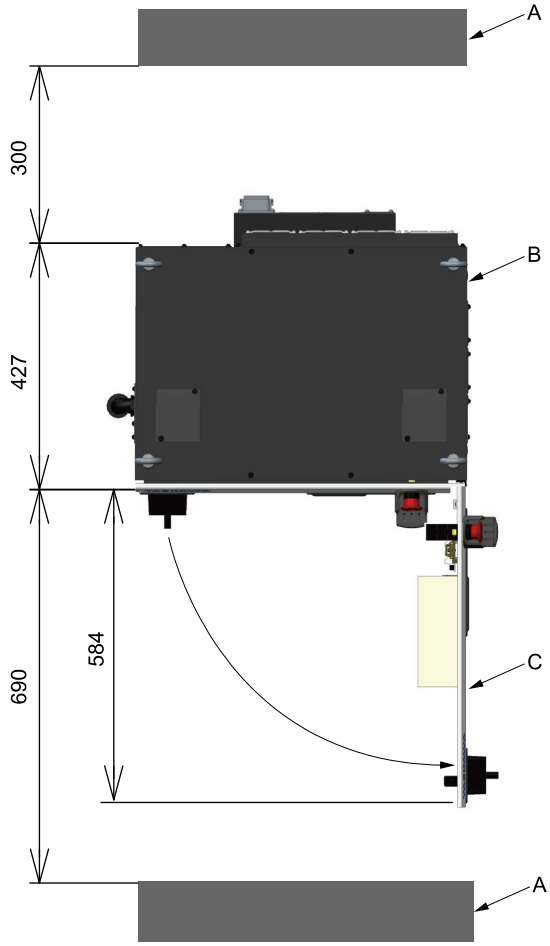
Name		Recommended Specifications	Quantity	Remarks
Mounting screw		M12 (length: 20 mm) **Note:** Select the screws based on a thread length of 14 mm for the sides of the robot controller.	4	Tightening torque: 45 N·m (4.6 kgf·m)
Fixing bracket		Hole 14 dia. (2 places) Plate thickness 6 mm	4	–

Use the screw holes (M12) on the sides of the robot controller to fix it to the floor or a pedestal.



Important

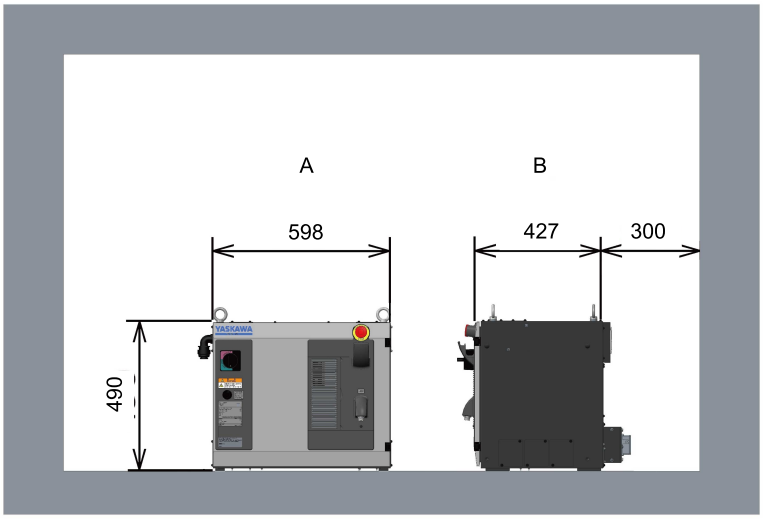
Ensure space to open the robot controller door for inspection.



A	Wall	C	Robot controller door
B	Robot controller	–	–

Important

For the work space during maintenance, install the YRC1000 robot controller in a location with a gap of approximately 300 mm or greater from the walls.



A	Front side of robot controller	B	Side of robot controller

2.5 Transporting the YRC1000micro Robot Controller

The mass of the YRC1000micro robot controller depends on the specifications as given below.

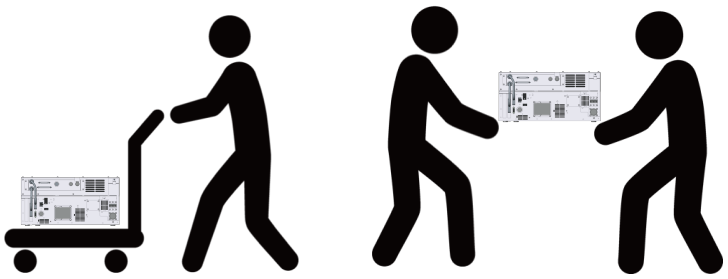
Table 2.8 YRC1000micro Robot Controller Mass

YRC1000micro Robot Controller Specifications	Approx. Mass (kg)
Specification for Japan, North America, and Asia	16.5
Specification for Europe	20

When transporting the YRC1000micro robot controller, use a cart or have two workers lift and carry the robot controller from its bottom. Be careful not expose the product to excessive vibration or shock during transport.

Note:

Use a lifter to lower the product from a rack or shelf.



2.6 Installing the YRC1000micro Robot Controller

A bracket for fixing the robot controller is not provided by YASKAWA.

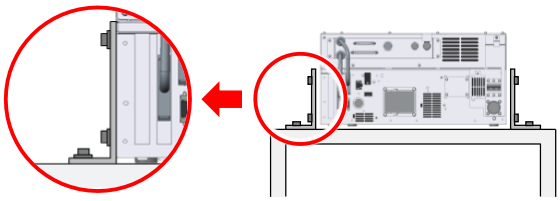


Figure 2.1 Installation Example of the YRC1000micro Robot Controller

Information Refer to the following manual for details on the installation environment of the robot controller.

YRC1000micro Instructions (Manual No.: RE-CTO-A222)

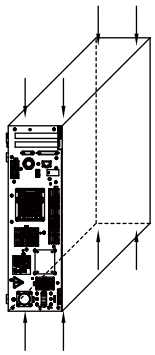
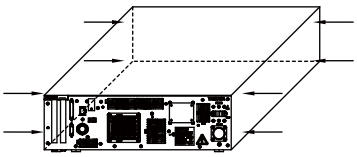
Table 2.9 Required Items

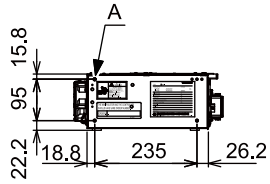
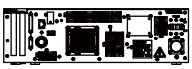
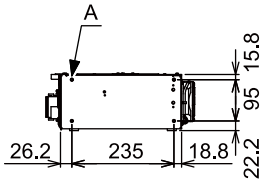
Name	Specifications	Quan-tity	Remarks
Mounting screw	M5 **Note:** Select screws with a thread length that is the thickness of the fixing bracket + 5 mm or less.	12	Material: Mild steel or a stronger material
Fixing bracket		4	Prepare fixing brackets according to the mounting method of the robot controller.

NOTICE

If the thread length of the mounting screws exceeds the thickness of the mounting bracket + 5 mm, the components inside the robot controller may be damaged.

Use the screw holes M5 (8 places) on the sides of the robot controller to fix it to the floor or a pedestal.

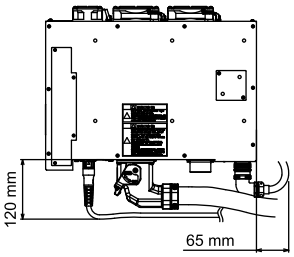
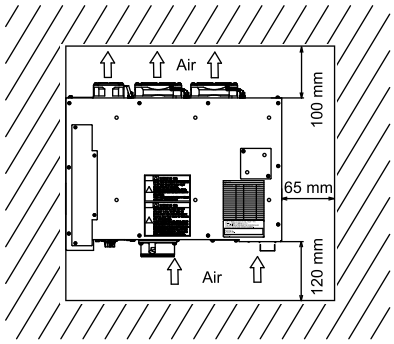
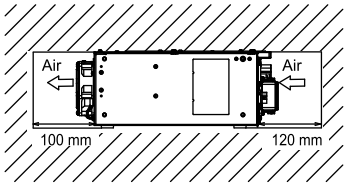
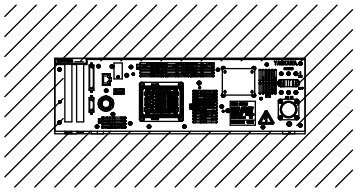
Side Mounted	Horizontally Mounted
	

Left Side View	Front Side View	Right Side View
		

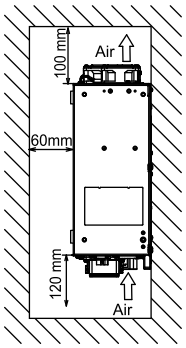
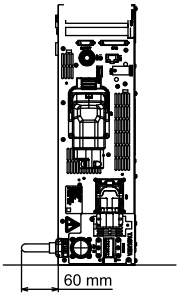
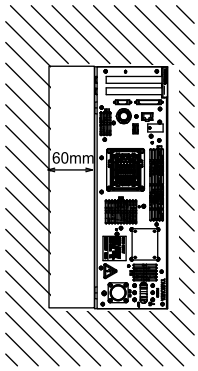
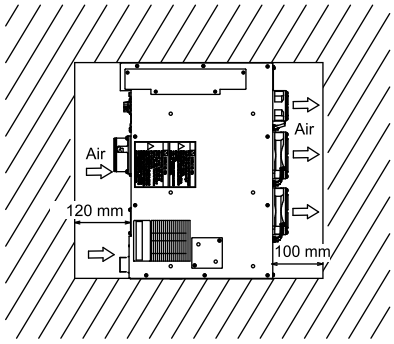
A M5 tapped holes (hole depth: 5 mm) (4 places)

Important

1. Ensure the following space when the YRC1000micro robot controller lays flat (horizontally mounted).

Space for Manipulator Cable	Top Side View
	
Left Side View	**Front Side View**
	

2. Ensure the following space when the YRC1000micro robot controller is side mounted.

Top Side View	Space for Manipulator Cable
	
Front Side View	**Right Side View**
	

Information The YRC1000micro robot controller is free-standing. Install the robot controller so that it is not exposed to excessive shock.

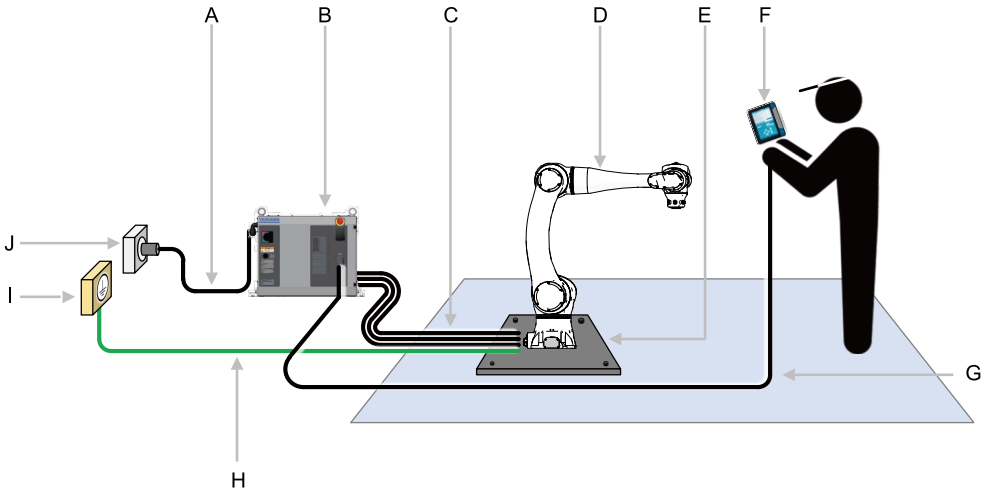
Refer to the mounting procedures in the following manual when side mounting the robot controller.

YRC1000micro Instructions (Manual No.: RE-CTO-A222)

3

Connecting the Robot Controller

3.1 Connecting the YRC1000 Robot Controller and Other Devices



Symbol	Name	Symbol	Name
A	Primary power supply cable	F	Smart Pendant
B	Robot controller	G	Pendant connection cable
C	Manipulator cables (3 types)	H	Ground wire
D	Manipulator	I	Grounding equipment (earth)
E	Baseplate	J	Primary power supply

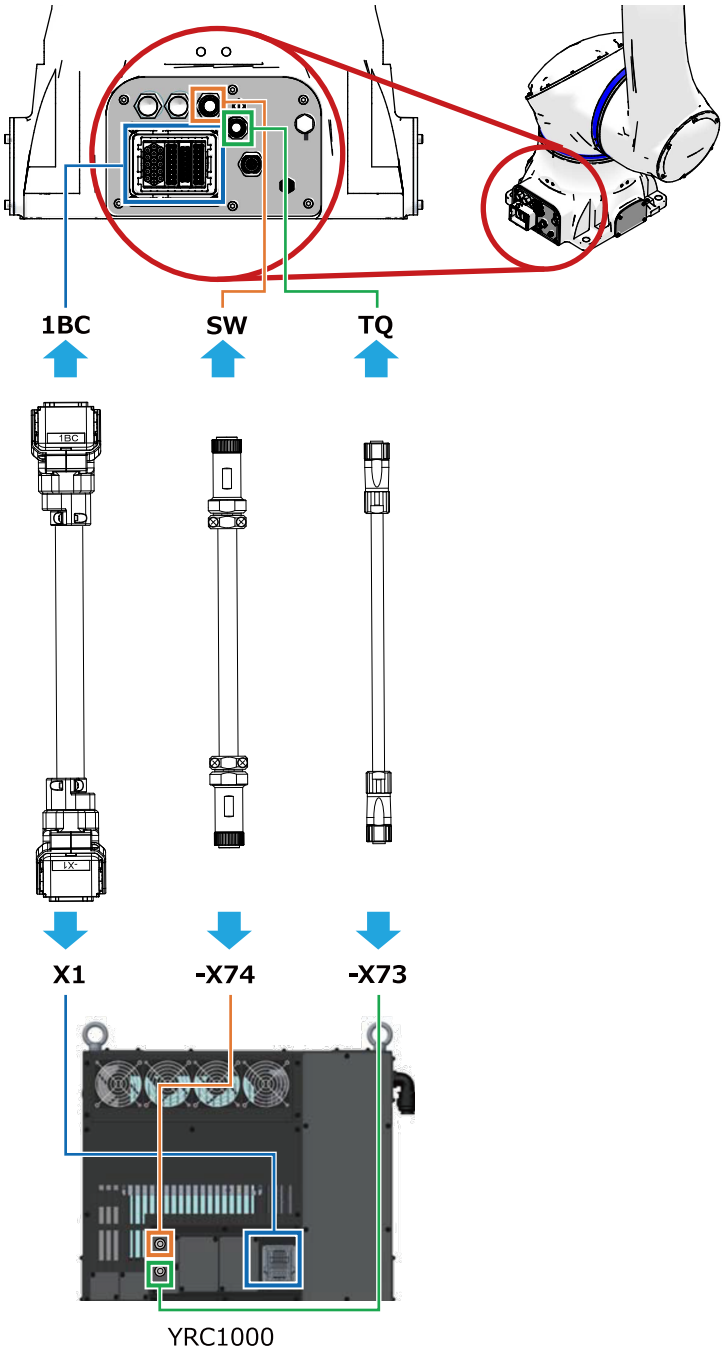
3.1.1 Connecting the Manipulator

Table 3.1 Required Items

Name	Specifications	Quantity	Remarks
Manipulator cable		1	Included with the manipulator.
Torque sensor cable		1	
Switch/lamp cable		1	
Power supply cable *1	Power requirement 1.0 kVA Cable size 3.5 mm^2	3	Robot controller breaker capacity: 15 A
Power outlet plug *1		1	
Ground wire *1		1	
Earth leakage breaker *2		1	–
Phillips screwdriver		1	–
Flat head screwdriver		1	–

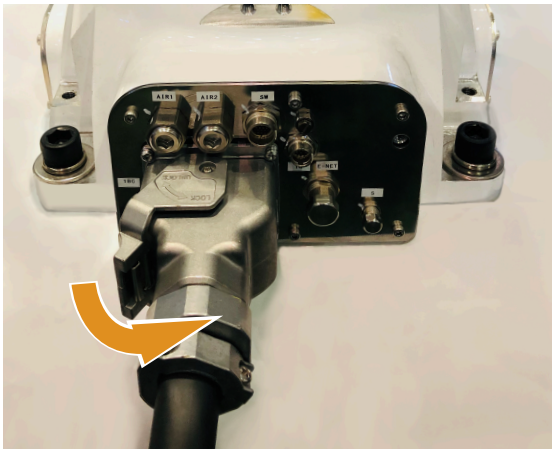
*1 Not provided by YASKAWA.
*2 Refer to the following manual for selecting the earth leakage breaker.

YRC1000 Instructions (Manual No.: RE-CTO-A221)

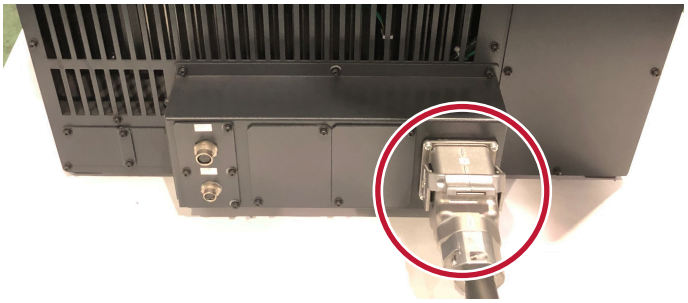


1. **Connect the 1BC connector on the manipulator cable to the manipulator.**

   Insert the manipulator cable into the 1BC connector, and turn the connector lever on the manipulator cable side to the locked position to connect the connector.

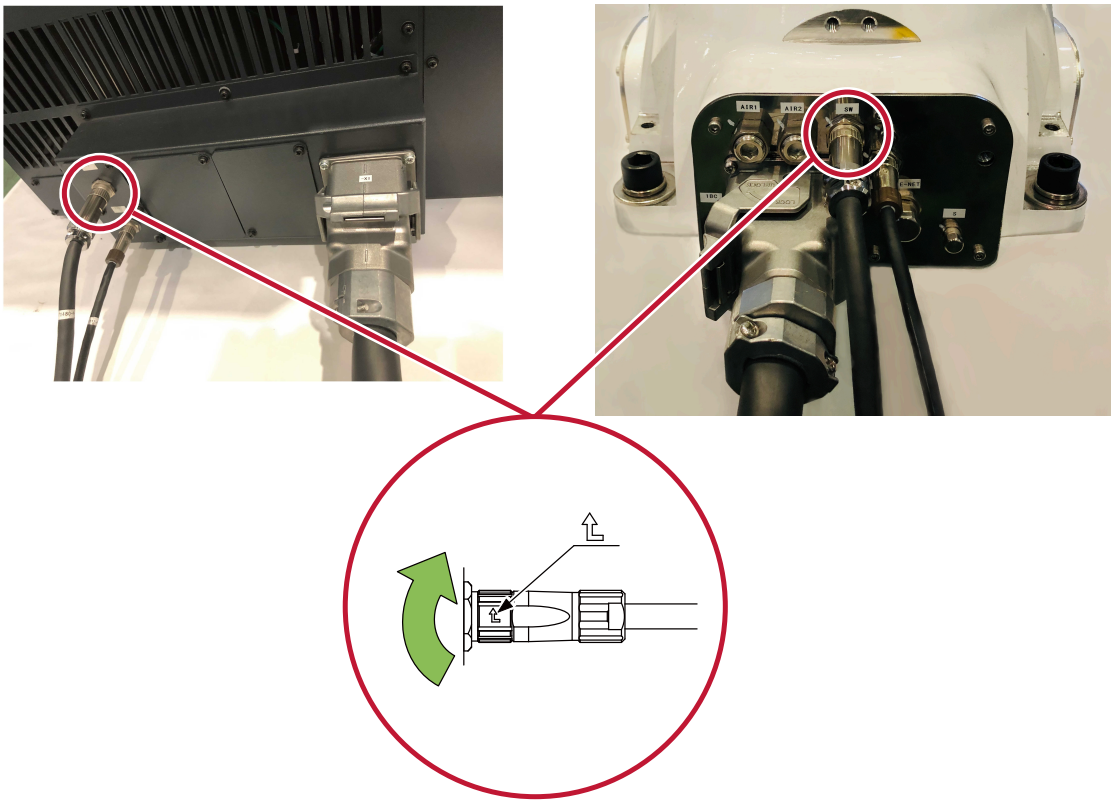


2. **Use the same procedure to connect the X1 connector on the manipulator cable to the robot controller.**

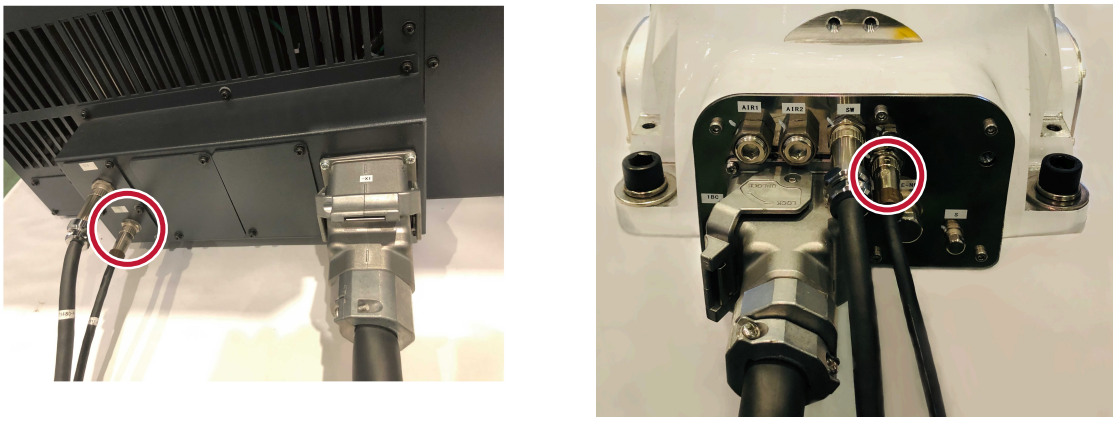


3. **Connect the switch/lamp cable to the [SW] connector on the manipulator and the [-X74] connector on the robot controller.**

Turn the tip of the cable connector with the arrow in the direction of the arrow to lock the cable.

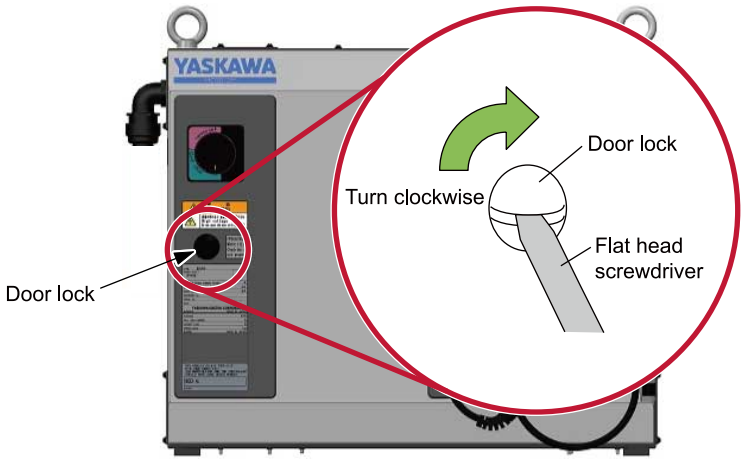


4. **Use the same procedure to connect the torque sensor cable to the [TQ] connector on the manipulator and the [-X73] connector on the robot controller.**

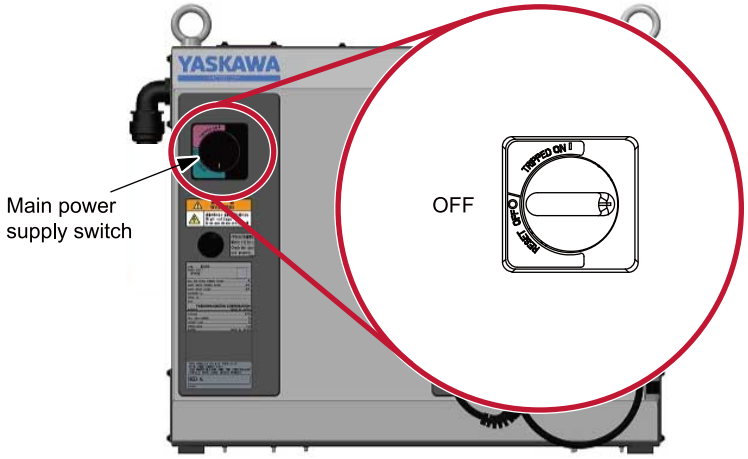


3.1.2 Connecting the Primary Power Supply

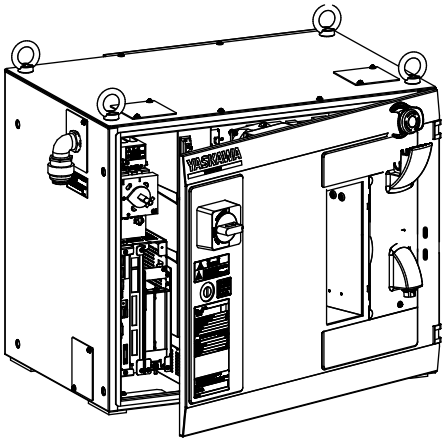
1. **Using a flat head screwdriver, rotate the door lock of the robot controller 90 degrees clockwise.**



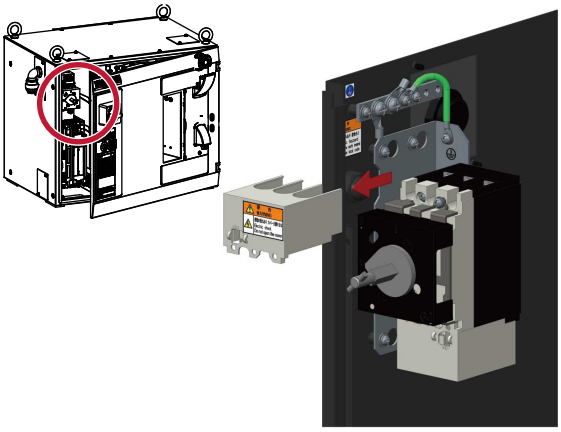
2. **Turn the main power supply switch to the OFF position.**



3. **Open the robot controller door.**



4. **Pull the breaker cover straight off.**



5. **Connect the ground wire to the ground terminal (M6 screw).**

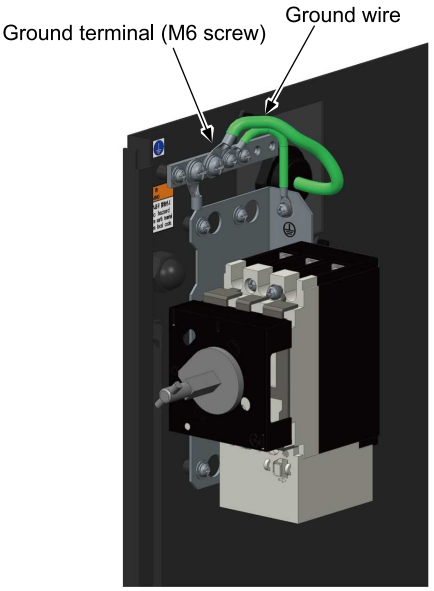
Power requirement: 1.0 kVA

Cable size (for flexible cable (3 cores)): 3.5 mm^2

Breaker capacity: 15 A

Note:

1. The ground wire is not provided by YASKAWA.
2. Ground the robot controller to a ground resistance of 100 Ω or less in accordance with all relevant local and national electrical codes.
   - Ground resistance of 100 Ω or less (200 to 240 VAC specification)
   - Ground resistance of 10 Ω or less (380 to 480 VAC specification)



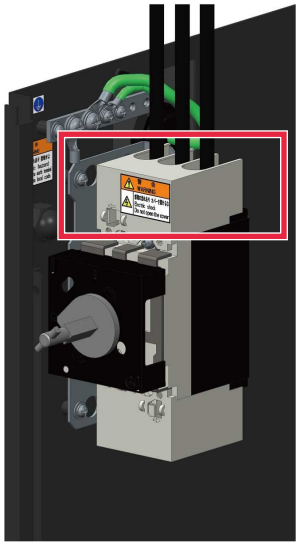
Important

- Always use an earth leakage breaker for a ground resistance of 100 Ω or less. Refer to the following manual for details.

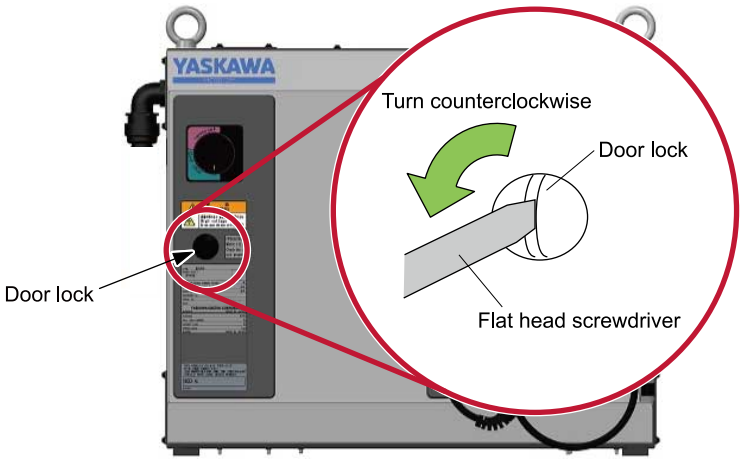
  YRC1000 Instructions (Manual No.: RE-CTO-A221)
- Do not share the ground wire for the robot controller with any other ground wires or grounding electrodes, such as those for electrical power, motors, or welders.
- Ground the robot controller in accordance with all relevant local and national electrical codes when using metallic ducts, metallic conduits, or cable trays to install cables.

6. **Connect the primary power supply.**

7. **Mount the breaker cover.**

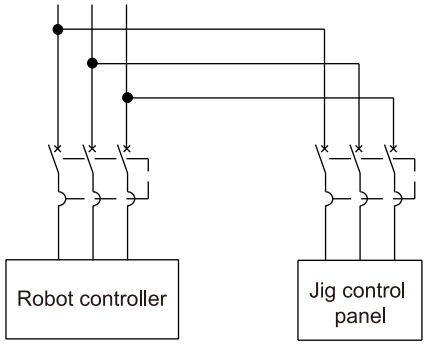


8. **Close the robot controller door and turn the door lock 90 degrees counterclockwise.**



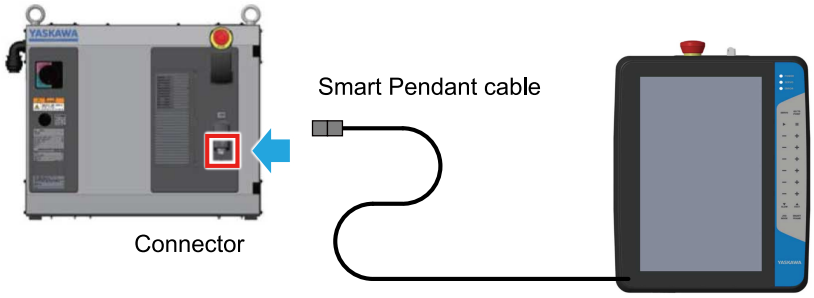
Important

Install a dedicated breaker for the robot controller to the primary power supply.



3.1.3 Connecting the Smart Pendant

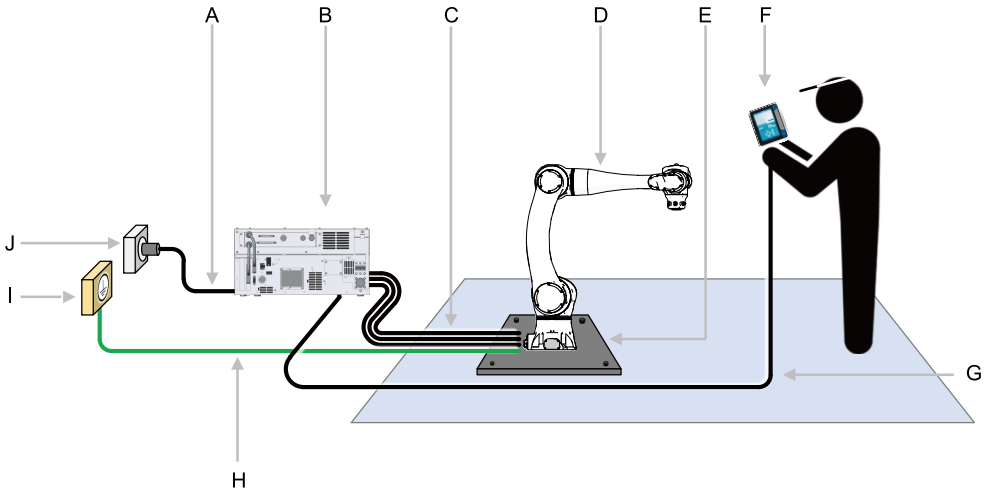
Connect the Smart Pendant cable to the robot controller.



Important

Insert the cable into the connector so that the arrow on connector of the robot controller is lined up with the triangle mark on the connector of the cable.

3.2 Connecting the YRC1000micro Robot Controller and Other Devices



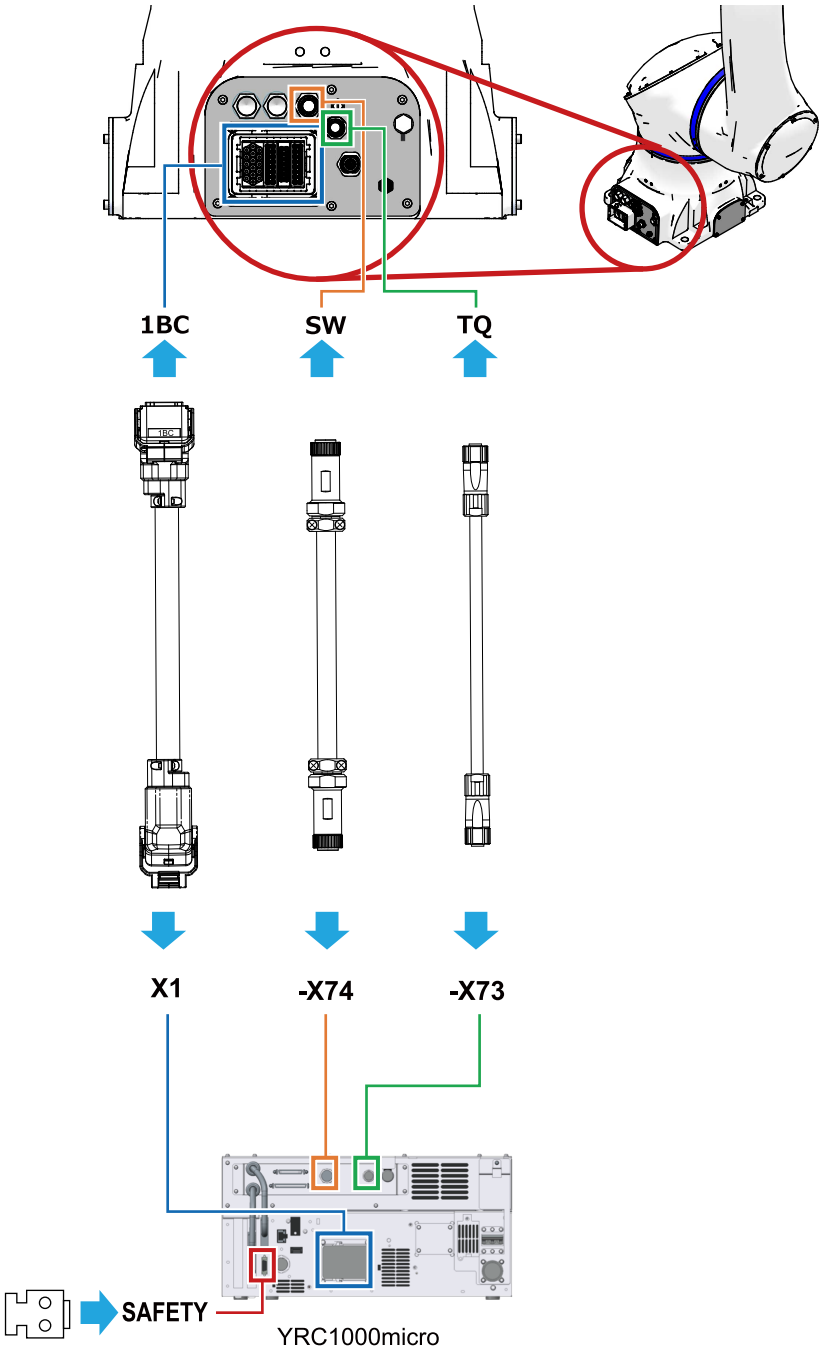
Symbol	Name	Symbol	Name
A	Primary power supply cable	F	Smart Pendant
B	Robot controller	G	Pendant connection cable
C	Manipulator cables (3 types)	H	Ground wire
D	Manipulator	I	Grounding equipment (earth)
E	Baseplate	J	Primary power supply

3.2.1 Connecting the Manipulator

Table 3.2 Required Items

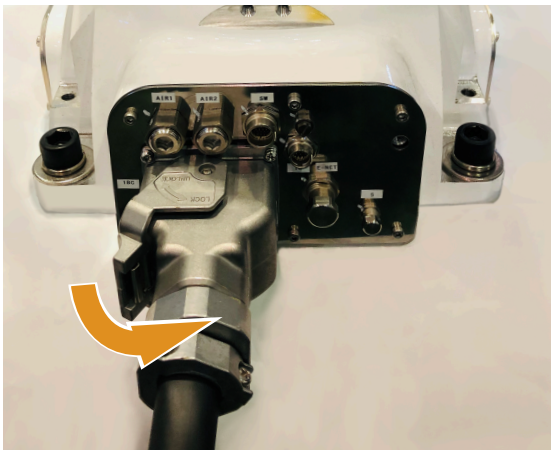
Name	Specifications	Quantity	Remarks
Manipulator cable		1	Included with the manipulator.
Torque sensor cable		1	
Switch/lamp cable		1	
Dummy connector for short-circuiting the safety signals		1	Included with the robot controller.
L-shaped angled plug for the primary power supply cable		1	
End bell		1	
Straight plug for the primary power supply cable		1	Must be purchased separately if the robot controller is side mounted.
Power supply cable *1	Power requirement 1.0 kVA Cable size 3.5 mm^2	3	Robot controller circuit protector capacity: 16 A
Cable clamp *1		1	
Power outlet plug *1		1	
Ground wire *1		1	
Circuit protector		1	
Phillips screwdriver		1	–

*1 Not provided by YASKAWA.



1. **Connect the 1BC connector on the manipulator cable to the manipulator.**

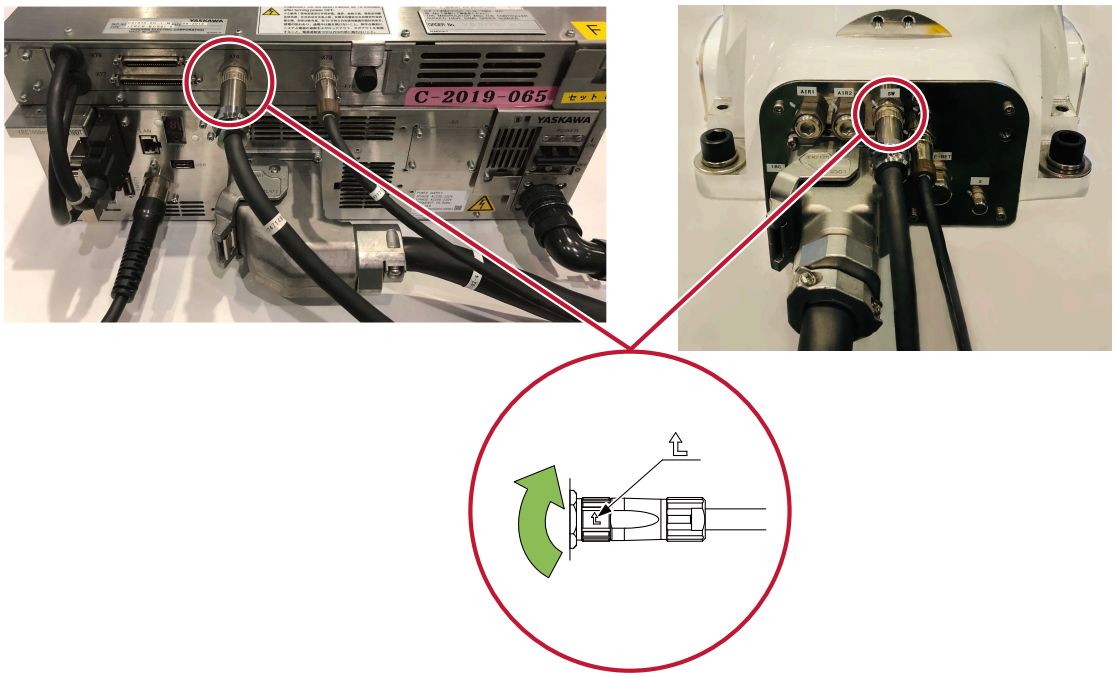
   Insert the manipulator cable into the 1BC connector, and turn the connector lever on the manipulator cable side to the locked position to connect the connector.



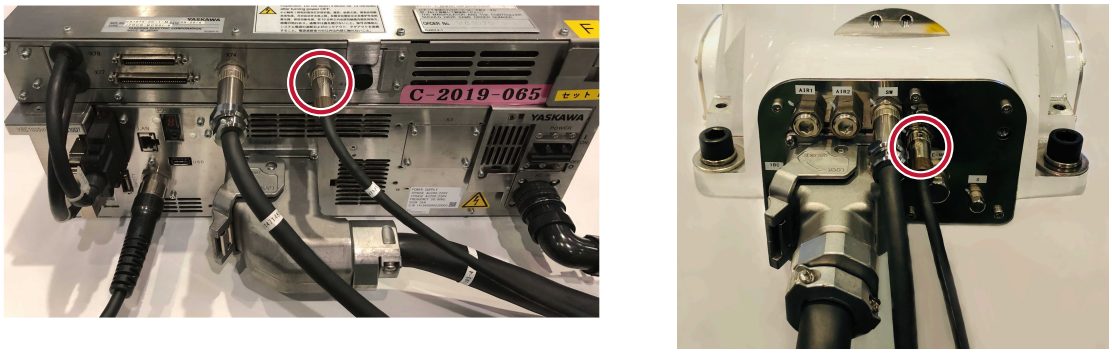
2. **Use the same procedure to connect the X1 connector on the manipulator cable to the robot controller.**

3. **Connect the switch/lamp cable to the [SW] connector on the manipulator and the [-X74] connector on the robot controller.**

Turn the tip of the cable connector with the arrow in the direction of the arrow to lock the cable.



4. **Use the same procedure to connect the torque sensor cable to the [TQ] connector on the manipulator and the [-X73] connector on the robot controller.**



5. **Connect the dummy connector for short-circuiting the safety signals to the SAFETY connector on the robot controller.**

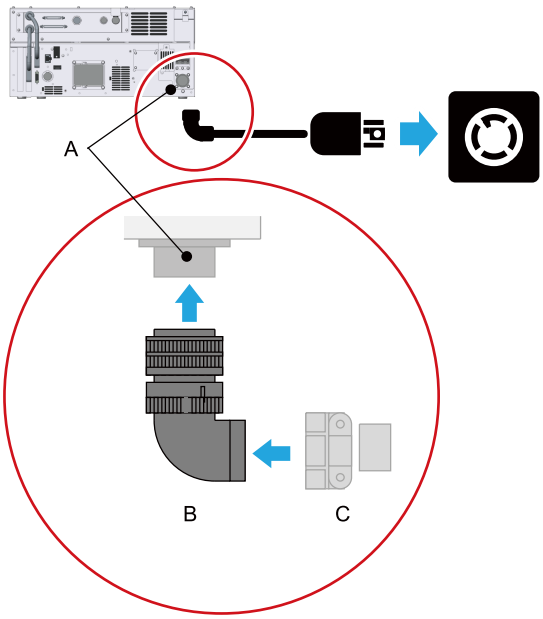
> Important
> Always connect the dummy connector for short-circuiting the safety signals. If this connector is not connected, protective stops and external emergency stops will occur.

3.2.2 Connecting the Primary Power Supply

1. **Connect the L-shaped angled plug for the primary power supply to the power supply connector on the robot controller.**
2. **Connect the primary power supply to the robot controller.**

Note:
Confirm that the circuit protector of the robot controller is turned OFF.

Note:
A straight type plug is required if the robot controller is side mounted.



A	Power supply connector	C	Cable clamp
B	L-shaped angled plug	–	–

Table 3.3 Power Supply Connector (ACIN) Pin Assignments on the YRC1000micro (Three-Phase Power Supply)

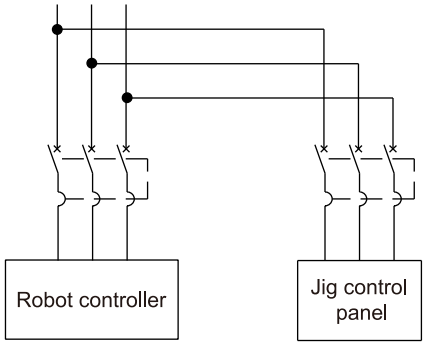
Pin No.	Signal Name	Description
A	L1	AC input (L1/R phase)
B	L2	AC input (L2/S phase)
C	L3	AC input (L3/T phase)
D	P.E.	Protective grounding

Table 3.4 Power Supply Connector (ACIN) Pin Assignments on the YRC1000micro (Single-Phase Power Supply)

Pin No.	Signal Name	Description
A	L1	AC input (L1/R phase)
B	N.C.	No connection
C	L3	AC input (L3/T phase)
D	P.E.	Protective grounding

Important

Install separate breakers for the primary power supply.

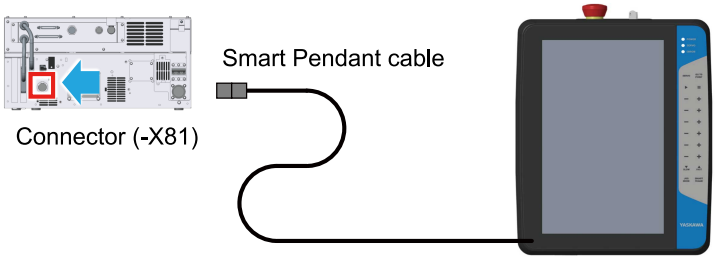


3.2.3 Connecting the Smart Pendant

Connect the cable to the [-X81] connector on the robot controller.

Note:

Confirm that the pins of the robot controller and cable connectors are aligned before inserting the connector.



Important

When the Smart Pendant is not used, attach the connector for short-circuiting the Smart Pendant safety signals to the [-X81] connector on the robot controller. The robot controller will not start if this connector is not attached.

4

Turning ON the Robot Controller Power Supplies

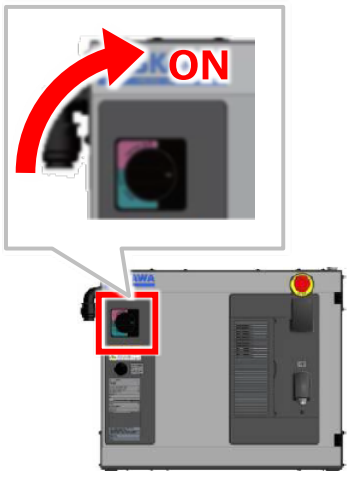
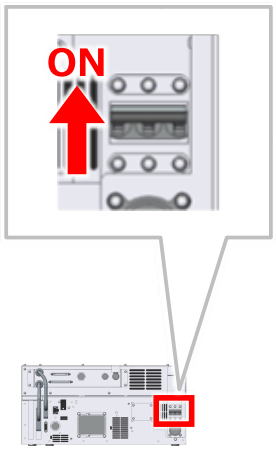
This chapter describes the how to turn ON/OFF the robot controller power supplies, how to check the power supplies, and how to reset alarms that may occur when the power supplies are turned ON.

4.1 Turning ON/OFF and Checking the Power Supplies

The main power supply and servo power are required to move the manipulator. Before moving the manipulator, first turn ON/OFF these power supplies and check the correct operation of the emergency stop button.

4.1.1 Turning ON the Main Power Supply

1. **Turn ON the main power supply to the robot controller.**

YRC1000	YRC1000micro
	

2. **Confirm that the startup window is displayed on the Smart Pendant.**

   It will take approximately three minutes until the window is displayed.

The main power supply is working correctly when the startup window is displayed.

Refer to the following section if an alarm is displayed on the Smart Pendant.

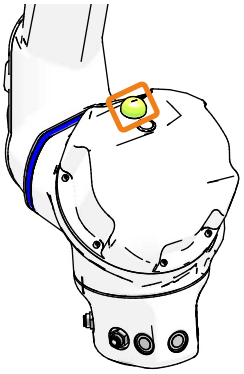
☞ *4.2 Corrective Actions for Alarms at Initial Startup on page 54*

This concludes the procedure.

4.1.2 Checking Operation of the Emergency Stop Button and Servo Power

Confirm the operation to turn ON/OFF the servo power, and confirm that the servo power is canceled when the emergency stop button is pressed.

1. **Confirm that the collaborative operation lamp on the manipulator is lit in green.**



Information

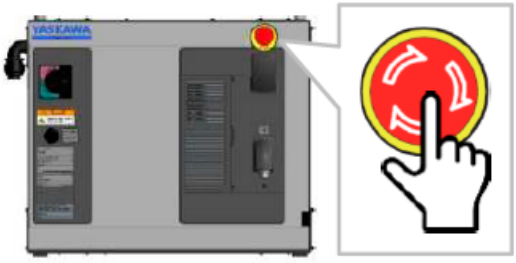
- A green lit lamp means collaborative operation is enabled. Enabled is the default setting. If the lamp is not lit, the subsequent operations cannot be performed.
- When using the YRC1000micro robot controller, protective stop and external emergency stop alarms will occur if the connector for short-circuiting the safety signals is not connected to the robot controller. Refer to the following section for details.
☞ *1.2.1 Components in a Basic Robot System on page 17*

2. **Tap {SERVO} to turn ON the servo.**

3. **Confirm that the servo power is turned ON and {SERVO} is green.**

The correct operation of servo power ON can be confirmed.

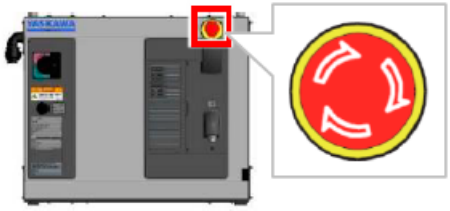
4. **Press the emergency stop button.**

YRC1000	YRC1000micro
There is an emergency stop button on the YRC1000.  The emergency stop button on the Smart Pendant can also be used. 	There is an emergency stop button on the Smart Pendant.  **Note:** The YRC1000micro is not equipped with an emergency stop button.

5. **Confirm that {SERVO} changes back to blue.**

A blue {SERVO} means the servo power has been turned OFF.

6. **Turn the emergency stop button in the direction of the arrows to reset the emergency stop.**

YRC1000	YRC1000micro
 or 	

This concludes the procedure.

4.2 Corrective Actions for Alarms at Initial Startup

The following alarms may occur when the manipulator is first started.

If the following alarms occur, take the corrective actions described in the reference section.

Alarm No.	Alarm Name	Possible Cause	Reference Section
6022	EXTERNAL FORCE ESTIMATION ERROR	• A large force was applied when the power supply to the robot controller was turned ON. • The home positions of the torque sensors have greatly deviated.	☞ *4.2.1 Correcting Alarm 6022 EXTERNAL FORCE ESTIMATION ERROR and Alarm 6004 ESCAPE FROM CLAMPING ERROR (PFL) on page 54*
6004	ESCAPE FROM CLAMPING ERROR(PFL)	• The manipulator cannot perform the escape operation because a large force was applied when the power supply to the robot controller was turned ON. • The manipulator cannot perform the escape operation because the home positions of the torque sensors have greatly deviated.	
4107	OUT OF RANGE(ABSO DATA)	• The motor axis became misaligned when the power supply was turned OFF. • There is a difference that exceeds the allowable range in the position of the motor axis when the power supply was turned OFF and when it was turned ON.	☞ *4.2.2 Correcting Alarm 4107 OUT OF RANGE (ABSO DATA) on page 56*

Term

Escape Operation :

The operation in which the manipulator automatically moves in a safe direction from a clamped state.

4.2.1 Correcting Alarm 6022 EXTERNAL FORCE ESTIMATION ERROR and Alarm 6004 ESCAPE FROM CLAMPING ERROR(PFL)

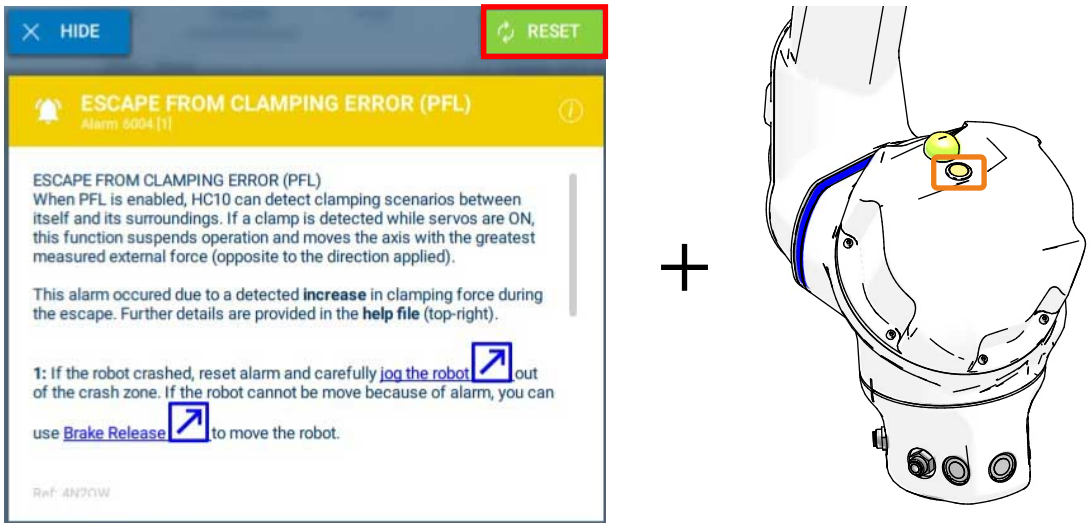
Use the following procedure to reset alarm 6022 EXTERNAL FORCE ESTIMATION ERROR or alarm 6004 ESCAPE FROM CLAMPING ERROR(PFL) that occurs when the manipulator is first started.

Information If multiple alarms occur, use this procedure to reset both alarm 6022 and alarm 6004 in a single operation.

(1) Reset the Alarm

If an alarm occurs, the ERROR lamp on the Smart Pendant will be lit, an alarm window similar to the following will be displayed, and the resume switch will be lit.

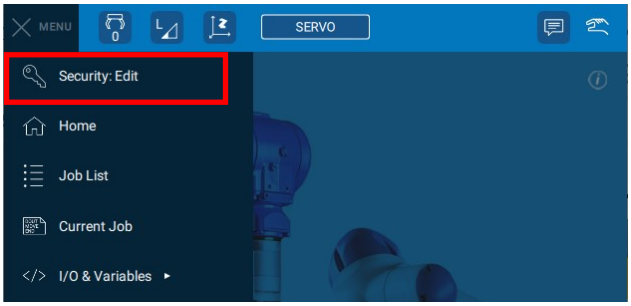
Select {RESET} to reset the alarm.



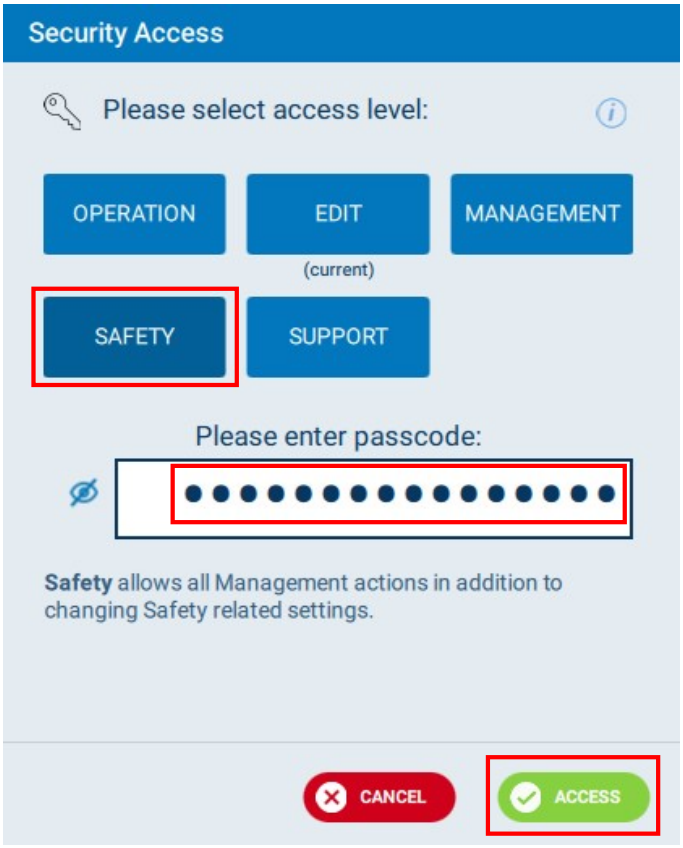
(2) Change Security to {Safety}

To change the home position settings of the torque sensors, change the security access level to {Safety}.

1. **From the status bar, select {MENU} - {Security: Edit}.**



2. **On the Security Access window, tap {SAFETY}.**



3. **Enter the password and tap {ACCESS}.**

Note:
The default password is set to "5555555555555555" (enter "5" 16 times).

(3) Set the Home Positions of the Torque Sensors Again

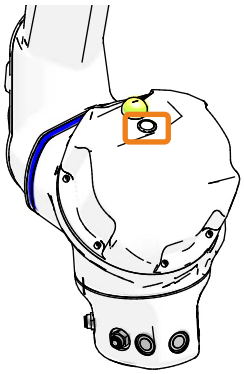
If the home positions of the torque sensors have deviated, such as due to receiving a large shock, erroneous detections will occur, such as a small external force being detected as a large external force.

To prevent erroneous detections, set the home positions of the torque sensors again.

Refer to the following section for the procedure to set the home positions of the torque sensors again.

☞ *7.3.2 Setting the Home Positions of the Torque Sensors Again on page 93*

When the home position of the torque sensor is set again, press the resume switch on the manipulator.



This concludes the procedure.

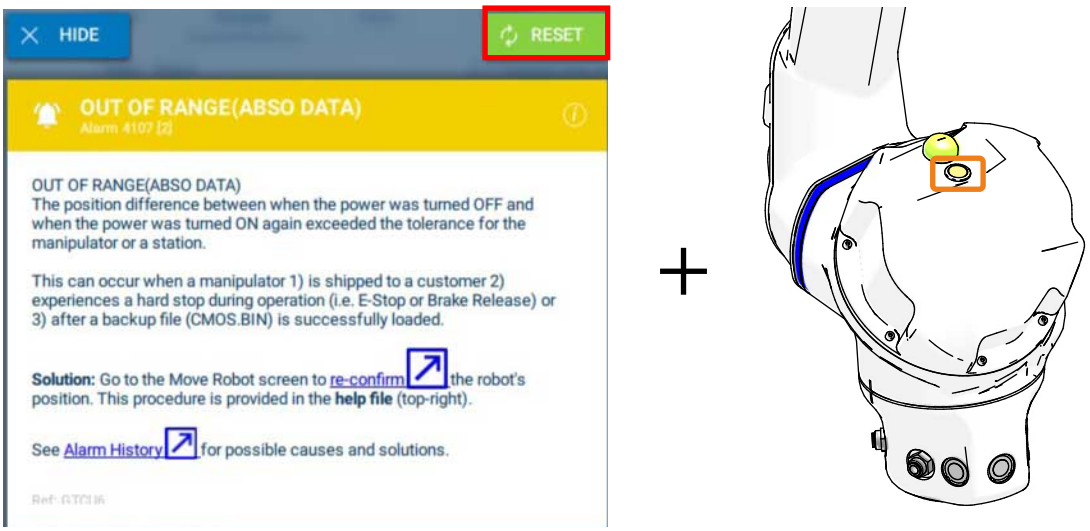
4.2.2 Correcting Alarm 4107 OUT OF RANGE(ABSO DATA)

Use the following procedure to reset alarm 4107 OUT OF RANGE(ABSO DATA) that occurs when the manipulator is first started.

(1) Reset the Alarm

If an alarm occurs, the ERROR lamp on the Smart Pendant will be lit, an alarm window similar to the following will be displayed, and the resume switch will be lit.

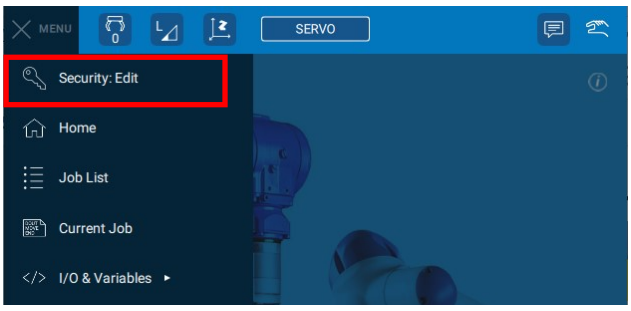
Select {RESET} to reset the alarm.



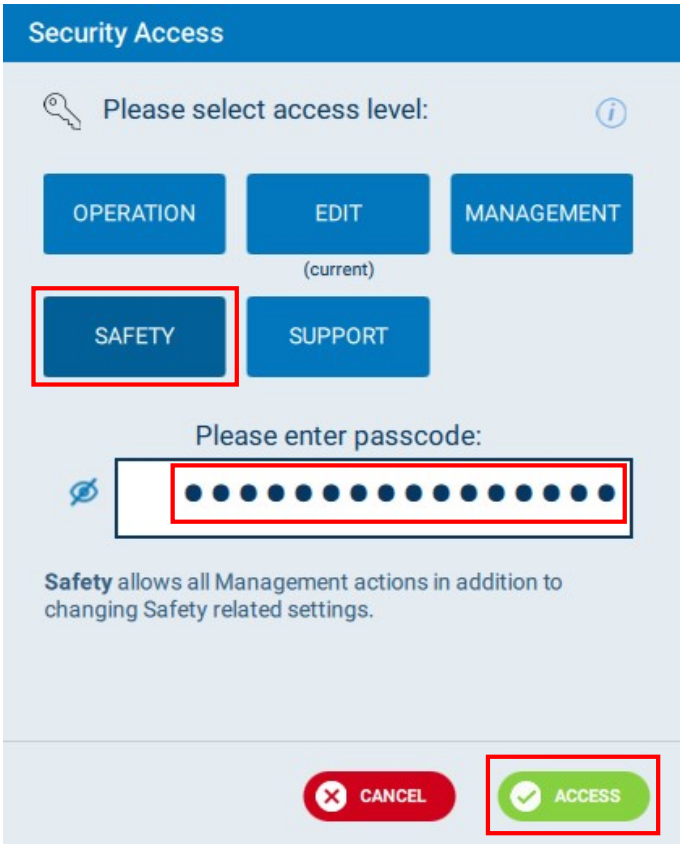
(2) Change Security to [Safety]

To confirm the position of the manipulator, change the security access level to [Safety].

1. **From the status bar, select {MENU} - {Security: Edit}.**



2. **On the Security Access window, tap {Safety}.**



3. **Enter the password and tap {ACCESS}.**

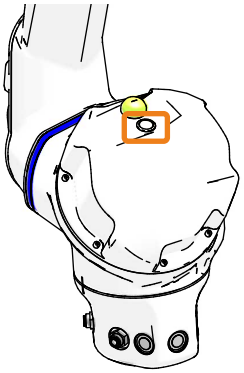
Note:
The default password is set to "5555555555555555" (enter "5" 16 times).

(3) Confirm the Position of the Manipulator

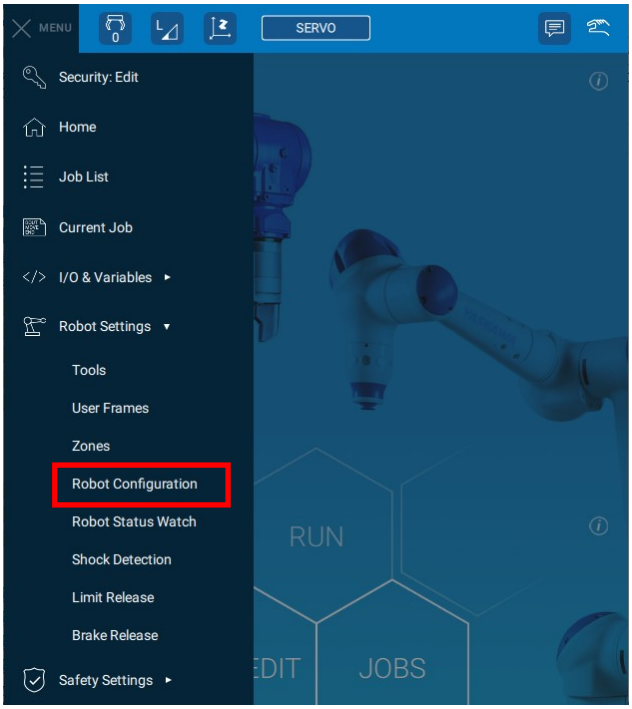
In the current state, there is a large difference between the position of the manipulator when the power supply was turned OFF and when the power supply was turned ON. The alarm occurred because of this difference in positions.

Confirm the position according to the rest of this procedure to eliminate this difference.

1. **If the resume switch on the manipulator is lit, press the resume switch.**



2. **From the status bar, select {MENU} - {Robot Settings} - {Robot Configuration}.**

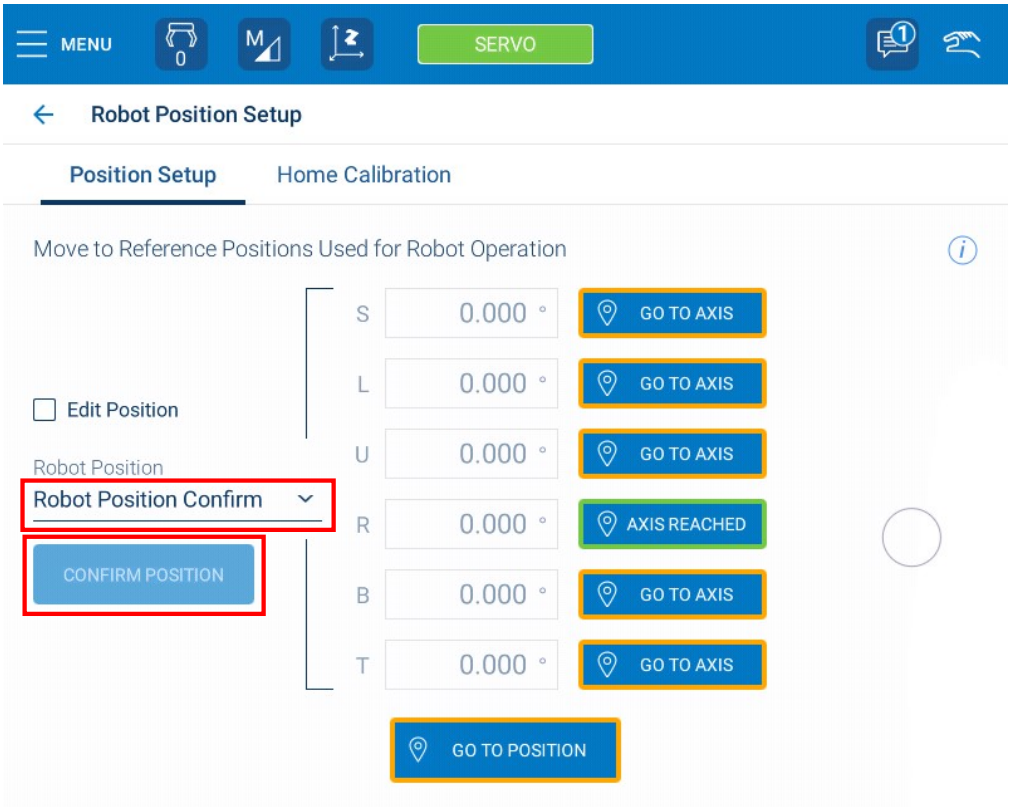


3. **Tap {SERVO} on the status bar to turn ON the servo.**

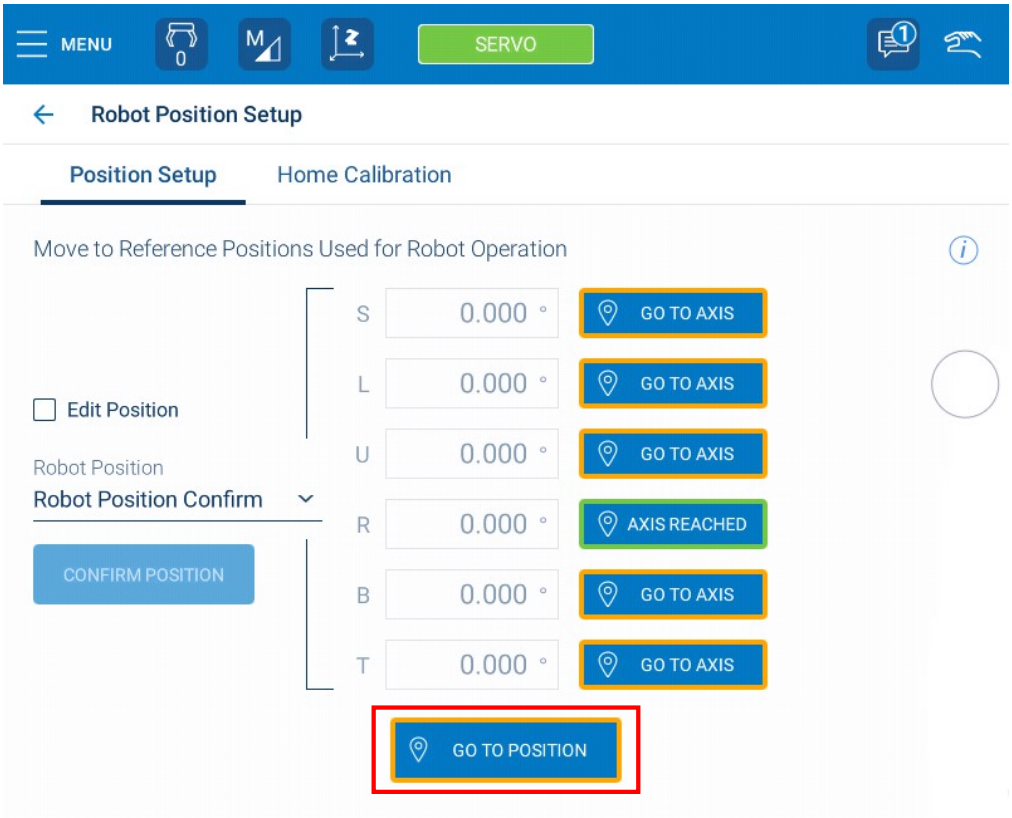
The button will turn green when the servo is turned ON.

4. **Confirm that {Robot Position Confirm} is selected.**

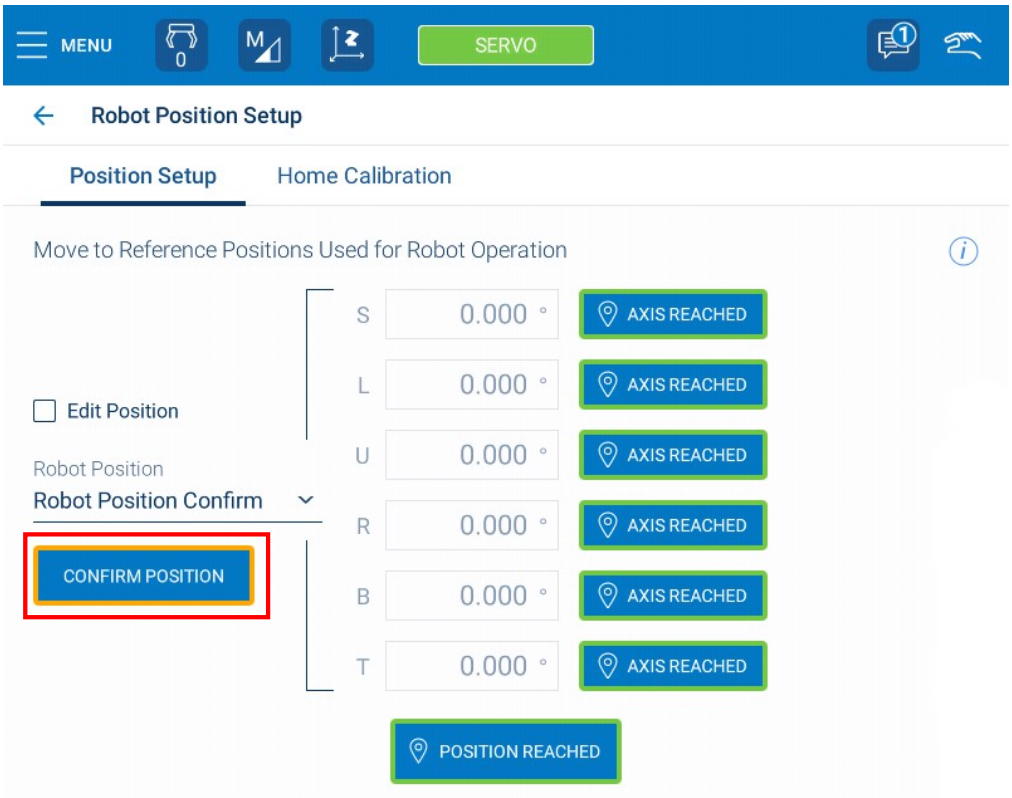
{CONFIRM POSITION} will be displayed and the orange box will flash. However, this will be disabled if the robot position is incorrect.



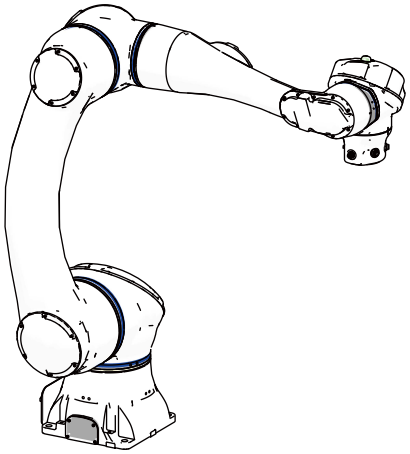
5. **Press and hold {GO TO POSITION}.**



When the robot moves to and reaches the confirmed position, {CONFIRM POSITION} will be enabled.



Information The second home position posture is shown below.



The manipulator will automatically stop at the second home position posture.

6. **Tap {CONFIRM POSITION}.**

   The robot position will be confirmed and a confirmation message will be displayed.

7. **Confirm that the confirmation message was displayed.**

This concludes the procedure. Jobs can be run and the operations to move to previous teaching points can be used again.

5

Controlling the Manipulator

This chapter describes jogging operations to move manipulator axes and direct teach operations to store operating positions in the manipulator.

5.1 Moving the Manipulator

This section describes the basic operations to move the manipulator.

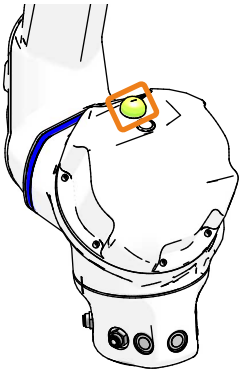
Operation	Menu Name	Description	Reference Section
Jogging Each Axis	Joint	The operation to move each axis of the manipulator independently.	☞ *5.1.1 Jogging Each Axis on page 62*
Jogging Parallel to the TCP	World	The operation to move in parallel to the X-axis, Y-axis, and Z-axis that are defined based on the manipulator.	☞ *5.1.2 Jogging Parallel to the TCP on page 65*
Direct Teach	Hand Guiding	The operation to manually move the manipulator to the desired position and store that position. The manipulator achieves continuous motion by moving between the recorded positions.	☞ *5.1.3 Direct Teach on page 67*

5.1.1 Jogging Each Axis

Jogging is the most basic manipulator operation.

Use the following procedure to move the desired axis of the manipulator.

1. **Confirm that the collaborative operation lamp is lit in green.**



Information If the lamp is not lit, the collaborative operation function is disabled. Refer to the following section and enable the collaborative operation function.

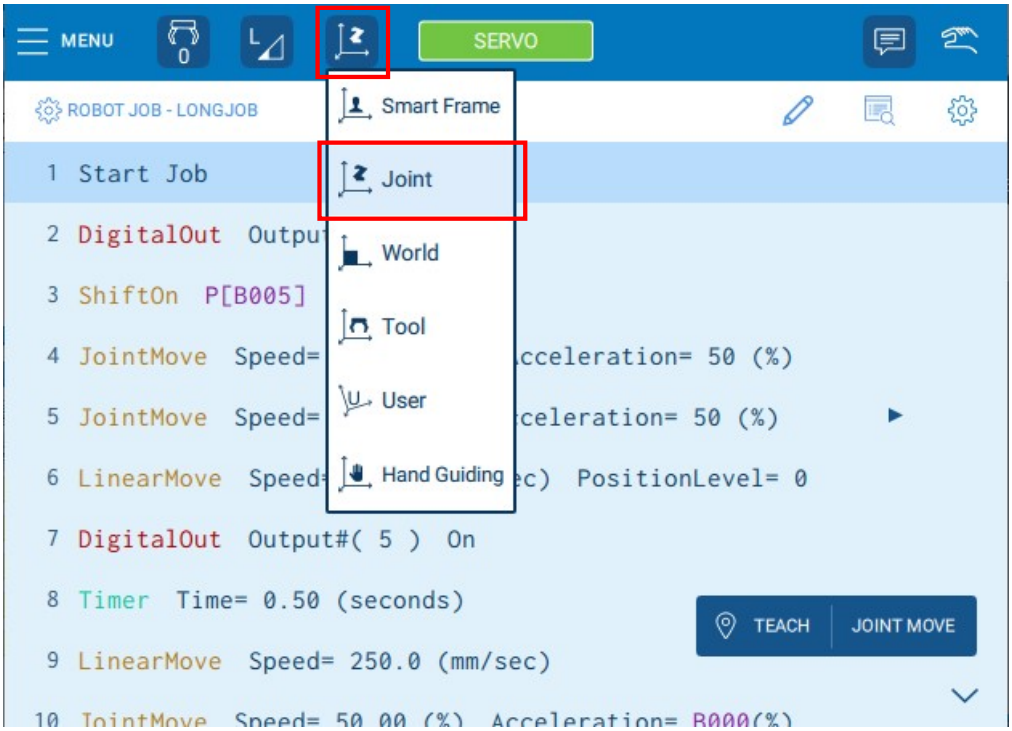
☞ *7.6 Enabling the Collaborative Operation Function on page 105*

2. **Change the mode switch to MANUAL (TEACH) mode, and set the operation mode to teach mode.**

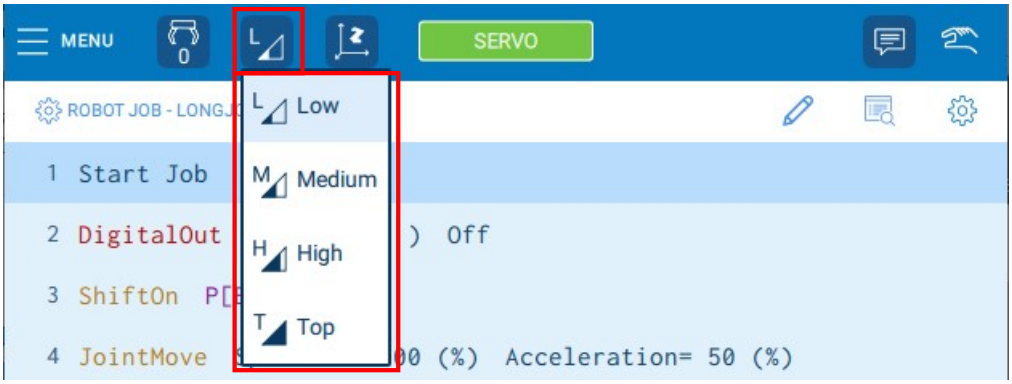
3. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

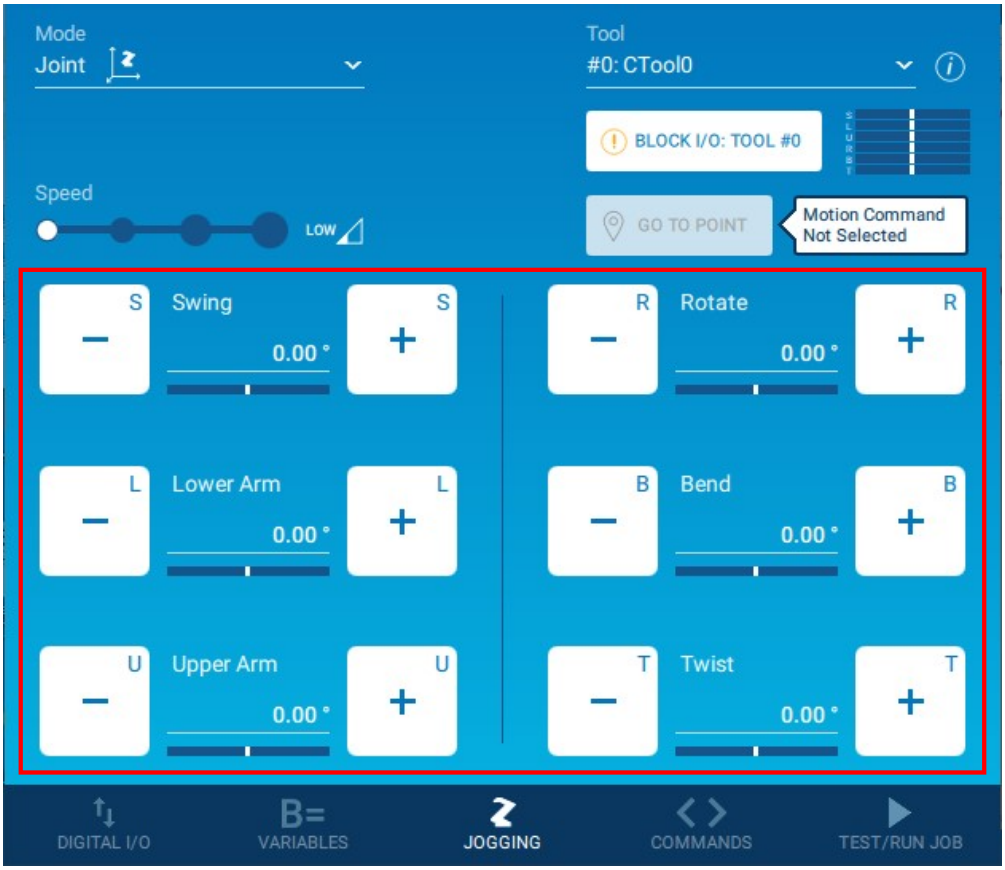
4. **Tap the operation mode icon on the status bar and select {Joint}.**

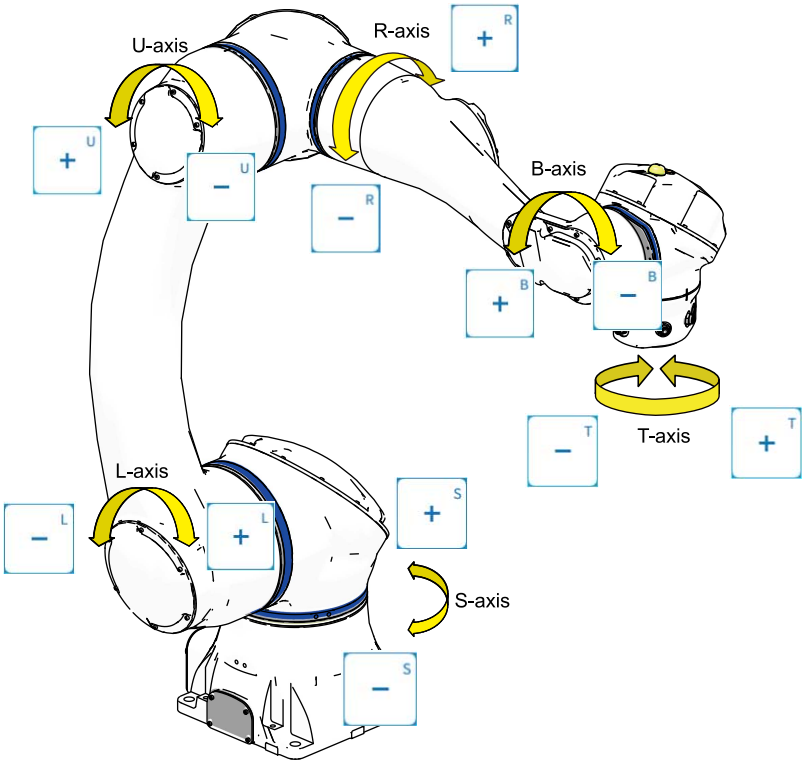


5. **Tap the operation speed icon on the status bar and select the operation speed.**



6. **Press the jog keys on the programming panel to move the manipulator.**



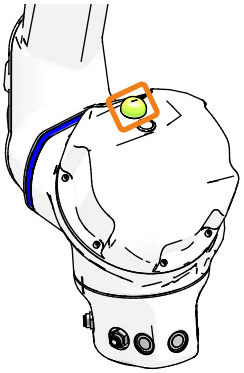


This concludes the procedure.

5.1.2 Jogging Parallel to the TCP

The tip of the manipulator moves in parallel to the X-axis, Y-axis, and Z-axis set for the manipulator base.
Use the following procedure to move the tip of the manipulator in the desired direction.

1. **Confirm that the collaborative operation lamp is lit in green.**



Information If the lamp is not lit, the collaborative operation function is disabled. Refer to the following section and enable the collaborative operation function.

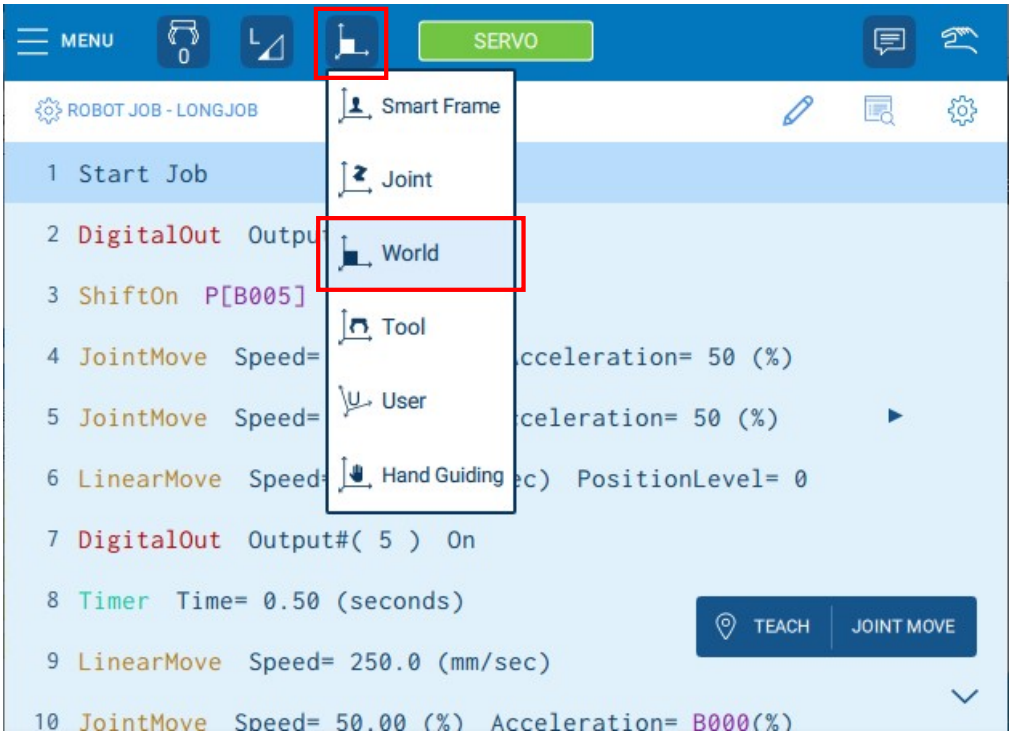
☞ *7.6 Enabling the Collaborative Operation Function on page 105*

2. **Change the mode switch to MANUAL (TEACH) mode, and set the operation mode to teach mode.**

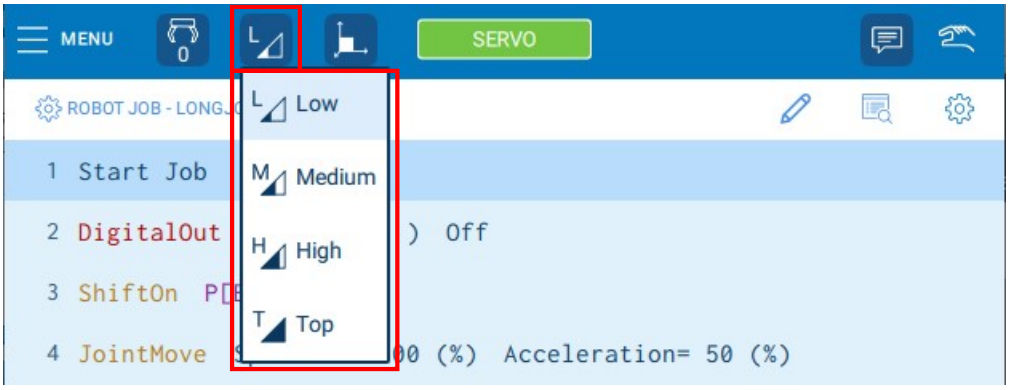
3. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

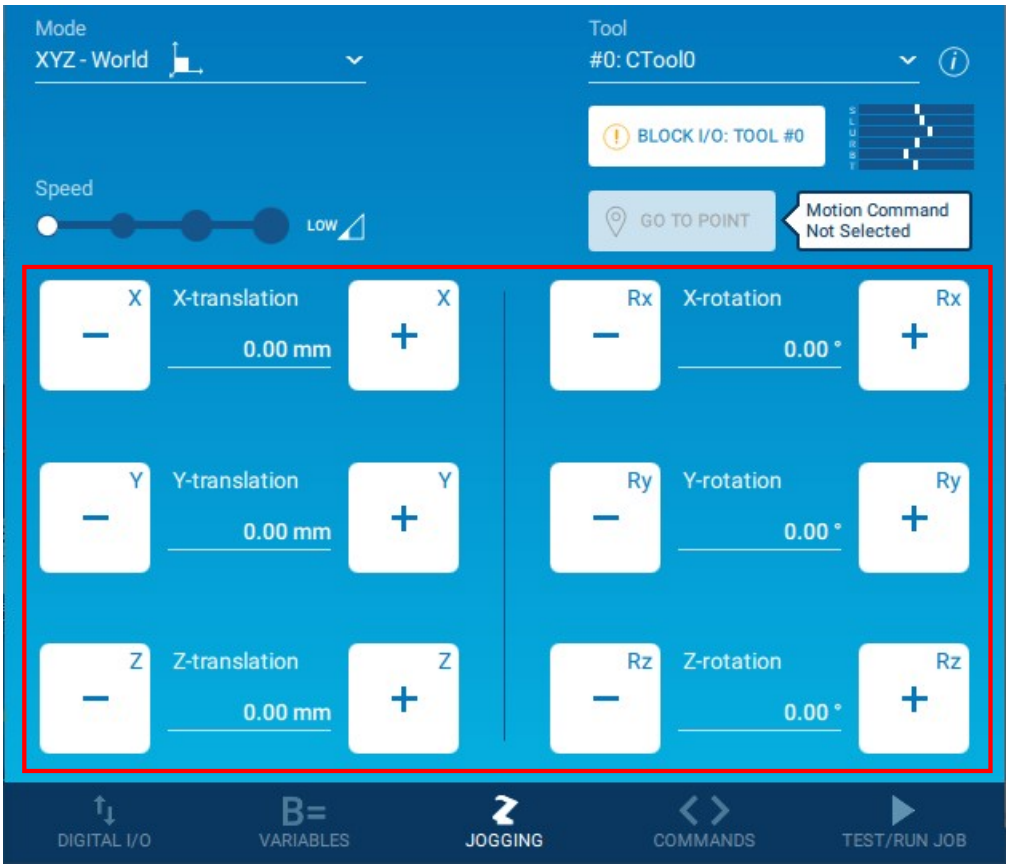
4. **Tap the operation mode icon on the status bar and select {World}.**



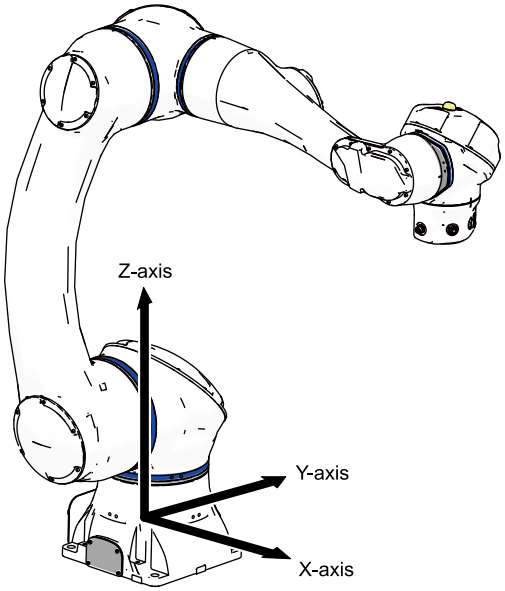
5. **Tap the operation speed icon on the status bar and select the operation speed.**



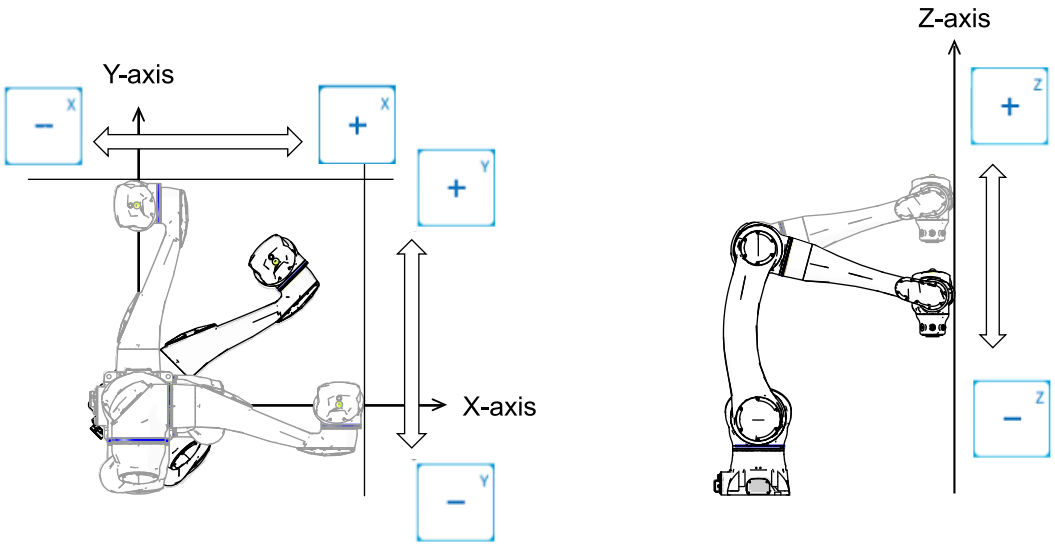
6. **Press the jog keys on the programming panel to move the manipulator.**



- X-Axis, Y-Axis, and Z-Axis Directions That Are Defined Based on the Manipulator



- Relationship between Smart Pendant Jog Keys and Manipulator Movement



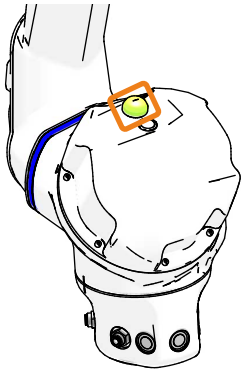
Information The illustration on the left is the view from directly above the manipulator.

This concludes the procedure.

5.1.3 Direct Teach

Hand guiding mode is the operation to manually move the manipulator to the desired position and store that position. For hand guiding mode, select {XYZ + TOOL}. The manipulator can be manually moved in the X, Y, and Z directions.

1. **Confirm that the collaborative operation lamp is lit in green.**



Information If the lamp is not lit, the collaborative operation function is disabled. Refer to the following section and enable the collaborative operation function.

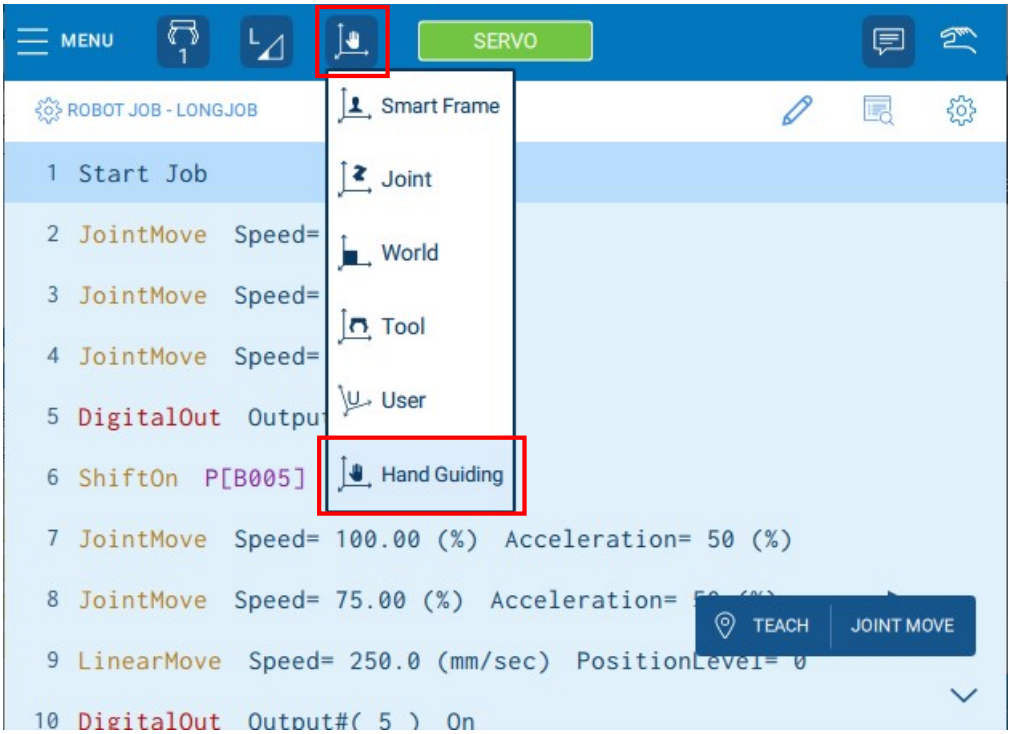
☞ *7.6 Enabling the Collaborative Operation Function on page 105*

2. **Change the mode switch to MANUAL (TEACH) mode, and set the operation mode to teach mode.**

3. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

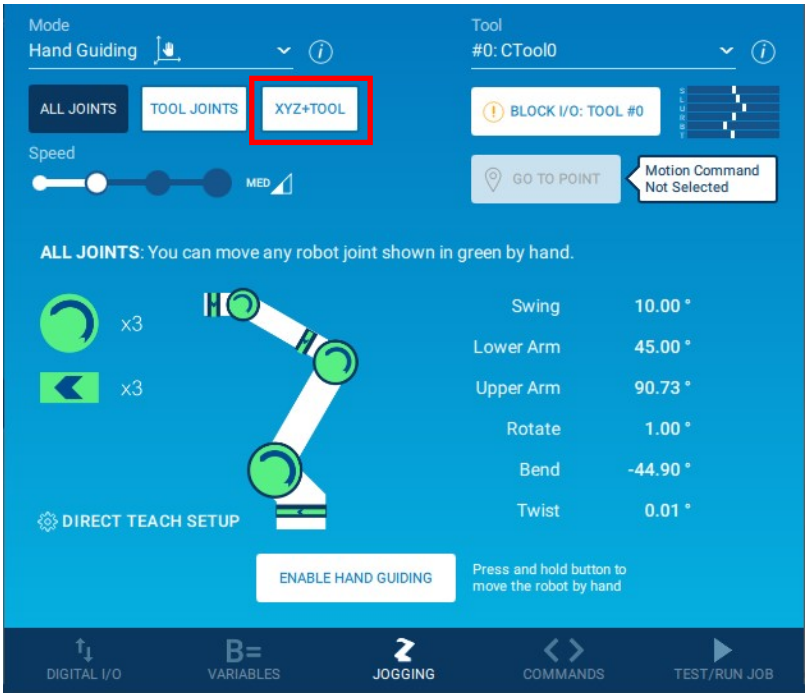
4. **Tap the operation mode icon on the status bar and select {Hand Guiding}.**



5. **If the operation speed is set to low speed, the following message will be displayed. Select {CHANGE TO HIGH SPEED}.**

Information If set to low speed, teaching precision will fall because a strong force will be required to manually move the manipulator. An alarm will occur if the manipulator is pushed too hard.

6. **Select {XYZ + TOOL}.**



7. **Confirm that the manipulator can be manually moved while the [MOVE] button on the manipulator is pressed.**

Information Refer to the following section for details on creating a program (registering a job).

☞ *8.2.1 Creating a Program on page 111*

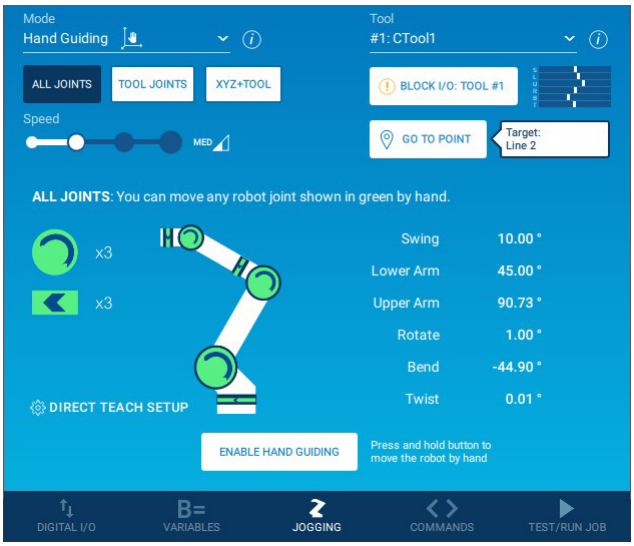
8. **While the [MOVE] button on the manipulator is pressed, manually move the arm of the manipulator to the location to be taught.**

Information If the arm speed feels fast, tap the [MOVE] button twice (double-click), and then move the arm when all three buttons are flashing. The arm will move slowly, and it will be easier to make fine adjustments because the feeling of arm coasting will be reduced.

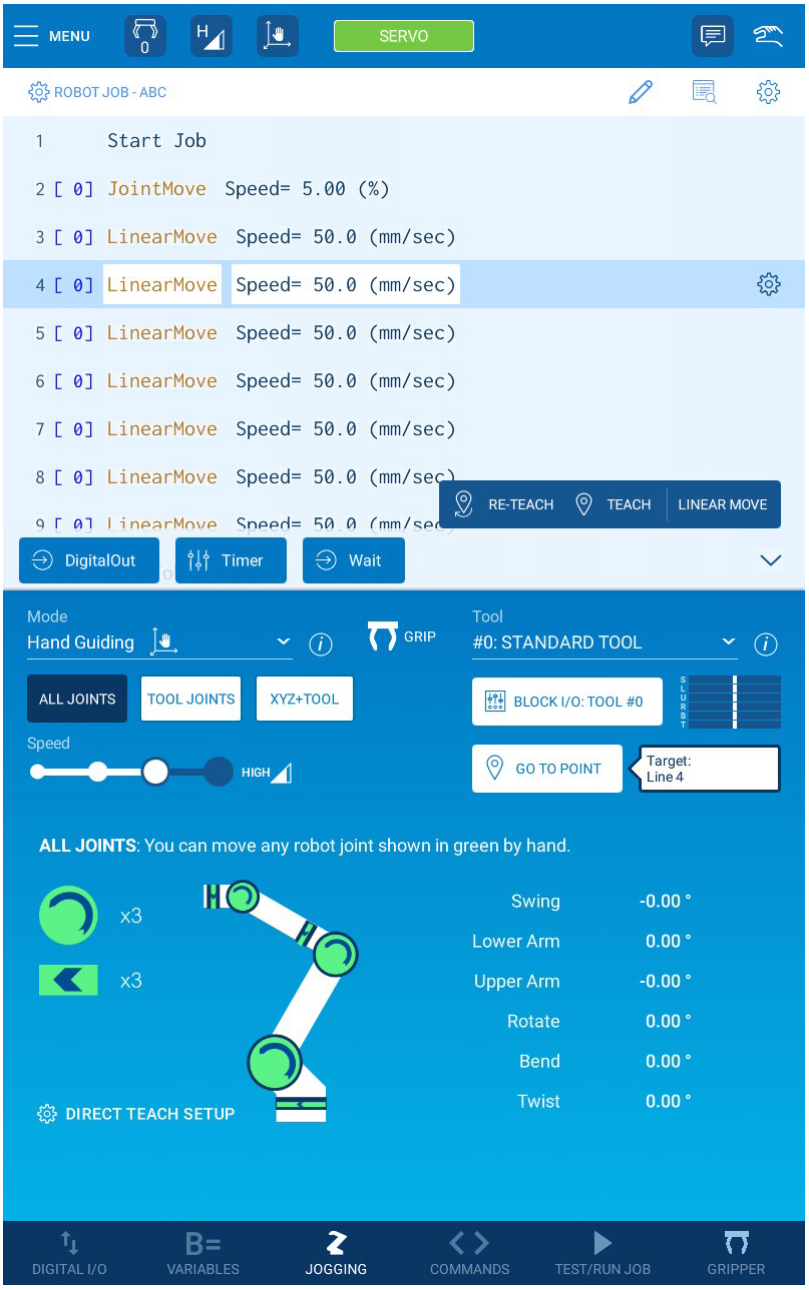
9. **Release the [MOVE] button on the manipulator.**

10. **Press the [TEACH] button on the manipulator.**

The position of the manipulator will be saved when the [TEACH] button is pressed.
Confirm that the saved content was inserted into the job program on the Smart Pendant.



11. **Return to step 8 and repeat the steps until the series of manipulator movements is completed.**



This concludes the procedure.

6

Mounting and Wiring the Hand

6.1 Required Items

This manual describes the required preparations and installation work for the manipulator based on the following hand.

- Area gripper FXCB for collaborative robots manufactured by Schmalz (type: ROB-SET-FXCB-3R18-O20-YASKAWA-HC-DTP)

Table 6.1 Hands and Hand Accessories

Name	Quantity	Remarks
Hand (area gripper FXCB)	1	–
Special cable	1	For connecting the hand to the manipulator

Table 6.2 Tools for Mounting the Hand

Name	Quantity	Remarks
Hexagon socket head cap screw M6 (length: 10 mm)	4	–

Table 6.3 Tools for Connecting the Air Hoses

Name	Quantity	Remarks
Union (for air inlet)	1	Air inlet on hand: M10 tapped hole
Union (for air outlet)	1	Air outlet on air supply equipment: Outside diameter 8
Air hose	1	–
Air supply equipment	1	–

Table 6.4 Tools for Connecting the I/O Cable

Name	Quantity	Remarks
General-purpose I/O terminal block	1	–
General-purpose I/O cable	1	–
I/O cable	1	–

Table 6.5 Tools

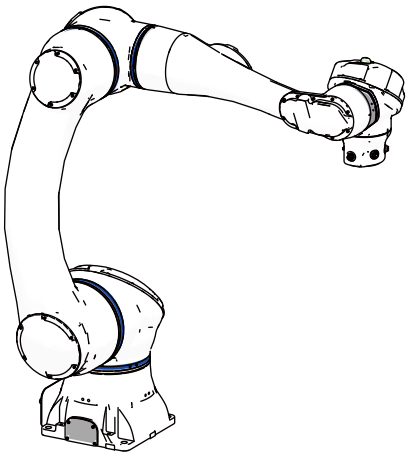
Name	Quantity	Remarks
Hex key (M6)	1	–

6.2 Mounting the Hand

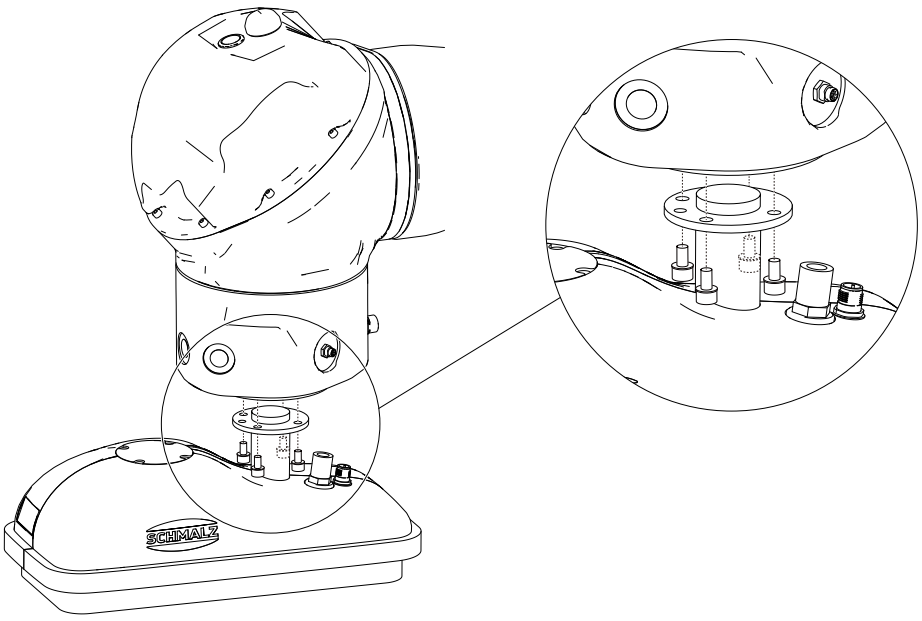
1. **Jog the robot arm to a position that makes it easier to mount the hand.**

   Refer to the following section for details on jogging.

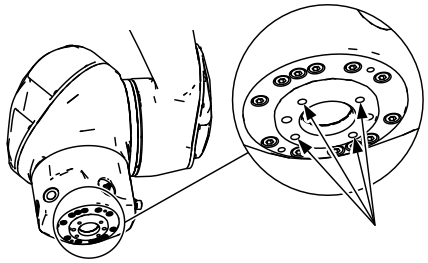
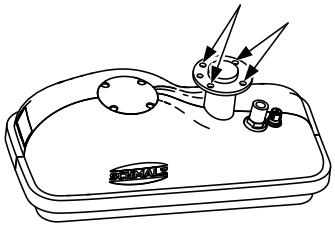
   ☞ *5.1.1 Jogging Each Axis on page 62*



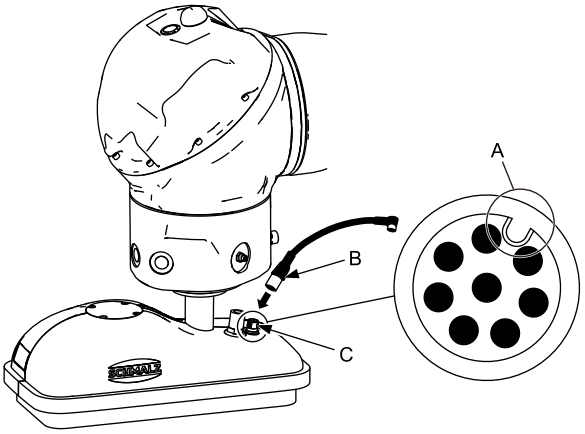
2. **Turn OFF the power supply to the robot controller and peripheral devices.**
3. **Confirm that the collaborative operation lamp on the manipulator are not lit.**
4. **Fix the mounting flange on the hand to the T-axis flange on the manipulator with the hexagon socket head cap screws M6 (length: 10 mm). Tightening torque: 13.7 N·m (1.40 kgf·m)**



The positions of the mounting holes are shown in the following table.

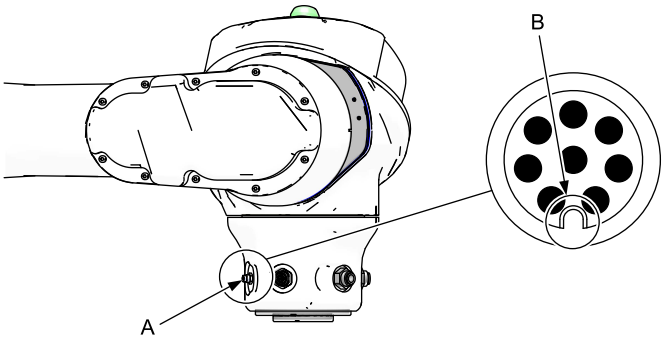
T-Axis Flange Surface on Manipulator (4 Places)	Mounting Flange on Hand (4 Places)
	

5. **Connect the special cable to the hand. Connect the cable connectors by first checking that the positioning key is aligned for both the hand-side and cable-side connectors.**



A	Positioning key on hand-side connector	C	Connector for cable connection
B	Special cable (M12 connector side)	–	–

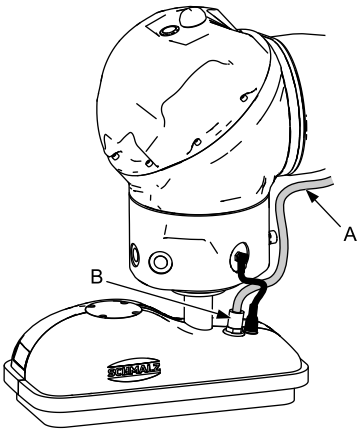
6. **Connect the cable to the manipulator. Connect the M8 connector on the special cable for the hand to the I/O cable connector (S) on the manipulator. Connect the cable connectors by first checking that the positioning key is aligned for both the manipulator-side and cable-side connectors.**



A	I/O cable connector (S)	B	Positioning key

7. **Connect the union to the air inlet on the hand, and connect the air hose.**

Note:
The union is not provided by YASKAWA.



A	Air hose	B	Air inlet on hand

8. **Connect the union to the air outlet on the air supply equipment, and connect the air hose.**

Note:

The union is not provided by YASKAWA.

Important

Normally, connecting the air hose to the air outlet on the manipulator wrist flange is recommended. For the following hand, however, the upper limit on the pressure of the air hose inside the manipulator falls below the allowable range of the supply air pressure for the hand.

"Area gripper FXCB for collaborative robots manufactured by Schmalz (type: ROB-SET-FXCB-3R18-O20-YASKAWA-HC-DTP)"

When the above hand is used, do not connect the air hose to the air outlet on the manipulator wrist flange; instead, connect the air hose from the air inlet on the hand directly to the air supply equipment.

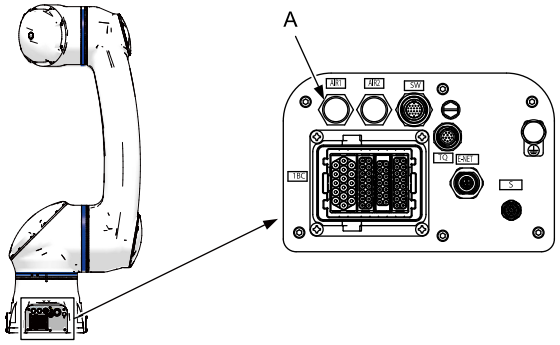
Information Refer to the manual that is included with the end effector for details on the air to supply (the necessary air flow rate, the types of supported air, and the precautions on the supply method).

6.3 Connecting the Air Hose

This section describes the method to connect the air hose inside the manipulator.

The customer must prepare the air supply source, unions, and air hoses for driving the hand.

1. **Remove the plug in the AIR1 inlet on the S-base part of the manipulator, and then connect the union.**



A	AIR1 inlet	-	-

2. **Connect the air hose to the union.**
3. **Connect the air hose to the air supply equipment.**

6.4 Connecting the I/O Cables

To perform the hand suction ON/OFF operation, the manipulator and the robot controller must be connected through the general-purpose I/O terminal block. Use the following connection example as a reference.

Note:

The connection example in this manual assumes the robot controller I/O is the NPN type (standard specification).

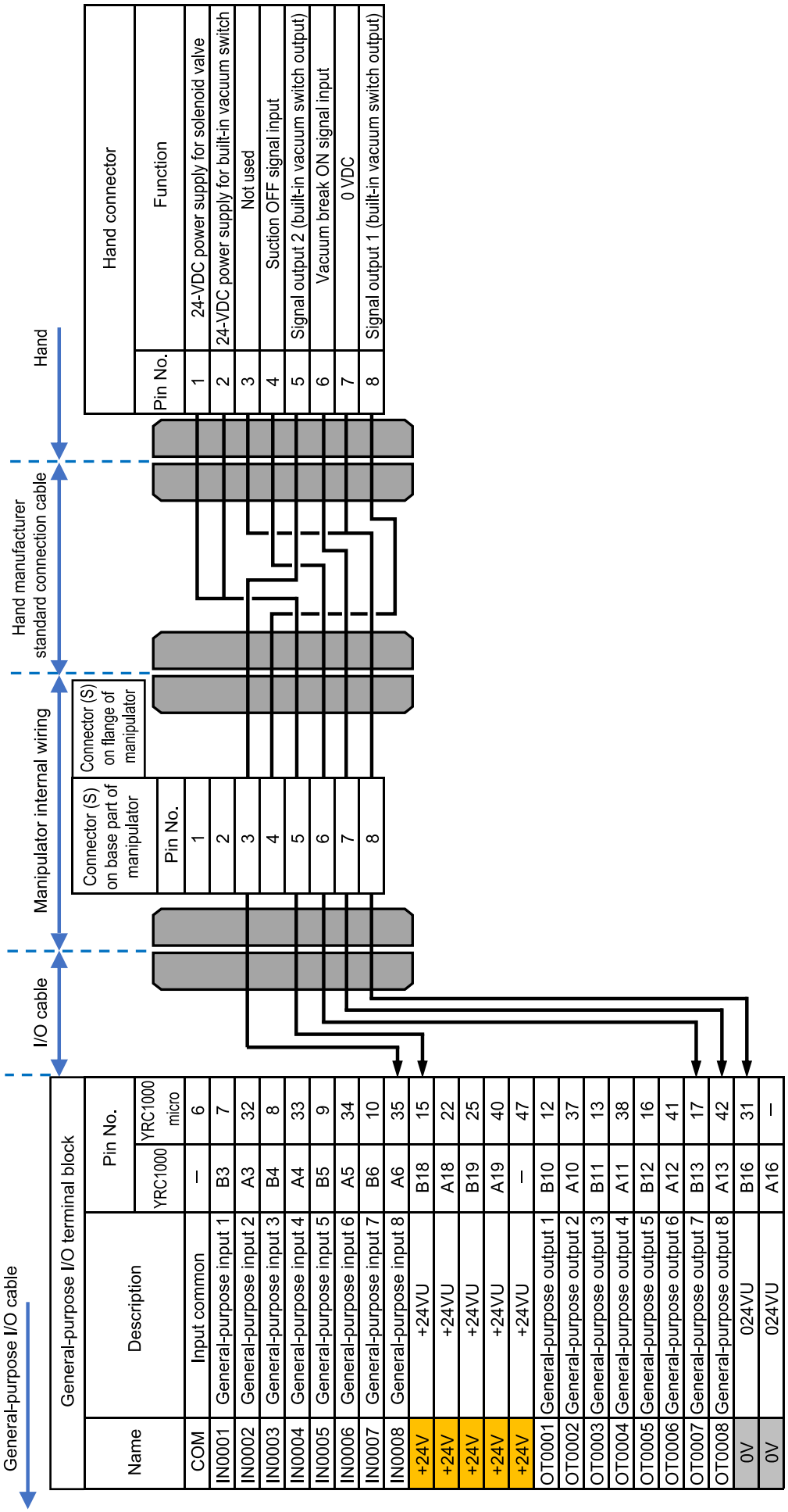
Important

The customer must prepare the following connections:

- Connecting the I/O cable to the general-purpose I/O terminal block
- Connecting the general-purpose I/O terminal block to the connector for the I/O cable on the S-base part of the manipulator

Information

Refer to the manual that is included with the end effector for the suction ON/OFF operation using simulated output for I/O from the pendant.


General-purpose I/O cable
General-purpose I/O terminal block
I/O cable
Manipulator internal wiring
Hand manufacturer standard connection cable
Hand
Connector (S) on base part of manipulator
Connector (S) on flange of manipulator
Hand connector
Name
Description
Pin No.
YRC1000
YRC1000 micro
Pin No.
Function
COM Input common — 6
IN0001 General-purpose input 1 B3 7 1 24-VDC power supply for solenoid valve
IN0002 General-purpose input 2 A3 32 2 24-VDC power supply for built-in vacuum switch
IN0003 General-purpose input 3 B4 8 3 Not used
IN0004 General-purpose input 4 A4 33 4 Suction OFF signal input
IN0005 General-purpose input 5 B5 9 5 Signal output 2 (built-in vacuum switch output)
IN0006 General-purpose input 6 A5 34 6 Vacuum break ON signal input
IN0007 General-purpose input 7 B6 10 7 0 VDC
IN0008 General-purpose input 8 A6 35 8 Signal output 1 (built-in vacuum switch output)
+24V +24VU B18 15
+24V +24VU A18 22
+24V +24VU B19 25
+24V +24VU A19 40
+24V +24VU — 47
OT0001 General-purpose output 1 B10 12
OT0002 General-purpose output 2 A10 37
OT0003 General-purpose output 3 B11 13
OT0004 General-purpose output 4 A11 38
OT0005 General-purpose output 5 B12 16
OT0006 General-purpose output 6 A12 41
OT0007 General-purpose output 7 B13 17
OT0008 General-purpose output 8 A13 42
0V 024VU B16 31
0V 024VU A16 —

7

Settings

This chapter describes the configuration procedures for the settings of the collaborative robot.

7.1 Temporarily Disabling the Collaborative Operation Function

The collaborative operation function must be disabled to temporarily disable external force monitoring and speed limits by collaborative operation.

⚠ WARNING

There is a risk of injury to the operator when the PFL function is disabled. Perform this operation only after a thorough risk assessment has been conducted.

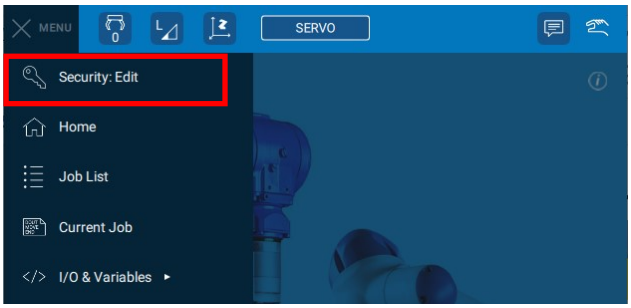
When collaborative operation is disabled, the stop function when contact is made by PFL function and the escape from clamping function are also disabled. Always enable the collaborative operation function after the following settings are changed.

- **Tool settings**
- **Torque sensor home position**
- **Speed limit**
- **External force limits**

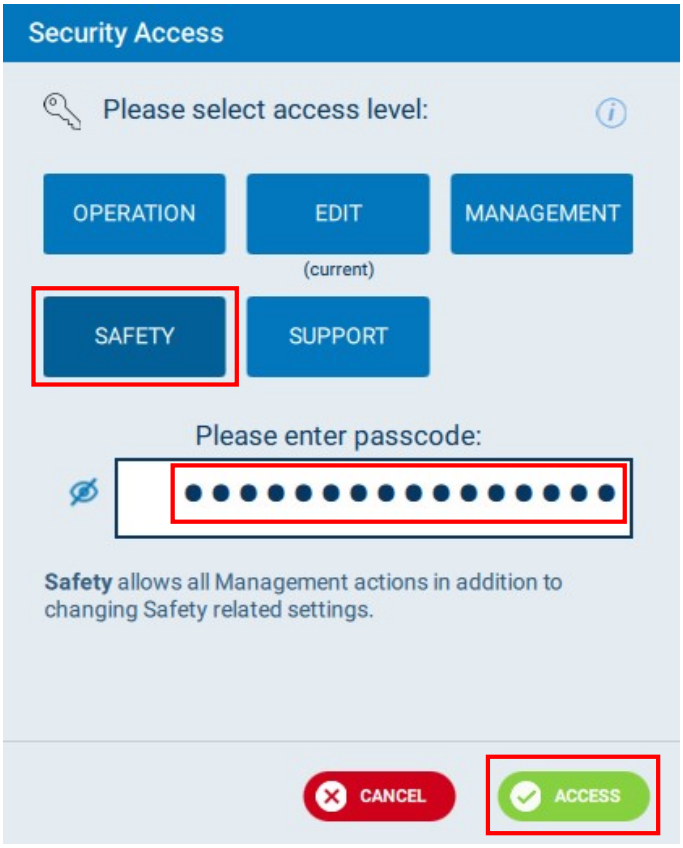
Use the following procedure to disable the collaborative operation function.

Information Alarm 6003 "UNDEFINED SPEED LIMIT(PFL)" may be displayed during the procedure. The alarm can be reset by tapping {RESET} on the alarm window.

1. **From the status bar, select {MENU} - {Security: Edit}.**



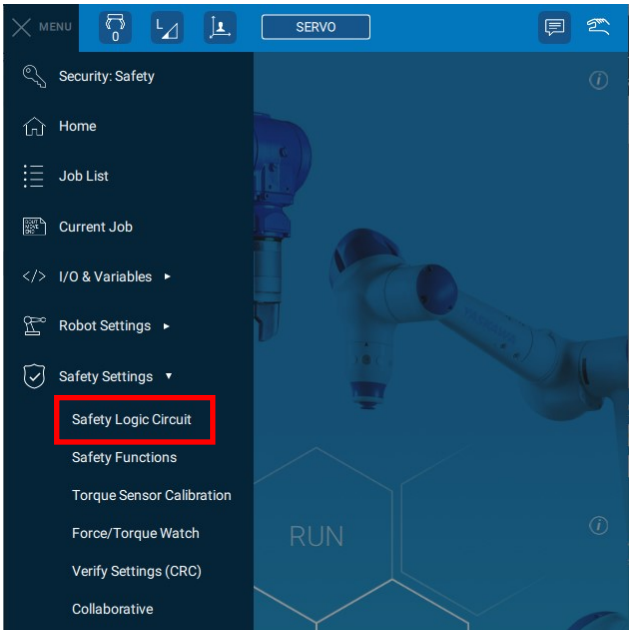
2. **On the Security Access window, select {SAFETY}.**



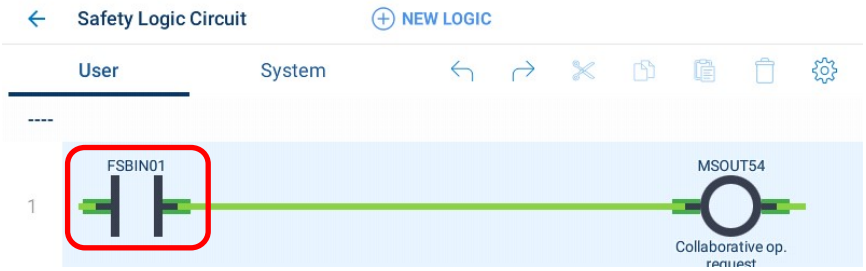
3. **Enter the password and select {ACCESS}.**

Note:
The default password is set to "5555555555555555" (enter "5" 16 times).

4. **Select {MENU} - {Safety Settings} - {Safety Logic Circuit}.**



5. **Find the line on which the output (right side of the window) is set to "MSOUT54 (Collaborative op. request)". (Found on the first line of the user circuits in the default state.)**



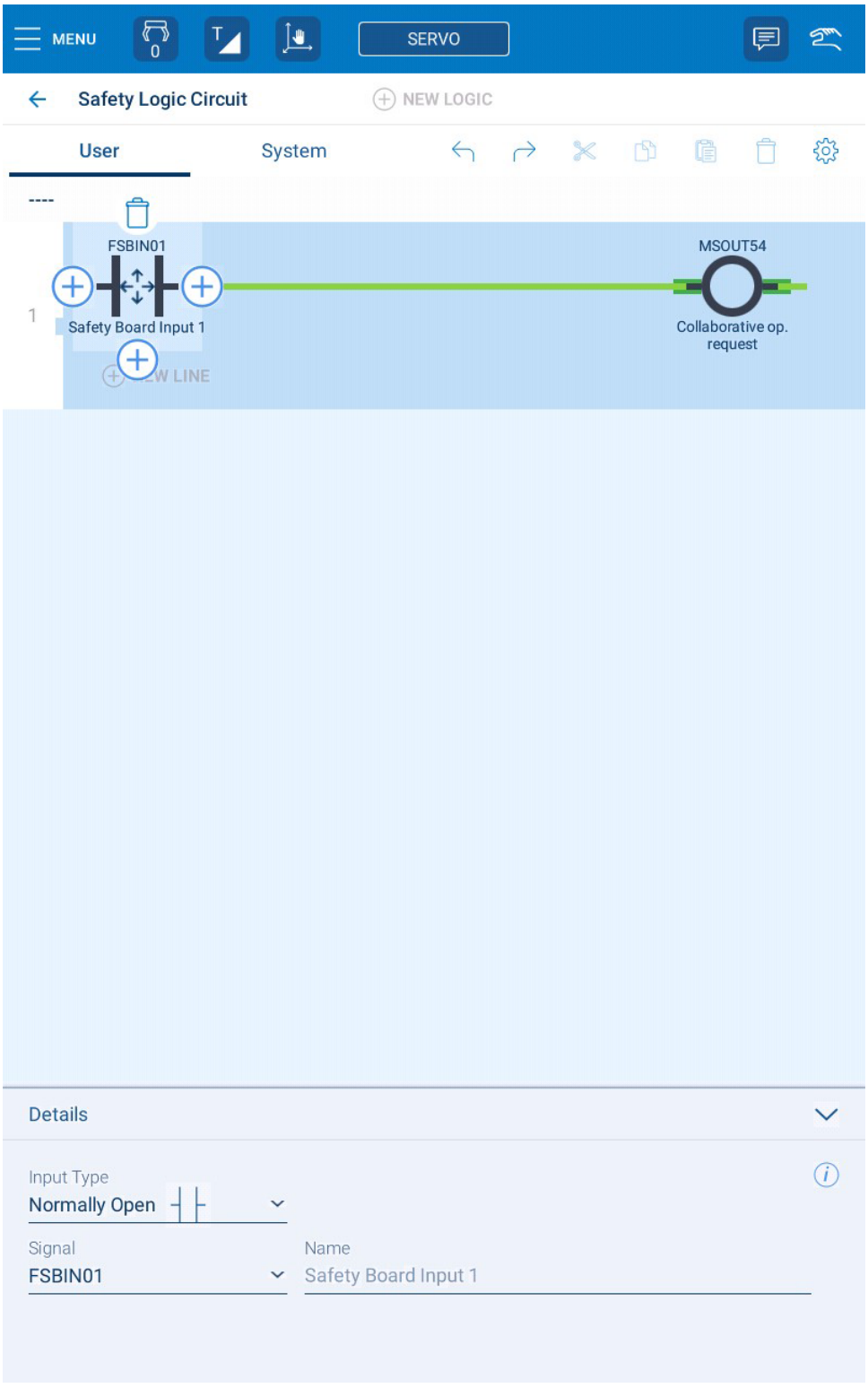
Refer to the following manual for details on the setting procedure for the safety logic circuit.

YRC1000/YRC1000micro Instructions for Smart Pendant (Manual. No.: HW1485509)

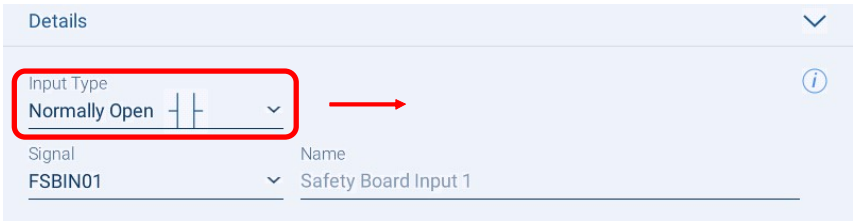
Signal Name	Description
MS-OUT54	Enables and disables collaborative operation • ON: Collaborative operation enabled • OFF: Collaborative operation disabled

6. **Tap the contact at the left edge of the relevant line (default state: FSBIN01).**

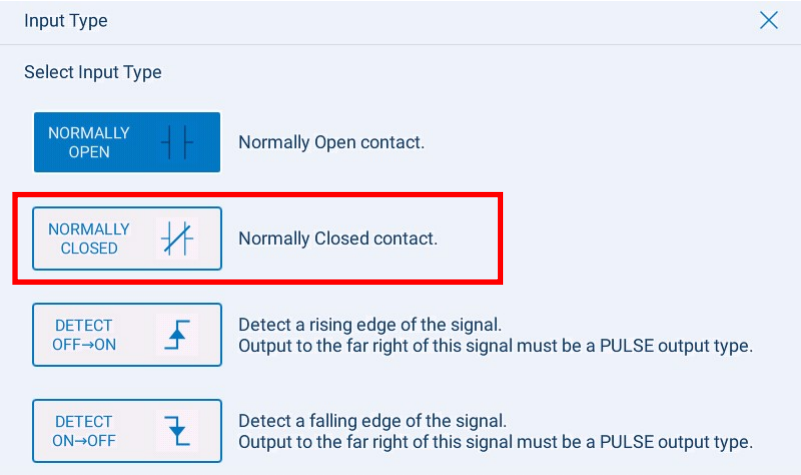
The selected contact will be displayed as follows, and the Details pane will be displayed at the bottom of the window.



7. **Tap {Input Type}.**

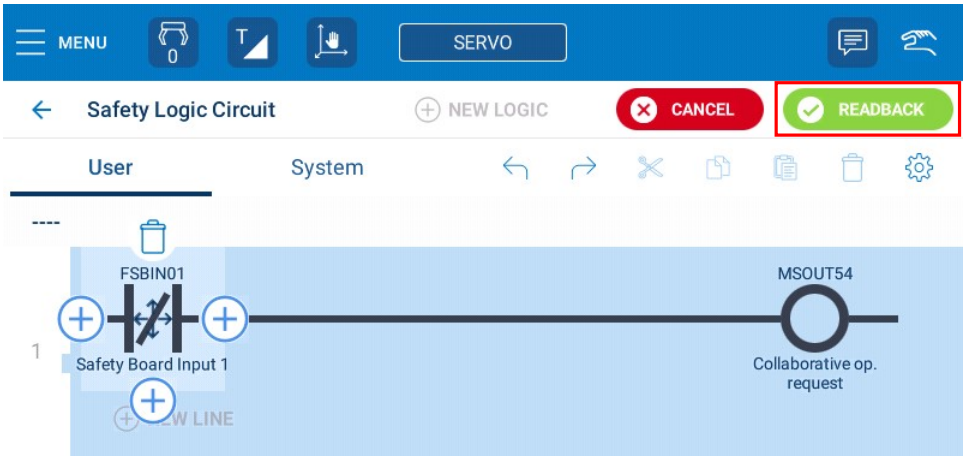


8. **Select {Normally Closed contact}.**

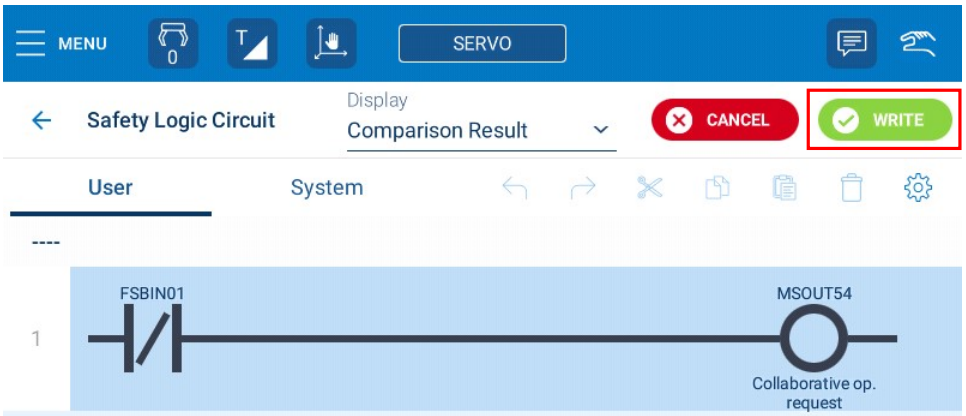


9. **Confirm that the MSOUT54 collaborative operation request signal is OFF.**

10. **Confirm that there are no mistakes in the safety logic circuit, and then tap {READBACK}.**



11. **Tap {WRITE}.**

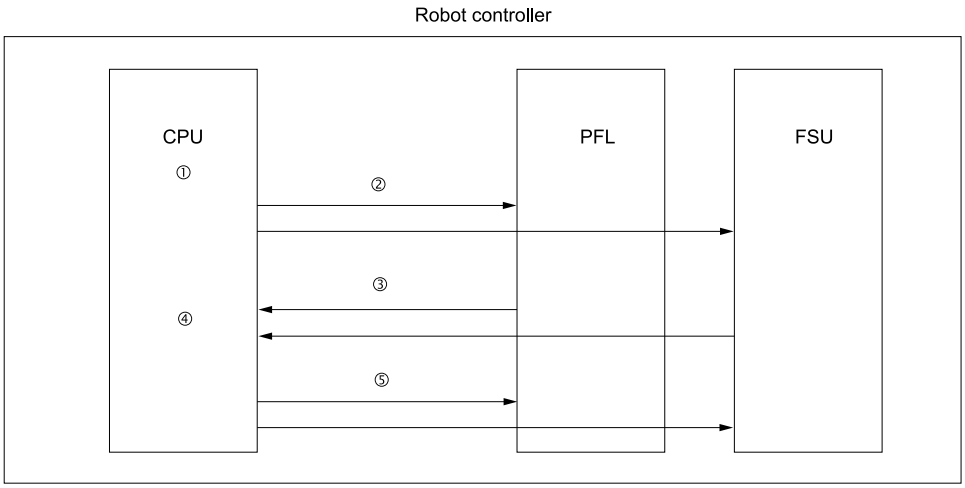


Term

Readback

Readback is the operation used to check if the data that was configured in the safety circuit board and PFL circuit board is correct.

Data related to safety functions is redundantly stored in the memory on the safety circuit board and PFL circuit board. The readback operation is required when data is changed on windows such as the safety function condition setting windows and tool windows.



PFL: PFL circuit board
FSU: Functional safety circuit board

①: A setting value is changed with the pendant.

②: The setting value is transferred to the PFL and FSU.

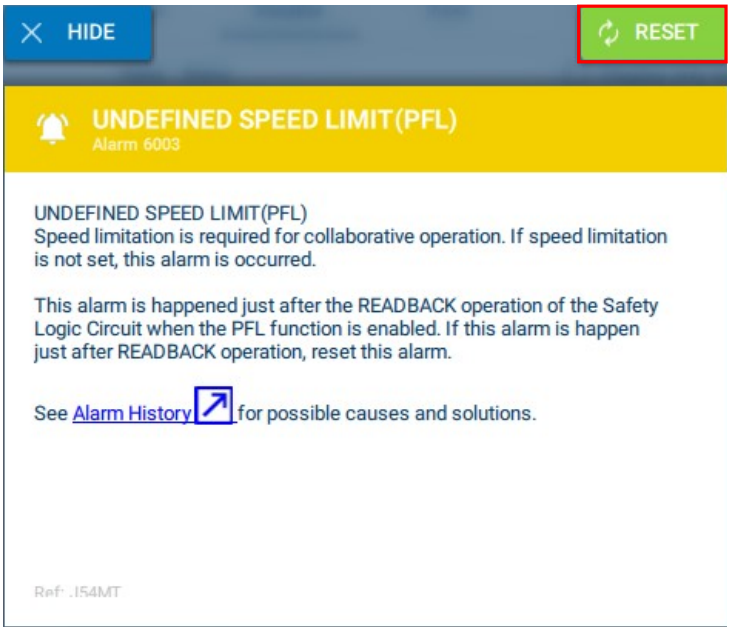
③: Answer data is sent from the PFL and FSU to the CPU (readback).

④: The CPU value and answer data value are compared.

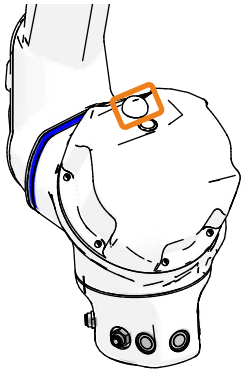
⑤: The setting value that was sent from the CPU is stored in the PFL and FSU.

Important

Alarm 6003 "UNDEFINED SPEED LIMIT(PFL)" may be displayed. Tap {RESET} to reset the alarm.



12. **MSOUT54 will be disabled, and the PFL function will be disabled. The collaborative operation lamp on the manipulator will go out.**



This concludes the procedure.

7.2 Configuring a Tool File

In collaborative operation mode, the external force is calculated by canceling the tool mass. For this reason, the tool installed on the manipulator and the mass and position of the center of gravity of the workpiece to transport must be configured in advance. The configured content is managed by selection number.

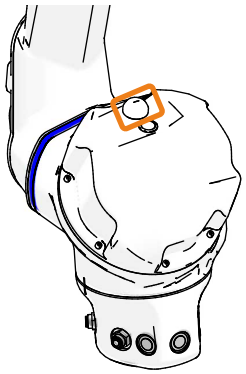
The tool selection number must also be changed at each step of the manipulator program in accordance with changes in the status of the hand.

Example: When Lifting a Workpiece on a Table by Applying Suction with the Hand

- When the workpiece is not grasped, the tool mass is the mass of the hand only.
- When the workpiece is grasped and lifted, the tool mass is the mass of the hand and workpiece.

Use the following procedure to configure a tool file.

1. **Confirm that the collaborative operation lamp is not lit.**



If the collaborative operation lamp is lit, the collaborative operation function is enabled. Refer to the following section for the operating procedure to disable the function.

☞ *7.1 Temporarily Disabling the Collaborative Operation Function on page 82*

Information: Always disable the collaborative operation function before continuing with the rest of this procedure. The subsequent operations may not correctly function if the collaborative operation function is enabled.

2. **Select {MENU} - {Robot Settings} - {Tools}.**
3. **Select tool number {0} with the cursor.**

The Tool Detail Panel for tool number {0} will be displayed.

Information: Data can be set in a maximum of 64 tool files. Information can be freely set in any tool file. Tool coordinates number 0 is selected here to make the procedure easier to understand.

Tools — Display only named

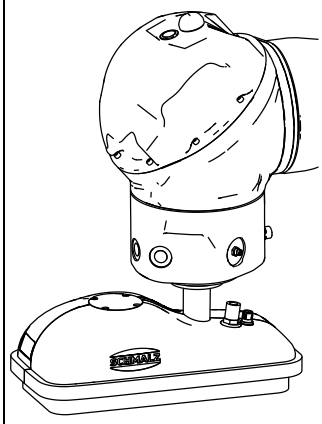
Tool No. ▲	Tool Name	Weight	Block I/O Name
0	STANDARD TOOL	0.001	-
1	-	0.000	-
2	-	0.000	-
3	-	0.000	-

4. **Enter the hand tool information.**

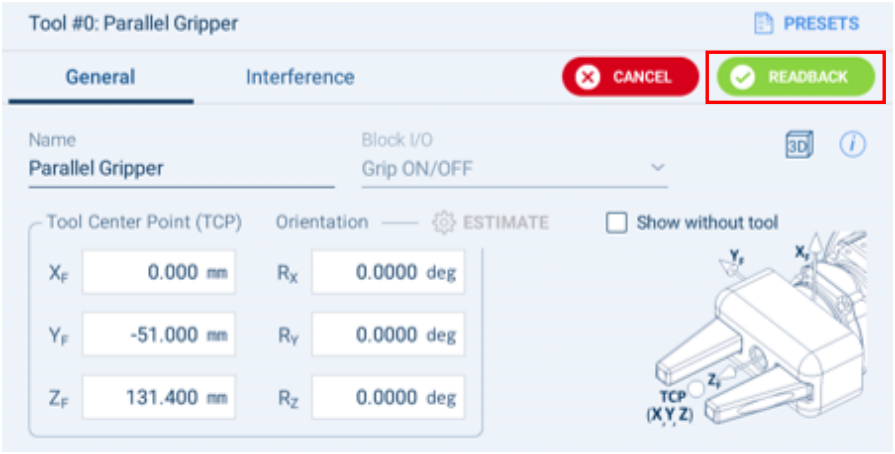
Important: Enter the appropriate set values in the tool file according to the mounting direction and angle of the hand.

This example shows the set values in the tool file for when the following hand is mounted in the direction shown in the figure.

"Area gripper FXCB for collaborative robots manufactured by Schmalz (type: ROB-SET-FXCB-3R18-O20-YASKAWA-HC-DTP)"

Hand Direction	Set Values in Tool File
	

5. **Tap {READBACK}.**



6. **Check the readback results.**

   Note:

   If the data is the same between the robot controller CPU and circuit board, the configuration was correctly completed. If the data is not the same, {Comparison Result} will display "***" instead of a value. In this case, what data was not updated on which circuit board must be checked.

7. **Tap {WRITE}.**

   The settings data will be registered in the tool file.

   This concludes only the procedure to register the information for the hand in tool coordinates number 00.

   Next, register the information for the hand and workpiece when the workpiece is grasped and lifted in tool coordinates number 01.

   Proceed to the next step.

8. **Select tool number 1.**

9. **Enter the tool information for the hand and the workpiece for when the hand grasps and lifts the workpiece.**

   Register the tool file with the hand grasping and lifting the workpiece in tool number 01.

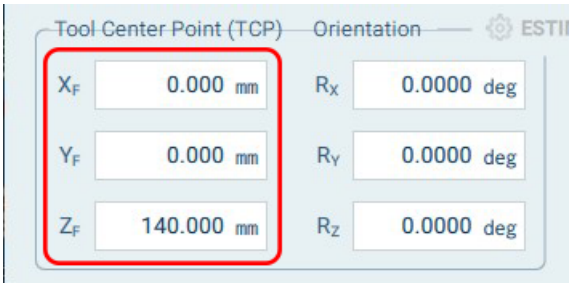
This concludes the procedure.

Term

Tool Center Point (TCP)

The tool center point is the offset position from the wrist flange of the tool to the tip of the tool. For a simple tool, this is the offset in the X/Y/Z directions only. If necessary, a rotational offset can also be set.

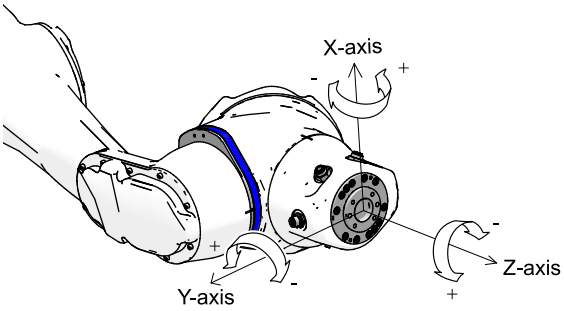
When the tool center point is set, the manipulator can be operated in an orthogonal direction with the correct position set as the center point. Positions can also be taught with the correct offset from the manipulator base.



Term

Orientation of Tool Tip

The orientation of the tool tip is the amount of TCP rotation from the wrist flange of the tool. Tool rotation is entered in degrees.



7.3 Checking the Home Positions of the Torque Sensors and Setting the Home Positions Again

The torque sensors built into the manipulator require regular inspections because deviations in the measured values will occur when the environment changes or the manipulator is mistakenly used, such as when the manipulator accidentally collides with something.

Information

Keeping a continuous record of the current torque values is recommended after the manipulator is installed. When the user changes the system (e.g., changes the tool), move the manipulator to the same posture each time, and record the current values of {Joint Data} on the Force/Torque Watch window. The user can compare this recorded data to the current values.

The following four conditions must be met when the allowable values and current values of torque are compared.

- The tool number matches the currently installed tool.
- The tool information is correct.
- When checking torque values, the values are recorded when the robot is set to the same posture (e.g., home position posture) each time.
- The current values of {Joint Data} do not exceed the values listed below.

If the values of the axes are larger than the torque values listed in the following table, adjust the torque sensors.

If values exceed the values in the following table, the external force estimation will be greatly affected. For this reason, adjusting the torque sensor for the relevant axis is highly recommended.

Axis	S	L	U	R	B	T
Torque Value	72.0 N·m	96.0 N·m	48.0 N·m	27.0 N·m	12.0 N·m	12.0 N·m

⚠ CAUTION

Even if the torque by external force is lower than the values given in the table above, adjust the torque sensors when there is a problem with the operation of the PFL function or escape from clamping function.

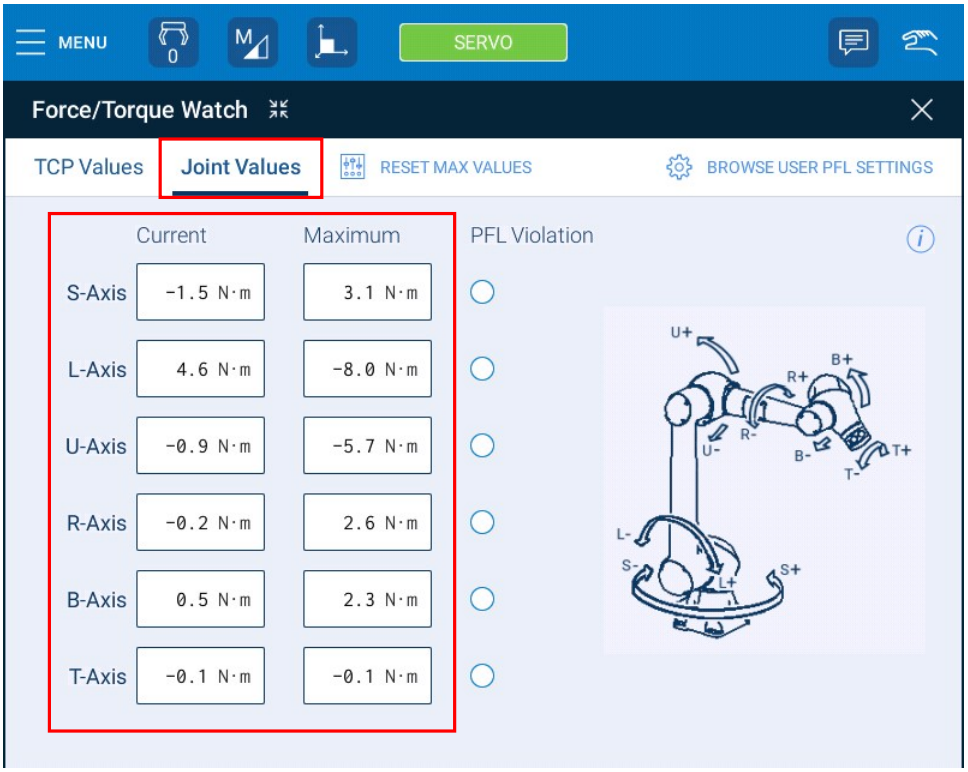
7.3.1 Checking the Home Positions of the Torque Sensors

To check the status of the torque sensors, regularly open the Force/Torque Watch window with the manipulator set to the same posture and with the same load, record the torque values by external force of each axis, and check if the difference between the values is growing larger from when the manipulator first started being used.

Use the following procedure to check the values.

1. **Select {MENU} - {Safety Settings} - {Force/Torque Watch}.**

2. **Tap {Joint Values} and check the torque values by external force of each axis.**



3. **Compare the current values to the values when the manipulator first started being used and check if the difference between the values is growing larger.**

Information Recording these values each day is recommended because these values must be checked regularly.

This concludes the procedure.

If the values exceed the thresholds as a result of the comparison, adjust the torque sensors according to the following procedure.

7.3.2 Setting the Home Positions of the Torque Sensors Again

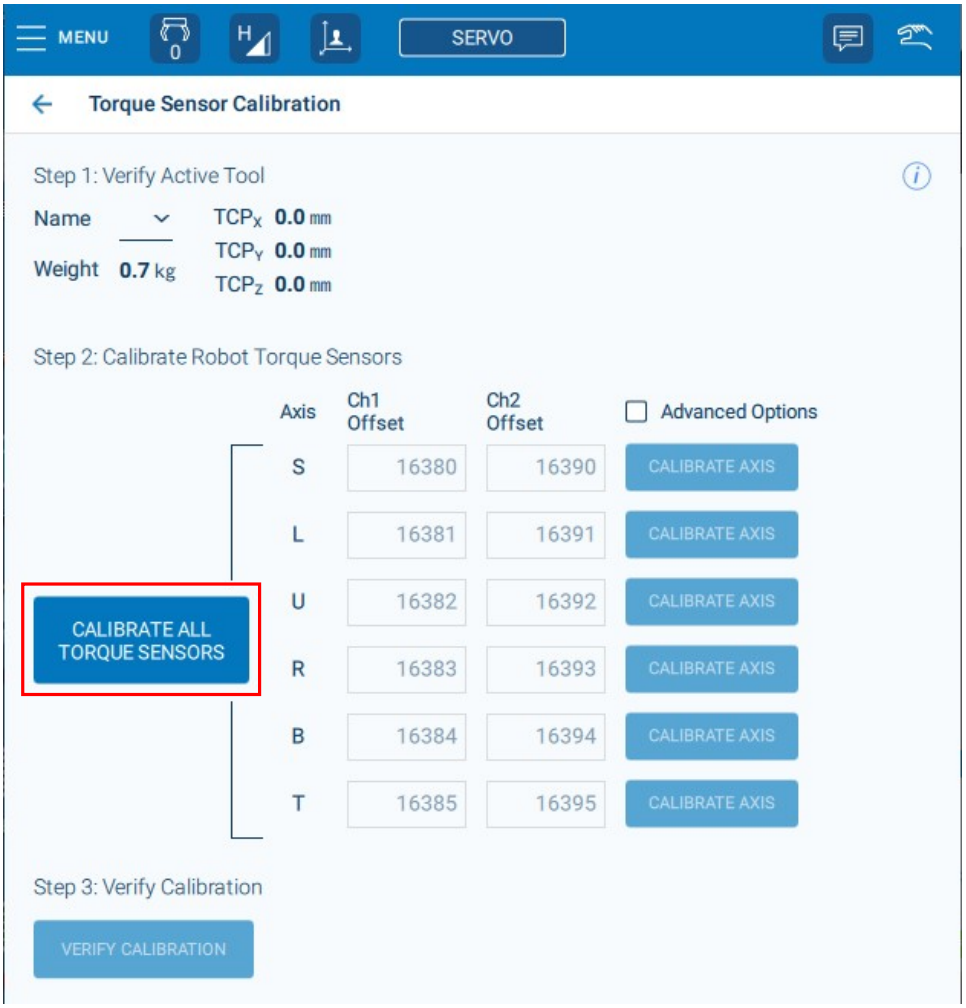
If the home positions of the torque sensors are checked and the threshold values were exceeded, the home positions of the torque sensors must be set again. Use the following procedure.

1. **Tap the tool icon and select tool #0.**

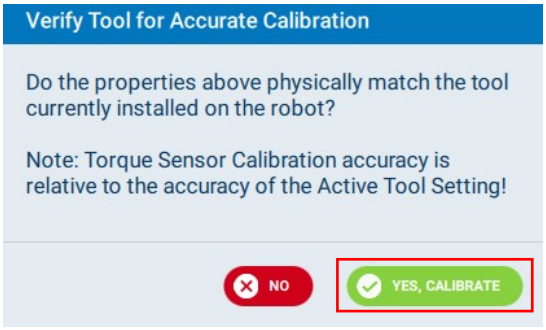
Information Select the tool file for the tool that is currently installed. In this example, number 0 is selected because the tool file for the currently installed tool is set to tool number 0.

2. **Select {MENU} - {Safety Settings} - {Torque Sensor Calibration}.**

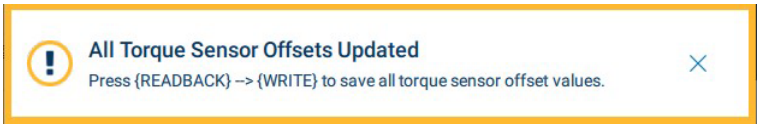
3. **Tap {CALIBRATE ALL TORQUE SENSORS}.**



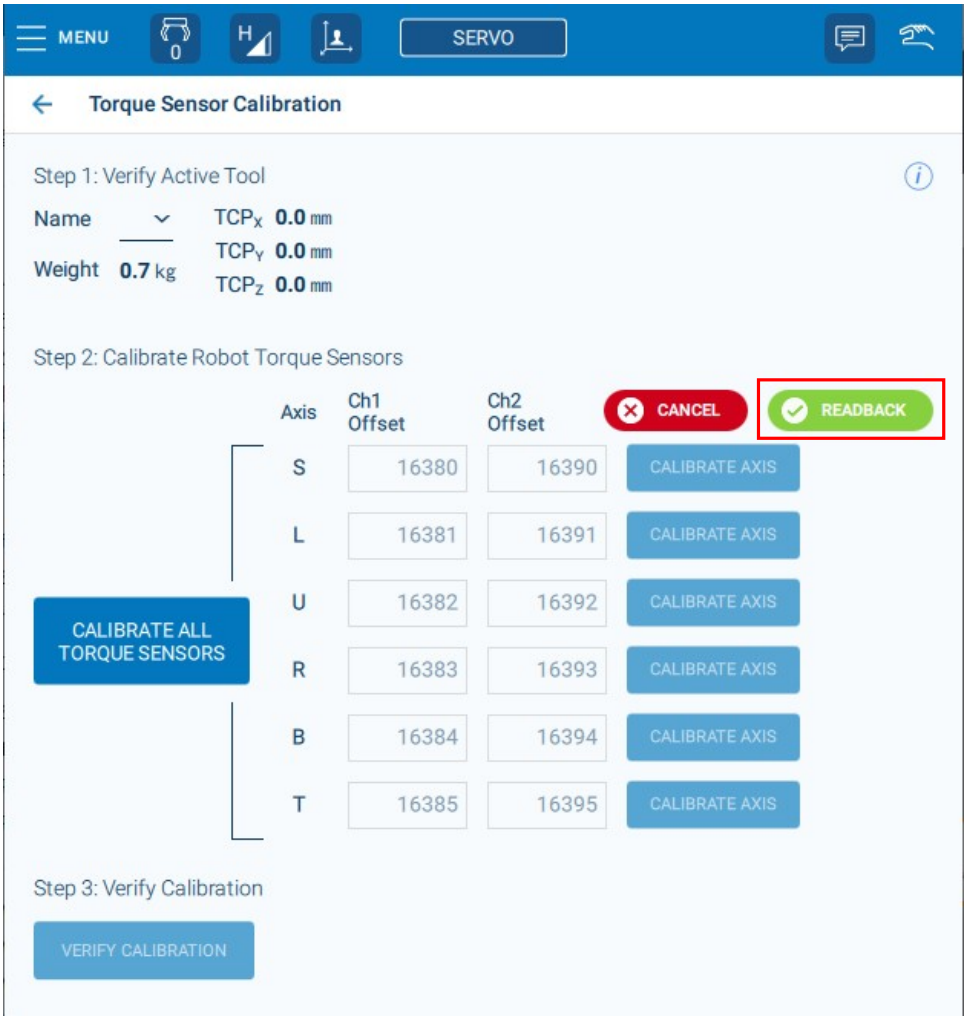
4. **When the following message is displayed, select {YES, CALIBRATE}.**



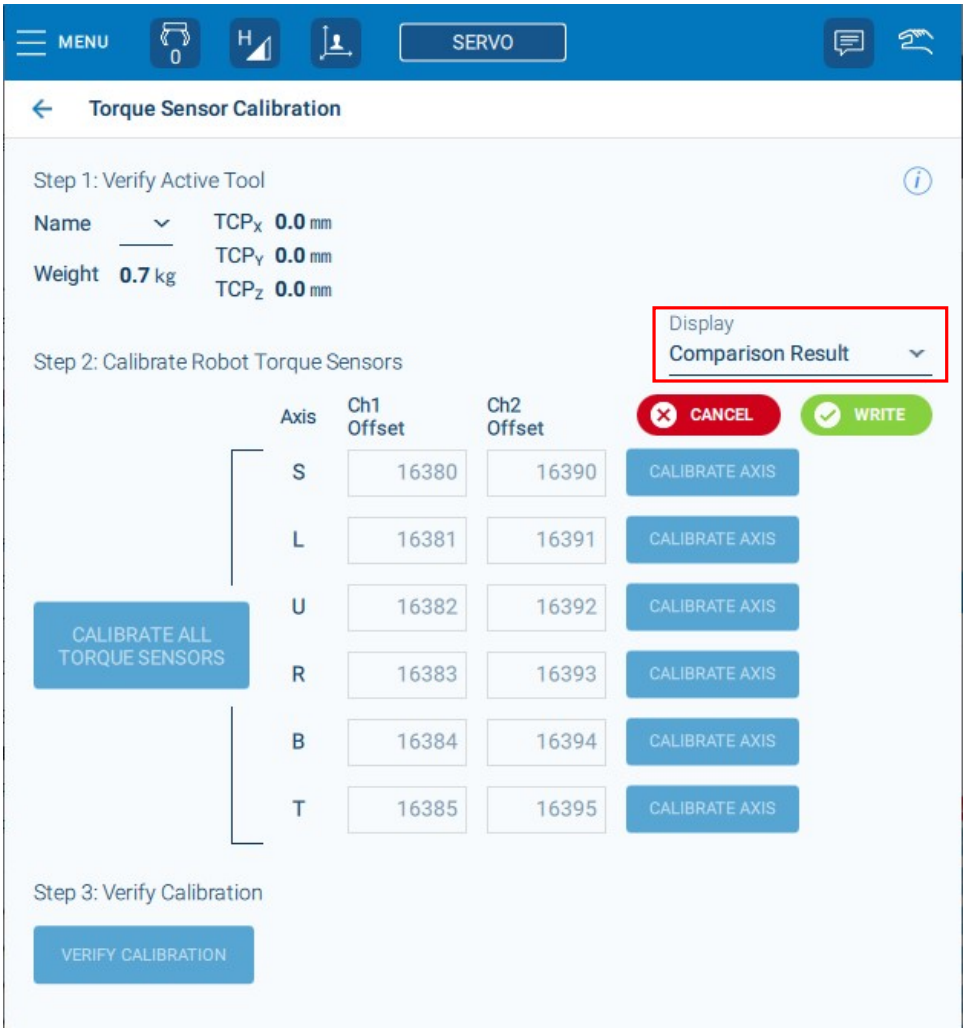
5. **The following message will be displayed.**



6. **Tap {READBACK}.**



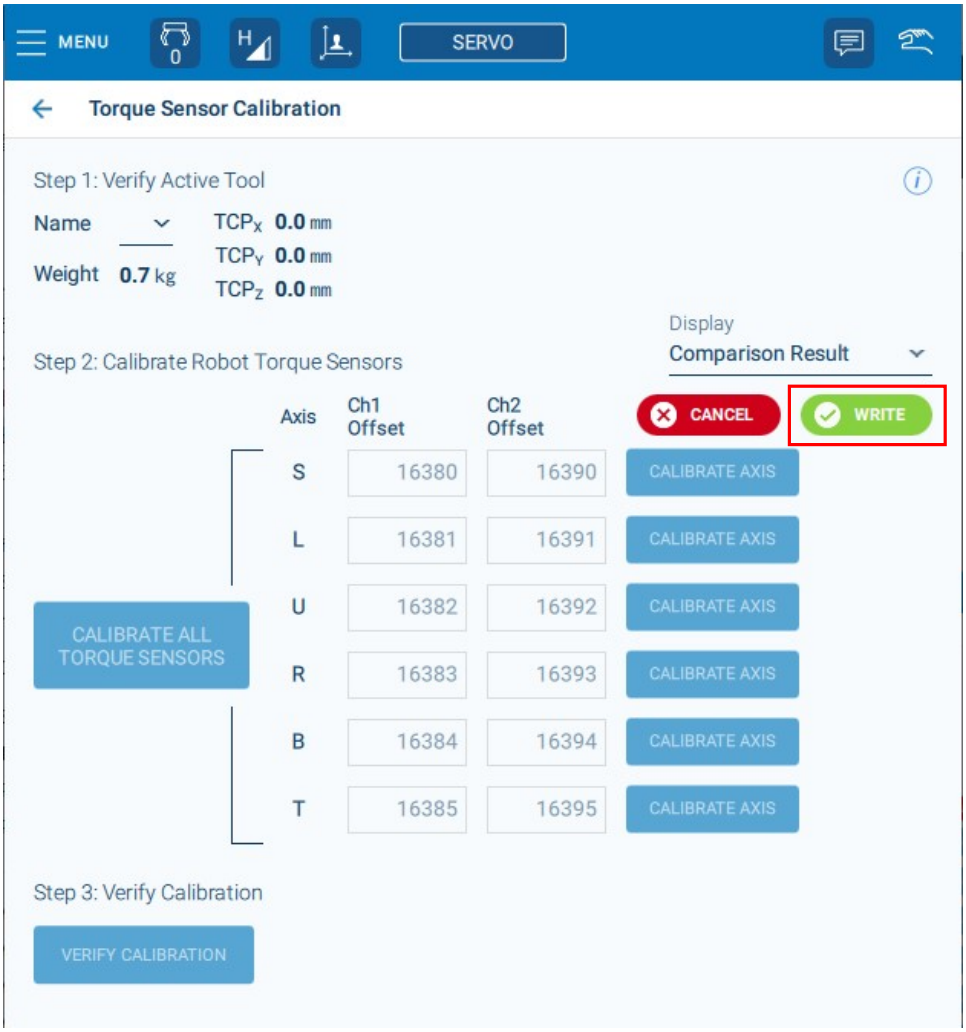
7. **Tap {Comparison Result} and confirm that there are no problems in the values that were written.**



This concludes the configuration procedure if the comparison result values match.

However, if the values do not match, {Comparison Result} will display "***". In this case, what data was not updated on the PFL circuit board must be checked.

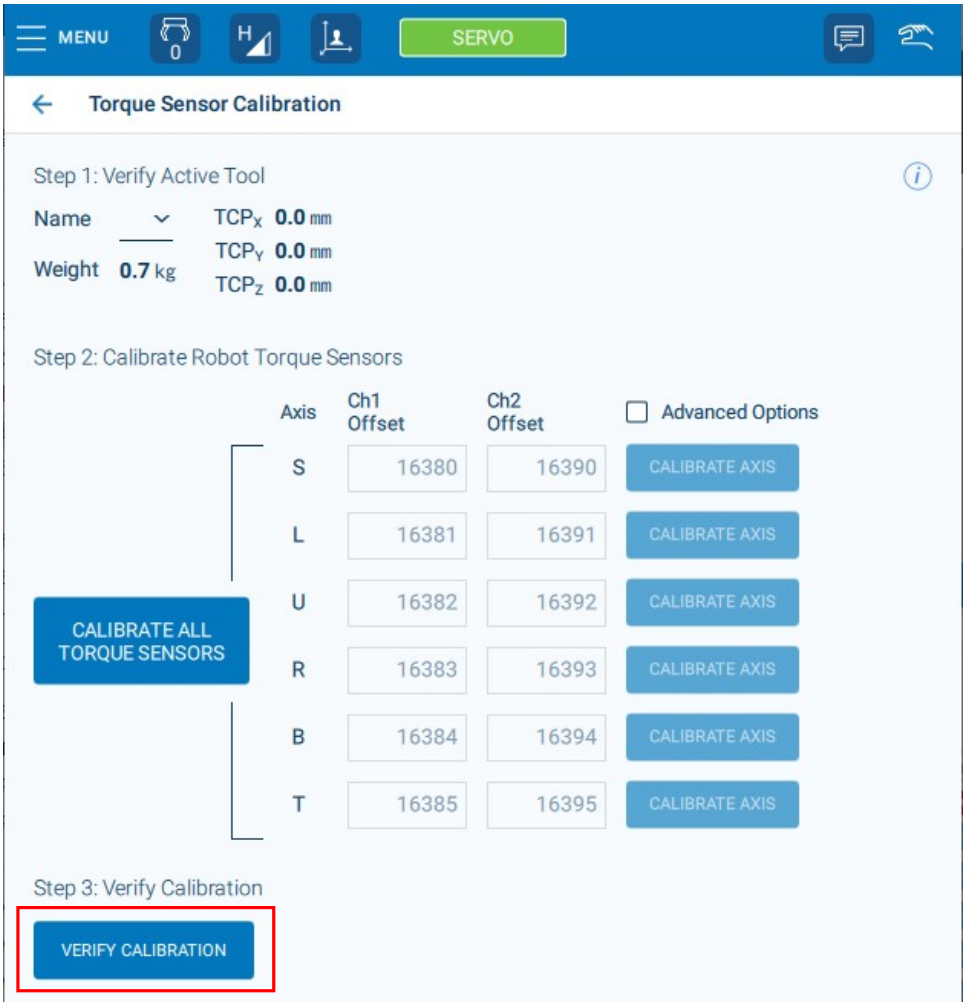
8. **Tap {WRITE}.**



The data that was configured will be transferred to and saved in the robot controller.

9. **Squeeze the enable switch on the smart pendant to set the servo ON state.**

10. **Tap {VERIFY CALIBRATION}.**



The current values of the torque sensors will be displayed.

Check the values. If there are no problems, tap {OK} on the confirmation dialog.

If there are problems with the current values, perform calibration again.

This concludes the procedure.

7.4 Setting External Force Limits

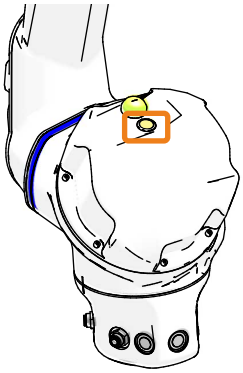
The manipulator has an external force monitor function. This function stops the manipulator according to the external force that is applied to the manipulator.

The manipulator will stop when the preset external force limits are exceeded.

The external force limits (TCP resultant force and each X/Y/Z axis direction external force) are set to 100 N by default.

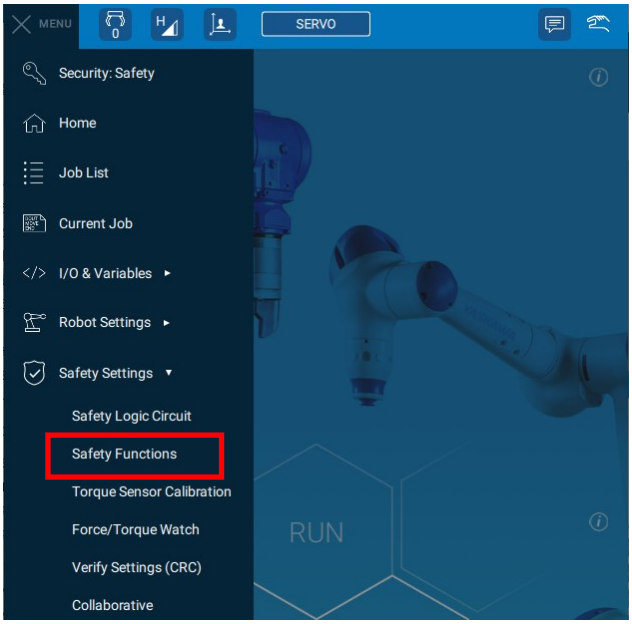
Up to 32 external force limits can be set.

Information The resume switch on the manipulator will be lit during external force monitoring.

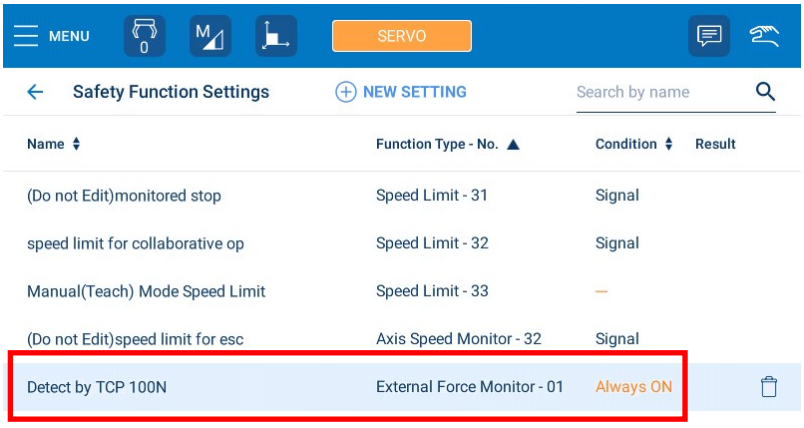


Use the following procedure to configure the external force limits that stop the manipulator. This example shows the procedure to set the external force limits (TCP resultant force and each X/Y/Z axis direction external force) to 90 N.

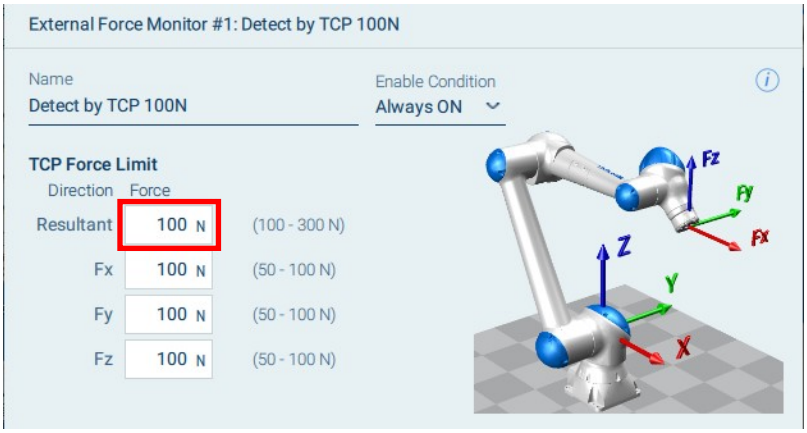
1. **From the status bar, select {MENU} - {Safety Settings} - {Safety Functions}.**



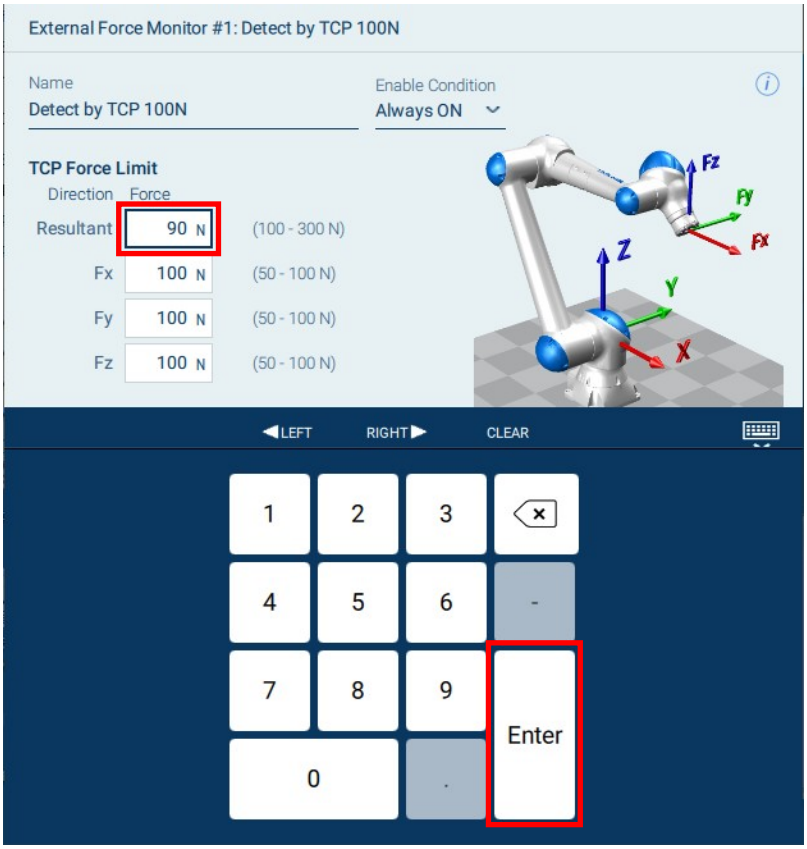
2. **Tap {Detect by TCP 100N}.**



3. **Tap {100 N} for resultant.**

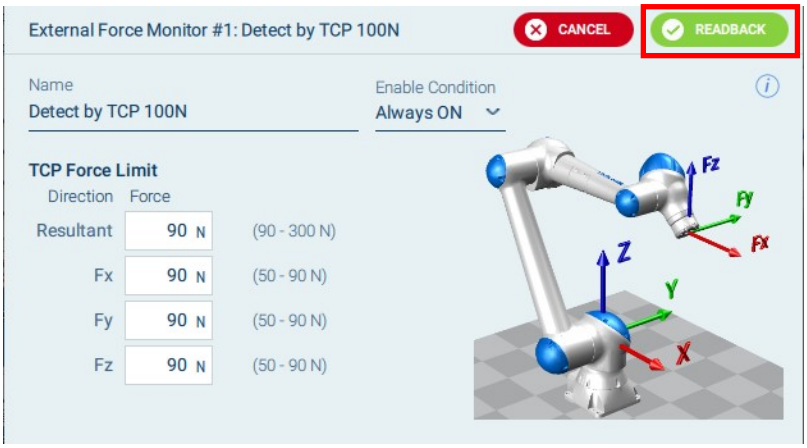


4. **Enter "90" and tap {Enter}.**

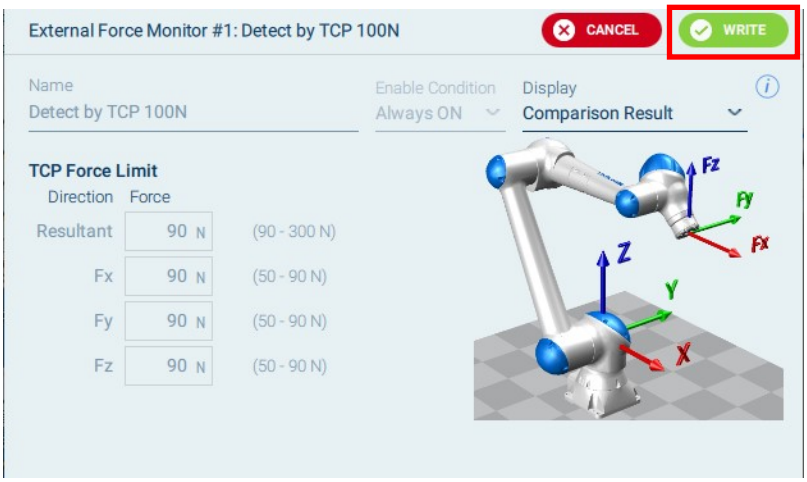


5. **Repeat steps 3 and 4 and set Fx, Fy, and Fz to 90 N.**

6. **Tap {READBACK}.**



7. **Tap {WRITE}.**



This concludes the procedure.

7.5 Configuring the Speed Limit Function

The speed limit function performs monitoring to ensure the manipulator control points do not exceed the set speed. The monitored control points are the TCP (tool center point) and FCP (flange center point).

> Important
> The default speed limit provides no guarantees regarding manipulator safety. Always conduct a risk assessment and configure the speed limit again based on those results.

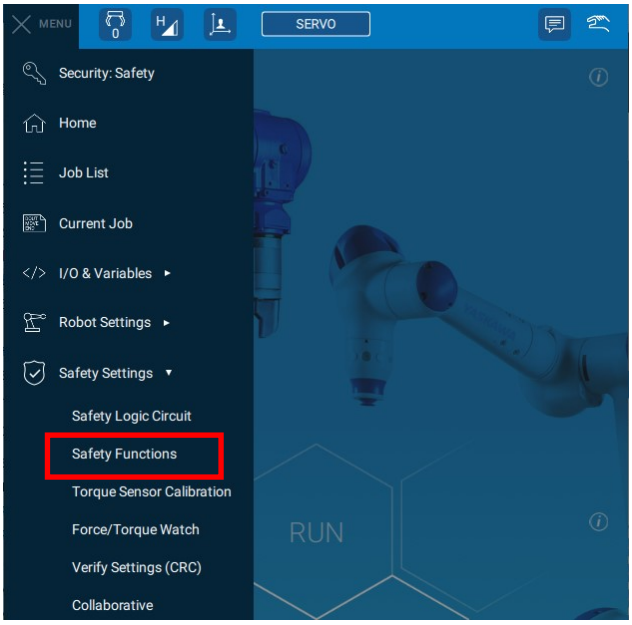
TCP speed 250 mm/s is the default setting.

The speed limit function has two monitor types: speed limit and stop monitor.

Monitor Type	Description
Speed limit	The TCP speed and FCP speed are monitored to ensure the set speed is not exceeded. When the speed limit is enabled, the teaching speed at that time is first lowered to the speed limit if the teaching speed is faster than the speed limit. The time until monitoring is started from when the conditions file becomes valid can be set in the conditions file as the detection delay time. If an error was detected for the monitoring result, power to the motor is turned OFF using machine safety. An alarm also occurs to provide notification of the error.
Stop monitor	The stop position of the TCP or FCP is monitored to confirm that the points do not move.

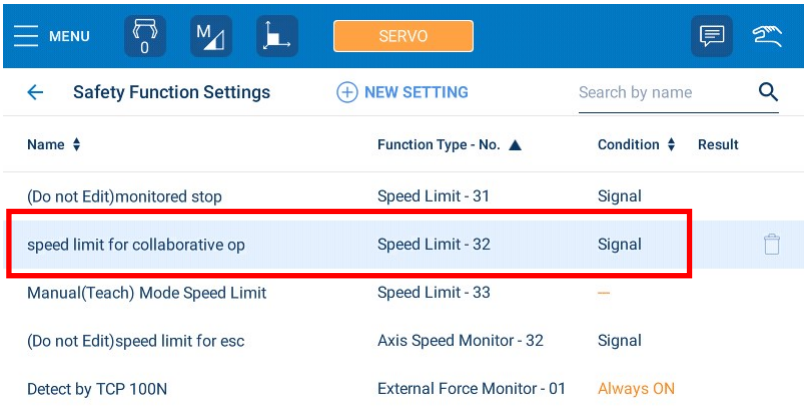
Use the following procedure to configure the speed limit function. This example shows the procedure to set the speed limit value to 100 mm/s.

1. **From the status bar, select {MENU} - {Safety Settings} - {Safety Functions}.**



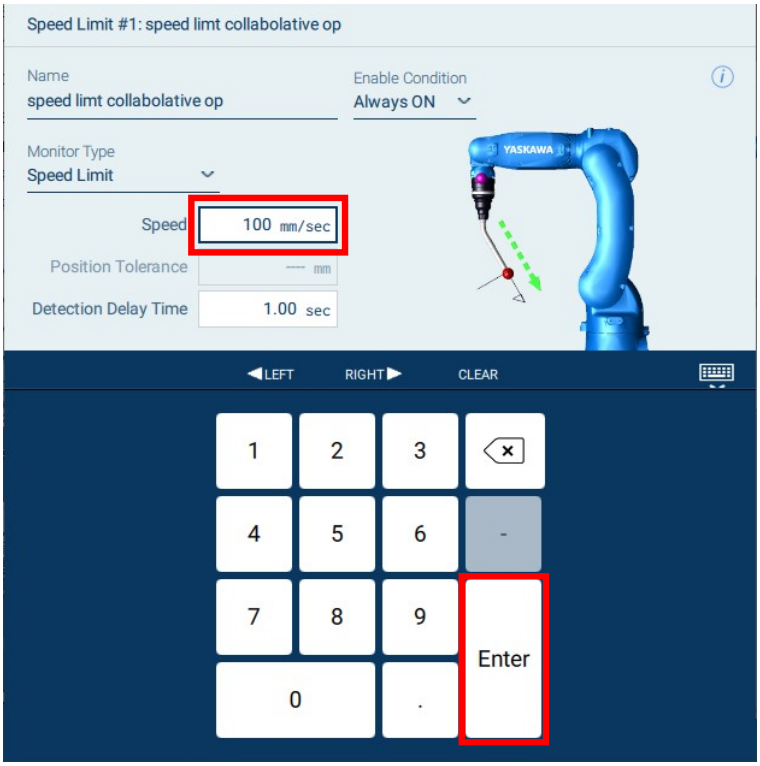
The Safety Function Settings window will be displayed.

2. **Tap {speed limit for collaborative op}.**



3. **Select "Speed Limit" under Monitor Type, and tap the speed {250.0 mm/sec}.**

4. **Enter "100" and tap {Enter}.**



5. **Tap {READBACK}.**

6. **Tap {WRITE}.**

This concludes the procedure.

Information When configuring the stop monitor settings, select "Stop Monitor" under Monitor Type, and then set {Position Tolerance} and {Detection Delay Time}.

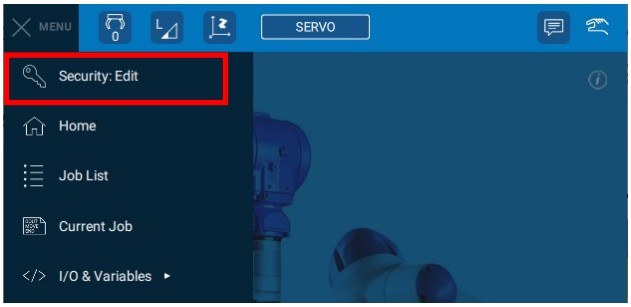
7.6 Enabling the Collaborative Operation Function

To configure the collaborative operation function, the collaborative operation function was temporarily disabled.

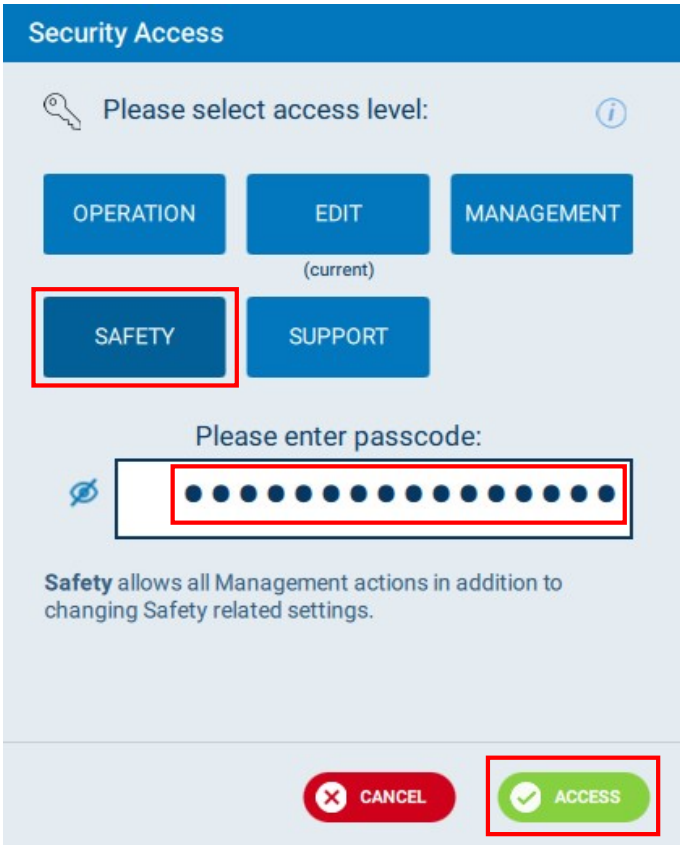
Therefore, when the collaborative operation function configuration shown in "*7.2 Configuring a Tool File on page 89*" to "*7.5 Configuring the Speed Limit Function on page 102*" is completed, the collaborative operation function must be enabled.

Use the following procedure to enable the collaborative operation function.

1. **From the status bar, select {MENU} - {Security: Edit}.**



2. **On the Security Access window, select {SAFETY}.**

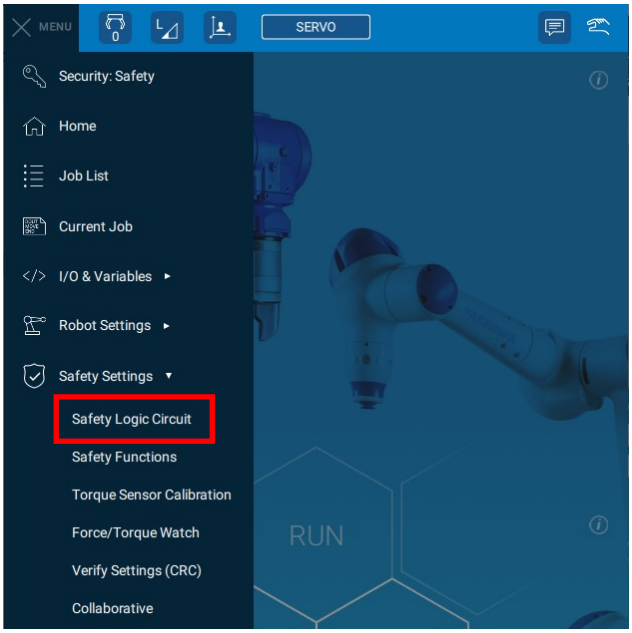


3. **Enter the password and select {ACCESS}.**

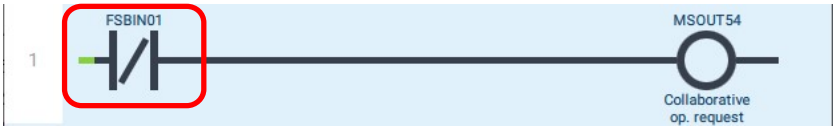
Note:

The default password is set to "5555555555555555" (enter "5" 16 times).

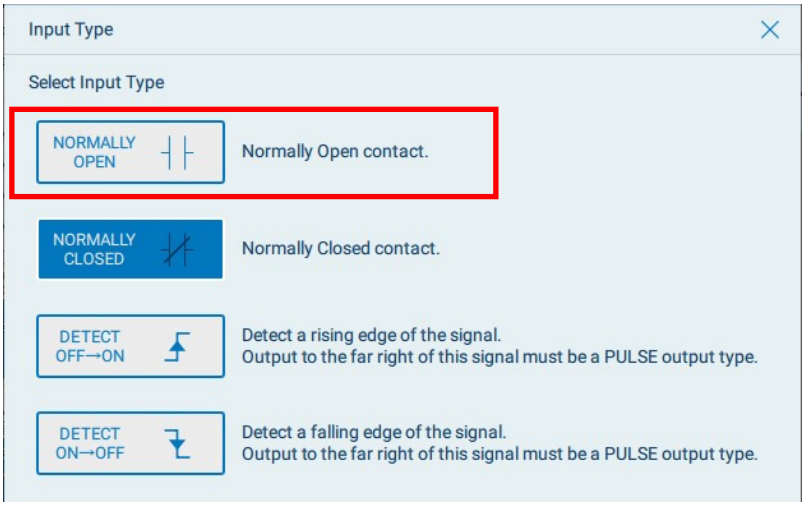
4. **Select {MENU} - {Safety Settings} - {Safety Logic Circuit}.**



5. **Select the input relay with the input type that was set to {NORMALLY CLOSED} when the collaborative operation function was temporarily disabled.**

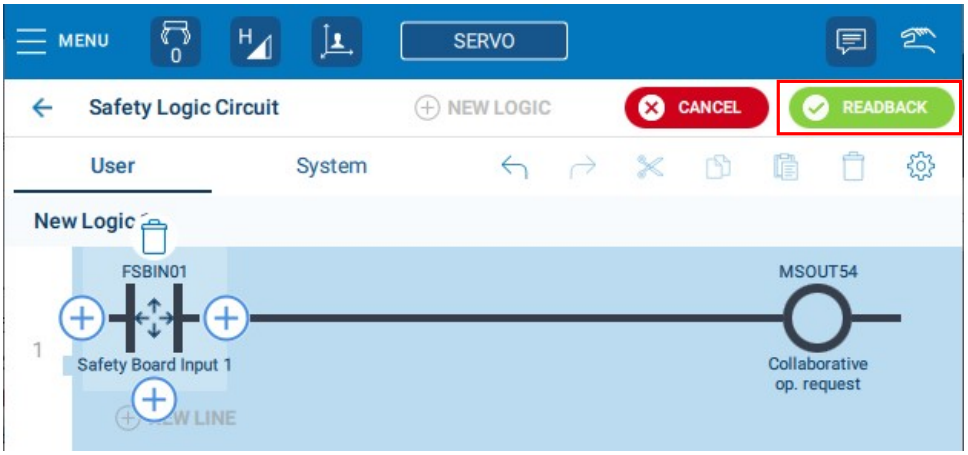


6. **Select {Normally Open contact} for the input type.**

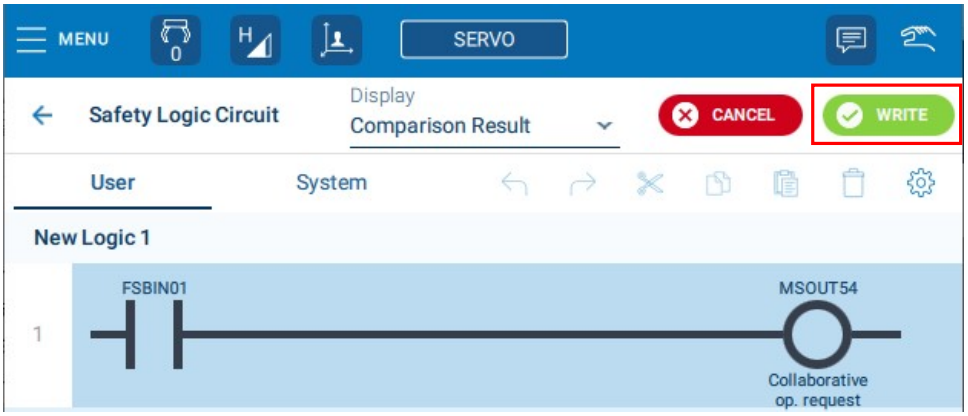


7. **Confirm that the MSOUT54 collaborative operation request signal is ON.**

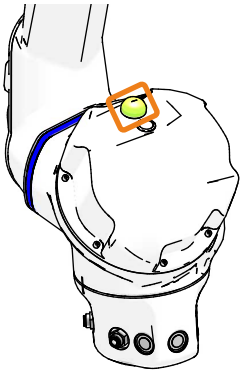
8. **Confirm that there are no mistakes in the safety logic circuit, and then tap {READBACK}.**



9. **Tap {WRITE}.**



10. **The collaborative operation function will be enabled. Confirm that the collaborative operation lamp on the manipulator is lit in green.**



Important

When tool file number 1 is set, the collaborative operation lamp will not be lit because the collaborative operation function is disabled inside the manipulator. First perform the following operation, and then confirm again that the collaborative operation lamp is lit.

Reset Procedure

Jog the tip of the manipulator approximately 5 mm.

Move a driven axis (e.g., B-axis) instead of a rotary axis (e.g., T-axis).

Refer to the following section for details on jogging.

☞ *5.1.1 Jogging Each Axis on page 62*

This concludes the procedure.

8

Programming

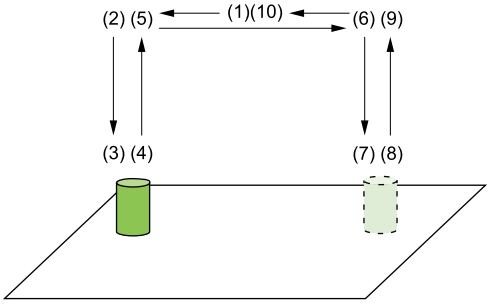
This chapter describes how to create a program according example movements and how to move the manipulator using that program.

8.1 Explanation of the Sample Program

8.1.1 Overview

In this chapter, a program that moves the position of a workpiece from the left edge to the right edge will be created.

An illustration that shows the workpiece positions and the path of the tip of the manipulator is shown below, as well as the sample program that achieves this motion.



Line No.	Step	Tool	Instruction/Additional Items
1			Start Job
2	0001	00	JointMove Speed= 10.00 (%)
3	0002	00	JointMove Speed= 25.00 (%)
4	0003	00	LinearMove Speed= 1000.0 (mm/sec)
5	0004	01	LinearMove Speed= 1000.0 (mm/sec)
6			DigitalOut Output#(7) Off
7			Wait Input#(8)= On
8	0005	01	LinearMove Speed= 1000.0 (mm/sec)
9	0006	01	JointMove Speed= 25.00 (%)
10	0007	01	LinearMove Speed= 1000.0 (mm/sec)
11	0008	00	LinearMove Speed= 1000.0 (mm/sec)
12			DigitalOut Output#(7) On
13			PulseOut Output#(8) Time=1.000 (seconds)
14			Wait Input#(8)= Off
15	0009	00	LinearMove Speed= 1000.0 (mm/sec)
16	0010	00	JointMove Speed= 25.00 (%)
17			End Job

Suction ON instruction

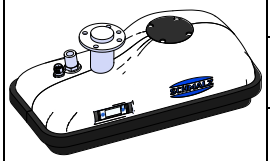
Wait until the vacuum pressure in the hand exceeds the threshold value

Suction OFF instruction

Output the release workpiece instruction for one second as a pulse signal

Wait until the vacuum pressure in the hand falls below the threshold value

This program uses the tool shown below. The following three signals must be connected to use this tool.

Appearance of Tool	Signal Name	Signal Application
	Suction OFF signal	Used for the instruction to stop hand suction.
	Vacuum break ON signal	Used for the release workpiece instruction. Air will be blown from the suction area of the hand.
	Built-in vacuum switch output signal (signal output 2)	Used for confirmation of the suction status of the workpiece.

The descriptions for this program assume the above signals have been connected as described in the following section.

☞ *6.4 Connecting the I/O Cables on page 79*

8.2 Creating a Program with Direct Teach

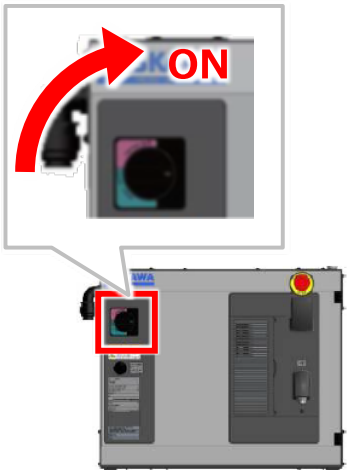
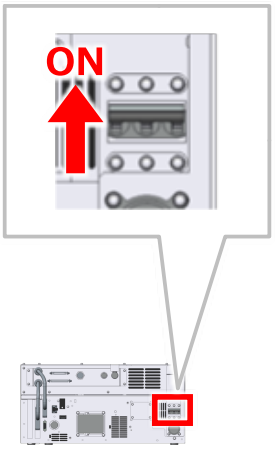
This section describes the procedure to create a sample program using direct teach. The description is split into the following steps.

Step	Task	Applicable Device	Reference Section
1	Creating a Program	Smart Pendant	☞ *8.2.1 Creating a Program on page 111*
2	Registering Manipulator Positions in the Program Using Direct Teach	Manipulator	☞ *8.2.2 Registering Manipulator Positions in the Program Using Direct Teach on page 117*
3	Adding and Changing Programming	Smart Pendant	☞ *8.2.3 Adding and Changing Programming on page 120*
4	Confirming Operation Step by Step	Smart Pendant	☞ *8.2.4 Confirming Operation Step by Step on page 130*
5	Running the Created Program	Smart Pendant	☞ *8.2.5 Running the Created Program on page 133*

8.2.1 Creating a Program

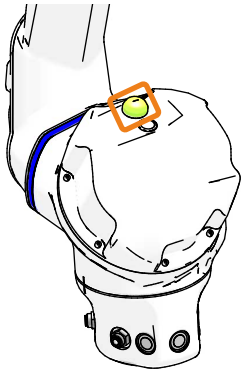
To use direct teach, a program must be created (job registered) in advance.

1. **Turn ON the main power supply to the robot controller.**

YRC1000	YRC1000micro
	

2. **Wait approximately three minutes, and confirm that the startup window is displayed on the Smart Pendant.**

3. **Confirm that the collaborative operation lamp is lit in green.**



Information If the lamp is not lit, the collaborative operation function is disabled. Refer to the following section and enable the collaborative operation function.

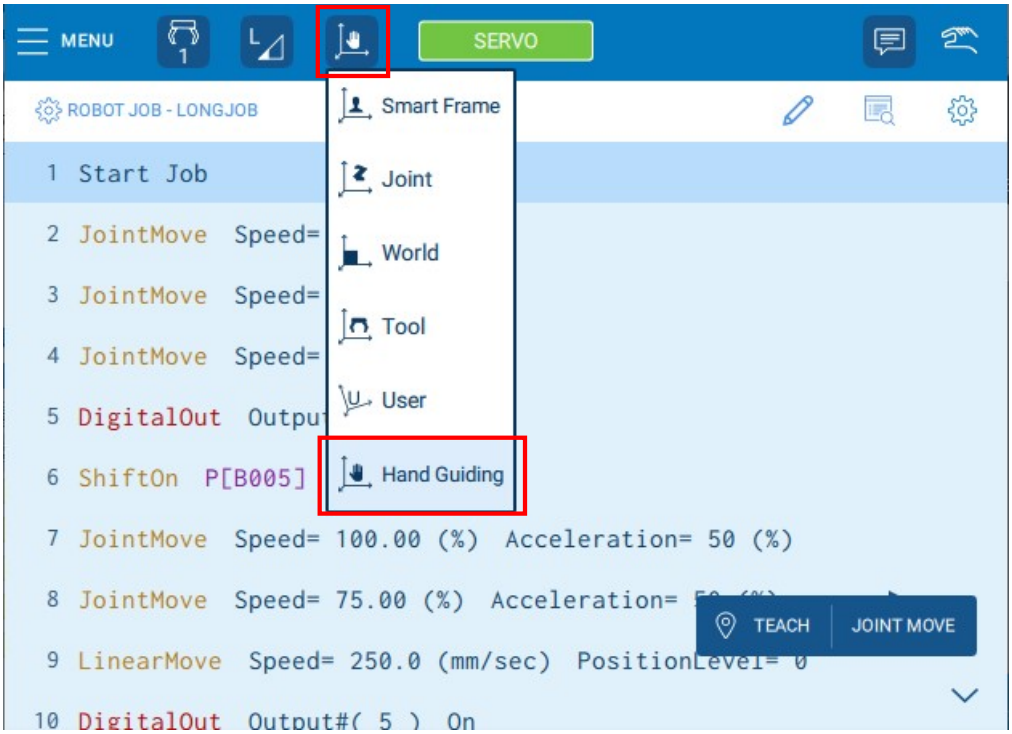
☞ *7.6 Enabling the Collaborative Operation Function on page 105*

4. **Change the mode switch to MANUAL (TEACH) mode, and set the operation mode to teach mode.**

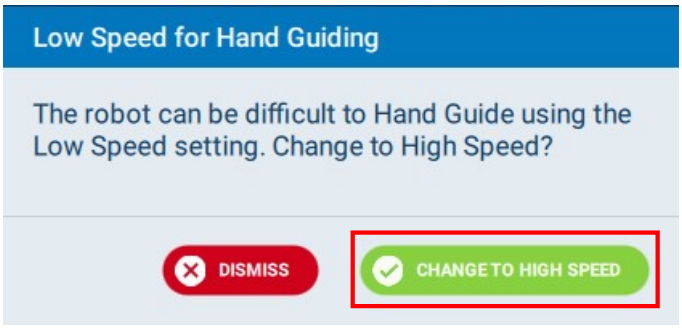
5. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

6. **Tap the operation mode icon on the status bar and select {Hand Guiding}.**



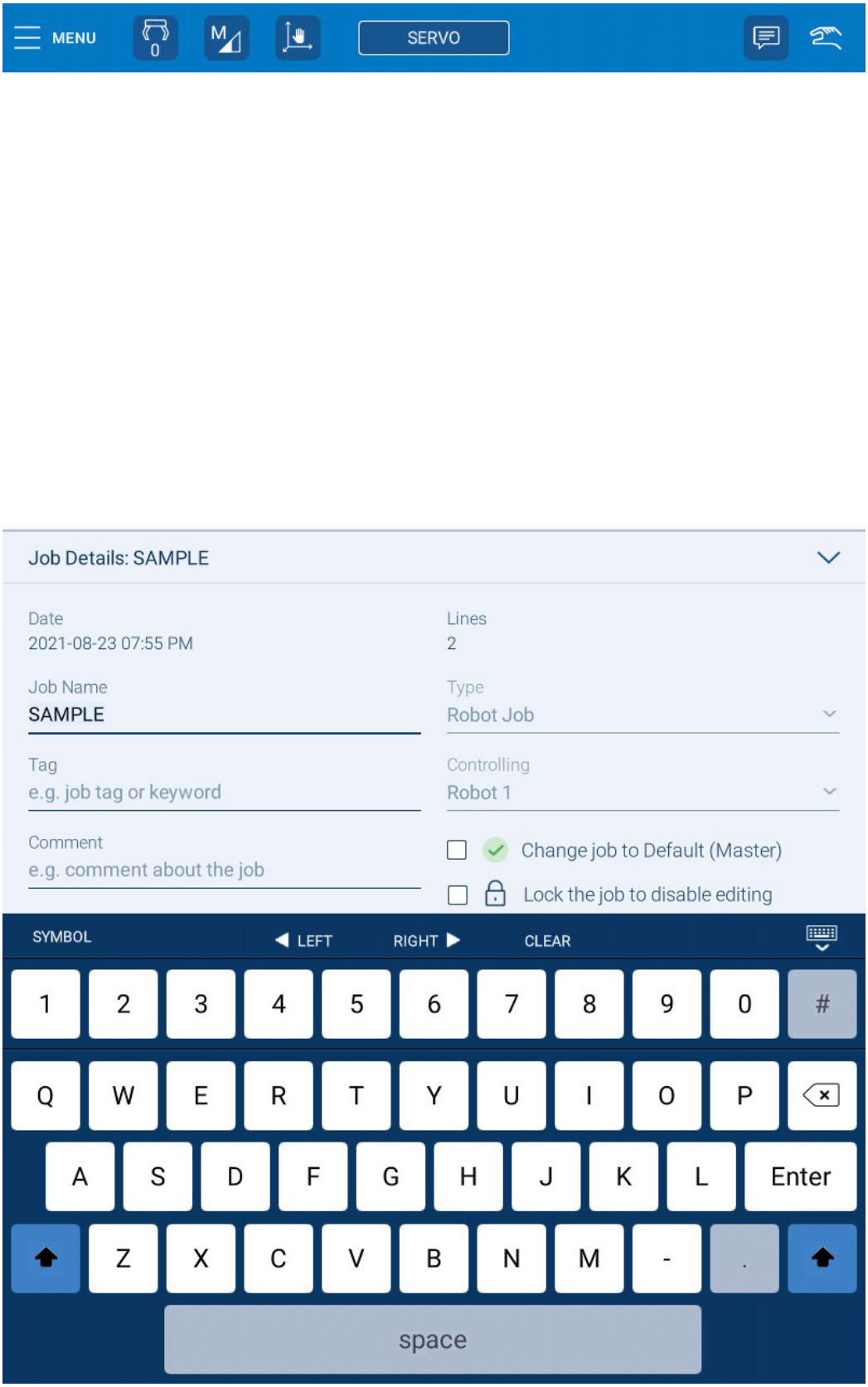
7. **If the operation speed is set to low speed, the following message will be displayed. Select {CHANGE TO HIGH SPEED}.**



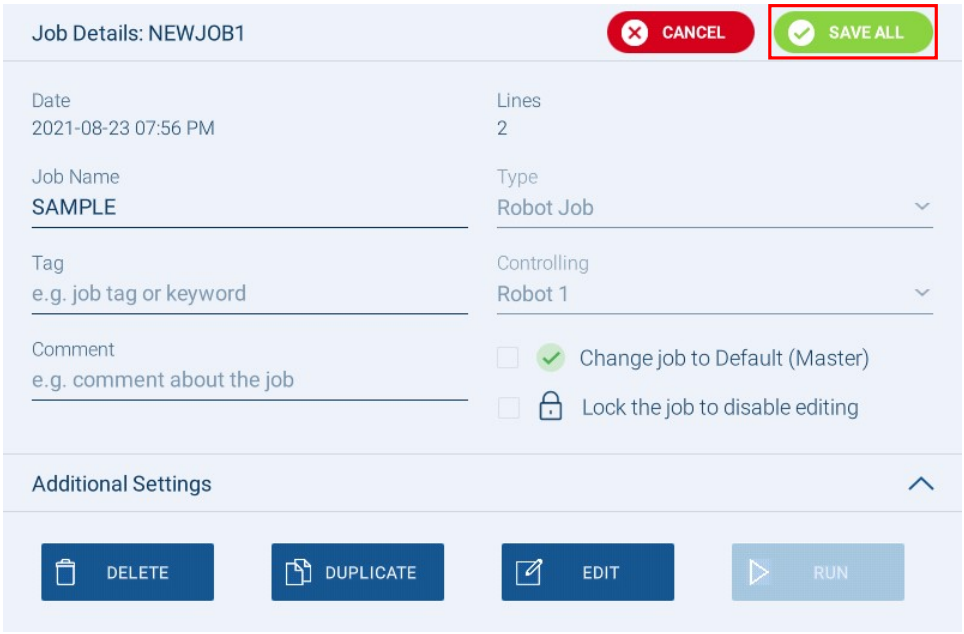
Information If set to low speed, a strong force will be required to manually move the manipulator. An alarm will occur if the manipulator is pushed too hard. The low speed setting is convenient for fine movements.

8. **From the status bar, select {MENU} - {Job List} - {+NEW JOB}.**

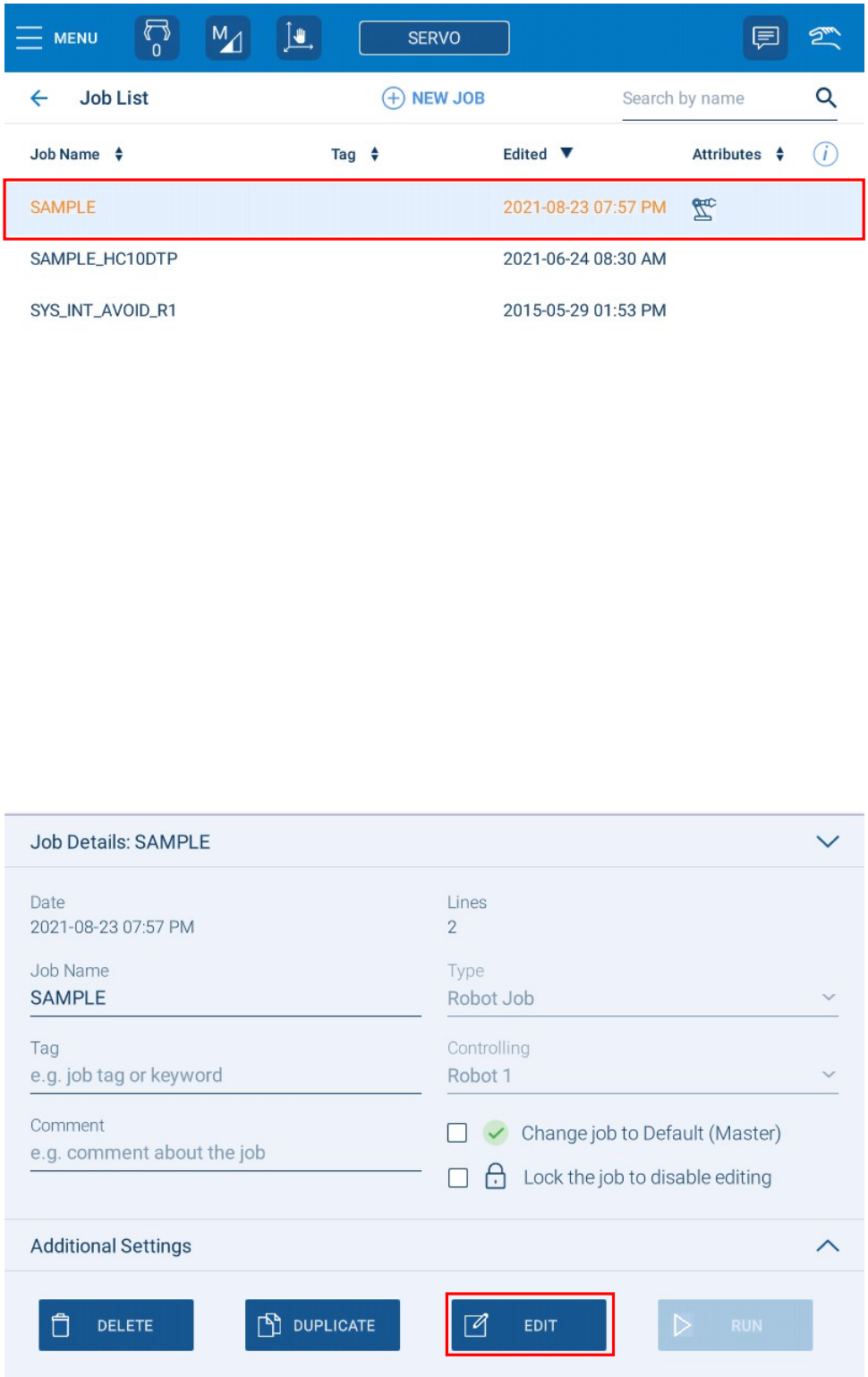
9. **Enter a name in {Job Name}. "SAMPLE" is used in this manual.**



10. **Confirm the job name and press {SAVE ALL}.**



11. **Select the SAMPLE job that was created from the job list and tap {EDIT}.**



Confirm that the job name that was registered is displayed.

This concludes the procedure. Proceed to the next step.

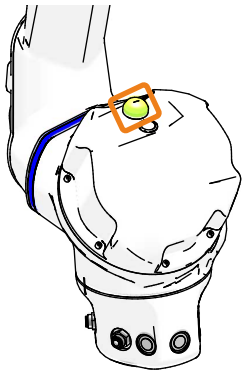
8.2.2 Registering Manipulator Positions in the Program Using Direct Teach

Register the manipulator positions in the program using direct teach.

1. **Confirm that the following procedure was completed.**

   ☞ *8.2.1 Creating a Program on page 111*

2. **Confirm again that the collaborative operation lamp is lit in green.**



Information If the lamp is not lit, the collaborative operation function is disabled. Refer to the following section and enable the collaborative operation function.

☞ *7.6 Enabling the Collaborative Operation Function on page 105*

3. **Confirm again that the operation mode is teach mode.**

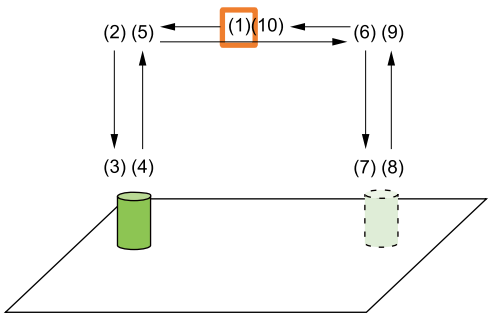
Note:
If the teach mode icon is not displayed on the status bar, change the mode switch to MANUAL (TEACH) mode.

4. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

Information When using direct teach, the servo ON state will be maintained even if the enable switch on the back of the Smart Pendant is not squeezed.

5. **While the [MOVE] button on the manipulator is pressed, move the manipulator to position (1).**



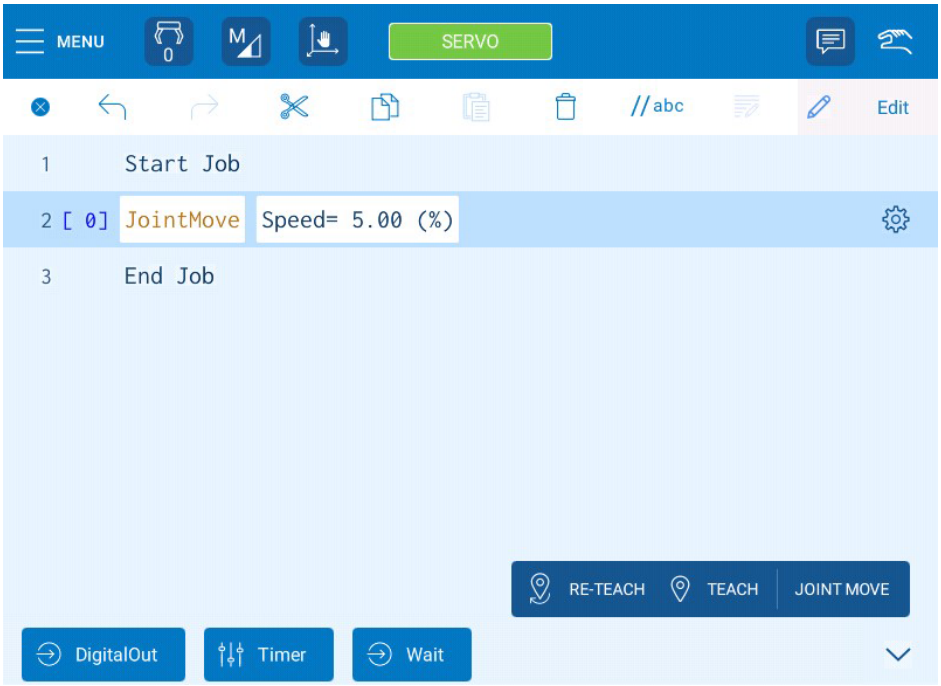
Information If the arm speed feels fast, tap the [MOVE] button twice (double-click), and then move the arm when all three buttons are flashing. The arm will move slowly, and it will be easier to make fine adjustments because the feeling of arm coasting will be reduced.

6. **Release the [MOVE] button on the manipulator.**

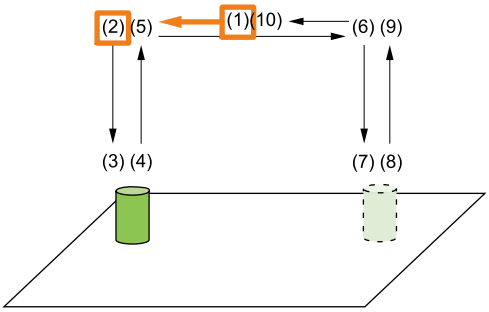
7. **Press the [TEACH] button on the manipulator.**

The position of the manipulator will be registered as line number 2 when the [TEACH] button is pressed.

Information "Joint Move Speed=5.00(%)" will be displayed because the position is registered with the default instruction and speed.



8. **While the [MOVE] button on the manipulator is pressed, move the manipulator from position (1) to position (2).**



9. **Release the [MOVE] button on the manipulator.**

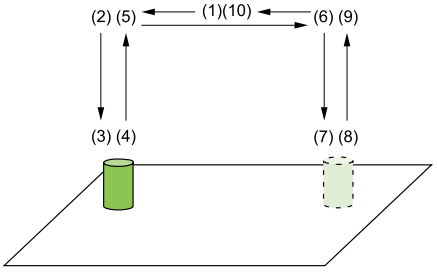
10. **Press the [TEACH] button on the manipulator.**

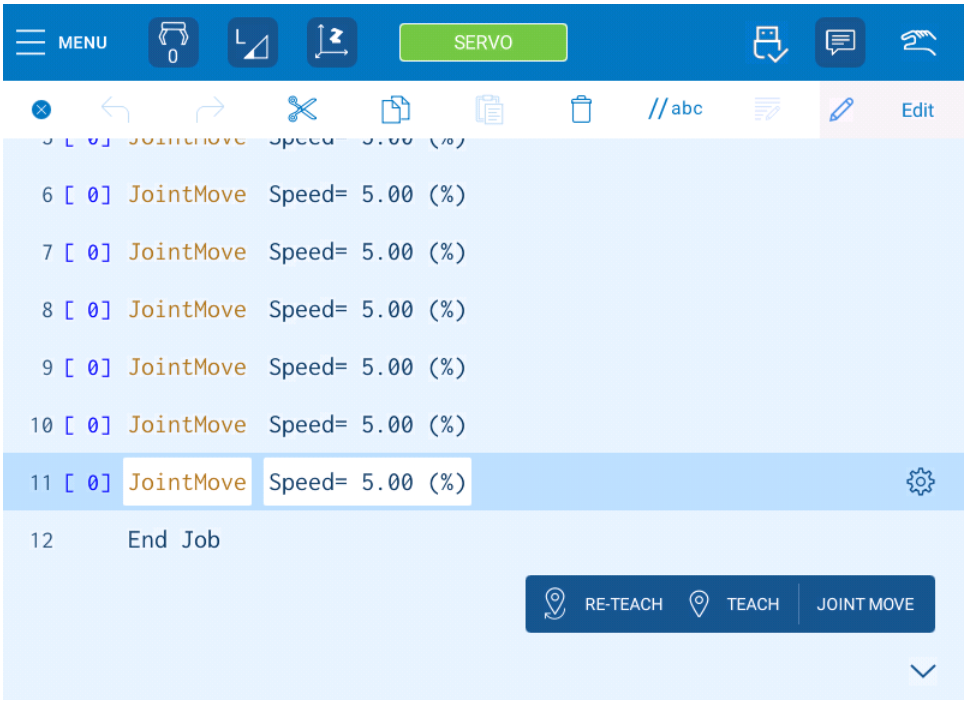
The position of the manipulator will be registered as line number 3 when the [TEACH] button is pressed.

11. **Repeat steps 8 to 10 and register positions (3) to (10) in the program.**

The line numbers that are registered and the descriptions of positions (1) to (10) are shown below.

For the positions in (4) and (8), register the same position as the previous step in order to switch the tool information.

Manipulator Position		Line No.	Description of Position
	(1)	2	Start job position
	(2)	3	Above workpiece suction position
	(3)	4	Workpiece suction position
	(4)	5	Workpiece suction position
	(5)	6	Above workpiece suction position
	(6)	7	Above release workpiece position
	(7)	8	Release workpiece position
	(8)	9	Release workpiece position
	(9)	10	Above release workpiece position
	(10)	11	End job position



Information The speed of manipulator motion, hand suction ON/OFF, the tool files, and other settings are configured after this procedure. This procedure registers the positions of the manipulator only.

This concludes the procedure. Proceed to the next step.

8.2.3 Adding and Changing Programming

Instructions can be added to and changed in the program in which the manipulator positions were registered.

This section describes the following four operations.

Operation	Reference Section
Set the Start Job Position (Line No. 2) and End Job Position (Line No. 11) to the Same Location	☞ *(1) Set the Start Job Position (Line No. 2) and End Job Position (Line No. 11) to the Same Location on page 120*
Change the Motion and Speed of the Manipulator	☞ *(2) Change the Motion and Speed of the Manipulator on page 121*
Add Instructions to Turn Hand Suction ON/OFF	☞ *(3) Add Instructions to Turn Hand Suction ON/OFF on page 124*
Change the Tool File	☞ *(4) Change the Tool File on page 128*

(1) Set the Start Job Position (Line No. 2) and End Job Position (Line No. 11) to the Same Location

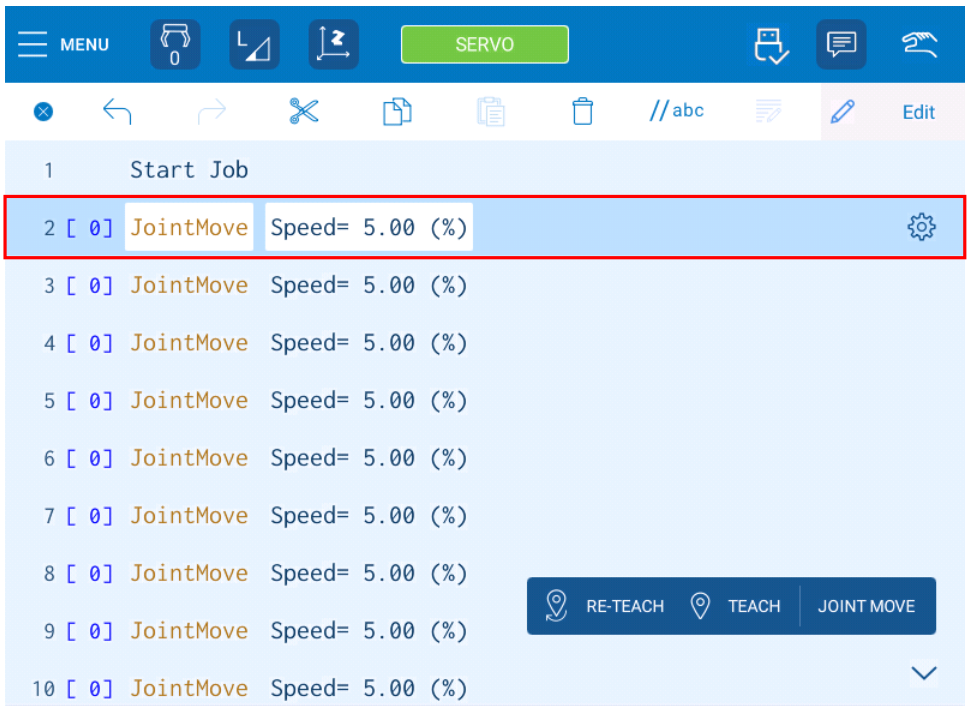
Setting the same position for the start job position (line number 2) and end job position (line number 11) is recommended.

Each position that was registered with direct teach is a position that was registered by sight, so there will be slight deviations in the positions. For this reason, use the following procedure to set the start job position (line number 2) and end job position (line number 11) to the same position.

1. **Confirm that the following procedure was completed.**

   ☞ *8.2.2 Registering Manipulator Positions in the Program Using Direct Teach on page 117*

2. **Select line number 2 on the Smart Pendant.**



3. **Tap {GO TO POINT}.**

   The manipulator will move to position (1).

Information If the movement speed seems slow or fast, tap the operation speed icon on the status bar and change the operation speed.

4. **Select line number 11 on the Smart Pendant, and tap {RE-TEACH}.**

The position of line number 11 will be set to the same position as line number 2.

This concludes the procedure. Proceed to the next step.

(2) Change the Motion and Speed of the Manipulator

The manipulator motions registered with direct teach are all registered with the "Joint Move Speed=5.00 (%)" instruction and speed.

The program described in this manual uses the Joint Move instruction and Linear Move instruction depending on the position where the manipulator moves. The differences between these instructions are described below.

Instruction	Manipulator Path
Linear Move	The manipulator moves along a linear path.
Joint Move	The path of the manipulator is not limited to a straight line.

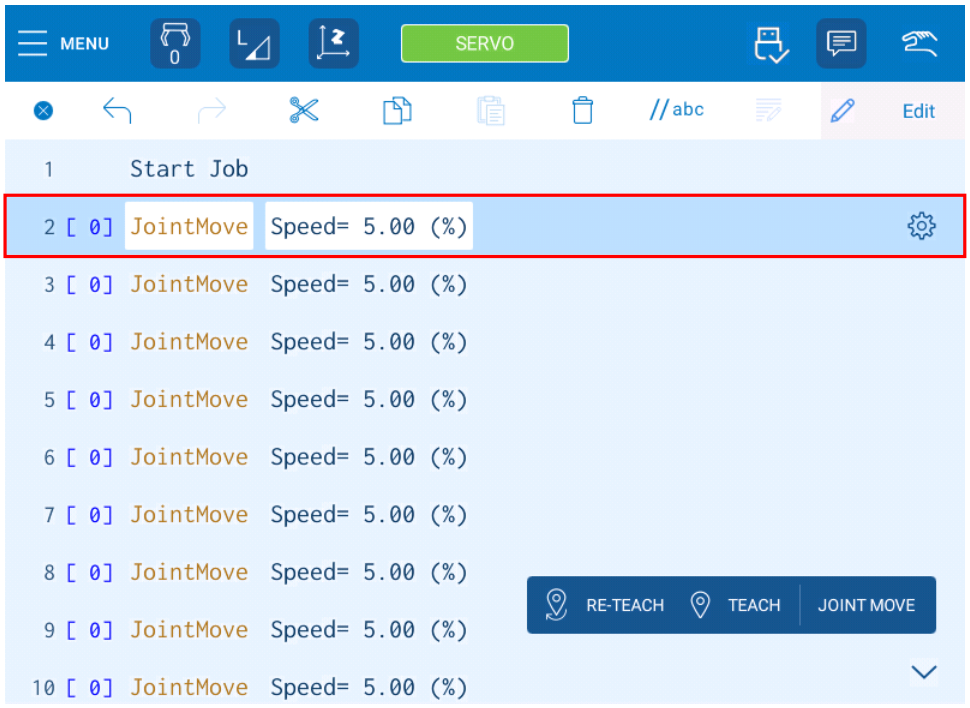
The sample program uses the Linear Move instruction for the steps before and after the operation to turn hand suction ON/OFF. The sample program uses the Joint Move instruction for all other steps.

To recreate the sample program, change the instructions and speeds. Use the following procedure.

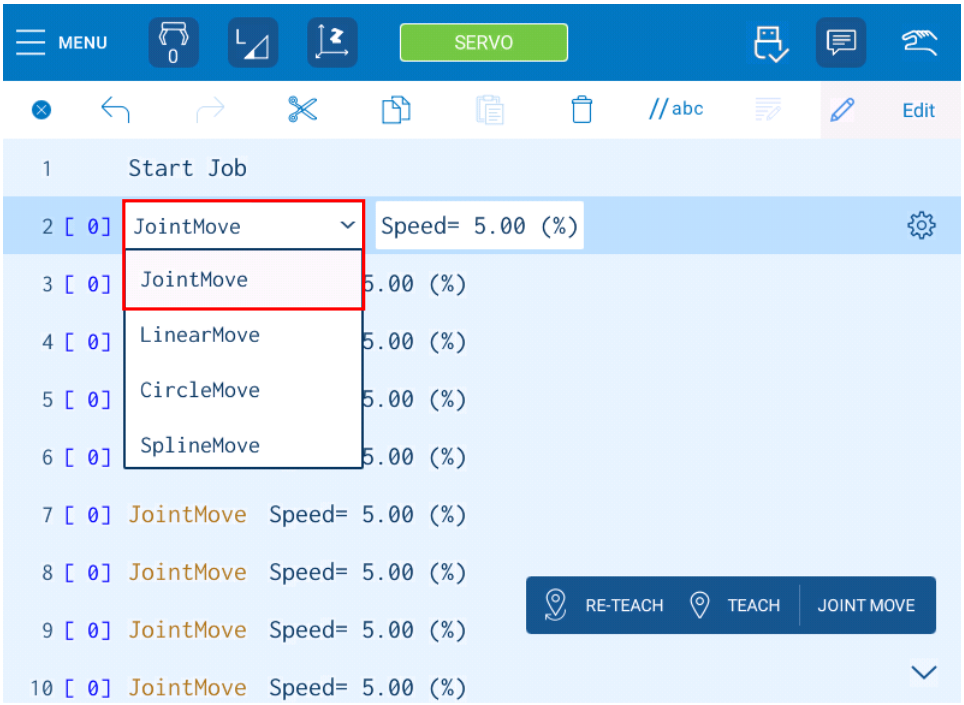
1. **Confirm that the following procedure was completed.**

☞ *8.2.2 Registering Manipulator Positions in the Program Using Direct Teach on page 117*

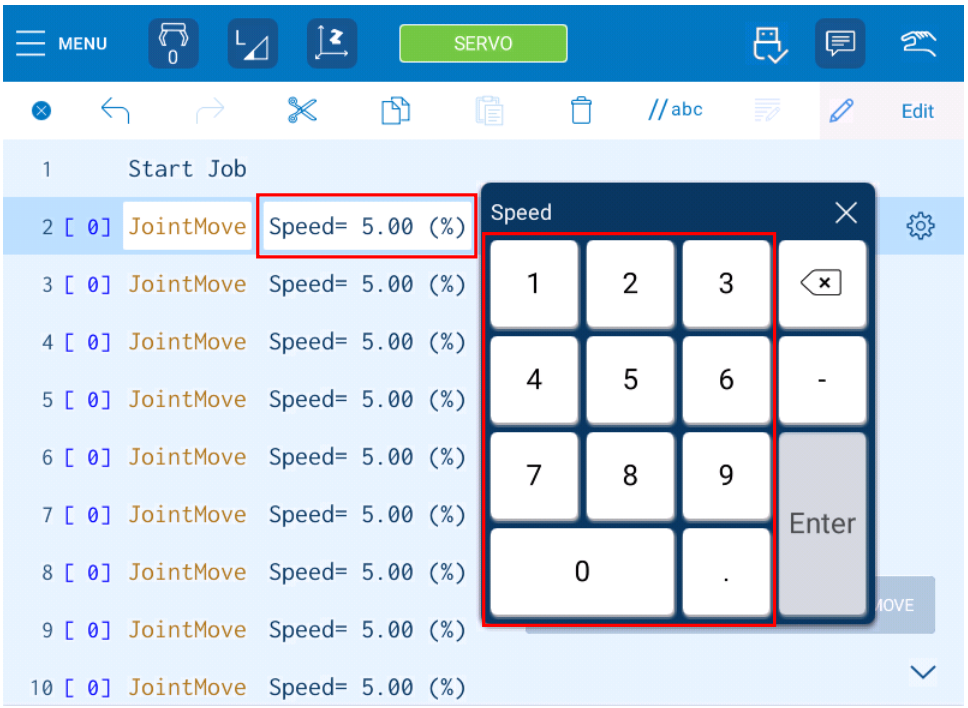
2. **Move the Smart Pendant cursor to line number 2.**



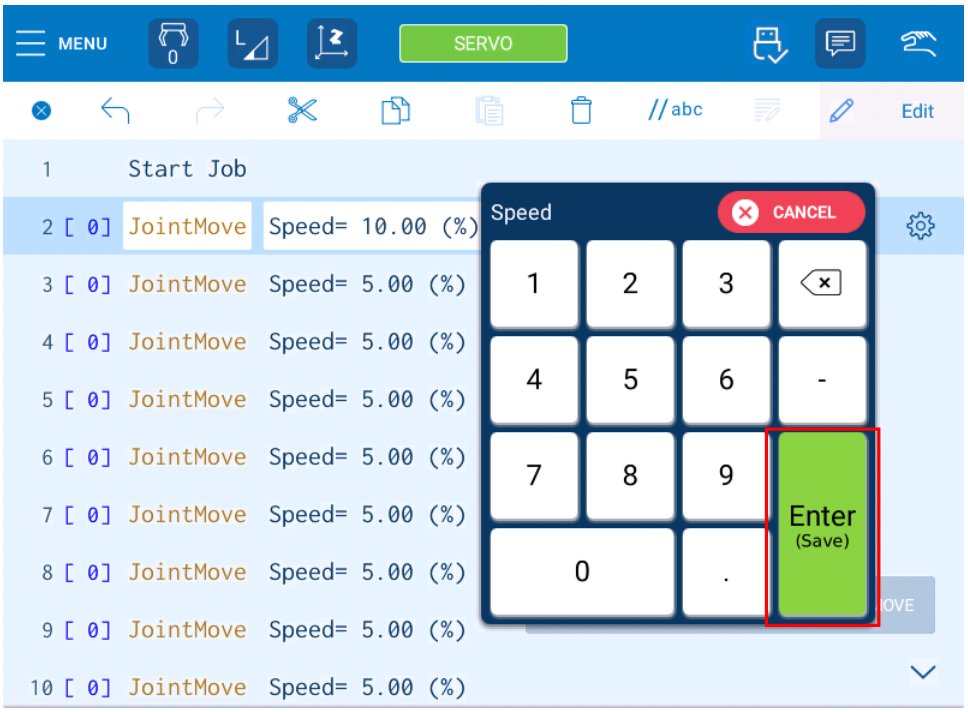
3. **Tap the instruction and set the motion (instruction) from the start position (home position) to step 1.**



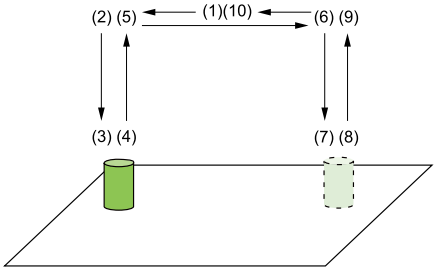
4. **Tap {Speed} and enter the speed from the start position (home position) to step 1.**



5. **Tap {Enter}.**



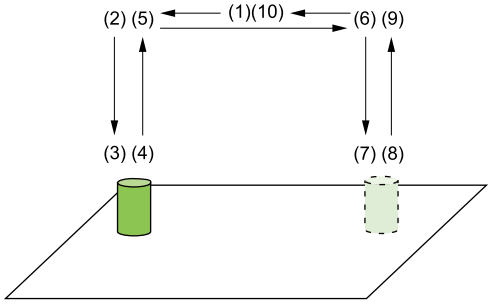
6. **Repeat steps 2 to 5 and change the following instructions and speeds as shown in the table.**

Manipulator Position		Line No.	Instruction and Speed
	(1)	2	JointMove Speed=10.00 (%)
	(2)	3	JointMove Speed=25.00 (%)
	(3)	4	LinearMove Speed=1000.0 (mm/sec)
	(4)	5	LinearMove Speed=1000.0 (mm/sec)
	(5)	6	LinearMove Speed=1000.0 (mm/sec)
	(6)	7	JointMove Speed=25.00 (%)
	(7)	8	LinearMove Speed=1000.0 (mm/sec)
	(8)	9	LinearMove Speed=1000.0 (mm/sec)
	(9)	10	LinearMove Speed=1000.0 (mm/sec)
	(10)	11	JointMove Speed=25.00 (%)

This concludes the procedure. Proceed to the next step.

(3) Add Instructions to Turn Hand Suction ON/OFF

At position (4) in the sample program, manipulator hand suction will be turned ON to apply suction to the workpiece. At position (8), hand suction will be turned OFF to release the workpiece.



The instructions to turn hand suction ON/OFF are not in the program that was created up to this point. These instructions must be added to the program.

The following instructions are required to turn hand suction ON/OFF.

- Turn Hand Suction ON

Instruction	Description
DigitalOut Output#(7) Off	Turns OFF output signal #7. Output #(7) on the manipulator is the suction OFF signal.
Wait Input#(8) = On	Waits until input signal #8 is turned ON. Input #(8) on the manipulator is the built-in vacuum switch output signal (signal output 2). The program waits here until the vacuum pressure in the hand exceeds the threshold value.

- Turn Hand Suction OFF

Instruction	Description
DigitalOut Output#(7) On	Turns ON output signal #7. Output #(7) on the manipulator is the suction OFF signal.
PulseOut Output#(8) Time=1.000 (seconds)	Outputs pulse signal to output signal #8 for one second. Output #(8) on the manipulator is the vacuum break ON signal. This signal is the release workpiece instruction signal.
Wait Input#(8) = Off	Waits until input signal #8 is turned OFF. Input #(8) on the manipulator is the built-in vacuum switch output signal (signal output 2). The program waits here until the vacuum pressure in the hand falls below the threshold value.

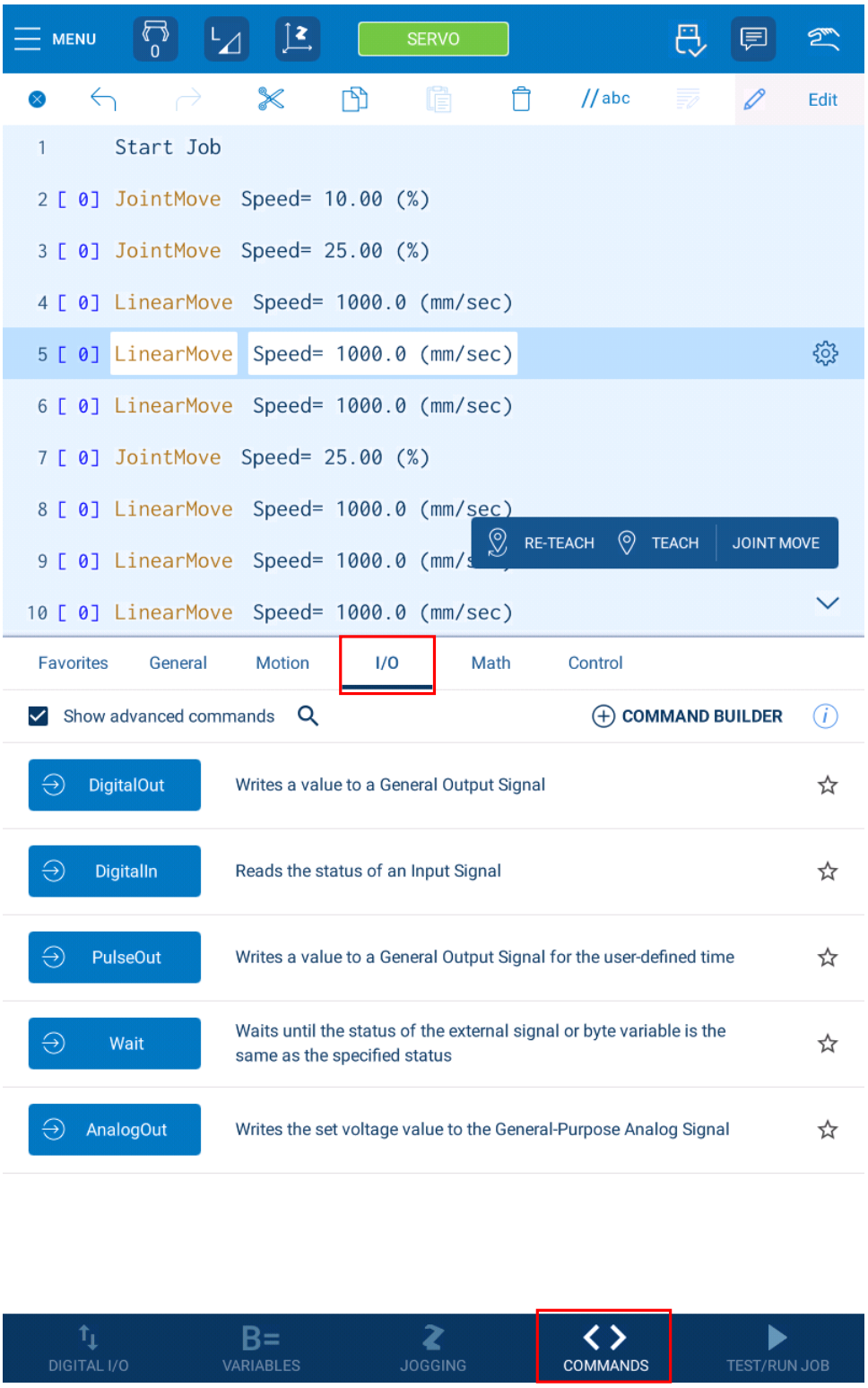
Use the following procedure.

1. **Confirm that the following procedure was completed.**

☞ *(2) Change the Motion and Speed of the Manipulator on page 121*

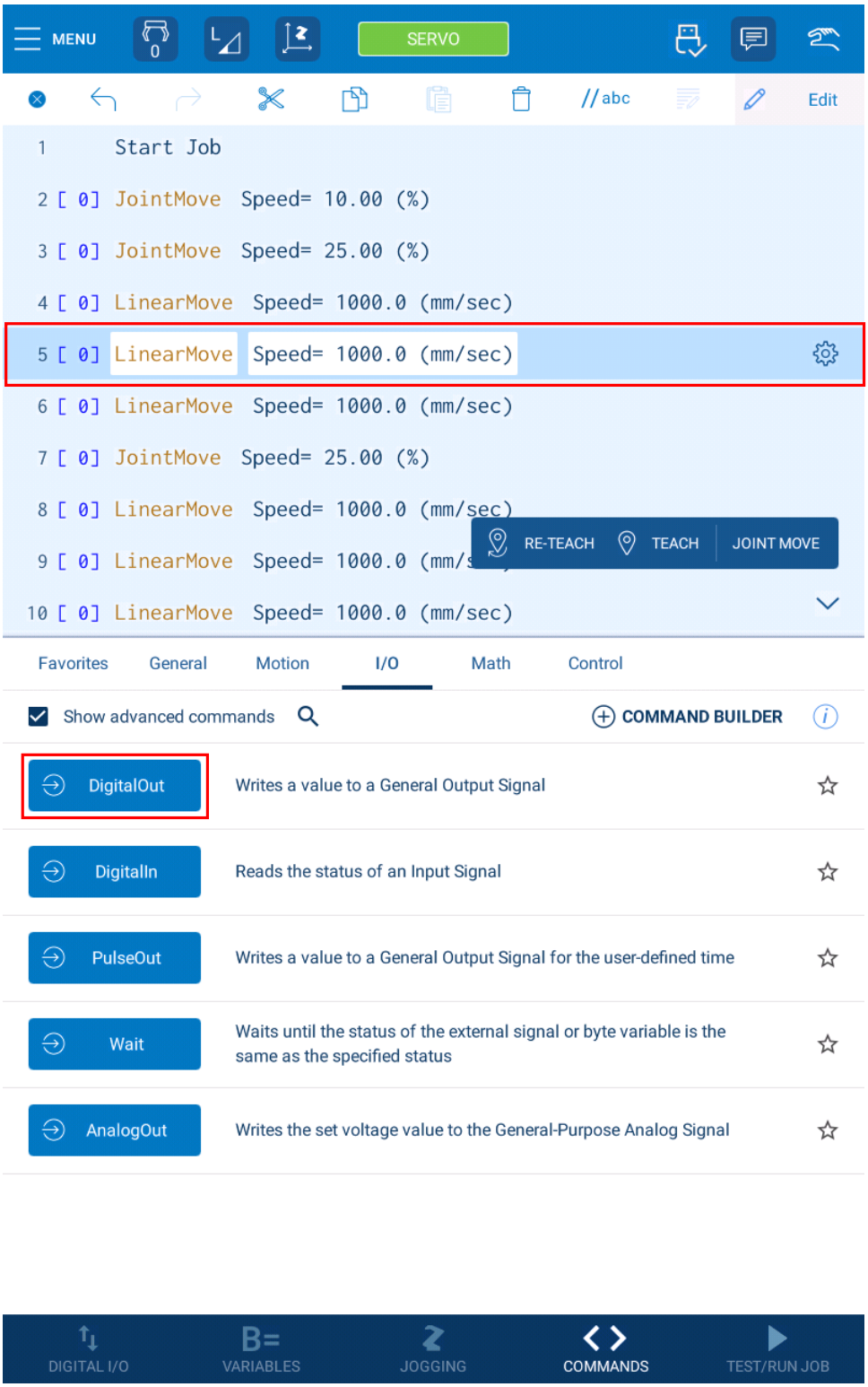
First, the procedure to add the DigitalOut instruction to turn ON hand suction at position (4) will be described.

2. **Tap {COMMANDS} at the bottom of the Smart Pendant window, and tap {I/O}.**

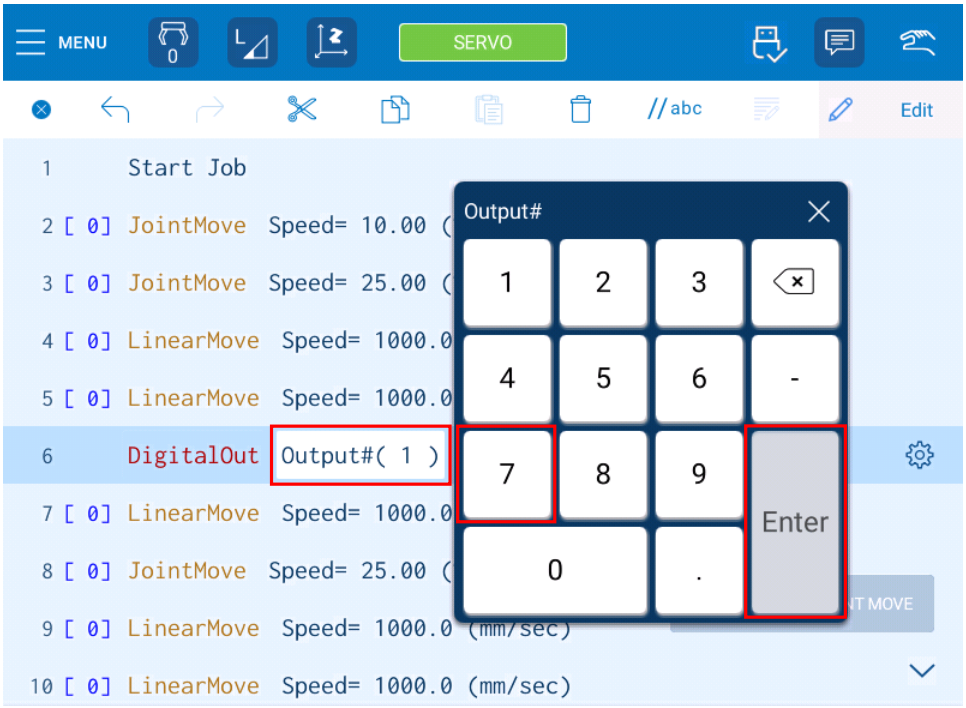


3. **Select line number 5, and tap {DigitalOut} at the bottom of the window.**

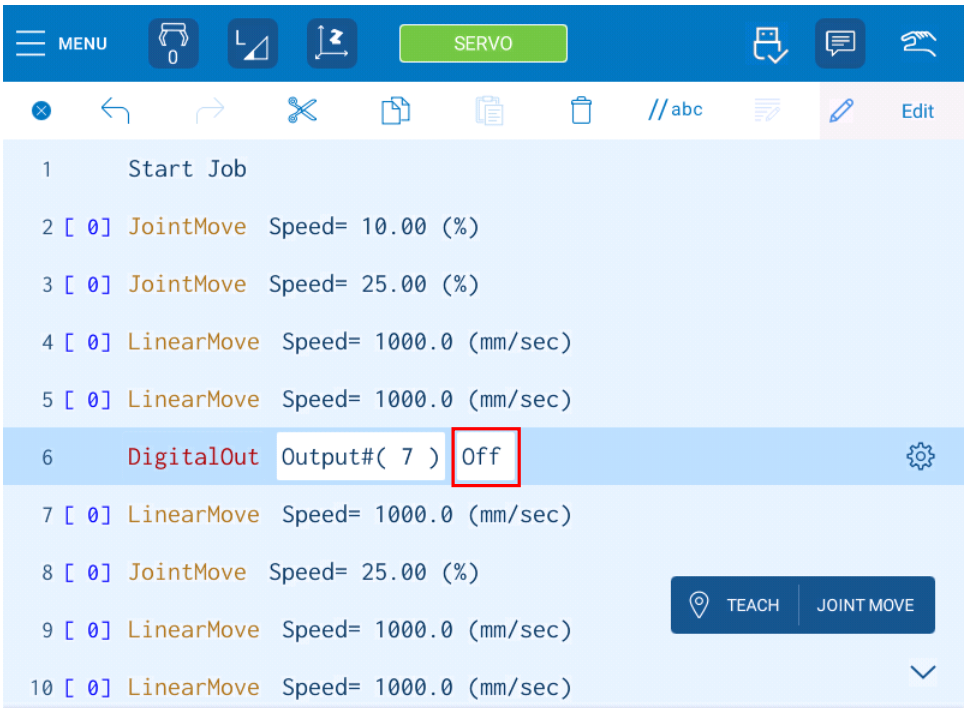
Information The instruction will be added to the line below the cursor position. Place the cursor on line number 5 here.


MENU
SERVO
Edit
1 Start Job
2 [0] JointMove Speed= 10.00 (%)
3 [0] JointMove Speed= 25.00 (%)
4 [0] LinearMove Speed= 1000.0 (mm/sec)
5 [0] LinearMove Speed= 1000.0 (mm/sec)
6 [0] LinearMove Speed= 1000.0 (mm/sec)
7 [0] JointMove Speed= 25.00 (%)
8 [0] LinearMove Speed= 1000.0 (mm/sec)
9 [0] LinearMove Speed= 1000.0 (mm/s
10 [0] LinearMove Speed= 1000.0 (mm/sec)
RE-TEACH
TEACH
JOINT MOVE
Favorites
General
Motion
I/O
Math
Control
Show advanced commands
COMMAND BUILDER
DigitalOut
Writes a value to a General Output Signal
DigitalIn
Reads the status of an Input Signal
PulseOut
Writes a value to a General Output Signal for the user-defined time
Wait
Waits until the status of the external signal or byte variable is the same as the specified status
AnalogOut
Writes the set voltage value to the General-Purpose Analog Signal
DIGITAL I/O
VARIABLES
JOGGING
COMMANDS
TEST/RUN JOB

4. **Tap {Output#} that was added to line number 6 on the Smart Pendant, enter "7", and then tap {Enter}.**

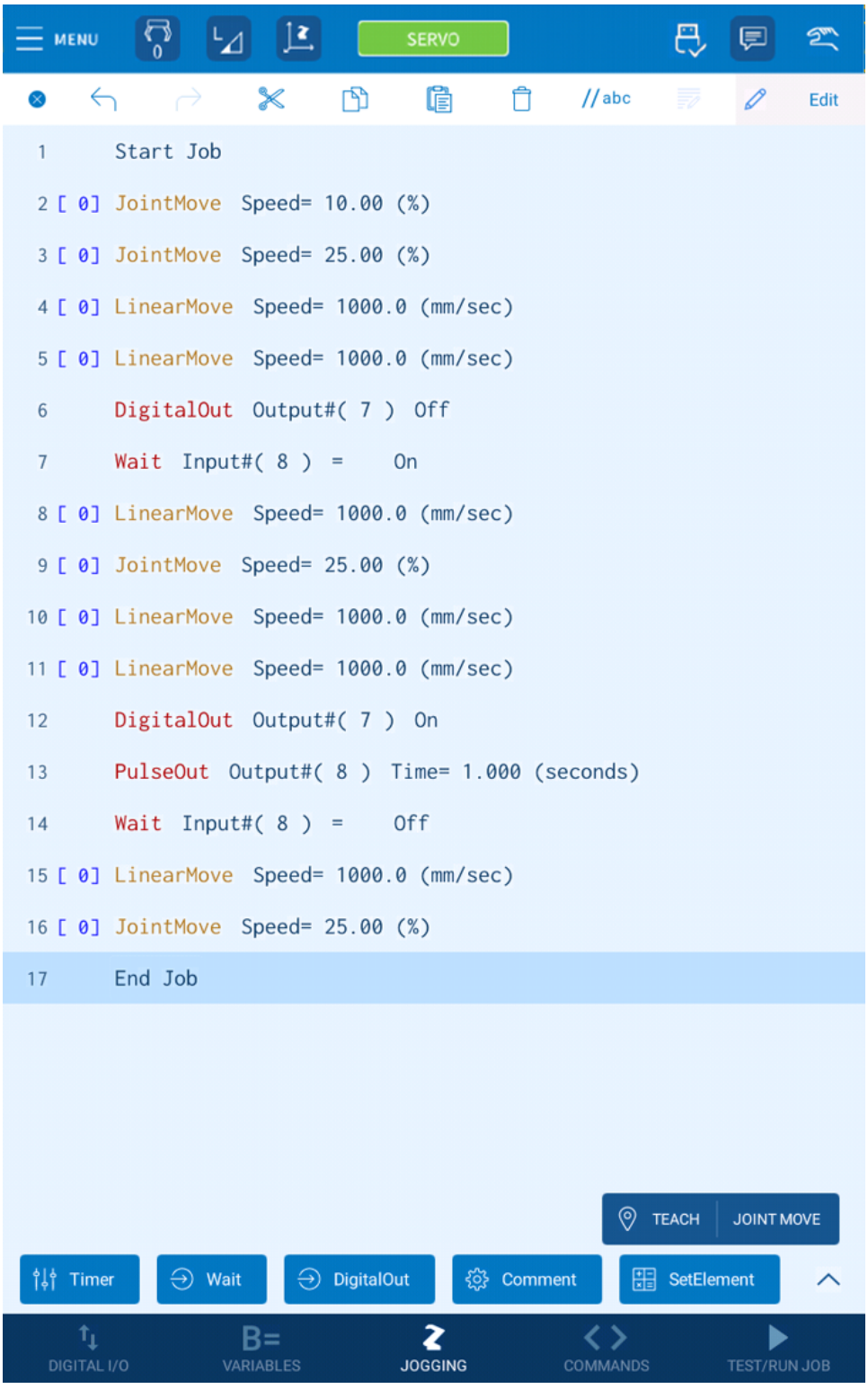


5. **Tap {On} for line number 6 on the Smart Pendant, and select {Off}.**



6. **Repeat steps 3 to 5 and set line number 7 to "Wait Input#(8) = On".**
7. **Repeat steps 3 to 5 and set line number 12 to "DigitalOut Output#(7) On".**
8. **Repeat steps 3 to 5 and set line number 13 to "PulseOut Output#(8) Time=1.000 (seconds)".**
9. **Repeat steps 3 to 5 and set line number 14 to "Wait Input#(8) = Off".**

The line numbers at which to add the instructions and the details of those instructions are shown next.



This concludes the procedure. Proceed to the next step.

(4) Change the Tool File

The sample program applies suction to the workpiece and moves it to a different location. For this reason, the tool file with the information for when the hand is not applying suction to the workpiece and the tool file with the information for when the hand is applying suction to the workpiece must be changed in the program.

Use the following procedure.

1. **Confirm that the following procedure was completed.**

☞ *(3) Add Instructions to Turn Hand Suction ON/OFF on page 124*

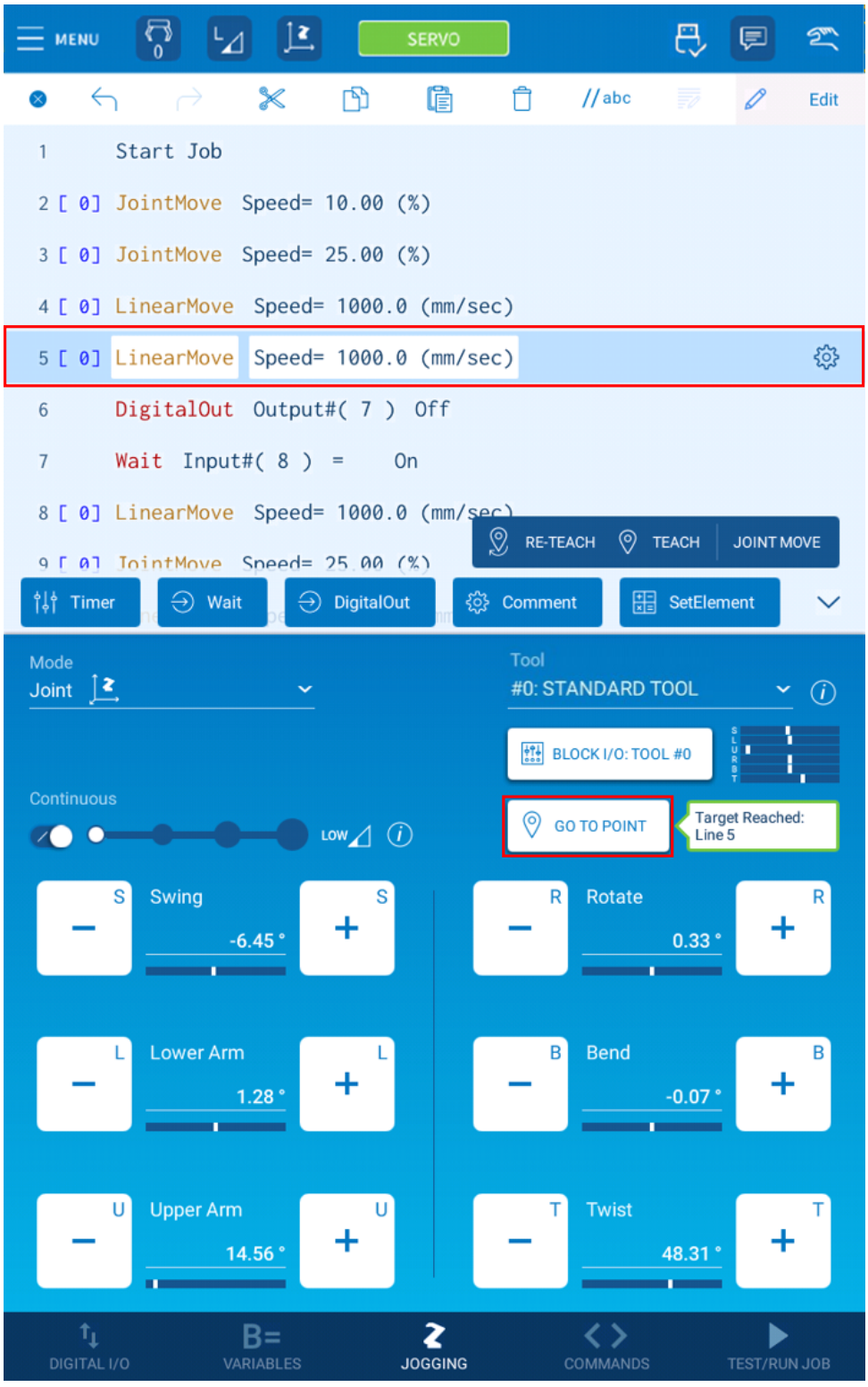
2. **Create the following two tool files.**

   - Information for when the hand is not applying suction to the workpiece
   - Information for when the hand is applying suction to the workpiece

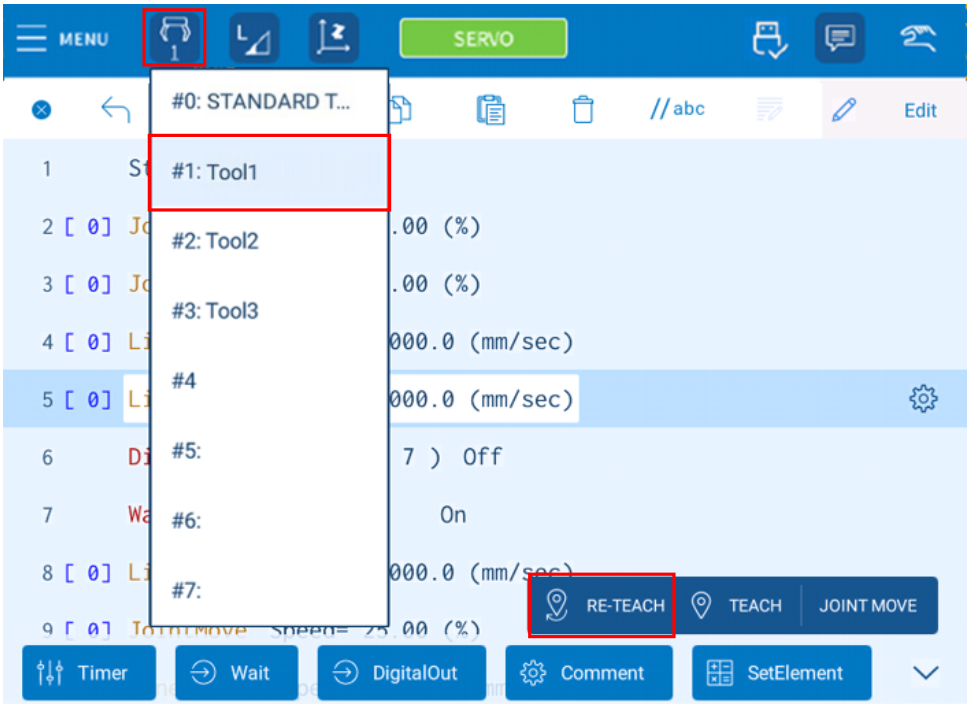
   Refer to the following section for details on creating a tool file.

   ☞ *7.2 Configuring a Tool File on page 89*

3. **Select line number 5 on the Smart Pendant, and tap {GO TO POINT}.**



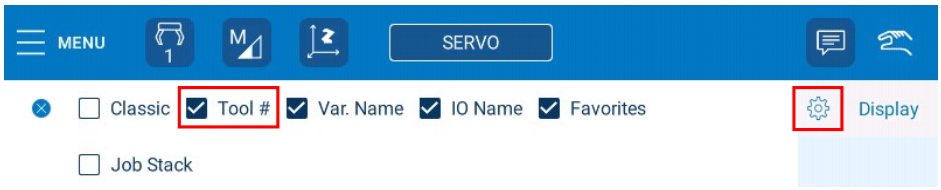
4. **Tap the tool number icon on the status bar, select {#1: Tool1}, and then tap {RE-TEACH}.**



The tool number of line number 5 will change to [1].

Information

If the tool numbers are not displayed in the window, tap {⚙} at the top right and select the {Tool #} check box.



5. **Repeat steps 3 to 4 and set the tool number on line numbers 8 to 10 to {#1: Tool1}.**

This concludes the procedure. Proceed to the next step.

8.2.4 Confirming Operation Step by Step

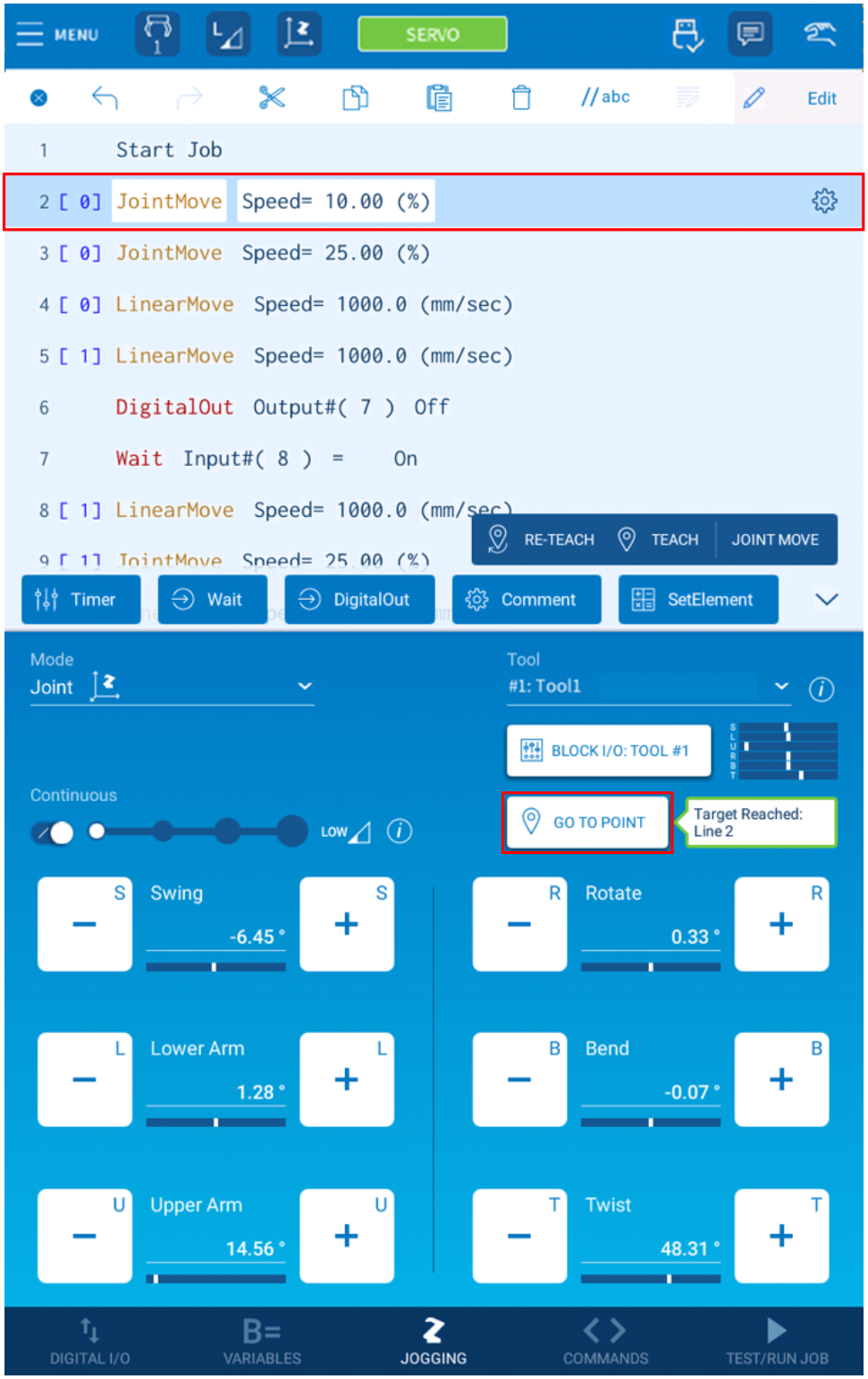
When creating the program is completed, confirm the operation of the manipulator while stepping through the created program (operation step by step).

1. **Confirm that nobody is near the manipulator.**
2. **Change the mode switch to MANUAL (TEACH) mode, and set the operation mode to teach mode.**

3. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

4. **Select line number 2 on the Smart Pendant, and tap {GO TO POINT}.**

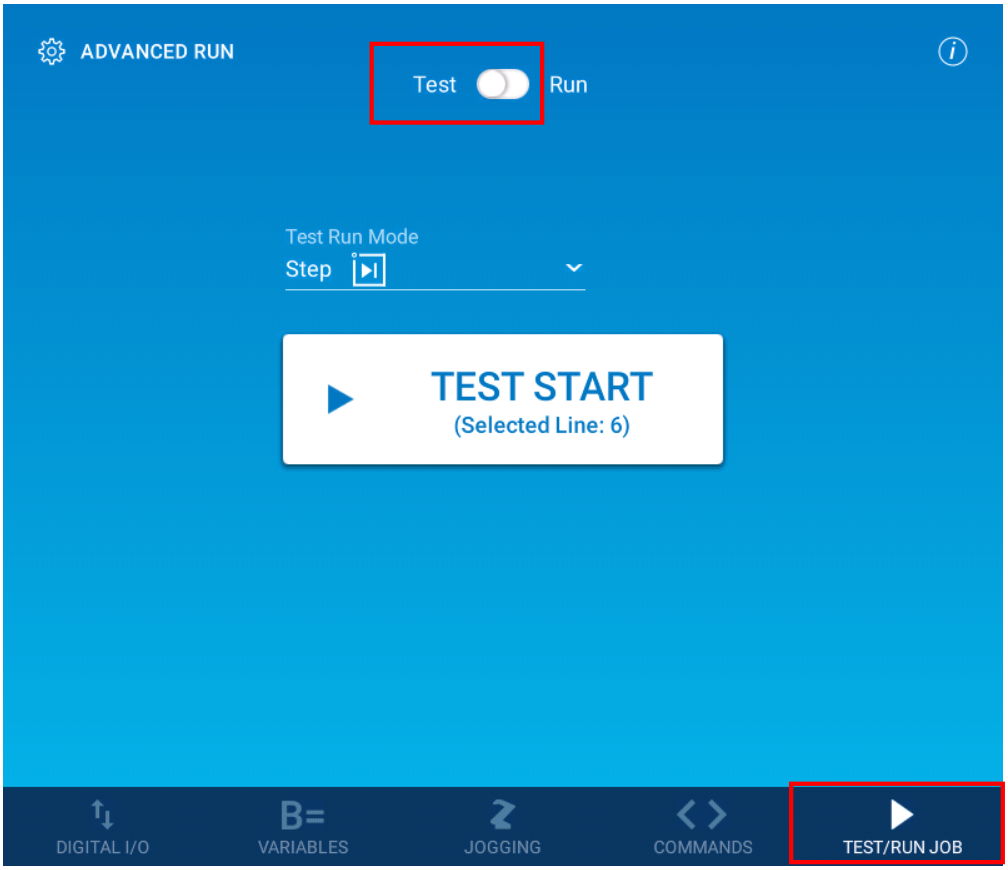


5. **Confirm that the manipulator moves according to the created program.**

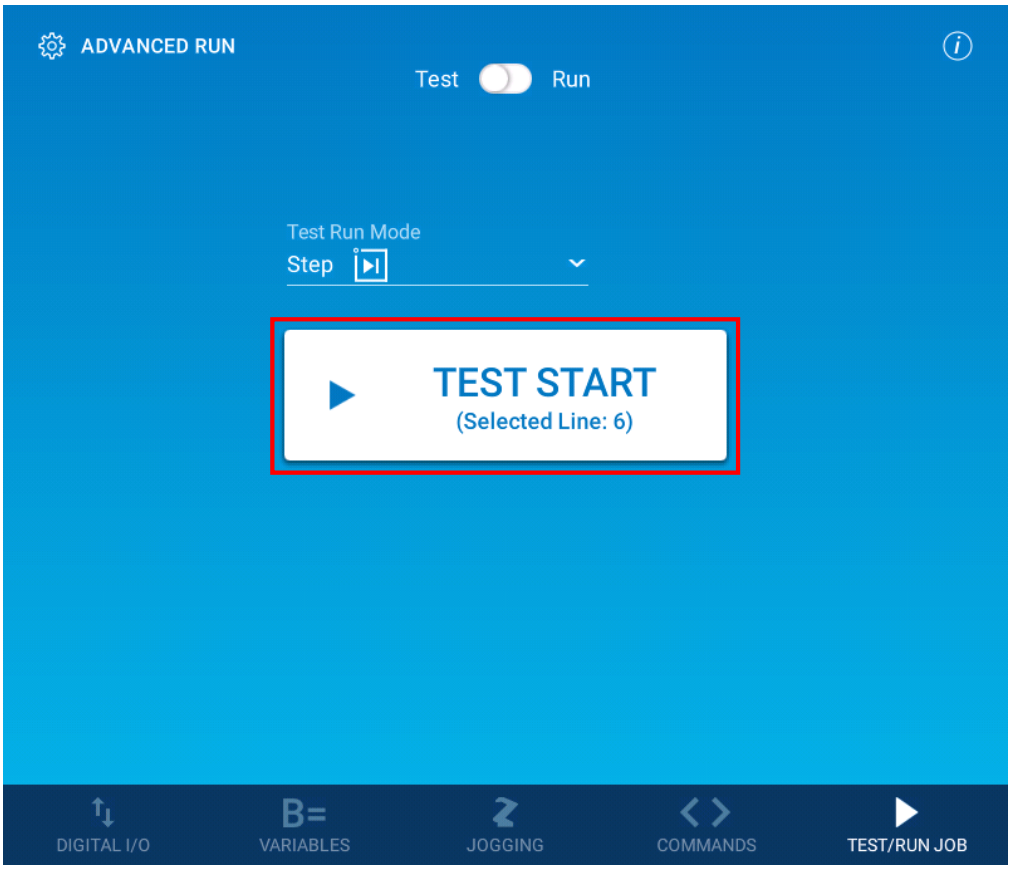
6. **Run the program up to line number 5 with steps 4 and 5 to confirm the operation of the manipulator.**

   The operation to turn hand suction ON/OFF is required for line numbers 6, 7, and 12 to 14. Use the following operation to turn hand suction ON/OFF.

7. **Tap {TEST/RUN JOB} at the bottom of the Smart Pendant window, and select {Test}.**



8. **Press and hold {TEST START}.**



The manipulator will start operation.

The job will start from the line where the cursor was placed. The line can be selected in teach mode.

9. **Run the program up to the end with steps 5 and 8 to confirm the operation of the manipulator.**

This concludes the procedure.

8.2.5 Running the Created Program

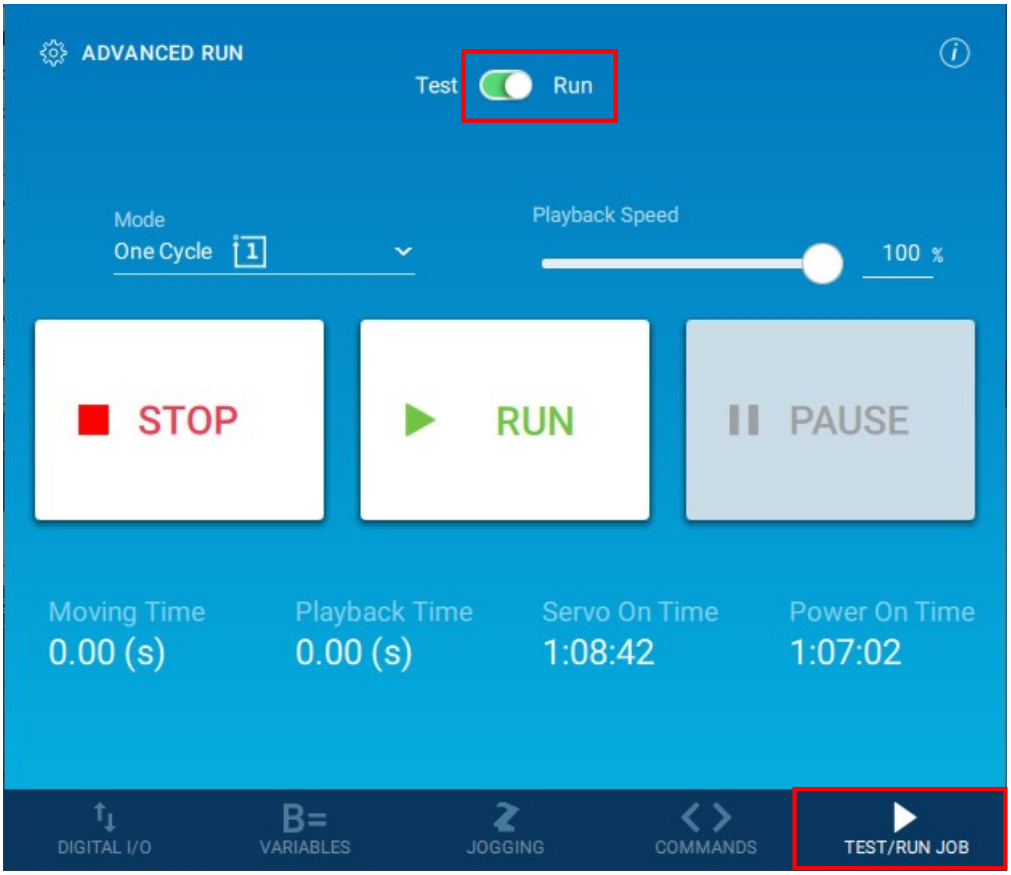
Run the program that was created using direct teach, and confirm that the manipulator moves as expected.

1. **Confirm that nobody is near the manipulator.**
2. **Change the mode switch to AUTOMATIC (PLAY) mode, and set the operation mode to play mode.**

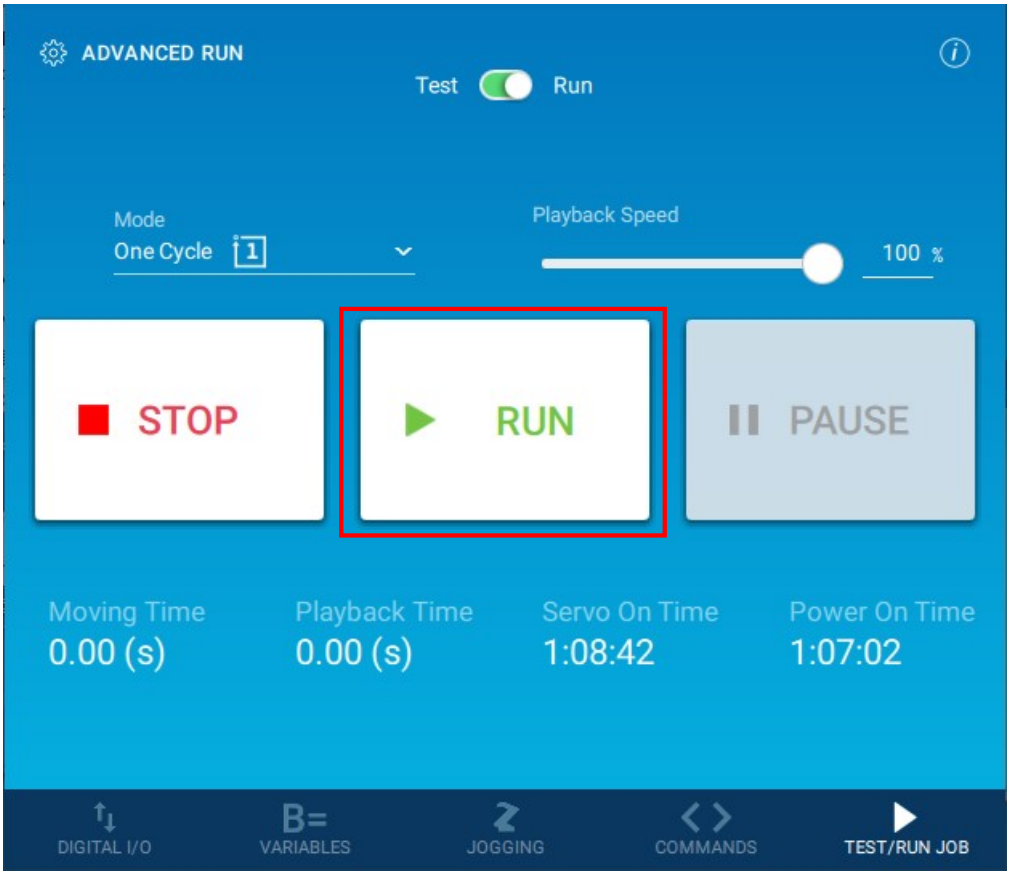
3. **Tap {SERVO} on the status bar to turn ON the servo.**

The button will turn green when the servo is turned ON.

4. **Tap {TEST/RUN JOB} at the bottom of the Smart Pendant window, and select {Run}.**



5. **Press and hold {RUN}.**



The manipulator will start operation.

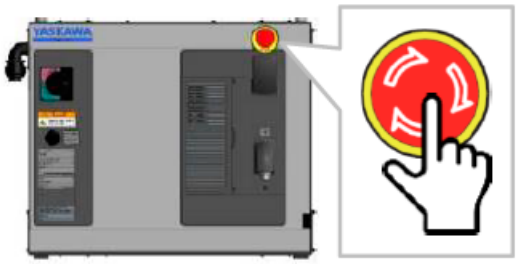
The job will start from the line where the cursor was placed. The line can be selected in teach mode.

6. **Confirm that the manipulator moves according to the created program.**

Information

- While the job is running, press {STOP} or {PAUSE} to stop or pause the job.
- The servo power remains ON when {PAUSE} is pressed, but the servo power is turned OFF when {STOP} is pressed.
- To cancel {CONTINUOUS}, select {ONE CYCLE} during job playback.

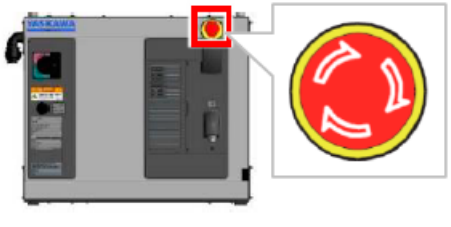
7. **Press the emergency stop button.**

YRC1000	YRC1000micro
There is an emergency stop button on the YRC1000.  The emergency stop button on the Smart Pendant can also be used. 	There is an emergency stop button on the Smart Pendant.  **Note:** The YRC1000micro is not equipped with an emergency stop button.

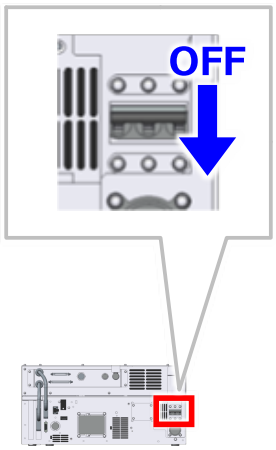
8. **Confirm that {SERVO} changes back to blue.**

   A blue {SERVO} means the servo power has been turned OFF.

9. **Turn the emergency stop button in the direction of the arrows to reset the emergency stop.**

YRC1000	YRC1000micro
 or 	

10. **Turn OFF the main power supply to the robot controller.**

YRC1000	YRC1000micro
	

This concludes the procedure.

Revision History

Date of Publication	Rev. No.	Section	Revised Contents
June 2023	-	-	First edition

MOTOMAN-HC30PL
Dust-Proof/Drip-Proof Specification

Quick Start Guide

Using the Smart Pendant

YASKAWA

YASKAWA ELECTRIC CORPORATION

June 2023 23-06

MANUAL NO.
HW2480998