



AUTO-SOLDERING SYSTEM

HU-200

Instruction Manual



Thank you very much for purchasing the HAKKO HU-200.

The HAKKO HU-200 is a soldering robot system.
This manual explains how to use the HAKKO HU-200 and the software.
Be sure to read this manual before operating the HAKKO HU-200.

Keep this manual readily accessible for reference.



Table of Contents

1. Set Components	1
1-1 Packing List	1
1-2 HAKKO HU-200	2
1-3 Cleaner (CX1003)	3
1-4 HAKKO FU-601	3
1-5 Soldering Unit Mount (CX5004)	4
1-6 Soldering Unit Fixture Base (CX5002)	4
1-7 Cleaner Base (CX5003)	4
1-8 Feeder Unit (CX5005)	4
1-9 PC	4
2. Specifications	5
2-1 Specifications for Each Model	5
2-1-1 Robot	5
2-1-2 HAKKO FU-601	6
2-1-3 Feeder Unit (CX5005)	6
2-2 Part Dimensions	7
2-2-1 Robot	7
2-2-2 Jig Table	8
3. Warnings, Cautions and Notes	9
4. Part Names	15
4-1 Front View	15
4-2 Rear View	16
4-3 Front Panel	17
4-4 Rear Panel	18
5. Installation	19
5-1 Cautions on Installation	19
5-2 Attaching Accessories to the Robot	19
5-2-1 Attaching the Feeder Unit (CX5005)	20
5-2-2 Attaching the Soldering Iron Unit	21
5-2-3 Attaching Tube Units	26
5-2-4 Connecting Cables and Cords	30
5-2-5 Mounting and Connecting the PC	31
5-2-6 Connecting the Power Cord (for robot)	31
5-2-7 Attaching the Cleaner (CX1003)	32
5-3-1 Wiring of the cleaner (CX1003)	33
5-3 External I/O Pin Layout	33
6. Installation	34
6-1 Performing a New Installation of the Software	34
6-2 Performing a Software Update	36
6-2-1 Backing up Data	36
6-2-2 Updating Software	36
6-2-3 After Installation Has Been Completed	37
7. Operation	38
7-1 Explanation of Software Screen	40
7-1-1 Program	41
7-1-2 Cleaning Settings	47
7-1-3 Soldering Conditions	48
7-1-4 System Settings	49
7-1-5 Work Information	50

7-1-6	Position	51
7-1-7	Settings	51
7-1-8	INCHING PITCH/JOG SPEED	52
7-1-9	Solder feeding / Solder retraction	53
7-1-10	Running Program	53
7-1-11	Start Button	53
7-1-11-1	Flowchart (Screen Button Operation)	54
7-1-11-2	Flowchart (Robot Button Operation)	55
7-2	JOG Operation.....	56
7-2-1	Basic Operations for JOG Operation	57
7-2-1-1	Movement Direction Using JOY STICKS	57
7-2-1-2	Axis Movement by Direct Coordinate Input	57
7-2-1-3	Axis Movement at Selected Speed (JOY STICK operation).....	58
7-2-1-4	Axis Movement by Inching (JOY STICK operation).....	59
7-2-2	Z Axis Lift	60
7-3	Cleaner (CX1003) Settings	63
7-3-1	Brush Cleaning Coordinate Settings.....	63
7-3-2	Connecting an Air Cleaner.....	67
7-3-3	Selecting Cleaner Type.....	67
7-4	Solder Installation and Solder Feed Settings.....	68
7-4-1	Solder Installation and Solder Feed Position Adjustment	68
7-4-1-1	Solder Installation	68
7-4-1-2	Solder Feed Position Adjustment	69
7-4-2	Solder Feed Settings	71
7-4-2-1	Creating a Solder Feed Program (Solder Feed Parameter Setting Screen)	71
7-4-2-2	Reading/Writing Soldering Conditions.....	72
7-5	Creating a Soldering Program	73
7-5-1	PS (Point Soldering) Settings	74
7-5-2	DS (Drag Soldering) Settings.....	83
7-5-3	Copying Soldering Programs	88
7-5-4	None (PWB Removal Position) Settings.....	91
7-6	Running a Program.....	92
7-6-1	Calling up and Running a Program.....	92
7-7	Performing Detailed Settings.....	94
7-7-1	Other Inputting Methods of Coordinates	94
7-7-1-1	Using "AUTO SET"	94
7-7-1-2	Using Gerber Data.....	97
7-7-2	Using the Palletizing Function.....	100
7-7-2-1	Repeating a Single Point	100
7-7-2-2	Duplicating a Program that Uses the Palletizing Function and Work Origin.....	102
7-7-2-3	Duplicating a Series of Multiple Points as a Group	103
7-7-3	Calling up a Program Using a Bar Code or I/O.....	105
7-7-3-1	Registering a Bar Code	105
7-7-3-2	Calling up a Program with a Bar Code	106
7-7-3-3	Registering an I/O Setting	106
7-7-3-4	Calling up a Program via I/O	107
7-7-4	I/O Settings	109
7-7-5	System Settings	110
7-7-5-1	OTHER (OFFSET, Z-ESC, COUNT) Functions	111
	■ OFFSET (Settable range: 0 – 100 mm)	111
	■ Z-ESC (Settable range: 0 – 200 mm).....	111

Table of Contents (continued)

■ COUNT (Settable range: 1 – 9999999).....	111
7-7-5-2 SOLDER HEAD ADJUST Function	112
7-7-5-3 SOLDER HEAD ANGLE Function	113
7-7-5-4 SOLDER UNIT.....	113
7-7-5-6 Lang (Change of the language).....	114
7-7-5-5 I/O MAPPING	114
■ Output Signal Assignment.....	114
■ Input Signal Assignment	114
7-7-5-7 Operation Mode	115
■ Operator mode	115
■ Admin mode	116
■ Setting password.....	116
■ Password reset	117
7-7-6 Changing Solder Diameter.....	118
7-7-7 Installing the Teflon Tube.....	119
8. Maintenance.....	120
8-1 Attached Accessories.....	120
8-1-1 Cleaner (CX1003)	120
8-1-2 Soldering Iron Unit (HAKKO FU-601)	120
8-1-3 Feeder Unit (CX5005).....	120
8-1-4 Soldering Unit Fixture Base (CX5002).....	121
8-1-5 Jig Table	121
8-1-6 Soldering Unit Mount (CX5004)	122
8-1-7 Cleaner Base (CX5003).....	122
8-2 Inspection Items and Inspection Frequency	123
8-2-1 Items to be Checked during External Visual Inspection.....	123
8-2-2 Cleaning during External Visual Inspection	123
8-2-3 Internal Inspection.....	123
8-2-4 Cleaning during Internal Inspection	124
8-2-5 Replenishing Grease	124
8-2-5-1 X Axis.....	125
8-2-5-2 Y Axis.....	126
8-2-5-3 Z Axis.....	127
8-3 Mechanical Adjustments (when Replacing Timing Belt or Y-axis Cover)	128
8-4 How to replace batteries.....	129
9. Error Messages.....	130
9-1 Attached Accessories.....	130
9-2 Robot.....	130
10. Troubleshooting	132
11. Parts List	134

1. Set Components

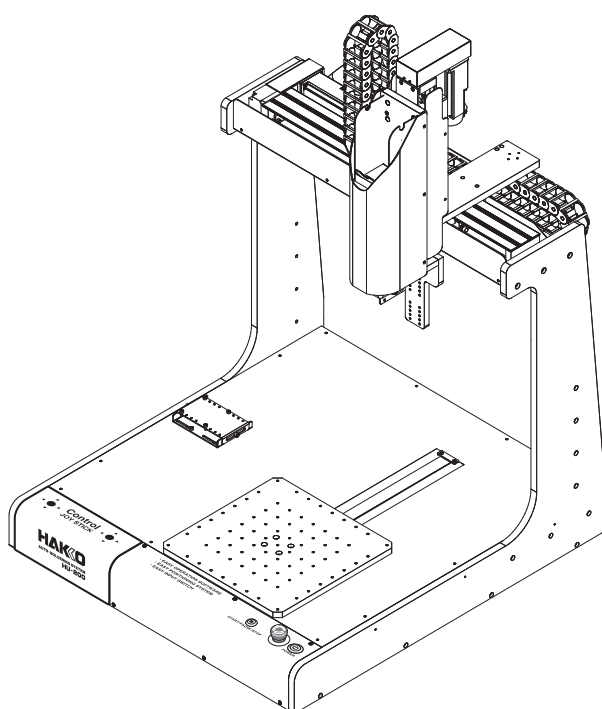
1-1 Packing List

Product Name	Product Number	Configuration Information
HAKKO HU-200 (robot)	—	p. 2
Power cord	—	p. 2
USB cable	BX1062	p. 2
Cleaner	CX1003	p. 3
HAKKO FU-601	—	p. 3
Soldering unit mount	CX5004	p. 4
Soldering unit fixture base	CX5002*1	p. 4
Cleaner base	CX5003*1	p. 4
Feeder unit	CX5005	p. 4
Solder reel support shaft	—	p. 2
Feeder cable: 4 m	BX1045*1	p. 2
Tube unit Φ 0.3 – 1.0	BX1055	p. 2
Tube unit Φ 1.2 – 1.6	BX1042	p. 2
Tube unit B Φ 0.3	BX1054	p. 2
Tube unit B Φ 0.5 – 1.0	BX1052	p. 2
Tube unit B Φ 1.2 – 1.6	BX1053	p. 2
PC	—	p. 4
Attachment holder (for tablet PC)	—*1	p. 2
Display arm (for tablet PC)	—*1	p. 2
Instruction manual (CD-ROM)	—	p. 2
Quick manual (Installation and Connection)	—	p. 2
Quick user guide (PC software)	—	p. 2
I/O cable (for cleaner)	—	p. 2
Relay cord (1.5 m)	—	p. 2

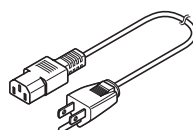
1. Set Components (continued)

1-2 HAKKO HU-200

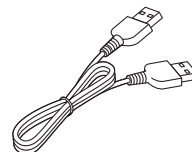
HAKKO HU-200 (robot)	1	Instruction manual (CD-ROM)	1
Power cord	1	Quick manual (Installation and Connection)	1
USB cable (BX1062)	1	Quick user guide (PC software)	1
Solder reel support shaft	1	I/O cable (for cleaner)	1
Feeder cable 4 m (BX1045)*1	1	Attachment holder*1	1
Tube unit Φ 0.3 – 1.0 mm (BX1055)	1	Display arm*1	1
Tube unit Φ 1.2 – 1.6 mm (BX1042)	1	Relay cord 1.5m	1
Tube unit B Φ 0.3 mm (BX1054)	1		
Tube unit B Φ 0.5 – 1.0 mm (BX1052)	1		
Tube unit B Φ 1.2 – 1.6 mm (BX1053)	1		



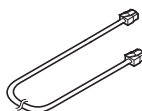
HAKKO HU-200
(robot)



Power cord



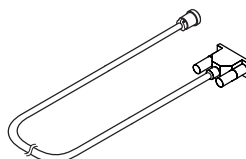
USB cable
(BX1062)



Relay cord 1.5m



I/O cable
(for cleaner)



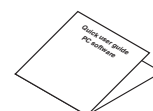
Feeder cable 4 m
(BX1045)



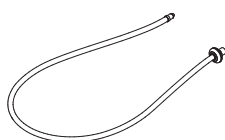
Solder reel
support shaft



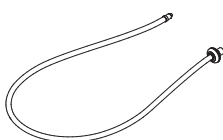
Quick manual
Installation and Connection



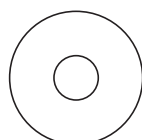
Quick user guide
PC software



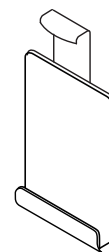
Tube unit
 Φ 0.3 – 1.0 mm
(BX1055)



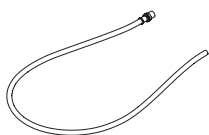
Tube unit
 Φ 1.2 – 1.6 mm
(BX1042)



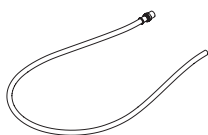
Instruction manual
(CD-ROM)



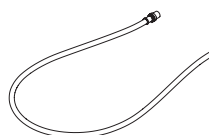
Attachment holder
(for tablet PC)



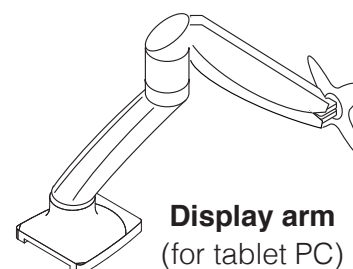
Tube unit B
 Φ 0.3 mm
(BX1054)



Tube unit B
 Φ 0.5 – 1.0 mm
(BX1052)



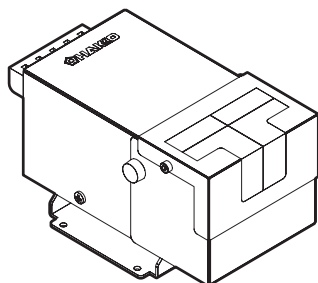
Tube unit B
 Φ 1.2 – 1.6 mm
(BX1053)



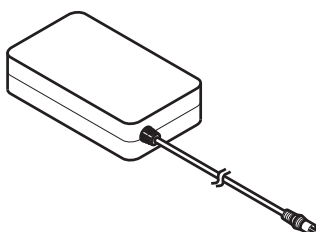
Display arm
(for tablet PC)

1-3 Cleaner (CX1003)

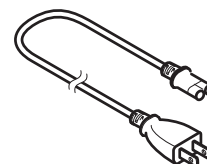
Cleaner (CX1003).....	1	Power cord (for cleaner)	1
AC adapter	1	Instruction manual (for cleaner).....	1



**Cleaner
(CX1003)**



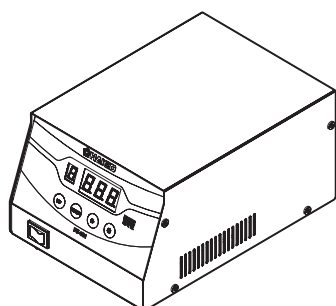
AC adapter



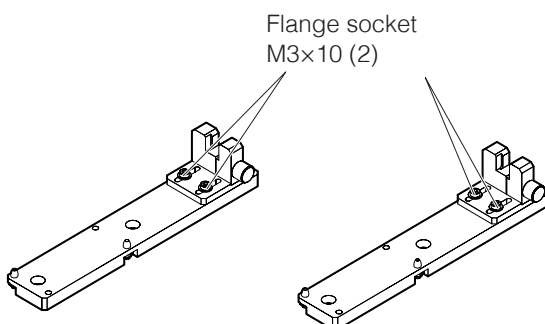
**Power cord
(for cleaner)**

1-4 HAKKO FU-601

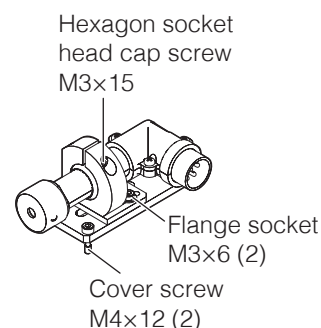
HAKKO FU-601 ^{*2}	1	Feeder unit attachment screw	1
HAKKO FU-6002 (FU6002-01X).....	1	Soldering iron cable 5 m (BX1033) ^{*1}	1
Spatter prevention cover (BX1027)	1	Relay cord (BX1056).....	1
Soldering unit fixture base (CX5019).....	1	Power cord	1
Tip adjustment jig unit		Heat-resistant pad	1
For TX1 series tips (CX5017)	1	Instruction manual	1
For TX2 series tips (CX5018)	1		



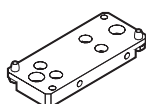
HAKKO FU-601



For TX1 series tips (CX5017) For TX2 series tips (CX5018)
Tip adjustment jig unit



**HAKKO FU-6002
(FU6002-01X)**



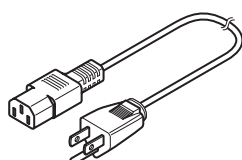
**Soldering unit fixture base
(CX5019)**



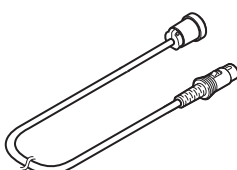
**Spatter prevention cover
(BX1027)**



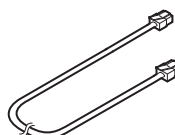
Feeder unit attachment screw



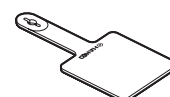
**Power cord
(for HAKKO FU-601)**



**Soldering iron cable 5 m
(BX1033)**



**Relay cord
(BX1056)**

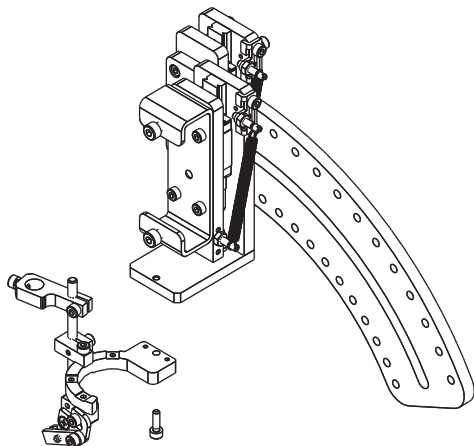


Heat-resistant pad

1. Set Components (continued)

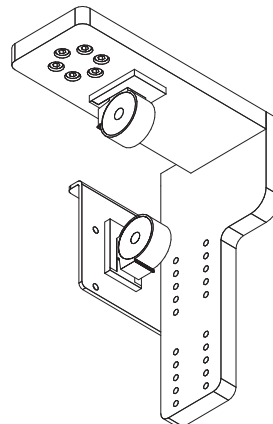
1-5 Soldering Unit Mount (CX5004)

Soldering unit mount (CX5004) 1



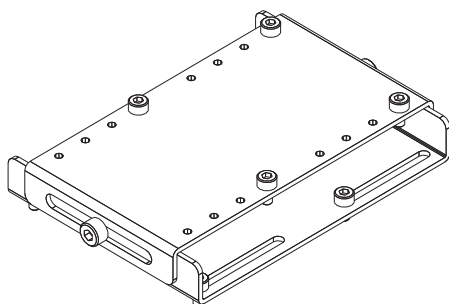
1-6 Soldering Unit Fixture Base (CX5002)

Soldering unit fixture base (CX5002)*1 1



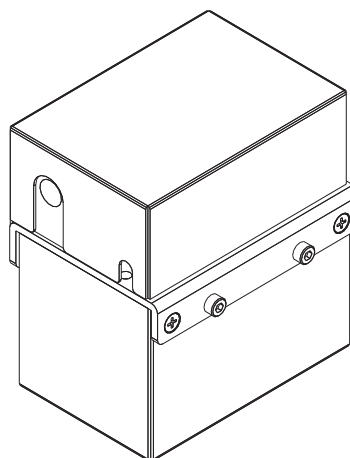
1-7 Cleaner Base (CX5003)

Cleaner base (CX5003)*1 1



1-8 Feeder Unit (CX5005)

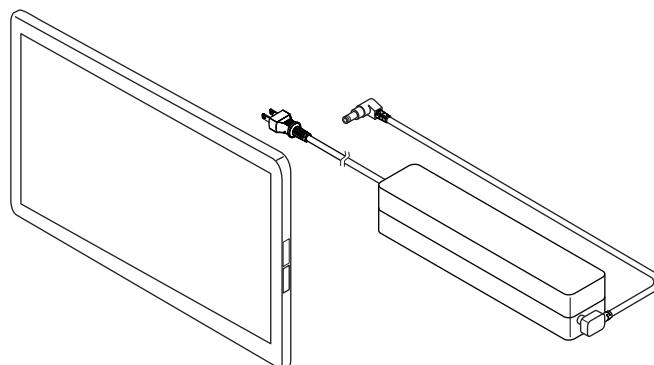
Feeder unit (CX5005)*3 1



1-9 PC

Tablet PC (Windows 10 Professional) 1

Power cord 1



*1 This system is shipped with it attached to the robot main body.

*2 Tips are sold separately. Refer to "11. Parts List" (p. 134) in this manual or to "Tip Types" in the instruction manual of HAKKO FU-601.

*3 Solder feed pulley units, solder feed guide sets and Teflon tubes are sold separately. For further details, refer to "11. Parts List" (p. 134).

2. Specifications

2-1 Specifications for Each Model

2-1-1 Robot

Power supply	AC100 – 240V 50/60Hz	
Power consumption	300W	
Movable range (stroke)	X	400 mm
	Y	300 mm
	Z	200 mm
	θ	$\pm 200^\circ$
Drive system (motor type)	X	Servo motor
	Y	
	Z	
	θ	
	Solder feed	Stepping motor
Position detection method	Absolute encoder	
Payload capacity	Y (workpiece)	20kg
Speed	X	1 – 800 mm/s
	Y	
	Z	
	θ	1 – 800°/s
Repeatable position accuracy	X	± 0.01 mm
	Y	
	Z	
	θ	$\pm 0.01^\circ$
Allowable voltage range	AC100 – 240V 50/60Hz $\pm 5\%$	
Noise level	56dB	
Operating environment	Ambient temperature range	0 – 40 °C (No condensation or freezing)
	Ambient humidity range	85% RH or less (No condensation or freezing)
	Use atmosphere	No corrosive or combustible gas
		No excessive dust
Outside dimensions	600 (W) × 910 (H) × 650 (D) mm	
Weight	50 kg	
External I/O	Input: 20	
	Output: 12 (NPN type) (including 2 for cleaner)	
External interface	USB × 4 (including one port for PC)	
Z axis solenoid brake release button	Provided on left side of Z axis	

2. Specifications (continued)

2-1-2 HAKKO FU-601

Station	
Power supply	AC 100V 50/60 Hz
Power consumption	300 W
Settable temperature range*1	50 – 500 °C
Temperature Stability	Unloaded condition ± 5 °C at idle
Output	AC 29 V
Outside dimensions	145 (W) \times 107 (H) \times 211 (D) mm
Weight	4 kg
Soldering Iron Unit (HAKKO FU-6002)	
Power consumption	260 W (29V)
Tip to ground resistance	$< 2 \Omega$
Leakage voltage	< 2 mV
Cord length	5 m
Overall length*2, *3	168 mm
Weight*2	134 g (173 g including soldering unit fixture base)

*1 Displayed temperatures are temperatures measured using HAKKO FG-101.

*2 When used with tip 4XD

*3 Dimension can be adjusted within a ± 5 mm range.

This product is protected against electrostatic discharge.

Settable ranges for solder feed*2-*4

Number of solder feed programs	Maximum of 250 programs
Solder feed length	0.1 – 99.9 mm
Solder feed speed	0.1 – 99.9 mm/s*1
Solder back feed length	0 – 20.0 mm
Solder back feed speed	0 – 99.9 mm
Heat time	0.1 – 9.9 sec

*1 Depending on the type of solder, it may not be possible to feed solder normally at high speed. In such cases, contact the dealer where you purchased the product.

*2 The values in the table above are for primary soldering.

*3 For secondary and tertiary soldering, all values can be set starting from 0. If no feed speed is set for secondary soldering, that operation will be canceled. For other values, setting any of the values to 0 or blank will skip all subsequent operations.

*4 For DS (drag soldering), if a condition in which the secondary feed length is set is selected, the secondary feed length setting will be ignored.

2-1-3 Feeder Unit (CX5005)

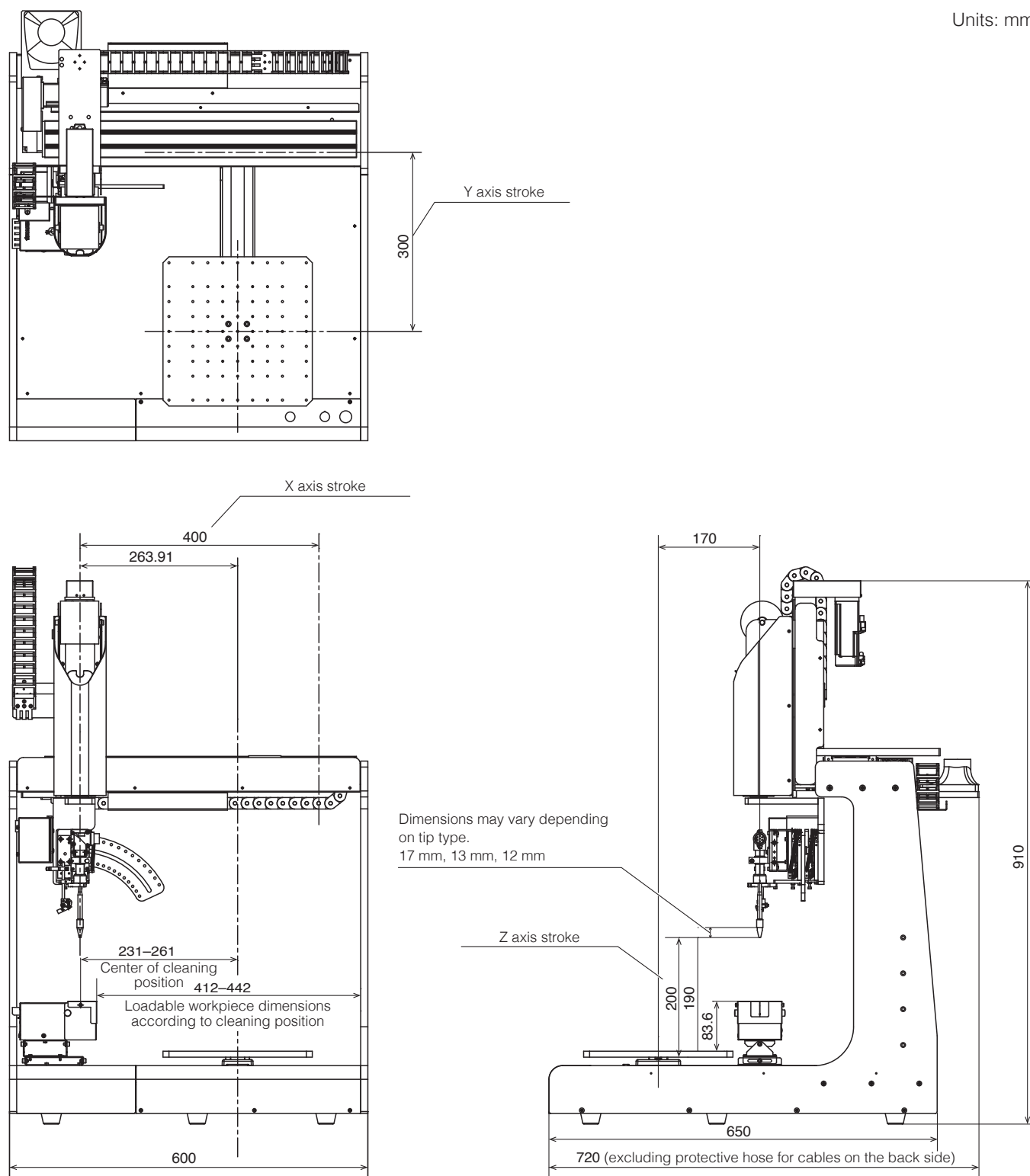
Usable solder wire diameter	0.3, 0.5, 0.6 (0.65), 0.8, 1.0, 1.2, 1.6 mm
-----------------------------	---

- A spool of up to 1 kg of solder can be installed.
- A solder feed pulley unit, solder feed guide set, and Teflon tube are necessary for use. These are sold separately and should be purchased according to the diameter of the solder which will be used.

2-2 Part Dimensions

2-2-1 Robot

Units: mm

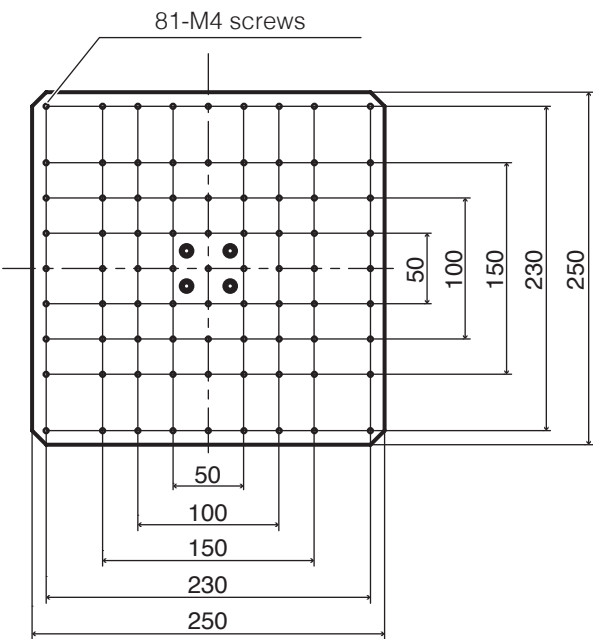


— Note —

Specifications and design are subject to change without notice.

2. Specifications (continued)

2-2-2 Jig Table



Units: mm

3. Warnings, Cautions and Notes

WARNING

In this manual, items requiring caution are classified into 2 categories, “WARNINGS” and “CAUTIONS”, as defined below. Please make sure to understand these items before reading the main text.

 **WARNING:** Failure to comply with a WARNING may result in serious injury or death.

 **CAUTION:** Failure to comply with a CAUTION may result in injury to the operator, or damage to the objects involved.

Note: Indicates important steps or items in the procedure being explained.

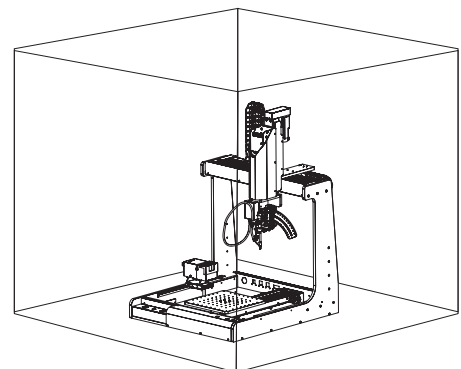
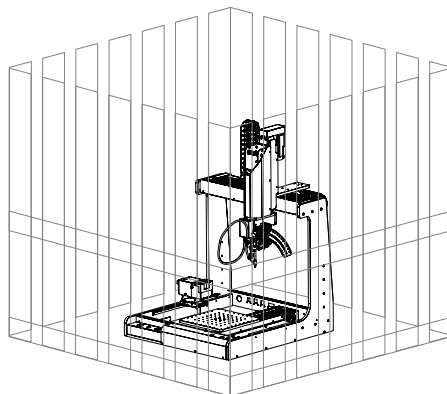
In Article 59 of the Industrial Safety and Health Act, Article 36 of the Labor Safety and Health Regulations, and related laws, special training for safety and health must be given to workers who direct, inspect, or adjust industrial robots. Be sure that such special training is provided to the workers involved in such activities.

WARNING

During operation

There is a risk of death or injury if a person comes in contact with the robot while it is operating. Take safety measures (such as installation of a safety enclosure) to prevent workers from entering the robot's range of movement during operation.

Safety enclosure: If there is no safety enclosure, indicate the robot's range of movement and take necessary safety measures.



Installation/transportation

- When transporting the robot, it should be carried by at least 2 people, or a cart, hand truck, etc. should be used.
- When performing work involving 2 or more people, be sure that the relationship between the leader and subordinates is clear, and perform work while giving voice instructions to each other to ensure safety and prevent dangerous contact or falls.
- Install the robot on a flat surface and secure it in place to prevent the robot from tipping over or falling.
- Do not climb on top of the robot or use it as a step.
- When moving the robot, be sure to secure its movable parts before moving.
- Be sure that the main power supply is switched off when installing the robot and performing wiring, and check that wiring has been performed properly.
- When using externally connected devices such as emergency stop equipment, etc., check that they operate correctly before use.

3. Warnings, Cautions and Notes (continued)

WARNING

During automatic operation

- Check the safety of the surrounding area before starting operation.
- Provide indications that the robot is in operation and be careful that no one enters the safety enclosure during operation.
- When workers have entered the safety enclosure, take measures to enable emergency stopping.

During work

- When performing work inside the safety enclosure, notify nearby workers that work is being performed and display a “Working” sign, etc. in an easily visible location.
- When work will be performed inside the safety enclosure, before starting work check whether or not external wires are equipped with insulation or shielding, whether or not there are abnormalities in the operation of moving sections, and that there are no abnormalities in the operation of emergency stop equipment, etc.
- When training work, inspection, etc. is being performed, be sure that workers perform the work thoroughly.
- To enable operation to be immediately stopped in the event of a dangerous condition, perform work within reach of an emergency stop button, or install emergency stop devices close at hand.
- If a dangerous situation occurs, press the emergency stop button (button of emergency stop device) immediately.
- When work is being performed by multiple workers, perform work while giving voice instructions to each other and while checking safety to prevent other workers from performing careless operations during the work.
- When inspecting or replacing parts that do not require operation, switch off the main power supply before performing such work.

Other

- Do not use near flammable, inflammable, explosive, or corrosive gases or materials.
- If the product will not be used for a long period of time, unplug the power plug.
- Do not touch metal parts near the tip while the tip is at high temperatures.
- Since there is a danger of fingers getting pinched, keep your fingers away from moving sections (X, Y, Z, and θ axes).
- When performing repairs or replacing parts, be sure to unplug the power plug and wait for the soldering iron to cool down before performing such work.
- Do not allow disassembly or repair to be performed by workers other than qualified repair technicians. Also, do not modify the product.

CAUTION

- Since the door (cover) of the JOY STICKS may become detached, be careful not to hold onto the door (cover).
- When transporting the product, be careful not to hold it by the X axis section. Doing so may result in damage to the product.
- Be sure to ground the product during use.
- Attach only HAKKO-specified accessories to the robot, and do not use this product for applications other than soldering.
- Ensure safety by wearing a helmet, protective gloves, safety glasses, and safety shoes when necessary.
- Do not subject the product to strong impact.
- Product should be installed so that sufficient working space to safely perform preventive maintenance, etc. can be secured.
- Be sure to ground the product during use.
- Be sure to provide sufficient illumination to perform work safely.
(JIS Z9110 specifies 300 to 750 lux.)
- Be sure to use the product only in the specified use environment. Use in high-temperature high-humidity regions or in cold high-altitude regions may not provide sufficient performance.
- Do not touch the product with wet hands or use the product when the main body or cords are wet.
- If the product becomes abnormally hot or emits smoke, abnormal odors, or abnormal noise, stop use immediately and set the power switch to off.
- When use is interrupted or completed, set power switch to off.
- Always hold the power plug when plugging it in or unplugging it.
- Do not place the cord close to heat, oil, or objects with protruding corners.
- Do not forcibly bend, pull on, or twist the cord.
- Do not use the cord if the plug is damaged or if it is loose in the electrical outlet.
- The cutting blade has a sharp edge. Be careful not to cut your hands, etc. on it.
- If cut flux-containing solder is not used for a long time, the flux characteristics may deteriorate.
- Since the flux characteristics of cut solder inside the guide pipe may deteriorate due to the heat of the soldering iron, it should be used quickly.
- Do not bend the guide pipe or forcibly turn it. Doing so may cause it to break.
- Do not fold the tube or bend it at a sharp angle. Doing so may cause it to become clogged with solder.
- If solder or flux sticks to the cutting blade or pulley, use a brush, etc. to remove it.
- Periodically remove the guide pipe and Teflon tube and clean off any flux that is stuck on.

3. Warnings, Cautions and Notes (continued)

About Batteries

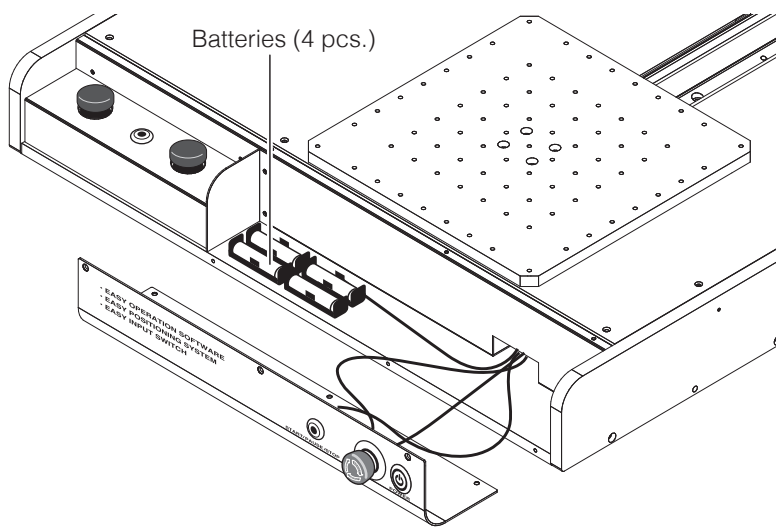
Please be sure to replace batteries before end of service life.

The battery will be depleted when all power supply is turned off or the main supply on the back side is turned on and the power supply button on the front panel is turned off.

Battery life Approx. 6500 hours (approx. 9 months)

Use the above information as a reference for the service life of the battery.

However, the duration of the charge varies depending on the use environment and ambient temperature.



⚠ CAUTION

If the battery runs out, the position information for each axis will be lost and the product will not operate normally.

Always be sure to have a new battery on hand and replace the battery before it runs out.

If battery has run out:

If the battery has run out, please consult the sales office or distributor since it will be necessary to set the position information again from the start.

Refer to “8-4 How to replace batteries” (p. 129) for the procedure for replacing batteries.

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3. Warnings, Cautions and Notes (continued)

4. Disclaimer

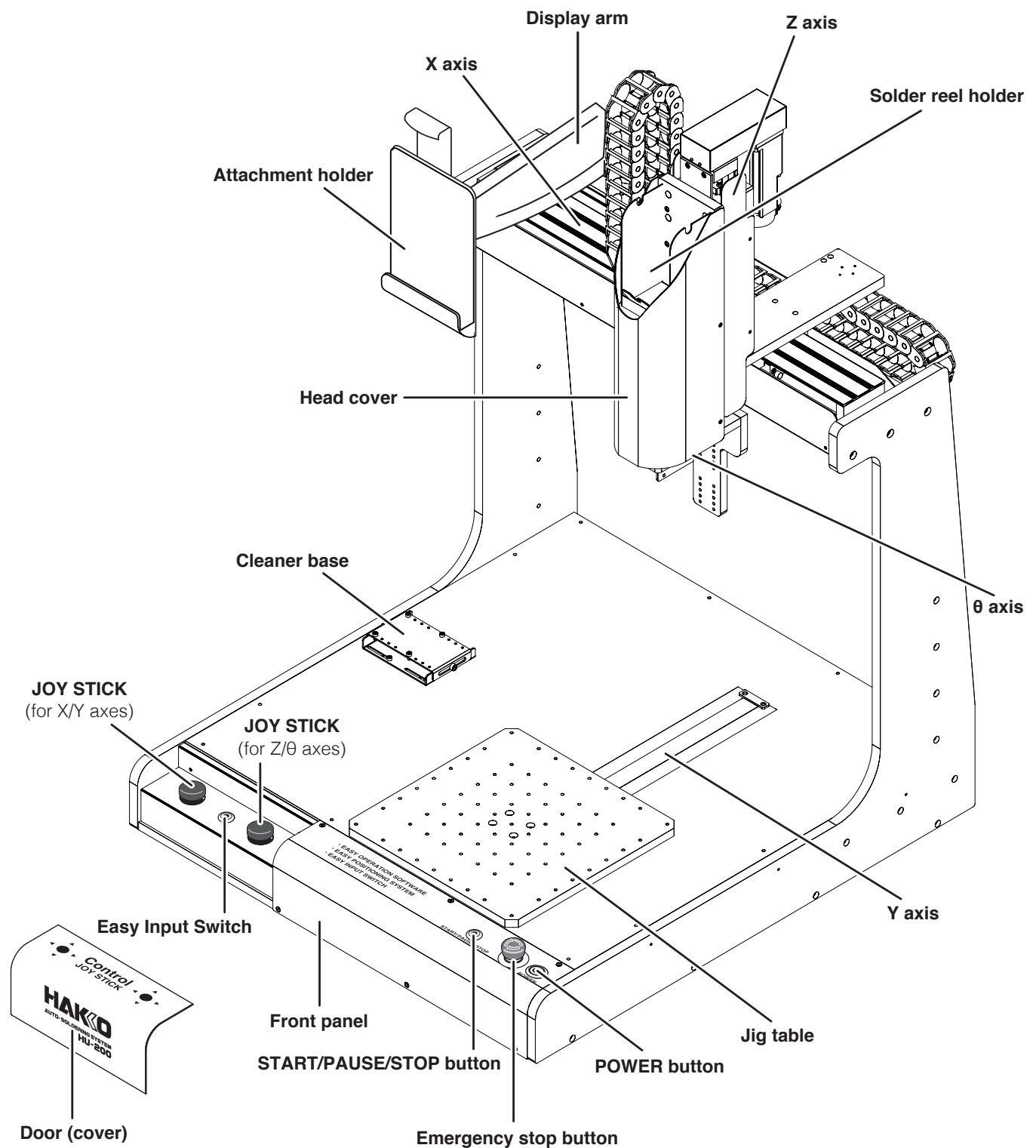
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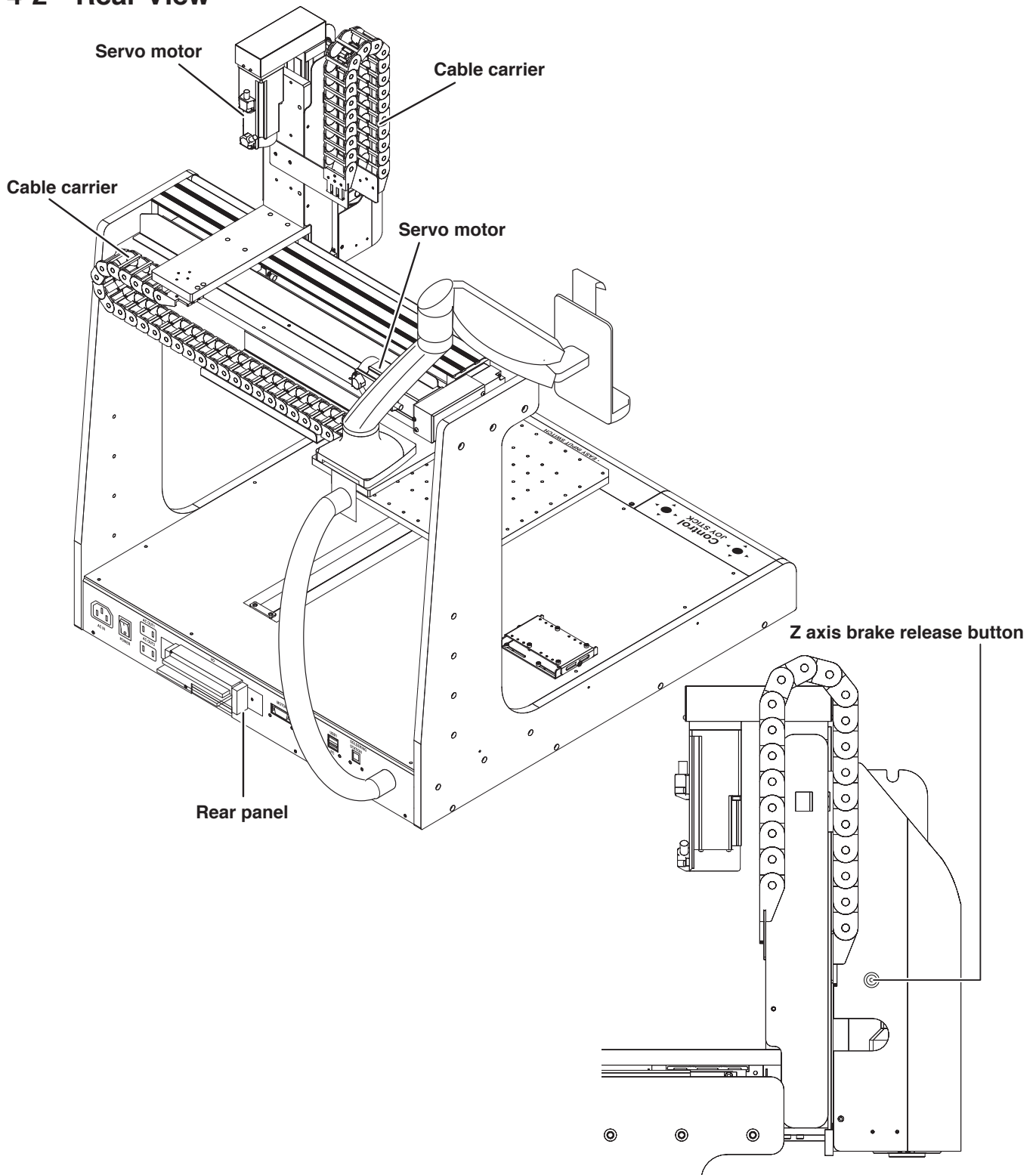
4. Part Names

4-1 Front View



4. Part Names (continued)

4-2 Rear View



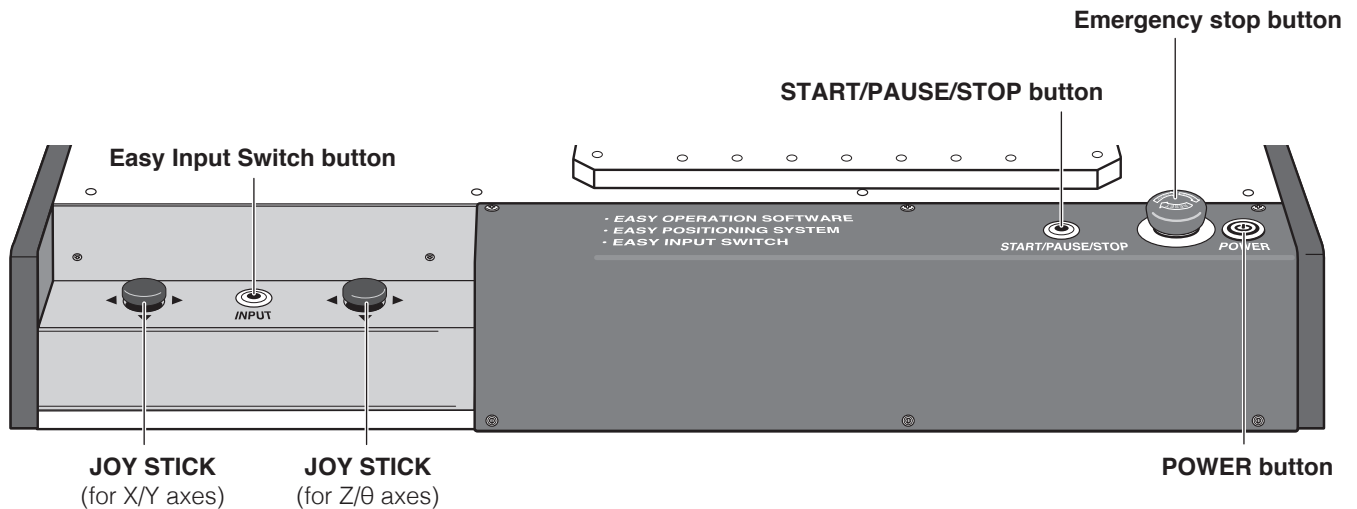
Z axis brake release button

If the **Z axis brake release button** is pressed while the equipment is in emergency stop condition while the application is running, the solenoid brake will be set to off.

⚠ CAUTION

**There is a danger of the Z axis dropping when the solenoid brake is set to off.
Be sure to support the Z axis before setting the solenoid brake to OFF.**

4-3 Front Panel



JOY STICK (for X/Y axes)

Moves the X axis and Y axis manually. For movement direction, refer to the diagram. For operation details, see “7-2 JOG Operation” (p. 56).

JOY STICK (for Z/θ axes)

Moves the Z axis and θ axis manually. For movement direction, refer to the diagram. For operation details, see “7-2 JOG Operation” (p. 56).

Easy Input Switch button

Pressing the Easy Input Switch will set the current coordinates as the soldering start point or end point. For operation details, see “7-4 Solder Installation and Solder Feed Settings” (p. 68).

START/PAUSE/STOP button

Runs, pauses, and stops the program. For operation details, see “7-6 Running a Program” (p. 92).

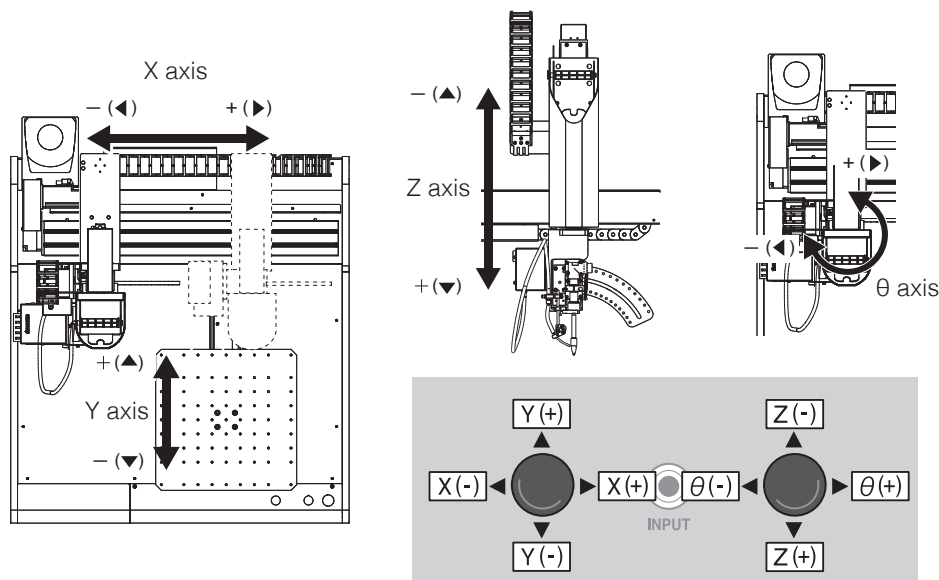
Emergency stop button

Sets the equipment to emergency stop condition. Turn clockwise to cancel this condition.

POWER button

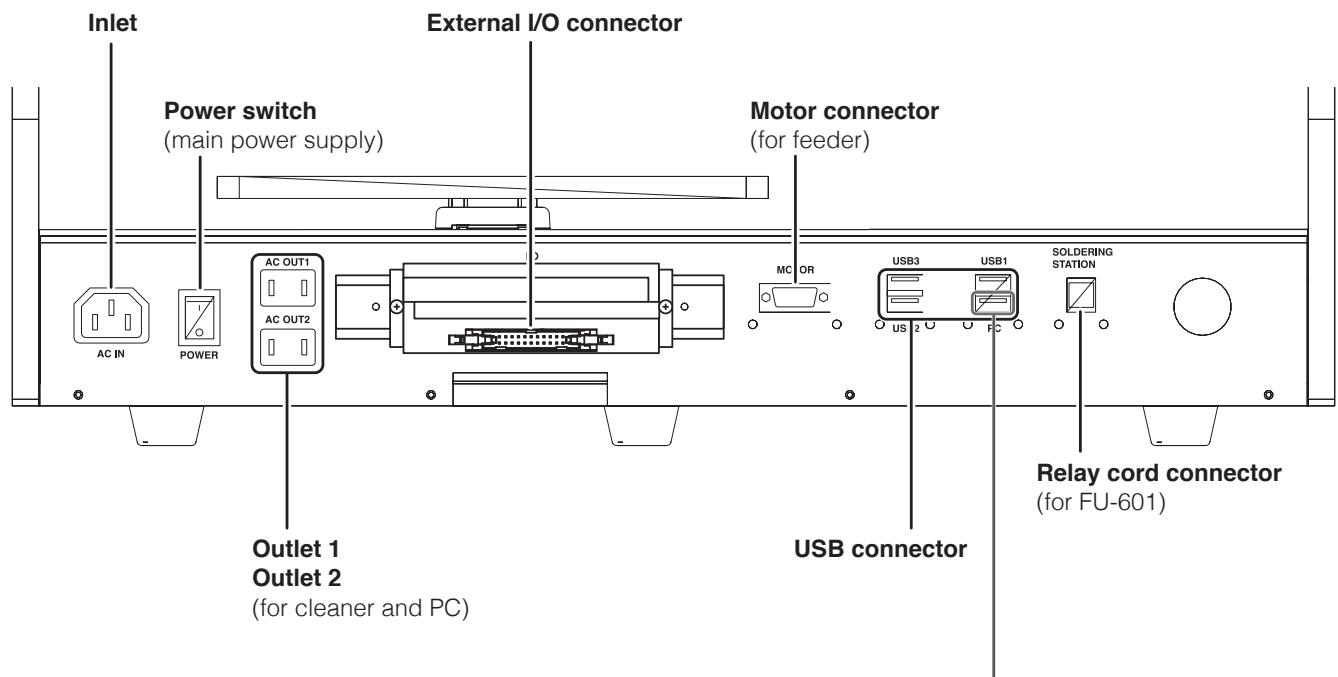
Button to switch the secondary-side power on and off.

JOY STICK operation and axis movement directions



4. Part Names (continued)

4-4 Rear Panel



⚠ CAUTION

Even if the cable is plugged into a USB connector other than the USB connector for PC (lower right), connection between the PC and robot will not be achieved.

5. Installation

5-1 Cautions on Installation

Install the robot on a level surface.

⚠ WARNING

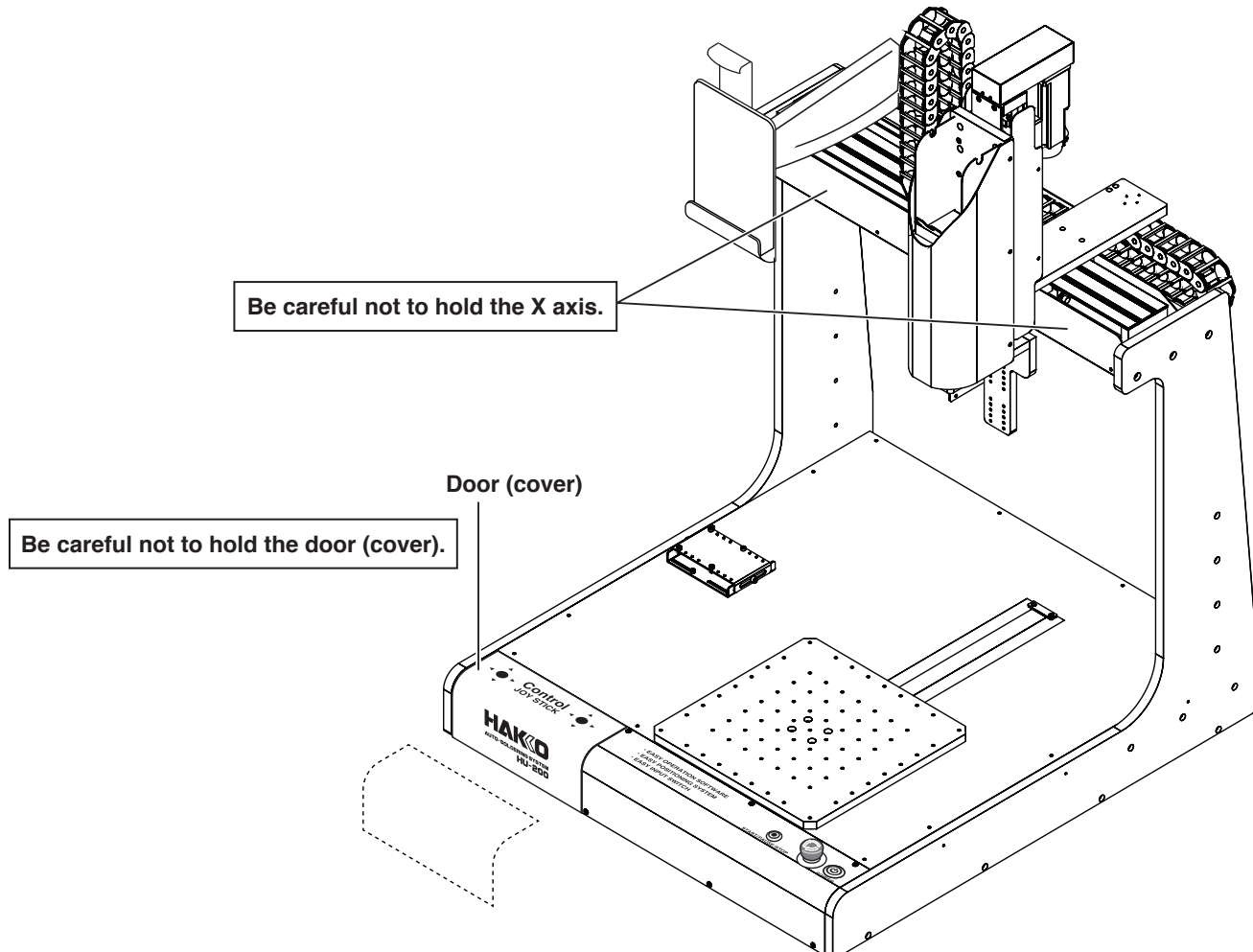
- When transporting the robot, it should be carried by at least 2 people, or a cart, hand truck, etc. should be used.
- When performing work involving 2 or more people, be sure that the relationship between the leader and subordinates is clear, and perform work while giving voice instructions to each other to ensure safety and prevent dangerous contact or falls.
- Secure the robot in place to prevent the robot from tipping over or falling.

⚠ CAUTION

- Since the door (cover) of the JOY STICKS may become detached, be careful not to hold onto the door (cover).
- When transporting the product, be careful not to hold it by the X axis section. Doing so may result in damage to the product.

5-2 Attaching Accessories to the Robot

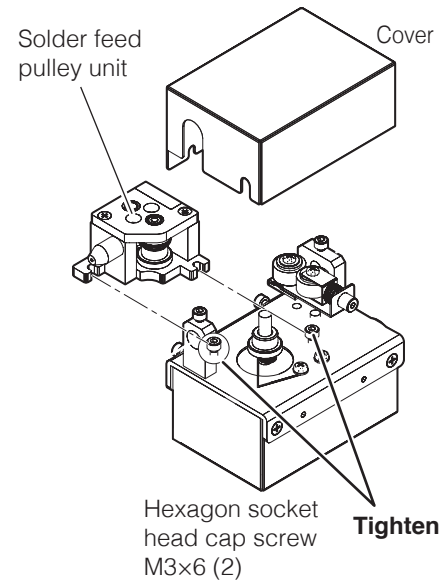
At the time of shipment, the robot is as shown below.



5. Installation (continued)

5-2-1 Attaching the Feeder Unit (CX5005)

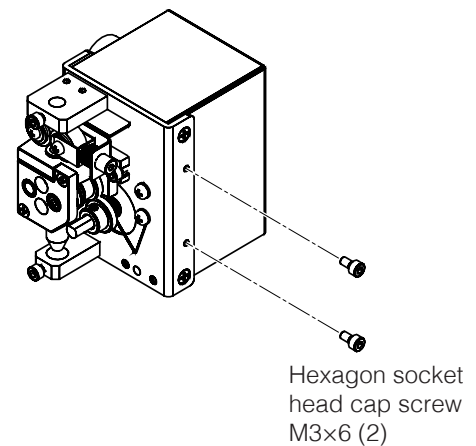
1. Open the cover of the feeder unit (CX5005), attach the solder feed pulley unit to the feeder unit (CX5005), and tighten the screws indicated in the diagram.



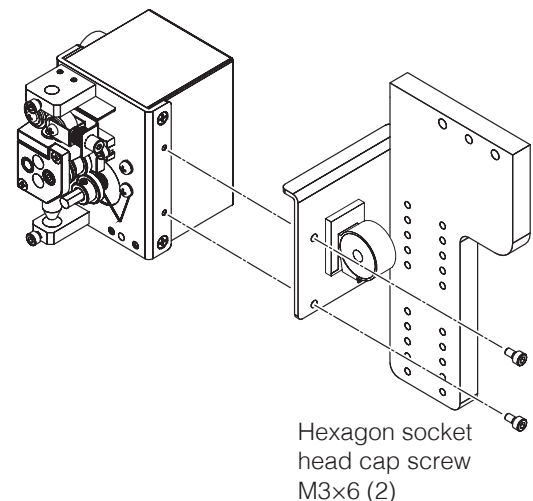
⚠ CAUTION

Do not touch any hexagon socket head cap screw other than those indicated in this manual. Also, be careful not to overtighten the screws.
The attachment method of the solder feed pulley unit for $\Phi 0.3$ mm solder (BX1000) is different. Refer to “Solder setting method” included with the BX1000.

2. Remove the hexagon socket head cap screws of the feeder unit (CX5005).

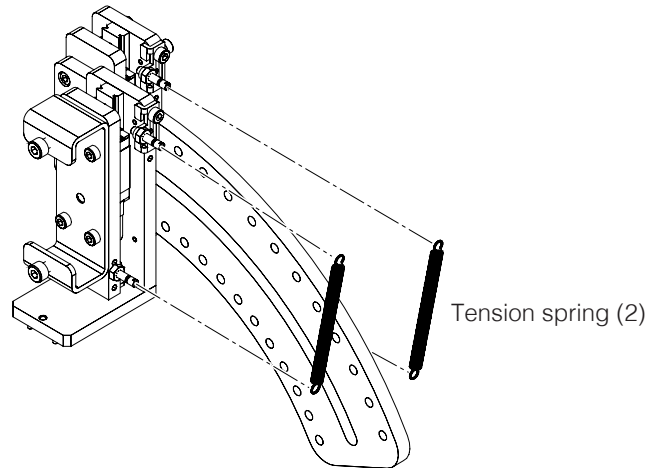


3. Use the removed hexagon socket head cap screws to attach the feeder unit (CX5005) to the soldering unit fixture base.

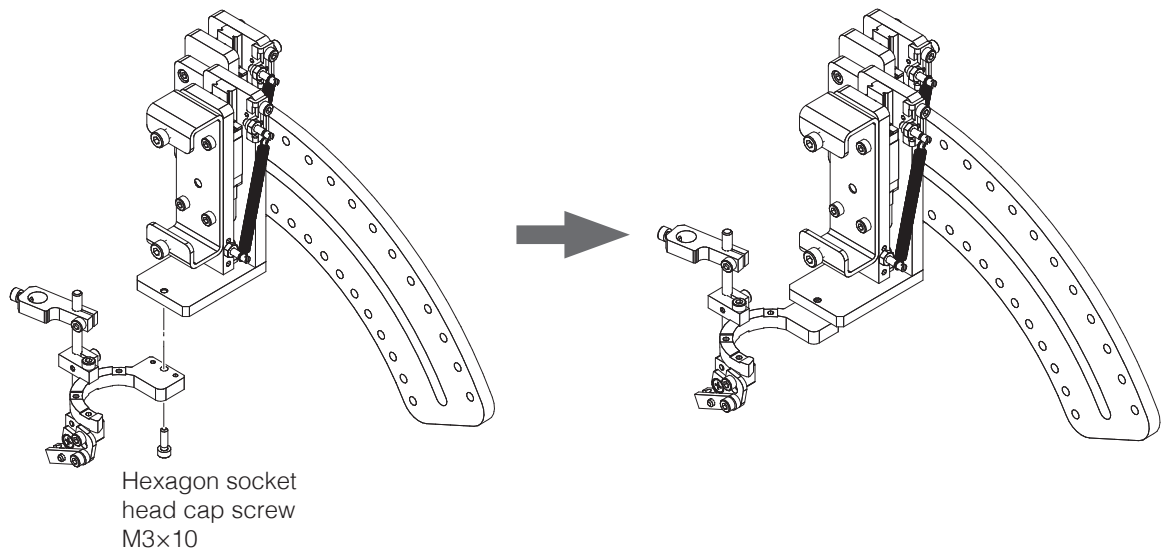


5-2-2 Attaching the Soldering Iron Unit

1. Attach the tension springs included with the soldering unit mount (CX5004) to the soldering unit mount.



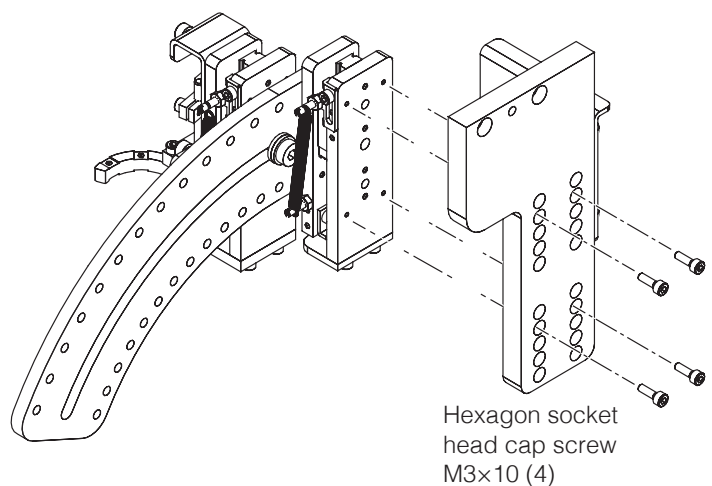
2. Assemble the soldering unit mount (CX5004) using 1 of the hexagon socket head cap screws included with the soldering unit mount.



3. Attach the soldering unit mount (CX5004) to the soldering unit fixture base (CX5002) using 4 of the hexagon socket head cap screws included with the soldering unit mount.

The mounting angle can be set with the soldering unit mount.

For details, refer to “About the Soldering Unit Mount (CX5004)” (p. 22).

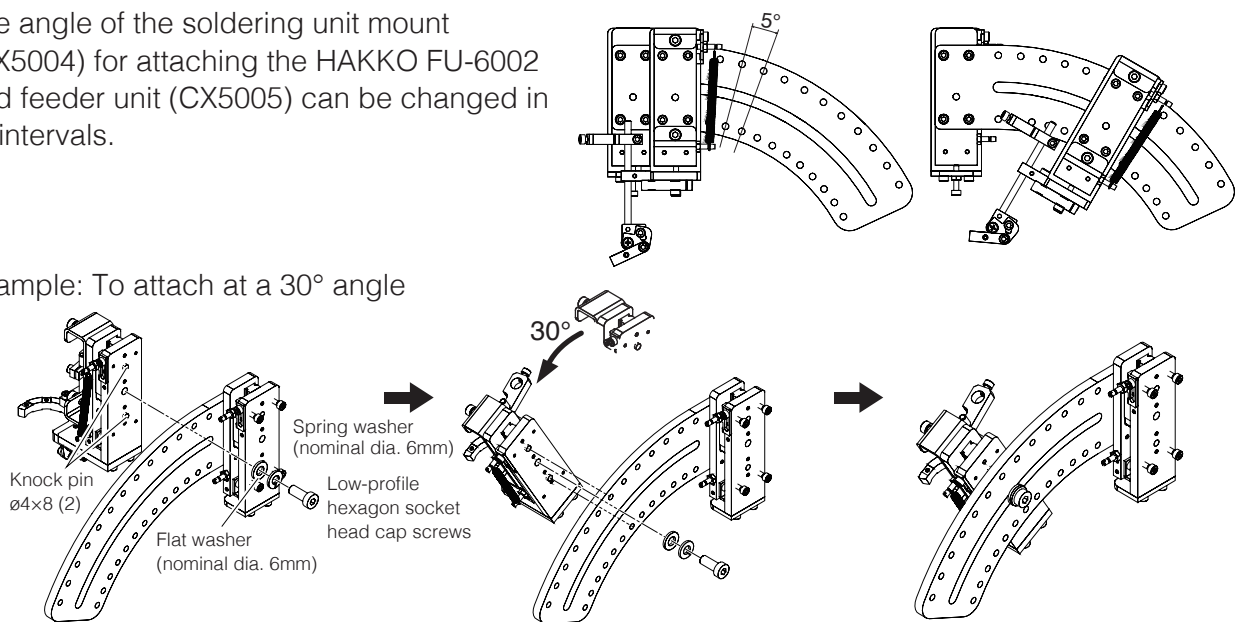


5. Installation (continued)

About the Soldering Unit Mount (CX5004)

The angle of the soldering unit mount (CX5004) for attaching the HAKKO FU-6002 and feeder unit (CX5005) can be changed in 5° intervals.

Example: To attach at a 30° angle



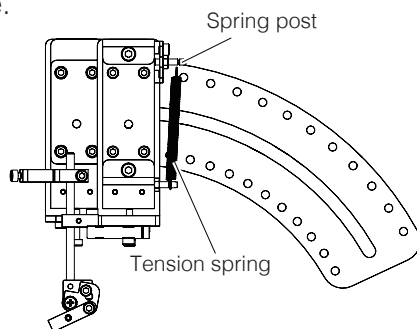
⚠ CAUTION

When changing the angle, be sure that the 2 knock pins are securely in the mounting holes.

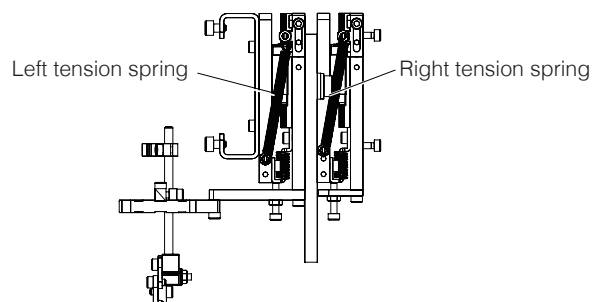
Setting the tension spring positions

Tension springs are included with the soldering unit mount (CX5004).

When the angle is changed when attaching the HAKKO FU-6002 and feeder unit (CX5005), change the tension spring attachment positions and adjust the pressure of the tip when it touches the workpiece.



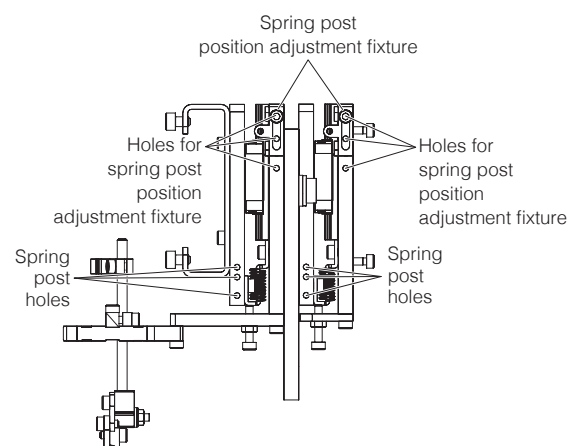
Right-side view of soldering unit mount



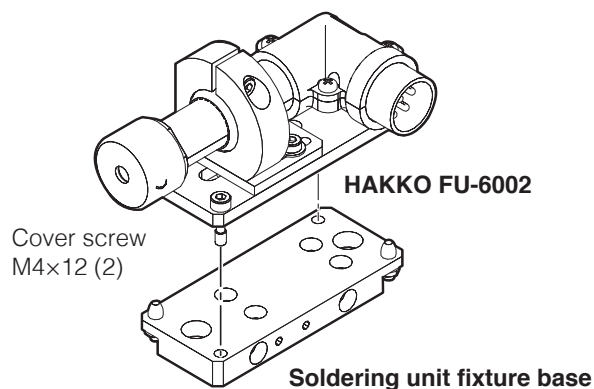
In the right-side view of the soldering unit mount, the right tension spring supports the soldering unit mount (CX5004), feeder unit (CX5005), and HAKKO FU-6002, and the left tension spring supports the feeder unit (CX5005) and HAKKO FU-6002. Insert the spring posts into the spring post holes and attach the tension springs to the spring posts.

— Note —

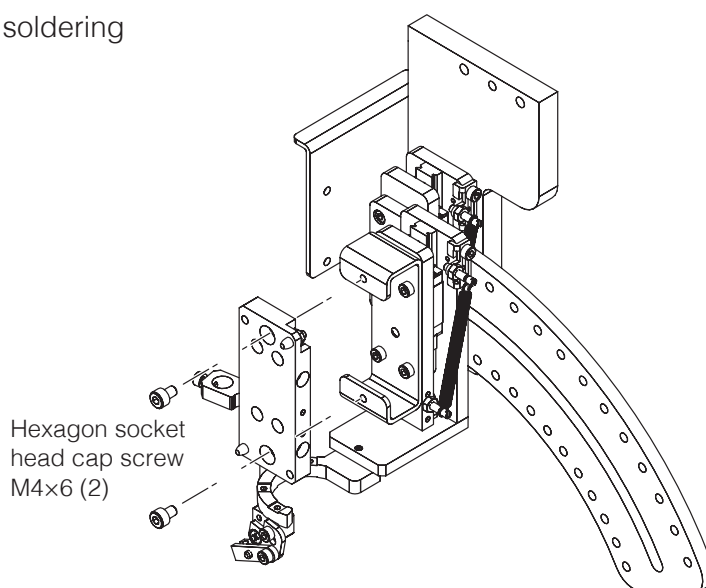
The spring post position adjustment fixture can be attached for finely adjusting the pressure of the tip when it touches the workpiece.



4. Remove the soldering unit fixture base included with the HAKKO FU-601 from the HAKKO FU-6002.

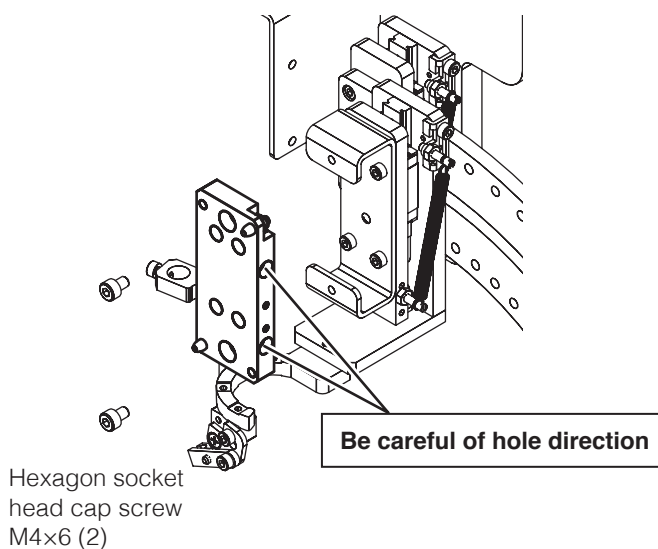


5. Attach the soldering unit fixture base to the soldering unit mount (CX5004).



⚠ CAUTION

Be sure to attach the soldering unit fixture base in the proper orientation. Attach in the orientation shown in the following diagram while paying attention to the hexagon socket head cap screw mounting holes, etc.



5. Installation (continued)

6. Attach the tip (sold separately) to the HAKKO FU-6002 included with the HAKKO FU-601.

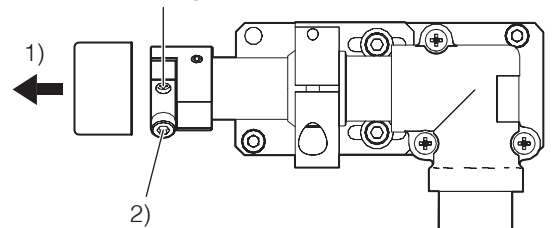
⚠ CAUTION

Allow the tip to cool before replacing it.

When replacing the tip while it is still hot, be sure to use the heat-resistant pad.

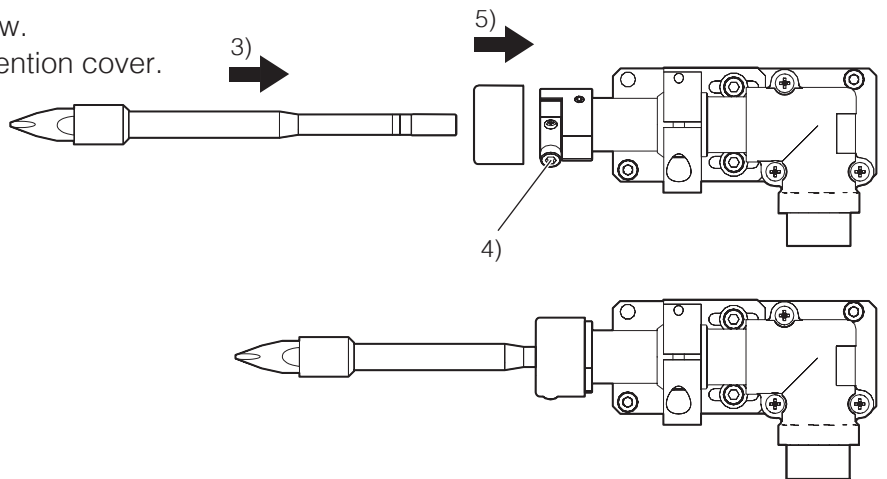
- 1) Slide the spatter prevention cover forward.
- 2) Loosen the tip holding screw (M3 × 10).

When replacing the tip, do not touch this screw.



HAKKO FU-6002

- 3) Insert the tip.
- 4) Tighten the tip holding screw.
- 5) Cover with the spatter prevention cover.



⚠ CAUTION

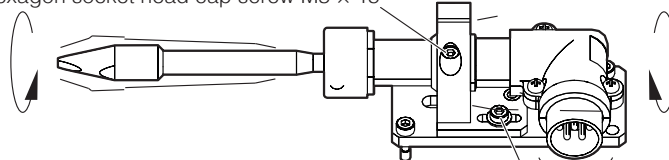
- Check that there are no gaps between the tip and the spatter prevention cover.
- When attaching a new tip, it is necessary to perform tip position adjustment. (See p. 25.)

How to Adjust the Tip Position

1. When the tip position adjustment screws are loosened, axis rotation **(a)** and left/right movement **(b)** can be performed. Move the tip relative to the target workpiece, and after determining the tip position, tighten the screws.

Tip position adjustment screw (a): Axis rotation

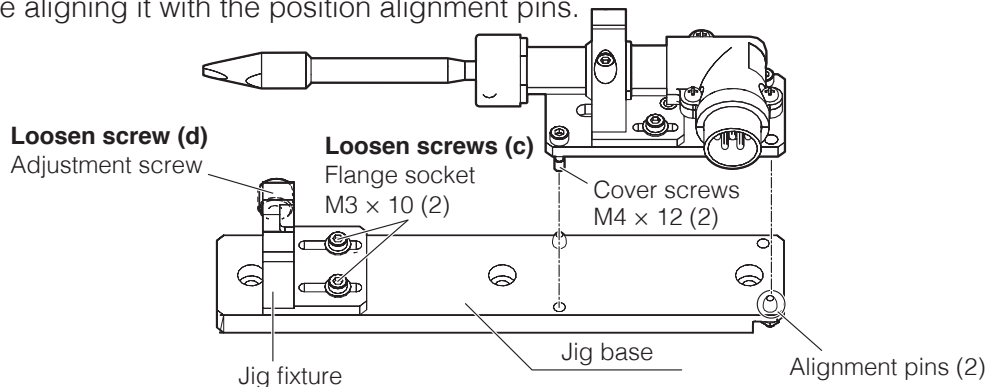
Hexagon socket head cap screw M3 × 15



Tip position adjustment screw (b): Left/right movement

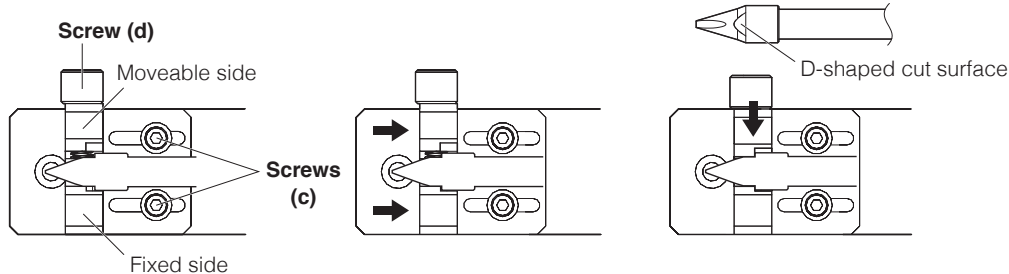
Flange socket M3 × 6 (2)

2. Loosen screws **(c)** and **(d)**, and place the HAKKO FU-6002 on the tip adjustment jig unit while aligning it with the position alignment pins.



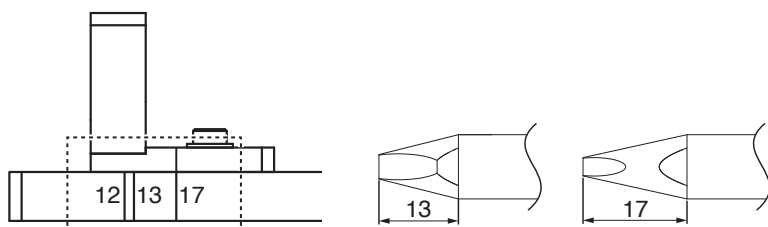
3. Align the D-shaped cut surface of the tip with the indentation in the jig fixture and move the jig fixture so that the tip fits into the fixture exactly. This position will be the standard point, so retighten the 2 screws **(c)**.

Then, to make sure that the tip does not lift up, hold it down while tightening screw **(d)**. Unless the workpiece changes, do not move the jig fixture other than the moveable side. After setting the standard point, remove the tip from the tip adjustment jig unit.



— Note —

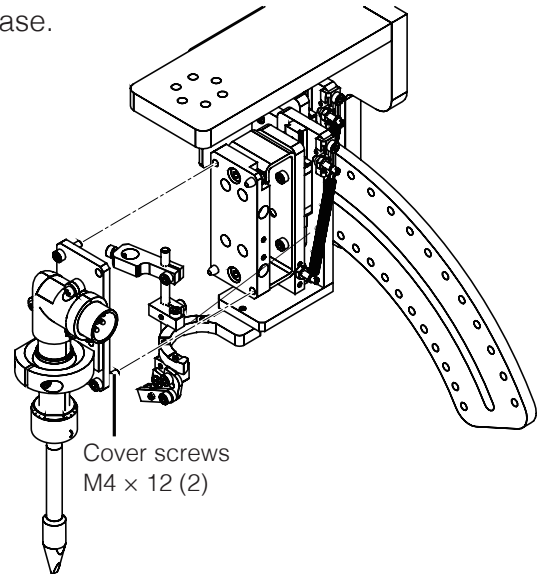
There are markings on the side of the tip adjustment jig unit. They are for tip end dimensions of 12 mm, 13 mm, and 17 mm. Use these markings as guides when adjusting the position of the jig fixture.



12 mm: —
 13 mm: TX2-XD4, TX2-XD6, TX2-XBCR4,
 TX2-XBCR6, TX2-XDR4,
 TX2-XDR6, TX2-XRK
 17 mm: TX2-XD3, TX2-XBCR3, TX2-XDR3

5. Installation (continued)

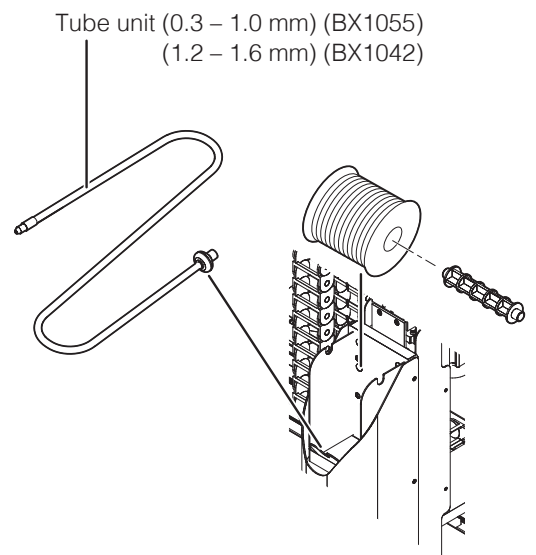
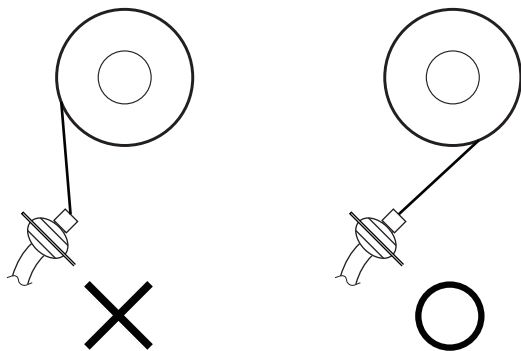
7. Attach the HAKKO FU-6002 to the soldering unit fixture base.



5-2-3 Attaching Tube Units

1. Install the tube unit and solder bobbin on the HU-200 (robot). Install the solder bobbin while paying attention to the solder feed direction.

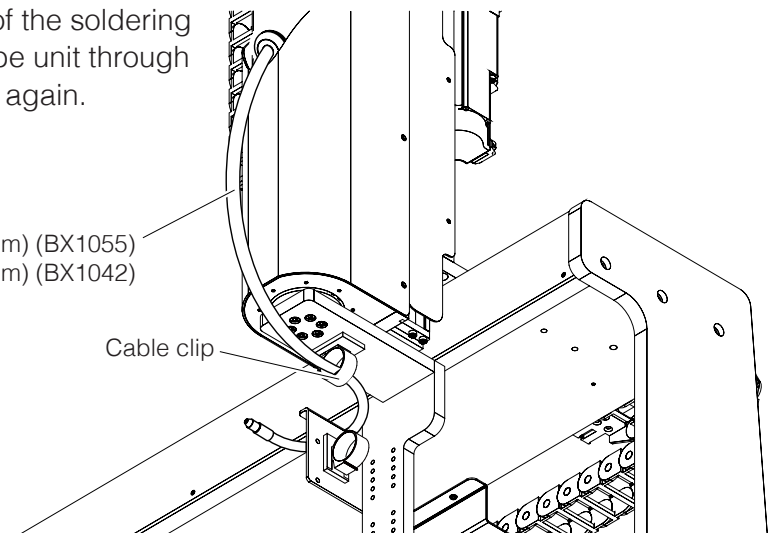
Solder feed direction



2. Open the cable clip on the upper part of the soldering unit fixture base (CX5002), pass the tube unit through the cable clip, and close the cable clip again.

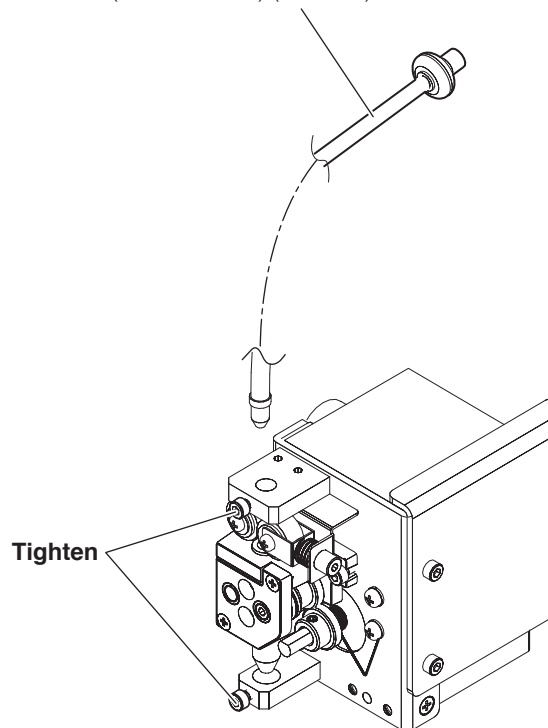
Tube unit (0.3 – 1.0 mm) (BX1055)
(1.2 – 1.6 mm) (BX1042)

Cable clip

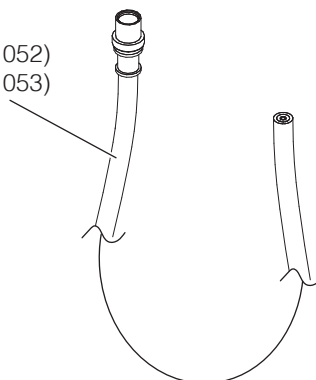


- 3.** Attach tube unit and tube unit B to the feeder unit (CX5005) and tighten the screws indicated in the diagram.

Tube unit (0.3 – 1.0 mm) (BX1055)
(1.2 – 1.6 mm) (BX1042)

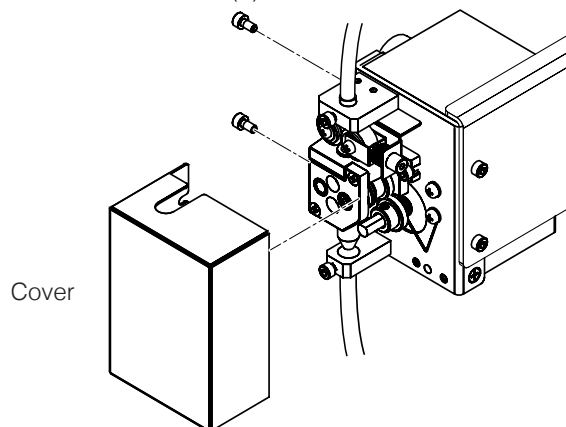


Tube unit B (0.3 mm) (BX1054)
(0.5 – 1.0 mm) (BX1052)
(1.2 – 1.6 mm) (BX1053)



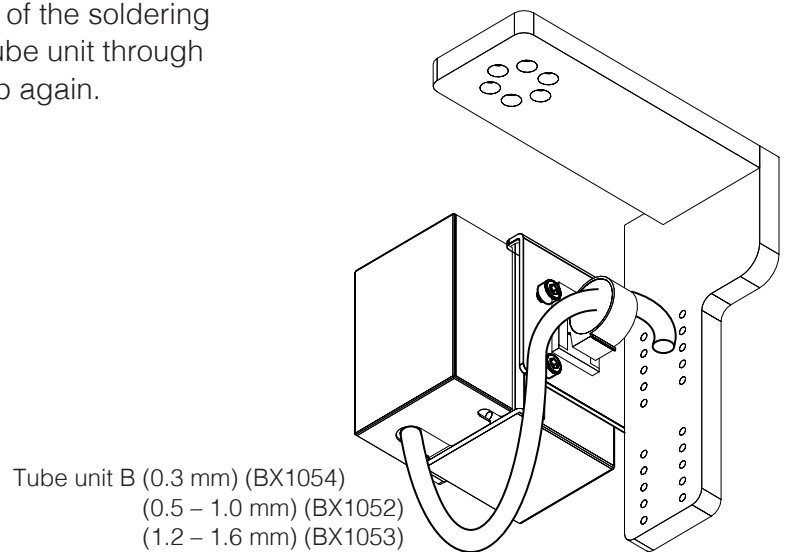
- 4.** Close the feeder unit cover.

Hexagon socket
head cap screw
M3×6 (2)

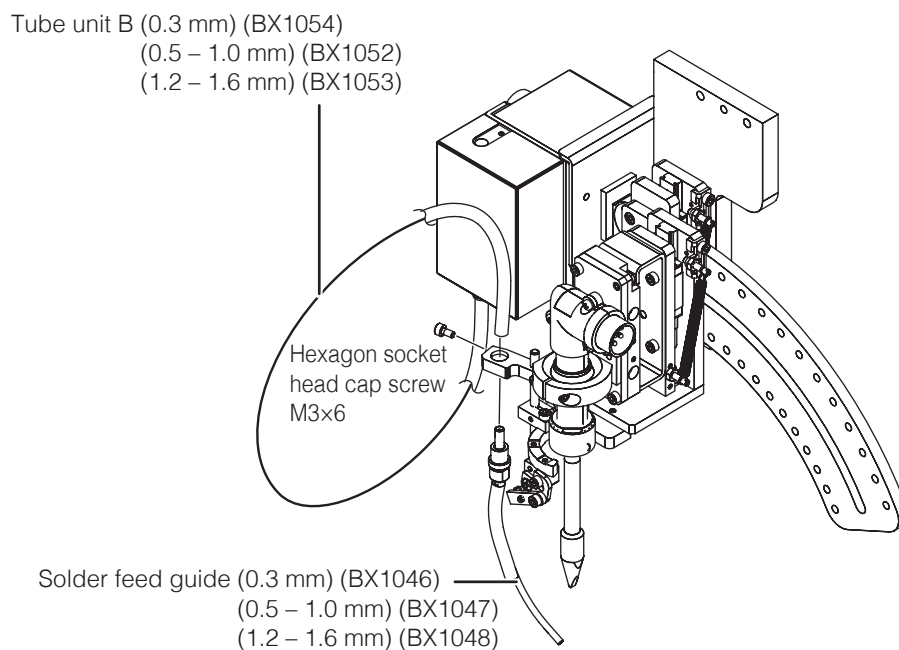


5. Installation (continued)

5. Open the cable clip on the upper part of the soldering unit fixture base (CX5002), pass the tube unit through the cable clip, and close the cable clip again.



6. Attach tube unit B and the solder feed guide to the soldering unit mount.



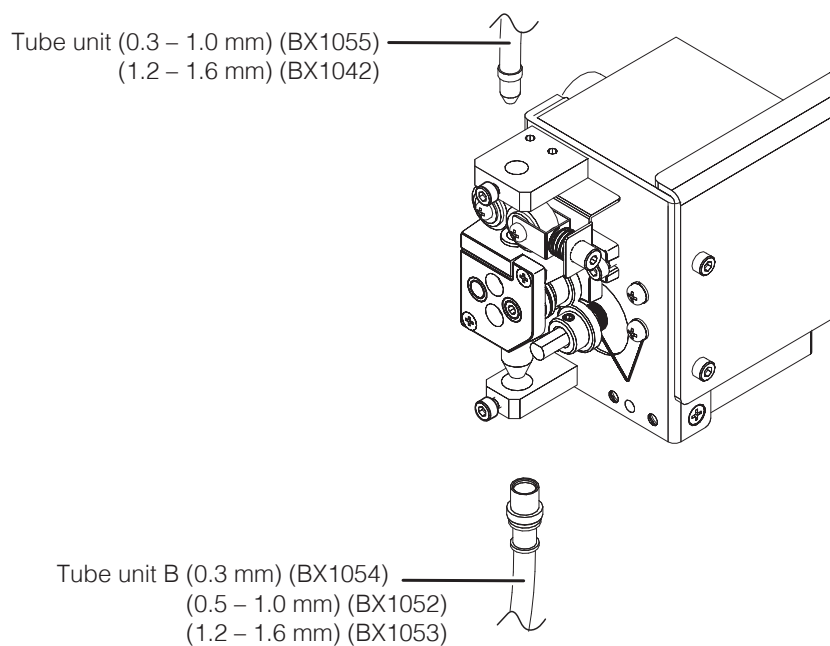
— Note —

It is necessary to adjust the solder feed position of the solder feed guide and the Teflon tube attachment method.

For adjustment method details, refer to “7-4-1 Solder Installation and Solder Feed Position Adjustment” (p. 68).

— Note —

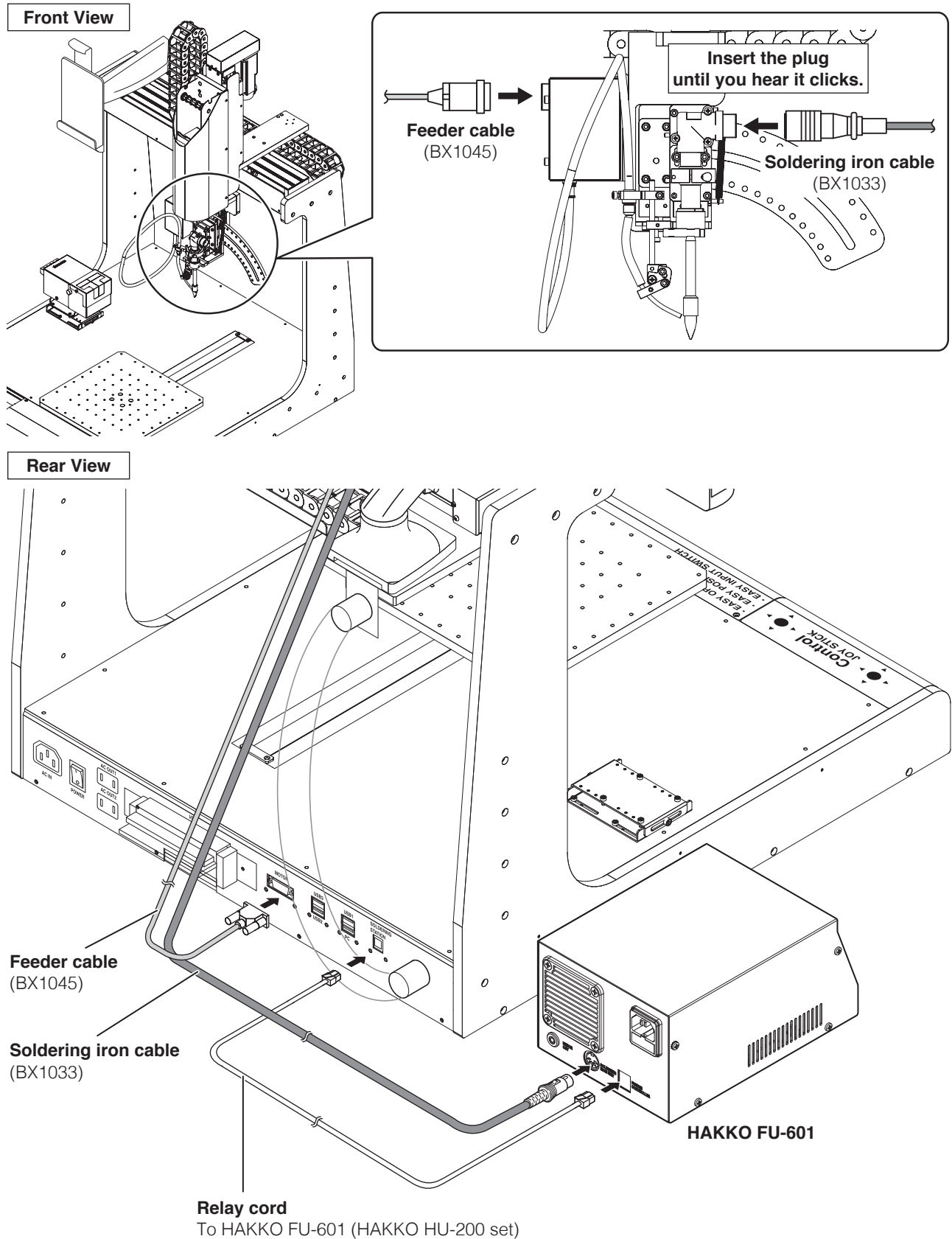
There are 2 kinds of tube units: The tube unit attached between the HAKKO HU-200 (robot) and the feeder unit, and tube unit B attached between the feeder unit and the solder feed guide. There are different models of each kind according to the solder diameter.



5. Installation (continued)

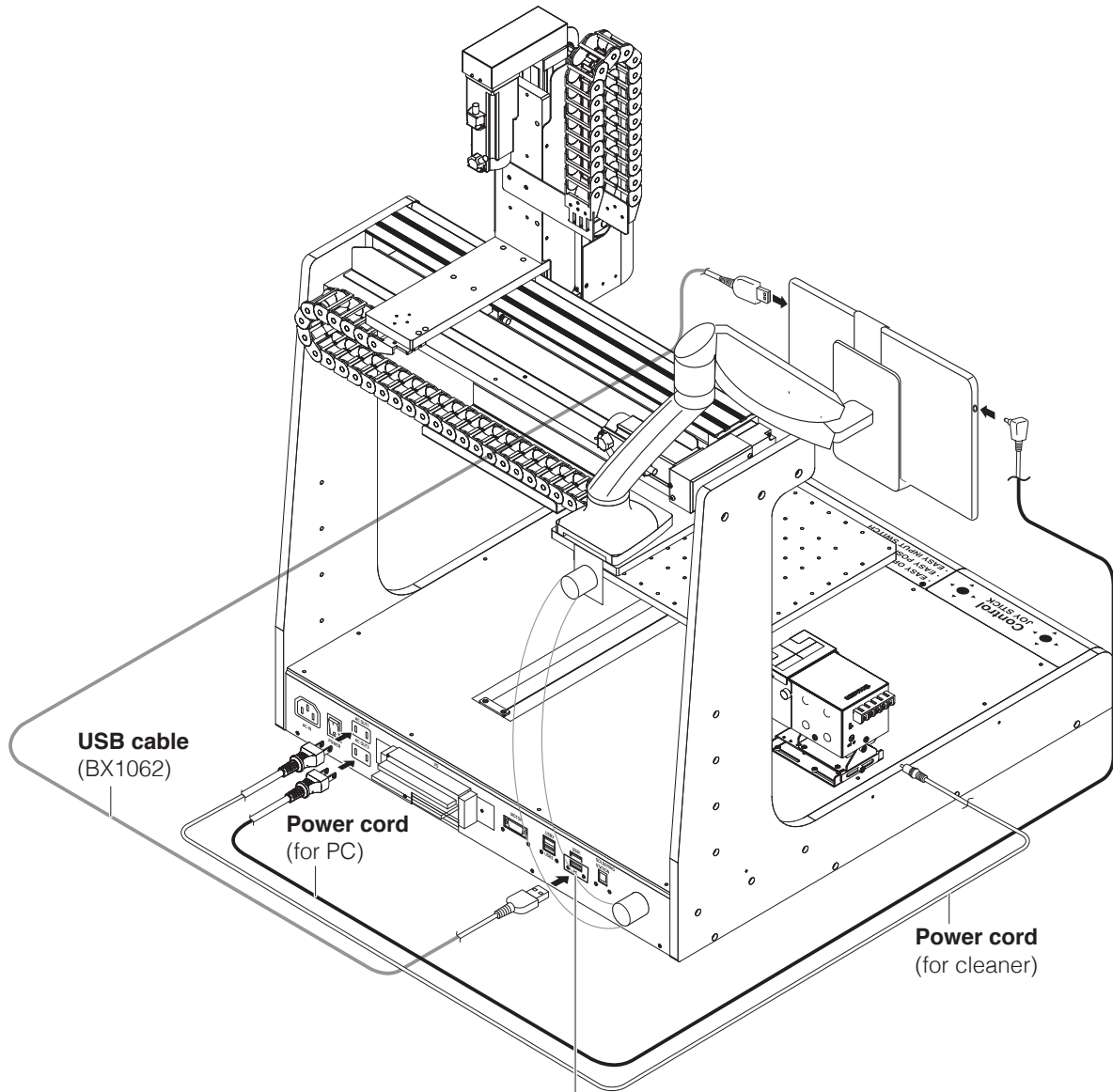
5-2-4 Connecting Cables and Cords

1. Connect the feeder cable (BX1045) between the robot and feeder unit (CX1010), and connect the relay cord (HAKKO HU-200 set) between the HAKKO FU-601 and robot.
2. Connect the soldering iron cable (BX1033) between the HAKKO FU-601 and HAKKO FU-6002.



5-2-5 Mounting and Connecting the PC

1. Lift up the top part of the tablet, slide the PC in, and secure it in the tablet holder.
2. Connect the PC and robot with the USB cable (BX1062) and power cord.

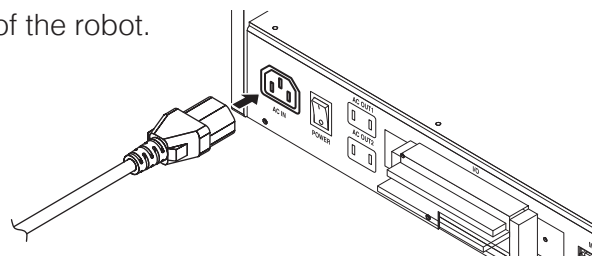


⚠ CAUTION

Even if the cable is plugged into a USB connector other than the USB connector for PC (lower right), connection between the PC and robot will not be achieved.

5-2-6 Connecting the Power Cord (for robot)

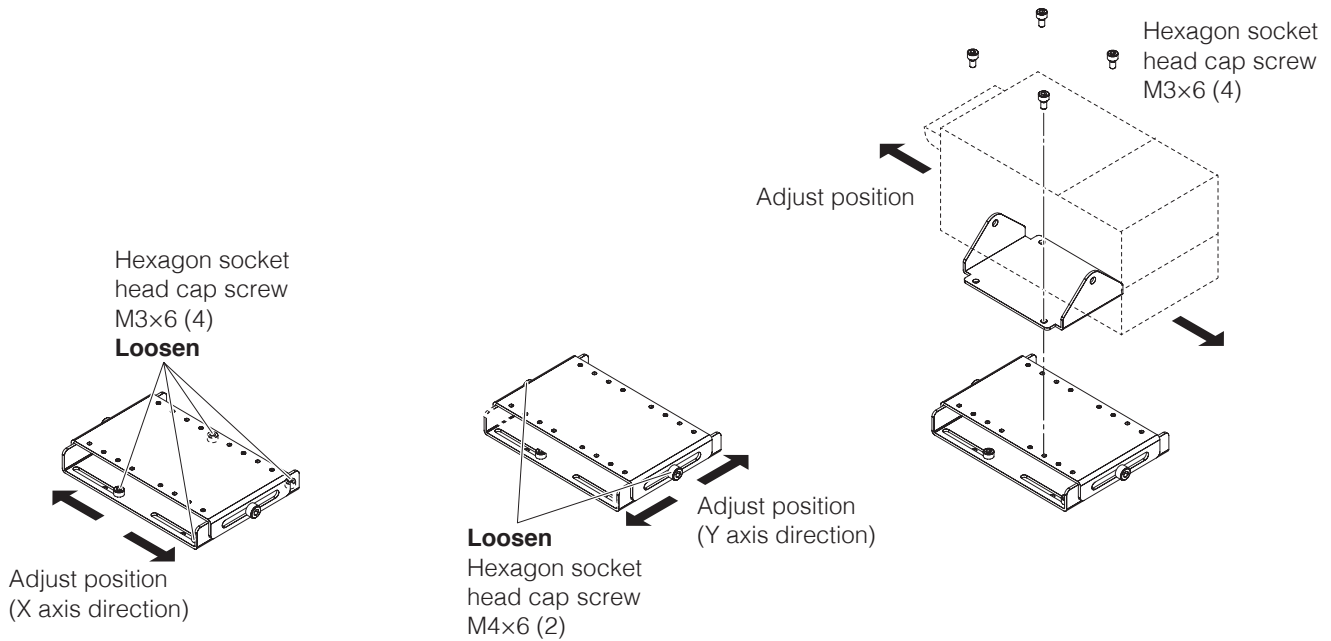
Insert the power cord (for robot) into “AC IN” at the back of the robot.



5. Installation (continued)

5-2-7 Attaching the Cleaner (CX1003)

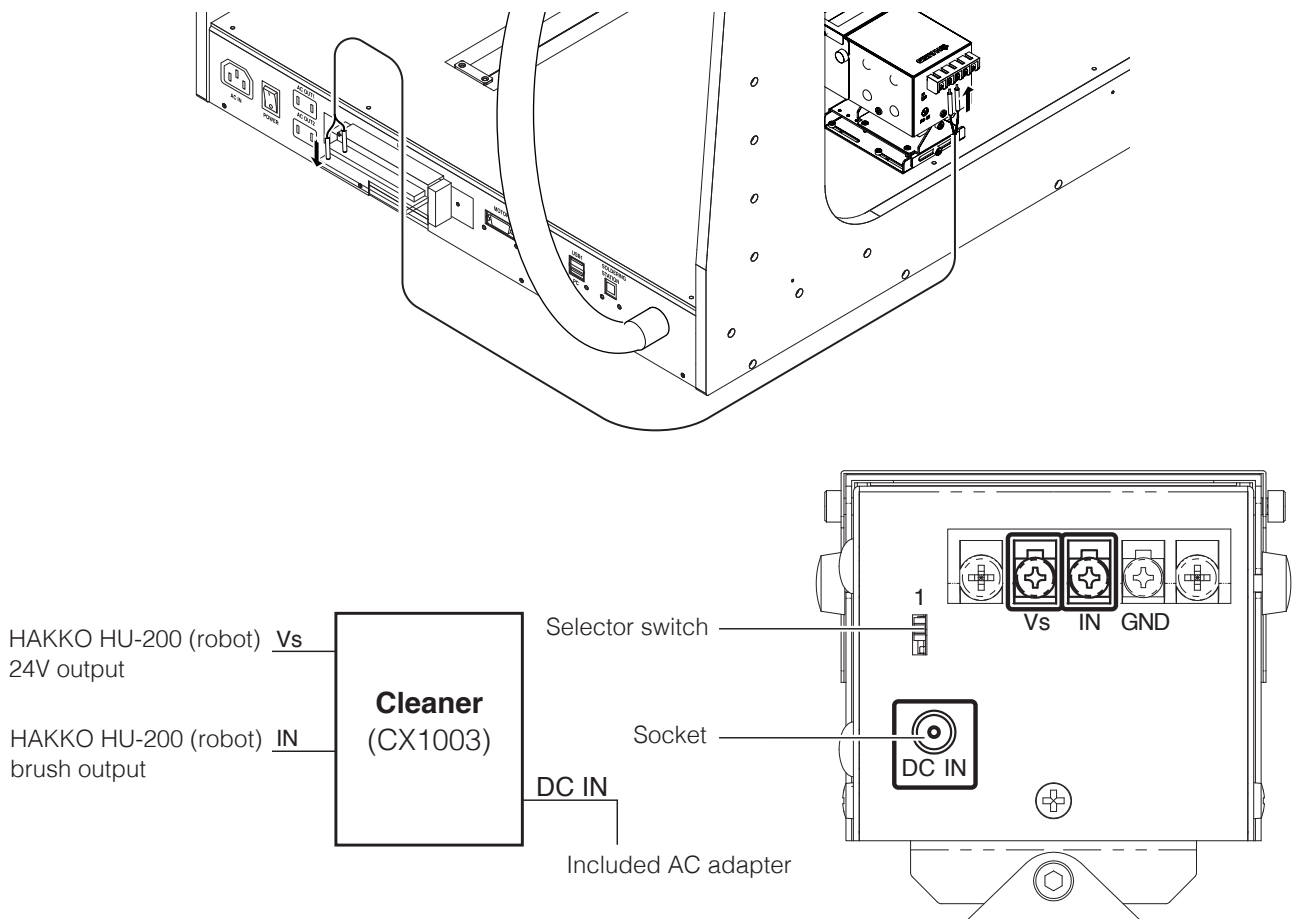
1. Attach the cleaner (CX1003) to the cleaner base (CX5003).



— Note —

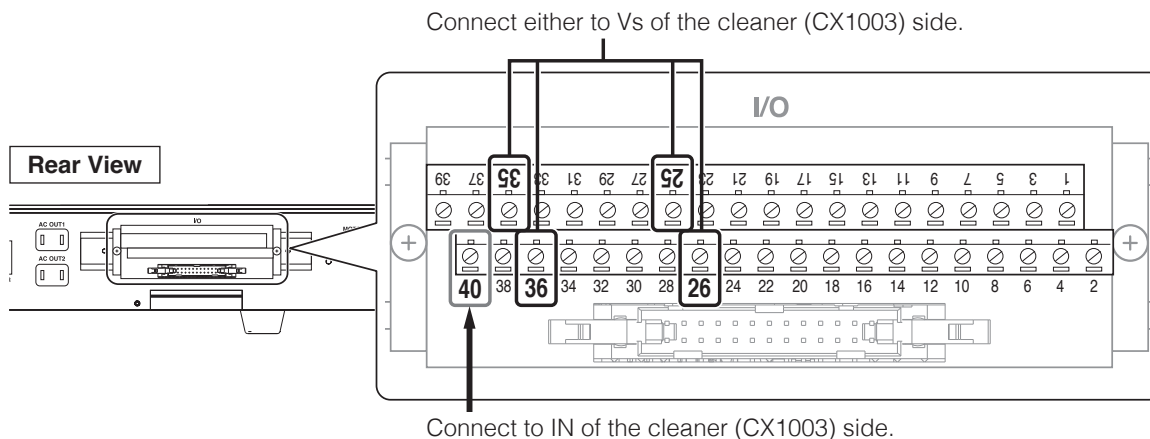
When the cleaner is connected to the robot, set the selector switch to "1" and connect as shown in the diagram below.

For information on how to use the cleaner (CX1003), refer to the cleaner instruction manual.



5-3-1 Wiring of the cleaner (CX1003)

The cleaner wires it like the diagram below.

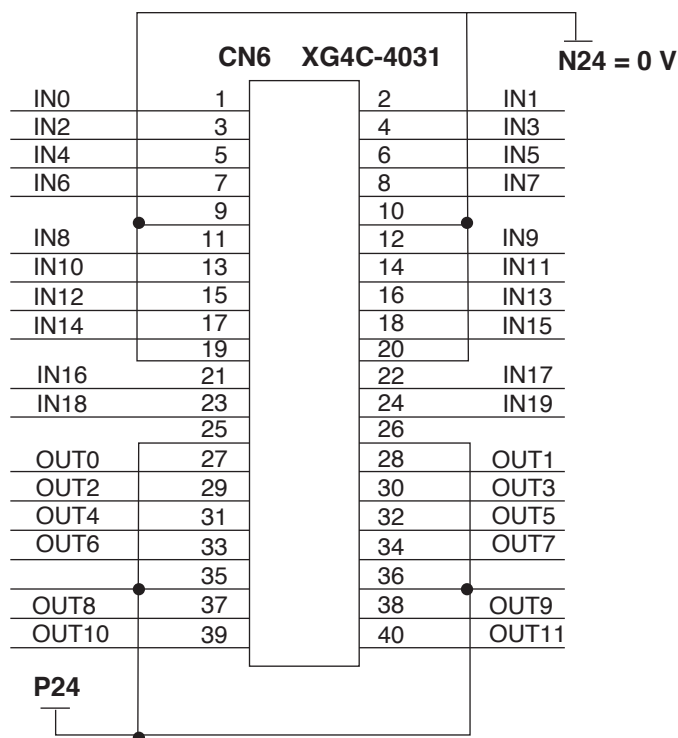


— Connecting of the lead —

- Loosen the screw
 - Insert the lead
 - Tighten the screw
- Pull the lead, and confirm that it is not pulled out.**

5-3 External I/O Pin Layout

This is the I/O pin layout for input/output with external devices. It is used when assigning input signals and output signals for use when running soldering programs or for external emergency stop circuits. Connection is performed using the connector on the back of the robot. (The pins for OUT10 and OUT11 are exclusively for connection to the cleaner.) Wiring should be performed using stranded wire with a diameter of 0.5mm² (equivalent to AWG20).



⚠ CAUTION

To prevent electrical shock, be sure to ground the product during use.

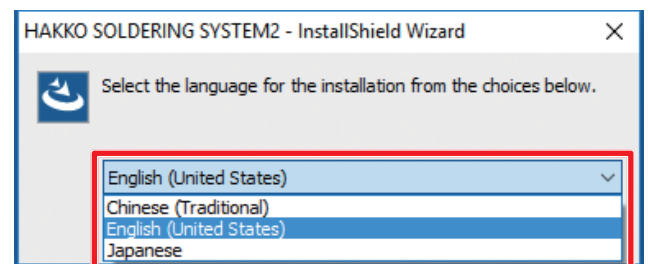
6. Installation

You must be logged into the computer with Administrator user rights in order to install the software.

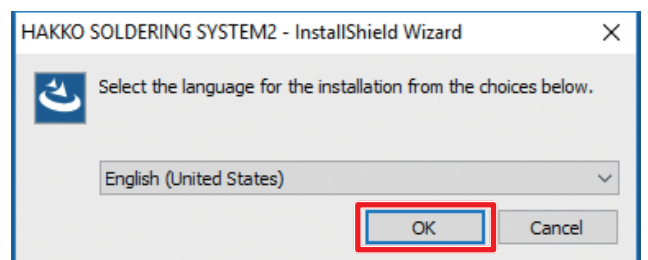
6-1 Performing a New Installation of the Software

1. Double-tap on  HAKKO SOLDERING SYSTEM2 Ver.*.** Setup.exe.

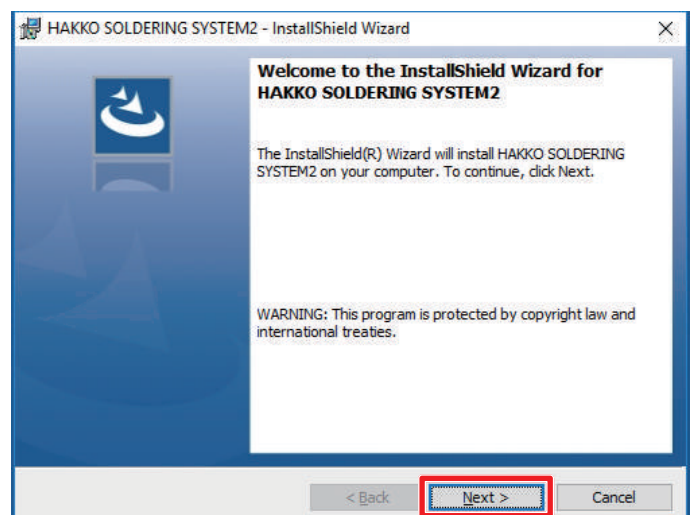
2. Select the language to be used for the installation.



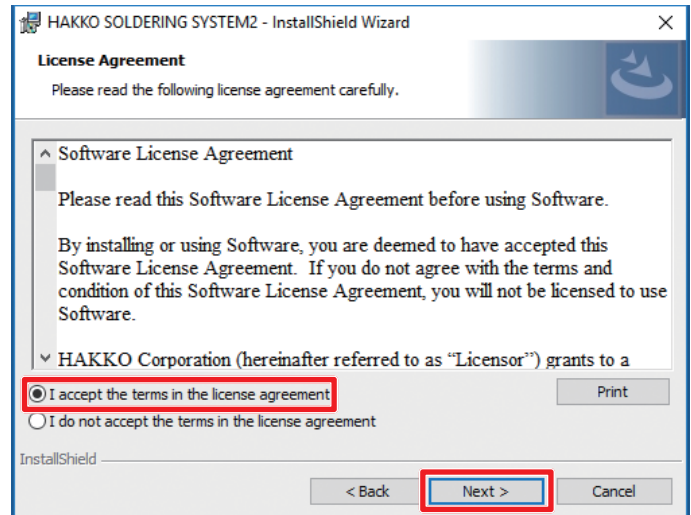
3. After selecting the language, tap **[OK]** to proceed to the installation screen.



4. When the installation screen is displayed, tap **[Next]**.



5. The End User's License Agreement will appear. Read the terms of the license agreement carefully and if you agree to the terms, select **"I accept the terms in the license agreement"** and tap **[Next]**.

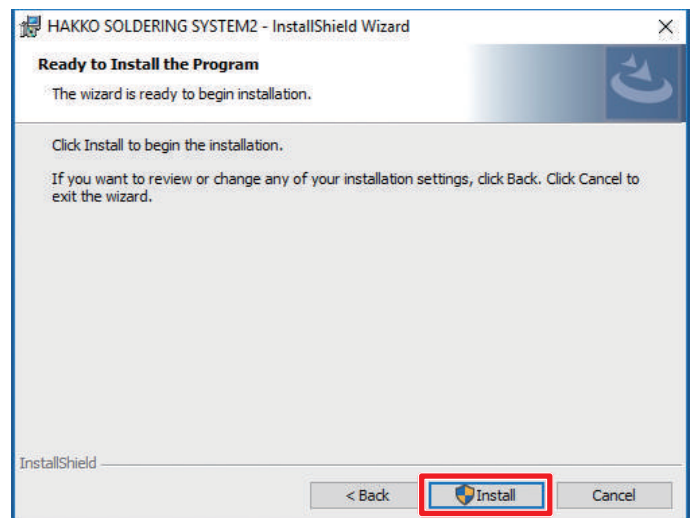


CAUTION

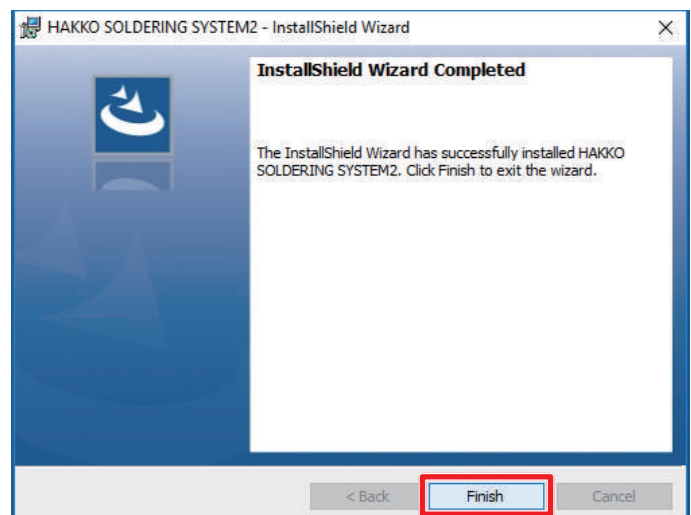
Installation and use of this software can be performed only by agreeing to this **"Software License Agreement"**.

If agreement to the End User's License Agreement is not given, this software cannot be used.

6. Tap **[Install]**.



7. After installation has been completed, tap **[Finish]**.



6. Installation (continued)

6-2 Performing a Software Update

6-2-1 Backing up Data


Back up the data before Updating the software.
The backup procedure is as follows:

1. Tap the “This PC” icon on the desktop and open the C: drive.
Next, open the HakkoCorporation folder and then open the HAKKO SOLDERING SYSTEM2 folder.
2. Create new folders on the desktop and copy the following two folders as backup data.
 - “**Program**” folder (containing soldering program data)
 - “**System**” folder (containing cleaning setting data)

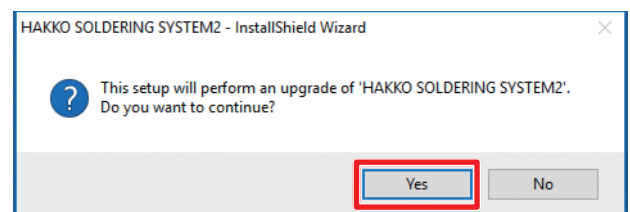
For information on backing up soldering conditions, refer to “7-4-2-2 Reading/Writing Soldering Conditions” (p. 72).

System setting and main screen setting information cannot be backed up. Be sure to keep a record of any changed setting values, etc.

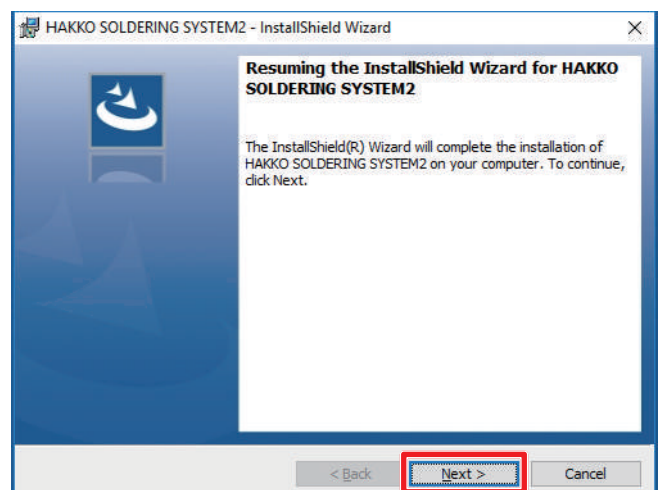
6-2-2 Updating Software

1. Double-tap on  **HAKKO SOLDERING SYSTEM2 Ver.*.**Setup.exe**.

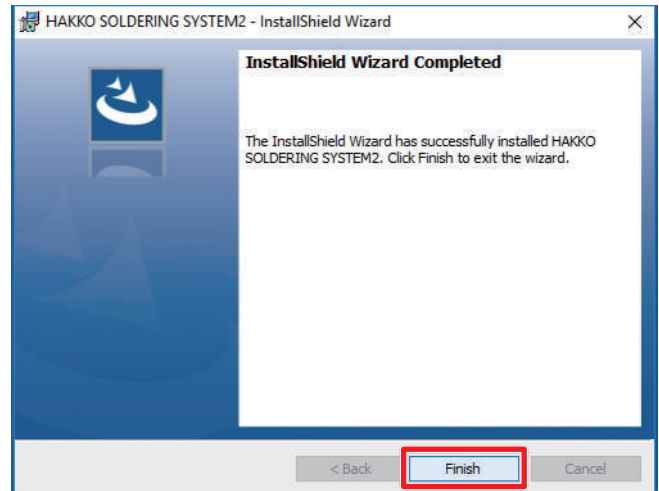
2. When the update screen is displayed, tap **[Yes]**.



3. When the installation screen is displayed, tap **[Next]**.



4. After installation has been completed, tap **[Finish]**.



6-2-3 After Installation Has Been Completed

- **“Program” folder**

After updating, check that there is a “Program” folder under the C:\Hakko Corporation\HAKKO SOLDERING SYSTEM2 folder.

If the “Program” folder has been deleted, copy the backup “Program” folder to that location.

- **“System” folder**

Copy the backup “System” folder to under C:\Hakko Corporation\HAKKO SOLDERING SYSTEM2 and overwrite the existing “System” folder.

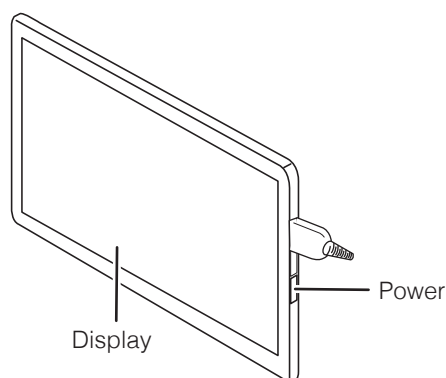
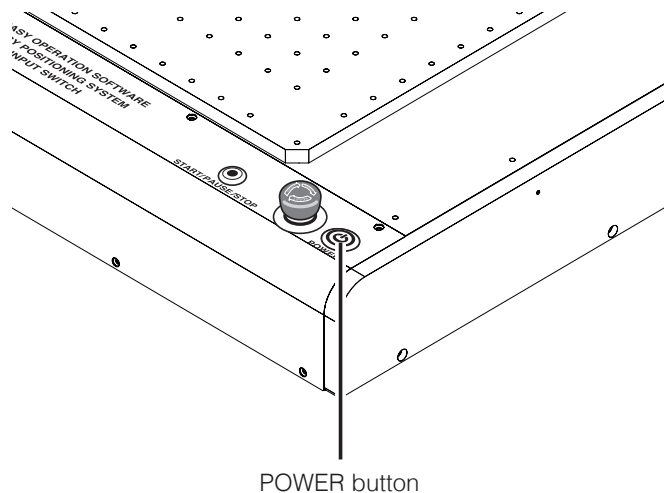
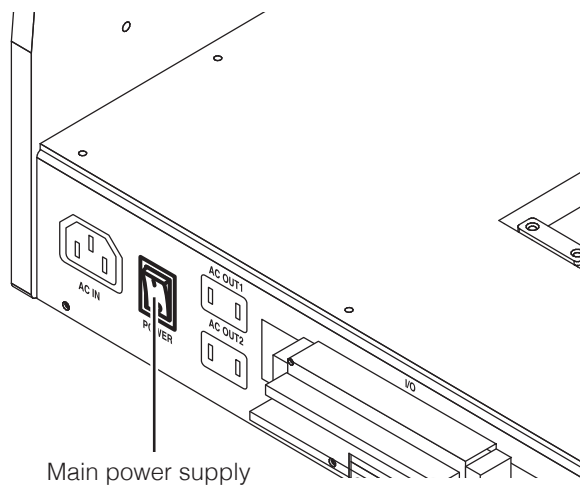
If the existing folder is not overwritten with the backup copy, cleaning settings will be the initial settings.

For soldering conditions, refer to “7-4-2-2 Reading/Writing Soldering Conditions” (p. 72) and read the files.

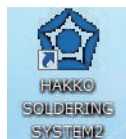
For system setting and main screen setting information, modify the changed values, etc. to the values recorded before updating the software.

7. Operation

First, check that all connections in “5. Installation” have been performed, and then switch on the main power supply and POWER button of the HAKKO HU-200 (robot) and switch on the power of the PC.

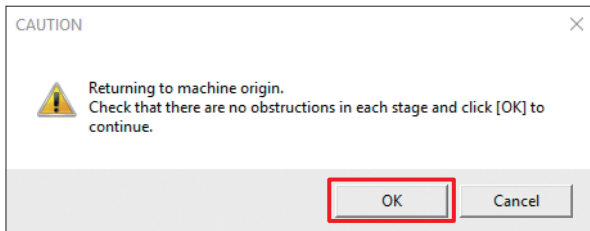


When the PC is switched on, the sign in screen will appear. When first shipped from the factory, it is possible to proceed without inputting anything. Next, double-tap on the HAKKO SOLDERING SYSTEM2 icon to start HAKKO SOLDERING SYSTEM2.

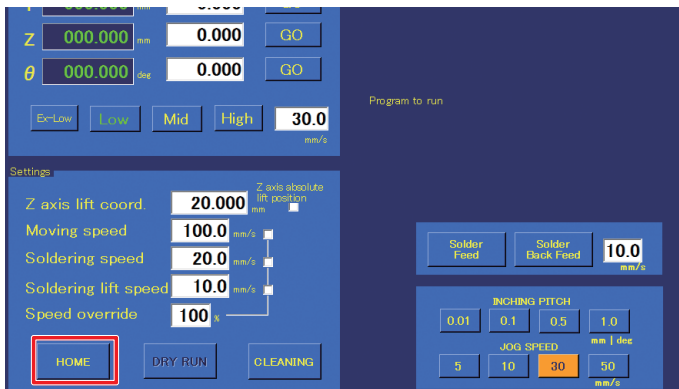


When the software is started, a window asking whether to return to origin will appear (refer to the diagram below).

Tap **[OK]** to execute return to origin.



When **[Cancel]** is selected, be sure to execute return to origin from **[HOME]** of the software's top screen.



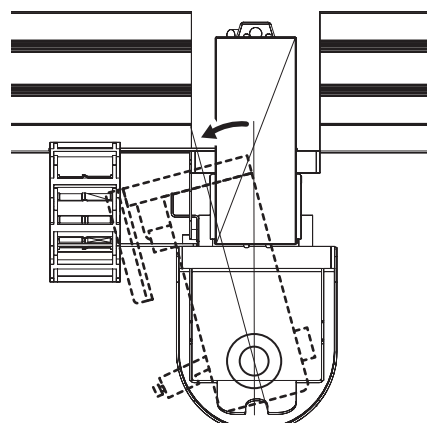
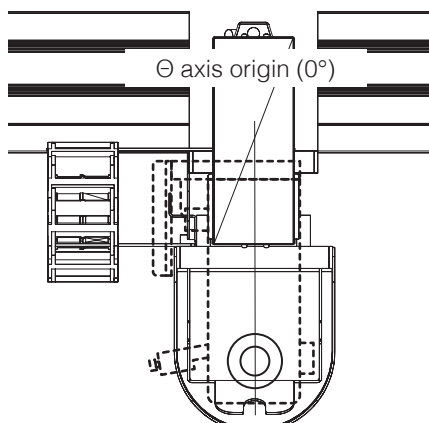
⚠ CAUTION

- First, check that all equipment have been connected properly and that there is no danger in the surrounding area.

When HAKKO SOLDERING SYSTEM2 starts, each axis will move as the robot returns to the origin. Be careful to stay out of the way of the robot as it moves.

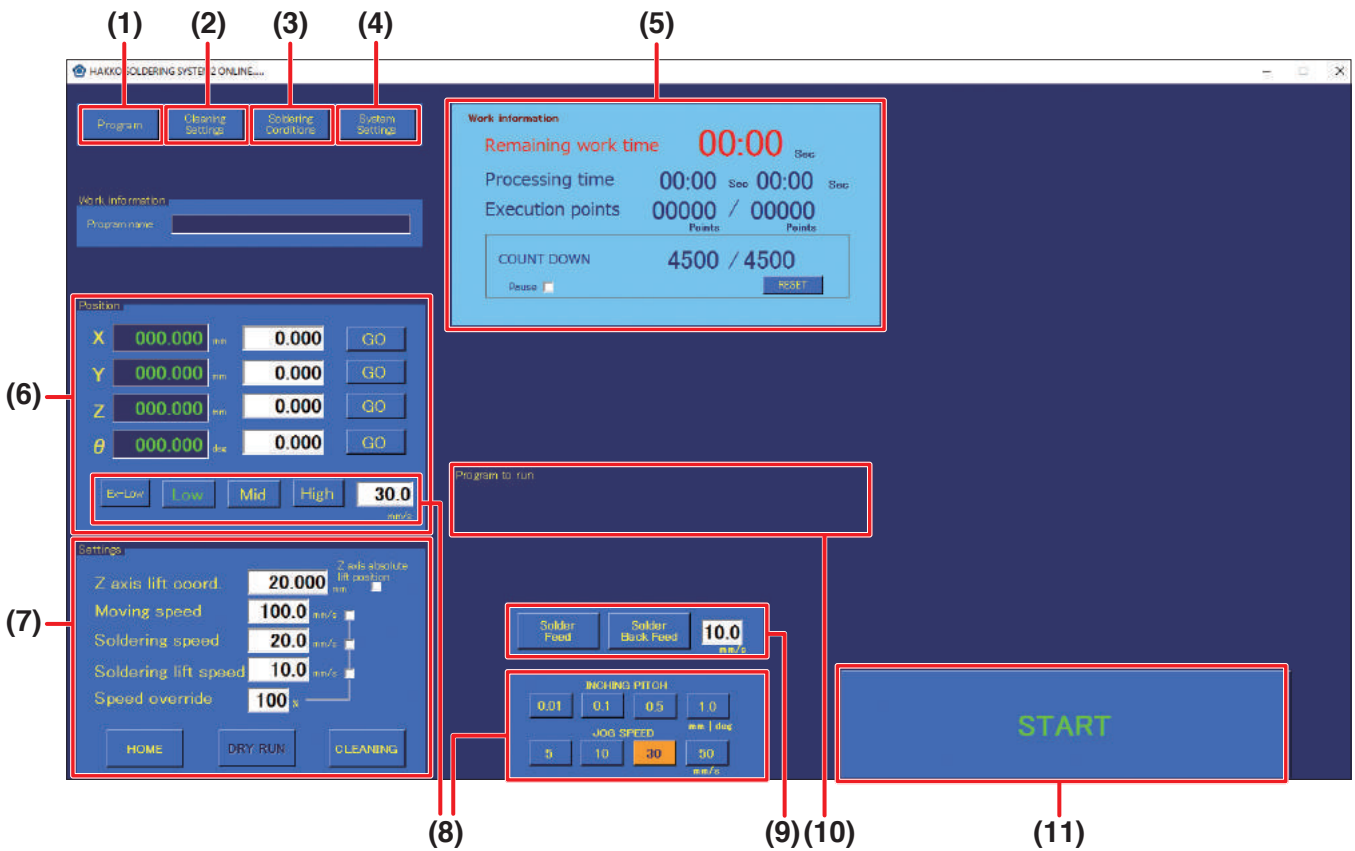
- When the θ axis rotates while returning to the origin, there is a danger of cables wrapping around the robot.

If it seems like there is a danger of cables wrapping around, press the emergency stop button immediately, turn the θ axis slightly counterclockwise from the origin (0°) when viewed from above the soldering unit fixture base, and then tap **[HOME]** again.



7. Operation (continued)

7-1 Explanation of Software Screen

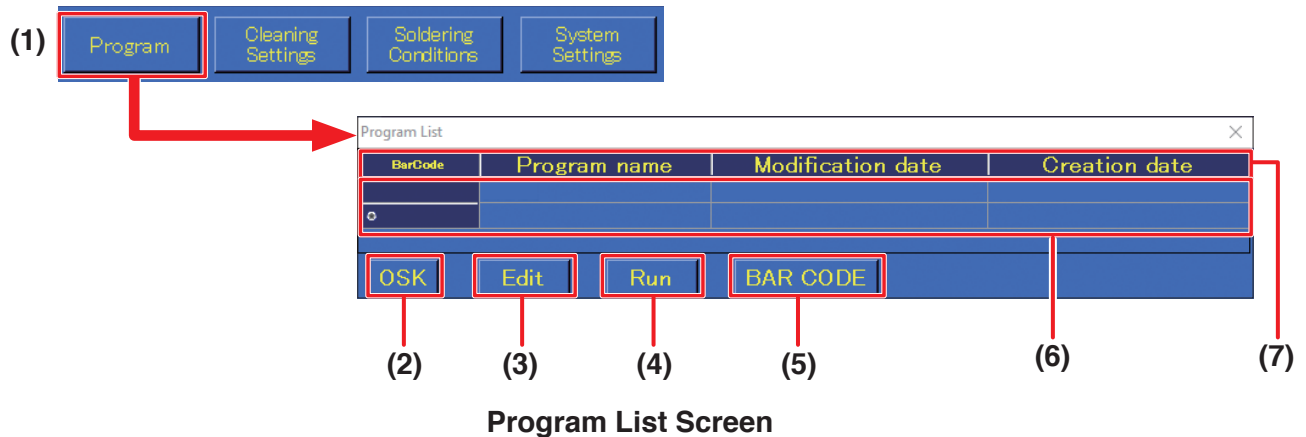


Software Top Screen (Admin mode)

When the software starts up, the top screen including the following information will be shown.

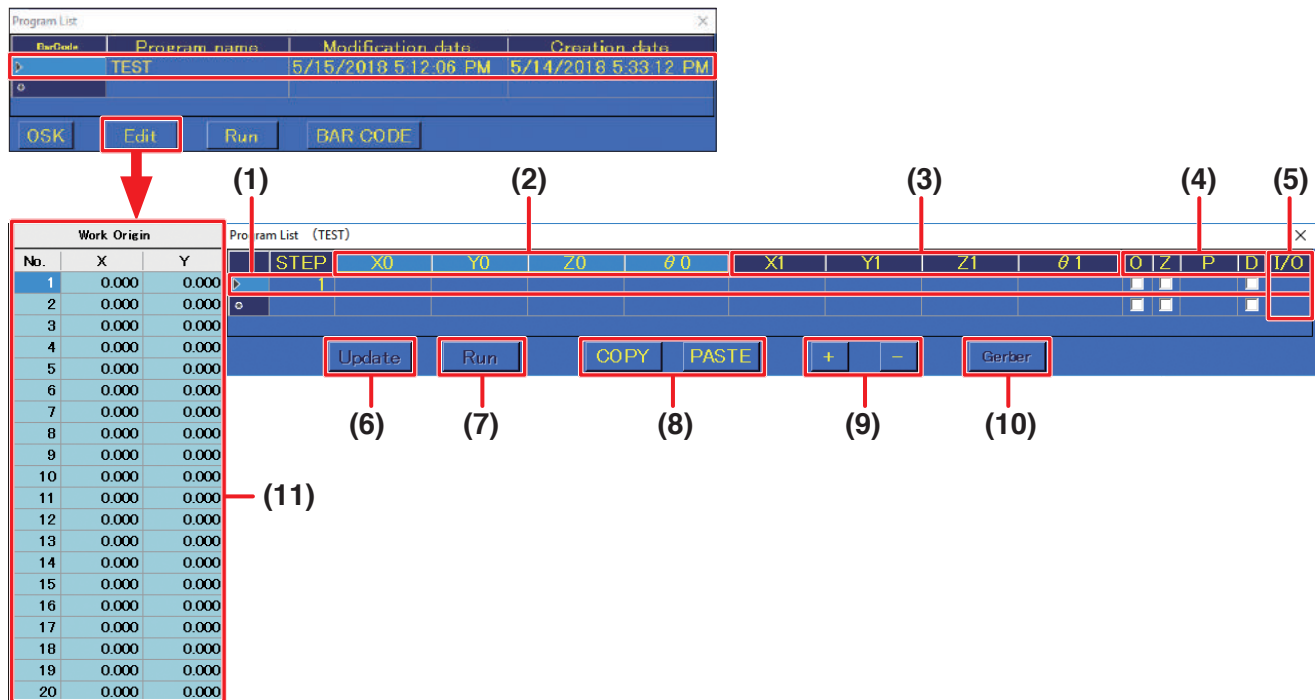
- | | |
|---------------------------------|---|
| (1) Program | (7) Settings |
| (2) Cleaning Settings | (8) JOG operation settings |
| (3) Soldering Conditions | (9) Solder Feed/Solder Back Feed |
| (4) System Settings | (10) Program to run |
| (5) Work information | (11) Start button |
| (6) Position | |

7-1-1 Program



- (1) **Program** (top screen)
Used for selecting, editing, or newly creating a work program.
- (2) **OSK**
Calls up the on-screen keyboard for inputting the program name.
- (3) **Edit**
Calls up the Program Edit Screen (refer to next page) for the selected program.
For details on the Program Edit Screen, refer to "7-5 Creating a Soldering Program" (p. 73).
- (4) **Run**
Selects the program to run. The selected program will be shown in the running programs area of the top screen.
- (5) **BAR CODE**
Calls up the Bar Code Setting Screen. The PWB to be worked on and the created program can be linked.
For details on the Bar Code Setting Screen, refer to "7-7-3 Calling up a Program Using a Bar Code or I/O" (p. 105).
→ A commercially available USB type bar code reader is necessary to use bar codes.
- (6) The bar code, program name, modification date, and creation date of the created program will be shown.
(If a bar code for calling up the program has been linked, a simplified bar code will be shown.)
- (7) **Program name, Modification date, Creation date**
Tapping each of the items will cause the list to be ordered by that item.

7. Operation (continued)



Program Edit Screen

The start point and end point cells and checkboxes can be set directly in the Program Edit Screen. More detailed settings can be performed in the Point Edit Screen which can be called up by double-tapping in the first column or in the STEP column.

- (1) Each horizontal row shows information for a single point.
- (2) **X0, Y0, Z0, Ø0**
Shows the information for the soldering start point.
- (3) **X1, Y1, Z1, Ø1**
Shows the information for the soldering end point.
- (4) **O:** If checked, indicates that the start point is an offset.
Z: Checked when "Return to" is set to Z lift position.
P: Shows the solder feed soldering condition number.
D: If checked, indicates that the soldering mode is DS (drag soldering).
- (5) Shows indications for when I/O settings or individual point settings have been set. If all settings have been set, **[IO CZSP]** will be shown. If no setting has been made for the corresponding section, the character for that section will be replaced by **[*]**.
I: Input setting
O: Output setting
C: Cleaning setting
Z: Individual point Z axis lift setting
S: Individual point speed setting
P: Palletizing setting
- (6) **Update**
Applies the changes to the program and saves it.

(7) Run

Selecting the desired program and tapping **[Run]** will cause the selected program to be shown in the running programs area of the top screen.

Error checking will be performed at the same time. If an error such as input of a value outside the range, etc. is found, an error screen will be shown. When the problem has been solved, the program can be run.

Outside range • STEP 1: X, Y axis start point and end point
• STEP 3: X axis start point and end point
• STEP 4: Y axis start point and end point
→Settable ranges: X axis: 0 – 400 mm, Y axis: 0 – 300 mm

Error screen showing values outside range

HU-200 LogBrowser

HAKKO Corporation HU-200 PROGRAM DATA ANALYSIS ERROR REPORT

2018/01/31 13:49:13 FILE = test

Solder Points: 4 / Total Steps: 4

STEP	SP	EP	ORG00	(0.000, 0.000)	X= 405.063, Y= -4.935	Z= 166.131, θ = 44.263, SPEED= (800.0, 20.0, 10.0), SNo = 1
STEP 1:	SP	EP	ORG00	(0.000, 0.000)	X= 405.063, Y= -4.935	Z= 166.131, θ = 44.263, SPEED= (800.0, 20.0, 10.0), SNo = 1
STEP 1:	EP	ORG00	(0.000, 0.000)	X= 405.063, Y= -4.935	Z= 166.131, θ = 44.263, SPEED= (800.0, 20.0, 10.0), SNo = 1	
STEP 3:	SP	EP	ORG00	(0.000, 0.000)	X= 400.106, Y= 82.671	Z= 166.131, θ = -0.491, SPEED= (800.0, 20.0, 10.0), SNo = 1
STEP 3:	EP	ORG00	(0.000, 0.000)	X= 400.106, Y= 82.671	Z= 166.131, θ = -0.491, SPEED= (800.0, 20.0, 10.0), SNo = 1	
STEP 4:	SP	EP	ORG00	(0.000, 0.000)	X= 351.907, Y= 305.642	Z= 158.927, θ = -89.413, SPEED= (800.0, 20.0, 10.0), SNo = 1
STEP 4:	EP	ORG00	(0.000, 0.000)	X= 351.907, Y= 305.642	Z= 158.927, θ = -89.413, SPEED= (800.0, 20.0, 10.0), SNo = 1	

SP: Start point
EP: End point

Solder point number

Procedure for Correcting Errors

HU-200 LogBrowser

HAKKO Corporation HU-200 PROGRAM DATA ANALYSIS ERROR REPORT

2018/01/31 13:49:13 FILE = test

1. Close the error screen.

2. Open the Point Edit Screen for the step to be corrected in the program list.

Program List

STEP	X0	Y0	Z0	θ0	X1	Y1	Z1	θ1	O	Z	P	D	I/O
1	405.063	-4.935	166.131	44.263	405.063	-4.935	166.131	44.263					

Update Run COPY PASTE + - Gerber

STEP = 1 NOTE

Current Pos. Start Pos. End Pos.

X 000.000 400.000 397.000 mm

Y 000.000 0.000 3.000 mm

Z 000.000 166.131 166.131 mm

θ 000.000 44.263 44.263 deg

AUTO SET Use Current Pos. Use Current Pos.

Check Operation Move Move

Cancel Prev. Next I/O Setting

Lifting Pos. mm

Moving Speed mm/s

Soldering Speed mm/s

Lifting Speed mm/s

CLEANING: 1 2 3 4 5

Before After

Soldering PS DS None

Preset No. 1

Return to Start Lifted Pos.

WORK ORIGIN

Exit

3. Input proper values in the start point and end point boxes.

4. When correction has been finished, tap **[Exit]**.

5. Correct STEP 3 and STEP 4 in the same way.

6. After all problems have been corrected, tap **[Update]** in the Program Edit Screen.

After that, tap **[Run]**.

For details on the Point Edit Screen, refer to Point Edit Screen on the next page.

7. Operation (continued)

(8) COPY: Copies point data. Select the beginning of the row to be copied and tap **[COPY]**. The data for a single point row will be copied. To select multiple rows, tap and drag on the beginning of the rows.

PASTE: Pastes the copied data. Select the beginning of the row to paste data into and tap **[PASTE]**. When **[PASTE]** is tapped, existing data in the selected row will be overwritten. To add data, add a new row before performing paste. When pasting, it is necessary to input the work origin. Set the post-copy workpiece origin in advance, and select the X axis and Y axis values for the set work origin.

Work Origin

No.	X	Y
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	0.000	0.000
6	0.000	0.000
7	0.000	0.000
8	0.000	0.000
9	0.000	0.000
10	0.000	0.000
11	0.000	0.000
12	0.000	0.000
13	0.000	0.000
14	0.000	0.000
15	0.000	0.000
16	0.000	0.000
17	0.000	0.000
18	0.000	0.000
19	0.000	0.000
20	0.000	0.000

Program List (TEST)

	STEP	X0	Y0	Z0	θ 0	X1	Y1	Z1	θ 1	O	Z	P	D	I/O
▷	1									▣	▣		▣	
◦										▣	▣		▣	

Update

Run

COPY

PASTE

+

-

Gerber

(9) As shown in the above figure, tapping the beginning of a row will cause the entire row to be selected. In this condition, tapping **[+]** or **[-]** will cause a row to be added or deleted respectively.

[+]: Adds a row below the selected row.

[-]: Deletes the selected row.

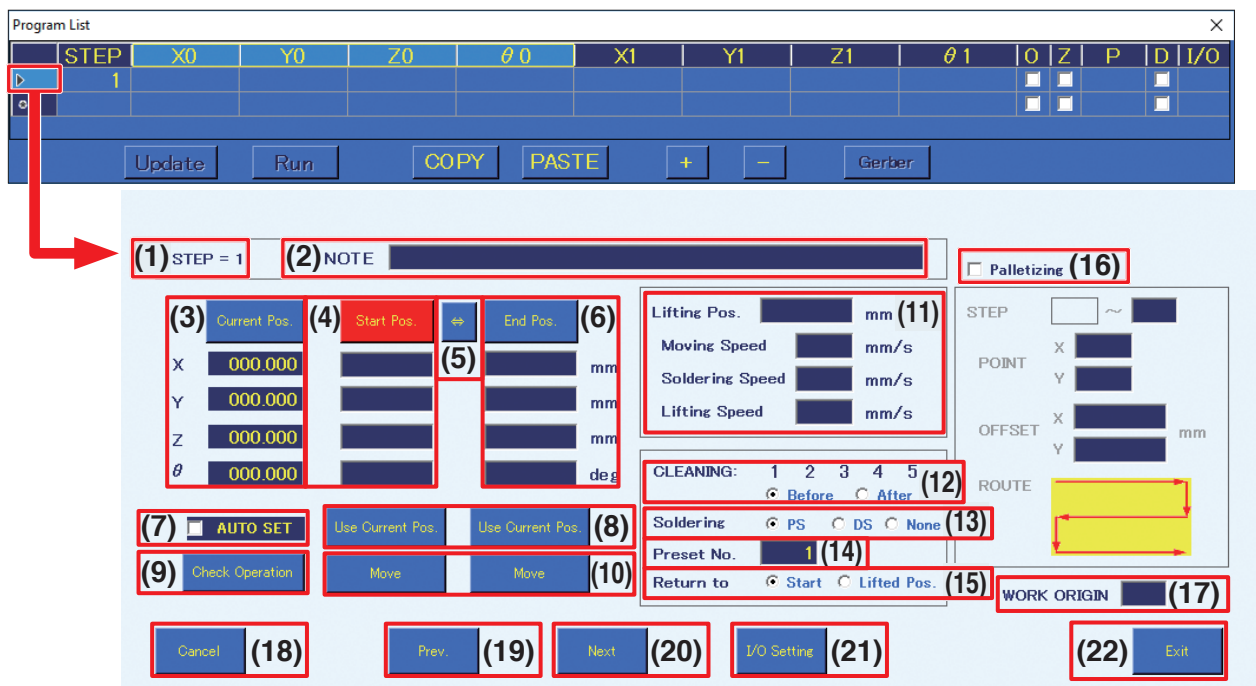
(10) Gerber

Calls up a screen for inputting coordinates for the aperture specification of Gerber data used in circuit design creation.

(11) Work Origin


When the Program Edit Screen is opened, the Work Origin screen will be shown on the left side of that screen.

Work origins can be set in this screen (up to 20 points).

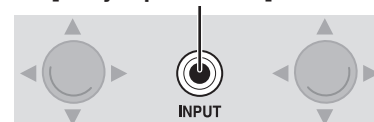


Point Edit Screen

Detailed point settings are performed in the Point Edit Screen.

- (1) **STEP = 1** (number)
1 (number) indicates the solder point number.
- (2) **NOTE**
Comments, memos, etc. for each point can be input.
- (3) **Current Pos.**
Shows the current tip position.
- (4) **Start Pos./OFFSET**
Sets the coordinates or offset amount of the start point.
When **[Start Pos.]** is shown, tapping **[Start Pos.]** will switch to **[OFFSET]**, and when **[OFFSET]** is shown, tapping **[OFFSET]** will switch to **[Start Pos.]**.
- (5) 
Switches between setting the coordinates read using the robot's **[Easy Input Switch]** button or **[Use Current Pos.]** as the start point/offset or end point.
- (6) **End Pos.**
Sets the coordinates of the end point.
- (7) **AUTO SET**
Reads coordinates using the robot's **[Easy Input Switch]** button.
When checked, the setting destination will be automatically switched each time the robot's **[Easy Input Switch]** button is pressed.
Soldering mode*1 For PS mode: End point → Start point → Next point
For DS mode: Start point → End point → Next point
For None: Start point → Next point
For PS mode (Offset): End point (Automatic offset input*2) → Next point
- (8) **Use Current Pos.**
Sets the current coordinates as the start point or end point.
When the start point is an offset, sets the offset value of the System Settings Screen.
- (9) **Check Operation**
The operation of the steps set in this screen will be simulated.

[Easy Input Switch] button



*1 For details about soldering mode, refer to "(13) Soldering" on the next page.

*2 The automatically input offset amount is set in the System Settings Screen.

For details about system settings, refer to "7-1-4 System Settings" (p. 49).

7. Operation (continued)

(10) Move

Moves to the set Start Pos./OFFSET or end point coordinates. If the value is blank, no movement will be performed.

If the end point is blank when the start point is an offset, no movement will be performed even if **[Move]** on the start point side is tapped because calculation cannot be performed.

(11) Individual point settings

Sets the Lifting Pos., Moving Speed, Soldering Speed, and Lifting Speed for individual points.

If a value is blank, the values in the top screen will be applied. When numerical values are input for the Lifting Pos., those values will be used even if Z axis absolute lift position is not checked in the top screen.

(12) CLEANING settings

Select from the cleaning numbers **[1]** – **[5]** set in the Cleaning Settings Screen. The cleaning timing can be set as before or after soldering of that point. For details on cleaning settings, refer to “7-1-2 Cleaning Settings” (p. 47).

(13) Soldering

Select from PS (point soldering), DS (drag soldering), or None (movement only)

(14) Preset No.

Sets the soldering conditions number. Settable range: 1 – 250

(15) Return to

Sets the movement destination for after solder completion. For start point, movement will be to the start point or offset destination; for Z lift position, movement will be vertically to the Z axis lift position.

(16) Palletizing

When checked, palletizing settings can be performed. Palletizing is used when the settings for a created point will be repeated multiple times.

(17) WORK ORIGIN

Sets the WORK ORIGIN number in the **Work Origin** screen.

When blank, X=0.000, Y=0.000 will be used as the Work Origin.

Work Origin		
No.	X	Y
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	0.000	0.000
6	0.000	0.000
7	0.000	0.000
8	0.000	0.000
9	0.000	0.000
10	0.000	0.000
11	0.000	0.000
12	0.000	0.000
13	0.000	0.000
14	0.000	0.000
15	0.000	0.000
16	0.000	0.000
17	0.000	0.000
18	0.000	0.000
19	0.000	0.000
20	0.000	0.000

(18) Cancel

Discards the points currently being edited and closes the screen.

(19) Prev.

Moves to the previous point.

(20) Next

Moves to the next point.

— Note —

If the necessary settings for start point coordinates, end point coordinates, and soldering conditions have not been set, a setting error will be shown and movement to the next Point Edit Screen will not be performed. If the next point is a new point, it will inherit the start point/offset display and soldering conditions.

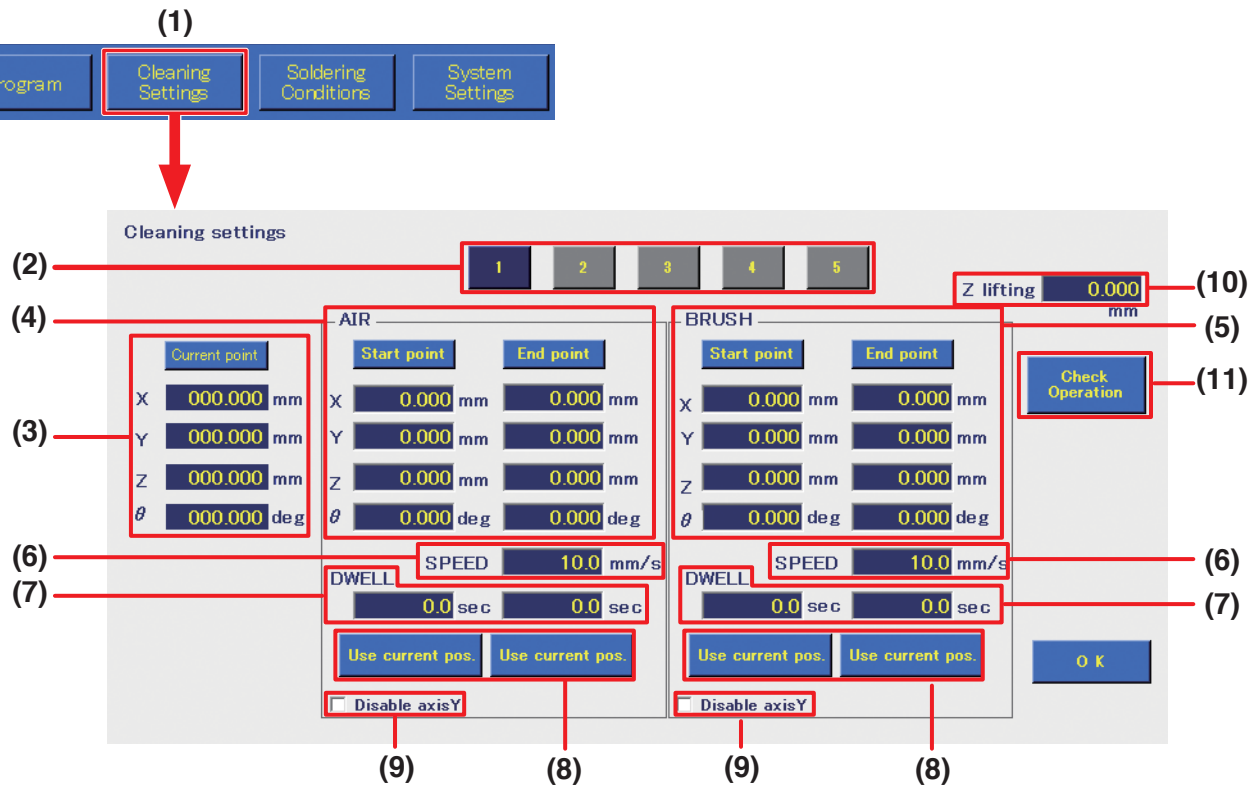
(21) I/O Settings

Opens the point I/O Settings Screen. For details on the I/O Settings Screen, refer to “7-7-4 I/O Settings” (p. 109).

(22) Exit

Finishes the settings and closes the current Point Edit Screen. If the necessary settings for start point coordinates, end point coordinates, and soldering conditions have not been set, a setting error will be shown and the screen cannot be closed. However, if movement to a new row has been performed using **AUTO SET** or **[Next]** and all coordinate values are blank, the point currently being edited will be discarded and the screen will close.

7-1-2 Cleaning Settings



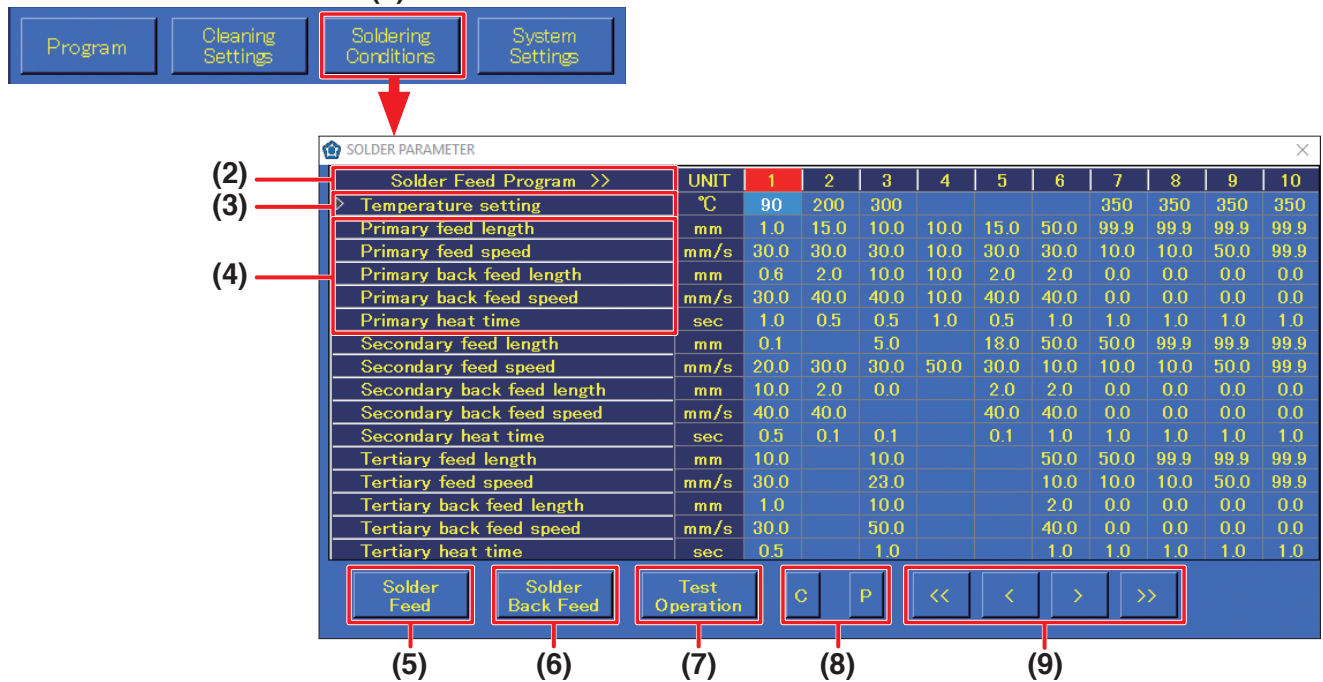
Cleaning Settings Screen

- (1) **Cleaning Settings** (top screen)
Button for setting cleaning settings. Up to 5 settings can be set.
- (2) **Cleaning number**
Cleaning program number. Up to 5 cleaning programs can be set.
- (3) **Current point**
Shows the current tip position.
- (4) **AIR**
Sets air cleaning settings.
- (5) **BRUSH**
Sets brush cleaning settings.
- (6) **SPEED**
Sets the movement speed when moving the tip from Start point → End point → Start point.
- (7) **DWELL**
Sets the respective cleaning times while waiting at the start point and end point during cleaning. (Settable range: 0.0 – 60.0 sec.)
- (8) **Use current pos.**
Sets the current coordinates as the start point or end point.
- (9) **Disable axis Y**
When checked, forces the Y axis to not move during cleaning regardless of the input coordinate values.
- (10) **Z lifting**
The Z axis lift coordinates to be used during cleaning. These values will be given priority during cleaning regardless of the **Z axis lift coord.** set in the top screen.
For details on Z axis lift behavior, refer to “7-2-2 Z Axis Lift” (p. 60).
- (11) **Check operation**
Checks the operation of the set cleaning behavior.

7. Operation (continued)

7-1-3 Soldering Conditions

(1)



Solder Feed Parameter Setting Screen

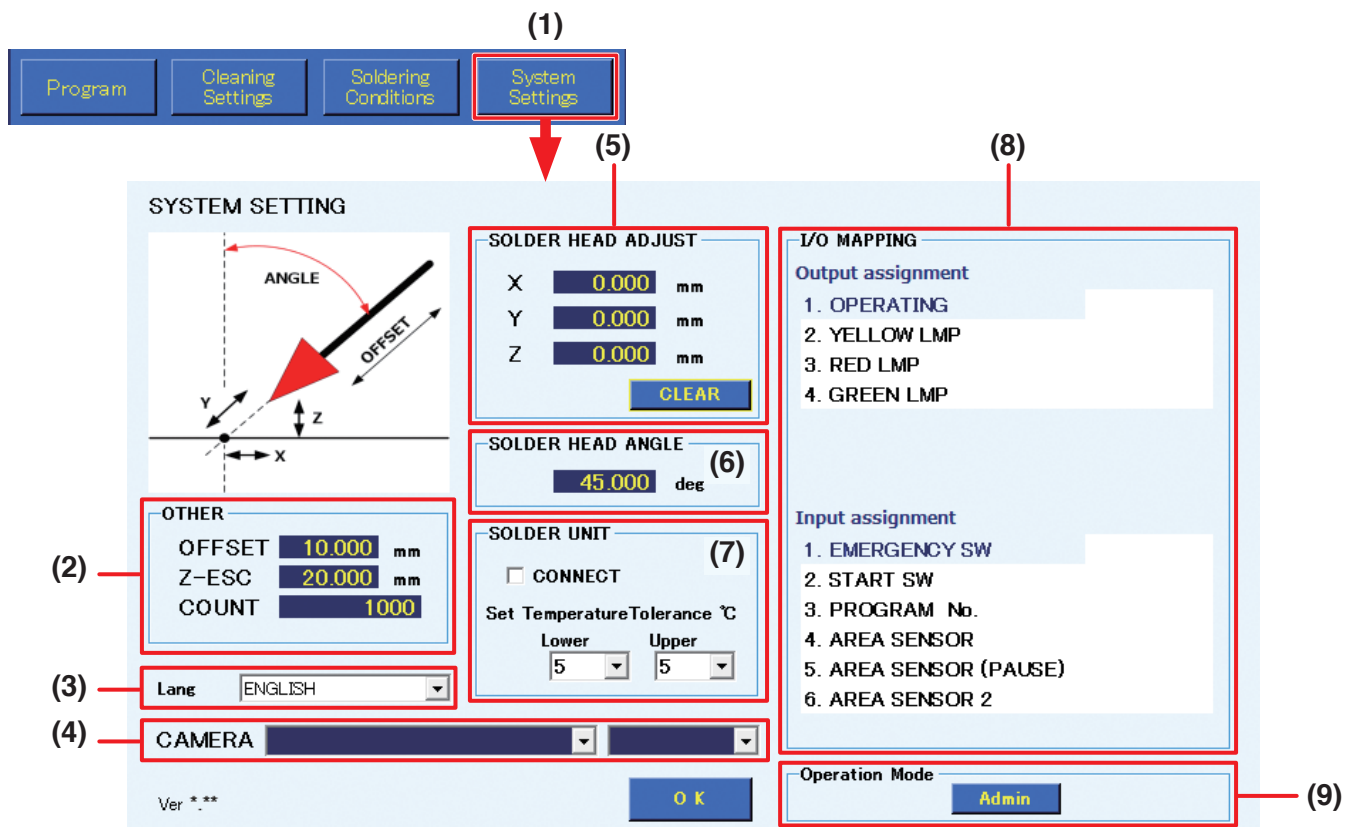
- (1) **Soldering Conditions** (top screen) Solder feed programs are created in the Solder Feed Parameter Setting Screen. A maximum of 250 solder feed programs can be set.
- (2) **Soldering Feed Program** Solder feed program numbers. A single vertical column is a single program.
- (3) **Temperature setting** Input the temperature setting. (Settable range: 50 – 500°C)
- (4) **Feed length, feed speed, back feed length, back feed speed, heat time** These are the solder feed settings. The settable range for each item are as shown in the table below. For primary soldering, the settings are for the start point position. For both secondary and tertiary soldering, the settings are for the end point position.

Setting item	Range*1
Solder feed length	0.1 – 99.9 mm
Solder feed speed	0.1 – 99.9 mm/s
Solder back feed length	0 – 20.0 mm
Solder back feed speed	0 – 99.9 mm
Heat time	0.1 – 9.9 sec

*1 For secondary and tertiary soldering, all values can be set starting from 0.

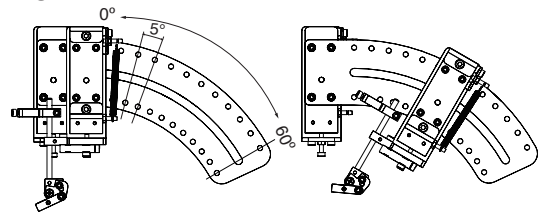
- (5) **Solder Feed** Button for manually feeding solder. When tapped, it will be set to on and solder will be fed. Tapping it again will set it to off. (Solder feeding, solder retraction, and solder feed speed settings can also be performed from the top screen.)
- (6) **Solder Back Feed** Button for manually retracting solder. When tapped, it will be set to on and solder will be retracted. Tapping it again will set it to off. (Solder feeding, solder retraction, and solder feed speed settings can also be performed from the top screen.)
- (7) **Test Operation** The program for the soldering conditions number for the selected column will be run.
- (8) **C:** Copies the soldering conditions in the selected column.
P: Pastes the copied soldering conditions into the selected column.
- (9) **<< / >>:** Moves to the previous or next soldering conditions page (1 page = 10 columns)
< / >: To switch between pages (columns 1 – 10 ⇌ columns 11 – 20), tap << or >>. Selects the previous or next column of conditions.

7-1-4 System Settings



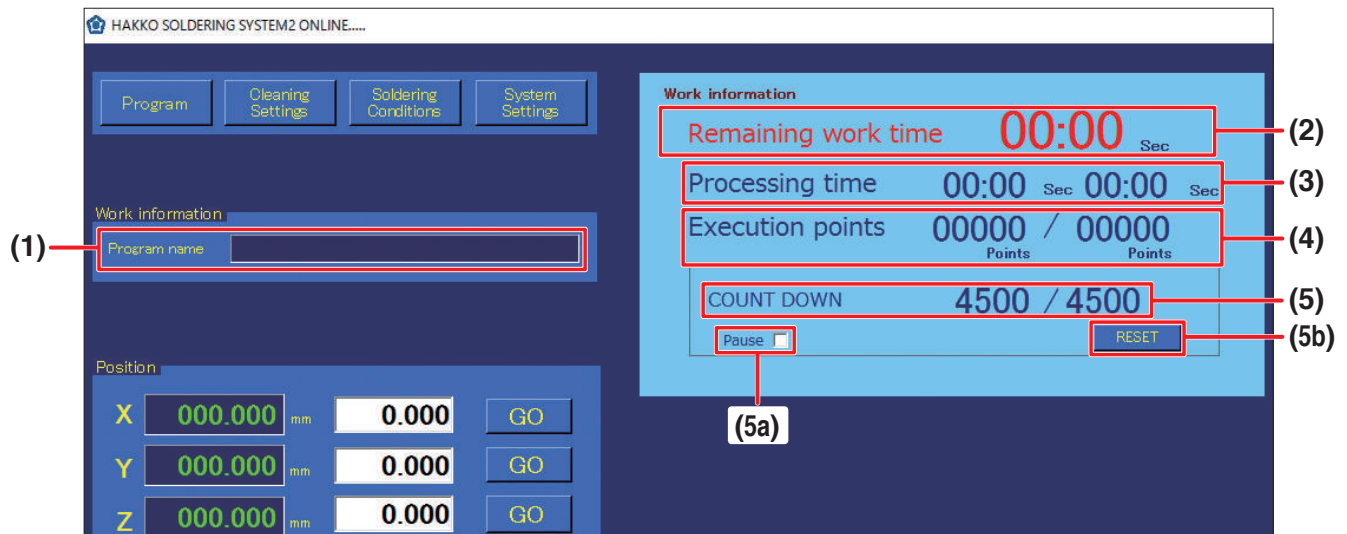
System Settings Screen (Admin mode)

- (1) **System Settings** (top screen)
Used for setting more detailed settings. For details, refer to “7-7 Performing Detailed Settings” (p. 94).
- (2) **OTHER**
OFFSET: Sets the offset when using AUTO SET.
Z-ESC: Sets the Z axis lift amount when an error occurs in the HAKKO FU-601 solder feed.
COUNT: Sets the numerical value for COUNT DOWN shown in work information in the top screen.
- (3) **Lang**
Select the language.
- (4) **CAMERA**
Selects the camera to be used by the system.
- (5) **SOLDER HEAD ADJUST**
Corrects the tip position for tips whose dimension has changed due to wear.
- (6) **SOLDER HEAD ANGLE**
Set the angle matching the mounting angle of the soldering iron unit.
The tip angle can be changed between 0° and 60° and mounted. (Refer to diagram at right.)
- (7) **SOLDER UNIT**
Connects to the HAKKO FU-601 and sets the upper limit temperature and lower limit temperature for the temperature tolerance standard.
- (8) **I/O MAPPING**
Sets the I/O connections for external peripheral equipment such as an emergency stop device, etc.
- (9) **Operation Mode**
Switches the mode to either Admin mode or Operator mode. In Admin mode, all operations can be performed. In Operator mode, program editing or settings such as cleaning settings, soldering conditions, etc. cannot be performed. For details on switching modes, refer to “7-7-5-7 Operation Mode” (p. 115).



7. Operation (continued)

7-1-5 Work Information



(1) Program name

Displays the name of the selected program. When a program name is displayed, the Program Edit Screen for the program corresponding to the name can be opened by double-tapping on the program name.

(2) Remaining work time

For a program which has been run to the end at least once already, the remaining work time will be shown when the program is run a second or later time. Even if the program has been changed, the remaining time for the program before the change will be shown.

(3) Processing time

Left value: Shows the elapsed time for the program currently being run.

Right value: Shows the time for a single program.

The program times are shown only for programs which have been run to the end at least once. In addition, even if the program has been changed, the work time for the program before the change will be shown.

(4) Execution points

Left value: Shows the number of points for which work has been completed.

Right value: Shows the total number of points for the program being run.

(5) COUNT DOWN

Left value:

Shows the value equal to the set value minus the number of executed points. When the count reaches 0, the program will pause even if the program is in the middle of running. At that time, a pause dialog will be shown. It can be used for tip life management, maintenance timing management, etc.

When the program is paused, **[START]** will change to **[PAUSE]**.

When **[PAUSE]** is tapped, operation will restart from the point at which it was paused.

(Refer to "7-1-11-1 Flowchart (Screen Button Operation)" (p. 54)).

When performing operation using the robot buttons, press the **[START/PAUSE/STOP]** button.

(Refer to "7-1-11-2 Flowchart (Robot Button Operation)" (p. 55)).

Right value:

Shows any desired value set in the COUNT box for OTHER in systems settings.

(5a) Pause

Check it to temporarily pause the COUNT DOWN function.

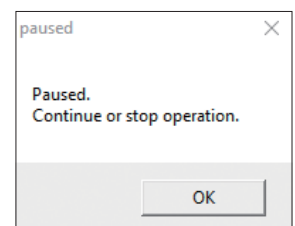
While checked, the count (left value) is stopped even if soldering is performed.

(5b) RESET

Resets the COUNT DOWN value.

If it is reset, the count (left value) will return to the same as the original value at right.

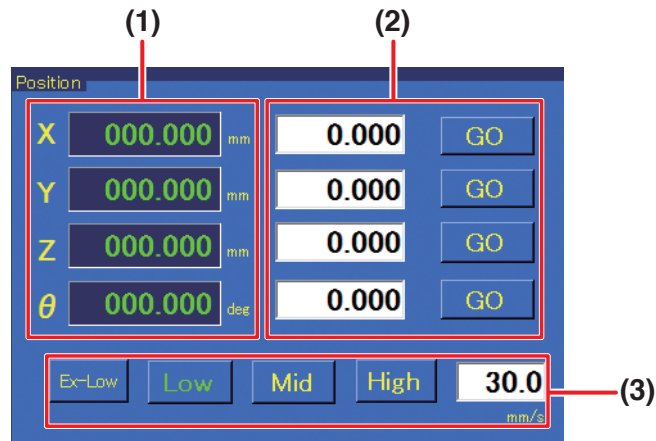
When this button is tapped after setting a value in the COUNT box for OTHER in systems settings, the value will be updated in this screen.



Press button.



7-1-6 Position



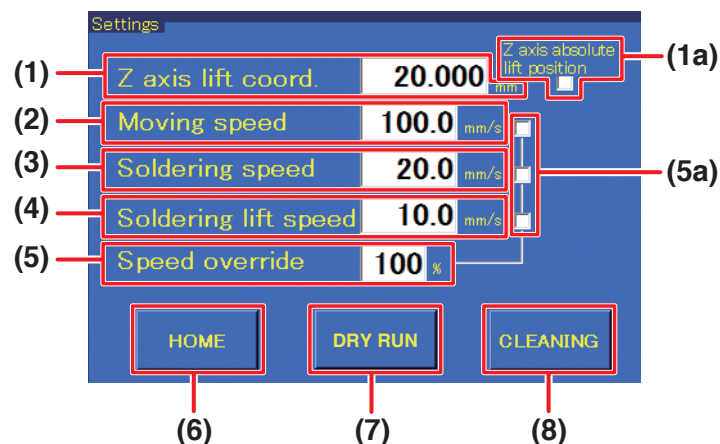
Used for checking the current coordinates of the robot or for performing coordinate movement of the robot.

- (1) Shows the current coordinate of the robot for each axis.
- (2) When the coordinates to move to are known, input the coordinates.
When **[GO]** is tapped, the corresponding axes will move to the specified coordinates.
(Settable range: X: 0 – 400 mm; Y: 0 – 300 mm; Z: 0 – 200 mm; θ: ± 200°)
- (3) Selects the speed for movement to the coordinates specified in (2).
Ex-Low: 5 mm/sec.; **Low:** 30 mm/sec.
Mid: 100 mm/sec.; **High:** 200 mm/sec.
Free setting range: 1 – 800 mm/sec. can be input.

— Note —

When the movement distance is long, select Mid or High while being careful to avoid contact.
When the movement distance is short, use Ex-Low or set a low value for the free setting.

7-1-7 Settings



Sets movement speed, etc. When individual settings are not performed, these values are used when running the program.

- (1) **Z axis lift coord.**
Sets the value for the Z axis lift when the robot is moving to coordinates. This coordinate is set to avoid contact with protruding objects on the workpiece. (Settable range: 0.000 – 200.000 mm)
For details on Z axis lift, refer to “7-2-2 Z Axis Lift” (p. 60)

7. Operation (continued)

(1a) Z axis absolute lift position (checkbox)

Sets the Z axis lift coordinate on and off. Normally, this checkbox is checked.

(2) Moving speed

Sets the movement speed of each axis for movement between points while the program is being run.
(Settable range: 1 – 800 mm/sec.)

(3) Soldering speed

Sets the soldering moving speed between primary soldering and secondary soldering (from start point to end point).

(Settable range: 1 – 800 mm/sec.)

(4) Soldering lift speed

Sets the speed for movement after the end point to the movement destination (start point or Z lift position).

(Settable range: 1 – 800 mm/sec.)

(5) Speed override

The speeds for moving speed, soldering speed, and soldering lift speed can be adjusted as percentages. This can be used for adjusting the speed of completed programs.

(Settable range: 1 – 100%)

(5a) Speed override (checkbox)

Sets the items for adjustment using speed override on and off.

(6) HOME

Returns the robot to the origin point. The Z axis will be moved first, and then the X, Y, and θ axes will be moved in that order.

(7) DRY RUN

Performs the robot motion of the selected program without adjusting the soldering iron temperature or performing solder feed. This operation is used to check the position information of the program.

— Note —

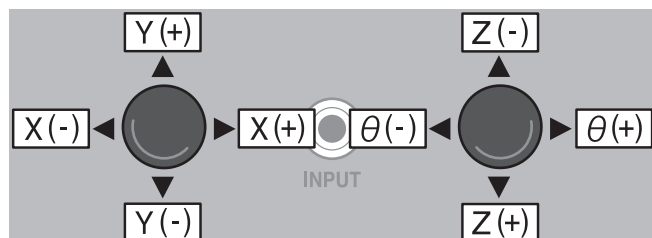
COUNT DOWN is also performed when using DRY RUN.

For details on COUNT DOWN, refer to “7-1-5 Work Information” (p. 50).

(8) CLEANING

Performs cleaning. Used to perform cleaning at any desired time. Cannot be used while a program is running. Only cleaning program 1 can be performed.

7-1-8 INCHING PITCH/JOG SPEED



Used for axis movement of the robot. There are 2 ways of moving. Fine adjustments can be performed by using either of the 2 methods according to the application.

(1) INCHING PITCH

When a numerical value is selected, operating the robot's JOY STICK will move the robot only by the selected amount.

Since movement will not continue even if the JOY STICK continues to be tilted, this is suitable for movements by small degrees.

(2) JOG SPEED

When a speed is selected, movement will be performed at the selected speed for as long as the robot's JOY STICK is kept tilted.

7-1-9 Solder feeding / Solder retraction

Buttons for feeding and retracting solder when in manual. The solder feed speed can also be set. For details, refer to “7-1-3 Soldering Conditions” (p. 48), and for operations refer to “7-4 Solder Installation and Solder Feed Settings” (p. 68).

7-1-10 Running Program

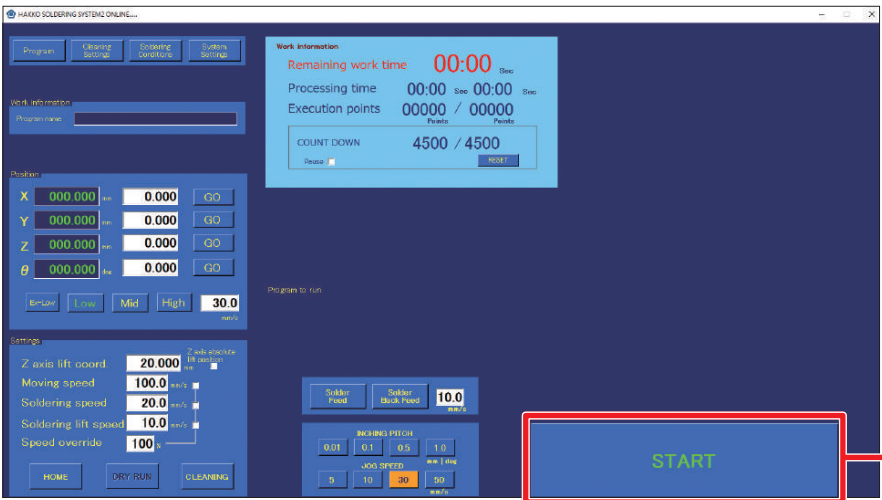
Running program													
STEP	X0	Y0	Z0	θ0	X1	Y1	Z1	θ1	O	Z	P	D	I/O
1	70.000	145.000	125.000	90.000	70.000	149.000	131.000	90.000	■	■	1	■	***C***
2	65.000	145.000	125.000	90.000	65.000	149.000	131.000	90.000	■	■	1	■	
3	60.000	145.000	125.000	90.000	60.000	149.000	131.000	90.000	■	■	1	■	****S*
4	55.000	145.000	125.000	90.000	55.000	149.000	131.000	90.000	■	■	1	■	***Z**
5	50.000	145.000	125.000	90.000	50.000	149.000	131.000	90.000	■	■	1	■	***C***

While a program is running, the STEP (row) currently being performed will be highlighted, and the rows will scroll.

A maximum of 5 rows of the program which was called up will be shown. While the program is running, the screen will automatically scroll with the STEP currently being executed. This section is for display only, and setting changes, etc. cannot be performed here. For details on programs, refer to “7-5 Creating a Soldering Program” (p. 73).

7-1-11 Start Button

Program start, pause, stop, and restart operations can be performed using the **[START/PAUSE/STOP]** button on the robot's front panel or the **[START]** button on the software's top screen. For details, refer to “7-1-11-1 Flowchart (Screen Button Operation)” (p. 54) or “7-1-11-2 Flowchart (Robot Button Operation)” (p. 55).



Top screen of software

List of button displays
All displays are blinking displays.

STOP

PAUSE

STOPPING (PC)

STOPPING (SW)

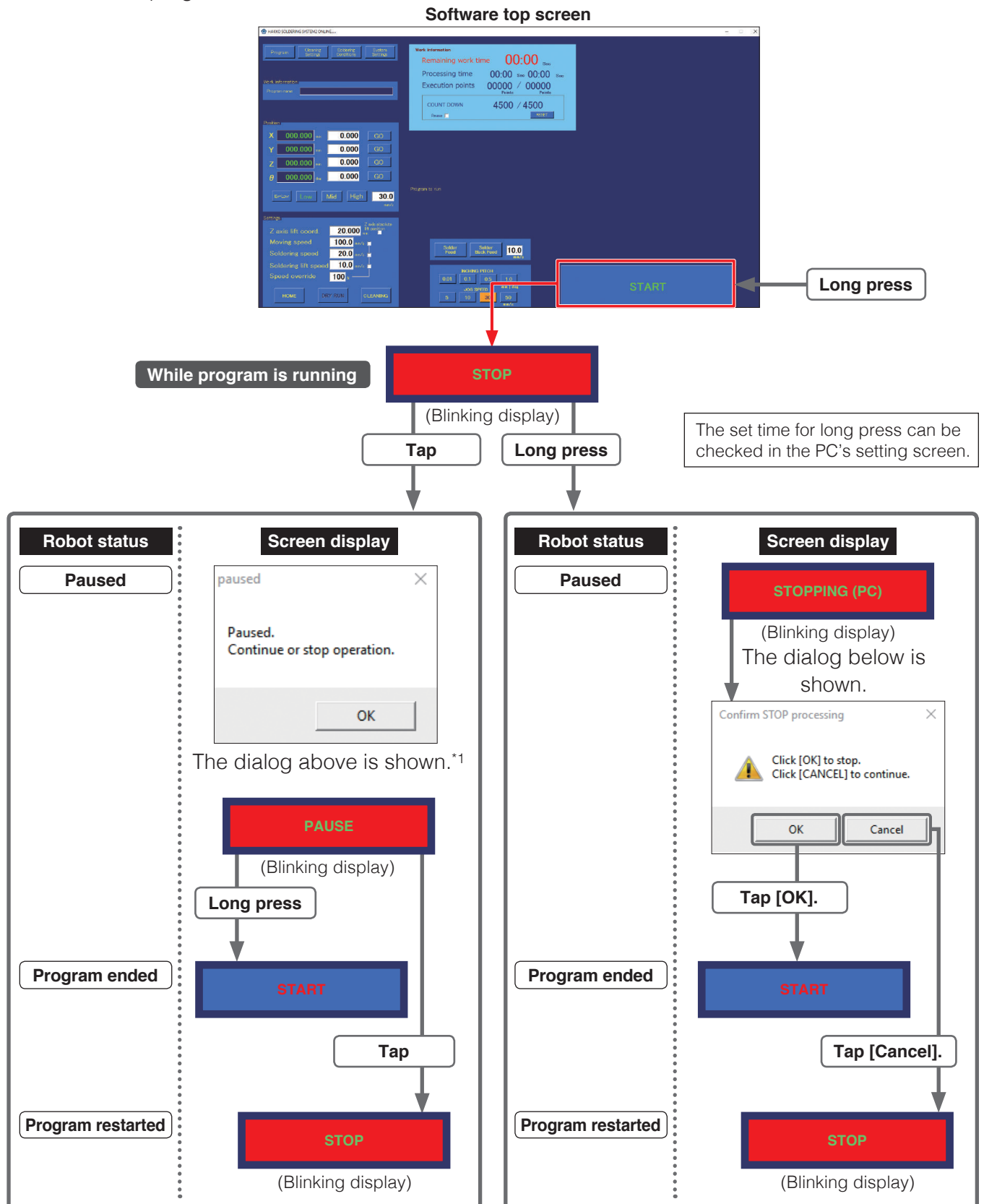
Screen button operation

Robot button operation

7. Operation (continued)

7-1-11-1 Flowchart (Screen Button Operation)

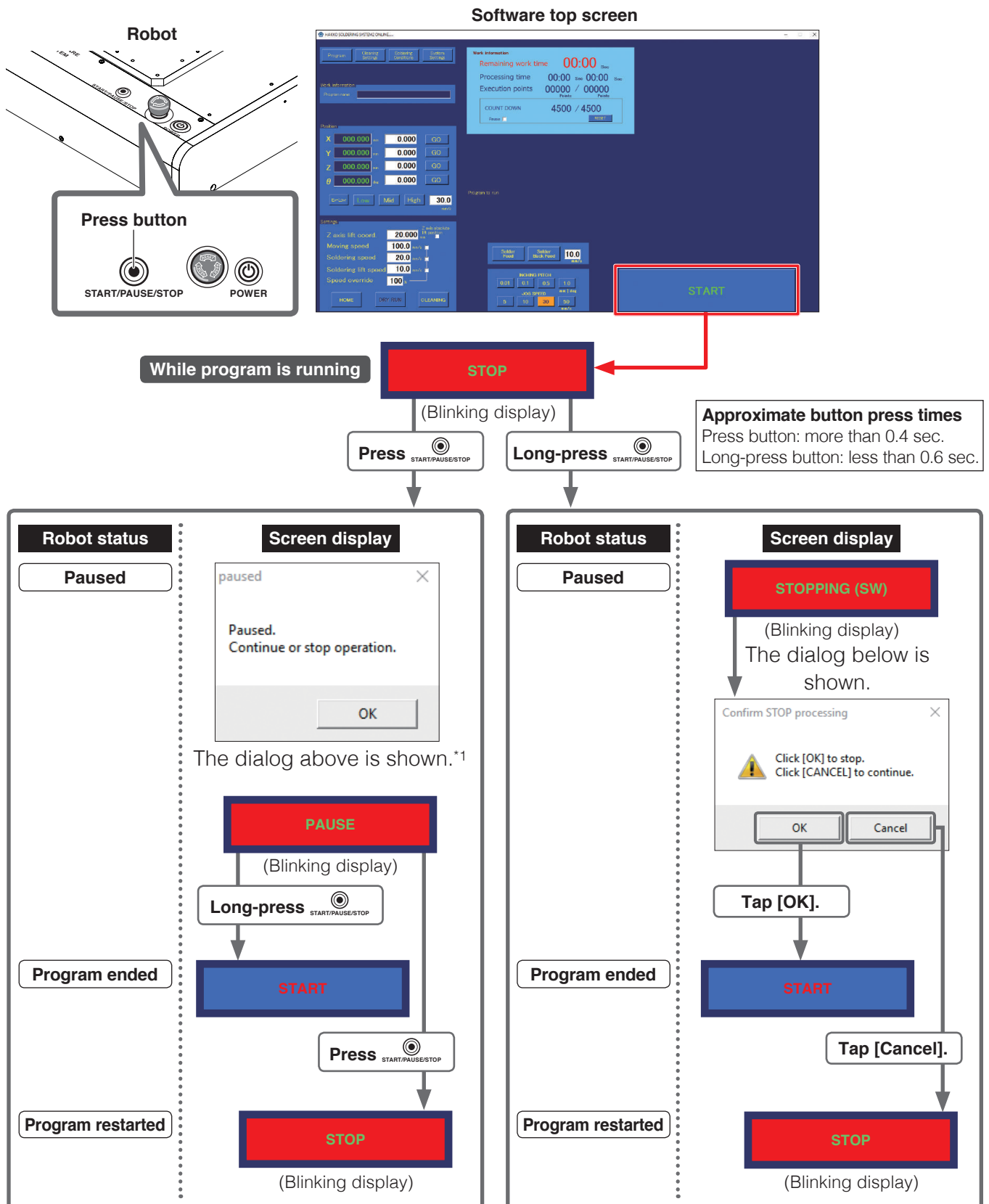
The diagram below shows the flow of program pause, stop, and restart operations using the screen buttons after a program has been started.



*1 During PAUSE, even if [OK] is tapped in the dialog, the same display will be shown again.
If [PAUSE] is long-pressed (end program) or tapped (restart program) the display will automatically disappear.

7-1-11-2 Flowchart (Robot Button Operation)

The diagram below shows the flow of program pause, stop, and restart operations using the robot button after a program has been started.



*1 During PAUSE, even if [OK] is tapped in the dialog, the same display will be shown again.
 If [PAUSE] is long-pressed (end program) or tapped (restart program) the display will automatically disappear.

7. Operation (continued)

7-2 JOG Operation

⚠ CAUTION

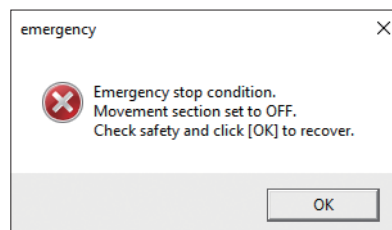
When the robot will be operated, notify nearby workers that work is being performed and perform work while checking safety.

To enable operation to be immediately stopped in the event of a dangerous condition, perform work within reach of an emergency stop button.

When an emergency stop condition has been entered by pressing the emergency stop button, the display below will be shown on the screen.

After removing the cause of the emergency stop, turn the robot's emergency stop button clockwise to return it to its normal position.

Then, tap **[OK]** in the message window.



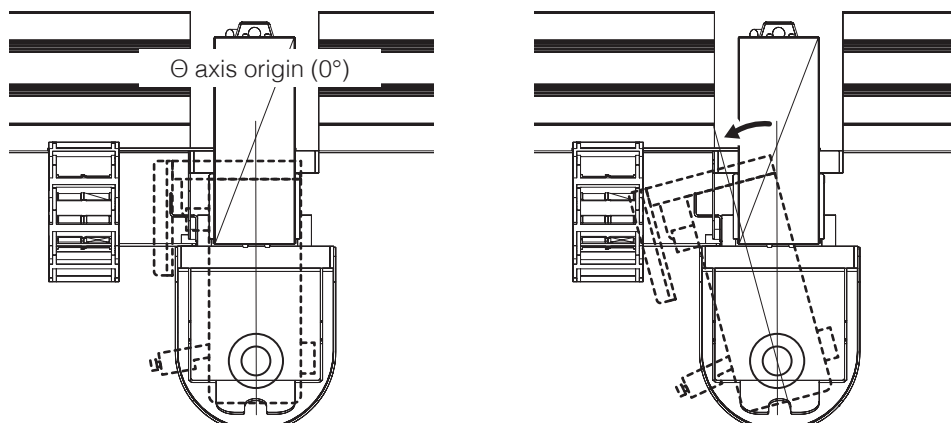
— Note —

- Even if **[OK]** is tapped before the emergency stop button has been returned to its normal position, the same display will appear again. Perform the emergency stop button operation first.
- After recovering from an emergency stop condition, be sure to tap **[HOME]** in the top screen to return the robot to the origin point. The Z axis will be moved first, and then the X, Y, and θ axes will be moved in that order.

⚠ CAUTION

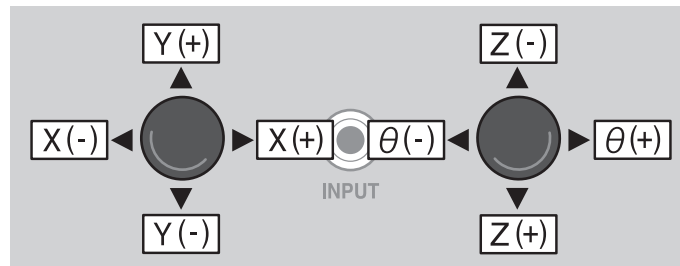
When the θ axis rotates while returning to the origin, there is a danger of cables wrapping around the robot.

If it seems like there is a danger of cables wrapping around, press the emergency stop button immediately, turn the θ axis slightly counterclockwise from the origin (0°) when viewed from above the soldering unit fixture base, and then tap **[HOME] again.**



7-2-1 Basic Operations for JOG Operation

7-2-1-1 Movement Direction Using JOY STICKS



7-2-1-2 Axis Movement by Direct Coordinate Input

If the rough coordinates are known, input the coordinate directly in the top screen and move the robot.

1. Select Ex-Low, Low, etc. speed.

Ex-Low: 5 mm/sec.; **Low:** 30 mm/sec.
Mid: 100 mm/sec.; **High:** 200 mm/sec.

Free speed setting (1 – 800 mm/sec.) can also be set by inputting.

— Note —

Select Ex-Low, Low, etc. speed first and be careful of contact.

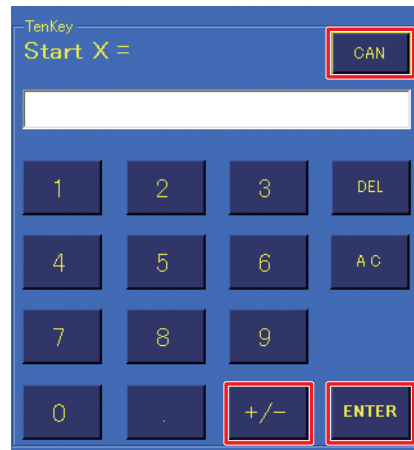


2. Input the X, Y, Z, and θ coordinates to move to into the respective spaces.
(Settable range: X: 0 – 400 mm; Y: 0 – 300 mm; Z: 0 – 200 mm; θ : $\pm 200^\circ$)
3. Tapping **[GO]** next to each axis will cause the corresponding axis to move to the input coordinate. **[GO]** for the moving axis will be shown in red, and if **[GO]** for the moving axis is tapped again or if **[GO]** for a different axis is tapped, movement will be interrupted.
Input values within the movement range for each axis.
(If the input value is outside the range or if the value is blank, the input space will be shown in red.)

7. Operation (continued)

Inputting Values

Tapping each input space will cause a numerical keypad window to be shown. (Refer to the diagram below.) After inputting the value using the numerical keypad, tapping **[ENTER]** will cause the input value to be reflected in the input space. To cancel the numerical keypad window, tap on **[CAN]** at the upper right. To input negative values, after inputting the number tap **[+/-]**.

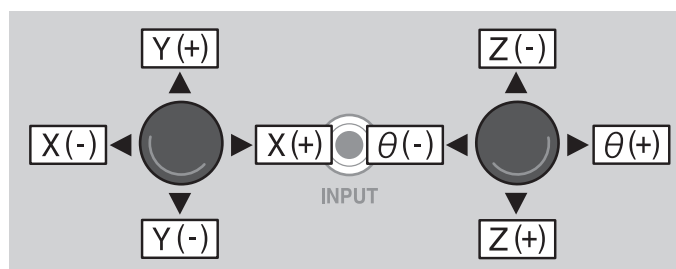


7-2-1-3 Axis Movement at Selected Speed (JOY STICK operation)

If the coordinates are unknown or if you want to move the robot freely, movement of axes can be performed using the JOY STICKS inside the door (cover) of the robot.



1. Select the desired **JOG SPEED** (5 mm/sec, 10 mm/sec, 30 mm/sec, or 50 mm/sec) in the top screen.
2. Tilt the JOY STICK inside the robot door (cover) in the desired direction. Refer to the diagram below for JOY STICK movement directions. Movement will be performed at the selected speed while the JOY STICK is tilted.



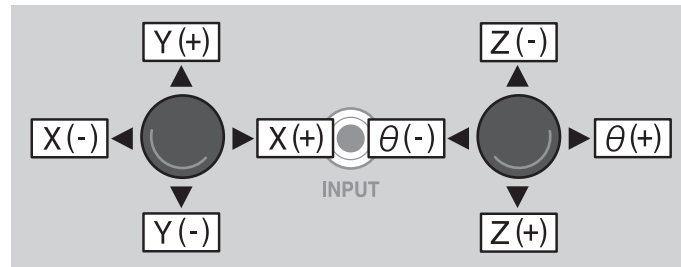
3. Move the axis close to the desired position while watching the robot movement. Letting go of the JOY STICK will stop movement.

7-2-1-4 Axis Movement by Inching (JOY STICK operation)

To move the axis in fine increments or to perform fine adjustments when adjusting tip position, etc., the axis can be moved using the inching function. (Refer to diagram below.)



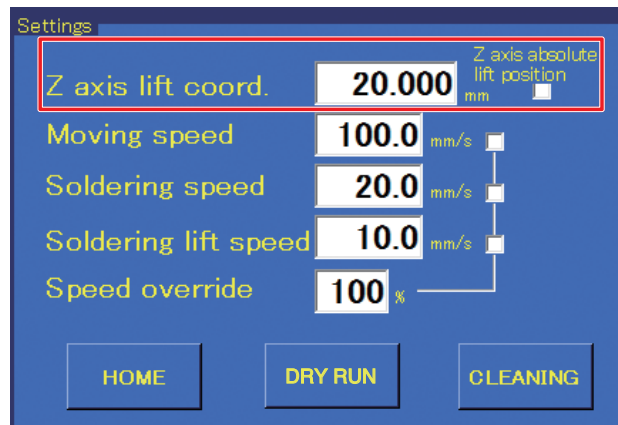
1. Select the desired **INCHING PITCH** (0.01 mm/deg, 0.1 mm/deg, 0.5 mm/deg, or 1.0 mm/deg) in the top screen.
2. Tilt the JOY STICK inside the robot's door (cover) in the desired direction. The robot will move only one unit of the selected pitch in the direction of the JOY STICK tilt.



3. Repeat **Step 2** as necessary to move the axis to the desired position.

7. Operation (continued)

7-2-2 Z Axis Lift



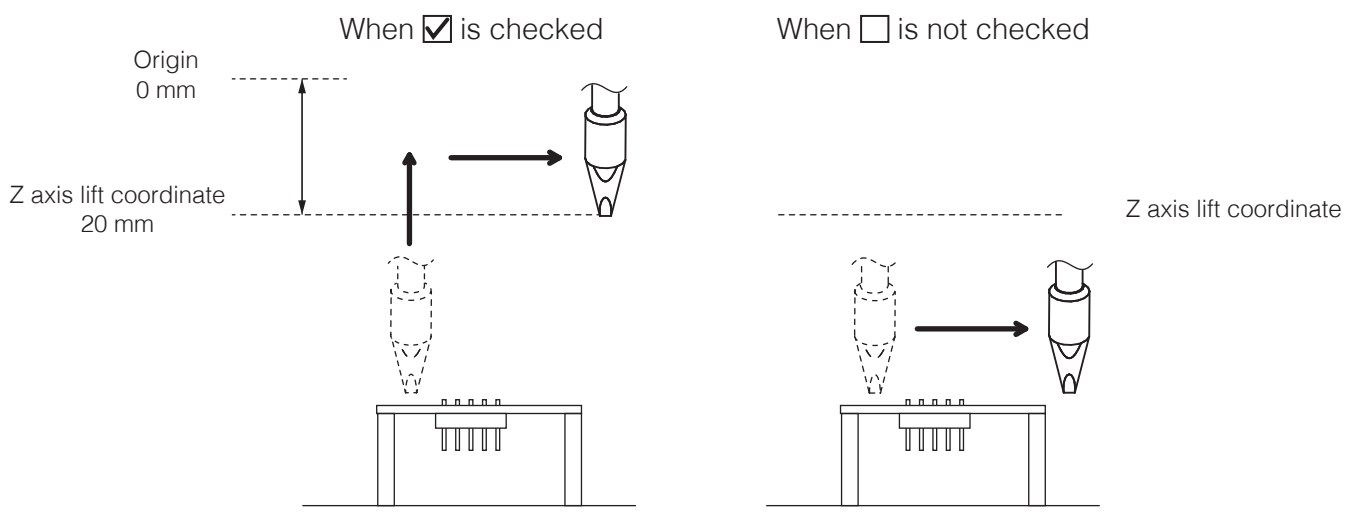
Z axis lift is a function for avoiding danger and unexpected damage to the PWB and areas around where soldering is performed.

The Z axis lift coordinate is a coordinate setting for avoiding contact with protruding objects on the workpiece during horizontal movement.

This operates both while a program is running and also during manual JOG operation.

When **Z axis absolute lift position** is checked in the top screen **Settings** and movement of an axis is performed, the Z axis will move to the lift coordinate before movement of the other axes is performed. The lift coordinate is set by inputting the **Z axis lift coord.** (Refer to diagram above.)

Ex.) When moving to the right by JOG operation

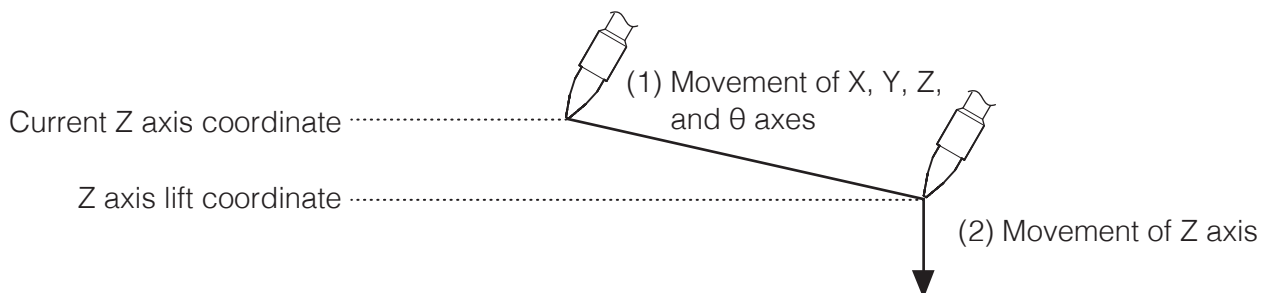


⚠ CAUTION

However, when fine adjustments such as setting tip position are necessary, if Z axis lift is performed each time the axis is moved, work becomes difficult. In such cases, uncheck the checkbox and use extra care to avoid contact with surrounding parts while moving. After work has been completed, be sure to check the checkbox again.

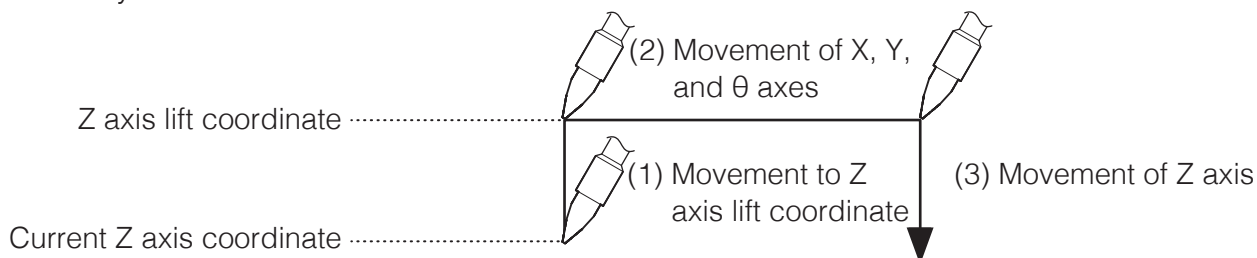
- **When current Z axis coordinate is higher than the Z axis lift coordinate**

Movement of the Z axis to the Z axis lift coordinate is performed after movement of the X, Y, Z, and θ axes.



- **When current Z axis coordinate is lower than Z axis lift coordinate**

Movement to the Z axis lift coordinate is performed, followed by movement of the X, Y, and θ axes, and finally the Z axis.



— Note —

If the Z axis before movement is at the same height as the Z axis lift coordinate, movement of the X, Y, and θ axes will be performed without moving the Z axis.

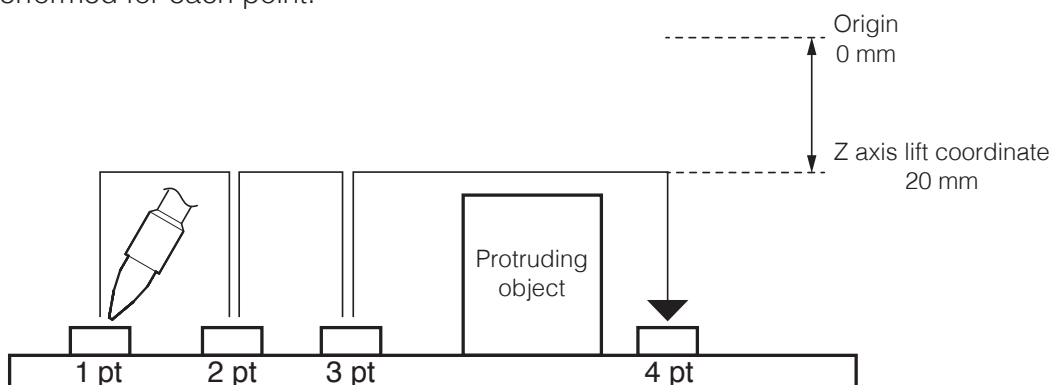
If movement of only the Z axis is performed without changing the X, Y, and θ axes, Z axis lift will not be performed.

When performing axis movement of the X, Y, and θ axes using the JOY STICKS, Z axis lift will be performed at the point when the JOY STICK is tilted, and movement cannot be interrupted until the Z axis lift coordinate has been reached.

During JOG operation, the Z axis lift operating speed will be the speed set for position in the top screen (refer to “7-1-6 Position” (p. 51)). The **JOG SPEED** is not applied.

When axis movement of the X/Y and θ /Z axes is performed simultaneously using the JOY STICKS, X, Y, and θ axis movement will be stopped at the point where the Z axis is moved from a position higher than the Z axis lift coordinate to a position lower than the Z axis lift coordinate.

While a program is running, if the **Z axis absolute lift position** in the top screen **Settings** is checked, Z axis lift will be performed for each point.



7. Operation (continued)

In addition, the height can be changed and a Z axis lift coordinate can be set only for specific points.

STEP = 4 NOTE

Current Pos. OFFSET End Pos.

X 000.000 0.000 mm

Y 000.000 0.000 mm

Z 000.024 0.000 mm

θ 000.000 0.000 deg

☐ AUTO SET Use Current Pos. Use Current Pos.

Check Operation Move Move

Lifting Pos. 75.000 mm

Moving Speed mm/s

Soldering Speed mm/s

Lifting Speed mm/s

CLEANING: 1 2 3 4 5

Before After

Soldering PS DS None

Preset No. 1

Return to Start Lifted Pos.

☐ Palletizing

STEP ~

POINT X Y

OFFSET X Y mm

ROUTE

WORK ORIGIN

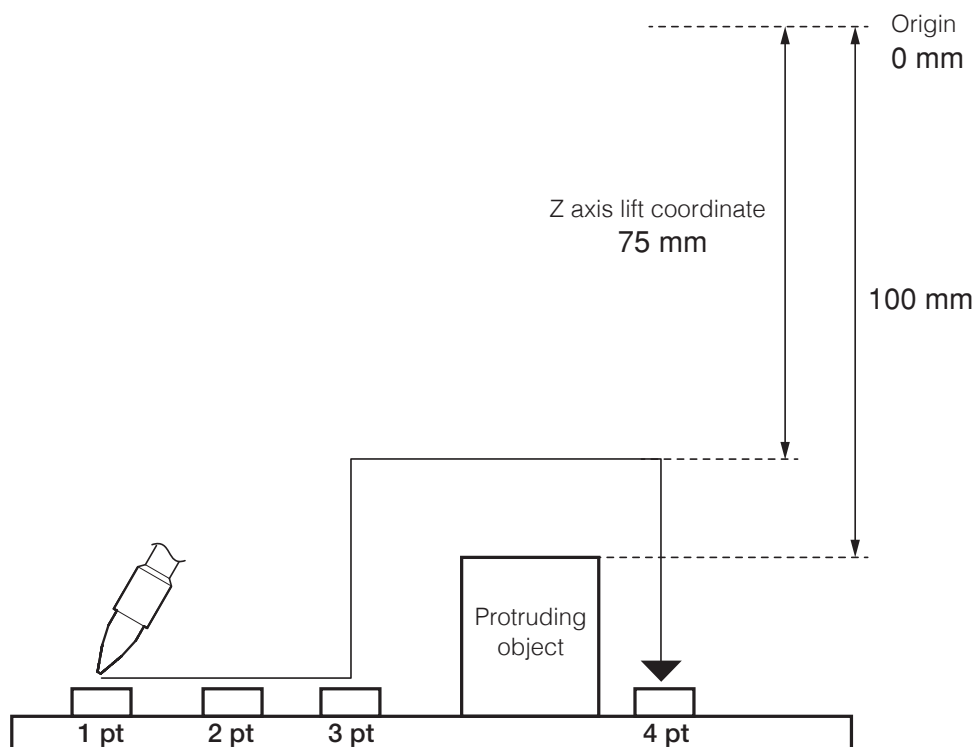
Cancel Prev. Next I/O Setting Exit

Ex.) When there is a protruding object between the 3rd point and the 4th point

- No Z axis lift is set up to the 3rd point.
 - In order to avoid the protruding object when moving from the 3rd point to the 4th point, the **Lifting Pos.** is set to 75 mm in the Point Edit Screen of the 4th point.
- Z axis lift is performed from the 3rd point to the 4th point.

— Note —

- If Z axis lift values are set in both the top screen and the Point Edit Screen, the Z axis lift coordinate set in the Point Edit Screen will be given priority and be applied.
- To avoid a protruding object between the 3rd point and the 4th point, input a value for the Z axis lift coordinate of the 4th point.



7-3 Cleaner (CX1003) Settings

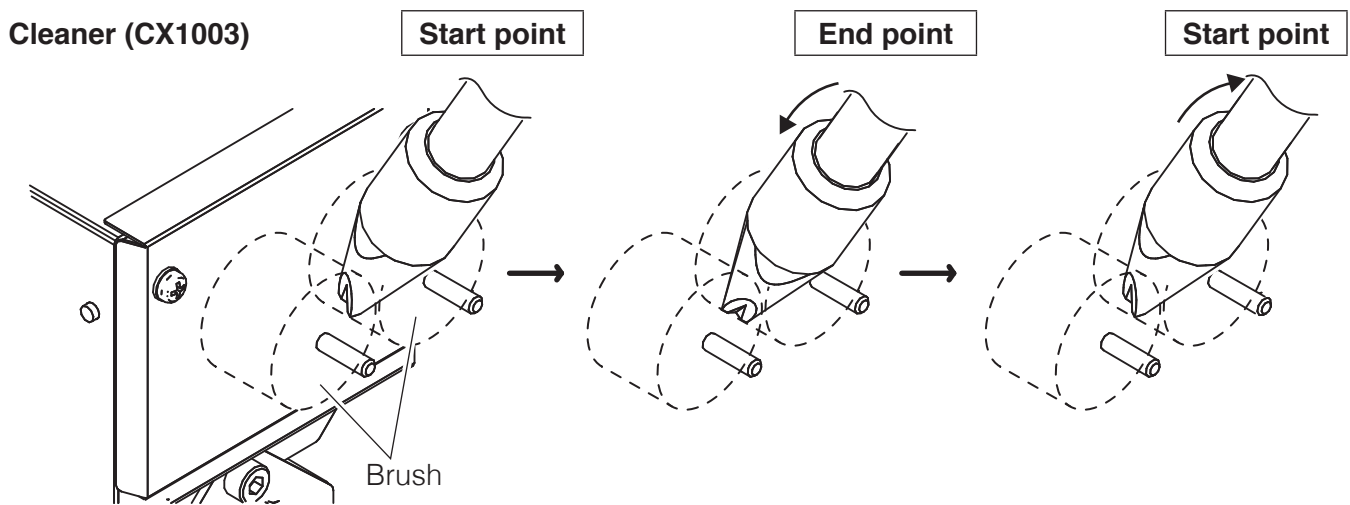
⚠ CAUTION

After performing JOG operation learning, be sure to set the cleaning position settings first.

7-3-1 Brush Cleaning Coordinate Settings

Determining the cleaning position of the installed cleaner (CX1003) will be performed.

To make it possible for the cleaner (CX1003) to perform cleaning and make the tip solder clean, the start point → end point → start point, movement to the cleaning process, and the angle can be set.



Tap **[Cleaning Settings]** in the top screen and input the settings.

1. Move the tip to a position where cleaning can be performed using the brushes of the cleaner (CX1003) by using the robot's JOY STICKS or specifying coordinates in the top screen. Adjust the cleaning position while selecting the appropriate **JOG SPEED** or **INCHING PITCH**.

— Note —

Since the Y axis coordinate is for jig table movement, it is not directly related to cleaning operation. If movement of the jig table is not desired, check the **Disable axis Y** checkbox.