JANOME DESKTOP ROBOT

JR3000 Series

JANOME CARTESIAN ROBOT

JC-3 Series

JANOME SCARA ROBOT

JS3 Series

Operation Manual

Dispensing Specifications

Thank you for purchasing this Janome Robot.

- **Before using this robot, read this manual thoroughly and always make sure you use the robot correctly. In particular, be sure to thoroughly read "For Your Safety" as it contains important safety information.**

- **After reading this manual, store in a safe place that can be easily accessed at any time by the operator.**

Original Instructions

JANOME

PREFACE

This manual covers the JR3200, JR3300, JR3400, JR3500, JR3600, JC-3, and the JS3 Series.

There are several manuals pertaining to these robots.

Manual	Details	JR3000	JC-3	JS3
Read This First	• For Your Safety Be sure to thoroughly read “For Your Safety” as it contains important safety information. (Refer to the operation manual *Special Specifications* if you use the special specifications.) • Package Contents (JS3 Series only) Check the items included with your robot. • CD-ROM Contents Explains the CD-ROM contents.	✓	✓	✓
Setup (JR3000 / JC-3) Installation (JS3)	Explains how to set up the robot. ■ Make sure you read this manual when installing the robot ■ NOTE: This manual is designed for people who have received safety and installation training regarding the robot.	✓	✓	✓
Maintenance	Explains maintenance procedures for the robot. ■ Make sure you read this manual when performing maintenance ■ NOTE: This manual is designed for people who have received safety and maintenance training regarding the robot.	✓	✓	✓
Basic Instructions	Provides part names, data configurations, and the basic knowledge necessary to operate the robot. ■ Make sure you read this manual when installing the robot unit and performing maintenance ■	✓ (Common)		✓
Quick Start	Explains the actual operation of the robot by creating and running simple programs.	✓ (Common)		✓
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.	✓ (Common)		✓
Functions I	Explains point teaching.	✓ (Common)		
Functions II	Explains commands, variables, and functions.	✓ (Common)		
Functions III	Explains functions such as All Program Common Settings and PLC programs.	✓ (Common)		
Functions IV	Explains Customizing Functions.	✓ (Common)		
External Control	Explains I/O and Fieldbus.	✓	✓	✓

Manual	Details	JR3000	JC-3	JS3
Communication Control	Explains COM 1 – 3 and LAN communication control.	✓ (Common)		
Camera & Sensor Functions	Explains the functions of the attachable camera and Z position sensor.	✓ (Common)		
Specifications	Outlines general specifications such as the robot's operating range, mass, etc.	✓	✓	–
Auxiliary Axis Functions	Explains the auxiliary axis functions.	✓ (Common)		
Dispensing Specifications	Explains the specialized dispensing specification functions.	✓ (Common)		
Special Specifications	Explains installation and maintenance procedures for the robot. ■ Make sure you read this manual when performing installation and maintenance ■ NOTE: This manual is designed for people who have received safety, installation and maintenance trainings regarding the robot.	✓	✓	–

⚠ Warning

Do not handle or operate the robot in ways not covered in the manuals listed here. Contact Janome (details on the back of this manual) or a Janome dealer for repairs. Failure to do so can cause electric shock or injury.

⚠ Caution

To make full use of the machine's functions and capabilities, make sure that you use the robot according to the correct handling/operation procedures that are written in the manuals pertaining to this robot.

When the robot power is turned OFF after changing settings and data without saving, those changes are lost and the robot will revert to its original settings. Make sure that you save any changes to data and/or settings.

Before using this robot for the first time, make sure you back up robot data and save the individual configuration information. Individual configuration information is needed when replacing internal circuit boards.
For details on how to back up robot data, refer to "3. BACKING UP AND RESTORING ROBOT DATA" in the operation manual *Setup* for the JR3000 Series, "6.1 Backing Up and Restoring Robot Data" in the operation manual *Setup* for the JC-3 Series, or "9.1 Backing Up and Restoring Robot Data" in the operation manual *Installation* for the JS3 Series.

- In addition to this “Dispensing” operation manual, there are also operation manuals with sections relevant to all robots in this series. Please also refer to these manuals when using the robot.
- The menu items displayed on the teaching pendant and PC may vary from those listed in this manual.
- Menu items related to the Z axis may appear with 2 axis specifications; however settings made for these items are not applied.
- For information regarding optional additions for this robot, refer to “24. SPECIFICATIONS” in the operation manual *Specifications* for the JR3000 Series,“14. SPECIFICATIONS” in the operation manual *Specifications* for the JC-3 Series, and “15. SPECIFICATIONS” in the operation manual *Basic Intructions* for the JS3 Series. The notation “optional” is not used in the main text of this manual except for diagrams.
- Machine specifications may be modified without prior notice to improve quality.

Remarks:

- The operation methods described in this manual are indicated as follows:

  TP Operation via the teaching pendant

  PC Operation via PC (JR C-Points II)

- Click text that appears in blue and is underlined to jump to that section.
  Example: Refer to “1. INSTALLATION”.

CONTENTS

PREFACE 1
FOR YOUR SAFETY 7
1. INSTALLATION 45
1.1 How to Mount the Dispenser (Example: JR3000 Series, 3-Axis Model) 45
1.2 How to Mount the Dispenser (Example: JC-3 Series, 3-Axis Model) 47
1.3 How to Mount the Dispenser (Example: JS3 Series) 49
2. TEACHING DATA 51
2.1 Point Types 51
2.2 Dispense Conditions 57
2.2.1 Individual Program Settings 59
2.2.2 Condition Number 60
2.3 Dispenser 60
3. TOOL DATA 66
3.1 JR3000 Series (3-Axis Models) 66
3.2 JR3000 Series (4-Axis Models) 68
3.2.1 Tool Data 69
3.3 JC-3 Series (2-Axis Models, 3-Axis Models) 69
3.4 JC-3 Series (4-Axis Models) 71
3.4.1 Tool Data 72
3.5 JS3 Series (4-Axis Models) 72
3.5.1 Tool Data 74
3.6 Main Tool Configuration 74
4. CAMERA CONFIGURATION 75
5. I/O FUNCTIONS (JR3000 Series) 76
5.1 I/O-SYS Function Assignments 76
5.1.1 Input 77
5.1.2 Output 82
5.2 I/O-1 Function Assignment 84
5.3 I/O Polarity 85
5.4 Other 85
6. I/O FUNCTIONS (JC-3 Series) 86
6.1 I/O-SYS Function Assignments 86
6.1.1 Input 87
6.1.2 Output 91
6.2 I/O-1 Function Assignment 93
6.2.1 Input 94
6.2.2 Output 94

6.3 I/O Polarity 95
6.4 Other 95
7. I/O FUNCTIONS (JS3 Series) 96
7.1 I/O-SYS Function Assignments 96
7.1.1 Input 97
7.1.2 Output 103
7.1.3 I/O Polarity 108
7.2 I/O-1 Function Assignment 109
7.2.1 Input 110
7.2.2 Output 111
7.2.3 I/O Polarity 111
7.3 I/O-H Function Assignment 112
7.4 Other 112
8. TIMING CHARTS 113
8.1 No Response Operations (Steady Mode, Line Dispensing, Point Dispensing) 113
8.2 Busy Signal Operations (Timer Mode, Point Dispense) 114
8.3 Finish Signal Operations (Timer Mode, Point Dispense) 115
9. POINT DISPENSING 116
10. LINE DISPENSING 117
10.1 How to Draw a Line in Line Dispensing 117
10.2 How to Draw an Arc in Line Dispensing 118
10.3 Create Arc 119
11. DISPENSE FILLING 122
11.1 Rectangle Filling 122
11.2 Circle Filling 126
12. HOW TO CONNECT THE DISPENSER 129
13. DISPENSER TYPE 134
14. DISPENSER MODE 136
15. FUNCTIONS AT THE START/END OF LINE DISPENSING 138
15.1 Prevent Fragmented Dispensing at the Start of Line Dispensing (Wait Time at Start) 138
15.2 Prevent Fragmented Dispensing at the End of Line Dispensing (Wait Time at Stop) 141
15.3 Prevent Liquid Stringing at the End of Dispensing 144
15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance) 149
15.4.1 When the Signal Timing is Selected 149
15.4.2 When the Adjust Distance is Selected 153
16. WORK ADJUSTMENTS FOR DISPENSING SPECIFICATIONS 156
17. PURGING THE DISPENSING AGENT 158
17.1 JR3000 Series 158
17.1.1 Purge Switch 159
17.1.2 Purge by Ext. Signal (#sysIn14) 160

17.1.3 Automatic Purge 161
17.2 JC-3 Series 162
17.2.1 Purge Switch 163
17.2.2 Purge by Ext. Signal (#genIn2) 164
17.2.3 Automatic Purge 165
17.3 JS3 Series 166
17.3.1 Purge Switch 167
17.3.2 Purge by Ext. Signal (#genIn2) 168
17.3.3 Automatic Purge 169
18. NEEDLE ALIGNMENT 170
18.1 JR3000/JC-3 Series 171
18.1.1 Setting the Needle Alignment Reference Point 171
18.1.2 Executing Needle Alignment 173
18.2 JS3 Series 176
18.2.1 Setting the Needle Alignment Reference Point 176
18.2.2 Executing Needle Alignment 178
19. USING NEEDLE ADJUSTER 2 (3-AXIS MODELS) 180
19.1 Needle Adjuster 2 Overview 181
19.2 JR3000 Series 182
19.2.1 Needle Adjuster 2 Installation 182
19.2.2 Connecting Needle Adjuster 2 183
19.2.3 Teaching and Making Standard Registration of Measuring Points 186
19.3 JC-3 Series 191
19.3.1 Needle Adjuster 2 Installation 191
19.3.2 Connecting Needle Adjuster 2 192
19.3.3 Teaching and Making Standard Registration of Measuring Points 195
19.4 Replacing the Sensor Circuit Board 200
19.5 Needle Adjuster 2 External Dimensions 201
19.6 Needle Adjuster 2 Specifications 203
20. USING NEEDLE ADJUSTER (4-AXIS MODELS) 204
20.1 Connecting Needle Adjuster (NPN Specifications) 205
20.2 4-Axis Needle Adjuster Overview 207
20.3 Teaching and Making Standard Registration of Measuring Points 209
20.3.1 New Program 209
20.3.2 Point Teaching 209
20.3.3 Standard Registration 210
20.3.4 Execution 212
21. OPERATION FLOWCHART (JR3000) 213
22. OPERATION FLOWCHART (JC-3) 218
23. OPERATION FLOWCHART (JS3) 223

FOR YOUR SAFETY

The safety notes outlined below are provided in order to ensure safe and correct usage of the product in addition to preventing injury to the operator, other people and damage to property as well.

・・・・・Be sure to follow the safety guidelines detailed here・・・・・

Symbols are also listed alongside the safety note explanations. Refer to the information below for understanding these terms and symbols.

■ Symbols that indicate the level of danger and/or damage.
The level of danger or damage that could occur as a result of ignoring these safety guidelines and misusing the robot are classified by the following symbols.

Danger	This symbol indicates an imminent risk of serious injury or death.
Warning	This symbol indicates a risk of serious injury or death.
Caution	This symbol indicates the possibility of serious injury or damage to property.

■ The following symbols indicate the nature of the danger and any necessary safety precautions to be taken.

	Indicates caution must be taken
	Take Caution (General Precaution)
	Indicates a forbidden action
	Never do this (General Prohibition)
	Do not disassemble, modify or repair.
	Do not touch (Contact Prohibition)
	Indicates a required action
	Be sure to follow instructions (General Requirement)
	Be sure to unplug the power supply cord
	Make sure the machine is grounded

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If using auxiliary axis functions to operate a motor, such as a servo motor, that produces feedback and/or a motor with high output, etc., or when using auxiliary axes in the robot setup, etc., we ask that you perform a risk assessment on your side and take any necessary safety measures.

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Danger

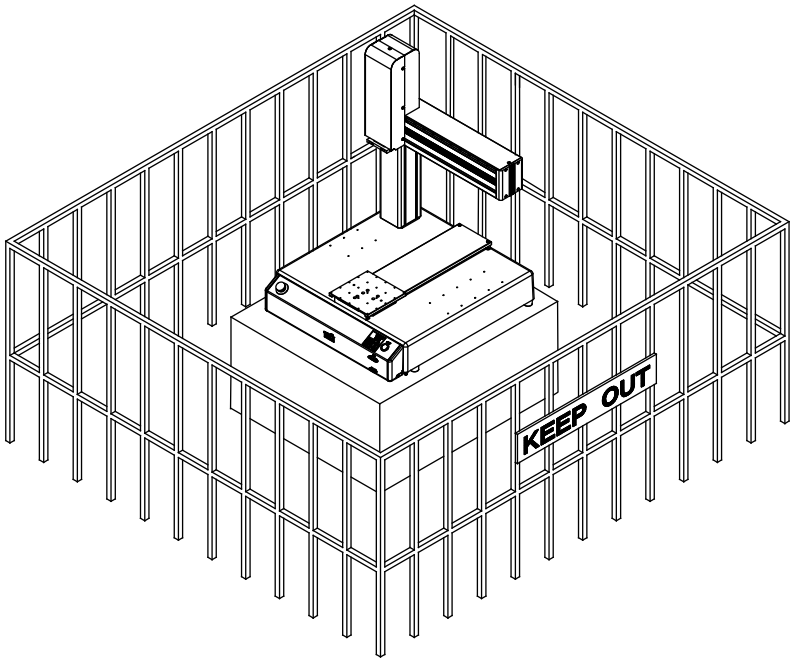
Always set up safety guards around the robot or the auxiliary axes so the moveable parts cannot be touched.

Anyone within the maximum reach of the robot and the auxiliary axes being controlled by the robot may be injured. Set up an **emergency stop interlock device that cuts OFF the motor power to the auxiliary axes when the entrance to the safety guard is opened** and make sure this entrance is the only way to access the machine.

NOTE: **A stop made via a device connected to the I/O-S connector is a stop category 2. Make sure to perform a separate risk assessment of the interlock device**.

Furthermore, put up a **"Keep Out"** or **"Do Not Operate"** warning sign in a clearly visible place.

Example:



FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Danger

When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.
Entering the safety guard could result in injury.

When entering the safety guard due to something wrong with the robot or a peripheral device, or to inspect or lubricate the machine, etc., **with both the power supply breaker and the robot switched OFF, make sure to lockout and tagout and confirm there is no electricity flowing to the robot.**
Failure to do so can cause electric shock or injury.

⚠ Warning

When creating a robot system using auxiliary axis functions, if the system can be categorized as an industrial robot, make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

Before performing a run or operation, always check the following:

- **Obstacles** : Make sure there are no obstacles or people within the safety guard.
- **Installation** : Make sure the robot is installed properly, that there are no abnormalities with the robot and the surrounding devices, and that the teaching pendant and tools are in the appropriate places.
- **Emergency Stop Switch** : Make sure the I/O-S circuit (interlock) and emergency stop switch(es) are functioning properly.

It is potentially dangerous to operate the robot without making these checks first.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Warning	
	Construct safety guards that are strong enough to protect the operator against such dangers as the tool or workpiece splintering, etc. When working within the safety guard, use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes. Failure to follow these safety measures can result in injury.
	If objects that the robot grasps have a risk of falling or being projected, **take into account the size, mass, and chemical composition of the objects for the required safety precautions.** Failure to do so can result in injury or unit breakdown.
	When working within the safety guard, make sure not to come within the maximum range of the robot. Failure to do so can cause injury.
	When starting a run, first confirm there are **no people inside of the safety guard and there are no obstacles that could interfere with the run.** Failure to do so can cause injury or unit breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Danger

Do not use where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions or fire.

⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when installing the robot and performing maintenance.
Failure to do so can cause injury.

Make sure that you securely install the unit in a place that can fully withstand both the unit's weight and its usage. Install the robot on a workbench 600 mm or higher above floor level, in the center of the workbench.
In addition, **for units with a cooling fan on the back, allow for 300 mm or more clearance between the back of the unit and the wall.**
Install the switchbox 600 mm or more above floor level in an easily accessible place.
If installation is inadequate, the unit can drop or fall over causing injury and unit breakdown. Also, inadequate installation causes overheating or fire.

Make sure to power the unit within its rated current range.
Failure to do so causes electric shock, fire, or unit breakdown.

Use the dedicated power cord. Do not modify the power cord.
Modification causes electric shock or unit breakdown.
We cannot take any responsibility for machines that malfunction due to modification.

Plug the power cord into the power outlet firmly.
Failure to do so causes the plug to heat up resulting in fire.

Be sure to use the unit within its indicated voltage range.
Failure to do so causes unit breakdown, fire, or electric shock.

When replacing fuses, or inspecting or lubricating the unit, unplug the power cord from the power outlet, then remove the cord from the main unit and make sure there is no electrical current. When doing this, do not touch any of the power inlet pins within 5 seconds of removing the power cords. Failure to follow these steps causes electric shock or injury.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Warning	
	Always **make sure the machine is grounded through the power cord. Do not use the machine when it is not grounded.** Improper grounding causes electric shock, fire, malfunction, or unit breakdown.
	Wipe the power plug with a clean, dry cloth periodically to eliminate dust. Dust accumulation deteriorates the electrical insulation or causes fire.
	Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time. Dust accumulation causes fire.
	Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable or LAN cable. Failure to do so causes electric shock, data loss, unit breakdown, or malfunction.
	If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not disassemble in any other way other than those specified. Do not modify the machine in any way. Inappropriate disassembly or modification causes electric shock or unit breakdown.
	Do not allow water or oil to come in contact with the unit, control box or the power cord. Contact with water or oil causes electric shock, fire, or unit breakdown. IP Protection Rating: IP20.
	If anything unusual occurs, such as a burning smell or unusual sound, stop operation and unplug the power cord immediately. Contact Janome or a Janome dealer. Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Caution	
	Do not drop or jar the unit during transport and/or installation. This can cause injury or damage the unit.
	Before performing any operation, ensure there is no imminent danger to any of the operators. Failure to do so causes injury.
	Use the robot in an environment that meets the following conditions: • **Ambient temperature of 0 to 40 °C** • **Relative humidity of 20 to 90 % (No condensation)** • **Altitude not exceeding 1,000 m** Use outside of these conditions may cause malfunction or unit breakdown.
	Use the unit in an environment where no electrical noise is present. Failure to do so causes unit malfunction or breakdown.
	For models with I/O-S* circuits, when installing the unit, take safety measures such as setting up area sensors and safety guards. If there are no safety measures in place and someone enters the area of operation when the robot is running, they may be injured.
	Keep the emergency stop switch within reach of the operator when running or operating the robot. If the robot is operated when the emergency switch is not within reach, it may not be possible to stop the robot immediately and safely. This is potentially dangerous.
	Make sure that you regularly perform a function check of the emergency stop switch(es). Also, for models with I/O-S* circuits, regularly perform an I/O-S circuit function check. If the robot is operated without making these checks, it may not be possible to stop the robot immediately and safely in an emergency. This is potentially dangerous.

* A stop made via a device connected to the I/O-S connector is a stop category 2. Make sure to perform a separate risk assessment of the interlock device.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Caution	
	When attaching tools, a camera, or any other device, make sure they are securely fitted before running the robot. Failure to do so causes injury or breakdown.
	Check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months or after every 750 hours of operation. Failure to do so causes injury or breakdown.
	Be sure to check the connections of the cords and cables to the main unit. Improper connection causes unit malfunction or breakdown.
	When lifting or transporting the robot, do so in accordance with the following: • **Secure the movable parts of the unit (the Z/ZR mechanism) before transportation.** • **Lift and transport the JR3200 Series with 2 or more people.** • **Lift and transport the JR3300 – JR3600 Series with 2 or more people or use a lifter.** • **Hold the bottom of the base and keep the robot horizontal.** • **Do not hold the robot by the column or Y body.** Failure to adhere to this can cause injury or damage the robot.
	Use the unit in an environment that is not exposed to direct sunlight. Direct sunlight causes unit malfunction or breakdown.
	Individual Configuration Information varies for each individual unit even if they are the same model. **Do not use backup data with a different robot. The robot cannot function normally with backup data from a different robot.**
	Use the necessary safety precautions if the needle adjuster (4 axis specifications) employs the use of a laser. Avoid eye contact with the laser (laser source). Also avoid placing your hands or face near any peripheral objects that can reflect the laser. Prolonged exposure to the laser may weaken eyesight and cause other such damage.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■■■

Industrial Robot Safety Standards

Make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

FOR YOUR SAFETY

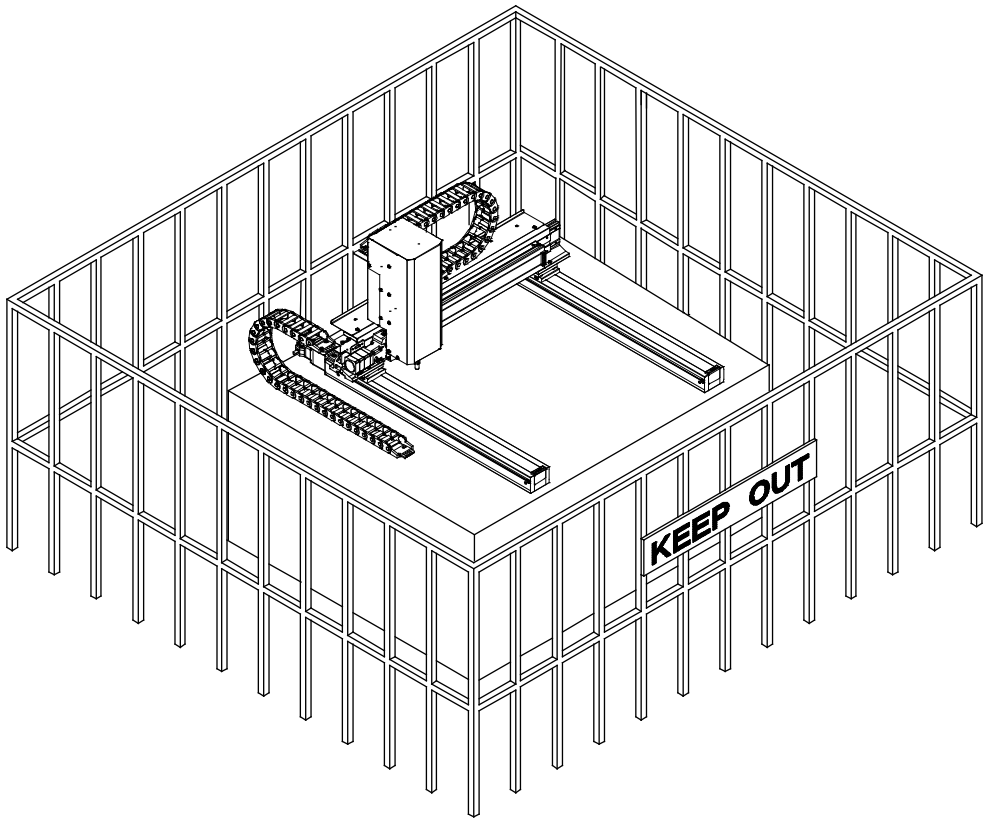
■■■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Danger

Do not use where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions or fire.

Always set up safety guards.
Anyone within the maximum reach of the robot may be injured.
Using the included EMG-OUT connector (unit), set up an emergency stop interlock system that is triggered when the entrance to the safety guard is opened and make sure this entrance is the only way to access the machine.
Furthermore, put up a **"Keep Out"** or **"Do Not Operate"** warning sign in a clearly visible place.

Example:



FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Danger

Construct a safety circuit before operating the robot.
Use the EMG-OUT connector (unit) to maintain safety by installing a relay such as an external stop device on the power supply line which cuts the DC 48 V power input. Construct the safety circuit so it operates as a stop category 0 when the emergency stop switch is pressed. Without the construction of a safety circuit, motor power 48 V will not be cut OFF even if the emergency stop switch is pressed, leading to unexpected accidents and injury. An error will occur if you construct the safety circuit without it operating as a stop category 0 when the emergency stop switch is pressed.

When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.
Entering the safety guard could result in injury.

Before entering the safety guard or inspecting or performing maintenance on the robot, make sure there is no electrical current.

- **Be sure to unplug the controller power cord (AC) from the power outlet. When doing this, do not touch any of the power inlet pins within 5 seconds of removing the power cords.**
- **If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.**

Failure to follow these steps can cause unexpected operation, electric shock, or injury.

Before performing a run or operation, always check the following:

- **Obstacles** : Make sure there are no obstacles or people within the safety guard.
- **Installation** : Make sure the robot is installed properly, that there are no abnormalities with the robot and surrounding devices, and that the teaching pendant and tools are in the appropriate places.
- **Emergency Stop Switch** : Make sure the EMG OUT circuit (interlock) and emergency stop switch(es) are functioning properly.

It is potentially dangerous to operate the robot without making these checks first.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Danger

Keep the emergency stop switch within reach of the operator when running or operating the robot.
If the robot is operated when the emergency switch is not within reach, it may not be possible to stop the robot immediately and safely. This is potentially dangerous.

Make sure that you regularly perform a function check of the emergency stop switch(es). Also regularly perform an EMG OUT circuit function check.
If the robot is operated without making these checks, it may not be possible to stop the robot immediately and safely in an emergency. This is potentially dangerous.

⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when installing the robot and performing maintenance.
Failure to do so can cause injury.

Make sure to power the unit within its rated current range.
Failure to do so causes electric shock, fire, or unit breakdown.

Use the dedicated power cord. Do not modify the power cord.
Modification causes electric shock or unit breakdown.
We cannot take any responsibility for machines that malfunction due to modification.

Plug the power cord into the power outlet firmly.
Failure to do so causes the plug to heat up resulting in fire.

Make sure to connect and use crimp terminals with the power cord connecting to the terminal block (DC 48 V input) and to securely tighten the terminal block screws. Failure to do so causes electric shock, fire, or unit breakdown.

Make sure to perform work from outside of the safety guards when the power is ON. Failure to do so can cause injury.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Warning

Be sure to use the unit within its indicated voltage range.
Failure to do so causes unit breakdown, fire, or electric shock.

Install the controller within an industrial control panel, and make sure when the industrial control panel door is opened, the controller power is automatically cut OFF. In addition, for controllers with a cooling fan, allow for a clearance of 300 mm or more from the top of the controller, as well as 100 mm or more from the air vent on the side. Inadequate installation can cause overheating, fire, electric shock, or injury.

With the 3 axis specifications, if releasing the brake, do so after either removing the attached tool or taking measures to prevent the tool from dropping.
If you release the brake when turning the power ON in Teaching Mode, Switch Run Mode, or External Run Mode, the axis may drop down depending on the mass attached to the Z axis. If the Z axis drops down, it can cause injury or unit breakdown.

If anything unusual occurs, such as a burning smell or unusual sound, stop the run, unplug the controller power cord from the power outlet, and make sure there is no electrical current. Contact Janome or a Janome dealer.

- **Be sure to unplug the controller power cord (AC) from the power outlet. When doing this, do not touch any of the power inlet pins within 5 seconds of removing the power cords.**
- **If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.**

Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

When inspecting or performing maintenance on the controller, **make sure there is no electrical current and perform the following**:

- **Be sure to unplug the controller power cord (AC) from the power outlet. When doing this, do not touch any of the power inlet pins within 5 seconds of removing the power cords.**
- **If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.**

Failure to follow these steps can cause electric shock, injury, data loss, unit breakdown, or malfunction.

Always **make sure the machine is grounded through the power cord.**
Do not use the machine when it is not grounded.
Improper grounding causes electric shock, fire, malfunction, or unit breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Warning

Wipe the power plug with a clean, dry cloth periodically to eliminate dust.
Dust accumulation deteriorates the electrical insulation or causes fire.

Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time. Dust accumulation causes fire.

If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not disassemble in any other way other than those specified. Do not modify the machine in any way.
Inappropriate disassembly or modification causes electric shock or unit breakdown.

Do not allow water or oil to come in contact with the unit, controller or the power cord. Contact with water or oil causes electric shock, fire, or unit breakdown.
IP Protection Rating: IP20.

⚠ Caution

Do not drop or jar the unit during transport and/or installation.
This can cause injury or damage the unit.

Before performing any operation, ensure there is no imminent danger to any of the operators.
Failure to do so causes injury.

Use the robot in an environment that meets the following conditions:

- **Ambient temperature of 0 to 40 °C**
- **Relative humidity of 20 to 85 % (No condensation)**
- **Altitude not exceeding 1,000 m**

Use outside of these conditions may cause malfunction or unit breakdown.

Use the unit in an environment where no electrical noise is present.
Failure to do so causes unit malfunction or breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Caution

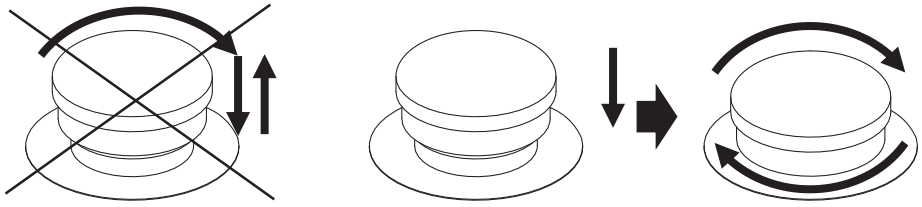
When attaching tools, a camera, or any other device, make sure they are securely fitted before running the robot.
Failure to do so causes injury or breakdown.

Check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months or after every 750 hours of operation. Failure to do so causes injury or breakdown.

Be sure to check the connections of the cords and cables to the main unit and controller.
Improper connection causes unit malfunction or breakdown.

Make sure to wait for at least 1 second before power cycling the robot after the external power supply to the controller (DC 48 V) is cut OFF. Failure to do so can cause unit breakdown.
Make sure to wait for at least 1 second between the following operations:

- When power cycling after the external power supply DC 48 V is cut OFF
- When releasing the emergency stop after the emergency stop switch is pressed down
- When releasing the emergency stop after an external emergency stop device is activated
- Operations to reset the emergency stop switch on the switchbox and teaching pendant when it is released



Do not push down emergency stop switch again when it is already rotated for release

Press straight down

Turn and release (Do not pull)

Make sure to construct a power circuit with enough margin for the rated current to avoid momentary interruption of the DC 48 V external power supply.
Failure to do so can cause breakdown.
External Power Supply Output: DC 48 V, 6.25 A or more
DC 48 V, 8.15 A or more (Absolute Encoder Model)

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⚠ Caution

When using the external safety circuit using the EMG-OUT connector (unit) and the emergency stop device is activated, make sure to release the emergency stop after resolving the cause of the emergency stop. Failure to do so can cause injury or unit breakdown.

Adhere to the followings:

- Do not use the external safety circuit or external emergency stop device to stop a run.
- When not in emergency, use the start / stop switch on the switchbox or use the I/O-SYS signal to stop a run.
- Using the external power supply DC 48 V to stop a run by cutting OFF and re-supplying the power can cause unit breakdown.

Secure the movable parts of the unit before transportation.
Failure to do so causes injury or breakdown.

When lifting and transporting the robot, do so with 2 or more people.
Failure to do so causes injury or breakdown.

Use the unit in an environment that is not exposed to direct sunlight.
Direct sunlight causes unit malfunction or breakdown.

Individual Configuration Information varies for each individual unit even if they are the same model. **Do not use backup data with a different robot. The robot cannot function normally with backup data from a different robot.**

Use the necessary safety precautions if the needle adjuster (4 axis specifications) employs the use of a laser.
Avoid eye contact with the laser (laser source).
Also avoid placing your hands or face near any peripheral objects that can reflect the laser.
Prolonged exposure to the laser may weaken eyesight and cause other such damage.

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Industrial Robot Safety Standards

Make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

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Safety Precautions Regarding Installation

Robot Unit

⚠ Danger

Anyone within the maximum reach of the robot may be injured.
Install safety guards in adherence with the following:

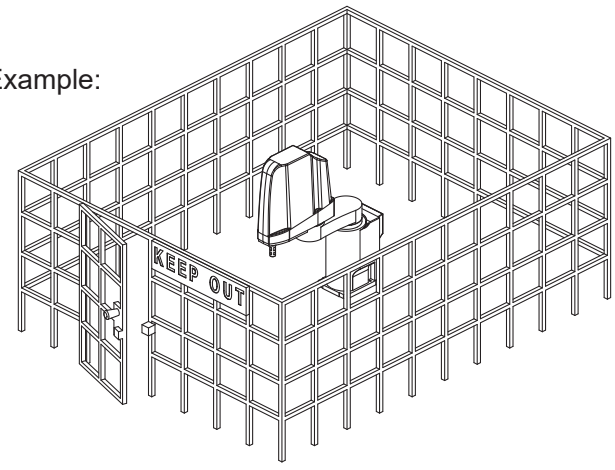
- The safety guards cannot easily be moved.
- The safety guards cannot easily fall over or be broken.
- Allow enough clearance between the robot and the safety guards so that even if the robot falls over, it does not hit the safety guards.
- No part of your body, such as your head or hands, can enter the safety guards.
- Install an interlock device on the entrance to the safety guards that activates an emergency stop when opened and make sure this entrance is the only way to access the machine. Connect the interlock device to the controller by using the included I/O-S connector.
- Place a warning sign such as “Keep Out” or “Do not Operate” on the safety guard entrance in a location that is easily visible.
- Affix the included danger sticker (shown below) in a location that is easily visible.

NOTE:

- A stop made via a device connected to the I/O-S connector is a stop category 1. Make sure to perform a separate risk assessment for the interlock device.
- Refer to the operation manual *Installation* for details regarding I/O-S connections.
- After installing the unit, make sure to perform pre-operation checks from outside of the safety guards.

Warning Sticker

Example:



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⚠ Danger

Do not remove the fixing plates from the robot arm until after transportation is complete.
Failure to do this can cause injury or breakdown.

If temporarily placing the robot on a mount, etc., make sure to secure the robot to the mount by tightening 2 or more bolts into the mounting holes on the mounting base to prevent the robot from tipping over.
Failure to do this may cause the robot to fall, resulting in injury or breakdown.

To set the home position for the J3 or J4-axis, release the brake and move the J3-axis (shaft) manually with two hands. When releasing the brake, take the following precautions:

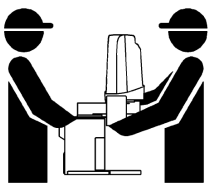
- Always release the brake with at least 2 people present.
- After the brake is released, the tool mass may cause the J3-axis to drop down. Make sure no people are within the operating range of the robot before releasing the brake.
- If there is risk that the robot may hit a peripheral device, make sure to position the robot arm appropriately before releasing the brake.

Failure to adhere to this can cause injury or breakdown.

⚠ Warning

Construct safety guards that are strong enough to protect the operator against such dangers as the tool or workpiece splintering, etc.
For the safety of the operator when working within the safety guard, use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes.
Entering the safety guards could result in injury.

Always have 2 people carry the robot with the fixtures attached as shown in the illustration to the right.
Mass: JS3-3520: Approx. 39 kg, JS3-4520: Approx. 40 kg
JS3-5520: Approx. 41 kg
Refer to “2.3 Transporting the Robot Unit” in the operation manual *Installation* for further details.



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⚠ Warning

Avoid using the robot in operating environments such as the ones below. If using the robot in environments such as these, take measures to protect the robot from the direct effects of the work environment.

- An environment where the robot vibrates or is bumped at 3.5 G or more during transportation.
- An environment where the robot vibrates or is bumped at 0.5 G or more during operation.

Using the robot in these environments can cause malfunction or breakdown.

Avoid using the robot in an environment that exceeds the radiation tolerance value for the average person. If using the robot in an environment such as this, take measures to protect the robot from the direct effects of the work environment. Using the robot in this environment can cause malfunction or breakdown.

⚠ Caution

Do not hold the robot from the left and right sides or hold the robot by the covers. Doing so may tip the robot over or the covers may break; causing the robot to fall resulting in injury.

Do not hold the robot by the J2 arm cover during transportation.
Doing so can damage the cover.

Do not apply force to the shaft (J3-axis).
Doing so can damage the shaft and cause an overload error to occur when the robot is run.

Do not tip or place the robot on its side.
Doing so can cause a grease leak or breakdown.

Mount the robot on a steel base that is designed to withstand both the robot's mass and the force generated during runs. Inadequate installation may cause the robot to fall, resulting in injury or breakdown.

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⚠ Caution	
	Firmly fix the robot to a specified horizontal mounting surface using the mounting bolts and make sure that positional displacements cannot occur.
	Install the robot in a location that provides enough clearance to replace the battery at the front of the robot and enough clearance to connect the motor power cable and the encoder cable to the back of the robot. Also, do not install the robot in a place where it is exposed to direct sunlight or heat from lighting. The robot surface may heat up and cause errors to occur.
	The robot requires periodic lubrication. Make sure you install the robot in a location where greasing is possible. (Refer to “4.8 Lubrication” in the operation manual *Maintenance.*
	Check the air tubing is connected correctly, has not come loose, or cannot easily come loose. If there is a problem, reconnect the tubing as required. Failure to do so can cause injury or breakdown.
	After installing the robot, make sure to remove the fixing plates attached to the robot arm. Failure to do so may cause breakdown.
	After installation, perform a periodic inspection (every 3 months or 750 hours of use, depending on how often the robot is in use) to check the tightening torque of the mounting screws with a torque wrench, etc.
	Adhere to the following when constructing or selecting a hand for the robot: • Make sure the total mass of the hand and the workpiece does not exceed the rated payload capacity of the robot. Especially if attaching an unconventional hand, check that the wrist does not exceed the allowable moment of inertia. • Use a hand or tool that has sufficient ability to grasp workpieces. • Secure the hand to the mechanical interface using bolts that are sized accordingly for the attachment dimensions. Make sure the tool has no protruding parts or sharp edges, other than those required for operation, and construct a cover for the tool if required. Failure to adhere to this can cause injury or breakdown.

FOR YOUR SAFETY

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⚠ Caution

If connecting cables or hoses to the hand, make sure they do not restrict the robot movements and make sure the robot operations do not cause the cables or hoses to get tangled and/or cause them to break.
Improperly attached cables or hoses can cause breakdown.

If using a pneumatic hand, make sure to provide clean air at the specified pressure. Also, make sure the air pressure does not exceed 0.7 MPa (7 kgf/cm^2).
Air pressure higher than this may cause the robot's internal air hoses to burst.

Robot Unit and Controller

⚠ Danger

Do not use the robot where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions and fire.

⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when installing the robot.
Entering the safety guards could result in injury.

Before wiring the power cords, make sure there is no electrical current and perform the following:

- **Lockout/tagout with the power source circuit breaker in the OFF position, and remove the power cords from the terminal block.**
- Do not touch the terminal block within 5 seconds of removing the power cords.

Failure to adhere to this may cause electric shock, injury, data loss or breakdown.

Be sure to use the unit within its indicated voltage range.
Failure to do so causes unit breakdown, fire, or electric shock.

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⚠ Warning

Make sure to isolate the robot motor power cable, the encoder cable, and external I/O cables from the power cable or grounding wire of other devices. Also make sure the external I/O cables are shielded.
Do not apply voltages to terminals other than those specified in the operation manuals. Doing so can damage the robot or cause the terminal to explode.

⚠ Caution

When transporting the robot, **do not excessively shock or vibrate the robot.** Doing so can cause malfunction or breakdown.

Do not drop or jar the unit during transport and/or installation.
This can cause injury or damage the unit.

Use the robot in an indoor environment where it is not exposed to direct sunlight. Direct sunlight can cause unit malfunction or breakdown.

Place the machine in a well-ventilated area for the health and safety of the operator.

Use the robot in an environment that meets the following conditions:

- **Ambient temperature of 0 to 40 °C**
- **Relative humidity of 45 to 85 % (no condensation)**
- **Altitude not exceeding 1,000 m**

Use outside of these conditions may cause malfunction or unit breakdown. If the unit is used where these conditions are not met, we cannot guarantee its operation. IP protection rating for the both the robot and the controller is IP20.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JS3 Series ■■■■■■■■■■■■■■■■■■

⚠ Caution	
	Use the unit in an environment where no electrical noise is present. Noise may cause unit malfunction or breakdown.
	Do not use the machine in an environment that is damp or dusty. Dust and moisture can cause malfunction or breakdown. IP protection rating for the both the robot and the controller is IP20 (not water resistant).
	Install the cables and connectors so there is no stress on them and do not forcefully bend or pull, or stand on them after they are installed. Protect the cables and connectors by using piping and covers, etc., as necessary. Make sure the latches and screws securing the cables and connectors are firmly secured. If the cables and connectors are not secure, they may come loose during a run.
	If the hand input cable (optional) has free terminals, make sure to insulate them before supplying power to the hand input cable (optional). Uncovered terminals can cause a short circuit to occur.
	Use the necessary safety precautions if the needle adjuster (4 axis specifications) employs the use of a laser. **Avoid eye contact with the laser (laser source).** **Also avoid placing your hands or face near any peripheral objects that can reflect the laser.** Prolonged exposure to the laser may weaken eyesight and cause other such damage.

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Controller

⚠ Danger	
	Mount the controller outside of the safety guards in a location where the switches can easily be reached and the controller can always be monitored by the operator without turning their back on the robot unit itself. Mount the controller so that the operation panel is 600 mm or more above floor level for maintenance work.
	Before connecting a Fieldbus, make sure safety can be maintained at all times when the robot is run. If signals such as a start signal, etc., are assigned to the Fieldbus, the Fieldbus may standby waiting to send signals and cause the robot to start running immediately after it is connected. Failure to do so can cause injury or breakdown.

⚠ Warning	
	Use a lifter, etc., to transport the controller. Failure to do so can cause injury or breakdown.
	If external vibrations can cause the controller to move, fix it in place using the base plate of the controller. (Do so without removing the rubber feet)
	Make sure that you securely install the unit in a place that can fully withstand both the unit's mass and its usage. If installation is inadequate, the unit can drop or fall over causing injury and unit breakdown. Inadequate installation can also cause overheating and fire.
	The controller has a fan and ventilation intakes for cooling. Do not block these openings and make sure there is a clearance of at least 20 mm on both the left and right sides and at least 40 mm on the back side. Blocking these openings can cause overheating or breakdown.

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⚠ Warning	
	Leave approximately 200 mm or more clearance from the front of the controller so there is no stress on the connectors and enough room to work. Failure to do so can cause malfunction or breakdown.
	In addition to the clearance required for installation, leave sufficient space around the controller for removing covers (with a screwdriver) as a contingency for maintenance work. The controller may get hot during a malfunction. Do not touch the controller immediately after use.
	Make sure the power cord prepared on your side uses the **correct crimped terminals for connecting to the terminal block. Make sure they are within the sizes outlined below and never forcefully connect them.** Incorrect connections may cause fire or breakdown. • Conductor size: AWG10 (cross-sectional area: 6.0 mm^2) • Crimped terminal: M4, with a width of 9.5 mm or less
	After wiring the power supply terminal block, attach the cover included to prevent electric shock. An unprotected terminal block can cause electric shock, fire, or unit breakdown.
	Always make sure to connect the protective ground through the power cord. **Do not use the machine when the protective ground is not connected.** **Make sure the protective grounding resistance is 100 Ω or less.** Improper grounding causes electric shock, fire, malfunction, or unit breakdown, etc.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JS3 Series ■■■■■■■■■■■■■■■■■■

⚠ Caution	
	Do not apply pressure to any protruding parts, such as a switch, the terminal block, or a connector when transporting the controller. Doing so can cause breakdown.
	If you want to use the controller, operation box (optional), or teaching pendant as a monitor while in Run Mode, **mount the respective device 600 mm or more above floor level in an easily accessible place so that the emergency stop switch can be immediately reached in the event of an emergency.** It is dangerous to operate the machine without the emergency stop switch within reach; you will not be able to stop the robot immediately and safely in the event of an emergency. Installing one of these devices too low can also result in malfunction from people knocking the device with their feet, etc.
	Make sure installation allows for access to the memory port during maintenance.

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Safety Precautions Regarding Usage

Robot Unit

⚠ Warning	
	If objects that the robot grasps have a risk of falling or being projected, **take into account the size, mass, and chemical composition of the objects for the required safety precautions.** Failure to do so can result in injury or unit breakdown.
	When manually moving the robot arm, do not insert your hands or fingers into any of the joints or openings. Your hands or fingers may get caught in these openings depending on the robot pose.

⚠ Caution	
	Before performing any operation, make sure there is no imminent danger to any of the operators. Failure to do so causes injury.
	When attaching tools, a camera, or any other device, make sure they are securely fitted before running the robot. A loose tool can cause injury or breakdown.
	If weight is applied to the J3 (Z) / J4 (R) axis, the load may cause the J3/J4 axis to drop down when the power to the robot is turned OFF. To prevent this from happening, remove the load from the J3/J4 axis or install a safety block, etc.
	When performing work inside the safety guards, perform your own risk assessment and establish **"work regulations", as outlined below, with thorough planning for safety.** Entering the safety guards may result in injury. • Work regulations should be relevant and appropriate for the type of work, and consist of details such as robot operating procedures and signs to be used between operators. • When creating work regulations, incorporate the opinion of operators and work safety specialists. Make sure to review and update the contents of the work regulations regularly.

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⚠ Caution	
	If manually moving the robot arm, do so slowly. Moving the arm at high speed can cause large amounts of backlash, reducing the robot's accuracy and damage the backup data.
	Depending on the arm pose, the shaft may come in contact with the robot base even when operating the robot within the work envelope. Make sure the shaft does not come in contact with the base while making JOG movements.
	The J3 (Z) axis is equipped with a brake. Do not forcibly move the J3-axis using an external source when the brake is active. Forcibly moving the axis can reduce accuracy and/or wear the brake, damaging the reduction drive.
	If the robot picks up a workpiece that is charged with static electricity, the electricity is discharged through the hand and the robot arm. To prevent the robot from malfunctioning, make sure to insulate the hand and robot arm. Also, when the robot places a charged workpiece on a device, the electricity is discharged through the device and may cause it to malfunction. Configure the system so that it provides a route for appropriate electrical discharge from charged workpieces. Failure to do so can cause malfunction or unit breakdown.
	The lubricant is not completely effective at low temperatures. Make sure to use the warmup function to prevent loss of positioning accuracy and to prevent servo errors such as Excessive Margin of Error.
	Take care when affixing tape that has a strong adhesive, such as gummed tape, to the painted surfaces on the robot. The tape may damage the painted surfaces when it is peeled off.

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Robot Unit and Controller

⚠ Danger	
	When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside. Entering the safety guards could result in injury.
	When changing modes or starting a run, first confirm there are **no people inside of the safety guard and there are no obstacles that could interfere with the run.** Entering the safety guards could result in injury.
	Before performing a run or operation, always check the following: • **Obstacles** Make sure there are no obstacles or people within the safety guard. • **Installation** Make sure the robot is installed properly, that there are no abnormalities with the robot and the surrounding devices, and that the teaching pendant and tools are in the appropriate places. • Emergency Stop Function Check Make sure the I/O-S circuit (interlock) and emergency stop switch(es) are functioning properly. It is potentially dangerous to operate the robot without making these checks first.
	If entering the safety guards without cutting OFF the power, **always make sure the select switch on the teaching pendant is set to TEACH (Teaching Mode).** If the select switch is set to AUTO (Run Mode), external commands can start the robot while you are inside the safety guards. Failure to adhere to this can cause injury or breakdown.
	If there are any safety devices that you disable while teaching, make sure to enable them after teaching to reestablish full functionality. Example: Enable the interlock device on the safety guard entrance, etc. Failure to do so can result in injury.

FOR YOUR SAFETY

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⚠ Warning	
	Make sure to use a power source that is in accordance with the range indicated on the rating identification plate. Failure to do so causes electric shock, fire, or unit breakdown.
	Do not allow water or oil to come in contact with the unit or power cord. Contact with water or oil causes electric shock, fire, or unit breakdown. IP Protection Rating: IP20.
	Make sure that no foreign objects can enter the robot or controller. In particular, a conductive or flammable foreign matter, such as a screw, metal shard or oil, can cause an explosion or damage the unit, etc.
	Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable or LAN cable. Failure to do so can cause electric shock, data loss, unit breakdown, or malfunction.
	Firmly connect and secure the power cord after checking that the connection area is not covered with dust, etc. If the power cord is not firmly plugged in, the connectors may heat up and cause a fire.
	Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time. Dust accumulation may cause fire.
	If anything unusual occurs, such as a burning smell or unusual sound, stop operation and turn the power supply circuit breaker OFF. Unplug the power cord after confirming there is no power supplied to the robot and then contact Janome or a Janome dealer. Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

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⚠ Caution	
	Be sure to check the connections of the cords and cables to the main unit. Improper connection may result in unit malfunction or breakdown.
	Make sure to save if you modify any settings or data. When the robot power is turned OFF after changing settings and data without saving, those changes are lost and the robot will revert to its original settings.
	Diagnostic Mode and Mechanical Adjustment Mode are for maintenance personnel* use only.

* “Maintenance Personnel” are individuals who have received maintenance training from Janome or from a Janome dealer.

FOR YOUR SAFETY

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Controller

⚠ Warning

Do not touch the terminal block when there is an electrical current present.
Touching the terminal block can result in electric shock or injury.

⚠ Caution

Keep the emergency stop switch within reach of the operator when running or operating the robot.
If you operate the robot without the emergency switch in reach, you may not be able to stop the robot immediately and safely. This is potentially dangerous.

Individual Configuration Information varies for each individual unit even if they are the same model.
Do not use backup data with a different robot.
The robot cannot function normally with backup data from a different robot.

Do not turn OFF the power while the robot is running.
Turning OFF the power during a run can cause the arm to drop down or coast to a stop, which may result in the arm hitting a peripheral device.

When an error occurs, the error code that appears on the 7 segment LED and the teaching pendant display are useful indicators for finding the source of the error. Record the error number and then refer to the operation manual *Maintenance* for the countermeasure.

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Safety Precautions Regarding Maintenance

Robot Unit

⚠ Warning	
	Do not touch or come in contact with any potentially hot components on the robot. Doing so can result in burns and serious accidents. The servomotor may get hot. Do not touch or come in contact with the servomotor while the power is ON, only do so when the power is OFF and after it has cooled down.

⚠ Caution	
	Check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months or after every 750 hours of operation. A loose tool can cause injury or breakdown.
	Periodically replace the robot battery. Failure to do so can cause malfunction or breakdown. Replace the battery approximately every 1 year.

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Robot Unit and Controller

⚠ Danger	
	If entering the safety guards, turn the power source circuit breaker OFF, lock and tag it, and then make sure there is no power supplied to the robot before continuing. Failure to do so can cause electric shock, injury, or the robot may move unexpectedly.
	If entering the safety guards, perform your own risk assessment and establish "work regulations", as outlined below, with thorough planning for safety. • Work regulations should be relevant and appropriate for the type of work, and consist of details such as robot operating procedures and signs to be used between operators. • When creating work regulations, incorporate the opinion of operators and work safety specialists. Make sure to review and update the contents of the work regulations regularly.
	When setting the home position or other such work that requires you to enter the safety guards with the power ON, make sure to activate the emergency stop switch before entering the safety guards and to perform the work with the robot in this state. Failure to do so can result in injury.

FOR YOUR SAFETY

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⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when performing maintenance.
Failure to do so can cause injury..

When inspecting or performing maintenance on the controller, **make sure there is no electrical current and perform the following:**

- **Lockout/tagout with the power source circuit breaker in the OFF position, and remove the power cords from the terminal block.**
- Do not touch the terminal block within 5 seconds of removing the power cords.

Failure to adhere to this may cause electric shock, injury, data loss or breakdown.

If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not dissemble in any ways other than as specified. Do not modify the machine in any way.
Inappropriate disassembly or modification causes electric shock or unit breakdown.

For your safety, **do not modify the machine in any way.**
Inappropriate disassembly or modification causes electric shock or unit breakdown.
We cannot take any responsibility for machines that malfunction due to modification.

After cutting OFF power to the system, energy stored by the devices is potentially dangerous, so make sure to establish means to reduce this risk.

- Controller
  Make sure the energy stored by the controller is discharged before opening the controller.
- Hand
  Use a hose connected to the solenoid valve to expel compressed air from a pneumatic chuck hand.

⚠ Caution

Perform daily and periodic inspections to check and make sure there are no abnormalities with the robot or peripheral devices. Additionally, keep records of the inspections and store them for 3 years or more so that the details can be referred to for future inspections.

Place a sign such as “Robot Inspection in Progress” in the necessary locations and establish means so as to prevent operation of the robot by those who may be unaware of the maintenance work. Whenever possible, also perform maintenance with at least one other person present so as to stop any unexpected robot movements.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JS3 Series ■■■■■■■■■■■■■■■■■■

⚠ Caution	
	For a smooth and long operating life, **lubricate the shaft once for every 2,000 km the robot is run.** Grease the robot more frequently if running it continuously for long periods, such as 24 hour runs. The lubrication periods are calculated based on runs at maximum speed.
	Make sure to use the specified grease. Use of grease other than the specified grease can adversely affect the robot's performance or cause breakdown.
	If the arm joints or the Z-axis is subject to only minute operational angles or distances, fretting may occur in the internal robot bearings. Fretting refers to wear that occurs when minute operation angles do not allow the lubricant within the bearings to fully coat the working parts as required. This is also applies to axes that are inactive, as the counterforce from other axis operations or vibrations from the robot mounting surface cause minute movements in the inactive axes, which may result in fretting damage. To prevent fretting damage, we recommend running the arm joints more than 30 degrees and the Z-axis more than 20 mm per day.
	Do not charge, dispose of in a fire, or reuse the robot unit battery or controller battery (unit) in any way.
	The robot unit battery and controller battery (unit) are considered industrial waste. Make sure they are disposed of in accordance with the national and/or local authority laws and legislations.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JS3 Series ■■■■■■■■■■■■■■■■■■

Controller

⚠ Danger

Before entering the safety guard because of something wrong with the robot or a peripheral device, or to **inspect or lubricate the machine, etc., always make sure to turn the controller and power source circuit breakers OFF, lock and tag them, and make sure there is no electrical current.**
Failure to follow these steps can cause electric shock or injury.

⚠ Warning

When replacing fuses, or inspecting or lubricating the unit, turn OFF the power supply, then remove the cord from the main unit and make sure there is no power supplied to the robot before continuing.
Also, **do not touch the terminal block within 5 seconds of removing the power cords.** Failure to follow these steps can cause electric shock or injury.

1. INSTALLATION

1.1 How to Mount the Dispenser (Example: JR3000 Series, 3-Axis Model)

1. If you want to stop dispensing when the emergency stop switch is pressed while the dispenser is working, use one of the following methods:

   (1) When you want to stop the dispenser by cutting OFF the power supply
   - Outlet Equipped Models and Specifications:
     Connect the dispenser unit's power cord to the outlet on the robot*1
   - No Outlet Models and Specifications:
     Use the I/O-SYS "#sysOut7 Emergency Stop" signal to construct a system that cuts OFF power to the dispenser unit when an emergency stop occurs*2

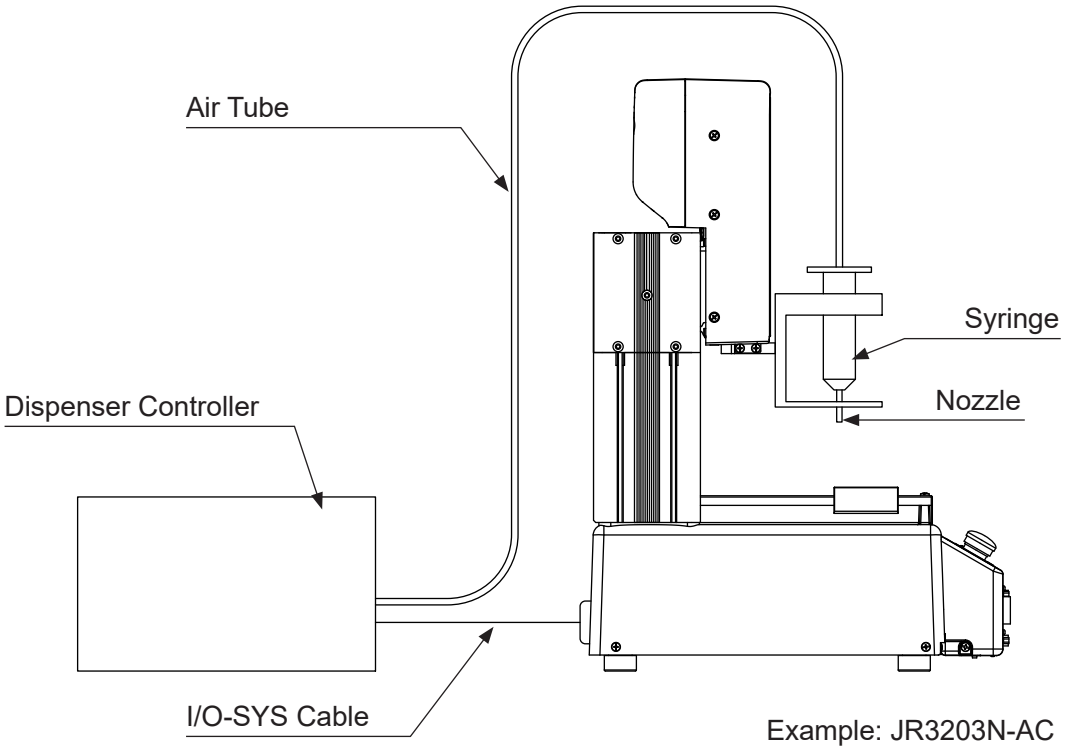
   (2) When using a dispenser that keeps the dispensing agent out (cannot be shut off) even if the power supply is cut OFF
   Do not connect the dispenser unit to the robot outlet, but instead use the I/O-SYS "#sysOut7 Emergency Stop" signal to construct a system that inputs a reset signal to the dispenser unit when an emergency stop occurs*2

*1: Refer to the operation manual *External Control* for details regarding the internal circuit and outlet function.
*2: Refer to the I/O-SYS circuitry diagrams in the operation manual *External Control*.

2. Mount the syringe on the Z-axis of the robot.

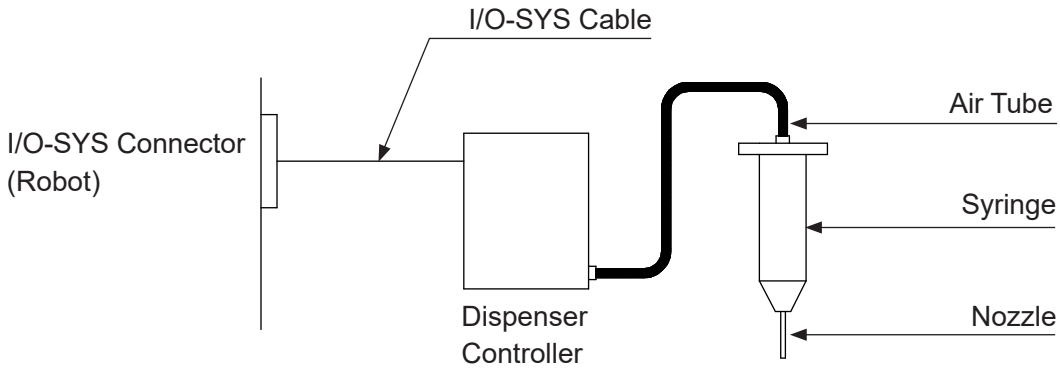
3. Connect the air tube to the syringe.

4. Connect the air tube to the dispenser controller.



Example: JR3203N-AC

5. Connect the I/O SYS cable to the dispenser controller and to the robot.
   For further details, refer to “2.6.6 Attaching Devices” in the operation manual *Setup*.



1.2 How to Mount the Dispenser (Example: JC-3 Series, 3-Axis Model)

1. If you want to stop dispensing when the emergency stop switch is pressed while the dispenser is working, use one of the following methods:

   (1) When you want to stop the dispenser by cutting OFF the power supply
   Use the I/O-SYS “#sysOut9 Emergency Stop” signal to construct a system that cuts OFF power to the dispenser unit when an emergency stop occurs*

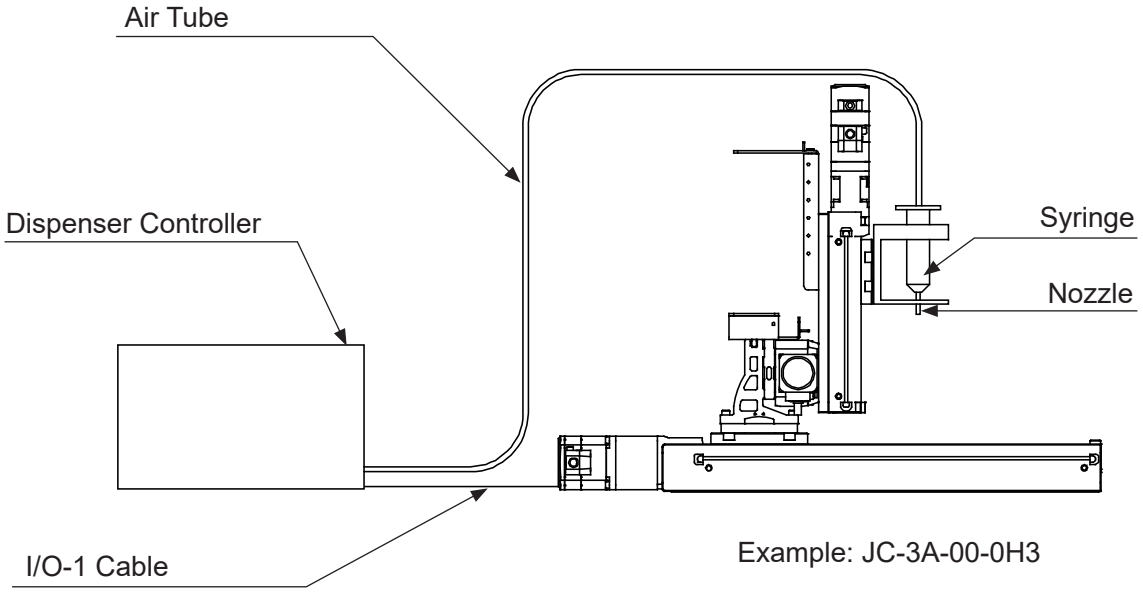
   (2) When using a dispenser that keeps the dispensing agent out (cannot be shut off) even if the power supply is cut OFF
   Do not connect the dispenser unit to the robot outlet, but instead use the I/O-SYS “#sysOut9 Emergency Stop” signal to construct a system that inputs a reset signal to the dispenser unit when an emergency stop occurs*

   * Refer to the I/O-SYS circuitry diagrams in the operation manual *External Control.*

2. Mount the syringe on the Z-axis of the robot.

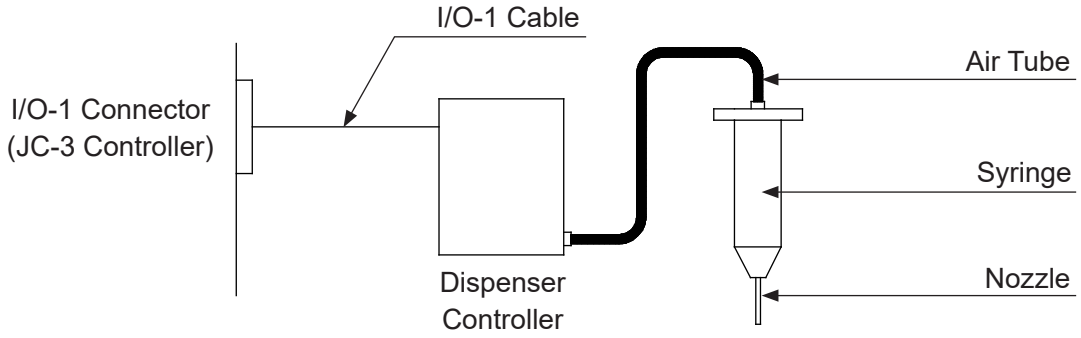
3. Connect the air tube to the syringe.

4. Connect the air tube to the dispenser controller.



Example: JC-3A-00-0H3

5. Connect the I/O-1 cable to the dispenser controller and to the robot controller.
   For further details, refer to “4.4 Attaching Devices” in the operation manual *Setup*.



1.3 How to Mount the Dispenser (Example: JS3 Series)

1. If you want to stop dispensing when the emergency stop switch is pressed while the dispenser is working, use one of the following methods:

   (1) When you want to stop the dispenser by cutting OFF the power supply
   Use the I/O-SYS “#sysOut8 Emergency Stop” signal to construct a system that cuts OFF power to the dispenser unit when an emergency stop occurs.*

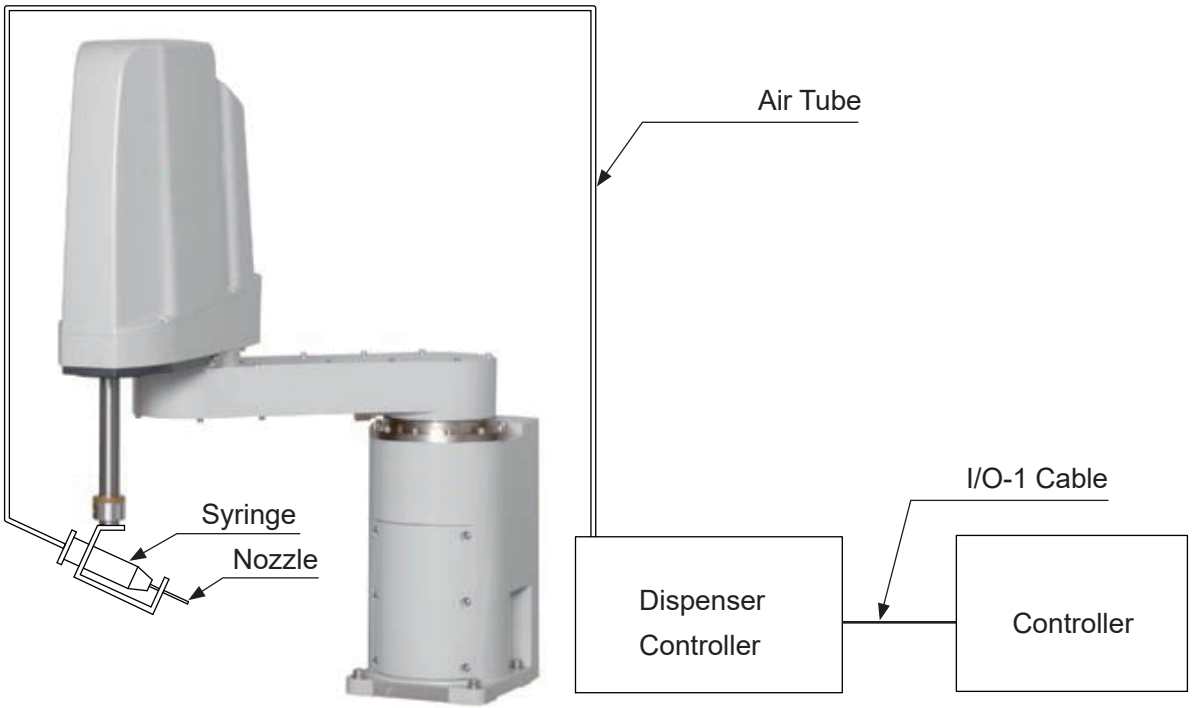
   (2) When using a dispenser that keeps the dispensing agent out (cannot be shut off) even if the power supply is cut OFF
   Use the I/O-SYS “#sysOut8 Emergency Stop” signal to construct a system that inputs a reset signal to the dispenser unit when an emergency stop occurs.*

* Refer to the I/O-SYS circuitry diagrams in the operation manual *External Control*.

2. Mount the syringe on the J4-axis of the robot.

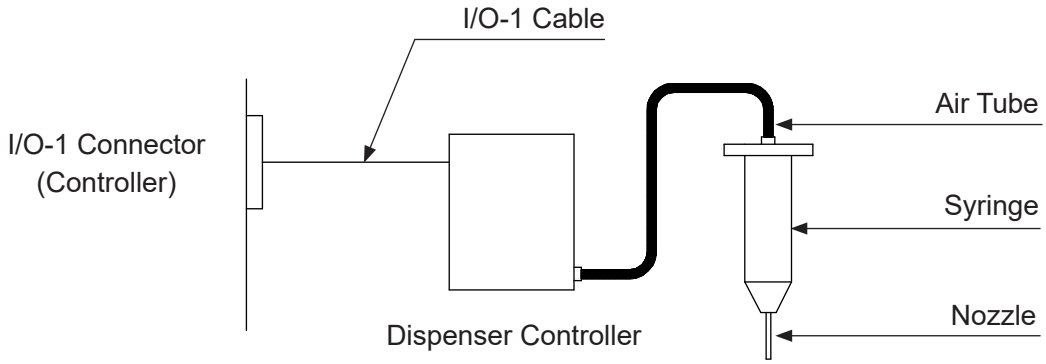
3. Connect the air tube to the syringe.

4. Connect the air tube to the dispenser controller.



5. Connect the I/O-1 cable to the dispenser controller and to the robot controller.

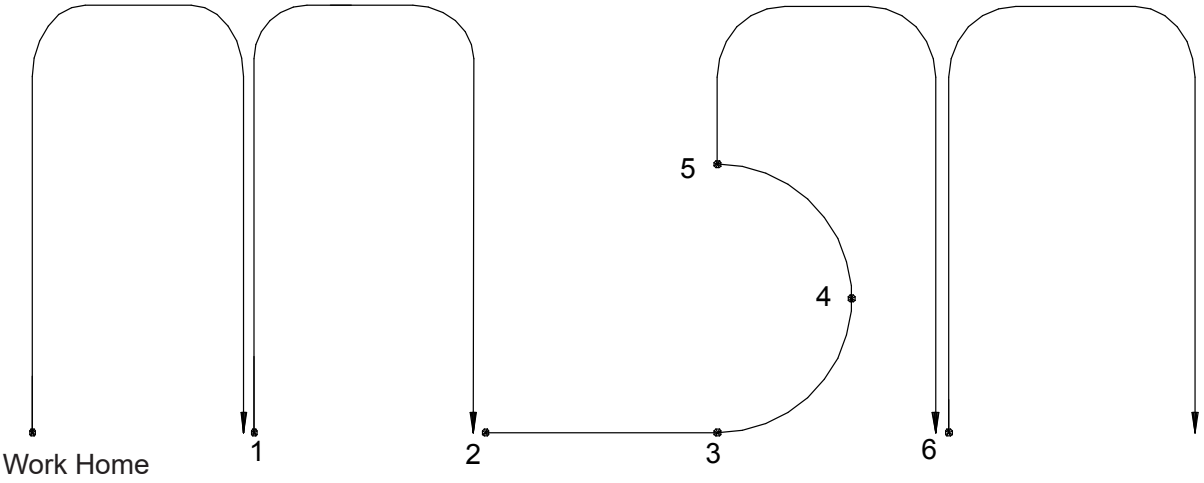
NOTE: You can use I/O-SYS or I/O-H instead of using I/O-1. However, you need to change the I/O Function Assignment when using I/O-SYS or I/O-H.



2. TEACHING DATA

2.1 Point Types

Point types are defined according to the type of job or movement, such as Point Dispense or Start of Line Dispense. For dispensing specifications there are the 6 standard point types and as well as the following 19 point types:



No.	Point Type	Description
1	Point Dispense	This performs point dispensing. A point dispensing time can be set for this. When point dispensing is finished, the “dispensing return movement” as set in Dispense Conditions is performed. The robot makes a PTP movement to the next point. The main tool TCP tool data is applied for this point.
2	Start of Line Dispense	Line dispensing starts from this point. The robot switches from PTP to CP movement for this. You can set the dispenser ON/OFF and the line speed to this point. After the dispenser is turned ON, the robot holds for the [Wait Time at Start] set in Dispense Conditions. The robot then moves by CP movement until it finishes the End of Line Dispense point. Also, you can adjust the Dispenser ON/OFF timing in the dispensing condition [Adjust Dispensing Distance]. (Refer to “15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance)”.) The main tool TCP tool data is applied for this point.
3	Line Passing	This point changes the direction or speed of the CP movement between the Start of Line Dispense and the End of Line Dispense points. The main tool TCP tool data is applied for this point.

No.	Point Type	Description
4	CP Arc Point	This point is necessary for specifying an arc in a CP movement drawn between the Start of Line Dispense and End of Line Dispense points. You can set the line speed for this point.
5	End of Line Dispense	This point executes the “dispensing return movement” set in Dispense Conditions once Line Dispensing (CP movement) finishes. The robot makes a PTP movement to the next point. Also, you can adjust the Dispenser ON/OFF timing in the dispensing condition [Adjust Dispensing Distance]. (Refer to “15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance)”.)
6	Start of Circle Dispense	By teaching points consecutively from a Start of Circle Dispense point → Center of Circle Dispense point, the robot draws a circle or arc. You can set the line speed to the Start of Circle Dispense, and a circle angle to the Center of Circle Dispense points. After the dispenser is turned ON at the Start of Circle Dispense point, the robot stands by for the prescribed [Wait Time at Start] set in Dispense Conditions, and then makes a circle or arc CP movement by the specified circle angle. At the circle or arc end position, the robot executes the dispensing return movement set in Dispense Conditions. Also, you can adjust the Dispenser ON/OFF timing in the dispensing condition [Adjust Dispensing Distance]. (Refer to “15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance)”.) NOTE: • The [Dispenser ON] signal comes ON automatically at the Start of a Circle Dispense point and goes OFF at the end position of the circle or arc. • You can set up to ±9999.999 deg. for the circle angle in increments of 0.001 deg. • If the value of the circle angle is positive, the robot makes an arc counterclockwise (when looking from above the front of the robot). • When drawing a circle or an arc from Start of Circle Dispense → Center of Circle Dispense, the robot makes a PTP movement from the arc to the succeeding point. If you want to make a CP movement from the circle or arc, use a CP Arc Point. • Always make sure to consecutively teach from a Start of Circle Dispense point → Center of Circle Dispense point. If a point other than Center of Circle Dispense comes after Start of Circle Dispense, an error occurs. Also note that because the robot makes a PTP movement from the arc, an error occurs if a Line Passing or End of Line Dispense point succeeds Center of Circle Dispense. The main tool TCP tool data is applied for this point. • If you set a workpiece adjustment, the Center of Circle Dispense point is offset together with the Start of Circle Dispense point.
7	Center of Circle Dispense	

No.	Point Type	Description
8	Zigzag Start Point	The robot zigzags and fills in the area of a rectangle specified by the Zigzag Start Point and Rectangle End Point. The main tool TCP tool data is applied for this point.
9	Rectangular Spiral Start Point	The robot spirals from the Rectangular Spiral Start Point toward the center, and does so by executing line dispensing using the Z coordinates of this point on a horizontal plane and at the specified [Painting Speed]. The main tool TCP tool data is applied for this point.
10	Hollow Rectangle Start Point	The robot spirals from the Hollow Rectangle Start Point toward the center, and does so by executing line dispensing using the Z coordinates of this point on a horizontal plane and at the specified [Painting Speed]. However, line dispensing finishes directly before a bend that exceeds the specified [Filling width]. The center of the rectangle is not filled in. The main tool TCP tool data is applied for this point.
11	Rectangle End Point	The robot fills in the area of a rectangular shape specified by one of the following points: Zigzag Start Point, Rectangular Spiral Start Point or Hollow Rectangle Start Point, and the Rectangle End Point. After dispensing is finished, the robot makes a PTP movement to the next point. The main tool TCP tool data is applied for this point.
12	Spiral Start Point	The robot fills in a circular area specified by the three points: Spiral Start Point, Circumference of Spiral Area 1, and Circumference of Spiral Area 2. The robot spirals from the Spiral Start Point toward the center at the specified [Painting Speed], and does so by executing line dispensing using the Z coordinates of this point on a horizontal plane. The main tool TCP tool data is applied for this point.
13	Hollow Spiral Start Point	The robot spirals toward the center at the specified [Painting Speed], does so by executing line dispensing using the Z coordinates of this point on a horizontal plane. However, line dispensing ends at the position where the robot exceeds the specified [Filling width]. The center of the spiral is not filled in. The main tool TCP tool data is applied for this point.
14	Circumference of Spiral Area 1	The robot fills in the area of a circle specified by the three points: Spiral Start Point or Hollow Spiral Start Point, Circumference of Spiral Area1 and Circumference of Spiral Area 2.

No.	Point Type	Description
15	Circumference of Spiral Area 2	The robot fills in the area of a circle specified by the three points: Spiral Start Point or Hollow Spiral Start Point, Circumference of Spiral Area1 and Circumference of Spiral Area 2. After dispensing is finished, the robot makes a PTP movement to the next point.
16	Circle Center Point	Specify a Circle Center Point and Circle, and then use this point to make an arc movement (CP movement). The subsequent point, the Circle Center Point, is the center of the arc. The circle angle is set in the subsequent point; the Circle Center Point. If you set a workpiece adjustment, the Circle Center Point is offset together with the Circle Start Point. The [Dispenser ON] signal does not turn ON/OFF. The main tool TCP tool data is applied for this point. NOTE: This does not have settings for an arc end point.
17	Circle Center Point	This point is used to indicate the center and angle of the arc movement (CP movement) started by the Circle Start Point. The [Dispenser ON] signal does not turn ON/OFF.
18	Needle Measure Point 1	• JR3000/JC-3 Series (3 axis specifications) This point measures the needle in the X direction when using needle adjuster functions. • JR3000/JC-3 Series (4 axis specifications) and JS3 Series This point measures the nozzle tip when the R axis angle is 0° and using needle adjuster functions. When replacing the nozzle, use this point to compare and adjust the nozzle tip position. By applying [No Tool] tool data to this point, the robot does not deviate from the taught position. The robot position will not change even if the tool data for the main tool TCP is modified.

No.	Point Type	Description
19	Needle Measure Point 2	• JR3000/JC-3 Series (3 axis specifications) This point measures the needle in the Y direction when using needle adjuster functions. • JR3000/JC-3 Series (4 axis specifications) and JS3 Series This point measures the nozzle tip when the R axis angle is 180° (or when the R axis angle is +180° in comparison to Needle Measure Point 1) and using needle adjuster functions. When replacing the nozzle, use this point to compare and adjust the nozzle tip position. By applying [No tool] tool data to this point, the robot does not deviate from the taught position. The robot position will not change even if the tool data for the main tool TCP is modified.

NOTE: For information regarding standard point types, refer to the to the operation manual *Basic Instructions*.

Depending on the point types set to the points, some items cannot be set to them.
The chart on the next page indicates what items can be set to each point type.

(✓: Can be set, Blank: Cannot be set)

Job/Additional Function Data / Point Type	Line Speed	Condition Number*1	Job Before Moving*2	Job while moving*2	Job After Moving*2	Job while CP Moving*2	PTP Condition Number	CP Condition Number	Tool Number	Pallet Routine Number	Work Adjustment Number	Execute Condition Number	Tag Code	Dispense Time	Dispenser ON/OFF	Circle Angle	Direction	Painting Speed	The number of pitches	Line Dispensing	Filling width	Ref. Work Adj. No.
Point Dispense		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓								
Start of Line Dispense	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓							
Line Passing	✓	✓			✓						✓	✓	✓		✓							
CP Arc Point	✓				✓						✓	✓	✓									
End of Line Dispense					✓		✓				✓	✓	✓									
Wait Start Point		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									
Start of Circle Dispense	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓							
Center of Circle Dispense					✓		✓						✓			✓						
Zigzag Start Point		✓	✓	✓	✓			✓	✓	✓	✓		✓				✓	✓	✓			
Rectangular Spiral Start Point		✓	✓	✓	✓			✓	✓	✓	✓		✓					✓	✓			
Hollow Rectangle Start Point		✓	✓	✓	✓			✓	✓	✓	✓		✓					✓	✓		✓	
Rectangle End Point					✓		✓						✓									
Spiral Start Point		✓	✓	✓	✓			✓	✓	✓	✓		✓					✓	✓	✓		
Hollow Spiral Start Point		✓	✓	✓	✓			✓	✓	✓	✓		✓					✓	✓	✓	✓	
Circumference of Spiral Area 1																						
Circumference of Spiral Area 2					✓		✓						✓									
PTP Point		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									
CP Start Point	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓									
CP Passing Point	✓	✓			✓						✓	✓	✓									
CP Stop Point	✓	✓			✓	✓		✓			✓	✓	✓									
CP End Point					✓		✓				✓	✓	✓									
PTP Evasion Point							✓			✓		✓										
Circle Start Point	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓									
Circle Center Point					✓		✓						✓			✓						
X Needle/4 Axis TCP Measure Point 1*3		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									
Y Needle/4 Axis TCP Measure Point 2*3		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									
Standby Point on Camera Error		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									
Single Camera Shoot Point		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									✓
Multi Camera Shoot Point		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									✓
Double Camera Shoot Point 1		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									✓
Double Camera Shoot Point 2		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓									

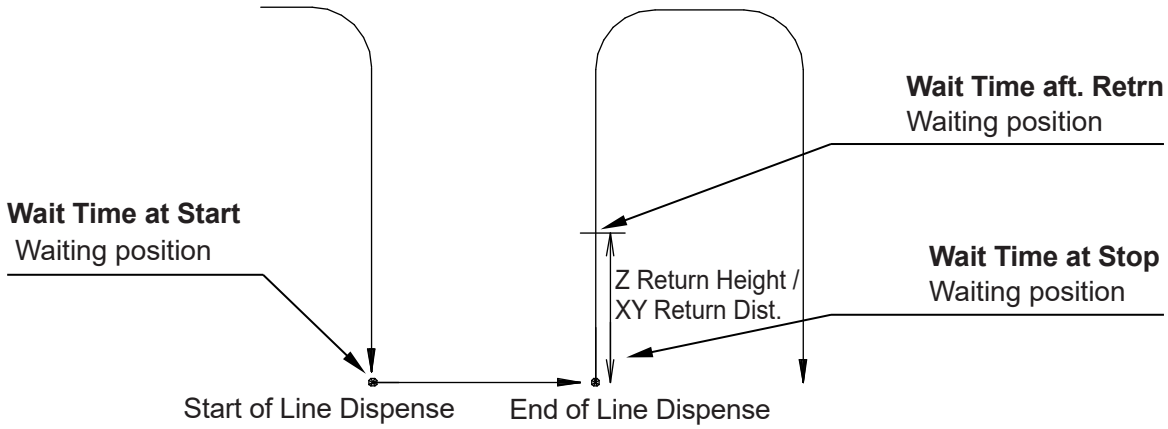
*1: [Condition Data] selected from [Condition Number] is different from [Condition Data] set from individual program settings. For further details, refer to “2.2 Dispense Conditions”.

*2: Job Before Moving, Job while Moving, Job after Moving, and Job while CP Moving are referred to as “point jobs”. When a point job, etc., is set to the point types [Point Dispense] – [Line Passing], [End of Line Dispense], [Wait Start Point], [Start of Circle Dispense] – [Circumference of Area 2], the job/operation attached to that point type is not executed. For example, [Wait Start Point] is a point where the robot waits until the start/stop switch is pressed or until a start command is received; however, if an optional [Point Job] is set, the robot will not wait anymore. If you want to set [Point Job], etc., to these points and also want the robot to do the jobs included in the point types, use the *callBase* command.

*3: Do not set the items shown as settable for the point types [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2]. For details, refer to “19. USING NEEDLE ADJUSTER 2 (3-AXIS MODELS)” for the JR3000/JC-3 Series (3 axis specifications) or “20. USING NEEDLE ADJUSTER (4-AXIS MODELS)” for the JR3000/JC-3 Series (4 axis specifications) and JS3 Series.

- Dispenser ON/OFF
  With points (Start of Line Dispense, End of Line Dispense, Start of Circle Dispense) that are set by selecting the [Signal Timing] in the [Adjust Dispensing Distance] using a dispensing condition number, Dispenser ON/OFF settings are invalid. For example, if the [Signal Timing] is selected in the condition data [Adjust Dispensing Distance], the robot performs dispensing even if [Dispenser] is set to OFF.

2.2 Dispense Conditions



1. Wait Time at Start
   This is the time the robot holds until it starts dispensing after the dispenser signal is turned ON. (Waiting position: Start of Line Dispense point/Start of Circle Dispense point)

2. Wait Time at Stop
   This is the time the robot holds until the Z axis starts going up after the dispenser signal is turned OFF. (Waiting position: Point Dispense/End of Line Dispense point/dispensing end position*)

3. Return Type
   After dispensing ends, the Z axis is raised at the [Return line speed] to prevent dripping. You can select from the following 4 types. The return movements are executed with [Point Dispense], [End of Line Dispense] or at the dispensing end position*.

Without	After the end of dispensing, once the robot stands by for the prescribed [Wait Time at Stop], it moves to the next point.
Z Up Only	After the end of dispensing, once the robot stands by for the prescribed [Wait Time at Stop]; only the Z axis ascends at the specified [Return line speed] to exactly the specified [Z return Height].
XY Moving After Z Up	After the end of dispensing, once the robot stands by for the prescribed [Wait Time at Stop]; only the Z axis ascends at the specified [Return line speed] to exactly the specified [Z return Height]. Thereafter, X and Y move by the exact [XY return dist.] in the return direction (opposite to line dispensing).
XYZ Simultaneous	After the end of dispensing, once the robot stands by for the prescribed [Wait Time at Stop], X and Y move by the exact [XY return dist.] in the return direction while the Z axis ascends at the specified [Return line speed] to exactly the specified [Z return Height]. (XYZ move and rise simultaneously)

4. Z Return Height
5. XY Return Dist
   In order to prevent dripping on non-dispensing areas once dispensing has finished, the X and Y axes move by the distance specified here while the Z axis ascends after the robot stands by for the prescribed [Wait Time at Stop]. With a [Point Dispense] operation, only the Z axis ascends and even if [XY return dist.] is set, the robot does not move in the X and Y directions.

6. Return Line Speed
   After the robot holds for the specified [Wait Time at Stop], the robot moves/raises each axis by the exact amount set in [Z return Height] / [XY return dist.] at the speed specified here.

7. Wait Time aft. Retrn
   The robot stands by for the time specified here before the Z axis ascends at normal speed, after the return movement is complete (the robot moves/raises each axis by the exact amount set in [Z return Height] / [XY return dist.] at the speed specified in [Return line speed]).
   (Hold position: (Point Dispense/End of Line Dispense point/dispensing end position*) + [Z return Height] / [XY return dist.])

* Dispensing End Position: This is the end position of an arc or dispense filling that is drawn with Start of Circle Dispense – Center of Circle Dispense

8. Adjust Dispensing Distance
   You can select from Invalid/Signal Timing/Adjust Distance for the dispensing distance adjustment function.
   If the [Signal Timing] is selected, the following setting items appear.
   - Dispenser-ON Distance
   - Dispenser-OFF Distance

   Adjusts the distance the dispenser stays ON/OFF at the Start of Line Dispense and End of Line Dispense points using the distances specified here.

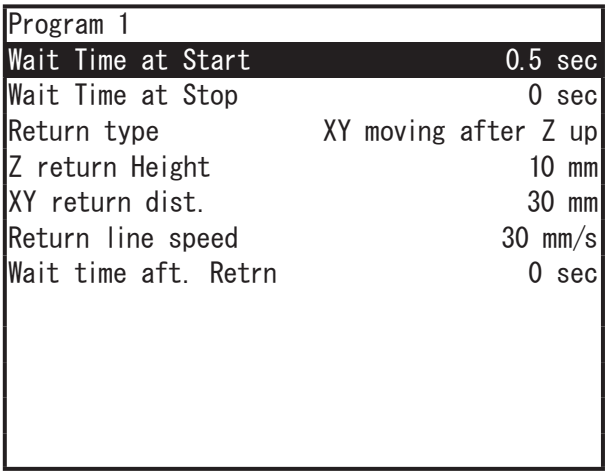
   If the [Adjust Distance] is selected, the following setting items appear.
   - XY Acceleration/Deceleration Distance
     Set the acceleration/deceleration zone distance to extrapolate. Extrapolate the acceleration zone for the Start of Line Dispense and the deceleration zone for the End of Line Dispense. If the acceleration/deceleration distance is too short (such as when the target line speed cannot be reached at the Start of Line Dispense, etc.), the CP speed error occurs.
   - Z Height
     Set the Z height for the extrapolate destination. Set this when you want to evade the obstacles on the workpiece.

NOTE:
- This only functions when set to the Start of Line Dispense, End of Line Dispense, or a Start of Circle Dispense point.
- [Adjust Dispensing Distance] is not displayed for [Dispense Condition] in individual program settings. Use dispensing conditions specified by condition numbers to set this function.
  Refer to “15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance)” for further details.

2.2.1 Individual Program Settings

Within individual program settings there is the settable item [Dispense Condition]. These can be set for each program, and the values set are valid only when that program is executed.

Press the MENU key and select [Individual Program Settings] → [Dispense Condition]. The dispense condition settings screen (as shown to the right) is displayed.



2.2.2 Condition Number

When [Condition Number] is set with a “dispense condition”, use this method rather than [Individual Program Settings].

Press the MENU key and select [Dispense Condition] and enter the condition number. The dispense condition settings screen (as shown to the right) is displayed.

Dispense Condition 1	
Wait Time at Start	0.5 sec
Wait Time at Stop	0 sec
Return type	XY moving after Z up
Z return Height	10 mm
XY return dist.	30 mm
Return line speed	30 mm/s
Wait time aft. Retrn	0 sec
Adjust Dispensing Distance	Invalid

2.3 Dispenser

There are [Dispenser] settings which are universal settings (common data) for all programs. You can set or change the dispenser connection point, type and valid/invalid status for dispenser response signals, and the dispenser mode.

TP MENU [Dispenser]

Press the MENU key and select [Dispenser] to display the dispenser setting screen (as shown to the right.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

JR3000/JC-3 Series
Dispenser Item Selection Screen

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec
Evasion Points of Going Home	

JS3 Series Dispenser Item Selection Screen

1. I/O Function Assignment

   The assignment of dispenser related signals can be changed. By default, these are assigned as follows:

	JR3000 Series	JC-3 Series	JS3 Series
Dispenser ON	#sysOut10	#genOut1	#genOut1
Dispenser Response	#sysIn13	#genIn1	#genIn1
Purge by Ext. Signal	#sysIn14	#genIn2	#genIn2
X Needle Sensor	#sysIn15	#genIn7	#genIn3
Y Needle Sensor	#sysIn16	#genIn8	#genIn4

2. Dispenser Type

   You can select and set the dispenser return signal types from among the following 3 choices:

   - No Response Signal

     The robot ignores signals from the dispenser.
   - Busy Signal Operation

     The robot verifies signals output from the dispenser while dispensing from the start to the end of dispensing.
   - Finish Signal Operation

     The robot verifies signals from the dispenser when dispensing ends.

3. Dispenser Mode

   The Dispenser mode can be selected from the following 2 choices:

   - Steady

     Dispensing time is controlled at the robot side.
   - Timer

     Dispensing time is set by the timer on the dispenser.

   However, during line dispensing or when the dispensing type is set to [No Response Signal], the robot runs in Steady Mode even if [Dispenser Mode] is set to [Timer].

4. Purge Switch (JR3000 Series)

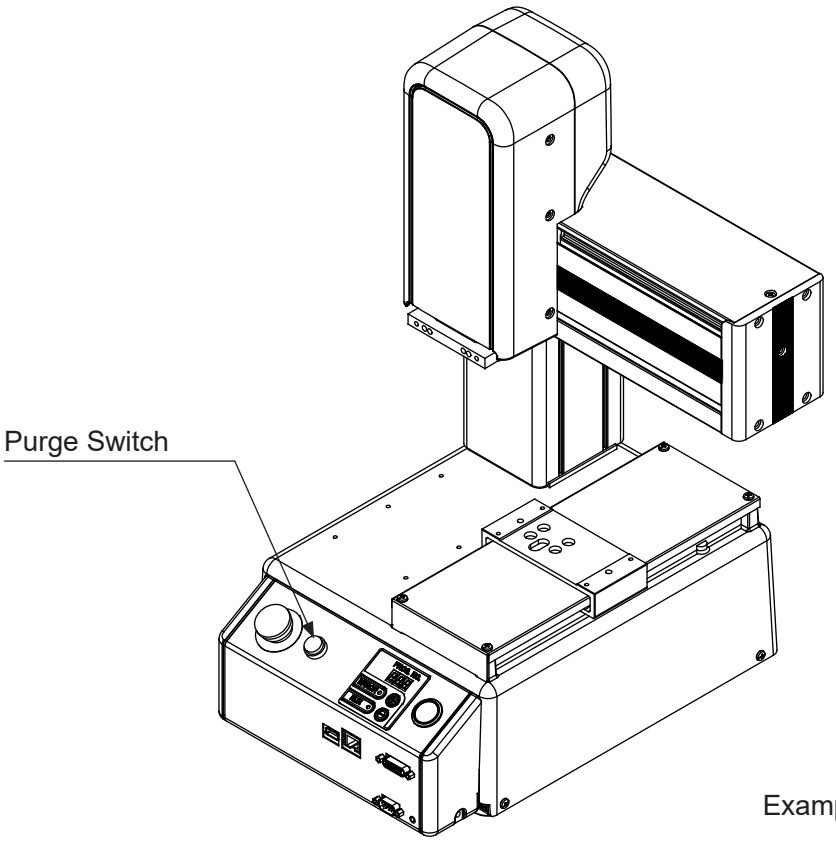
This enables/disables the purge switch on the front of the robot or on the switchbox.

- Constant Valid:

  The purge operation is executed regardless of the robot's status.(Do not press the purge switch during a dispensing operation in a run. The robot will be unable to dispense correctly.)
- Invalid During Operation:

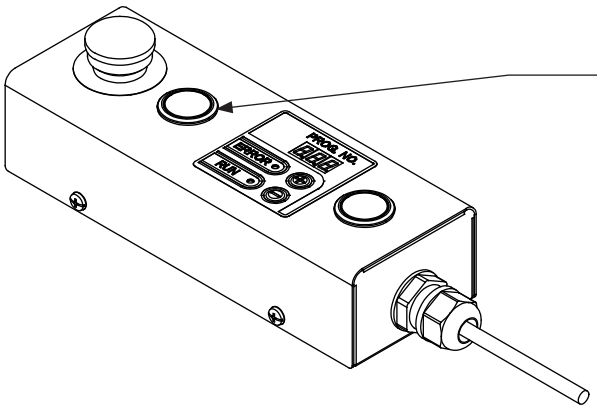
  The purge operation is not executed when the robot is running even if the switch is pressed.
- Constant Invalid:

  The purge operation is not executed even if the switch is pressed regardless of the robot's status.



Example: JR3203N-AC

Switchbox

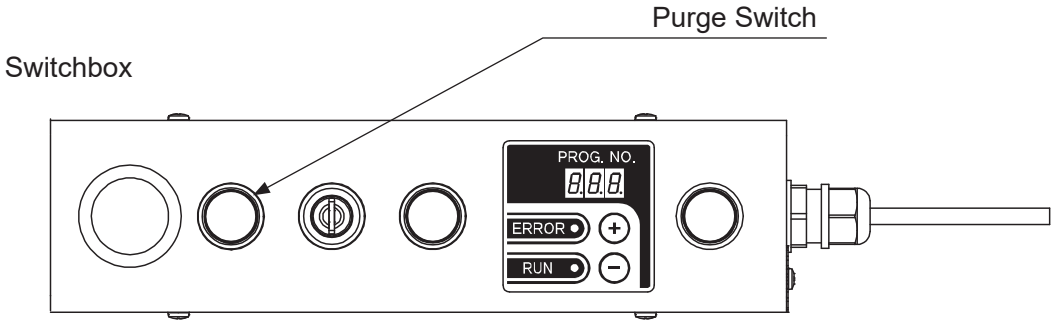


* [Option Switch 1] in Diagnostic Mode refers to the purge switch for dispensing robots.

5. Purge Switch (JC-3 Series)

   This enables/disables the purge switch on the switchbox.

   - Constant Valid : The purge operation is executed regardless of the robot's status.
     (Do not press the purge switch during a dispensing operation in a run. The robot will be unable to dispense correctly.)
   - Invalid During Operation : The purge operation is not executed when the robot is running even if the switch is pressed.
   - Constant Invalid : The purge operation is not executed even if the switch is pressed regardless of the robot's status.



6. Purge by External Signal

   With the JR3000 Series, it is assumed that there is an arbitrary remote purge switch connected to #sysIn14 of I/O-SYS.

   With the JC-3/JS3 Series, it is assumed that there is an arbitrary remote purge switch connected to #genIn2 of I/O-1.

   Here, the remote purge switch can be enabled or disabled.

   - Constant Valid
     The purge operation is executed regardless of the robot's status.
     (Do not press the purge switch during a dispensing operation in a run. The robot will be unable to dispense correctly.)
   - Invalid During Operation
     The remote purge switch is disabled when the robot is running.
   - Constant Invalid
     The remove purge switch is disabled regardless of the robot's status.

7. Automatic Purge

   - Valid: When the current operation ends and after the robot returns to the work home position, the robot automatically executes the purge operation.
   - Invalid: The purge operation is only executed when the purge switch is pressed.

8. Auto Purge Cycle

   When [Automatic purge] is executed, if [Auto Purge Cycle] is set to execute once during the registered time period and [Auto Purge Time] for the dispenser is turned ON (purge execution), the auto purge operation is repeated until a run is started or until an emergency stop is executed.

9. Auto Purge Time
   When [Automatic purge] is executed, if [Auto Purge Cycle] is set to execute once during the registered time period and [Auto Purge Time] for the dispenser is turned ON (purge execution), the auto purge operation is repeated until a run is started or until an emergency stop is executed. When [Dispenser Mode] is set to [Timer], this setting is invalid. The time that is set for [Timer] on the dispenser becomes the ON time (purge execution) for the dispenser.

10. Evasion Points of Going Home (JS3 Series only)
    After stopping the robot during a run with an emergency stop, you can set the point to evade obstacles when returning from the position where the robot stopped to the work home.

■ Disabling the Purge Function
If the purging function is disabled, the responsiveness of the dispenser ON signal improves. Disable the purge function by modifying the settings as shown in the table below:

Dispenser Setting	Setting Value	Default Value
Dispenser Type	No Response Signal	No Response Signal
Dispenser Mode	Steady	Steady
Purge Switch (JR3000/JC-3 Series Only)	Constant invalid	Constant invalid
Purge by ext. signal	Constant invalid	Constant invalid
Automatic purge	Invalid	Invalid
Dispenser ON (I/O signal settings)	JR3000/JC-3 Series: Set to a sysOut or genOut signal number JS3 Series: sysOut or genOut or handOut signal number	JR3000 Series: sysOut10 JC-3/JS3 Series: genOut1

■ Dispense Device Error

For the JR3000 Series and JC-3 Series, when an error occurs, “Er” and the error number shown in the table below are lit and displayed alternately on the program number display of the front panel of the robot unit.

For the JS3 Series, “Er” and the error number shown in the table below are alternately lit and displayed on the program number display of the front of the controller, and the red LED (ERROR) blinks.

Error No.	Message	Countermeasure	Error Category

026	Dispense Device ON Error	Depending on the setting of [Dispenser Type], this error occurs in the following cases.
		• When [Dispenser Type] is [Busy Signal Operation]
		  • The Dispenser Response (Busy Signal Operation) is ON while the dispensing operation stops.
		  • After turning ON the dispenser signal, the Dispenser Response (Busy Signal Operation) does not turn ON even after 0.5 seconds have passed.
		• When [Dispenser Type] is [Finish Signal Operation]
		  • The Dispenser Response (Finish Signal Operation) is ON while the dispensing operation stops.
		The dispenser may be defective, or the robot and the dispenser may not be connected.
		Confirm the condition of the dispenser and the connection between the robot and the dispenser.
			Run Error

027*	Dispense Device OFF Error	This error occurs when the Dispenser Response (Busy Signal Operation) does not turn OFF within 0.5 seconds after turning OFF the dispenser signal. The dispenser may be defective, or the robot and the dispenser may not be connected. Confirm the condition of the dispenser and the connection between the robot and the dispenser.	Run Error

* Occurs only when [Dispenser Type] is set to [Busy Signal Operation]

3. TOOL DATA

Tool data is used to set the characteristics of each tool attached to the robot. If tool data is set according to the characteristics for tools such as the needle (dispensing syringe), camera, and height sensor, you can point each of the tool tips to the same location on a workpiece by simply switching among the tool data.

Tool data consists of settings for specifying the tool mass and the TCP.
The TCP (tool center point) is position related information for the tool tip.
The TCP values are calculated differently for 3-axis models and 4-axis models. The TCP values for 3-axis models are calculated according to the difference between the current tool tip position and the standard tool tip position. For 4-axis models, the TCP is calculated according to the distance from the R axis center to the tool tip.

Before registering a program, etc., match up the following settings to the methods and environment with which you will use the robot.

3.1 JR3000 Series (3-Axis Models)

The following settings are in Tool Data:
- Tool Mass (the mass affecting the Y axis)
- TCP-X: The X direction distance from the tool tip during teaching to the current tool tip
- TCP-Y: The Y direction distance from the tool tip during teaching to the current tool tip
- TCP-deltaZ: The Z direction distance from the tool tip height during teaching to the current tool tip height

The offset value for the offset from the tool tip is referred to as the tool center point (TCP).

■ Tool Mass
This [Tool Mass] refers to the total mass of the tool and of the object which the tool is holding. Make sure this mass is equal to or lower than the registered mass.

	Tool Mass			
	1	**2**	**3**	**4**
JR3200	1 kg	3.5 kg		
JR3300 – JR3600	1 kg	4 kg	7 kg	
JR3303F, JR3403F	1 kg	5 kg	10 kg	15 kg

NOTE: Mount tools so the center of gravity is within 50 mm of the attachment surface.

⚠ Caution

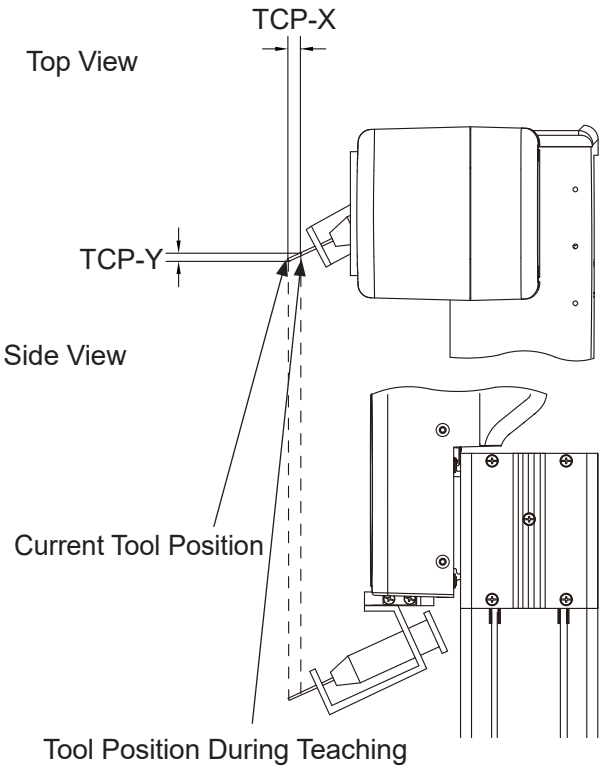
If the tool mass is heavier than the registered settings, a position error may occur.

■ TCP-X, TCP-Y

For 3 axis specifications, set [TCP-X] [TCP-Y] with the offset from the teaching tool position and the current tool position (the offset amount for the X direction and Y directions).

With [Direct TCP-XY Setting], you can automatically calculate (subtract) and set the offset by indicating a registered point when changing tools during teaching.

For 3 axis specifications, you do not need to set the [TCP-X] [TCP-Y] in advance. Teach with the 0,0 setting as is, and if there is a tool tip offset when you change tools, etc., set that difference for the first time then.



Tool Position During Teaching

■ TCP-deltaZ

After changing tools, etc., if the tool height is different from the registered tool center point position, enter the Z-direction difference to TCP-deltaZ.

Additionally, when using the additional function data [Tool Data], you can change tool data at intervals between specific points. For example, it is possible to change the registered tool mass settings for only the period of time it is gripping something.

3.2 JR3000 Series (4-Axis Models)

The following settings are in Tool Data:

- Tool Mass (mass affecting the Y axis)
- TCP-X: The X direction distance from the R axis center to the tool tip.
- TCP-Y: The Y direction distance from the R axis center to the tool tip.
- TCP-deltaZ: The Z direction distance from the tool tip height during teaching to the current tool tip height.

The offset value for the offset from the tool tip is referred to as the tool center point (TCP).

■ Tool Mass

[Tool Mass] refers to the total mass of the tool and of the object which the tool is holding. Make sure this mass is equal to or lower than the registered mass. The settings are as follows:

	Tool Mass		
	1	**2**	**3**
JR3200	1 kg	3.5 kg	
JR3300 – JR3600	1 kg	4 kg	7 kg

⚠ Caution

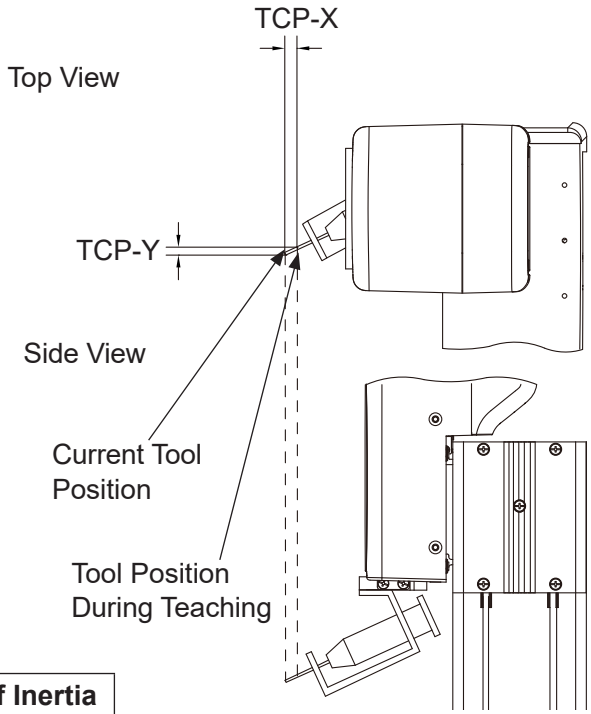
If the tool mass is heavier than the registered settings, a position error may occur.

■ TCP-X, TCP-Y

The TCP (tool center point) is the X and Y direction distance from the R axis center to the tool tip.

With [Direct TCP-XY Setting], you can automatically calculate and set the [TCP-X] [TCP-Y] values by indicating the same point twice with the tool tip (from different R-axis angles).

For 4 axes specifications, make sure to set tool data [TCP-X] [TCP-Y] before teaching programs. If you perform program teaching, etc., without setting tool data, you will have to repeat teaching all of the coordinates whenever you change tools.



If the tool exceeds the acceptable moment of inertia, a position error may occur.

	Acceptable Moment of Inertia
JR3200	65 kg/cm^2
JR3300 – JR3600	90 kg/cm^2

■ TCP-deltaZ

After changing the tool, etc., if the tool tip height is different from the registered tool center point position, enter the Z-direction difference to TCP-deltaZ.

Additionally, when using the additional function data [Tool Data], you can change tool data at intervals between specific points. For example, it is possible to change the registered tool mass settings for only the period of time it is gripping something.

3.2.1 Tool Data

In [Tool Data], the settable item [Direct TCP-XY Setting] is included for 4-axis models only.

3.3 JC-3 Series (2-Axis Models, 3-Axis Models)

The following settings are in Tool Data:

- Tool Mass (the mass affecting the Y axis)
- TCP-X: The X direction distance from the tool tip during teaching to the current tool tip
- TCP-Y: The Y direction distance from the tool tip during teaching to the current tool tip
- TCP-deltaZ: The Z direction distance from the tool tip height during teaching to the current tool tip height. (NOTE: 2 axis specifications do not have the TCP-deltaZ setting)

The offset value for the offset from the tool tip is referred to as the tool center point (TCP).

■ Tool Mass

This [Tool Mass] refers to the total mass of the tool and of the object which the tool is holding. Make sure this mass is equal to or lower than the registered mass.

Tool Mass (Fixed Value)			
2 Axes Single Sided	2 Axes Double Sided	3 Axes Single Sided	3 Axes Double Sided
4 kg	8 kg	4 kg	8 kg

NOTE: Mount tools so the center of gravity is within 50 mm of the attachment surface.

⚠ Caution

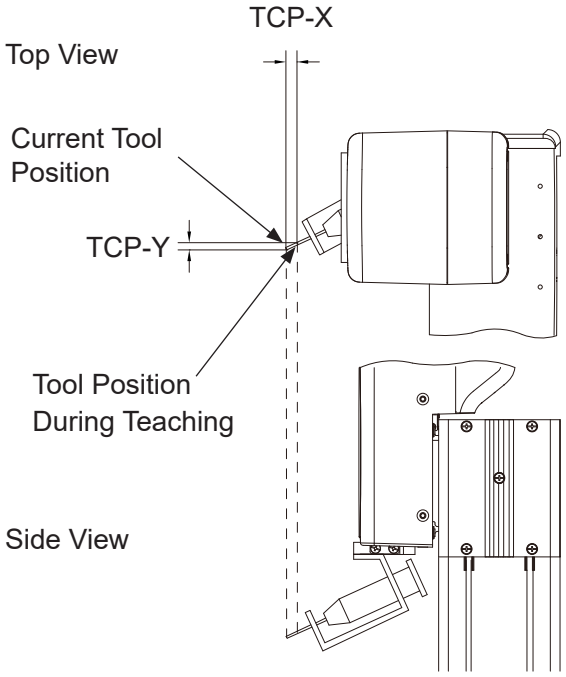
If the tool mass is heavier than the registered settings, a position error may occur.

■ TCP-X, TCP-Y

For 2 axis and 3 axis specifications, set [TCP-X] [TCP-Y] with the offset from the teaching tool position and the current tool position (the offset amount for the X direction and Y directions).

With [Direct TCP-XY Setting], you can automatically calculate (subtract) and set the offset by indicating a registered point when changing tools during teaching.

For 2 axis and 3 axis specifications, you do not need to set the [TCP-X] [TCP-Y] in advance. Teach with the 0,0 setting as is, and if there is a tool tip offset when you change tools, etc., set that difference for the first time then.



■ TCP-deltaZ

After changing tools, etc., if the tool height is different from the registered tool center point position, enter the Z-direction difference to TCP-deltaZ.

Additionally, when using the additional function data [Tool Data], you can change tool data at intervals between specific points. For example, it is possible to change the registered tool mass settings for only the period of time it is gripping something.

3.4 JC-3 Series (4-Axis Models)

The following settings are in Tool Data:

- Tool Mass (mass affecting the Y axis)
- TCP-X: The X direction distance from the R axis center to the tool tip
- TCP-Y: The Y direction distance from the R axis center to the tool tip
- TCP-deltaZ: The Z direction distance from the tool tip height during teaching to the current tool tip height.

The offset value for the offset from the tool tip is referred to as the tool center point (TCP).

■ Tool Mass

[Tool Mass] refers to the total mass of the tool and of the object which the tool is holding. Make sure this mass is equal to or lower than the registered mass. The settings are as follows:

	Tool Mass
4 Axes Double Sided	3 kg

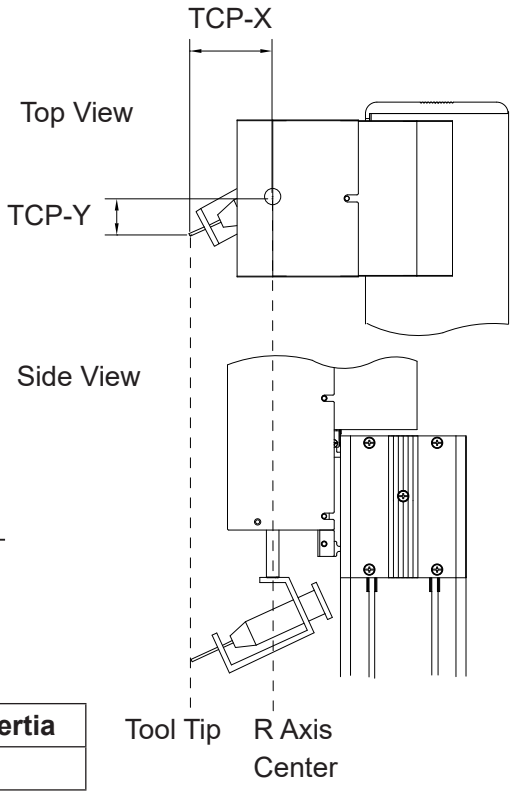
⚠ Caution

If the tool mass is heavier than the registered settings, a position error may occur.

■ TCP-X, TCP-Y

The TCP (tool center point) is the X and Y direction distance from the R axis center to the tool tip.
With [Direct TCP-XY Setting], you can automatically calculate and set the [TCP-X] [TCP-Y] values by indicating the same point twice with the tool tip (from different R-axis angles).

For 4 axes specifications, make sure to set tool data [TCP-X] [TCP-Y] before teaching programs. If you perform program teaching, etc., without setting tool data, you will have to repeat teaching all of the coordinates whenever you change tools.
If the tool exceeds the acceptable moment of inertia, a position error may occur.



If the tool exceeds the acceptable moment of inertia, a position error may occur.

	Allowable Moment of Inertia
4 Axes Double Sided	90 kg/cm^2

■ TCP-deltaZ

After changing the tool, etc., if the tool tip height is different from the registered tool center point position, enter the Z-direction difference to TCP-deltaZ.

Additionally, when using the additional function data [Tool Data], you can change tool data at intervals between specific points. For example, it is possible to change the registered tool mass settings for only the period of time it is gripping something.

3.4.1 Tool Data

In [Tool Data], the settable item [Direct TCP-XY Setting] is included for 4-axis models only.

3.5 JS3 Series (4-Axis Models)

The following settings are in Tool Data:

- Tool Mass (mass affecting the arm)
- TCP-X: The X (J1) direction distance from the R (J4) axis center to the tool center
- TCP-Y: The Y (J2) direction distance from the R (J4) axis center to the tool center
- TCP-deltaZ: The Z (J3) direction distance from the tool center height during teaching to the current tool center

The offset value for the offset from the tool center is referred to as the tool center point (TCP).

■ Tool Mass

[Tool Mass] refers to the total mass of the tool and of the object which the tool is holding. Make sure this mass is equal to or lower than the registered mass. The settings are as follows:

Model	Tool Mass		
	1	2	3
JS3	1 kg	3 kg	6 kg

⚠ Caution

If the tool mass is heavier than the registered settings, a position error may occur.

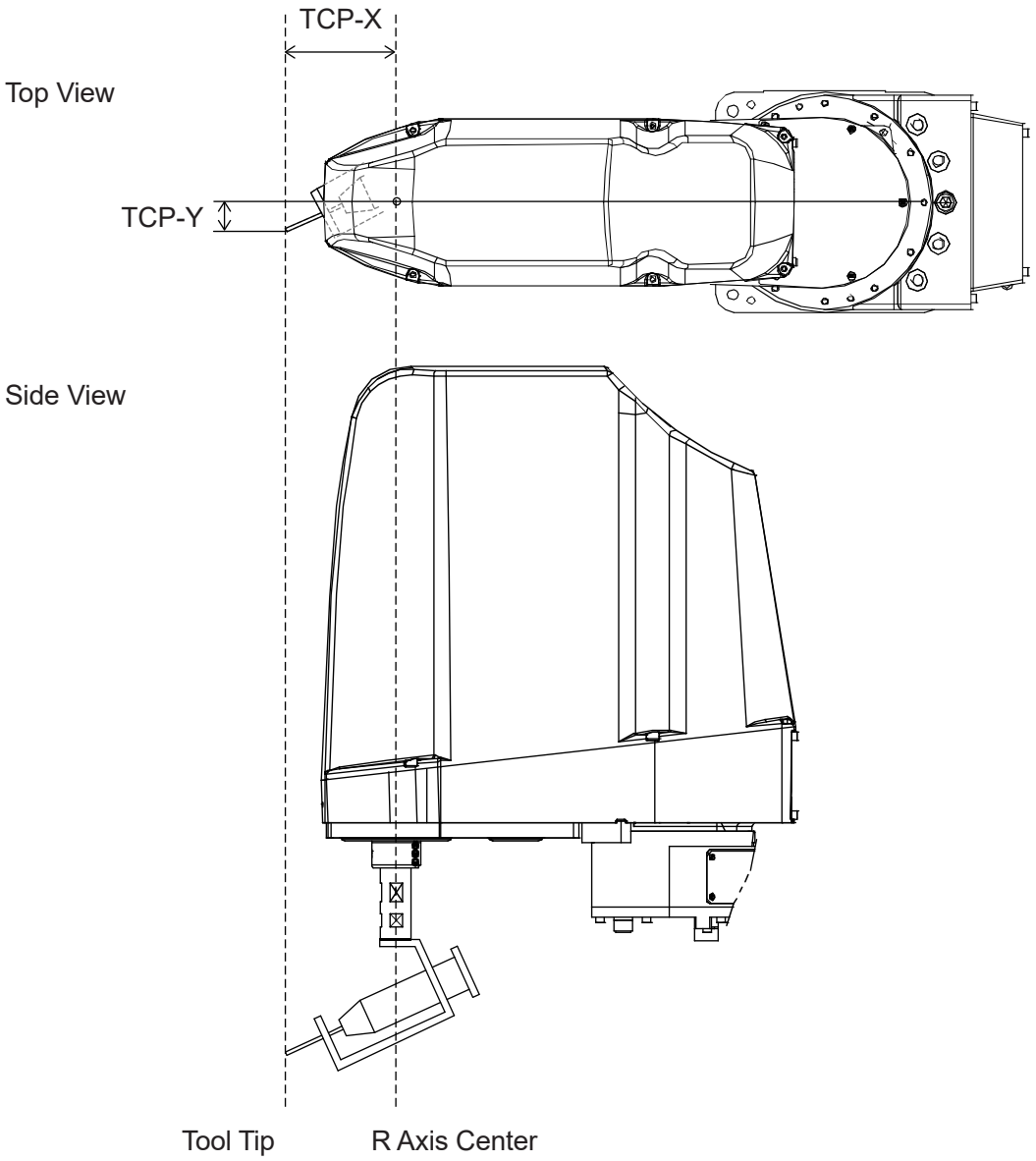
■ TCP-X, TCP-Y

The TCP (tool center point) is the X (J1) and Y (J2) direction distance from the R (J4) axis center to the tool tip.

With [Direct TCP-XY Setting], you can automatically calculate and set the [TCP-X] [TCP-Y] values by indicating the same point twice with the tool tip (from different R (J4) axis angles).

For 4 axes specifications, make sure to set tool data [TCP-X] [TCP-Y] before teaching programs. If you perform program teaching, etc., without setting tool data, you will have to repeat teaching all of the coordinates whenever you change tools.

If the tool exceeds the acceptable moment (0.12 kg/cm^2) of inertia, a position error may occur.



■ TCP-deltaZ

After changing the tool, etc., if the tool tip height is different from the registered tool center point position, enter the Z-direction difference to TCP-deltaZ.

Additionally, when using the additional function data [Tool Data], you can change tool data at intervals between specific points. For example, it is possible to change the registered tool mass settings for only the period of time it is gripping something.

3.5.1 Tool Data

In [Tool Data], the settable item [Direct TCP-XY Setting] is included for 4-axis models only.

3.6 Main Tool Configuration

The main tool refers to the primary tool used in job content and for jobs.
The syringe needle nozzle is considered the “main tool” with dispensing applications.

Set the tool data for the main tool (TCP, etc.), in [Main Tool Configuration].

TP MENU → [Main-Tool Configuration] → [Main TCP Setting]

PC Refer to the operation manual *PC Operation*.

The tool data set in [Main-Tool Configuration] is automatically set to dispensing related point types.
These point types are as follows:

- Point Dispense
- Start of Line Dispense*
- Start of Circle Dispense*
- Zigzag Start Point*
- Rectangular Spiral Start Point*
- Hollow Rectangle Start Point*
- Spiral Start Point*
- Hollow Spiral Start Point*

* The tool data is applied from the start point through to the end position of the CP movement.

4. CAMERA CONFIGURATION

The camera refers to a camera used for adjusting the positions of main tool point jobs in program runs. Configure the camera when you want to make position adjustments using a camera during program runs.

Set tool data and other such settings for the camera in [Camera Configuration].
For details regarding [Camera Configuration], refer to “1.3.6 Workpiece Adjustment Settings 2: Calibration (Match up the Robot and Camera Positioning)” in the operation manual *Camera & Sensor Functions* or “9.2 Camera Configuration” in the operation manual *PC Operation*.

5. I/O FUNCTIONS (JR3000 Series)

5.1 I/O-SYS Function Assignments

		Name	Function	Pin No.
Input	Ext	#sysIn1	Start/Free	1
		#sysIn2	Free/(B) Start Inhibition/(B) Stop-Start Inhibition/ (B) Software Interlock/(B) Urgent Stop/(A) Start Inhibition/ (A) Stop-Start Inhibition/(A) Software Interlock/(A) Urgent Stop	2
		#sysIn3	Program Number Load/Free	3
		#sysIn4	Program Number 1/Free	4
		#sysIn5	Program Number 2/Free	5
		#sysIn6	Program Number 4/Free	6
		#sysIn7	Program Number 8/Free	7
		#sysIn8	Program Number 16/Free	8
		#sysIn9	Program Number 32/Free	9
		#sysIn10	Program Number 64/Free	10
		#sysIn11	Last Work/Program Number 128/Error Reset/Initialize/Free	11
		#sysIn12	Temporary Stop/Temporary Stop - Single Point Run/ Program Number 256/Speed Limit/Free	12
	Var	#sysIn13	Dispenser Response/Program Number 512/Free	13
	Var	#sysIn14	Purge By External Signal/Free/(A) Start Inhibition/ (A) Stop-Start Inhibition/(A) Software Interlock/(A) Urgent Stop/ (B) Start Inhibition/(B) Stop-Start Inhibition/(B) Software Interlock/ (B) Urgent Stop	14
	Var	#sysIn15	X Needle Sensor/Last Work/Error Reset	15
	Var	#sysIn16	Y Needle Sensor/Temporary Stop	16
Output	Ext	#sysOut1	Ready for Start/Free	17
		#sysOut2	Robot Stopped/Free	18
		#sysOut3	Program Number ACK/Free	19
		#sysOut4	Program Number Error/Free	20
		#sysOut5	Running/Free	21
		#sysOut6	Error/Free	22
		#sysOut7	Emergency Stop/Free	23
		#sysOut8	Position Error/Free	24
		#sysOut9	Free	25
	Var	#sysOut10	Dispenser ON/Free	26
		#sysOut11	Free	27
		#sysOut12	Free/Finish Initialize	28
		#sysOut13	Free	29
		#sysOut14	Free	30
		#sysOut15	Free	31
		#sysOut16	Free	32
		N.C.	Not in use	33

		Name	Function	Pin No.
Others		COM +	DC 24 V	34
		COM -	GND	35
		COM -	GND	36
		COM -	GND	37

Ext: Activated only in External Run Mode.

Var: The arbitrary I/O function assignments can be changed. Change by selecting Teaching Mode → MENU key → [Dispenser] → [I/O Function Assignment].

NOTE: A type signals use positive logic and B type signals use negative logic.

5.1.1 Input

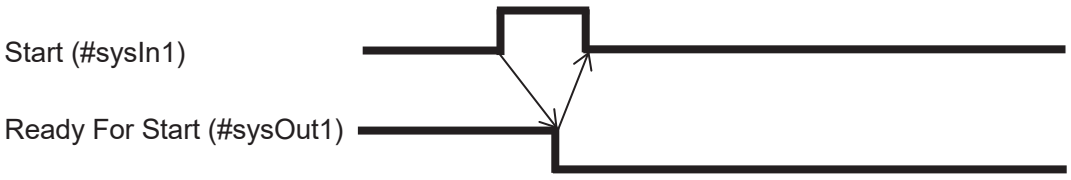
■ Start (#sysIn1)

Turn ON this signal to start or restart a program in External Run Mode. In addition, this signal is used for moving to the work home position coordinates. This signal is enabled when Ready to Start (#sysOut1) is ON.

The Start (#sysIn1) signal starts, or restarts running programs with the robot under any of the following conditions when the I/O-S input is ON:

(1) Waiting for program start at the work home position.
(2) Waiting for restart after a temporary stop.
(3) Waiting for restart after stopping at the wait start stop point.
(4) Waiting for start according to a point job *waitStart* command.

A Start (#sysIn1) signal with a pulse of 20 msec or less is invalid due to noise elimination.
A pulse width of 30 msec or wider is useable, however, rather than using time to establish the signal, we recommend using the action of the Ready for Start (#sysOut1) signal turning OFF as an acknowledgment signal (ACK signal). When waiting to start as described above, the Ready for Start Signal (#sysOut1) goes ON.
The Ready for Start (#sysOut1) turns OFF when the Start (#sysIn1) turns ON.



■ Free (#sysIn2)

The default for the #sysIn2 signal is Free.
This signal is useable as a free signal unless its function is changed in [I/O Function Assignment].

■ Start Inhibition (#sysIn2, #sysIn14)

This signal becomes a function to inhibit starts when Start Inhibition (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal. “(A) Start Inhibition” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Start Inhibition” (#sysIn2, #sysIn14) works when it is OFF (negative logic). For example, starts are inhibited if “(A) Start Inhibition” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (when the robot is stopped). Even if you try to start the robot, it will not move. When the Robot Stopped (#sysOut2) signal is OFF (when the robot is moving), this signal is invalid.

■ Stop – Start Inhibition (#sysIn2, #sysIn14)

This signal becomes a function to temporarily stop operation or inhibit start when Stop/Start Inhibition (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal. “(A) Stop - Start Inhibition” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Stop - Start Inhibition” (#sysIn2, #sysIn14) works when it is OFF (negative logic). For example, start is inhibited if “(A) Stop - Start Inhibition” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move. If you turn this signal ON when the Robot Stopped (#sysOut2) signal is OFF (when the robot is moving), the robot completes its current PTP movement and then holds. To restart, input a start signal after turning OFF this signal.

■ Software Interlock (#sysIn2, #sysIn14)

If Software Interlock (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment], this becomes a function to inhibit starts and make urgent stops during operation. You can select either type A or type B for this signal. “(A) Software Interlock” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Software Interlock” (#sysIn2, #sysIn14) works when it is OFF (negative logic). For example, starts are inhibited if “(A) Software Interlock” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.

If this signal is turned ON when the Robot Stopped (#sysOut2) signal is OFF (the robot is moving), the robot makes an urgent stop.

■ Urgent Stop (#sysIn2, #sysIn14)

When Urgent Stop (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment], this becomes a function for making urgent stops. You can select either type A or type B for this signal. “(A) Urgent Stop” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Urgent Stop” (#sysIn2, #sysIn14) works when it is OFF (negative logic).

For example, the robot makes an urgent stop if “(A) Urgent Stop” (#sysIn13) is ON in Run Mode.

■ Program Number Load (#sysIn3)

This signal directs the loading of program numbers. When this signal goes ON, Program Number (#sysIn 4 – 10) is loaded. This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid] and the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake].

■ Program Number 1 – 64 (#sysIn4 – #sysIn10)

You can specify program numbers by turning ON this signal.

Example: If you want to specify program number [67]:

67 = 64 (#sysIn10) +2 (#sysIn5) + 1 (#sysIn4) = Turn ON signals #sysIn10, #sysIn5 and #sysIn4.

This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid]. If the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)], start the program after specifying the program number with this signal.

If [Program Number Reading Format] is set to [Binary Code], specify the program number in binary code to this register.

If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the program number in BCD to this register. For further information, refer to “8.2.2 Program Number Reading Format” in the operation manual *Setup*.

NOTE: Refer to the following signal (Program Number (word) (#fbIn101) (Fieldbus) for how to specify Fieldbus program numbers.

■ Program Number (word) (#fbIn101) (Fieldbus)

You can specify program numbers in this word register.

This is valid if [Fieldbus] is set to [Valid] in [Change Program Number] in [Administration Settings Mode].

If [Program Number Switching Method] is set to [Load at Start (Fieldbus)], start the program after specifying the program number to this register.

If [Program Number Reading Format] is set to [Binary Code], specify the binary code’s program number to this register.

If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the BCD code’s program number to this register.

■ Last Work (#sysIn11)

When the Teaching Mode menu [Individual Program Settings] → [Cycle Mode] is set to [Continuous Playback], after finishing the last point, the robot moves to point 01 and repeats the operation. To end this function, end the program using a point job or turn this signal ON. This function is only valid at the point when the last point is finished (before moving). You cannot use this signal to terminate a program mid operation.

■ Error Reset (#sysIn11, #sysIn15)

If an error occurs when the robot is running programs, turn this signal ON to do an error reset. The program (run) is then terminated on the spot. In addition, the Error (#sysOut6) signal turns OFF when this signal is turned ON, so you can use Error (#sysOut6) as an ACK signal for this signal.

Another way to use this signal is when the robot is holding or the Ready for Start (#sysOut1) signal is output and the robot is waiting to start, you can turn ON this signal to reset the program's execution and terminate the program on the spot.

Program termination via this signal is enabled in the following situations:

1) The robot is stopped due to an error during a run.
2) The robot has stopped moving due to a hold and is awaiting a restart.
3) The robot is holding at a Wait Start Point and is awaiting a restart.
4) The robot is awaiting restart from a point job *waitStart* command.

■ Initialize (#sysIn11)

Turn this signal ON to mechanically initialize when the robot is in External Run Mode and waiting to run or temporarily stopped. If this signal is input when the robot is temporarily stopped, the robot mechanically initializes, performs the Job on Starting, and then ends the program.

For details regarding the execution of Run Mode jobs during mechanical initialization for each of the Run Modes, refer to "2.2.1 Run Mode Jobs" in the operation manual *Functions III.*

■ Program Number 128 (#sysIn11)

When ON, this signal enables you to specify program number 128 and higher.

■ Temporary Stop (#sysIn12)

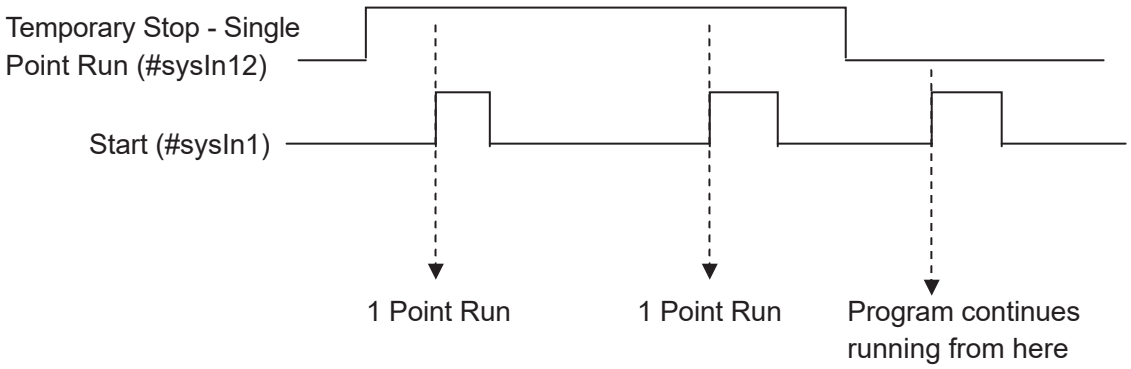
You can temporarily stop running programs by turning ON this signal. However, you cannot stop a CP movement while it is running. You can only hold at PTP points.

Also, when this signal is ON, start is inhibited.

■ Temporary Stop - Single Point Run (#sysIn12)

When running a program in External Run Mode, you can temporarily stop at the subsequent point by turning this signal ON. However, you cannot stop a CP movement while it is running. You can only stop at PTP points.

If you turn ON the Start (#sysIn1) signal while the Temporary Stop - Single Point Run (#sysIn12) signal is ON, 1 point is run.



■ Program Number 256 (#sysIn12)

When ON, this signal enables you to specify program number 256 and higher.

■ Speed Limit (#sysIn12)

You can limit the speed of the robot to 250 mm/s (safe speed) when in External Run Mode or Switch Run Mode by turning this signal ON.

■ Dispenser Response (#sysIn13)

This signal is invalid when [Dispenser Type] is set to [No Response Signal]. When set to [Busy Signal Operation], the robot determines it is dispensing when this signal is ON. When set to [Finish Signal Operation], the robot determines dispensing is finished when this signal is ON.

■ Program Number 512 (#sysIn13)

When ON, this signal enables you to specify program number 512 and higher.

■ Purge by Ext. Signal (#sysIn14)

The default status for the #sysIn14 signal is [Purge by ext. signal].

If a remote purge switch is connected to I/O-SYS #sysIn14, press the purge switch to turn ON dispensing, release the switch to turn dispensing OFF. For further details, refer to “17.1.2 Purge by Ext. Signal (#sysIn14)”.

■ X Needle Sensor (#sysIn15)
If the nozzle is at the [X Needle/4 Axis TCP Measure Point 1], this signal is OFF.
This signal is also OFF if the X sensor is blocked (X_LED is OFF) with Needle Adjuster 2 (3-axis models); or the X axis sensor is blocked with needle adjuster functions (4-axis models).
This signal is normally ON at all other times.

■ Y Needle Sensor (#sysIn16)
If the nozzle is at the [Y Needle/4 Axis TCP Measure Point 2], this signal is OFF.
This signal is also OFF if the Y sensor is blocked (Y_LED is OFF) with Needle Adjuster 2. (3-axis models); or the Y axis sensor is blocked with needle adjuster functions (4-axis models).
This signal is normally ON at all other times.

5.1.2 Output

■ Ready for Start (#sysOut1)
When the robot is ready to start, this signal comes ON.

This occurs in the following situations:

(1) Mechanical initialization standby when the power is turned ON.
(2) Mechanical initialization standby after an emergency stop and emergency stop cancellation.
(3) Waiting for program start at the work home position.
(4) Waiting for restart after a temporary stop.
(5) Waiting for restart after stopping at the wait start stop point.
(6) Waiting for start due to a point job *waitStart* command.

If the Running (#sysOut5) signal is OFF, the robot is under conditions 1, 2 or 3.

Also, when the Ready for Start (#sysOut1) signal is ON, the Robot Stopped (#sysOut2) signal is always also ON. However, this is not so for the reverse. If the robot is stopped because it is waiting for a signal, then the Robot Stopped (#sysOut2) signal is ON, but the Ready for Start (#sysOut1) signal will not come ON.

■ Robot Stopped (#sysOut2)
When the robot is stopped this signal is ON, when the robot is moving, it is OFF. If you turn the “(A) Software Interlock” (#sysIn2, #sysIn14) signal ON when this signal is ON (the robot is stopped), start is inhibited. Even if you try to start the robot, it will not move.
If you turn the “(A) Software Interlock” (#sysIn2, #sysIn14) signal ON when this signal is OFF (the robot is moving), it will make an urgent stop.

■ Program Number ACK (#sysOut3)
This is a response signal for Program Number Load (#sysIn3). When you turn Program Number Load (#sysIn3) ON, this signal comes ON after Program Number (#sysIn4 – #sysIn10) is loaded. If Program Number Load (#sysIn3) goes OFF, this signal also goes OFF.

■ Program Number Error (#sysOut4)
This signal goes ON when you specify an unregistered program number in Switch Run/ External Run Mode.

■ Running (#sysOut5)
When you start to run a program this signal goes ON. When the program finishes it goes OFF.

■ Error (#sysOut6)
This signal comes ON when an error occurs.

■ Emergency Stop (#sysOut7)
This signal comes ON when an “Emergency Stop Error” occurs (due to the emergency stop switch being pressed, etc.). When this signal is ON, the Error (#sysOut6) signal comes ON at the same time.

■ Position Error (#sysOut8)
If the Teaching Mode menu [All Program Common Settings] → [Other Parameters] → [Position Error Check] is set to [Valid], the position sensor checks the position error just before the robot completes a run (before returning to the work home position). This signal turns ON if a position error is detected.

■ Dispenser ON(#sysOut10)
This is a signal to turn the dispenser ON (execute dispensing).

■ Finish Initialize (#sysOut12)
This signal is ON when mechanical initialization is complete. This signal stays ON except when mechanical initialization is required due to an emergency stop error, etc.

■ Free (#sysOut9, #sysOut11 – 16)
The default for the #sysOut9, #sysOut11 – 16 signals is Free.
These signals are useable as free signals unless their functions are changed in [I/O Function Assignment].

5.2 I/O-1 Function Assignment

	Name	Function	Pin No.
Input	#genIn1	Free	1
	#genIn2	Free	2
	#genIn3	Free	3
	#genIn4	Free	4
	#genIn5	Free	5
	#genIn6	Free	6
	#genIn7	Free	7
	#genIn8	Free	8
Output	#genOut1	Free	9, 10
	#genOut2	Free	11, 12
	#genOut3	Free	13, 14
	#genOut4	Free	15, 16
	#genOut5	Free	17
	#genOut6	Free	18
	#genOut7	Free	19
	#genOut8	Free	20
Others	COM+	DC 24 V	21
	COM+	DC 24 V	22
	COM-	GND	23
		GND	24

5.3 I/O Polarity

There are two types of I/O polarity: NPN specifications and PNP specifications. After confirming your robot's polarity specifications, always connect tools, etc., which are compatible with these specifications.
The robot's I/O polarity can be confirmed on the I/O polarity nameplate.
For further details, refer to the operation manual *External Control*.

- COM+ (DC 24 V)
  If I/O-SYS is using an external power supply, connect the COM+ pin to the plus pole of the external power supply (DC 24 V).
  If I/O-SYS is using the internal power supply, DC 24 V (+) is output.

- COM- (GND)
  If I/O-SYS is using an external power supply, connect the COM- pin to the external power supply ground.
  If I/O-SYS is using the internal power supply, use the pin as a common ground.

⚠ Caution

When I/O-SYS is using the internal power supply, do not connect the robot to an external power supply. Doing so causes unit breakdown.

5.4 Other

For details regarding Fieldbus, refer to the operation manual *External Control.*

6. I/O FUNCTIONS (JC-3 Series)

6.1 I/O-SYS Function Assignments

		Name	Function	Pin No.
Input	Ext	#sysIn1	Start/Free	1
	Ext	#sysIn2	Mechanical Initialize/Free	2
	Ext	#sysIn3	Go Home/Free	3
		#sysIn4	Reset/Free	4
		#sysIn5	Program Number Load/Free	5
		#sysIn6	Program Number 1/Free	6
		#sysIn7	Program Number 2/Free	7
		#sysIn8	Program Number 4/Free	8
		#sysIn9	Program Number 8/Free	9
		#sysIn10	Program Number 16/Free	10
		#sysIn11	Program Number 32/Free	11
		#sysIn12	Program Number 64/Free	12
		#sysIn13	Last Work/Free/Program Number 128/(A) Start Inhibition/ (A) Stop-Start Inhibition/(A) Software Interlock/(A) Urgent Stop/ (B) Start Inhibition/(B) Stop-Start Inhibition/(B) Software Interlock/ (B) Urgent Stop	13
		#sysIn14	Temporary Stop/Free/Program Number 256/(A) Start Inhibition/ (A) Stop-Start Inhibition/(A) Software Interlock/(A) Urgent Stop/ (B) Start Inhibition/(B) Stop-Start Inhibition/(B) Software Interlock/ (B) Urgent Stop	14
		#sysIn15	Free/Program Number 512/(B) Start Inhibition/ (B) Stop-Start Inhibition/(B) Software Interlock/(B) Urgent Stop/ (A) Start Inhibition/(A) Stop-Start Inhibition/(A) Software Interlock/ (A) Urgent Stop	15
		#sysIn16	Free	16
Output	Ext	#sysOut1	Ready for Start/Free	17
		#sysOut2	Finish Initialize/Free	18
		#sysOut3	Home/Free	19
		#sysOut4	Program Number ACK/Free	20
		#sysOut5	Program Number Error/Free	21
		#sysOut6	Running/Free	22
		#sysOut7	Robot Stopped/Free	23
		#sysOut8	Error/Free	24
		#sysOut9	Emergency Stop/Free	25
		#sysOut10	Free	26
		#sysOut11	Request Initialize/Free	27

		Name	Function	Pin No.
Output		#sysOut12	Request Work Home/Free	28
		#sysOut13	Free	29
		#sysOut14	Free/Teaching Mode	30
		#sysOut15	Free/Switch Run Mode	31
		#sysOut16	Free/Ext-Run Mode	32
		N.C.	Not in use	33
Others		COM +	DC 24 V	34
		COM -	GND	35
		COM -	GND	36
		COM -	GND	37

Ext: Activated only in External Run Mode.

NOTE: A type signals use positive logic and B type signals use negative logic.

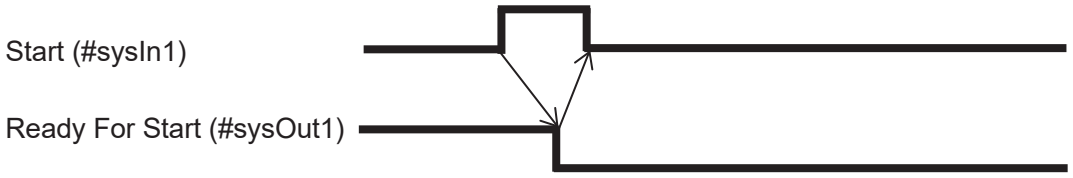
6.1.1 Input

- Start (#sysIn1)
  Turn ON this signal to start or restart a program in External Run Mode. In addition, this signal is used for moving to the work home position coordinates. This signal is enabled when Ready to Start (#sysOut1) is ON.

  The Start (#sysIn1) starts, or restarts running programs with the robot under any of the following conditions when the EMG OUT input is ON and when Start is not inhibited by the Start Inhibition (#sysIn13 – 15) signal in External Run Mode:

  (1) Waiting for program start at the work home position.
  (2) Waiting for restart after a temporary stop.
  (3) Waiting for restart after stopping at the wait start stop point.
  (4) Waiting for start according to a point job *waitStart* command.

  A Start (#sysIn1) signal with a pulse of 20 msec or less is invalid due to noise elimination. A pulse width of 30 msec or wider is useable, however, rather than using time to establish the signal, we recommend using the action of the Ready for Start (#sysOut1) signal turning OFF as an acknowledgment signal (ACK signal). When waiting to start as described above, the Ready for Start Signal (#sysOut1) goes ON.
  The Ready for Start (#sysOut1) turns OFF when the Start (#sysIn1) turns ON.



- Initialize (#sysIn2)
  Turn this signal ON to start mechanical initialization in External Run Mode.

- Go Home (#sysIn3)
  Turn this signal ON to move the axes to the work home position coordinates in External Run Mode.

- Reset (#sysIn4)
  If an error occurs when the robot is running programs, turn this signal ON to do an error reset. The program (run) is then terminated on the spot. In addition, the Error (#sysOut8) signal turns OFF when this signal is turned ON, so you can use Error (#sysOut8) as an ACK signal for this signal. Another way to use this signal is when the robot is holding or the Ready for Start (#sysOut1) signal is output and the robot is waiting to start, you can turn ON this signal to reset the program's execution and terminate the program on the spot.
  Program termination via this signal is enabled in the following situations:
  (1) The robot is stopped due to an error during a run.
  (2) The robot has stopped moving due to a hold and is awaiting a restart.
  (3) The robot is holding at a Wait Start Point and is awaiting a restart.
  (4) The robot is awaiting restart from a point job *waitStart* command.

- Program Number Load (#sysIn5)
  This signal directs the loading of program numbers. When this signal goes ON, Program Number (#sysIn6 – 12) is loaded. This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid] and the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake].

NOTE: The program number specification method slightly varies with I/O-SYS and Fieldbus.

- Program Number 1 – 64 (#sysIn6 – #sysIn12) (I/O-SYS)
  You can specify program numbers by turning ON this signal.
  Example: If you want to specify program number [67]:
  67 = 64 (#sysIn12) + 2 (#sysIn7) + 1 (#sysIn6,) = Turn ON signals #sysIn12, #sysIn7 and #sysIn6.
  This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid]. If the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)], start the program after specifying the program number with this signal.
  If [Program Number Reading Format] is set to [Binary Code], specify the program number in binary code to this register.
  If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the program number in BCD to this register. For further information, refer to "7.4.2 Setting Program Numbers" in the operation manual *Setup*.

NOTE: Refer to the signal below (Program Number (word) (#fbIn101) (Fieldbus) for details on how to specify program numbers from a Fieldbus.

- Program Number (word) (#fbIn101) (Fieldbus)
  You can specify program numbers in this word register.
  This is valid if [Fieldbus] is set to [Valid] in [Change Program Number] in [Administration Settings Mode].
  If [Program Number Switching Method] is set to [Load at Start (Fieldbus)], start the program after specifying the program number to this register.
  If [Program Number Reading Format] is set to [Binary Code], specify the binary code's program number to this register.
  If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the BCD code's program number to this register.

- Last Work (#sysIn13)
  When the Teaching Mode menu [Individual Program Settings] → [Cycle Mode] is set to [Continuous Playback], after finishing the last point, the robot moves to point 01 and repeats the operation. To end this function, end the program using a point job or turn this signal ON. This function is only valid at the point when the last point is finished (before moving). You cannot use this signal to terminate a program mid operation.

- Program Number 128 (#sysIn13)
  When ON, this signal enables you to specify program number 128 and higher.

- Start Inhibition (#sysIn13 – 15)
  This signal becomes a function to inhibit starts when Start Inhibition (#sysIn13 – 15) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal.
  "A Start Inhibition" (#sysIn13 – 15) works when it is ON (positive logic), and "B Start Inhibition" (#sysIn13 – 15) works when it is OFF (negative logic). For example, starts are inhibited if "A Start Inhibition" (#sysIn13) is ON and the Robot Stopped (#sysOut7) signal is ON (when the robot is stopped). Even if you try to start the robot, it will not move. When the Robot Stopped (#sysOut7) signal is OFF (when the robot is moving), this signal is invalid.

- Stop – Start Inhibition (#sysIn13 – 15)
  This signal becomes a function to temporarily stop operation or inhibit start when Stop/Start Inhibition (#sysIn13 – 15) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal. “(A) Stop - Start Inhibition” (#sysIn13 – 15) works when it is ON (positive logic), and “(B) Stop - Start Inhibition” (#sysIn13 – 15) works when it is OFF (negative logic).
  For example, start is inhibited if “(A) Stop - Start Inhibition” (#sysIn13) is ON and the Robot Stopped (#sysOut7) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.
  If you turn this signal ON when the Robot Stopped (#sysOut7) signal is OFF (when the robot is moving), the robot completes its current PTP movement and then holds. To restart, input a start signal after turning OFF this signal.

- Software Interlock (#sysIn13 – 15)
  If Software Interlock (#sysIn13 – 15) is set in [I/O-SYS Function Assignment], this becomes a function to inhibit starts and make urgent stops during operation. You can select either type A or type B for this signal. “(A) Software Interlock” (#sysIn13 – 15) works when it is ON (positive logic), and “(B) Software Interlock” (#sysIn13 – 15) works when it is OFF (negative logic).
  For example, starts are inhibited if “(A) Software Interlock” (#sysIn13) is ON and the Robot Stopped (#sysOut7) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.
  If this signal is turned ON when the Robot Stopped (#sysOut7) signal is OFF (the robot is moving), the robot makes an urgent stop.

- Urgent Stop (#sysIn13 – 15)
  When Urgent Stop (#sysIn13 – 15) is set in [I/O-SYS Function Assignment], this becomes a function for making urgent stops. You can select either type A or type B for this signal. “(A) Urgent Stop” (#sysIn13 – 15) works when it is ON (positive logic), and “(B) Urgent Stop” (#sysIn13 – 15) works when it is OFF (negative logic).
  For example, the robot makes an urgent stop if “(A) Urgent Stop” (#sysIn13) is ON in Run Mode.

- Temporary Stop (#sysIn14)
  You can temporarily stop running programs by turning ON this signal. However, you cannot stop a CP movement while it is running. You can only hold at PTP points.
  Also, when this signal is ON, start is inhibited.

- Program Number 256 (#sysIn14)
  When ON, this signal enables you to specify program number 256 and higher.

- Program Number 512 (#sysIn15)
  When ON, this signal enables you to specify program number 512 and higher.

- Free (#sysIn15, #sysIn16)
  The default for the #sysIn15, #sysIn16 signals are Free.
  These signals are useable as free signals unless their functions are changed in [I/O-SYS Function Assignment].

6.1.2 Output

- Ready for Start (#sysOut1)
  When the robot is ready to start, this signal comes ON.
  This happens in the following circumstances:

  1. Mechanical initialization standby when the power is turned ON.
  2. Mechanical initialization standby after an emergency stop and emergency stop cancellation.
  3. Waiting for program start at the work home position.
  4. Waiting for restart after a temporary stop.
  5. Waiting for restart after stopping at a wait start stop point.
  6. Waiting to start due to a point job *waitStart* command.

  If the Running (#sysOut6) signal is OFF, the robot is in any of the conditions 1, 2 or 3.

  When the Ready for Start (#sysOut1) signal is ON, the Robot Stopped (#sysOut7) signal is also ON. However, this is not so for the reverse. If the robot is stopped because it is waiting for a signal, then the Robot Stopped (#sysOut7) signal will be ON, but the Ready for Start (#sysOut1) signal will not go ON.

- Finish Initialize (#sysOut2)
  This signal is ON when mechanical initialization is complete. This signal stays ON except when mechanical initialization is required due to an emergency stop error, etc.

- Home (#sysOut3)
  This signal is ON while the axes are at the work home position in Switch Run Mode or External Run Mode.

- Program Number ACK(#sysOut4)
  This is a response signal for Program Number Load (#sysIn5). When you turn Program Number Load (#sysIn5) ON, this signal comes ON after Program Number (#sysIn6 – #sysIn12) is loaded. If Program Number Load (#sysIn5) goes OFF, this signal also goes OFF.

- Program Number Error(#sysOut5)
  This signal goes ON when you specify an unregistered program number in Switch Run/External Run Mode.

- Running (#sysOut6)
  When you start to run a program this signal goes ON. When the program finishes it goes OFF.

- Robot Stopped (#sysOut7)
  When the robot is stopped, this signal is ON, when the robot is moving, it is OFF. When this signal is ON (when the robot is stopped), starts are inhibited if you turn the “(A) Software Interlock” (#sysIn13 – 15) signal ON. Even if you try to start the robot, it will not move.
  When this signal is OFF (when the robot is moving), the robot will make an urgent stop if you turn the “(A) Software Interlock” (#sysIn13 – 15) signal ON.

- Error (#sysOut8)
  This signal comes ON when an error occurs.

- Emergency Stop (#sysOut9)
  This signal comes ON when an “Emergency Stop Error” occurs (due to the emergency stop switch being pressed, etc.). When this signal is ON, the Error (#sysOut8) signal comes ON at the same time.

- Free (#sysOut10, 13 – 16)
  The default for the #sysOut10, 13 – 16 signals are Free. These signals are useable as free signals unless their functions are changed in [I/O-SYS Function Assignment].

- Request Initialize (#sysOut11)
  This signal comes ON when you turn ON the robot or release the emergency stop.
  The message “Press Initialize Switch” (in Run Mode), “Input Initialize Signal” (in External Run Mode), or “Press F4 key with Enable-Switch” (in Teaching Mode) will be displayed on the teaching pendant LCD.

- Request Work Home (#sysOut12)
  When you turn ON the robot or release the emergency stop, this signal comes ON once mechanical initialization is complete. However, if [Initialize] is set to [Work Home After Initialize] or [Work Home on Start], the signal will not come ON when the power is turned ON.

- Teaching Mode (#sysOut14)
  This signal comes ON when in Teaching Mode.

- Switch Run Mode (#sysOut15)
  This signal comes ON when in Switch Run Mode.

- Ext-Run Mode (#sysOut16)
  This signal comes ON when in External Run Mode.

■ Others

- COM+ (DC 24 V)
  If I/O-SYS is using an external power supply, connect the COM+ pin to the plus pole of the external power supply (DC 24 V). If I/O-SYS is using the internal power supply, DC 24 V (+) is output.

- COM− (GND)
  If I/O-SYS is using an external power supply, connect the COM- pin to the external power supply ground. If I/O-SYS is using the internal power supply, use the pin as a common ground.

⚠ Caution

When I/O-SYS is using the internal power supply, do not connect the robot to an external power supply. Doing so causes unit breakdown.

6.2 I/O-1 Function Assignment

		Name	Function	Pin No.
Input	Var	#genIn1	Dispenser Response	1
		#genIn2	Purge by ext. signal	2
		#genIn3	Free	3
		#genIn4	Free	4
		#genIn5	Free	5
		#genIn6	Free	6
		#genIn7	X Needle Sensor	7
		#genIn8	Y Needle Sensor	8
Output	Var	#genOut1	Dispenser ON	9, 10
		#genOut2	Free	11, 12
		#genOut3	Free	13, 14
		#genOut4	Free	15, 16
		#genOut5	Free	17
		#genOut6	Free	18
		#genOut7	Free	19
		#genOut8	Free	20
Others		COM+	Free	21
		COM+	Free	22
		COM-	Free	23
		COM-	Free	24
		N.C.	DC 24 V	25

Var: The signal being used can be changed (to I/O-SYS for example) via [I/O Function Assignment].

NOTE: The signals on the next page are unique to Dispensing Specifications.

6.2.1 Input

- Dispenser Response (#genIn1)
  This signal is invalid when [Dispenser Type] is set to [No Response Signal]. When set to [Busy Signal Operation], the robot determines it is dispensing when this signal is ON. When set to [Finish Signal Operation], the robot determines dispensing is finished when this signal is ON.

- Purge by ext. Signal (#genIn2)
  The default status for the #genIn2 signal is [Purge by Ext. Signal].
  If a remote purge switch is connected to #genIn2 of I/O-1, press the purge switch to turn ON dispensing, release the switch to turn dispensing OFF. For further details, refer to “17.3.2 Purge by Ext. Signal (#genIn2)”.

- X Needle Sensor (#genIn7)
  If the nozzle is at the [X Needle/4 Axis TCP Measure Point 1], this signal is OFF.
  This signal is also OFF if the X sensor is blocked (X_LED is OFF) with Needle Adjuster 2 (3 axis specifications); or the X axis sensor is blocked with needle adjuster functions (4 axis specifications).
  This signal is normally ON at all other times.

- Y Needle Sensor (#genIn8)
  If the nozzle is at the [Y Needle/4 Axis TCP Measure Point 2], this signal is OFF.
  This signal is also OFF if the Y sensor is blocked (Y_LED is OFF) with Needle Adjuster 2 (3 axis specifications); or the Y axis sensor is blocked with needle adjuster functions (4 axis specifications).
  This signal is normally ON at all other times.

6.2.2 Output

- Dispenser ON (#genOut1)
  This is a signal to turn the dispenser ON (execute dispensing).
  However, when [Dispenser Type] is set to [Busy Signal Operation], this is an exception for point dispensing only. For further details, refer to “8. TIMING CHARTS”.

6.3 I/O Polarity

There are two types of I/O polarity: NPN specifications and PNP specifications. After confirming your robot's polarity specifications, always connect tools, etc., which are compatible with these specifications. The robot's I/O polarity can be confirmed on the I/O polarity nameplate.
For further details, refer to the operation manual *External Control*.

- COM+ (DC 24 V)
  If I/O-SYS is using an external power supply, connect the COM+ pin to the plus pole of the external power supply (DC 24 V).
  If I/O-SYS is using the internal power supply, DC 24 V (+) is output.

- COM- (GND)
  If I/O-SYS is using an external power supply, connect the COM- pin to the external power supply ground.
  If I/O-SYS is using the internal power supply, use the pin as a common ground.

⚠ Caution

When I/O-SYS is using the internal power supply, do not connect the robot to an external power supply. Doing so causes unit breakdown.

6.4 Other

For details regarding Fieldbus (optional), refer to the operation manual *External Control*.

7. I/O FUNCTIONS (JS3 Series)

7.1 I/O-SYS Function Assignments

	Name	Function	Pin No.
Emergency Stop Input		Emergency stop switch contact 1 terminal 1 input	1
		Emergency stop switch contact 1 terminal 2 input	2
		Emergency stop switch contact 2 terminal 1 input	3
		Emergency stop switch contact 2 terminal 2 input	4
		N.C.	5
		N.C.	6
Input	#sysIn1	Start / Free	7
	#sysIn2	Go Home / Free	8
	#sysIn3	Reset / Free	9
	#sysIn4	Program Number Load / Free	10
	#sysIn5	Program Number 1 / Free	11
	#sysIn6	Program Number 2 / Free	12
	#sysIn7	Program Number 4 / Free	13
	#sysIn8	Program Number 8 / Free	14
	#sysIn9	Program Number 16 / Free	15
	#sysIn10	Program Number 32 / Free	16
	#sysIn11	Program Number 64 / Free	17
	#sysIn12	Program Number 128 / Free	18
	#sysIn13	Last Work / Program Number 256 / Free	19
	#sysIn14	Free / Start Inhibition / Stop - Start Inhibition / Software Interlock / Urgent Stop / Program Number 512	20
	#sysIn15	Motor Power ON / Free	21

	Name	Function	Pin No.
Output	#sysOut1	Ready for Start / Free	22
	#sysOut2	Work Home / Free	23
	#sysOut3	Program Number ACK / Free	24
	#sysOut4	Program Number Error / Free	25
	#sysOut5	Running / Free	26
	#sysOut6	Robot Stopped / Free	27
	#sysOut7	Error / Free	28
	#sysOut8	Emergency Stop / Free	29
	#sysOut9	Motor Power OFF / Free	30
	#sysOut10	In Cycle / Free	31
	#sysOut11	Operation Mode Code 1 (Run Mode) / Green LED / Free	32
	#sysOut12	Operation Mode Code 2 (Teaching Mode) / Red LED / Free	33
	#sysOut13	Start Source Code 1 (I/O-SYS start channel) / Free	34
	#sysOut14	Start Source Code 2 (COM1 / Ethernet / Fieldbus start channel) / Maintenance Forecast / Free	35
Other	COM+	DC 24 V	36
	COM -	24 V GND	37

7.1.1 Input

■ Start (#sysIn1)

Turn ON this signal when you want to start or restart a program in Run Mode.

This signal can be activated when both the Ready for Start (#sysOut1) and Start Source Code 1 (I/O-SYS start channel) (#sysOut13) signals are ON. The program starts running (In Cycle (#sysOut10) is OFF) or restarts (In Cycle (#sysOut10) is ON) when this signal is turned ON.

⚠ Danger

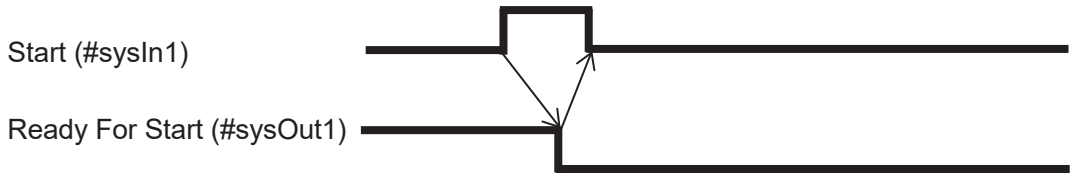
When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.

Entering the safety guards could result in injury.

When in Run Mode and starts are not prohibited by the Start Inhibition (#sysIn2) signal, the Start (#sysIn1) signal starts or restarts running programs with the robot under any of the following conditions when the I/O-S input is ON:

(1) Waiting for program start at the work home position.
(2) Waiting for restart after a temporary stop.
(3) Waiting for start according to a point job *waitStart* command.

A Start (#sysIn1) signal with a pulse of 20 msec or less is invalid due to noise elimination. A pulse width of 30 msec or wider is usable, however, rather than using time to acknowledge the signal, we recommend using the OFF edge of the Ready for Start (#sysOut1) signal as an acknowledgment signal (ACK signal).
When waiting to start as described above, the Ready for Start signal (#sysOut1) is ON.
The Ready for Start (#sysOut1) signal turns OFF when the Start (#sysIn1) signal turns ON.



■ Go Home (#sysIn2)

This signal can be activated when both the Ready for Start (#sysOut1) and Start Source Code 1 (I/O-SYS start channel) (#sysOut13) signals are ON. When this signal comes ON, the robot moves to the work home. This signal can be activated when the robot is temporarily stopped, even during a run cycle. Note however that if this signal is activated during a run cycle, the point number is not reset (the program is not reset to the start) after the robot moves to the work home. Unless however, Teaching Mode Menu → [All Program Common Settings] → [Point Reset Settings] → [Reset at Going Home] is enabled, then the point is reset when the robot moves to the work home.
While the robot is returning to the home position, the Ready for Start (#sysOut1) and Stopped (#sysOut6) signals are OFF and Running (#sysOut5) is ON.
While the robot is returning to the work home position, the Running (#sysOut5) signal is OFF and Work Home (#sysOut2) and Stopped (#sysOut6) are ON. The Ready for Start (#sysOut1) signal also turns ON.

■ Reset (#sysIn3)

The Reset (#sysIn3) signal resets points and run errors.

A “point reset” resets the run to point number 1. This is also known as returning the run to the start of the cycle.

If you turn this signal ON while the robot is temporarily stopped (during a run cycle), the point number is reset (to 1) without completing the remaining run cycle.

If you turn this signal ON after a run error, the error is reset (the error output signal goes OFF). The point number is also reset (to 1) when the error is reset.

However, this signal does not reset system errors, such as those caused by a hardware or mechanical failure. If a system error occurs, turn the robot OFF and correct the cause of the fault.

⚠ Caution

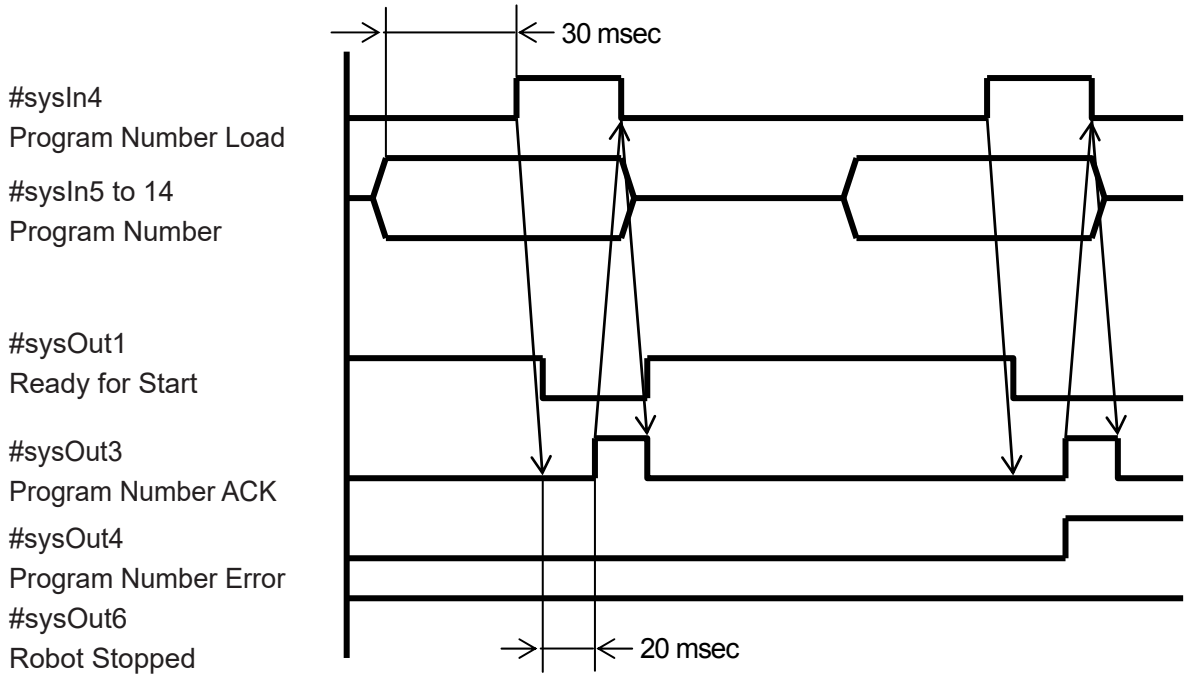
Do not start a run while the error reset is processing.

■ Program Number Load (#sysIn4)

This signal directs the loading of program numbers. When this signal goes ON, Program Number (#sysIn5 to 14) is loaded. This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid] and the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake].

- You can only change program numbers when the robot is stopped. Make sure that the Robot Stopped (#sysOut6) signal is ON.
- Set the program number you want to use to one of the Program Number (#sysIn5 to #sysIn14) signals in advance.
- After this signal is stabilized, switch the Program Number Load (#sysIn4) signal ON. After receiving a stable transmission of a Program Number signal (the signal stays ON for 20 msec), the robot loads the program number and turns ON the Program Number ACK (#sysOut3) signal. The Start (sysIn1) signal cannot be activated when the robot is processing the program number or processing the Program Number ACK signal output.
- After the Program Number ACK (#sysOut3) signal comes ON, switch the Program Number Load (#sysIn4) signal OFF. The robot turns OFF the Program Number ACK (#sysOut3) signal when the Program Number Load (#sysIn4) signal goes OFF, completing the program number change.

NOTE: The program number specification method slightly varies with I/O-SYS and Fieldbus.



■ Program Number 1 to 512 (#sysIn5 to #sysIn14) (I/O-SYS)

You can specify program numbers by turning ON this signal.
This function is enabled when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid].
If the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)], start the program after specifying the program number with this signal.

You can set whether the signals are read in binary or BCD (binary coded decimal) from [All Program Common Settings] → [I/O Settings] → [Program Number Reading Format]. If the signals are read in binary, you can specify 1 to 999 program numbers using 10 bit input from the #sysIn5 to #sysIn14 signals. If the signals are read in BCD, you can specify numbers 1 to 99 using the #sysIn5 to #sysIn8 signals for the first digit and #sysIn9 to #sysIn12 signals for the second digit.

Example: If you want to specify program number “67”:
Binary: 67 = 64 (#sysIn11) + 2 (#sysIn6) + 1 (#sysIn5)
= Turn ON #sysIn11, #sysIn6, #sysIn5
BCD: 67 = 7 (4 (#sysIn7) + 2 (#sysIn6) + 1 (#sysIn5))
+ 60 (40 (#sysIn11) + 20 (#sysIn10))
= Turn ON #sysIn11, #sysIn10, #sysIn7, #sysIn6, #sysIn5

NOTE: Refer to the signal below (Program Number (word) (#fbIn101) (Fieldbus) for details on how to specify program numbers from a Fieldbus.

■ Program Number (word) (#fbIn101) (Fieldbus)

You can specify program numbers by using this word register.
This function is enabled when [Administration Settings Mode] → [Change Program Number] → [Fieldbus] is set to [Valid].
If the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (Fieldbus)], start the program after specifying the program number to this register.

If [All Program Common Settings] → [I/O Settings] → [Program Number Reading Format] is set to [Binary Code], specify the binary code for the program number to this register.
If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the BCD for the program number to this register.

■ Last Work (#sysIn13)

If the robot is running in continuous cycles and this signal comes ON, the robot returns to the work home and the program finishes without error at the end of the current cycle (at the last point in the cycle).

When the Teaching Mode menu [Individual Program Settings] → [Cycle Mode] is set to [Continuous Playback], after finishing the last point, the robot moves to point 01 and repeats the operation. To end this repeated operation, end the program using a point job or turn this signal ON.

This function is only valid at the point when the last point is finished (before moving). You cannot use this signal in the middle of a program.

■ Program Number 256 (#sysIn13)

When ON, this signal enables you to specify program number 256 and higher.

■ Free (#sysIn14)

The default for the #sysIn14 signal is Free. This signal is usable as a free signal unless its function is changed in [I/O Function Assignment].

■ Start Inhibition (#sysIn14)

This signal function is activated when it is OFF (negative logic).

Starts are inhibited if this signal is OFF and the Robot Stopped (#sysOut6) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move. Movements to the work home are also prohibited. This signal does affect program number changes or point resets, etc. You cannot activate this signal when the Robot Stopped (#sysOut6) signal is OFF (when the robot is moving).

■ Stop – Start Inhibition (#sysIn14)

This signal function is activated when it is OFF (negative logic).

Starts are inhibited if this signal is OFF and the Robot Stopped (#sysOut6) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.

If you turn this signal OFF when the Robot Stopped (#sysOut6) signal is OFF (when the robot is moving), the robot completes its current PTP movement and then waits. To restart, input a start signal after turning ON this signal.

■ Software Interlock (#sysIn14)

This signal function is activated when it is OFF (negative logic).

Starts are inhibited or the robot performs an urgent stop if this signal is OFF and the Robot Stopped (#sysOut6) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.

If this signal is turned OFF when the Robot Stopped (#sysOut6) signal is OFF (the robot is moving), the robot makes an urgent stop.

■ Urgent Stop (#sysIn14)
This signal function is activated when it is OFF (negative logic).
The robot makes an urgent stop if you turn Urgent Stop (#sysIn14) OFF in Run Mode. Unlike an emergency stop, an urgent stop does not turn OFF the motor power.

■ Program Number 512 (#sysIn14)
When ON, this signal enables you to specify program number 512 and higher.

■ Motor Power ON (#sysIn15)
When the Motor Power OFF (#sysOut9) signal is OFF, turn ON this signal to turn ON the motor power.
Turning ON this signal is functionally the same function as pressing the motor power ON switch on the operation box.
Note however that you cannot turn ON the motor power when an emergency stop is activated or the I/O-S circuit contacts are open.

7.1.2 Output

■ Ready for Start (#sysOut1)
When the robot is ready to start, this signal comes ON.
This signal is affected by the start channels (this signal comes ON regardless of the start channel). Meaning that the ON status of this signal does not indicate that the Start (#sysIn1) signal can be activated.
The Start (#sysIn1) signal can be activated when this signal and the Start Source Code 1 (I/O-SYS start channel) (#sysOut13) signal are ON.
The following situations prevent the Ready for Start (#sysOut1) signal from turning ON (you cannot start a run) even when the robot is stopped in Run Mode:

- The motor power is OFF (an emergency stop is activated or the I/O-S circuit contacts are open, etc.). (In this situation, the Motor Power OFF (#sysOut9) signal is ON)
- Starts are inhibited by #sysIn14 (note that starts are also prohibited when #sysIn14 is assigned with Software Interlock or Urgent Stop and the robot is not running).
- The robot is processing a program number change (the Program Number Load (#sysIn4) signal is ON).
- A program number error has occurred (the Program Number Error (#sysOut4) signal is ON).
- However, if the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)], the Ready for Start signal comes ON even if a program number error occurs.
- An error occurs (the Error (#sysOut5) signal is ON).
- When accessing the Run Mode menu on the teaching pendant.
- When transferring data using a PC (the robot is processing a communication command).

■ Work Home (#sysOut2)

This signal comes ON after the robot returns to the work home as instructed by the Go Home (#sysIn2) signal or a control command.

This signal also comes ON when the robot returns to the work home at the end of a program run.

This signal goes OFF when a program run is started or the robot is instructed to move by a control command.

This signal does not recognize the work home via coordinate values. For example, this signal does not come ON if the robot stops at a point during the program run that has the same coordinates as the work home.

■ Program Number ACK (#sysOut3)

This is a response signal indicating that the program change requested by I/O-SYS input is possible. The following explanation is based on the Teaching Mode menu set to [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] → [LOAD/ACK Handshake].

You can only change program numbers when the robot is stopped. Make sure that the Robot Stopped (#sysOut6) signal is ON.

Set the program number you want to use to one of the Program Number (#sysIn5 to #sysIn12) signals in advance.

After this signal is stabilized, switch the Program Number Load (#sysIn4) signal ON.

After receiving a stable transmission of a Program Number signal (the signal stays ON for 20 msec), the robot loads the program number and turns ON the Program Number ACK (#sysOut3) signal. The Start (sysIn1) signal cannot be activated when the robot is processing the program number or processing the Program Number ACK signal output.

After the Program Number ACK (#sysOut3) signal comes ON, switch the Program Number Load (#sysIn4) signal OFF. The robot turns OFF the Program Number ACK (#sysOut3) signal when the Program Number Load (#sysIn4) signal goes OFF, completing the program number change.

You can set whether the signals are read in binary or BCD (binary coded decimal) from [All Program Common Settings] → [I/O Settings] → [Program Number Reading Format]. If the signals are read in binary, you can specify 1 to 255 program numbers using 8 bit input from the #sysIn5 to #sysIn12 signals. If the signals are read in BCD, you can specify numbers 1 to 99 using the #sysIn5 to #sysIn8 signals for the first digit and #sysIn9 to #sysIn12 signals for the second digit.

■ Program Number Error (#sysOut4)

This signal goes ON when you specify an unregistered program number in Run Mode.

■ Running (#sysOut5)

This signal can be activated in Run Mode and during test runs and point runs. This signal is not activated in Teaching Mode (or Administration Mode). This signal is also not activated for GO key movements or JOG operations.

When this signal is ON, the Robot Stopped (#sysOut6) signal is OFF. When this signal is OFF, the Robot Stopped (#sysOut6) signal is ON.

The Running (#sysOut5) signal comes ON in the following situations:

(1) The robot is executing a run cycle.

(2) The robot is moving to the work home.

(3) The robot is executing a movement control command or an execution command.
The Running (#sysOut5) signal does not turn OFF when the robot is stopped by a *delay* or *waitCond* command. The *waitStart* command temporarily stops the robot and so the Running (#sysOut5) signal goes OFF in this case.

■ Robot Stopped (#sysOut6)

When the robot is stopped this signal is ON, when the robot is moving, it is OFF.

This signal can be activated in Run Mode and during test runs and point runs. This signal is not activated in Teaching Mode (or Administration Mode).

When this signal is ON, the Running (#sysOut5) signal is OFF. When this signal is OFF, the Running (#sysOut5) signal is ON.

When the robot executes a *waitStart* command during a run cycle, a movement command, or an execution command, the robot temporarily stops and turns ON the Robot Stopped (#sysOut6) signal. The Robot Stopped (#sysOut6) signal does not come ON when the robot is stopped by a *delay* or *waitCond* command.

■ Error (#sysOut7)

This signal comes ON when a system error (caused by a hardware or mechanical failure) or a run error (caused by a move area limit error or a command parameter error) occurs.

You can reset run errors by turning ON the Reset (#sysIn3) signal.

However, you cannot reset system errors using signal input. If a system error occurs, turn the robot OFF and correct the cause of the error.

The Error (#sysOut7) signal will not always come ON when an emergency stop is activated. For example, when an emergency stop is activated while the robot is stopped, the Emergency Stop (#sysOut8) signal comes ON but the Error (#sysOut7) signal stays OFF. In this situation, you restart (continue) the run by releasing the emergency stop and turning the motor power ON.

When an emergency stop is activated while the robot is running, the Emergency Stop (#sysOut8) signal and the Error (#sysOut7) signals come ON. In this situation, you can normally resume operation by releasing the emergency stop and then resetting the error (and the point) with the Reset (#sysIn3) signal. However, if the error was caused by an external factor (emergency stop), you can restart operation by turning ON the motor power, without turning ON the Reset (#sysIn3) signal.

■ Emergency Stop (#sysOut8)

This signal is turned ON if the I/O-S circuit contacts are opened during a run or the emergency stop switch is pressed.

Turn OFF the Emergency Stop (#sysOut8) signal by releasing the emergency stop switch. You can then restart operation by turning ON the motor power using the Motor Power ON (#sysIn15) signal.

Turn OFF the Emergency Stop (#sysOut8) signal when the I/O-S circuit contacts are open by closing the I/O-S circuit contacts and then turning the motor power ON with the Motor Power ON (#sysIn15) signal.

■ Motor Power OFF (#sysOut9)

This signal comes ON when the motor power is OFF. You need to turn the motor power ON before starting a run.

Note however that you cannot turn ON the motor power when an emergency stop is activated or the I/O-S circuit contacts are open.

■ In Cycle (#sysOut10)

This signal is ON while the robot is running a program and stays ON even if the robot is temporarily stopped.

This signal goes OFF when the point is reset.

The point is reset in the following situations:

(1) When the robot completes a run cycle.
(2) When the program number is changed.
(3) When you switch ON the Reset (#sysIn3) signal during a temporary stop.
(4) After turning the robot ON when [All Program Common Settings] → [Point Reset Settings] → [Reset at Power ON] is enabled.
(5) After an emergency stop occurs when [All Program Common Settings] → [Point Reset Settings] → [Reset at Emergency] is enabled.
(6) After the robot returns to the work home when [All Program Common Settings] → Point Reset [Settings] → [Reset at Going Home] is enabled.

■ Operation Mode Code 1 (#sysOut11) / Operation Mode Code 2 (#sysOut12)
The signals go ON/OFF according to the operation mode of the robot.

• Operation Mode Code

Mode	#sysOut11	#sysOut12
Run Mode	ON	OFF
Teaching Mode	OFF	ON
Administration	OFF	ON
Customizing Mode	OFF	ON
Test Run (Teaching Mode)*	ON	ON
Point Run (Teaching Mode)*	ON	ON

* Test runs and point runs may executed in Teaching Mode under certain conditions. Both Operation Mode Code 1 and Operation Mode Code 2 signals come ON in this situation. This can be considered a type of Run Mode contained within Teaching Mode.

■ Start Source Code 1 (#sysOut13) / Start Source Code 2 (#sysOut14)
The “start source” (or start channel) is the channel from which the robot receives commands to start running (or make arm movements such as when moving to the work home). From a safety point of view, this limits the robot so that it cannot be activated from multiple sources. Specifically, you can define the start channel from among the following in Administration Settings Mode: I/O-SYS, Fieldbus, COM1, and Ethernet. The Start Source Code (#sysOut13, #sysOut14) signals are output according to the start channel settings:

• Start Channel Code

Start Channel	#sysOut13	#sysOut14
I/O-SYS	ON	OFF
Fieldbus, COM1, Ethernet	OFF	ON
User Definition*	OFF	OFF

* If the start channel is set to **User Definition**, you cannot start runs using I/O-SYS, Fieldbus, COM1, or Ethernet and both start source code signals are OFF.
This setting is designed not to run programs or perform arm movements using system programs, but to run programs and perform arm movements via user defined run mode jobs. When using this setting, make sure to use only one start channel.

■ Maintenance Forecast (#sysOut14)
This signal comes ON when one of the following items in the robot maintenance function meets the conditions to produce a warning: the battery, lubrication (defined for each axis (J1 to J4)), or the belt (defined for each individual axis (J1 to J4)).

■ Other

- COM+ (DC24V)
  DC 24 V (+) is output from this pin.

- COM- (GND)
  Use this pin as a common grounding.

⚠ Caution

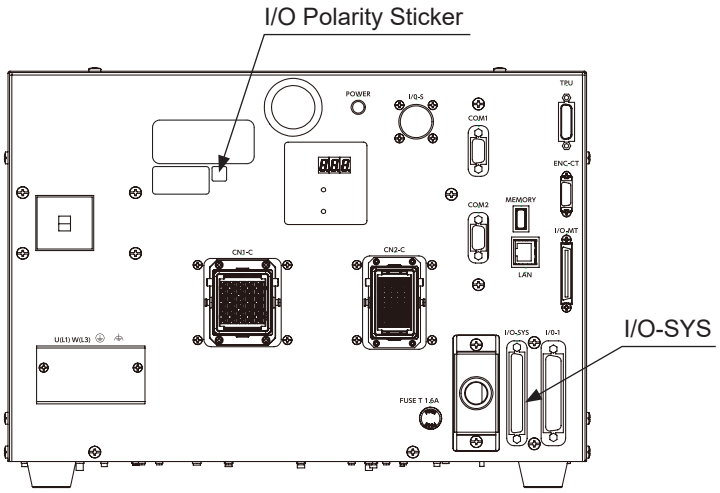
Do not connect COM+ or COM- to an external power supply.
Doing so can cause breakdown.

7.1.3 I/O Polarity

There are two types of I/O polarity: NPN and PNP. After confirming your robot polarity, always connect tools, etc., which are compatible with that polarity type.

■ I/O Polarity
If connecting an external device, make sure it is compatible with the I/O polarity of your controller.
You can check the robot I/O polarity using the sticker affixed to the controller.

■ I/O Power Supply
The power supply (DC 24 V) for an external device connected to I/O-SYS is output from the I/O-SYS connector.



7.2 I/O-1 Function Assignment

		Name	Function	Pin No.
Input	Var	#genIn1	Dispenser Response / Free	1
	Var	#genIn2	Purge by ext. signal / Free	2
	Var	#genIn3	X Needle Sensor / Free	3
	Var	#genIn4	Y Needle Sensor / Free	4
		#genIn5	Free	5
		#genIn6	Free	6
		#genIn7	Free	7
		#genIn8	Free	8
		#genIn9	Free	9
		#genIn10	Free	10
		#genIn11	Free	11
		#genIn12	Free	12
		#genIn13	Free	13
		#genIn14	Free	14
		#genIn15	Free	15
		#genIn16	Free	16
		#genIn17	Free	17
		#genIn18	Free	18
Output	Var	#genOut1	Dispenser ON / Free	19
		#genOut2	Free	20
		#genOut3	Free	21
		#genOut4	Free	22
		#genOut5	Free	23
		#genOut6	Free	24
		#genOut7	Free	25
		#genOut8	Free	26
		#genOut9	Free	27
		#genOut10	Free	28
		#genOut11	Free	29
		#genOut12	Free	30
		#genOut13	Free	31
		#genOut14	Free	32
		#genOut15	Free	33
		#genOut16	Free	34
		#genOut17	Free	35
		#genOut18	Free	36
		#genOut19	Free (relay output)	37
		#genOut19	Free (relay output)	38

		Name	Function	Pin No.
Output		#genOut20	Free (relay output)	39
		#genOut20	Free (relay output)	40
		#genOut21	Free (relay output)	41
		#genOut21	Free (relay output)	42
		#genOut22	Free (relay output)	43
		#genOut22	Free (relay output)	44
Others		COM+	DC 24 V	45
		COM+	DC 24 V	46
		COM+	DC 24 V	47
		COM-	GND	48
		COM-	GND	49
		COM-	GND	50

Var: The arbitrary I/O function assignments can be changed. Change by selecting Teaching Mode → MENU key → [Dispenser] → [I/O Function Assignment].

7.2.1 Input

■ Dispenser Response (#genIn1)

This signal is invalid when [Dispenser Type] is set to [No Response Signal]. When set to [Busy Signal Operation], the robot determines it is dispensing when this signal is ON.
When set to [Finish Signal Operation], the robot determines dispensing is finished when this signal is ON.

■ Purge by Ext. Signal (#genIn2)

The default status for the #genIn2 signal is [Purge by ext. signal]. If a remote purge switch is connected to #genIn2 of I/O-1, press the purge switch to turn ON dispensing, release the switch to turn dispensing OFF.
For further details, refer to “17.3.2 Purge by Ext. Signal (#genIn2)”.

■ X Needle Sensor (#genIn3)

If the nozzle is at the [X Needle/4 Axis TCP Measure Point 1], this signal is OFF. This signal is also OFF if the X axis sensor is blocked with needle adjuster functions. This signal is normally ON at all other times.

■ Y Needle Sensor(#genIn4)

If the nozzle is at the [Y Needle/4 Axis TCP Measure Point 2], this signal is OFF. This signal is also OFF if the Y axis sensor is blocked with needle adjuster functions. This signal is normally ON at all other times.

7.2.2 Output

■ Dispenser ON (#genOut1)

This is a signal to turn the dispenser ON (execute dispensing).

7.2.3 I/O Polarity

There are two types of I/O polarity: NPN and PNP. After confirming your robot polarity, always connect tools, etc., which are compatible with that polarity type.

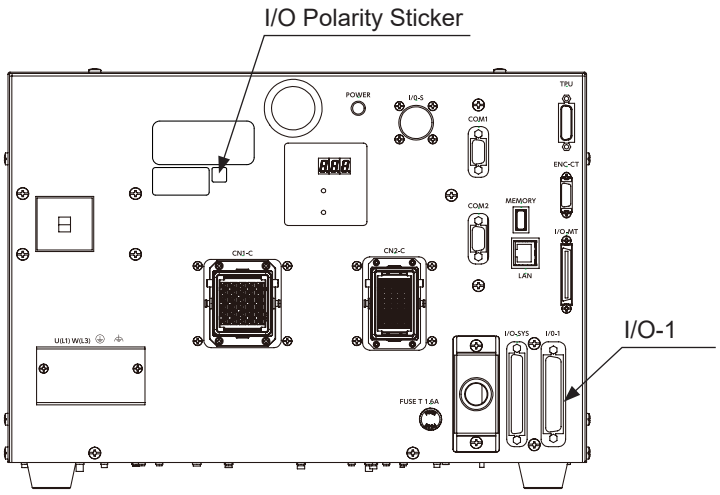
■ I/O Polarity

If connecting an external device, make sure it is compatible with the I/O polarity of your controller.

You can check the robot I/O polarity using the sticker affixed to the controller.

■ I/O Power Supply

The power supply (DC 24 V) for an external device connected to I/O-1 is output from the I/O-1 connector.



7.3 I/O-H Function Assignment

	Name	Function	Pin No.	Connector
Input	#handIn1	Free	A3	HC1
	#handIn2	Free	B1	
	#handIn3	Free	B2	
	#handIn4	Free	B3	
	#handIn5	Free	A3	HC2
	#handIn6	Free	B1	
	#handIn7	Free	B2	
	#handIn8	Free	B3	
Output	#handOut1	Free	A3	GR1
	#handOut2	Free	A4	
	#handOut3	Free	B1	
	#handOut4	Free	B2	
	#handOut5	Free	A3	GR2
	#handOut6	Free	A4	
	#handOut7	Free	B1	
	#handOut8	Free	B2	
Other	+24V (COM)	DC 24 V / GND *	A1	GR1
	+24V (COM)	DC 24 V / GND *	A1	GR2
	+24V	DC 24 V	A1	HC1
	24G	GND	A1	HC2

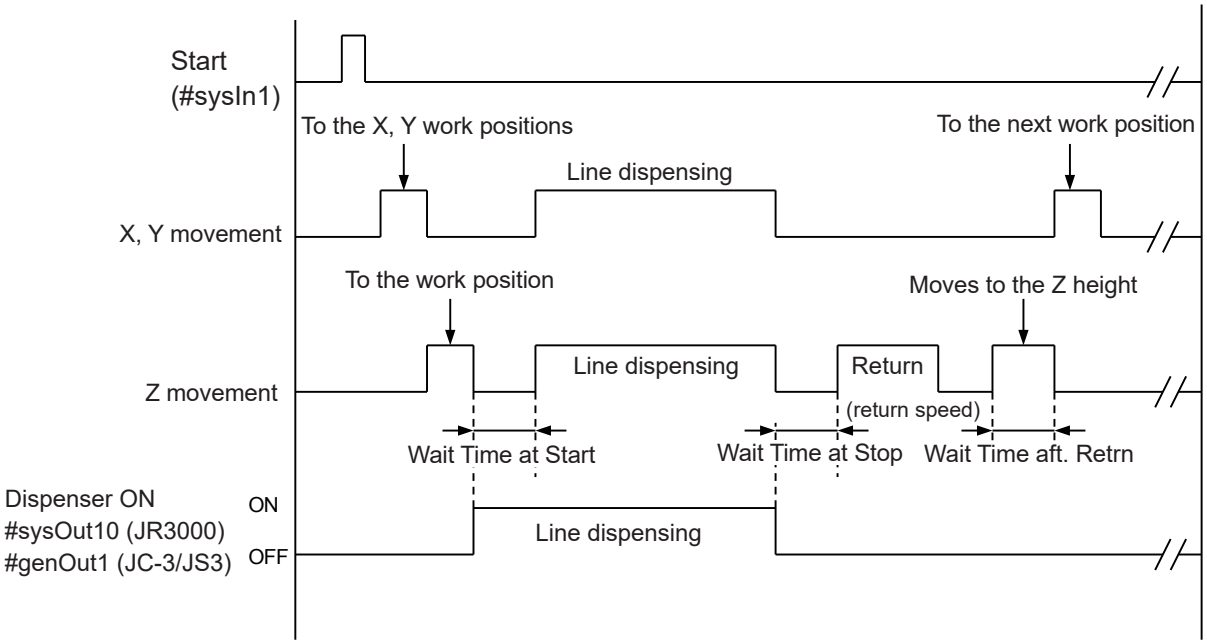
* With an NPN type circuit, the +24 V (COM) pin supplies DC 24 V. With a PNP type circuit, the +24 V (COM) pin is a grounding pin.

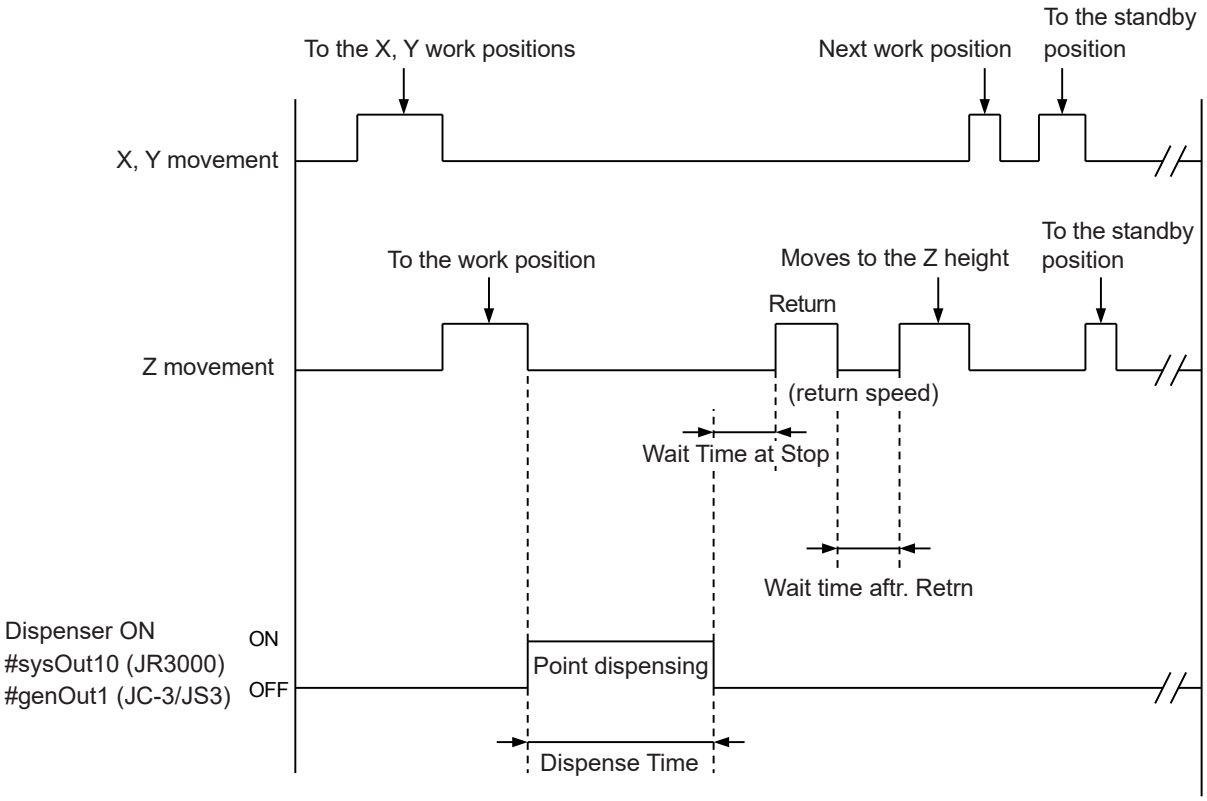
7.4 Other

For details regarding Fieldbus, refer to the operation manual *External Control.*

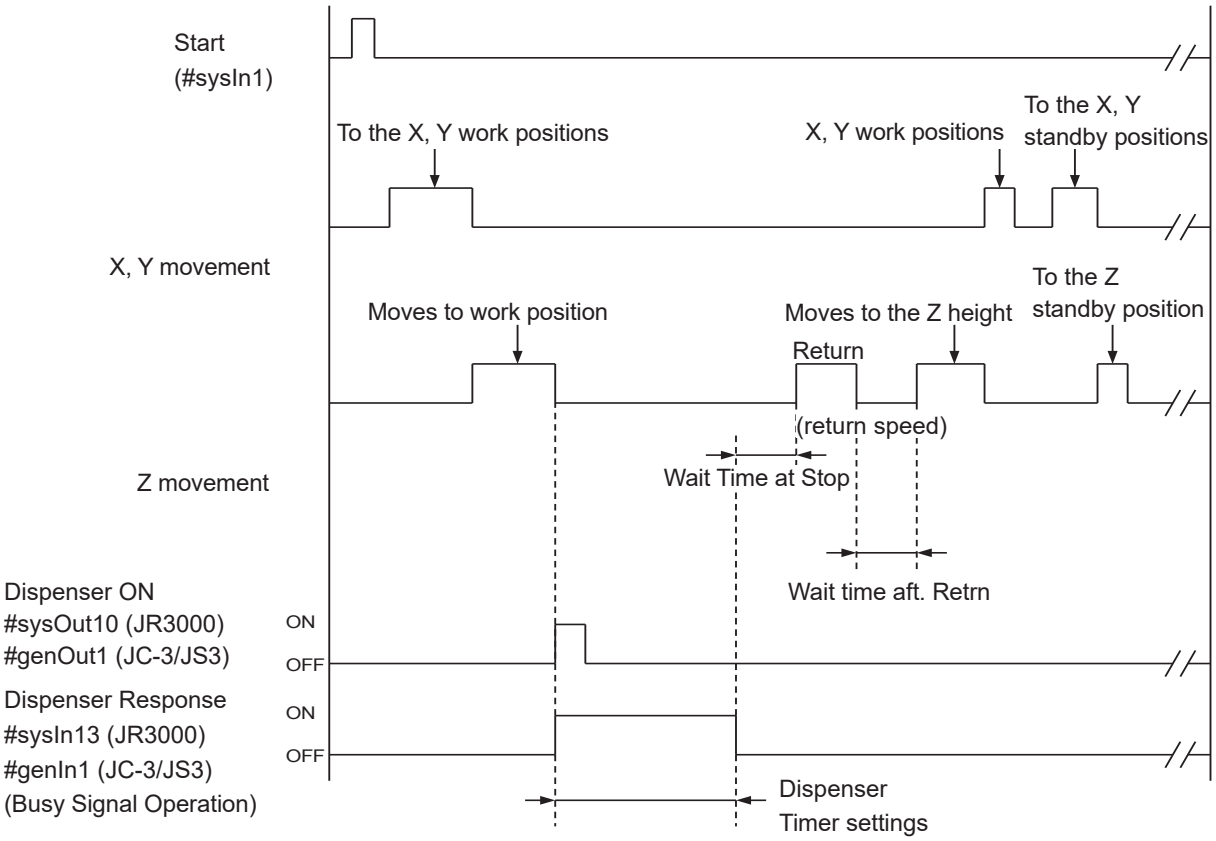
8. TIMING CHARTS

8.1 No Response Operations (Steady Mode, Line Dispensing, Point Dispensing)





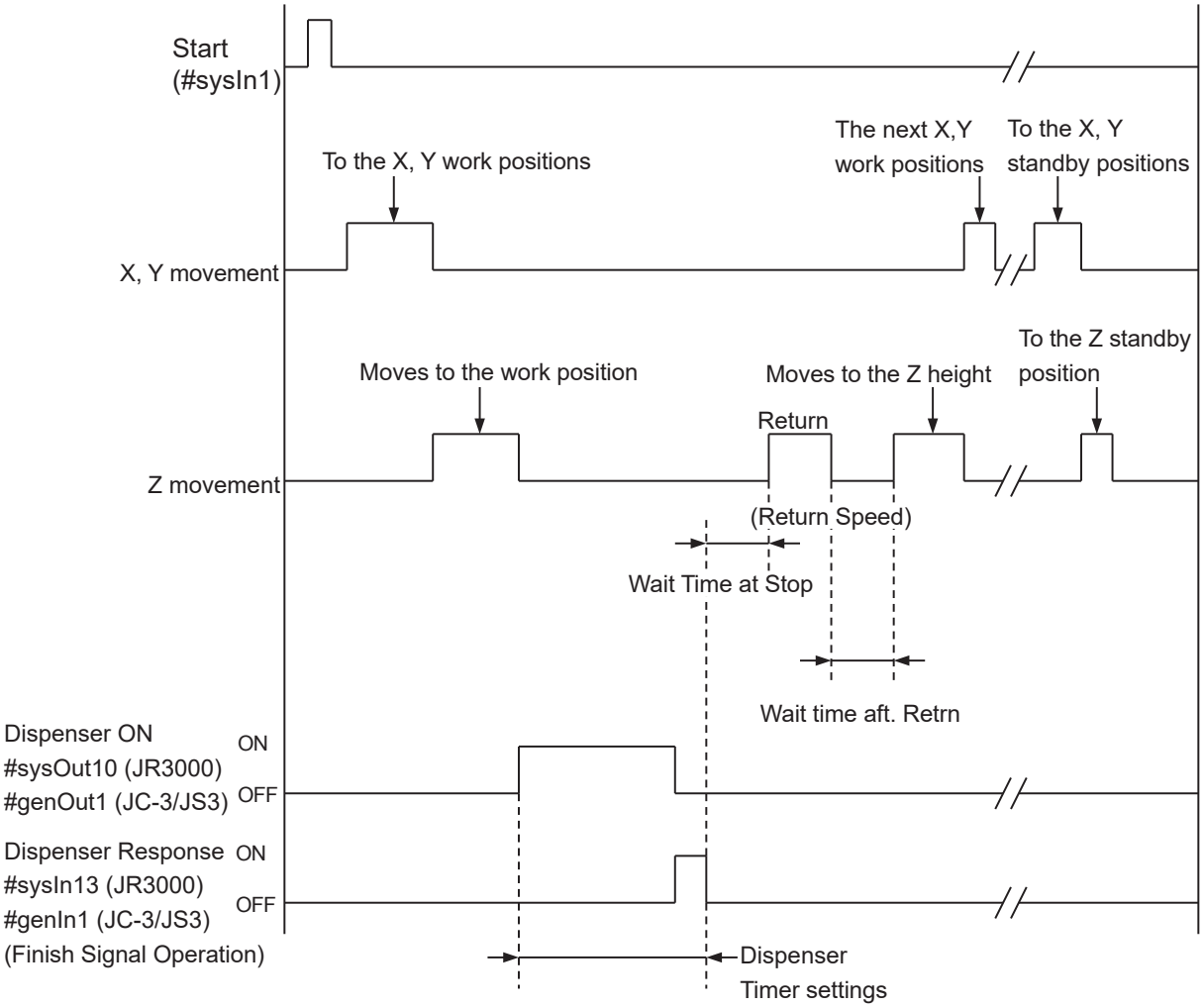
8.2 Busy Signal Operations (Timer Mode, Point Dispense)



The robot turns ON the [Dispenser ON] signal (#sysOut10/#genOut1) and waits until the [Dispenser Response] signal (#sysIn13/#genIn1) (Busy Signal Operation) comes ON.
If the robot waits for 0.5 seconds and the [Dispenser Response] signal (#sysIn13/#genIn1) (Busy Signal Operation) has not come ON, the robot determines that the dispenser is damaged or not connected causing an error and stopping the robot.

When the [Dispenser Response] signal (#sysIn13/#genIn1) (Busy Signal Operation) comes ON, the robot determines that dispensing has started and turns OFF the [Dispenser ON] signal (#sysOut10/#genOut1).
Afterward, the robot waits until the [Dispenser Response] signal (#sysIn13/#genIn1) (Busy Signal Operation) goes OFF, and when it does so, the robot determines that dispensing is complete and moves to the next operation.

8.3 Finish Signal Operations (Timer Mode, Point Dispense)



The robot turns ON the [Dispenser ON] signal (#sysOut10/#genOut1) and waits for the [Dispenser Response] pulse (#sysIn13/#genIn1) (Finish Signal Operation) to come.
When the Dispenser Response signal (#sysIn13/#genIn1) (Finish Signal Operation) turns ON, the [Dispenser ON] signal (#sysOut10/#genOut1) turns OFF.
After that, if the Dispenser Response signal (#sysIn13/#genIn1) (Finish Signal Operation) turns OFF, the robot determines that dispensing is finished and moves to the next operation.

9. POINT DISPENSING

With point dispensing, the robot stops for the preset point dispensing time at the point position and turns ON the dispenser. To point dispense, register a point with the point type [Point Dispense].

Enter the point position where you want to perform Point Dispense. If you are registering a new point, the point type selection screen shown to the right appears after coordinate entry. Select [Point Dispense].
If you wish to change the point type of an existing point to Point Dispense, display the point settings screen for the point you want to change and select the point type sub-menu. The point type selection screen is displayed. Select [Point Dispense].
When you select [Point Dispense], the entry screen for the dispensing time appears. Enter the point dispensing time you want.

Select Point Type	1/3
Point Dispense	
Start of Line Dispense	
Line Passing	
CP Arc Point	
End of Line Dispense	
Wait Start Point	
Start of Circle Dispense	
Center of Circle Dispense	
Zigzag Start Point	
Rectangular Spiral Start Point	
Hollow Rectangle Start Point	
Rectangle End Point	

Point Type Selection Screen

If you are teaching using a PC (JR C-Points II), click the icon to add the [Point Dispense] point to the end of the program.

NOTE:

- If you set MENU → [Dispenser] → [Dispenser Mode] to [Timer], you can control the dispensing time using the timer on the dispenser. When [Dispenser Mode] is set to [Timer], the dispensing time set to the point is ignored and dispensing is done according to the dispense time set to the dispenser.
- After dispensing, the robot moves according to the [Wait Time at Stop], [Return type], [Z return Height], [XY return dist.], [Return line speed], and [Wait time aft. Retrn] settings in [Individual Program Settings]/[Dispense Condition], however, even if [XY return dist.] is set to a Point Dispense point, the XY axes do not make a return movement.

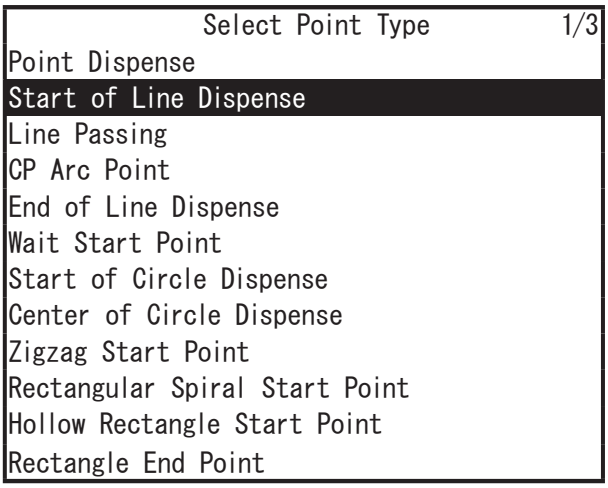
10. LINE DISPENSING

To perform line dispensing, you need to register points with the point types [Start of Line Dispense] and [End of Line Dispense] respectively. If you register a [Line Passing] point between the [Start of Line Dispense] and the [End of Line Dispense] points, you can change direction during line dispensing.
Also, if you insert a [CP Arc Point] point between the [Start of Line Dispense] and the [End of Line Dispense] points, you can draw an arc.

10.1 How to Draw a Line in Line Dispensing

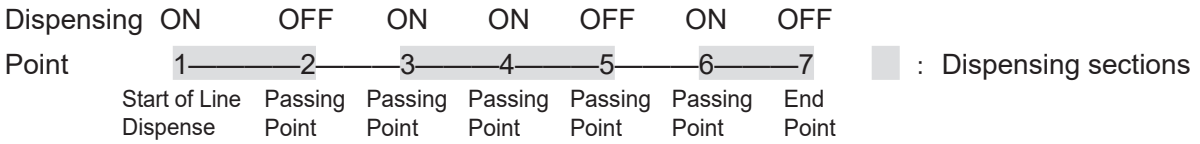
Register the point position where you wish to perform line dispensing.
If you are registering a new point, the point type selection screen shown to the right appears after coordinate entry. Select [Start of Line Dispense].
When you select [Start of Line Dispense], the entry screen for the line speed appears. Enter the line speed you want.

Register [End of Line Dispense] to the position where you want to finish line dispensing. The dispenser is turned OFF automatically at this point.



Point Type Selection Screen

For the [Start of Line Dispense] and the [Line Passing] points, you can select whether to turn dispensing ON or OFF. By setting dispensing ON or OFF for [Line Passing] points, you can set the sections where dispensing is done and the sections where it is not done.

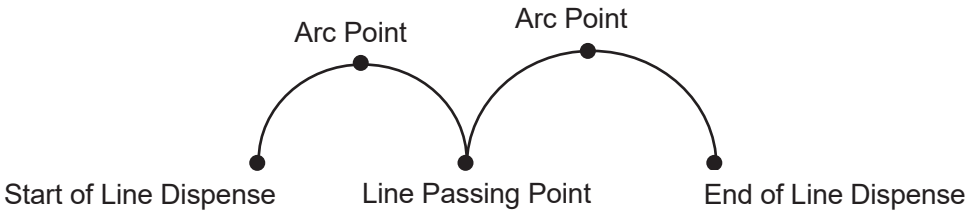


NOTE:

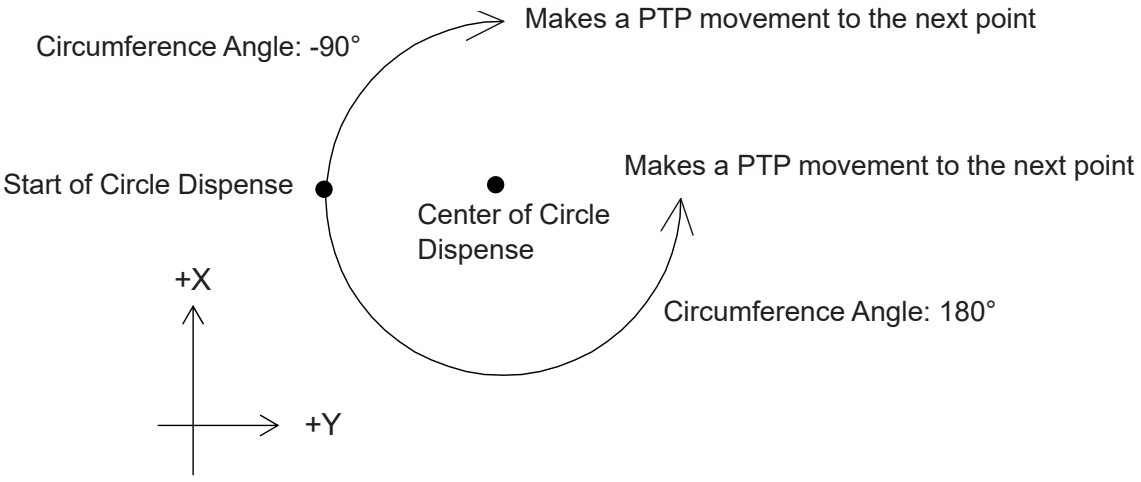
- At the Start of Line Dispense point, the robot holds according to the [Wait Time at Start] settings in [Individual Program Settings]/[Dispensing Condition]. [Wait Time at Start] is only valid for the Start of Line Dispense and the Start of Circle Dispense points.
- For an End of Line Dispense point, the robot operates according to the [Wait Time at Stop], [Z return Height], [XY return dist.], [Return line speed], and [Wait time aft. Retrn] settings in [Individual Program Settings]/[Dispense Condition].
- Even if [Dispenser Mode] is set to [Timer], dispensing cannot be controlled by the dispenser's timer for line dispensing. Line dispensing is run in [Steady] Mode regardless of the settings.

10.2 How to Draw an Arc in Line Dispensing

With line dispensing it is possible to draw an arc.
Register these three points in this order: [Start of Line Dispense] → [CP Arc Point] → [End of Line Dispense]. The robot draws an arc by passing through these three points.
By registering [Line Passing] instead of [End of Line Dispense], you can continue to draw arcs.



You can also draw an arc in line dispensing if you register the points [Start of Circle Dispense] → [Center of Circle Dispense] consecutively. However, the robot will make a PTP movement to the next point. If you want to continue line dispensing after drawing an arc, or move the robot by CP movement, use a CP Arc Point.
Set a line speed to the Start of Circle Dispense point and set a circle angle to the Center of Circle Dispense point.
You can set up to ±9999.999 deg. for the circle angle in increments of 0.001 deg. If the value of the circle angle is positive, the robot will draw a circle counterclockwise from the Start of Circle Dispense point (when looking from above the front of the robot).
The [Dispenser ON] signal comes ON automatically at the Start of a Circle Dispense point and goes OFF at the circle, or arc end position.



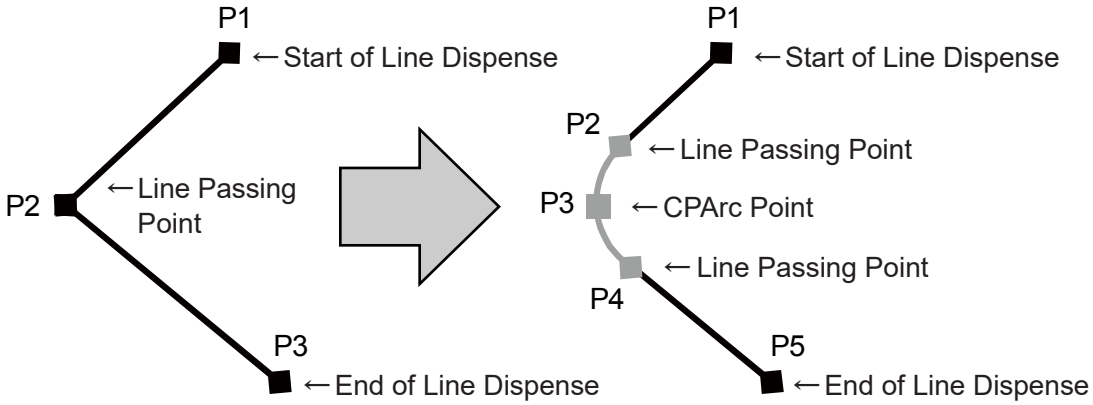
If you are using a PC (JR C-Points II) to register points, click the icons below to add the corresponding point to the program.

	Start of Line Dispense		End of Line Dispense
	Line Passing		CP Arc Point

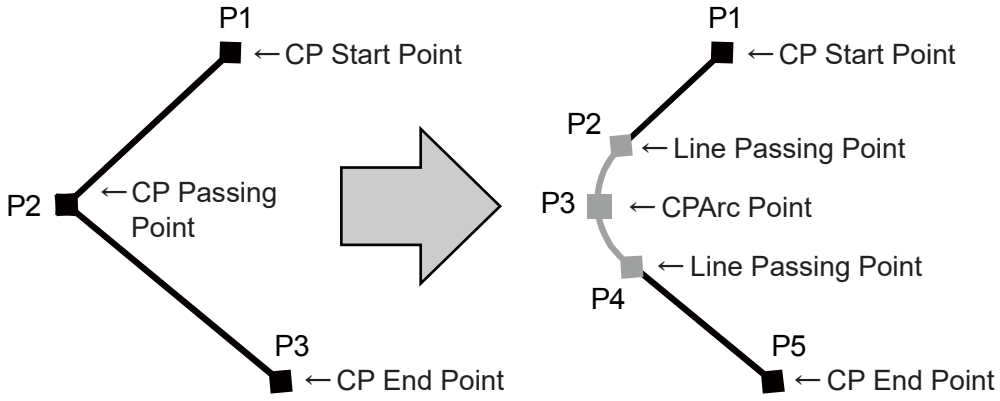
In order to set point types other than the ones shown on the previous page, change the point type of the point you have added. Click the point type cell to display the " ▼ " mark on the right of the cell. Click this mark to display the point types in a pull-down menu. Select and set the point type that you want to set.

10.3 Create Arc

This is a function used to round the path angle of an intermediate point (Line Passing Point, CP Passing Point, or CP Stop Point). Select [Create Arc] and enter the radius for the subject point you want to convert to an arc. The original intermediate point is converted to 2 Line Passing Points, which define the start and end of the arc, and a CP Arc Point, which is placed in between the 2 passing points at the specified radius (as shown in the example below). Note that the points generated for the arc are set with a height of 0. Review and modify the height setting as necessary.

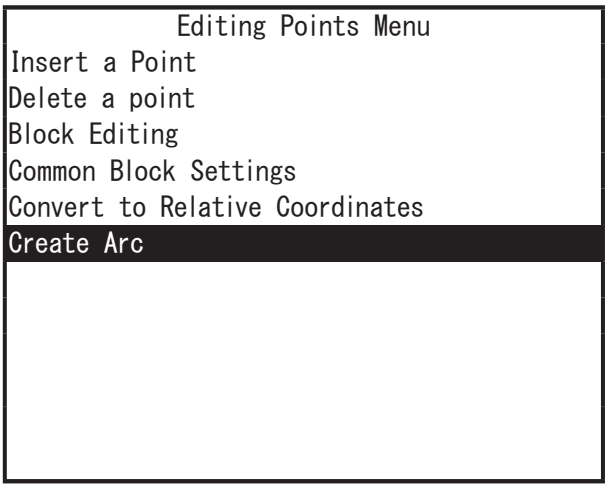


However, even if you use the Create Arc function to convert a CP Passing Point or CP Stop Point to an arc (as shown below), the arc is created using Line Passing Points and a CP Arc Point. For an arc created from a CP Passing Point, change the Line Passing Points to CP Passing Points. For an arc created from a CP Stop Point, change the Line Passing Points to CP Stop Points.



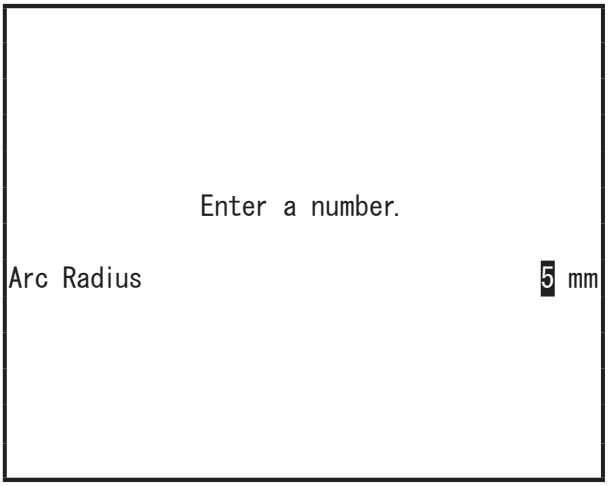
Display the editing screen for the subject point (Line Passing Point, CP Passing Point or CP Stop Point).

TP EDIT [Create Arc]



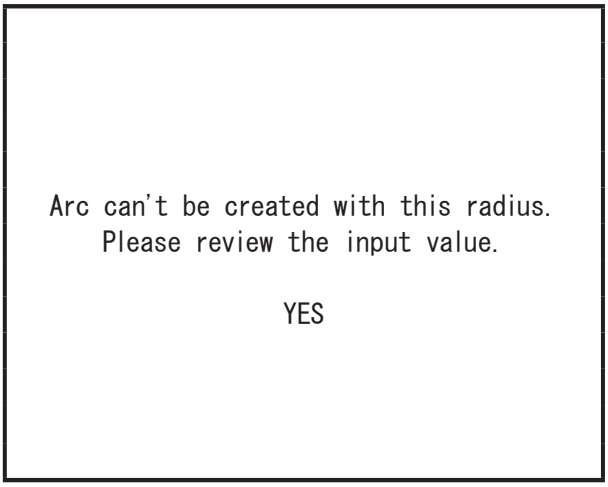
Editing Points Menu

Select [Create Arc] to display the arc radius entry screen (as shown to the right).
Enter the arc radius to create the arc.



Arc Radius Entry Screen

If an arc cannot be created from the entered value, the message to the right is displayed.
Press ENTR key and edit the arc radius value.



NOTE: [Create Arc] is only displayed when you select a point that meets the following conditions:

- The specified point is either a line passing point, CP passing point or a CP stop point.
- The point before the specified point is either a CP start point, start of line dispense point, line passing point, CP passing point, or a CP stop point.
- The point after the specified point is either a CP end point, end of line dispense point, line passing point, CP passing point, or a CP stop point.

11. DISPENSE FILLING

11.1 Rectangle Filling

Specify the rectangle area with 2 consecutive points: [Zigzag Start Point] and [Rectangle End Point], or [Rectangular Spiral Start Point] and [Rectangle End Point], and by line dispensing in either a zigzag shape or a rectangular spiral shape, the robot fills in the specified area.
If you specify the rectangular area with the two points: [Hollow Rectangle Start Point] and [Rectangle End Point], you can dispense a donut shape with an empty center.
Once dispensing is complete, the robot makes a PTP movement to the next point.

NOTE: With line dispensing operations, if the distance from one turning point to the next is short, the line speed may slow down. Specifically, when filling in towards the center of a spiral shape pattern, the dispensing speed near the corners of the zigzag dispensing may slow down.

Specify the area that you want to fill in by registering the two points: [Zigzag Start Point] and [Rectangle End Point], or [Rectangular Spiral Start Point] and [Rectangle End Point].
If you want to use a donut shape pattern with an empty center, specify the area you want to fill in with the two points: [Hollow Rectangle Start Point] and [Rectangle End Point].
With the diagrams below, the grey areas are the areas that are filled in.

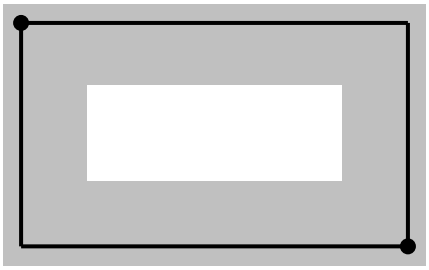
Select Point Type	1/3
Point Dispense	
Start of Line Dispense	
Line Passing	
CP Arc Point	
End of Line Dispense	
Wait Start Point	
Start of Circle Dispense	
Center of Circle Dispense	
Zigzag Start Point	
Rectangular Spiral Start Point	
Hollow Rectangle Start Point	
Rectangle End Point	

:Filling Area

Zigzag Start Point /
Rectangular Spiral Start Point

Rectangle End Point

Hollow Rectangle Start Point

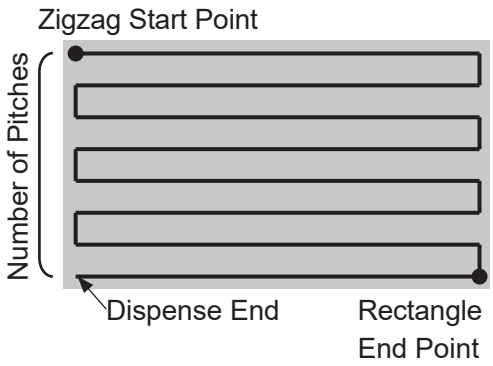


Rectangle End Point

■ Zigzag Start Point – Rectangle End Point

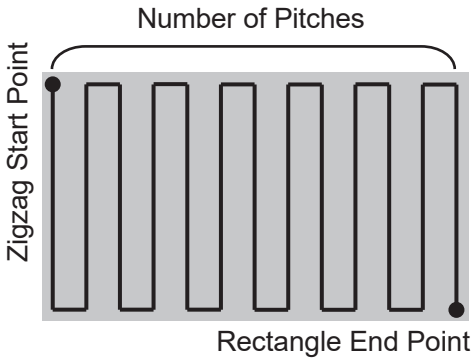
Specify the “Direction”, the “Painting Speed” and “The Number of Pitches” at the [Zigzag Start Point].

- Direction: Y Direction



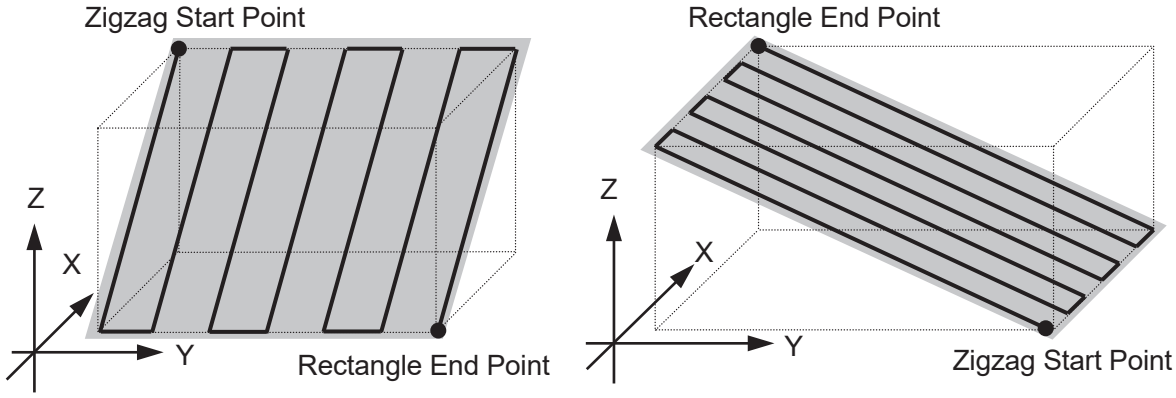
The robot executes line dispensing back and forth in a zigzag motion at the specified [Painting Speed] filling in the rectangular area specified by the Zigzag Start Point and Rectangle End Point.
If the Z coordinates for the Zigzag Start Point and the Rectangle End Point differ, the robot changes the height of the Z axis so it dispenses on a slope while it performs line dispensing.
The robot moves back and forth by splitting up the X direction distance from the Zigzag Start Point to the Rectangle End Point according to [The number of pitches]. The pitch count shown in the diagram to the top right is 7. The pitch count can be set 2 – 100.

- Direction: X Direction



The robot line dispenses back and forth in a zigzag pattern at the specified [Painting Speed], filling in the rectangular area specified by the Zigzag Start Point and Rectangle End Point.
If the Z coordinates for the Zigzag Start Point and the Rectangle End Point differ, the robot changes the height of the Z axis so it dispenses on a slope while it performs line dispensing.
The robot moves back and forth by splitting up the Y direction distance from the Zigzag Start Point to the Rectangle End Point according to [The number of pitches].
The pitch count shown in the diagram on the right is 12. If the number of pitches is an even number, the Rectangle End Point becomes a Dispense End point.

NOTE: When filling in a rectangle from the Zigzag Start Point to the Rectangle End Point, if the Z coordinates for the Zigzag Start Point and the Rectangle End Point differ, the robot changes the height of the Z axis so it dispenses on a slope while it executes dispensing. With other dispensing operations, the robot dispenses from the start point Z coordinates in a horizontal plane.

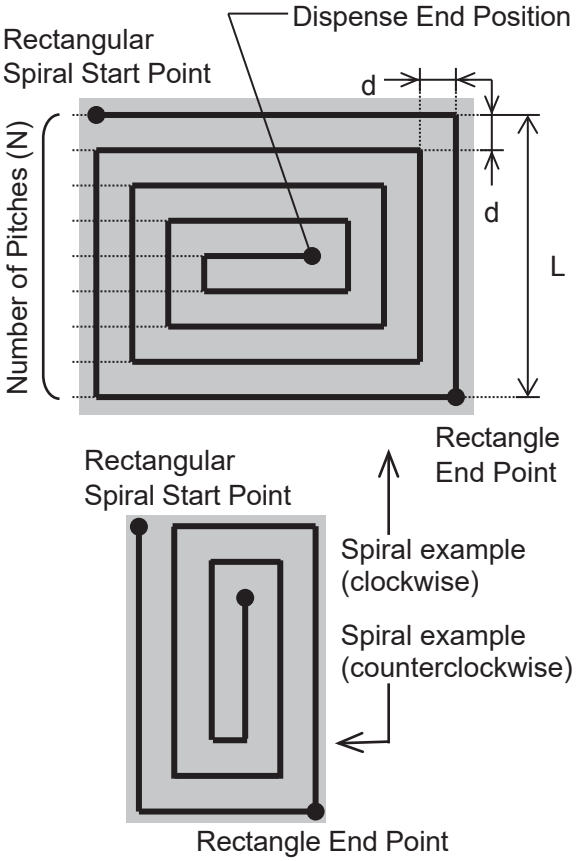


■ Rectangular Spiral Start Point – Rectangle End Point

Specify the “Painting Speed” and “The Number of Pitches” at the [Rectangular Spiral Start Point].

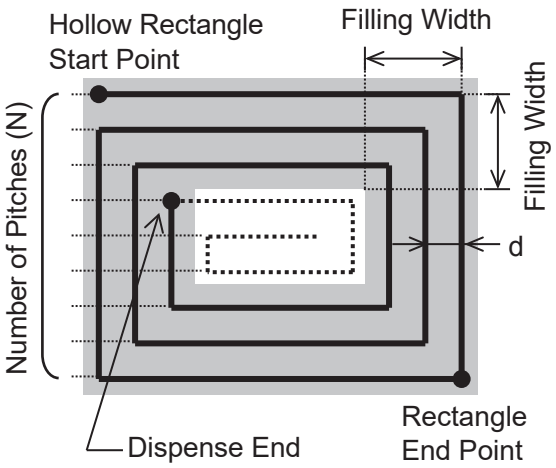
The robot spirals from the Rectangular Spiral Start Point toward the center, and does so by executing line dispensing at the specified [Painting Speed] on a horizontal plane at the Rectangular Spiral Start Point. The robot draws the spiral by splitting up the shorter X or Y direction distance (L in the diagram to the right) according to the number of pitches (N) from the Rectangular Spiral Start Point to the Rectangle End Point. (L) ÷ (N) = (d)

Also, the robot dispenses along the longer X or Y direction. With the diagram above and to the right, the horizontal direction is longer than the vertical direction (L), and therefore spirals in a clockwise direction. With the diagram to the right, this is the opposite.



■ Hollow Rectangle Start Point – Rectangle End Point

Specify the “Painting Speed”, “The Number of Pitches” and the “Filling width” at the [Hollow Rectangle Start Point].



The robot spirals from the Hollow Rectangle Start Point toward the center, and does so by executing line dispensing at the specified [Painting Speed] on a horizontal plane at the Hollow Rectangle Start Point.
Just the same as for a spiral from a Rectangular Spiral Start Point to a Rectangle End Point, the robot draws the spiral by splitting up the shorter X or Y direction distance according to the number of pitches (N) from the Hollow Rectangular Spiral Start Point to the Rectangle End Point. If the Start Point and End Point have the same coordinates, the interval “d” will have the same width as it does with a Rectangular Start Point – Rectangular End Point operation regardless of [Filling width].
However, with a Hollow Rectangle Start Point – Rectangle End Point operation, the line dispensing finishes directly before the corner that exceeds the specified [Filling width] of the spiral trajectory.
Also, the robot dispenses along the longer X or Y direction. With the diagram above, the horizontal direction is longer than the vertical direction, and therefore the robot spirals in a clockwise direction.

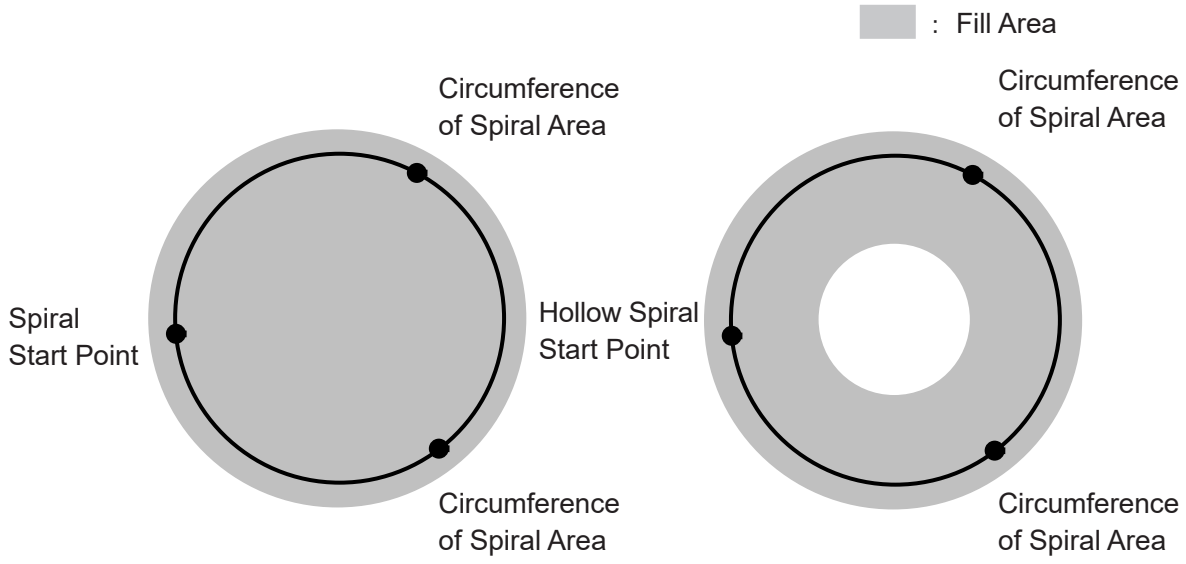
11.2 Circle Filling

Specify the circular area with the 3 point types: [Spiral Start Point], [Circumference of Spiral Area 1] and [Circumference of Spiral Area 2], and by line dispensing in a spiral shape, the robot fills in the specified area.
If you specify a circular area with the 3 point types: [Hollow Spiral Start Point], [Circumference of Spiral Area 1] and [Circumference of Spiral Area 2], you can make a donut shape with an empty center.
After dispensing is finished, the robot makes a PTP movement to the next point.

NOTE: When line dispensing, if the arc is small, the line speed may slow down. Specifically, when filling in a spiral shape, the dispensing operation toward the center of the circle may slow down.

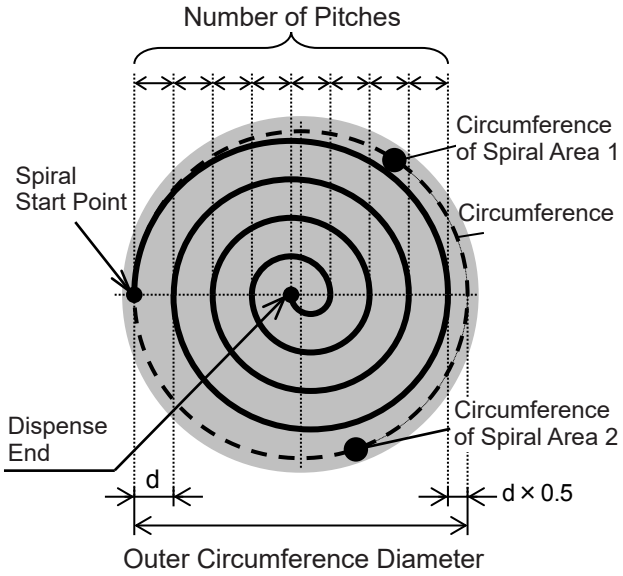
Specify the circular area that you want to fill in by registering the 3 points: [Spiral Start Point], [Circumference of Spiral Area 1] and [Circumference of Spiral Area 2]. To make a donut shape pattern with an empty center, specify the area using the points: [Hollow Spiral Start Point], [Circumference of Spiral Area 1] and [Circumference of Spiral Area 2]. Specify the [Painting Speed], [The number of pitches] and [Line dispensing] at the start point. To perform a donut shape pattern with an empty center, specify the [Filling width] as well. The grey areas in the diagrams below are the areas that are filled in.

Select Point Type 2/3
Spiral Start Point
Hollow Spiral Start Point
Circumference of Spiral Area 1
Circumference of Spiral Area 2
PTP Point
CP Start Point
CP Passing Point
CP Stop Point
CP End Point
PTP Evasion Point
Circle Start Point
Circle Center Point



■ Spiral Start Point – Circumference of Spiral Area 1 – Circumference of Spiral Area 2

The robot spirals from the Spiral Start Point toward the center at the specified [Painting Speed], and does so by executing line dispensing on a horizontal plane at the Spiral Start Point. The robot draws a spiral in the order of Spiral Start Point, Circumference of Spiral Area 1, and Circumference of Spiral Area 2. The spiral is drawn clockwise in the example to the right. If Circumference of Area 1 and Circumference of Area 2 are round the other way, the robot draws the spiral counterclockwise.

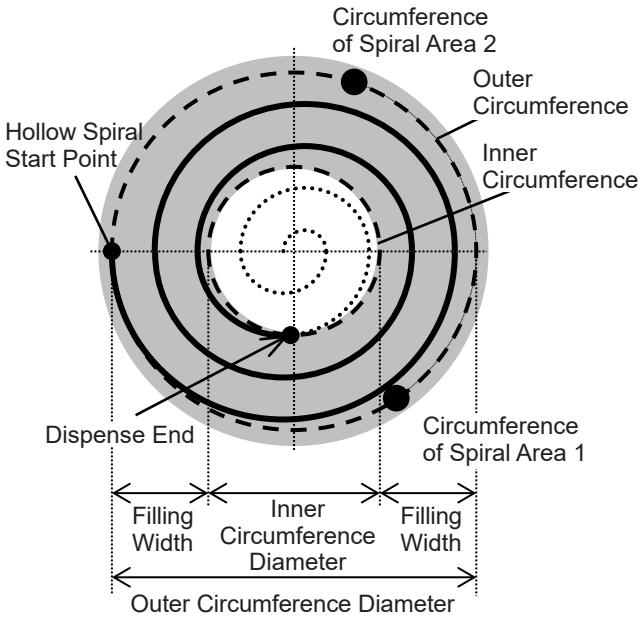


The robot defines how many times it spirals around by splitting up the outer circumference diameter by [The number of pitches].
Outer Circumference Diameter ÷ (Pitch Count + 0.5) = d

If [Line dispensing] is set to [Circumference], the robot dispenses along the circumference before drawing the spiral.

■ Hollow Spiral Start Point – Circumference of Spiral Area 1 – Circumference of Spiral Area 2

The robot spirals from the Hollow Spiral Start Point toward the center at the specified [Painting Speed], and does so by executing line dispensing on a horizontal plane at the Hollow Spiral Start Point. The robot draws a spiral in the order of Hollow Spiral Start Point, Circumference of Spiral Area 1, and Circumference of Spiral Area 2. The spiral is drawn counterclockwise in the example to the right.



The robot defines how many times it spirals around by splitting up the outer circumference diameter by [The number of pitches].

However, line dispensing ends at the position where the robot exceeds the specified [Filling width].

The following settings are for [Line dispensing]:

Without	No border operation is executed.
Circumference	Draws a spiral after line dispensing along the circumference of the circle.
Inner Circumference	Line dispenses along the inner circumference of the circle at the end.
Circumference, Inner Circumference	Draws a spiral after line dispensing along the circumference of the circle, and line dispenses along the inner circumference of the circle at the end.

12. HOW TO CONNECT THE DISPENSER

The [Dispenser Response] and [Dispenser ON] output signals are assigned by default as follows:

	Dispenser Response	Dispenser ON
JR3000 Series	#sysIn13	#sysOut10
JC-3/JS3 Series	#genIn1	#genOut1

These are intended for connecting the dispenser to I/O-SYS for the JR3000 Series and I/O-1 for the JC-3/JS3 Series.
If you want to connect a dispenser to I/O-1(JR3000) or I/O-SYS(JC-3/JS3), or to output the [Dispenser ON] signal to multiple dispensers, you can change this I/O assignment.

TP MENU [Dispenser]
[I/O Function Assignment]

Press the MENU key and select [Dispenser] from the menu. The selection screen shown below appears.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

JR3000/JC-3 Dispenser Selection Screen

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec
Evasion Points of Going Home	

JS3 Dispenser Selection Screen

Select [I/O Function Assignment].

The [I/O Function Assignment] selection screen for dispensing shown below appears.

Select the signal you wish to set or change.

I/O Function Assignment	
Dispenser ON	#sysOut10
Dispenser Response	#sysIn13
Purge by ext. signal	#sysIn14
X Needle Sensor	#sysIn15
Y Needle Sensor	#sysIn16

JR3000 I/O Function Assignment Selection Screen

I/O Function Assignment	
Dispenser ON	#sysOut1
Dispenser Response	#sysIn1
Purge by ext. signal	#sysIn2
X Needle Sensor	#sysIn7
Y Needle Sensor	#sysIn8

JC-3 I/O Function Assignment Selection Screen

I/O Function Assignment	
Dispenser ON	#sysOut1
Dispenser Response	#sysIn1
Purge by ext. signal	#sysIn2
X Needle Sensor	#sysIn3
Y Needle Sensor	#sysIn4

JS3 I/O Function Assignment Selection Screen

The “Dispenser Responses” are input signals, therefore they are normally assigned to I/O-SYS (sysIn) or I/O-1 (genIn).

However, as a setting they can typically be assigned not only as input but also as output signals (sysOut, genOut) and internal or keep relays.

Select [I/O-SYS (sysIn)] or [I/O-1 (genIn)] and a number entry screen is displayed. Enter the I/O number and the display returns to the I/O Function Assignment selection screen.

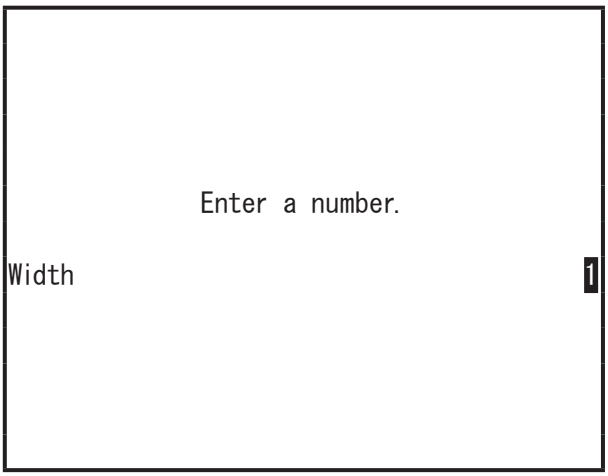
Dispenser Response
I/O-SYS (sysIn)
I/O-1 (genIn)
I/O-FB (fbIn)
I/O-SYS (sysOut)
I/O-1 (genOut)
I/O-FB (fbOut)
Internal Relay (mv)
Keep Relay (mkv)

JR3000/JC-3 Dispenser Response Type Selection Screen

Dispenser Response
I/O-SYS (sysIn)
I/O-1 (genIn)
I/O-H (handIn)
I/O-FB (fbIn)
I/O-SYS (sysOut)
I/O-1 (genOut)
I/O-H (handOut)
I/O-FB (fbOut)
Internal Relay (mv)
Keep Relay (mkv)

JS3 Dispenser Response Type Selection Screen

If you select the [Dispenser ON] output signal (normally #sysOut or #genOut), after entering the I/O number, the output width entry screen appears as shown to the right.
The default width is “1”.

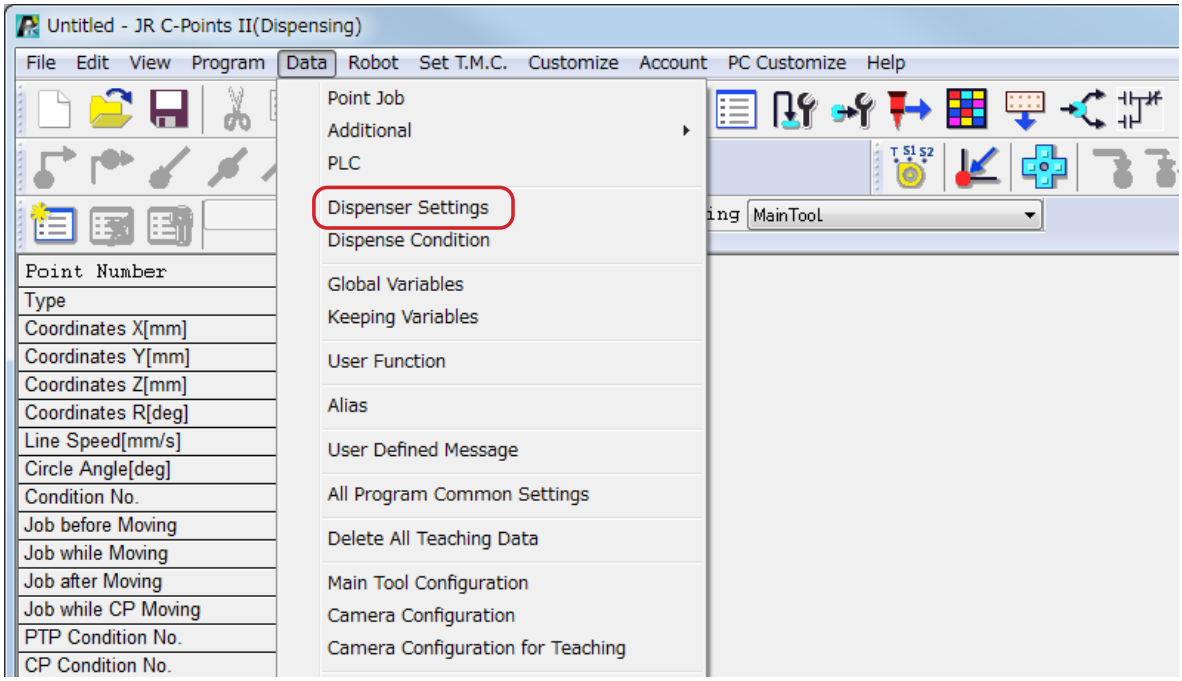


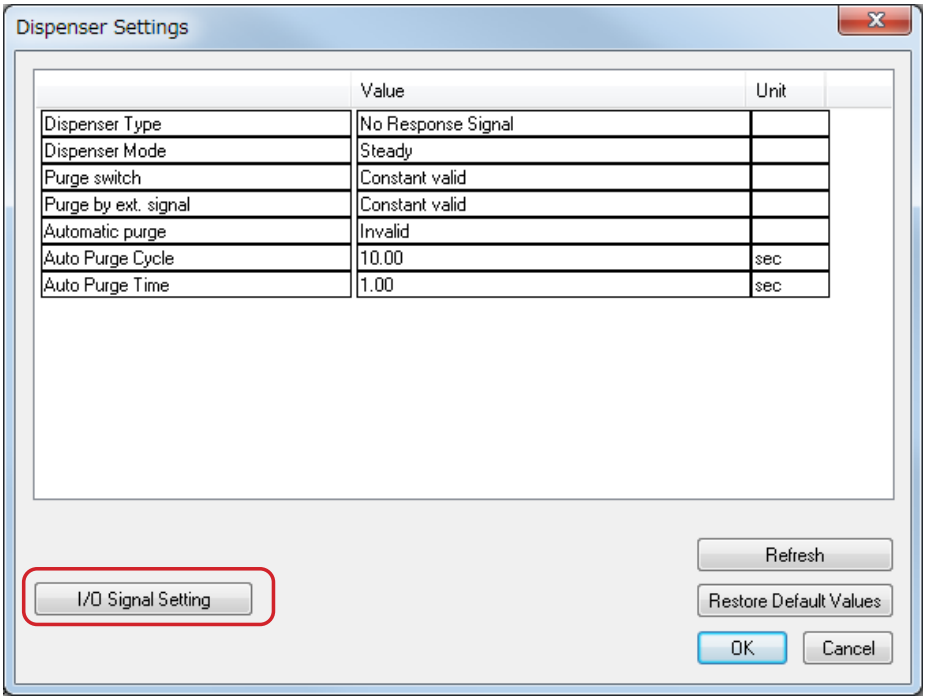
If you select [#genOut] on the type selection screen, enter [3] on the number entry screen, and then enter [2] on the width entry screen, the Dispenser ON signal is output from #genOut3 and #genOut4 at the same time.
If the output width is set to “3”, the Dispenser ON signal is output from #genOut3, #genOut4 and #genOut5.

NOTE:

- The “Width” cannot be set to extend over different types of I/O, such as #sysOut10 and #genOut1. It is limited to I/O with consecutive numbers.
- If you wish to assign a dispenser-related signal to I/O-SYS, assign that signal to [Free] in [I/O-SYS Function Assignment] of all program common data settings.

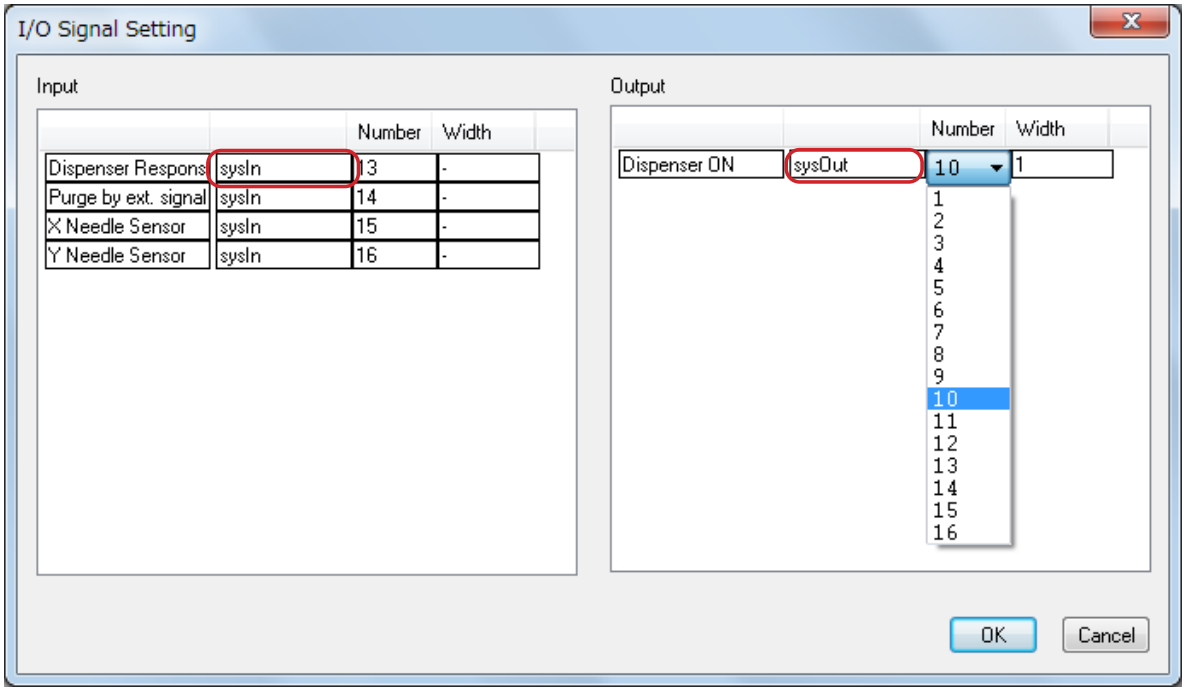
PC [Data] → [Dispenser Settings] → [I/O Signal Setting]





Select [Dispenser Settings]. The Dispenser Settings screen appears. Click the [I/O Signal Setting] button. The screen on the next page is displayed.

To connect the dispenser, set the connector (framed in red in the diagram below), pin number (the [Number] cell), and the number of pins (the [Width] cell). Click each setting cell to select or numerically enter the item you want.



Example: JR3000 Series

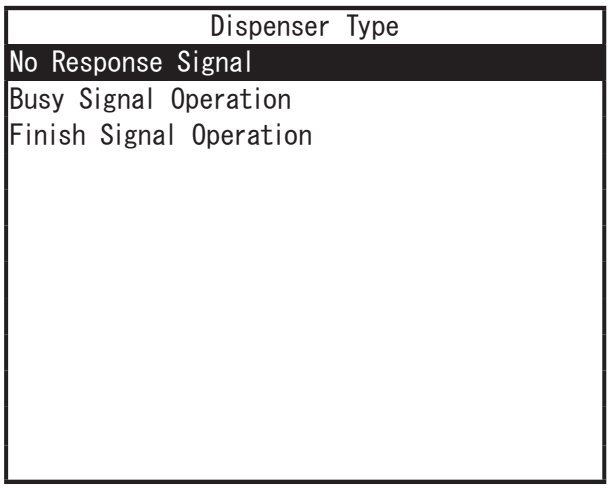
13. DISPENSER TYPE

When using this robot, set/modify [Dispenser Type], under MENU [Dispenser], according to the dispenser connected to the robot. There are three types as follows:

- No Response Signal
  The robot ignores the signals returned from the dispenser.
- Busy Signal Operation
  The robot checks the signals returned from the dispenser during dispensing, from start to finish.
- Finish Signal Operation
  The robot checks the signal returned from the dispenser when dispensing is complete.

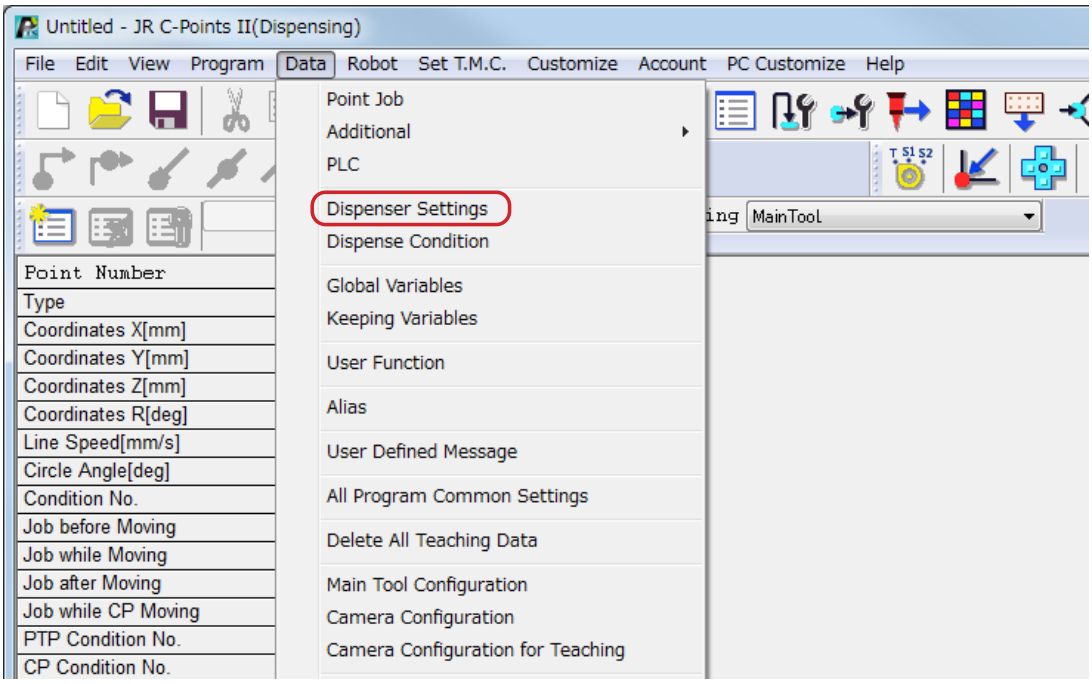
TP MENU [Dispenser]
[Dispenser Type]

Press the MENU key and select [Dispenser] from the menu. Select [Dispenser Type].
The Dispenser Type selection screen shown to the right appears.

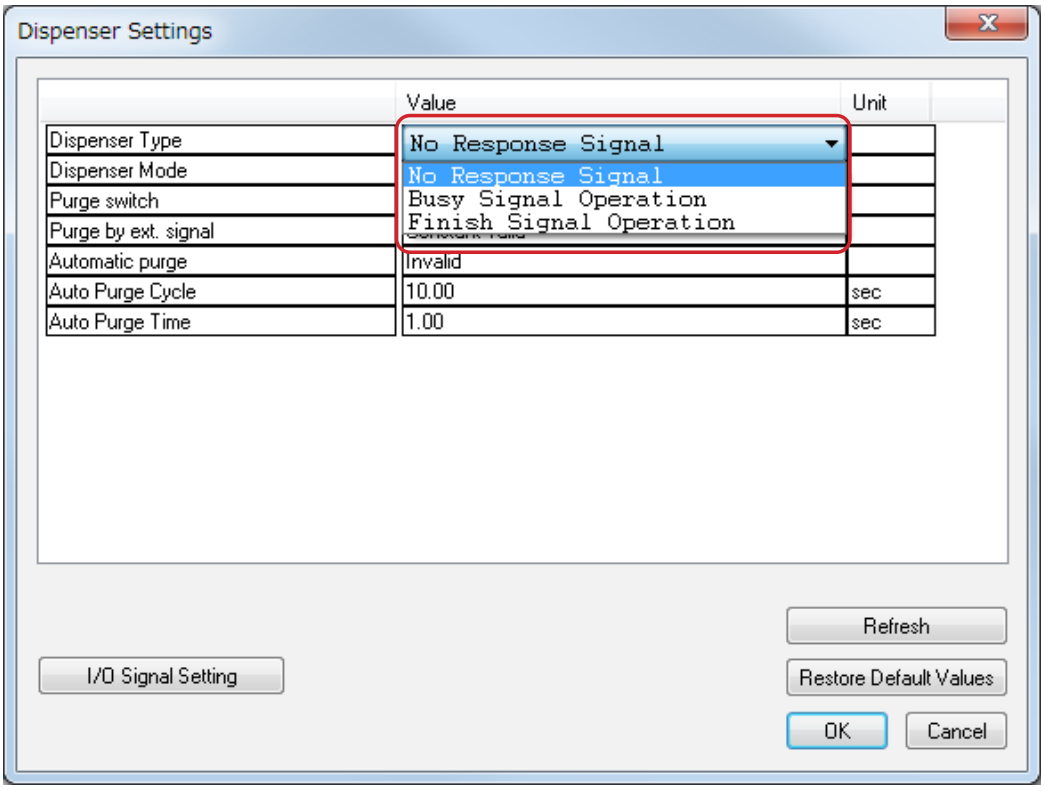


Dispenser Type Selection Screen

PC [Data] → [Dispenser Settings] → [Dispenser Type]



Select [Dispenser Settings] from the menu and then select [Dispenser Type].



JR3000/JC-3 Series Example

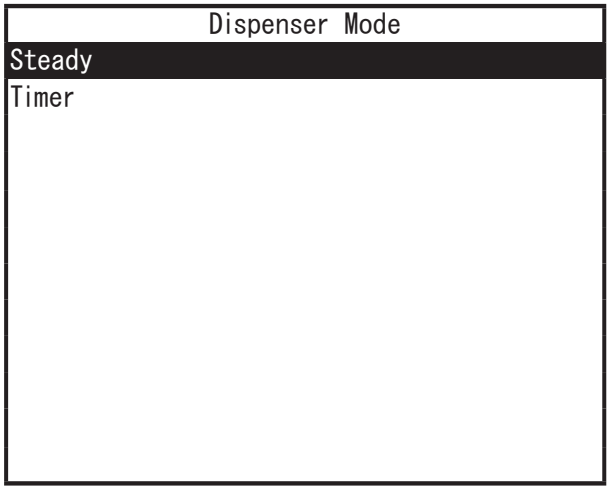
14. DISPENSER MODE

This changes the [Dispenser Mode], under MENU [Dispenser]. There are two types to select from:

- Steady
  The dispensing time is controlled by the robot.
- Timer
  The dispensing time is controlled by the timer on the dispenser.
  (However, during line dispensing or when [Dispenser Type] has been set to [No Response Signal], this setting is invalid. The robot runs in [Steady] mode even if [Dispenser Mode] is set to [Timer].)

TP MENU [Dispenser]
[Dispenser Mode]

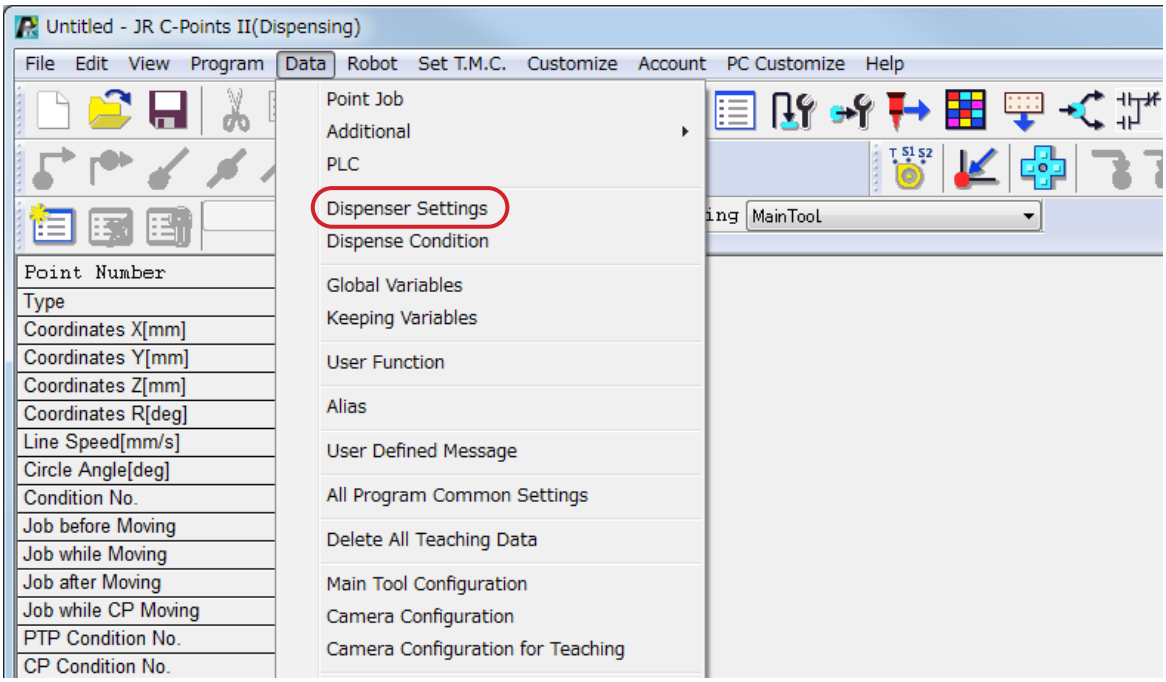
Press the MENU key and select [Dispenser] from the menu. Select [Dispenser Mode]. The Dispenser Mode selection screen shown to the right appears.
If you want to determine the dispensing time using the timer on the dispenser, select [Timer].



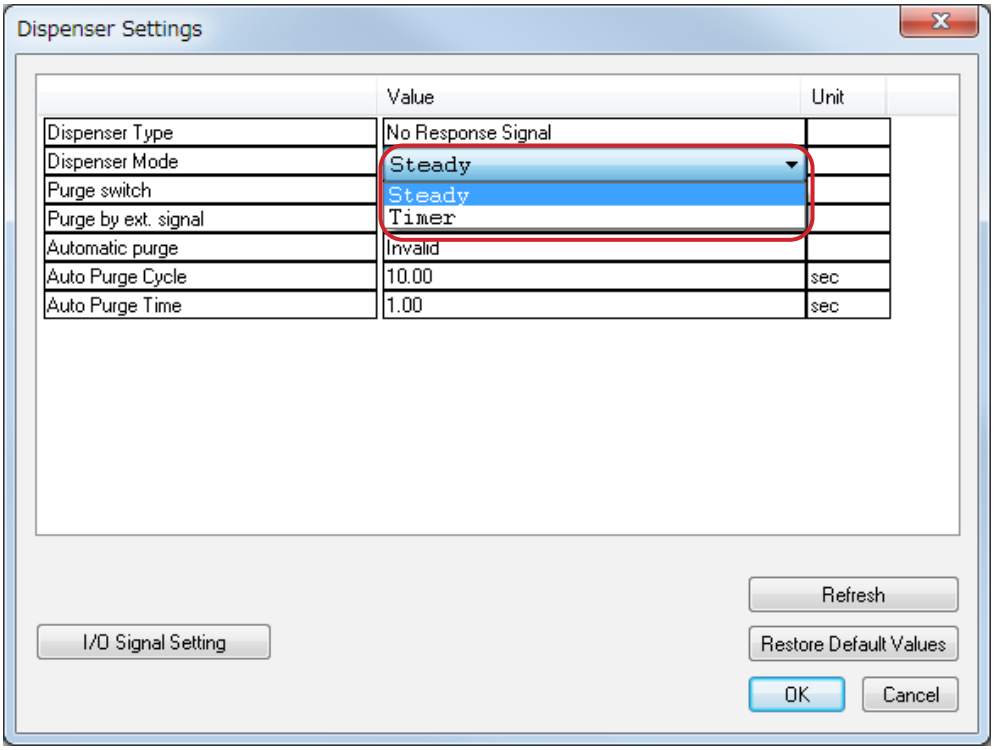
Dispenser Mode Selection Screen

NOTE: If [Dispenser Mode] is set to [Timer], the settings entered for [Point Dispense Time] when teaching Point Dispense points are ignored. The same also applies for the [Point Dispense Time] for Point Dispense points already registered.

PC [Data] → [Dispenser Settings] → [Dispenser Mode]



Select [Dispenser Settings] from the menu and then select the Dispenser Mode.



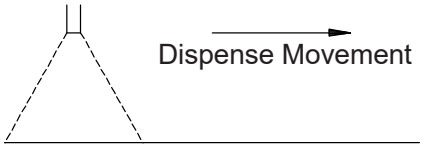
JR3000/JC-3 Series Example

15. FUNCTIONS AT THE START/END OF LINE DISPENSING

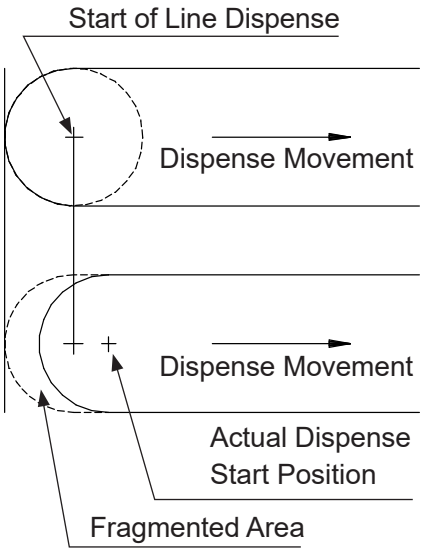
15.1 Prevent Fragmented Dispensing at the Start of Line Dispensing (Wait Time at Start)

At a line dispensing start point*, if the X and/or Y axes, etc., move before the actual dispensing operation starts and the dispensing agent fragments at the start section, or if you want the dispensing agent thicker at the start section, modify/register [Wait Time at Start] in [Dispense Condition].

Once [Wait Time at Start] is set, after the [Dispenser ON] signal comes ON at [Start of Line Dispense]/[Start of Circle Dispense], the robot waits exactly for the set time before moving.



If you want to set this function to the majority of start points for line dispensing operations in your program, set these points with [Dispense Condition] in the individual program settings.
If you want to set these to a minority of such points, register these points with the condition data [Dispense Condition].



* Start of Line Dispense, Start of Circle Dispense, Zigzag Start Point, Rectangular Spiral Start Point, Hollow Rectangle Start Point, Spiral Start Point, and Hollow Spiral Start Point

Dispense Conditions in Individual Program Settings

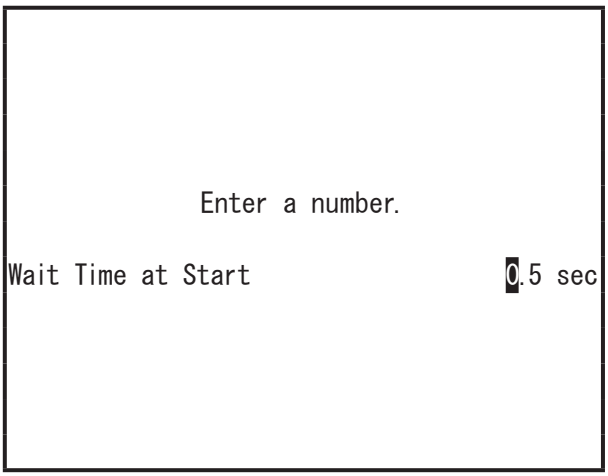
T P MENU [Individual Program Settings]
[Dispense Condition]
[Wait Time at Start]

Dispense Conditions in Condition Data

T P MENU [Dispense Condition]
Number Entry
[Wait Time at Start]

[Dispense Condition] in individual program settings is applied to all line dispensing start points in the same program. Condition data [Dispense Condition] apply only to points that are set with dispensing condition numbers.

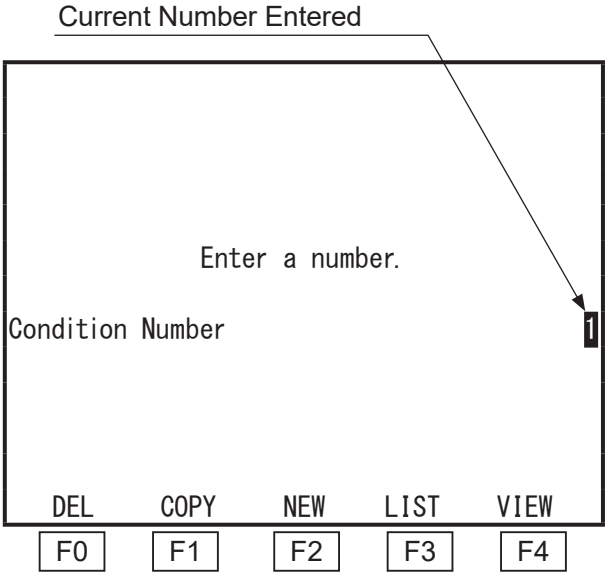
■ Individual Program Settings
[Dispense Condition]
Press the MENU key, select [Individual Program Settings], and then select [Dispense Condition]. Select [Wait Time at Start].
The Wait Time at Start entry screen shown on the right is displayed.
Enter the value you want to register.



■ Condition Data [Dispense Condition]

1. Press the MENU key on the value setting screen for the point you want to prevent fragmented dispensing on at the start of the line dispensing, such as a Start of Line Dispense point, etc., and select [Dispense Condition] and enter the condition number. Select [Wait Time at Start]. The screen for entering the wait time (as shown above) is displayed. Enter the value you want to set.
2. Call up value setting screen for the point for which you want to set the dispensing condition and select [Condition Number]. (Move the cursor (highlight bar) to a blank line on the point setting screen to display the settable point jobs and condition data.)
3. The condition number entry screen (as shown below) for the dispensing condition is displayed. Enter the dispensing condition number entered in 1. Press the F3 (LIST) key to display a list of registered dispensing condition numbers. You can also select the number you want to set from this list.

NOTE: With the following procedure you can register dispensing conditions and also set them to points. Select [Condition Number] from the point setting screen, and press the F4 (VIEW) key on the dispensing condition selection screen (as shown to the right) while the dispensing condition number you want to set is displayed to show the dispensing condition information for that number. You can select the item you want to enter and also enter the values you want here.



[Wait Time at Start] is executed only at points that start line dispensing.

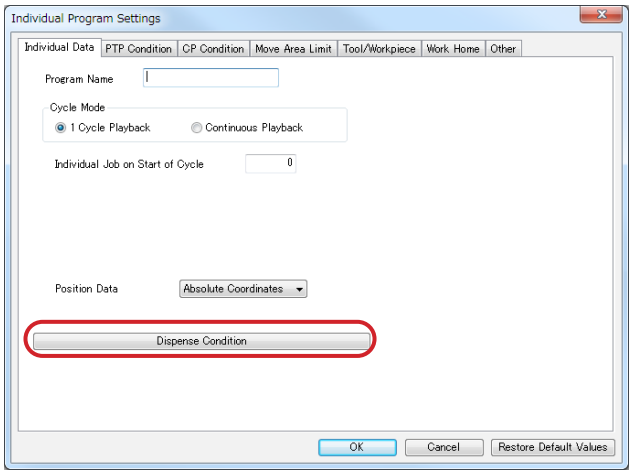
Dispense Conditions in Individual Program Settings

PC [Program] → [Individual Program Settings] → [Individual Data] → [Dispense Condition] → [Wait Time at Start]

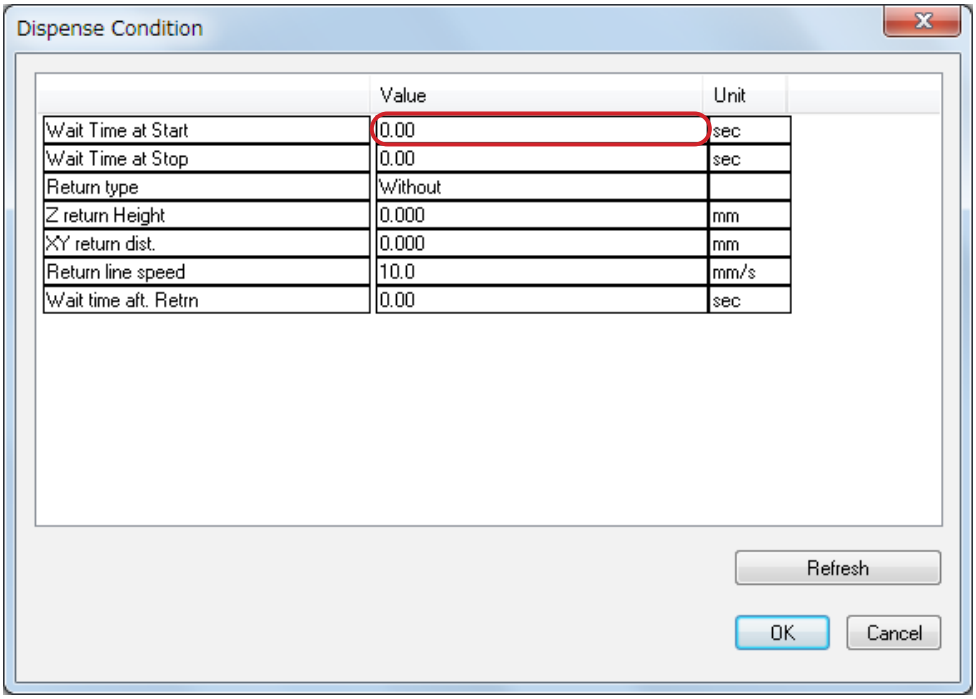
Dispense Conditions in Condition Data

PC [Data] → [Dispense Condition] → [Add] / [Edit] → [Wait Time at Start]

To set dispense conditions in individual program settings, select [Individual Data] tub in the [Individual Program Settings] dialog box and click [Dispense Condition]. The dialog box below is displayed.



To register conditional data dispense conditions, select [Dispense Condition] from the [Data] pull-down menu. The dialog box below is displayed. Enter the values you want to change in the dispense condition [Wait Time at Start].



15.2 Prevent Fragmented Dispensing at the End of Line Dispensing (Wait Time at Stop)

At a Point Dispense/End of Line Dispense/dispensing end position*, if the Z axis ascends before the actual dispensing finishes and/or the X and/or Y axes, etc., start moving causing the dispensing agent to drip, register/modify the dispensing condition [Wait Time at Stop].
Once [Wait Time at Stop] is set, after the [Dispenser ON] signal goes OFF at the Point Dispense/ End of Line Dispense/dispensing end position*, the robot waits for exactly the time set here before ascending/moving.

* Dispensing end position:
  The end position of a circle or arc drawn with [Start of Circle Dispense] – [Center of Circle Dispense]. The dispensing end position of a rectangle or circle dispense filling area.

Dispense Conditions in Individual Program Settings

TP MENU [Individual Program Settings]
[Dispense Condition]
[Wait Time at Stop]

Dispense Conditions in Condition Data

TP MENU [Dispense Condition]
Number Entry
[Wait Time at Stop]

[Dispense Condition] in individual program settings is applied to all line dispensing start points in the same program. [Dispense Condition] set by [Condition Number] is only applied to points that are set with dispensing condition numbers.

■ Dispense Conditions in Individual Program Settings

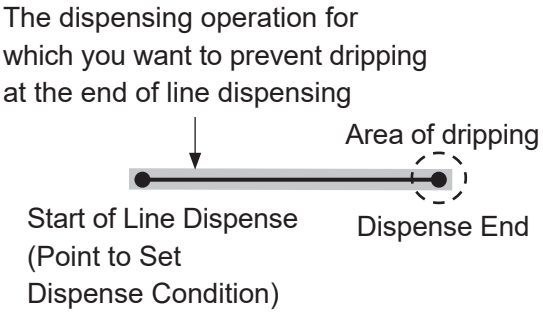
Press the MENU key, select [Individual Program Settings], and then select [Dispense Condition] (shown on the right).

Select [Wait Time at Stop].
The Wait Time at Stop entry screen is displayed.
Enter the value you want to set.

Program 1	
Wait Time at Start	0.5 sec
Wait Time at Stop	0 sec
Return type	XY Move after Z Up
Z return Height	10 mm
XY return dist.	-30 mm
Return line speed	30 mm/s
Wait time aft. Retrn	0 sec

■ Condition Data Dispense Conditions

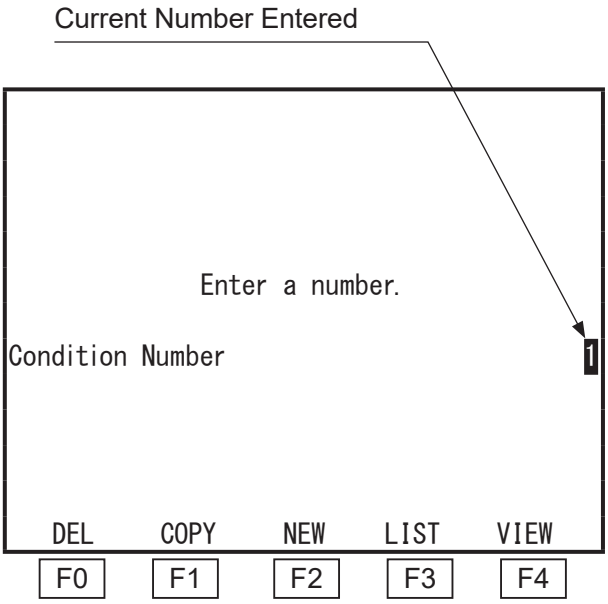
1. Press the [MENU] key on the value setting screen for the start point of the dispensing operation for which you want to prevent the dispensing agent dripping at the end of line dispensing, such as a Start of Line Dispense point, etc. Select [Dispense Condition] and enter the condition number.
   Select [Wait Time at Stop]. The screen for entering the wait time is displayed. Enter the value you want to set.



2. Call up the value setting screen for the point to where you want to set the dispensing condition and select the condition number.(Move the cursor (highlight bar) to a blank line on the point setting screen to display the settable point jobs and condition data.)

3. The condition number entry screen for the dispensing condition is displayed. Set the dispensing condition number entered in 1. If you press the [F3] (LIST) key to display a list of registered dispensing condition numbers, you can also select the number you want to set from this list.

NOTE: With the following procedure you can register dispensing conditions and also set them to points. Select the condition number from the point setting screen, and press the [F4] (VIEW) key when the dispensing condition number you want to set is displayed on the screen (as shown to the right) to show the information for that number.
You can select the item you want to edit and also modify the information here.



The [Wait Time at Stop] is only executed at [Point Dispense], [End of Line Dispense], and/or dispensing end positions.

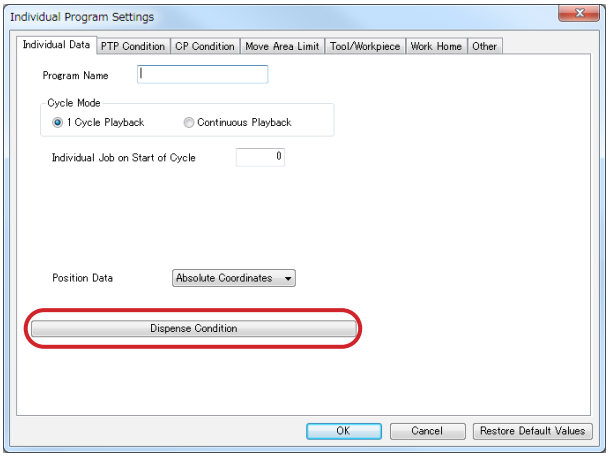
Dispense Conditions in Individual Program Settings

PC [Program] → [Individual Program Settings] → [Individual Data] → [Dispense Condition] → [Wait Time at Stop]

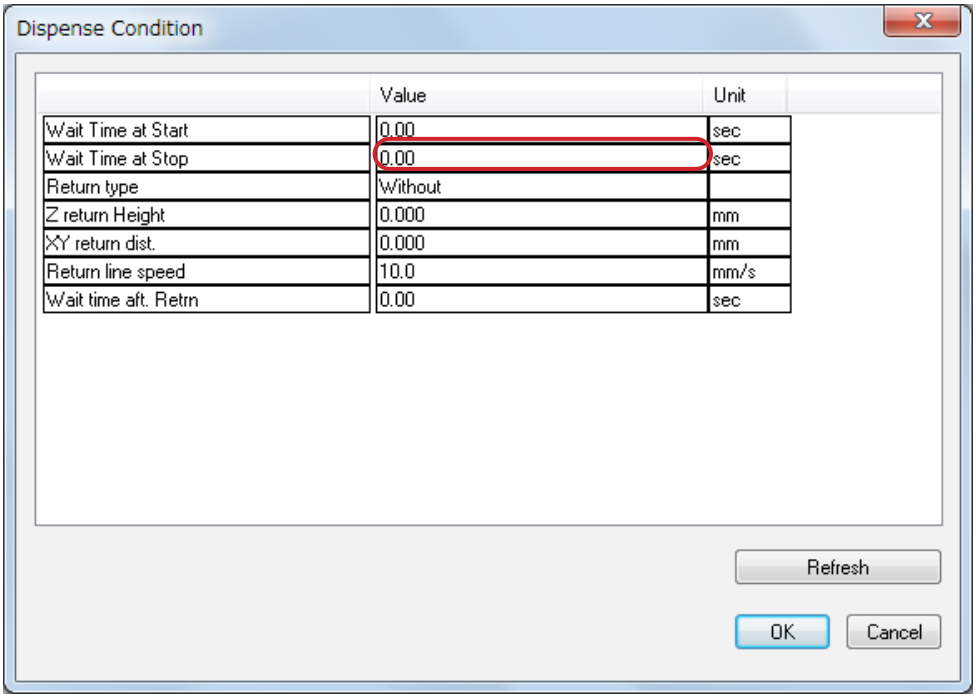
Dispense Conditions in Condition Data

PC [Data] → [Dispense Condition] → [Add]/[Edit] → [Wait Time at Stop]

Select [Individual Data] tub in the [Individual Program Settings] dialog box and click [Dispense Condition]. The dialog box below is displayed.
Enter the values you want to modify in [Wait Time at Stop].



To register conditional data dispense conditions, select [Dispense Condition] from the [Data] pull-down menu. The dialog box below appears.
Enter the values you want to modify in [Wait Time at Stop].



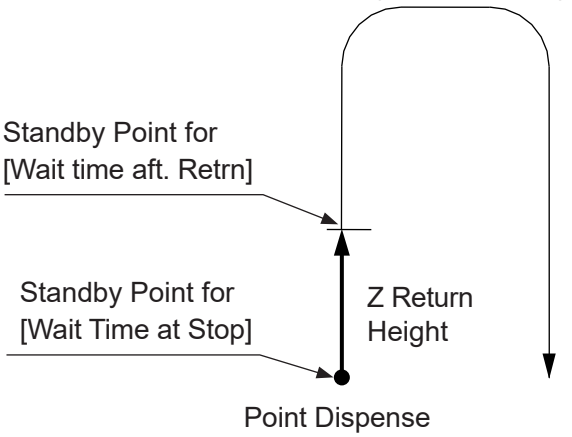
15.3 Prevent Liquid Stringing at the End of Dispensing

If liquid strings at a [Point Dispense], [End of Line Dispense], or dispense end position, you can set a stop time, or raise the Z axis at a slow speed to help reduce stringing.
Set the [Return type], the [Z return Height], the [XY return dist.], the [Return line speed] and the [Wait time aft. Retrn] in [Dispense Condition]. If you set [Dispense Condition] in individual program settings, the content set is applied to all dispensing points in the program. If you set [Dispense Condition] in condition data, the condition data [Dispense Condition] is applied only to the point to which it is set.

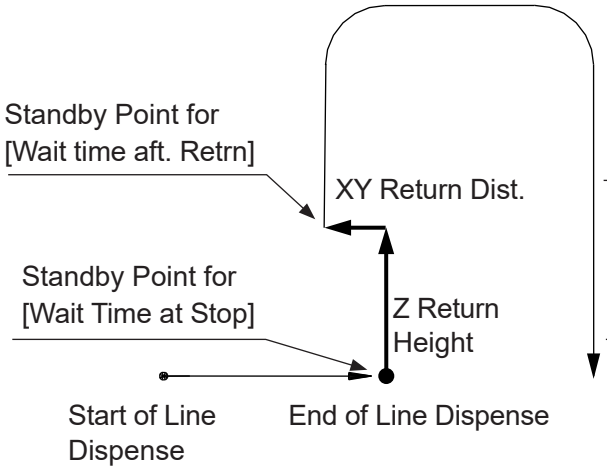
Return type	Return type at the line dispensing end position*
Without	After the robot stands by for [Wait Time at Stop], it moves to the next point.
Z up only	After the robot stands by for [Wait Time at Stop], the Z axis ascends exactly to [Z return Height] at the specified [Return line speed], and then waits the exact [Wait time aft. Retrn] to move to the next point.
XY moving after Z up	After the robot stands by for [Wait Time at Stop], the Z axis ascends exactly to [Z return Height] at the specified [Return line speed], and then the X and Y axes move the exact [XY return dist.] at the specified [Return line speed]. After this, the robot waits the exact [Wait time aft. Retrn] to move to the next point.
XYZ simultaneous	After the robot stands by for [Wait Time at Stop], the X,Y, and Z axes move diagonally (synchronized) to [Z return Height] and [XY return dist.] at the specified [Return line speed]. After this, the robot waits the exact [Wait time aft. Retrn] to move to the next point.

* With [Point Dispense], dispense filling end position, or a circle ([Start of Circle Dispense] – [Center of Circle Dispense]), a [Z up only] movement is made even if [XY moving after Z up] or [XYZ simultaneous] is set. If [Without] is set, no return movement is performed.

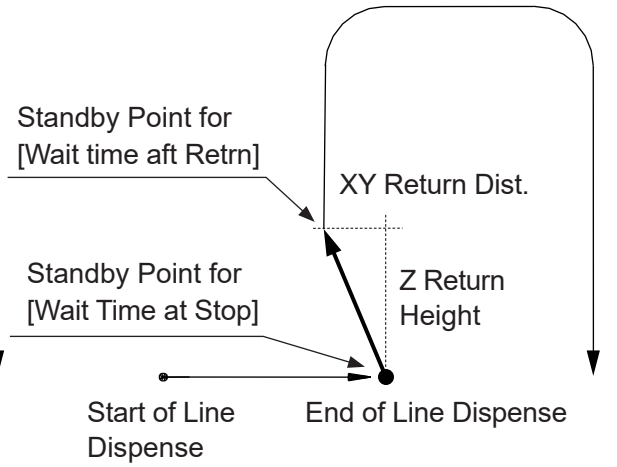
Return Type: Z Up Only



Return Type: XY Moving After Z Up



Return Type: XYZ Simultaneous

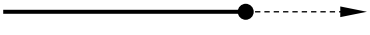


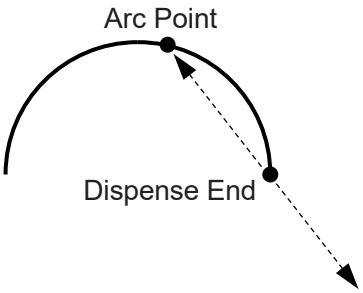
Set a positive (+) or negative (-) value for the [XY return dist.].

- If a positive value ([XY return dist.] > 0) is set, the XY axes return in the direction opposite from the direction used to reach the dispensing end position.
- If a negative value ([XY return dist.] < 0) is set, the XY axes continue in the same direction as the direction used to reach the dispensing end position.
- The return movement with circle dispensing is done in a straight line from the dispensing end position to the arc point. If the [XY return dist.] is a negative value, the robot returns in the opposite direction.

XY Return Dist.: Positive

XY Return Dist.: Negative





Dispense Conditions in Individual Program Settings

TP MENU [Individual Program Settings]
[Dispense Condition]
[Return type]
[Z return Height]
[XY return dist.]
[Return line speed]
[Wait time aft. Retrn]

NOTE: Even if values are set to [Z return Height] – [Wait time aft. Retrn], no return movement is performed if [Return type] is set to [Without].

Press the MENU key, select [Individual Program Settings], and then select [Dispense Condition].
The Dispense Condition settings screen is displayed as shown to the right.
Select the [Return type] and then select and set the movement you want. The display returns to the Dispense Condition settings screen.
After selecting [Z return Height], [XY return dist.], [Return line speed], or [Wait time aft. Retrn], each entry screen appears accordingly. Enter and set the values you want to modify. The display returns to the Dispense Condition settings screen.

Program 1	
Wait Time at Start	0.5 sec
Wait Time at Stop	0 sec
Return type	XY moving after Z up
Z return Height	10 mm
XY return dist.	-30 mm
Return line speed	30 mm/s
Wait time aft. Retrn	0 sec

Dispense Conditions in Condition Data

TP MENU [Dispense Condition]

Number Entry

[Return type]

[Z return Height]

[XY return dist.]

[Return line speed]

[Wait time aft. Retrn]

The dispensing operation for which you want to prevent liquid stringing at the End of Line Dispensing

Start of Line Dispense (Point Set with Dispense Condition)

End of Line Dispense

1. Press the MENU key on the settings screen of a given point, select [Dispense Condition] and enter the condition number. Enter and set the “dispensing return movement” you want. The display returns to the dispensing condition setting screen.
2. After selecting [Z return Height], [XY return dist.], [Return line speed] or [Wait time aft. Retrn], each entry screen appears accordingly. Enter and set the values you want to modify. The display returns to the Dispense Condition settings screen.
3. On the settings screen for the point for which you want to set the dispensing condition (the point you want to prevent stringing at for the end of the line dispensing, such as a Start of Line Dispense Point) select [Condition Number] (move the cursor (highlight bar) to a blank line on the point setting screen to display the settable point jobs and condition data).
4. The dispensing condition number entry screen is displayed.
   Enter the dispensing condition number entered in 1. If you press the F3 (LIST) key to display a list of registered dispensing condition numbers, you can also select the number you want to set from this list.

NOTE: With the following procedure you can register dispensing conditions and also set them to points. Select [Condition Number] from the point setting screen, and when the dispensing condition number you want to set has been entered, press the F4 (VIEW) key to show the information for that number. You can select the item you want to edit and also modify the information here.

Return movements are executed at [End of Line Dispense] points, and/or dispensing end positions.

Dispense Conditions in Individual Program Settings

PC [Program] → [Individual Program Settings] → [Individual Data] → [Dispense Condition]
→[Z return Height]

[XY return dist.]

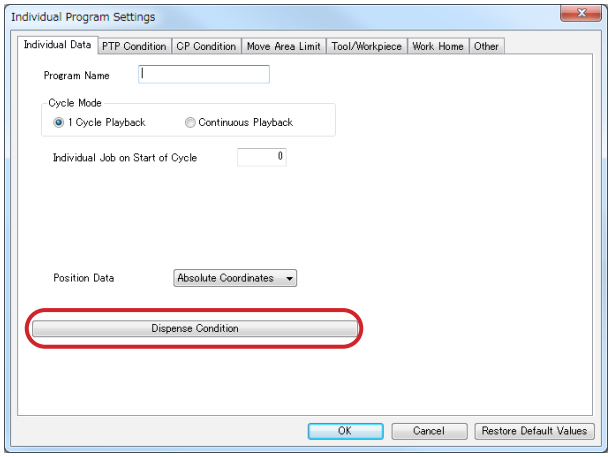
[Return line speed]

[Wait time aft. Retrn]

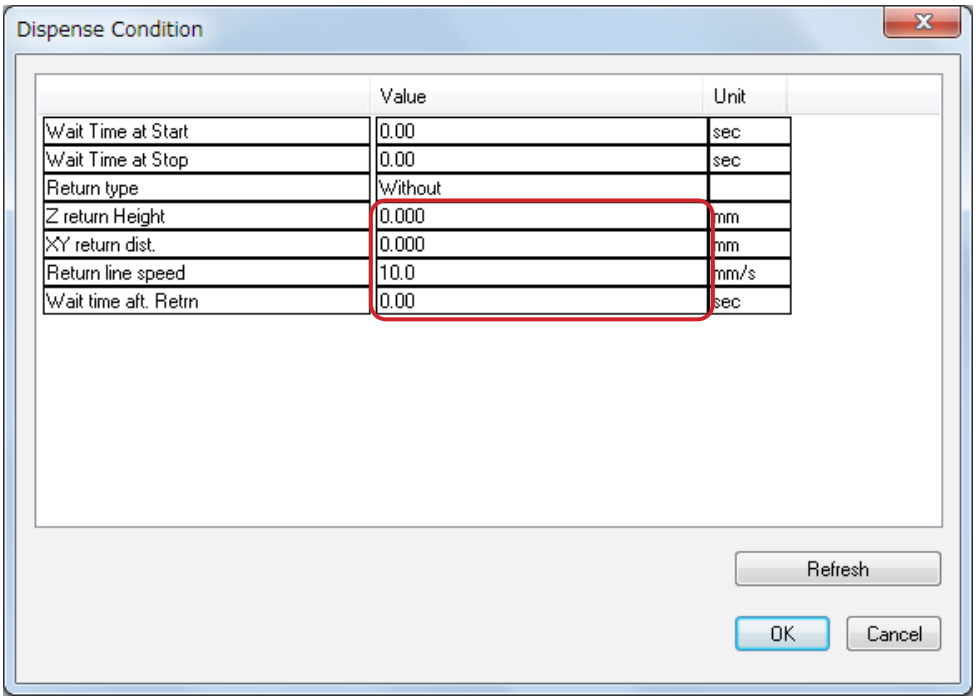
Dispense Conditions in Condition Data

PC [Data] → [Dispense Condition] → [Add]/[Edit] → [Z return Height]
[XY return dist.]
[Return line speed]
[Wait time aft. Retrn]

Select [Individual Data] tub in the [Individual Program Settings] dialog box and click [Dispense Condition]. The dialog box below is displayed. Enter the values you want to modify in [Z return Height], [XY return dist.], [Return line speed] and [Wait time aft. Retrn].



To register conditional data dispense conditions, select [Dispense Condition] from the [Data] pull-down menu. The dialog box below appears.



15.4 Adjusting the Dispensing Start Position/End Position (Adjust Dispensing Distance)

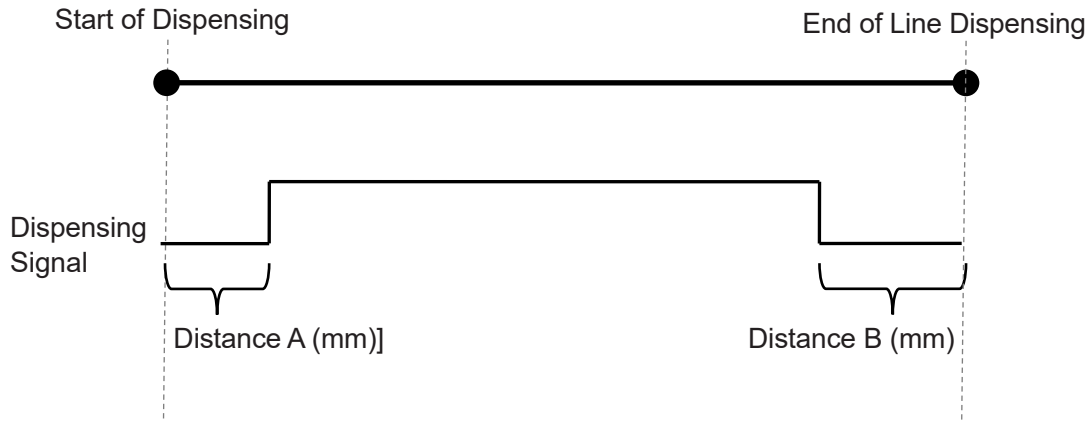
In the dispensing condition [Adjust Dispensing Distance], you can select the adjust dispensing distance settings from Invalid, Signal Timing, or Adjust Distance.

15.4.1 When the Signal Timing is Selected

When dispensing using Line Dispensing points with [Signal Timing], you can specify a distance from the dispensing start point to set a location where the dispenser comes ON. Likewise, you can also specify a distance before the dispensing end point from where the dispenser turns OFF. If the [Signal Timing] is selected in the dispensing condition [Adjust Dispensing Position], the [Dispenser-ON Distance] and [Dispenser-OFF Distance] appears underneath the [Adjust Dispensing Position]. Set these parameters to adjust the dispensing distance. Only points set with this dispensing condition data are affected.

Adjust Dispensing Distance	Select from Invalid/Signal Timing/Adjust Distance. If the [Signal Timing] is selected, a required setting parameter displays.
Dispenser-ON Distance	Displays when the [Signal Timing] is selected. Specifies distance A (mm) from the dispensing start point where the dispenser turns ON.
Dispense-OFF Distance	Displays when the [Signal Timing] is selected. Specifies distance B (mm) before the dispensing end position where the dispenser turns OFF.

Example: Line Dispensing

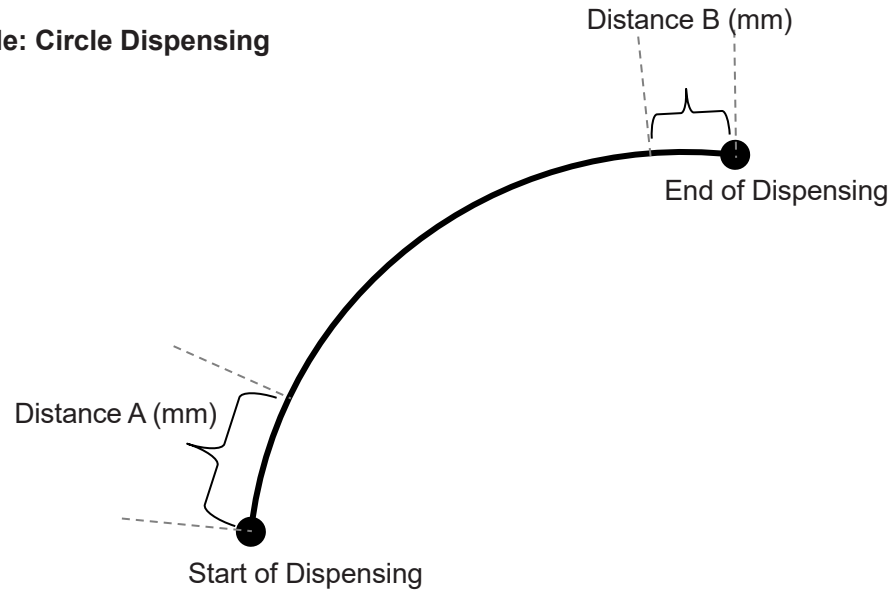


NOTE:

- The dispenser ON distance and the dispenser OFF distance need to be set shorter than the line dispensing distance (start of dispensing to end of dispensing).

- The dispensing position adjustment is calculated at the start of the line dispensing point and performed after the [Job After Moving] is performed (if applicable). For this reason, make sure the following conditions and items are set before the [Job After Moving] and make sure that there are no changes to them up until the end of dispensing:
    - Data condition number and the accompanying conditions
    - Workpiece adjustment number and the accompanying adjustment value
    - CP conditions
- Do not set this function to CP Stop Points as they are not compatible.
- Register a Line Passing point in after distance A and before distance B. If a Line Passing point is set in between distance A or in between distance B, the dispenser may not switch ON or OFF correctly. If a passing point is needed in between distance A or distance B, use a CP Passing Point.
- If you register a Line Passing point after distance A and before distance B, make sure the dispenser is ON at the Line Passing point. If the dispenser is set to OFF, the dispensing signal may not turn ON and OFF correctly.

Example: Circle Dispensing



NOTE:

- The dispenser ON distance and the dispenser OFF distance need to be set shorter than the line dispensing distance (start of circle dispensing to end of circle dispensing).
- The dispensing position adjustment is applied after the [Job After Moving] is performed (if applicable). For this reason, make sure the following conditions and items are set before the [Job After Moving] and make sure that there are no changes to them up until the end of circle dispensing:
    - Data condition number and the accompanying conditions
    - Workpiece adjustment number and the accompanying adjustment value
    - CP conditions

Dispense Conditions in Condition Data

TP MENU [Dispense Condition]

Enter condition number

[Adjust Dispensing Distance]

[Dispenser-ON Distance]

[Dispenser-OFF Distance]

NOTE: If [Adjust Dispensing Distance] is set to [Invalid] or [Adjust Distance] is selected, [Dispenser-ON Distance] and [Dispenser-OFF Distance] are not displayed.

Dispense Condition 1	
Wait Time at Start	0 sec
Wait Time at Stop	0 sec
Return type	None
Z return Height	0 mm
XY return dist.	0 mm
Return line speed	10 mm/s
Wait time aft. Retrn	0 sec
Adjust Dispensing Distance	Signal Timing
Dispenser-ON Distance	0 mm
Dispenser-OFF Distance	0 mm

1. Press the MENU key, select [Dispense Condition], and enter a condition number. Next, select [Adjust Dispensing Distance] and set it to [Signal Timing]. The parameters [Dispenser-ON Distance] and [Dispenser-OFF Distance] used for the dispensing distance adjustment function are displayed.

2. Select [Dispenser-ON Distance] or [Dispenser-OFF Distance] to display the setting screen for that item. Enter and set the amount you want to adjust the dispenser ON/OFF position. After the setting is made, the screen returns to the dispensing condition setting screen.

3. Move the cursor (highlight bar) to a blank line on the point setting screen to see point jobs and conditional data that can be set to that point. Select or set the point type to which you want to set the dispensing condition and select [Condition Number]. A screen for entering the dispensing condition number is displayed.
   Note that if line dispensing, you do not need to set condition data for this function to the End of Line Dispense point. Likewise, if circle dispensing, you do not need to set condition data to the Center of Circle Dispense point.

4. Enter the dispensing condition number entered in step 1. Alternatively, you can press the F3 (LIST) key to view a list of registered dispensing conditions and select the dispensing condition number.

NOTE: You can also use the following method to teach dispensing conditions and set them to points.

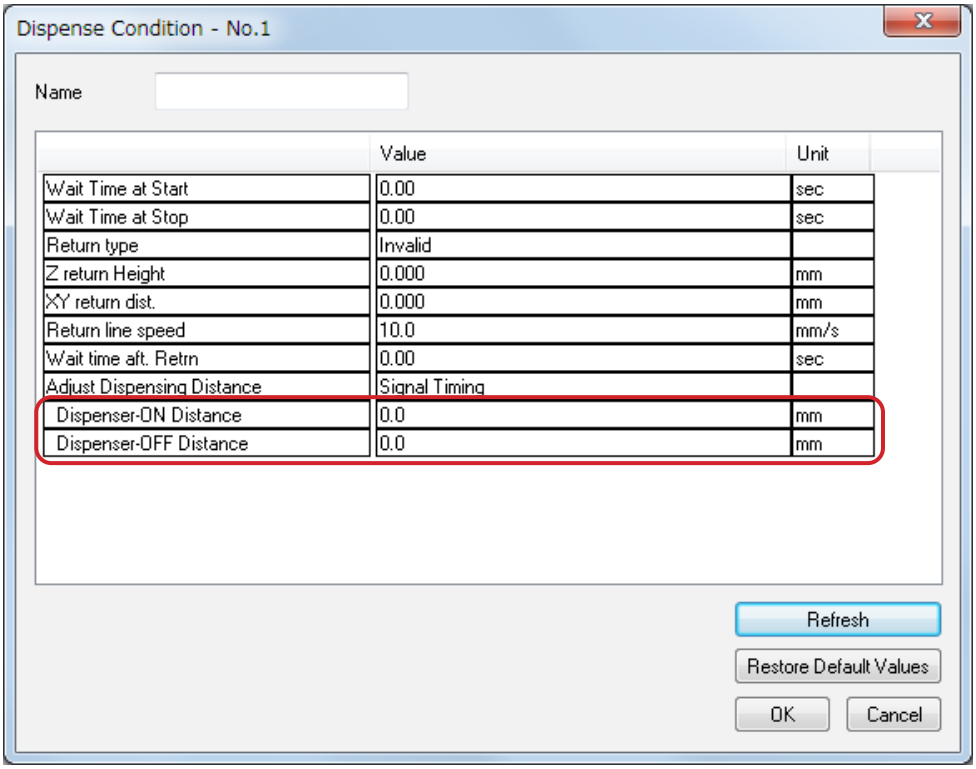
Select [Dispense Condition] from the point settings screen. The dispensing condition number entry screen is displayed. Enter the dispensing condition number you want to set to this point and press the F4 (VIEW) key. The dispensing condition contents for the condition number entered are displayed. Select the item you want to set and then enter the value for that item.

Dispense Conditions in Condition Data

PC [Data] → [Dispense Condition] → [Add]/[Edit] → [Adjust Dispensing Distance]
[Dispenser-ON Distance]
[Dispenser-OFF Distance]

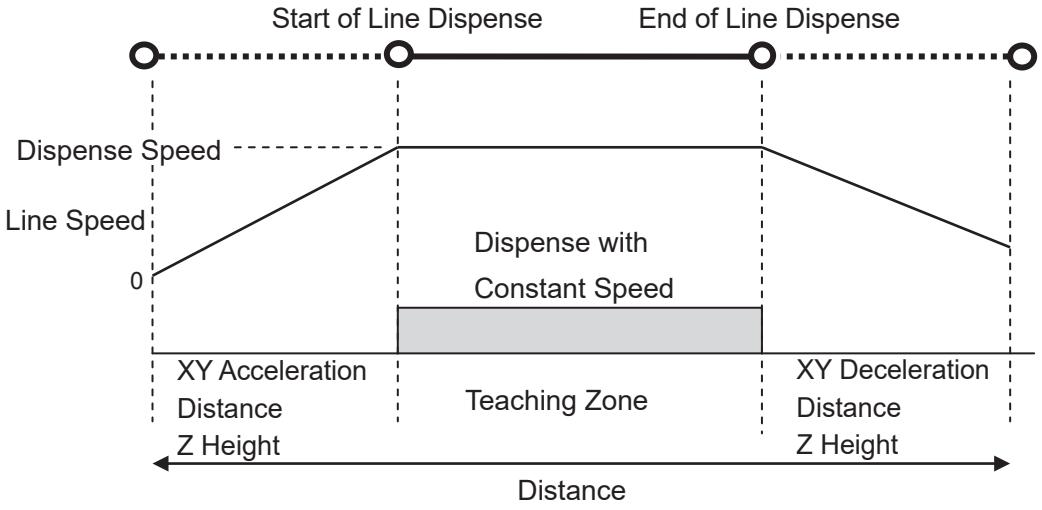
NOTE: If [Adjust Dispensing Distance] is disabled or [Adjust Distance] is selected, [Dispenser-ON Distance] and [Dispenser-OFF Distance] are not displayed.

Enter the values you want to modify for [Dispenser-ON Distance] and [Dispenser-OFF Distance].



15.4.2 When the Adjust Distance is Selected

In the [Adjust Distance], you can set an acceleration/deceleration zone for the Start of Line Dispense and End of Line Dispense by setting the appropriate dispensing condition parameter. By setting the appropriate parameter, you can adjust the dispensing zone with the constant speed to secure the dispensing.。



If the [Adjust Distance] is selected in the dispensing condition [Adjust Dispensing Distance], the [XY Acceleration/Deceleration Distance] and [Z Height] display under the [Adjust Dispensing Distance]. Set these parameters.
If you set an arbitrary point in this dispensing condition, only the dispensing condition the point set is affected.

Adjust Dispensing Distance	Select from Invalid/Signal Timing/Adjust Distance. If the [Adjust Distance] is selected, a required setting parameter displays.
XY Acceleration/ Deceleration Distance	Displays when the [Adjust Distance] is selected. Set the acceleration/deceleration zone distance [mm] to extrapolate. Extrapolates the acceleration zone for the Start of Line Dispense and the deceleration zone for the End of Line Dispense. If the acceleration/ deceleration distance is too short (such as when the target line speed cannot be reached at the Start of Line Dispense, etc.), the CP speed error occurs.
Z Height	Displays when [Adjust Distance] is selected. Set the Z height [mm] for the extrapolate destination. Set this when you want to evade the obstacles on the workpiece.

Dispense Conditions in Condition Data

TP MENU [Dispense Condition]

Enter condition number

[Adjust Dispensing Distance]

[XY Acceleration/Deceleration Distance]

[Z Height]

NOTE: If the [Adjust Dispensing Distance] is set to [Signal Timing] or [Invalid], the [XY Acceleration/Deceleration Distance] and [Z Height] does not display.

Dispense Condition 1	
Wait Time at Start	0 sec
Wait Time at Stop	0 sec
Return type	Without
Z return Height	0 mm
XY return dist.	0 mm
Return line speed	10 mm/s
Wait time aft. Retrn	0 sec
Adjust Dispensing Distance	Adjust Distance
XY Acceleration/Deceleration Distance	0 mm
Z Height	0 mm

1. Press the MENU key and select the [Dispense Condition] to enter the condition number. Then, select the [Adjust Dispensing Distance] → [Adjust Dispensing Distance]. The [XY Acceleration/Deceleration Distance] and [Z Height] parameters for the adjust dispensing distance display.

2. If you select the [XY Acceleration/Deceleration Distance] and [Z Height], the entry screen displays. Enter and set the values you want to modify. The display returns to the Dispense Condition settings screen.

3. Move the cursor (highlight bar) to a blank line on the point setting screen to see point jobs and conditional data that can be set to that point. Call up value setting screen for the point for which you want to set the dispensing condition and select [Condition Number]. The dispensing condition number entry screen is displayed.
   Note that if line dispensing, you do not need to set condition data for this function to the End of Line Dispense point. Likewise, if circle dispensing, you do not need to set condition data to the Center of Circle Dispense point.

4. Enter the dispensing condition number entered in 1. Alternatively, you can press the F3 key to view a list of registered dispensing conditions and select the dispensing condition number.。

NOTE: You can also use the following method to teach dispensing conditions and set them to points.

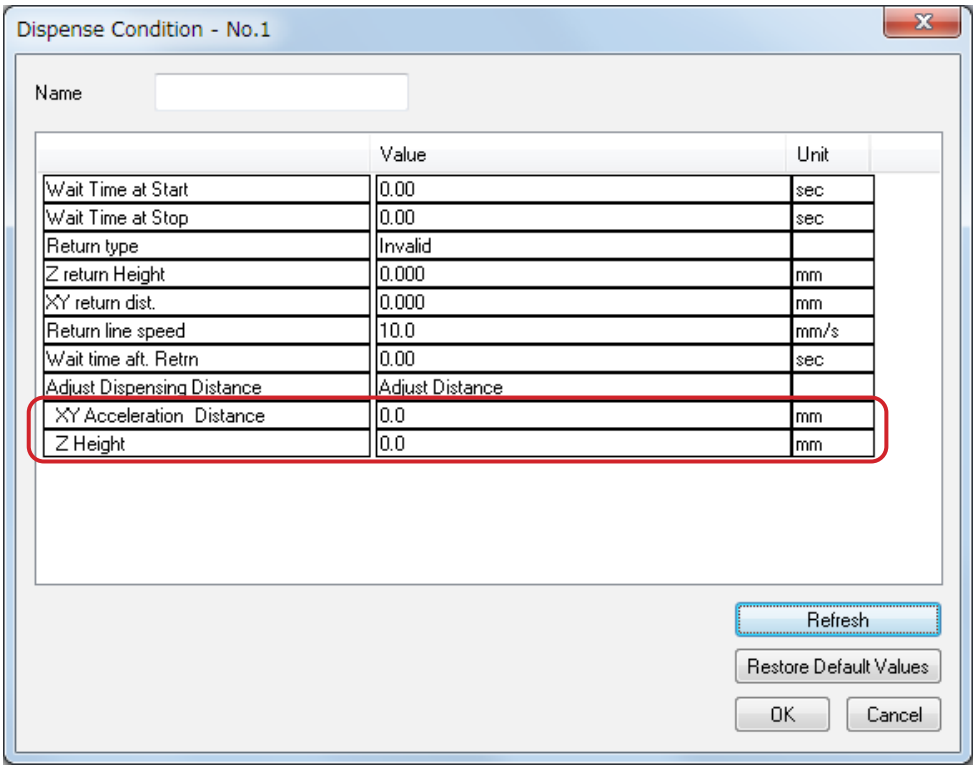
Select [Dispense Condition] from the point settings screen. The dispensing condition number entry screen is displayed. Enter the dispensing condition number you want to set to this point and press the F4 (VIEW) key. The dispensing condition contents for the condition number entered are displayed. Select the item you want to set and then enter the value for that item.

Dispense Conditions in Condition Data

PC [Data] → [Dispense Condition] → [Add]/[Edit] → [Adjust Dispensing Distance]
[XY Acceleration Distance]
[Z Height]

NOTE: If the [Adjust Dispensing Distance] is set to [Invalid] or [Signal Timing], the [XY Acceleration Distance] and [Z Height] does not display.

Enter the values you want to modify for [XY Acceleration Distance] and [Z Height].



16. WORK ADJUSTMENTS FOR DISPENSING SPECIFICATIONS

With work adjustments, the Start of Line Dispense Point – End of Line Dispense point (as well as the CP Start Point – CP End Point) is considered one block of points. Therefore, if a work adjustment is set at the Start of Line Dispense point, it applies to all points through the End of Line Dispense point.

However, if [Work Adjustment] is set to the points shown below in gray, you can only apply a height (Z direction) adjustment. The work adjustment set to the Start of Line Dispense point applies for the X, Y, R directions for those points.
To make a work adjustment to the height (Z direction) of the points shaded gray in the table below, create a work adjustment and set that number to the point type you want.

Settable Points for Workpiece Adjustment

Point Type	Point Dispense	Start of Line Dispense	Passing Point	CP Arc Point	End of Line Dispense	Wait Start Point	Start of Circle Dispense	Center of Circle Dispense	Zigzag Start Point	Rectangular Spiral Start Point	Hollow Rectangle Start Point	Rectangle End Point	Spiral Start Point	Hollow Spiral Start Point	Circumference of Spiral Area	PTP Point	CP Start Point	CP Passing Point	CP Stop Point	CP End Point	PTP Evasion Point	Circle Start Point	Circle Center Point	X Needle/4 Axis TCP Measure Point 1	Y Needle/4 Axis TCP Measure Point 2
Settable: ✓ N/A: Blank	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓		✓	✓

(Example)

Point	P1	P2	P3	P4	P5	P6
Point Type	Start of Line Dispense	Line Passing	Line Passing	End of Line Dispense	Start of Circle Dispense	Center of Circle Dispense
Work Adjustment number set to the point	7	8	0 (No number is set)	9	7	8
Work Adjustment number applicable to X, Y, and R directions	7	7	7	7	7	7
Work Adjustment number applicable to the Z direction	7	8	7	9	7	7

Point	P1	P2	P3	P4	P5	P6
Point Type	Start of Line Dispense	Line Passing	Line Passing	End of Line Dispense	Start of Circle Dispense	Center of Circle Dispense
Work Adjustment Number Set to the point	0 (No number is set.)	8	0 (No number is set.)	9	0 (No number is set.)	8
Work Adjustment Number Applicable to X, Y, and R directions	N/A	N/A	N/A	N/A	N/A	N/A
Work Adjustment Number Applicable to the Z direction	N/A	8	N/A	9	N/A	N/A

For robots running system software version 6 or higher, the Circle Start Point to Circle Center Point are handled as a block of points. If you set a workpiece adjustment to the Circle Start Point, the workpiece adjustment is also applied to the Circle Center Point.

T P MENU [Additional Function Data Settings]
[Workpiece Adjustment Settings]

If you move the cursor to a blank line on a point setting screen, the settable point jobs and condition data for that point are displayed. Select [Workpiece Adjustment] here, and set the workpiece adjustment number you created.

P C [Data] → [Additional] → [Work Adjustment] → [Add]/[Edit]

17. PURGING THE DISPENSING AGENT

You can purge the dispensing agent at your own discretion.

17.1 JR3000 Series

If in Switch Run/External Run Mode, make sure the robot is in run standby.

■ Switch Run Mode
Press the purge switch on the front of the robot or the switchbox. While the purge switch is pressed the dispenser is ON. Release the purge switch to turn the dispenser OFF.

■ External Run Mode
Turn ON the purge by external signal (#sysIn14). The dispenser is ON when the purge by external signal (#sysIn1) is ON. Turn OFF the purge by external signal and the dispenser also turns OFF.

■ Teaching Mode

TP Press the purge switch. While the purge switch is pressed, the dispenser is ON. Release the purge switch to turn the dispenser OFF.

PC If you are operating the robot from a PC, create and use point job data that turns the dispenser ON and set the [JOG] dialog box to [Point Job]. Point Job Example (the dispenser comes ON for 1 second when executed)

```
set #sysOut10
delay 1000
reset #sysOut10
```

⚠ Caution

When you want to purge the dispensing agent, do so by either pressing the purge switch on the front of the robot or on the switchbox, or using the external purge signal assigned to I/O-SYS.
Do not use your dispenser to purge even if it is equipped with its own individual purging process (discharge switch, external signal, etc.). Using a dispenser to purge may create conflict between dispensing control from the robot and the independent dispenser, causing dispensing malfunction.

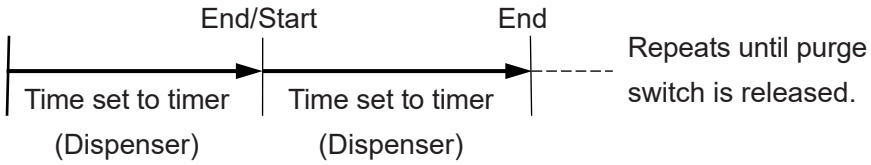
17.1.1 Purge Switch

There are two ways to press the purge switch:

- Press the purge switch (Option Switch 1) on the switchbox
- Set the Program Number -1 and press the Start Switch

You can turn the dispenser ON by pressing and dispenser OFF by releasing the purge switch. However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the purge switch will initiate the following operation:

You can turn the dispenser ON by pressing and dispenser OFF by releasing the purge switch. The dispenser turns ON according to the time set for it. This is repeated while the purge switch is pressed. Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.



TP MENU [Dispenser]
[Purge switch]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right. Select [Purge switch] and then select the item you want to set.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant invalid
Automatic purge	Valid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

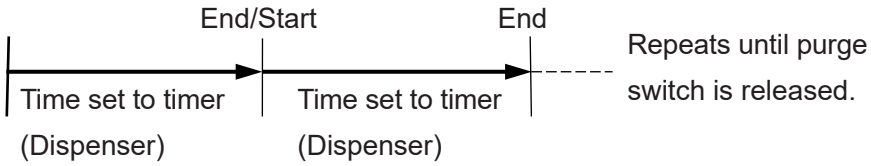
Dispenser Selection Screen

- Constant Valid
  The purge operation is executed regardless of the robot's status when the purge switch is pressed. (Do not press the purge switch during a dispensing operation in a run. The dispensing operation will not be able to be performed properly.)
- Invalid During Operation
  The purge operation is not executed when the robot is running even if the purge switch is pressed.
- Constant Invalid
  The purge operation is not executed even if the switch is pressed regardless of the robot's status.

17.1.2 Purge by Ext. Signal (#sysIn14)

To use this signal, connect the remote purge switch to I/O-SYS #sysIn14, and then press the remote purge switch. When the remote purge switch is pressed the dispenser turns ON, when it is released the dispenser turns OFF. However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the purge switch will initiate the following operation:

The dispenser turns ON according to the time set for the dispenser. This is repeated while the purge switch is pressed. Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.



TP MENU [Dispenser]
[Purge by ext. signal]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right. Select [Purge by ext. signal] and then select the item you want to set.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen

- Constant Valid
  The purge operation is executed regardless of the robot's status when the remote purge switch is pressed. (Do not press the remote purge switch during a dispensing operation in a run. The dispensing operation will not be able to be performed properly.)
- Invalid During Operation
  The purge operation is not executed when the robot is running even if the remote purge switch is pressed.
- Constant Invalid
  The purge operation is not executed even if the remote purge switch is pressed regardless of the robot's status.

NOTE: If the #sysIn14 function assignment is not set to [Purge by ext. signal], the setting for the [Purge by ext. signal] is disabled.

17.1.3 Automatic Purge

You can purge the dispensing agent automatically after one run cycle ends. This is called [Automatic purge]. For the [Automatic purge] function, the dispenser turns ON for the time set in [Auto Purge Time] for one [Auto Purge Cycle]. [Auto Purge Cycle] repeats until a run is started. The [Auto Purge Time] is disabled when [Dispenser Mode] is set to [Timer]. The time set in [Timer] for the dispenser becomes the [Auto Purge Time].

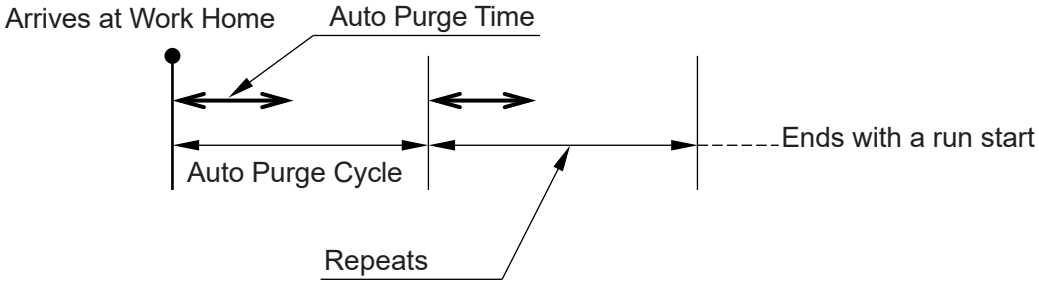
When one run cycle ends, [Automatic purge] is executed once the robot returns to the work home position. If the robot is set to [Continuous Playback] (individual program settings), [Automatic purge] is not executed as the dispenser does not return to the work home position.

T P MENU [Dispenser]
[Automatic purge]
[Auto Purge Cycle]
[Auto Purge Time]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right. Select [Automatic purge] and then select [Valid].

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant invalid
Automatic purge	Valid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen



When [Dispenser Mode] is set to [Timer], if a run is started during the purge operation (the robot is dispensing), the run starts after the time set to the dispenser ends.
If the time set in [Auto Purge Cycle] is shorter than the time set to the dispenser, the timing for the next purge cycle will overlap with the purge operation being executed. If this happens, the current purge operation being executed will continue, however the overlapping purge operation will not be executed.

NOTE: To end the purging operation without starting a run, press the emergency stop switch. However, if [Dispenser Mode] is set to [Timer], the purge operation being executed will continue, but following purge operations will not be executed.

17.2 JC-3 Series

If in Switch Run/External Run Mode, make sure the robot is in run standby.

■ Switch Run Mode

Press the purge switch on the switchbox. While the purge switch is pressed the dispenser is ON. Release the purge switch to turn the dispenser OFF.

■ External Run Mode

Turn ON the purge by external signal (#genIn2). The dispenser is ON when the purge by external signal (#genIn2) is ON. Turn OFF the purge by external signal and the dispenser also turns OFF.

■ Teaching Mode

TP Press the purge switch. While the purge switch is pressed, the dispenser is ON. Release the purge switch to turn the dispenser OFF.

PC If you are operating the robot from a PC, create and use point job data that turns the dispenser ON and set the [JOG] dialog box to [Point Job].
Point Job Example (the dispenser comes ON for 1 second when executed)

```
set #genOut1
delay 1000
reset #genOut1
```

⚠ Caution

When you want to purge the dispensing agent, do so by either pressing the purge switch on the switchbox, or using the external purge signal assigned to I/O-1.
Do not use your dispenser to purge even if it is equipped with its own individual purging process (discharge switch, external signal, etc.). Using a dispenser to purge may create conflict between dispensing control from the robot and the independent dispenser, causing dispensing malfunction.

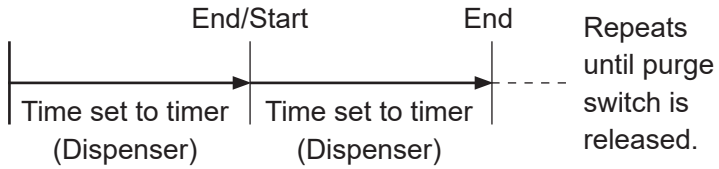
17.2.1 Purge Switch

There are two ways to press the purge switch:

- Press the purge switch (Option Switch 1) on the switchbox
- Set the Program Number -1 and press the Start Switch

You can turn the dispenser ON by pressing and dispenser OFF by releasing the purge switch. However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the purge switch will initiate the following operation:

The dispenser turns ON according to the time set for it. This is repeated while the purge switch is pressed.



Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.

TP MENU [Dispenser]
[Purge switch]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right. Select [Purge switch] and then select the item you want to set.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant invalid
Automatic purge	Valid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

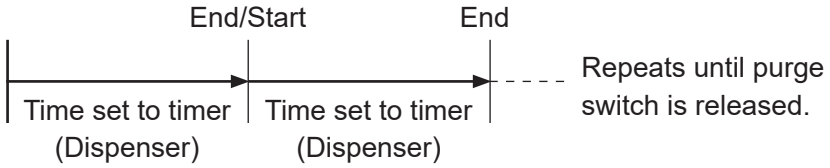
Dispenser Selection Screen

- Constant Valid
  The purge operation is executed regardless of the robot's status when the purge switch is pressed. (Do not press the purge switch during a dispensing operation in a run. The dispensing operation will not be able to be performed properly.)
- Invalid During Operation
  The purge operation is not executed when the robot is running even if the purge switch is pressed.
- Constant Invalid
  The purge operation is not executed even if the switch is pressed regardless of the robot's status.

17.2.2 Purge by Ext. Signal (#genIn2)

To use this signal, connect the remote purge switch to I/O-1 #genIn2, and then press the remote purge switch. When the remote purge switch is pressed the dispenser turns ON, when it is released the dispenser turns OFF. However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the purge switch will initiate the following operation:

The dispenser turns ON according to the time set for the dispenser. This is repeated while the purge switch is pressed. Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.



TP MENU [Dispenser]
[Purge by ext. signal]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right.
Select [Purge by ext. signal] and then select the item you want to set.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen

- Constant Valid
  The purge operation is executed regardless of the robot's status when the remote purge switch is pressed. (Do not press the remote purge switch during a dispensing operation in a run. The dispensing operation will not be able to be performed properly.)
- Invalid During Operation
  The purge operation is not executed when the robot is running even if the remote purge switch is pressed.
- Constant Invalid
  The purge operation is not executed even if the remote purge switch is pressed regardless of the robot's status.

NOTE: If the #genIn2 function assignment is not set to [Purge by ext. signal], the setting for the [Purge by ext. signal] is disabled.

17.2.3 Automatic Purge

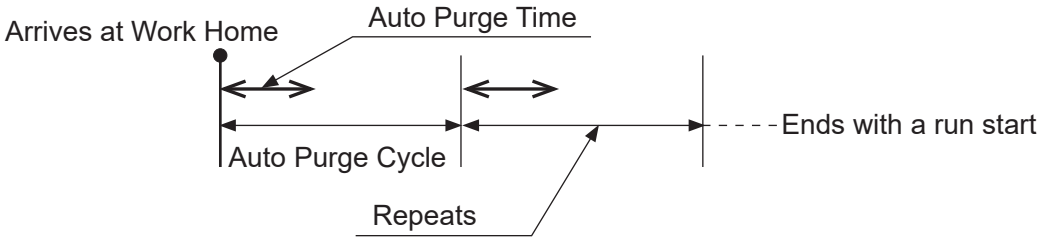
You can purge the dispensing agent automatically after one run cycle ends. This is called [Automatic purge]. For the [Automatic purge] function, the dispenser turns ON for the time set in [Auto Purge Time] for one [Auto Purge Cycle]. [Auto Purge Cycle] repeats until a run is started. The [Auto Purge Time] is disabled when [Dispenser Mode] is set to [Timer]. The time set in [Timer] for the dispenser becomes the [Auto Purge Time].
When one run cycle ends, [Automatic purge] is executed once the robot returns to the work home position. If the robot is set to [Continuous Playback] (individual program settings), [Automatic purge] is not executed as the dispenser does not return to the work home position.

TP MENU [Dispenser]
[Automatic purge]
[Auto Purge Cycle]
[Auto Purge Time]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right.
Select [Automatic purge] and then select [Valid].

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge switch	Constant valid
Purge by ext. signal	Constant invalid
Automatic purge	Valid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen



When [Dispenser Mode] is set to [Timer], if a run is started during the purge operation (the robot is dispensing), the run starts after the time set to the dispenser ends.
If the time set in [Auto Purge Cycle] is shorter than the time set to the dispenser, the timing for the next purge cycle will overlap with the purge operation being executed. If this happens, the current purge operation being executed will continue, however the overlapping purge operation will not be executed.

NOTE: To end the purging operation without starting a run, press the emergency stop switch. However, if [Dispenser Mode] is set to [Timer], the purge operation being executed will continue, but following purge operations will not be executed.

17.3 JS3 Series

If in Switch Run Mode, make sure the robot is in run standby.

■ Run Mode

- Switch Input
  1) Press the [PRG.NO] key and set the program number to “-1”.
  2) Press the start switch.
     While the start switch is pressed, dispenser is ON. Release the start switch to turn the dispenser OFF.

- External Signal Input
  Turn ON the purge by external signal (#genIn2). The dispenser is ON when the purge by external signal (#genIn2) is ON. Turn OFF the purge by external signal and the dispenser also turns OFF.

■ Teaching Mode

TP Press the [F0] (FUNC) key on the point position input screen to switch to the [Manual Job] on the bottom of the screen. If the [Dispenser ON] appears on [F4] key on the bottom of the screen, press the [F4] (Dispenser ON) key. Turn the dispenser ON while the [F4] key is pressed.

However, the [Dispenser ON] does not appear when the manual job is set even if the [F0] (FUNC) key is pressed once. Depending on the number of manual jobs set, press the [F0] key up to 4 times.

PC If you are operating the robot from a PC, create and use point job data that turns the dispenser ON and set the [JOG] dialog box to [Point Job].

Point Job Example (the dispenser comes ON for 1 second when executed)

```
set #genOut1
delay 1000
reset #genOut1
```

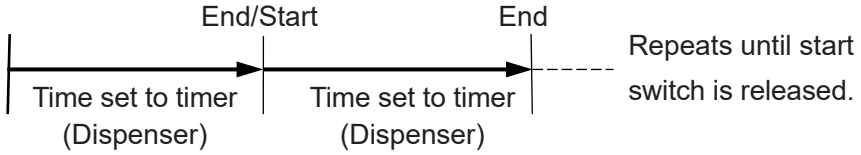
⚠ Caution

When you want to purge the dispensing agent, set the program number to the [-1], then press the start switch or use the external purge signal assigned to I/O-SYS.
Do not use your dispenser to purge even if it is equipped with its own individual purging process (discharge switch, external signal, etc.). Using a dispenser to purge may create conflict between dispensing control from the robot and the independent dispenser, causing dispensing malfunction.

17.3.1 Purge Switch

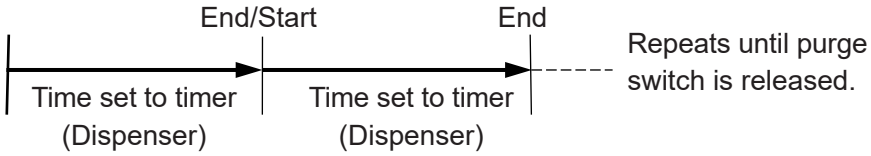
Set the program number to the [-1], then press the start switch. Press the start switch to turn ON dispensing, release the switch to turn dispensing OFF.
However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the start switch will initiate the following operation:

The dispenser turns ON according to the time set for it. This is repeated while the start switch is pressed. Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.



17.3.2 Purge by Ext. Signal (#genIn2)

To use this signal, connect the remote purge switch to I/O-1 #genIn2, and then press the remote purge switch. When the remote purge switch is pressed the dispenser turns ON, when it is released the dispenser turns OFF. However, if [Dispenser Mode] is set to [Timer] and [Dispenser Type] is set to [Busy Signal Operation] or to [Finish Signal Operation], pressing the purge switch will initiate the following operation:
The dispenser turns ON according to the time set for the dispenser. This is repeated while the purge switch is pressed. Dispensing continues until the time set on the timer runs out even if the purge switch is released before the time runs out.



TP MENU [Dispenser]
[Purge by ext. signal]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right. Select [Purge by ext. signal] and then select the item you want to set.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge by ext. signal	Constant valid
Automatic purge	Invalid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen

- Constant Valid
  The purge operation is executed regardless of the robot's status when the remote purge switch is pressed. (Do not press the remote purge switch during a dispensing operation in a run. The dispensing operation will not be able to be performed properly.)
- Invalid During Operation
  The purge operation is not executed when the robot is running even if the remote purge switch is pressed.
- Constant Invalid
  The purge operation is not executed even if the remote purge switch is pressed regardless of the robot's status.

NOTE: If the #genIn2 function assignment is not set to [Purge by ext. signal], the setting for the [Purge by ext. signal] is disabled.

17.3.3 Automatic Purge

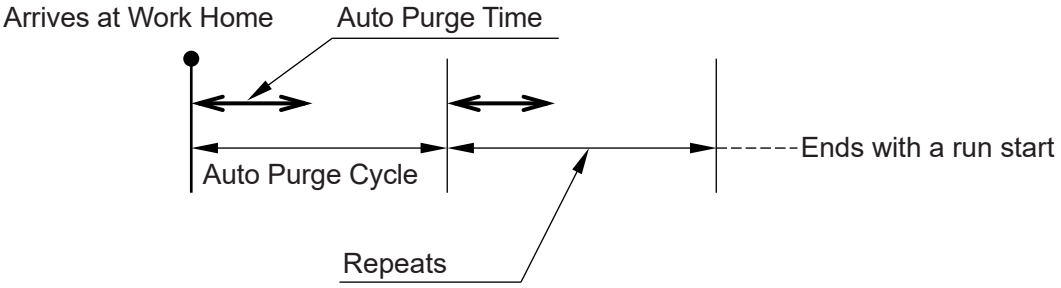
You can purge the dispensing agent automatically after one run cycle ends. This is called [Automatic purge]. For the [Automatic purge] function, the dispenser turns ON for the time set in [Auto Purge Time] for one [Auto Purge Cycle]. [Auto Purge Cycle] repeats until a run is started. The [Auto Purge Time] is disabled when [Dispenser Mode] is set to [Timer]. The time set in [Timer] for the dispenser becomes the [Auto Purge Time].
When one run cycle ends, [Automatic purge] is executed once the robot returns to the work home position. If the robot is set to [Continuous Playback] (individual program settings), [Automatic purge] is not executed as the dispenser does not return to the work home position.

T P MENU [Dispenser]
[Automatic purge]
[Auto Purge Cycle]
[Auto Purge Time]

Press the MENU key and select [Dispenser]. The selection screen for the dispenser's settable items appears as shown on the right.
Select [Automatic purge] and then select [Valid].

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady
Purge by ext. signal	Constant invalid
Automatic purge	Valid
Auto Purge Cycle	10 sec
Auto Purge Time	0.5 sec

Dispenser Selection Screen



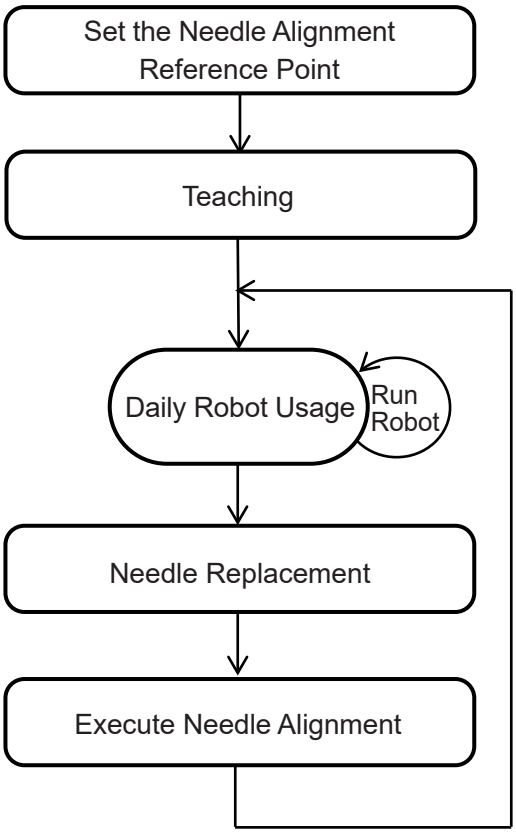
When [Dispenser Mode] is set to [Timer], if a run is started during the purge operation (the robot is dispensing), the run starts after the time set to the dispenser ends.
If the time set in [Auto Purge Cycle] is shorter than the time set to the dispenser, the timing for the next purge cycle will overlap with the purge operation being executed. If this happens, the current purge operation being executed will continue, however the overlapping purge operation will not be executed.

NOTE: To end the purging operation without starting a run, press the emergency stop switch. However, if [Dispenser Mode] is set to [Timer], the purge operation being executed will continue, but following purge operations will not be executed.

18. NEEDLE ALIGNMENT

The needle alignment function allows the user to manually correct any needle tip position displacement where the replacement needle tip position differs from the needle tip position set during teaching.
You can correct any needle tip position displacement manually in Run/External Run Mode (JR3000/JC-3 Series) or in Run Mode (JS3 Series).

The diagram to the right is a flowchart of needle alignment in use.



When using the needle alignment function, you must set the needle alignment reference point in advance. You can register the needle tip position coordinates used during teaching by setting the needle alignment “reference point” prior to point teaching in Teaching Mode. The preset reference point allows you to perform corrective needle alignment while in the Run Modes in cases where position displacement occurs after the syringe or needle tip is replaced. The robot moves in all three directions XYZ when applying the position correction amount.

The position displacement correction amount is registered in the main tool configuration and applies to dispensing point types. For details about main tool configuration, refer to “3.6 Main Tool Configuration”.

18.1 JR3000/JC-3 Series

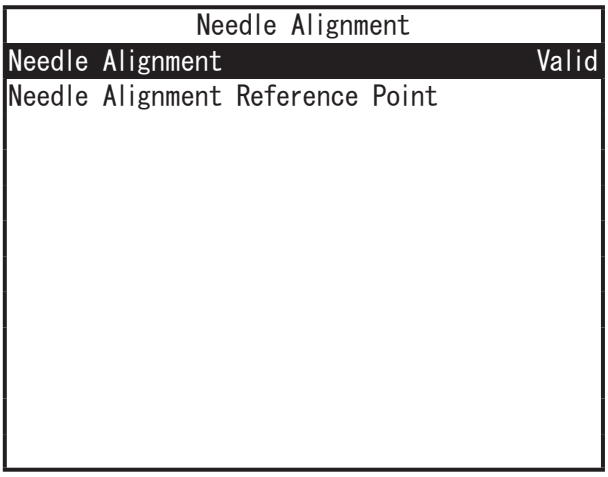
18.1.1 Setting the Needle Alignment Reference Point

Set the reference point used when correcting position displacements occurring after syringe or needle replacement. By setting this point in Teaching Mode prior to actual point teaching, you can set this position as the system reference position. First make the needle adjustment settings.

To begin with, make the following settings in Administration Mode.

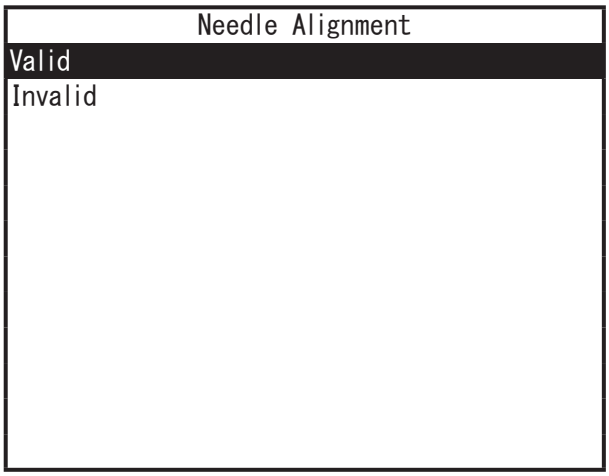
- Needle Alignment
  This setting enables and disables the needle alignment function.

- Needle Alignment Reference Point
  This sets the reference point position for position displacement correction.



TP MODE [Administration]
[Administration Settings Mode]
[Needle Alignment]

■ Needle Alignment
Here you can set whether or not to use the needle alignment function when in Run Mode/External Run Mode.



- Valid
  The EDIT key is enabled in the Run Modes allowing you to perform needle alignment from the Run Mode Edit Menu.

- Invalid
  The EDIT key is disabled in the Run Modes.

NOTE: When this function is disabled, the needle alignment reference point reverts to its default position. If you disable the needle alignment function, you need to set the needle alignment reference point again.

■ Needle Alignment Reference Point

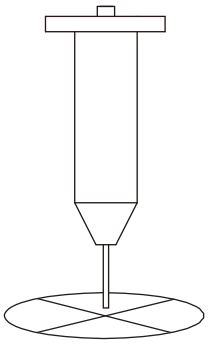
When adjusting for position displacement, the position coordinates set here are used as a reference point which is referred to when correcting position displacement.

```
      Needle Alignment Reference Point
>X                                    0 mm
 Y                                    0 mm
 Z                                    0 mm
 MT1                                  0 mm
 MT2                                  0 mm

                    JOG      MDI      INIT
```

Example: 3-Axis Model

- Reference Point Placement
  - With the JR3000 Series, set an arbitrary position at your discretion using a mark or pin as the reference point position on the X table.
  - With the JC-3 Series, set an arbitrary position within the robot operating range at your discretion using a mark or pin as the reference point position.



This completes the reference point settings.

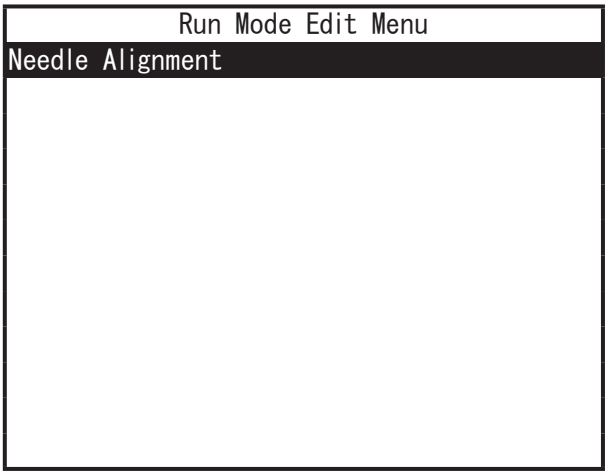
18.1.2 Executing Needle Alignment

You can make position displacement adjustment settings in Run Mode/External Run Mode.

T P MODE [Switch Run Mode]
[Run Mode Edit Menu]

T P MODE [External Run Mode]
[Run Mode Edit Menu]

■ Needle Alignment
Set the adjustment value for the needle alignment.
Press the EDIT key in Switch Run Mode / External Run Mode. The Run Mode Edit Menu appears. Select [Needle Alignment] from the Run Mode Edit Menu. A confirmation message appears. Select [YES] to move the robot to the reference point.



⚠ Caution

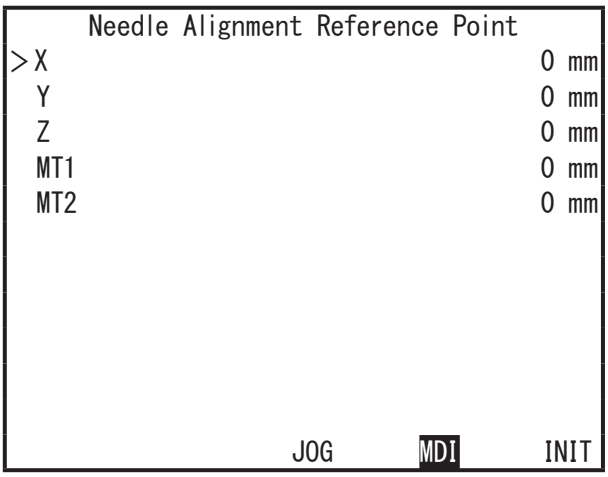
The robot axes move when you select this function.
Make sure the surrounding area is safe before proceeding.

If you replace the needle, make sure the needle is attached correctly before using this function to move to the reference point. If the needle attached lower than registered position, the needle may come in contact with the reference point and break.

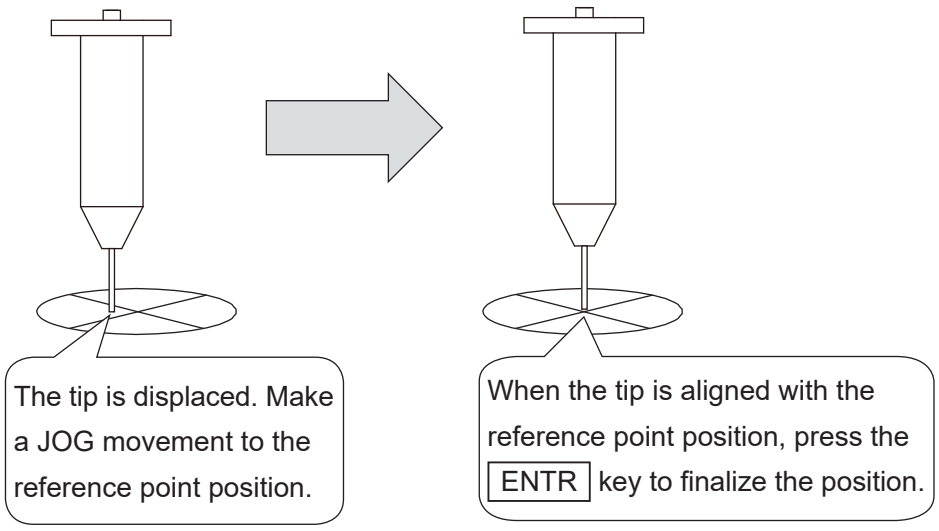
The procedure for setting the needle alignment adjustment value is different for 3 axis models and 4 axis models.

■ 3-Axis Models

Enter the current needle tip position.
These settings are set to the adjustment values for [Main TCP Setting] in the main tool configuration.



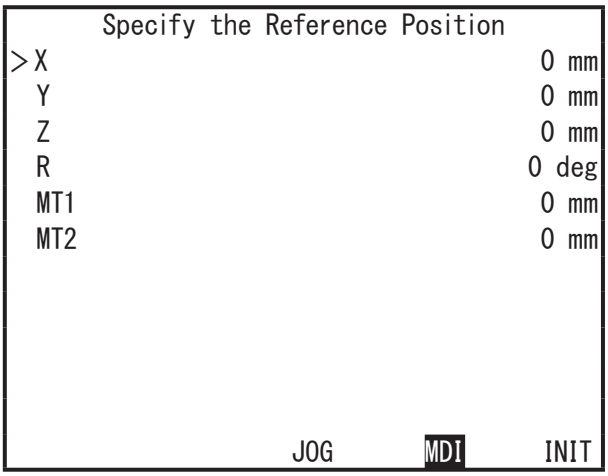
Use JOG movements to adjust the tool tip position as shown in the diagram below. Finalize the position to automatically calculate the position displacement amount from the reference point and register it to the main tool configuration.



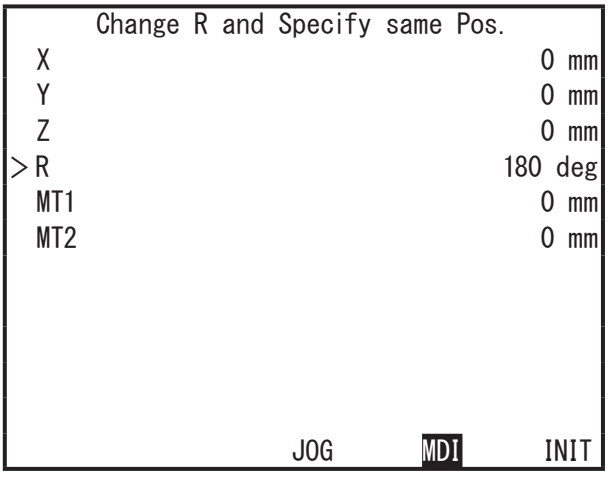
■ 4-Axis Models

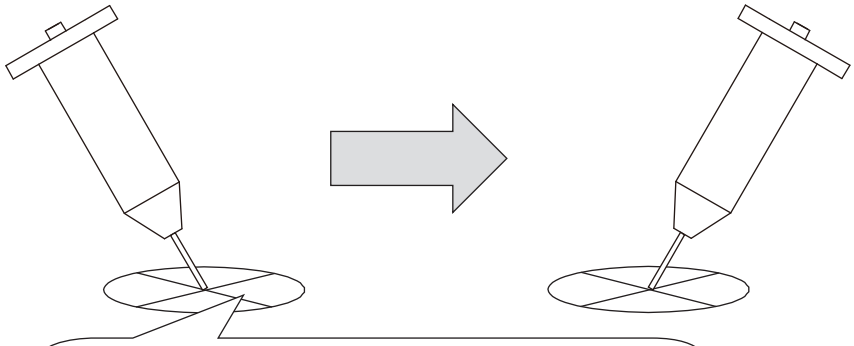
1. Move the needle to the reference point. The current needle tip position appears on the screen.

2. Press the ENTR key. The current needle tip position is entered and the subsequent screen appears.



3. Modify the value for R and then specify the same position as step 1 (R is set as 180° in the example to the right). The adjustment value is now set to [Main TCP Setting] in the main tool configuration.





For 4-axis models, set the needle tip alignment in the same way that you would set the TCP (refer to “18.2.1 Setting the Needle Alignment Reference Point”).

18.2 JS3 Series

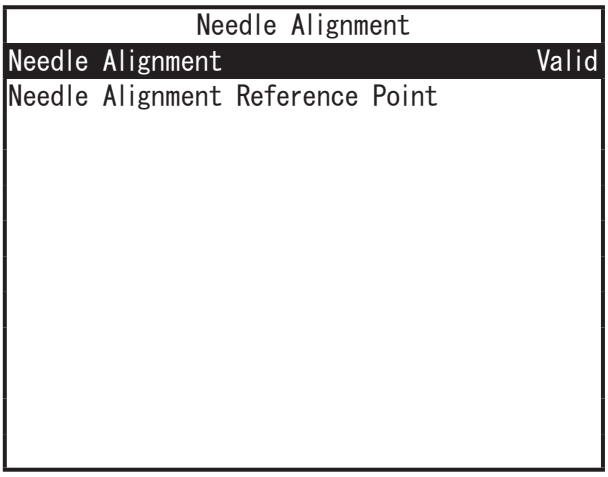
18.2.1 Setting the Needle Alignment Reference Point

Set the reference point used when correcting position displacements occurring after syringe or needle replacement. By setting this point in Teaching Mode prior to actual point teaching, you can set this position as the system reference position. First make the needle adjustment settings.

To begin with, make the following settings in Administration Mode.

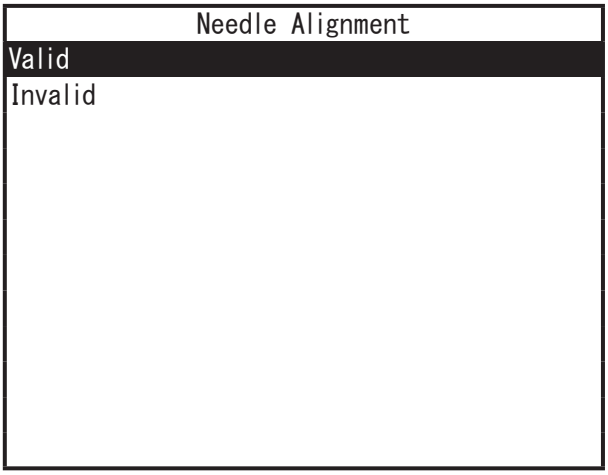
- Needle Alignment
  This setting enables and disables the needle alignment function.

- Needle Alignment Reference Point
  This sets the reference point position for position displacement correction.



T P UTILITY [Change Mode] [Administration]
[Administration Settings Mode]
[Needle Alignment]

■ Needle Alignment
Here you can set whether or not to use the needle alignment function when in Run Mode/External Run Mode.



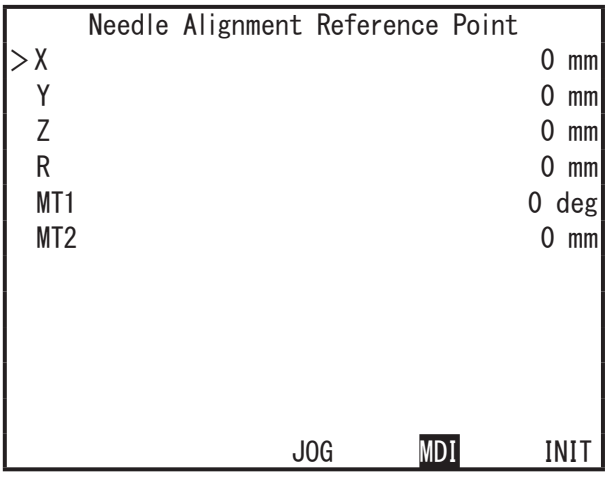
- Valid
  The EDIT key is enabled in the Run Modes allowing you to perform needle alignment from the Run Mode Edit Menu.

- Invalid
  The EDIT key is disabled in the Run Modes.

NOTE: When this function is disabled, the needle alignment reference point reverts to its default position. If you disable the needle alignment function, you need to set the needle alignment reference point again.

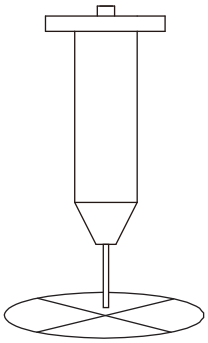
■ Needle Alignment Reference Point

When adjusting for position displacement, the position coordinates set here are used as a reference point which is referred to when correcting position displacement.



• Reference Point Placement

Set an arbitrary position within the robot operating range at your discretion using a mark or pin as the reference point position.



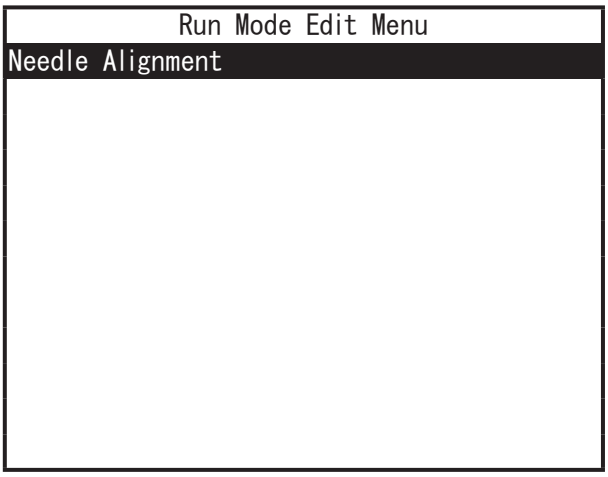
This completes the reference point settings.

18.2.2 Executing Needle Alignment

You can make position displacement adjustment settings in Run Mode.

TP Select Switch [AUTO] (Run Mode)
[Run Mode Edit Menu]

■ Needle Alignment
Set the adjustment value for the needle alignment.
Press the EDIT key in Switch Run Mode / External Run Mode. The Run Mode Edit Menu appears. Select [Needle Alignment] from the Run Mode Edit Menu. A confirmation message appears. Select [YES] to move the robot to the reference point.



⚠ Caution

	The robot axes move when you select this function. Make sure the surrounding area is safe before proceeding.
	If you replace the needle, make sure the needle is attached correctly before using this function to move to the reference point. If the needle attached lower than registered position, the needle may come in contact with the reference point and break.

1. Move the needle to the reference point.
   The current needle tip position appears on the screen.

2. Press the ENTR key.
   The current needle tip position is entered and the subsequent screen appears.

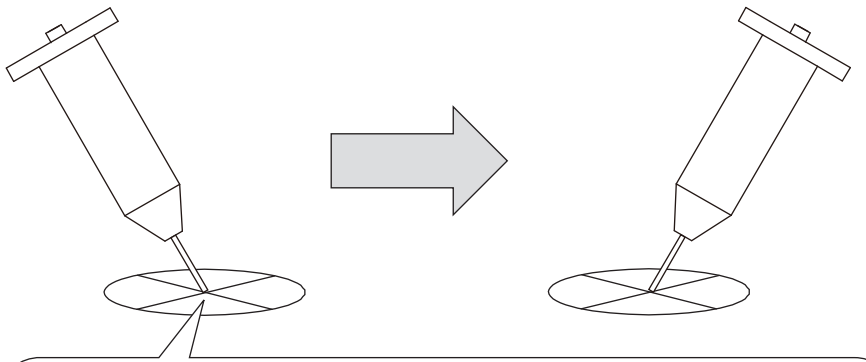
```
      Specify the Reference Position
>X                                  0 mm
 Y                                  0 mm
 Z                                  0 mm
 R                                  0 deg
 MT1                                0 mm
 MT2                                0 mm

                    JOG   MDI   SPEED
```

3. Modify the value for R and then specify the same position as step 1 (R is set as 180° in the example to the right). The adjustment value is now set to [Main TCP Setting] in the main tool configuration.

```
      Change R and Specify same Pos.
 X                                  0 mm
 Y                                  0 mm
 Z                                  0 mm
>R                                  180 deg
 MT1                                0 mm
 MT2                                0 mm

                    JOG   MDI   INIT
```



For 4-axis models, set the needle tip alignment in the same way that you would set the TCP (Refer to “10. TOOL DATA” in the operation manual *Functions I*)

19. USING NEEDLE ADJUSTER 2 (3-AXIS MODELS)

NOTE: For the 4-axis JR3000/JC-3 Series or the JS3 Series, refer to the “20. USING NEEDLE ADJUSTER (4-AXIS MODELS)” for details.

The Janome Needle Adjuster 2 features a slim and compact structure with high resolution sensors.
Needle Adjuster 2 has a simple structure using two infrared sensors and can support a wide range of nozzles; there is the standard specification type (PR-1) supporting needle dimensions of ø0.35 to 2.5 mm and the EXF specification type (PR-2) that supports needle dimensions of ø0.20 to 1.0 mm.
In addition, for the sensor areas which can easily get dirty, Needle Adjuster 2 is equipped with detachable sensors for simple and economical replacement.
Needle Adjuster 2 is available with either NPN or PNP specifications.

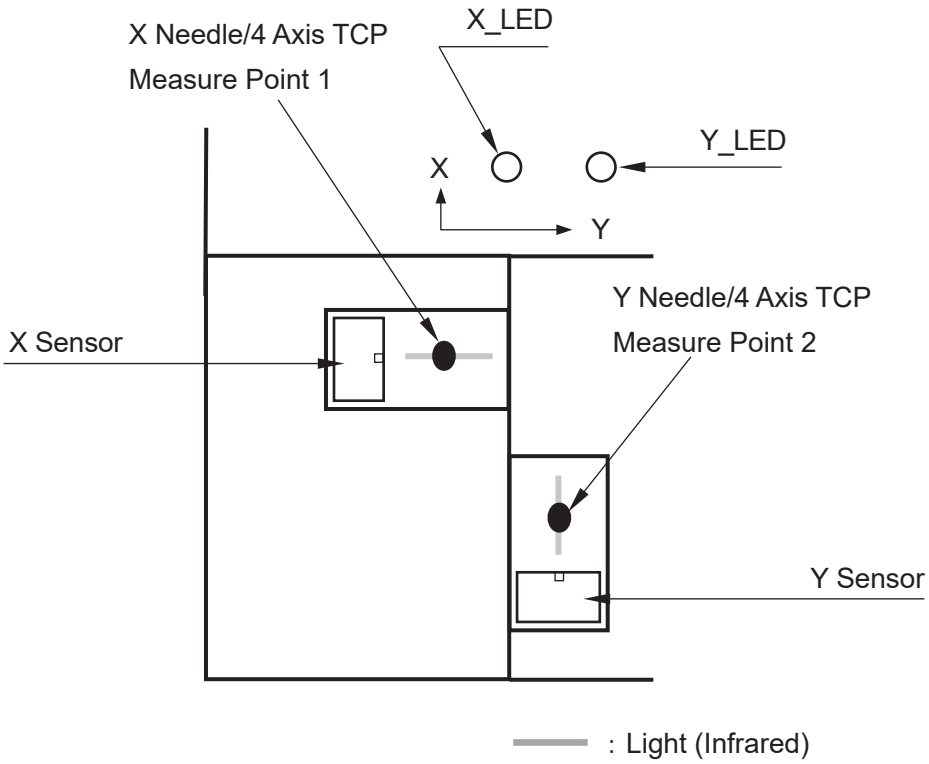
■ Precautions

- Needle nozzles which are severely bent might be undetectable by Needle Adjuster 2 (this can particularly occur when using fine needles).
- Transparent taper nozzles (plastic translucent nozzles, etc.), might be undetectable by Needle Adjuster 2. Also, errors may still occur even if the needle is detected.
- Before you use the needle adjuster functions, check to make sure that there is no dispensing agent dripping from the nozzle. If the sensor area gets dirty, it cannot detect nozzles.
- Needle Adjuster 2 is a dedicated 3-axis desktop robot device.
- As this device uses an infrared LED, the device may react to infrared light emitted from a heater and malfunction. Avoid using this device in combination with a heater.
- Avoid using this device near sunlight, tungsten lamps, electric heaters, or near machines and lighting equipment that emit a lot of infrared rays (or rays of light that feel warm to the skin). Doing so can cause malfunction.
- Multiple nozzles of various dimensions cannot be detected during the same job. If the nozzle dimensions change, reteach the points or adjust the positions using [XYZR Offset]*.
- If you want to use needle adjuster functions with an existing program, perform standard registration of the needle adjuster functions after adjusting the point positions using [XYZR Offset]*.

* For further details regarding [XYZR Offset], refer to “7.1.3 Block Editing” in the operation manual *Teaching Pendant Operation*.

19.1 Needle Adjuster 2 Overview

Use Needle Adjuster 2 by attaching it to the X table (JR3000 Series) or to the installation surface (JC-3 Series).
If you teach a program such as the one shown below only containing 2 points and then load the nozzle position as standard data, you can automatically adjust the nozzle position by simply running the program after you replace the nozzle.
(You need to run this program every time you replace the nozzle.)



1. Switch the tool for teaching to [No Tool].
2. Register [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2] to a given program number.

NOTE: Needle measuring in the X direction is determined by [X Needle/4 Axis TCP Measure Point 1] and needle measuring in the Y direction is determined by [Y Needle/4 Axis TCP Measure Point 2].

3. Register the nozzle tip height for the measuring point and the standard positions for the X/Y orientations in the Teaching Mode menu.
4. When replacing the nozzle, and you run this program, Needle Adjuster 2 makes adjustment (overwrites the tool data) for the position of the new nozzle tip position by comparing it to the registered standard position data.

NOTE: For further details, refer to “19.2.3 Teaching and Making Standard Registration of Measuring Points”.

19.2 JR3000 Series

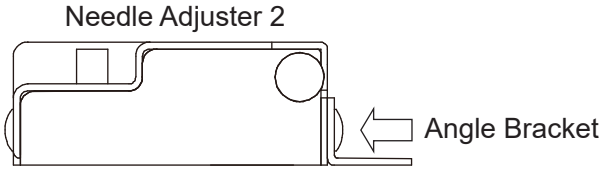
19.2.1 Needle Adjuster 2 Installation

⚠ Caution

When attaching the angle bracket to Needle Adjuster 2, make sure to use the 2 screws included with Needle Adjuster 2, or the equivalent (M3x3).
Using screws any longer can internally damage Needle Adjuster 2.

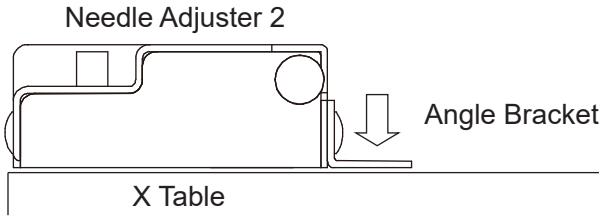
The screws for attaching Needle Adjuster 2 to the X table are not included. Use 2 M4 screws per angle bracket.
If there is a gap between Needle Adjuster 2 and the surface to which you are attaching it, you can attach angle brackets to both sides of Needle Adjuster 2 to firmly secure it. (2 angle brackets are included). Refer to “19.5 Needle Adjuster 2 External Dimensions” for further details.

1. Loosely screw the angle bracket(s) to Needle Adjuster 2 using the screws included (so there is still some movement with the angle bracket).



2. Place Needle Adjuster 2 on the X table, and firmly screw the angle bracket(s) to Needle Adjuster 2 while adjusting it so that it sits flush on the X table.

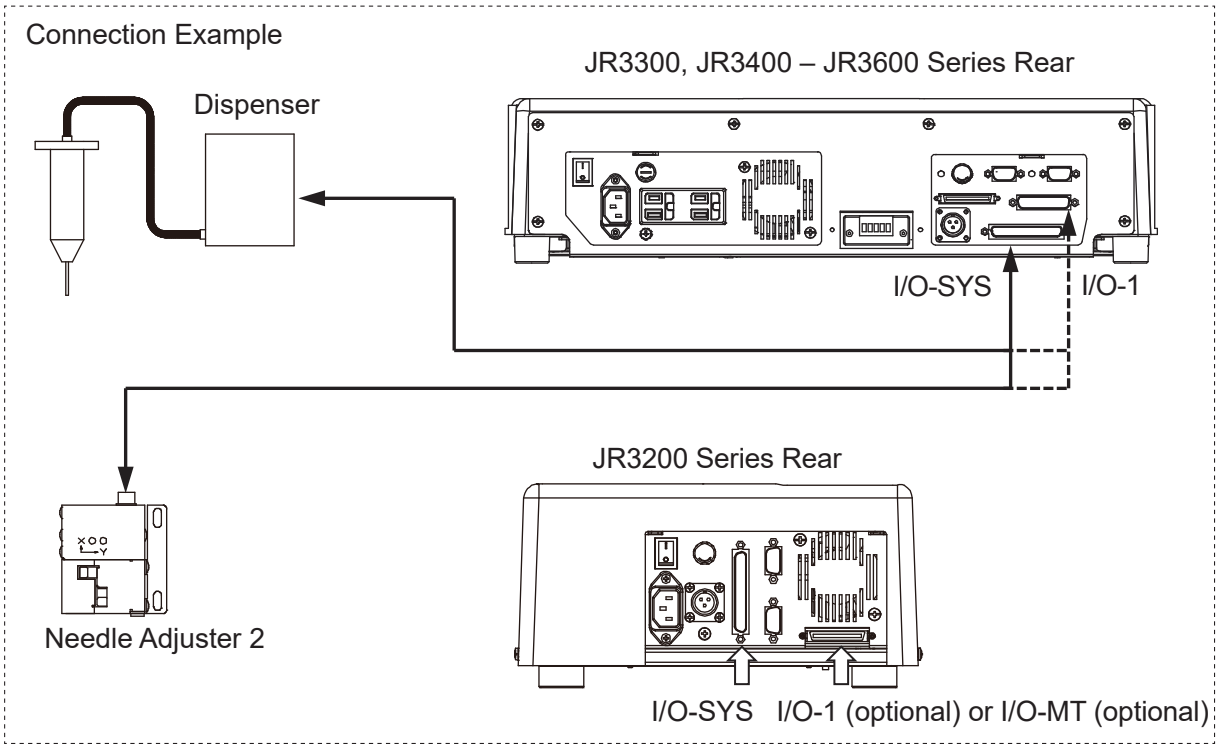
3. Use 2 M4 screws (not included) per angle bracket to screw down the angle bracket(s) to the X table.



19.2.2 Connecting Needle Adjuster 2

- I/O-SYS
  Connect Needle Adjuster 2 to the I/O-SYS connector on the robot side using the cable included. Create a split cable for connecting the dispenser and Needle Adjuster 2 to the I/O-SYS connector on the robot.
- I/O-1
  If you select the I/O-MT connector with the JR3200 Series, the I/O-1 connector is not available. Connect Needle Adjuster 2 to the I/O-1 connector on the robot side using the cable included. If you also want to connect the dispenser to I/O-1, create a split cable for connecting the dispenser and Needle Adjuster 2 to the I/O-1 connector on the robot.

NOTE: Modify the I/O function assignment for the X Needle Sensor and Y Needle Sensor signals from I/O-SYS (sysIn) to I/O-1 (genIn).



⚠ Caution

Turn OFF the power to the robot before making connections.
Failure to do so can cause breakdown.

■ Signals

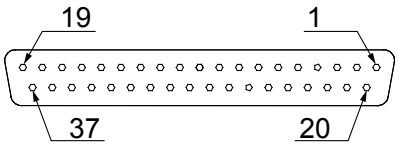
- X Needle Sensor (I/O-SYS: #sysIn15, I/O-1: #genIn2 as per the example in the table below)
  If the nozzle is at the [X Needle/4 Axis TCP Measure Point 1], this signal is OFF.
  This signal is also OFF if the X sensor is blocked (X_LED is OFF) with Needle Adjuster 2.
  This signal is normally ON at all other times.
- Y Needle Sensor (I/O-SYS: #sysIn16, I/O-1: #genIn3 as per the example in the table below)
  If the nozzle is at the [Y Needle/4 Axis TCP Measure Point 2], this signal is OFF.
  This signal is also OFF if the Y sensor is blocked (Y_LED is OFF) with Needle Adjuster 2.
  This signal is normally ON at all other times.

■ Cable

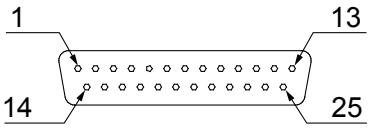
I/O-SYS		I/O-1		Function	Needle Adjuster 2 Cable	
I/O-SYS Pin No.	Name	I/O-1 Pin No.	Name		Insulator Color	Dot Color
15	#sysIn15	2	#genIn2	X Needle Sensor	Orange	Red
16	#sysIn16	3	#genIn3	Y Needle Sensor	Gray	Black
34	COM+	21, 22	COM+	DC 24 V	Orange	Black
35 – 37	COM-	23, 24	COM-	GND	Gray	Red

- I/O-SYS
  Connect a ground wire to one of the 35, 36 or 37 pins.
- I/O-1
  Connect the DC24V to either pin number 21 or 22 and a ground wire to either pin number 23 or 24.

■ Robot Side Pin Number



I/O-SYS



I/O-1

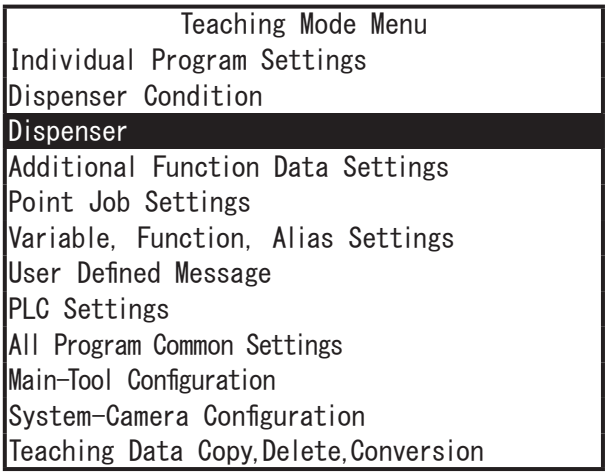
■ Setting the Signals

When one of the lights emitted from Needle Adjuster 2 is blocked (the LED goes OFF), the I/O-SYS signal #sysIn15 or #sysIn16 turns OFF.

You can make settings so that these signals are assigned to and turn OFF using I/O-1.

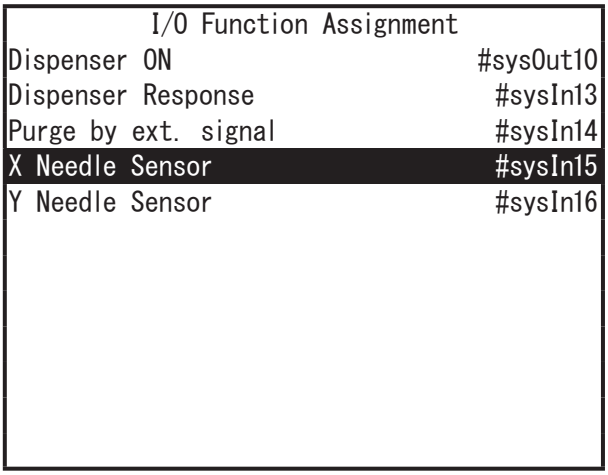
If these two signals are assigned to I/O-1, you can connect Needle Adjuster 2 and the dispenser to the robot using two different cables.

Press the MENU key in Teaching Mode to display the Teaching Mode Menu screen and select [Dispenser].



Select [I/O Function Assignment] from the Dispenser menu screen to display the I/O signal selections for [X Needle Sensor] and [Y Needle Sensor] shown to the right.

Select [X Needle Sensor] or [Y Needle Sensor] to modify the connector and signal assignments.



NOTE: Only signals set to [Free] in [I/O-SYS Function Assignment] can be selected here. You can also modify the signal assignment of the [Dispenser ON] and [Dispenser Response] signals in the same way as the needle sensor signals.

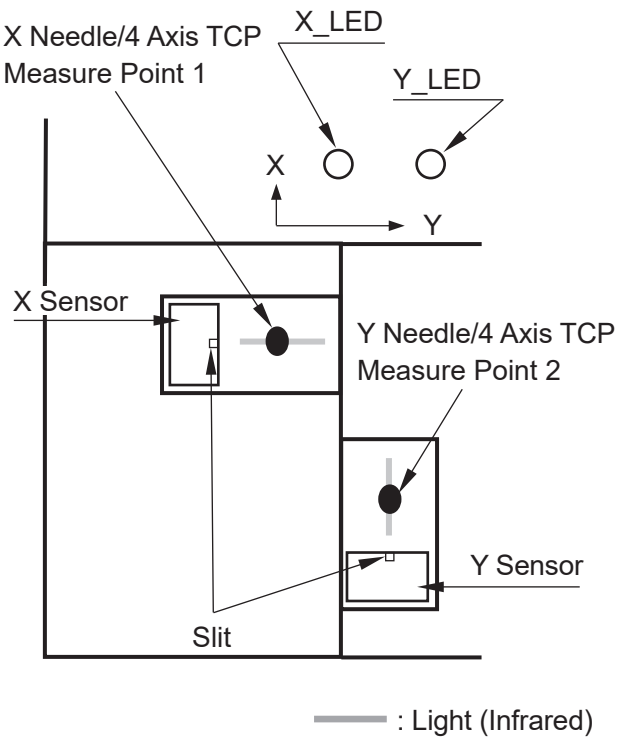
19.2.3 Teaching and Making Standard Registration of Measuring Points

Make sure the robot and Needle Adjuster 2 are properly connected and set the nozzle the same as it is during a run.

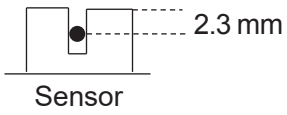
1. New Program
   Open a new program.
   Create a dedicated measuring program separate from programs that are used to actually perform jobs.

2. Point Teaching
   Switch the tool for teaching to [No Tool] before teaching the measuring points. Register the measuring points as the first and second points in the program.

   Register a total of two points: the nozzle measuring position for the X direction to [X Needle/4 Axis TCP Measure Point 1] and the nozzle measuring position for the Y direction to [Y Needle/4 Axis TCP Measure Point 2]. You can also register the [Y Needle/4 Axis TCP Measure Point 2] first. Register the measuring points so that the nozzle is at a height where it blocks the light. If the light is blocked, the corresponding LED turns OFF.
   (When the light is blocked at the X measuring point, the X_LED turns OFF and the Y_LED turns OFF when the light is blocked at the Y measuring point).

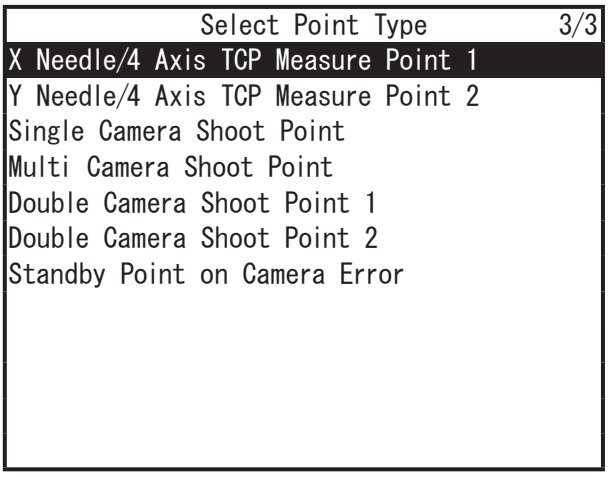


Teaching Height Reference



The approximate needle detection area is 2.3 mm from the top of the sensor. However, note that there may be position deviation depending on the needle shape and/or material, and the locations of [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2].

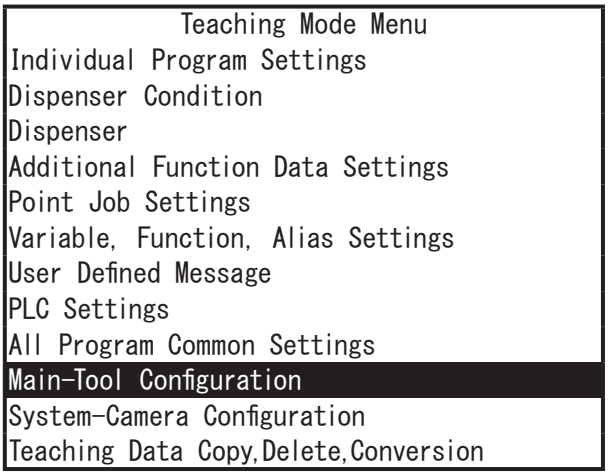
When you enter point coordinates, the point type selection screen is displayed. Use the [CURSOR ▽] to move down the screen or the [.] key to display the screen to the right.
Select [X Needle/4 Axis TCP Measure Point 1] or [Y Needle/4 Axis TCP Measure Point 2].

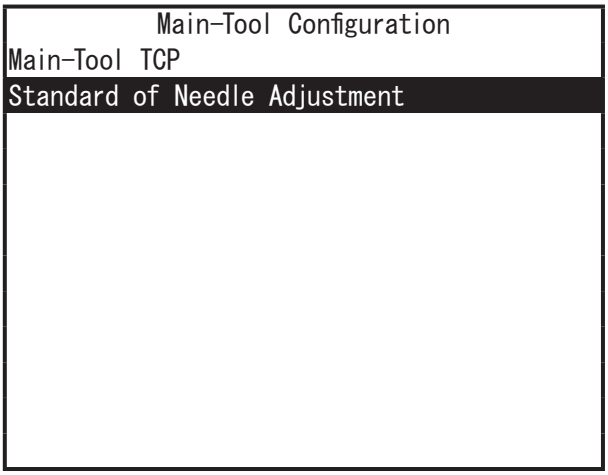


3. Standard Registration

After you enter the X and Y measuring points, register the needle standard position.
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.

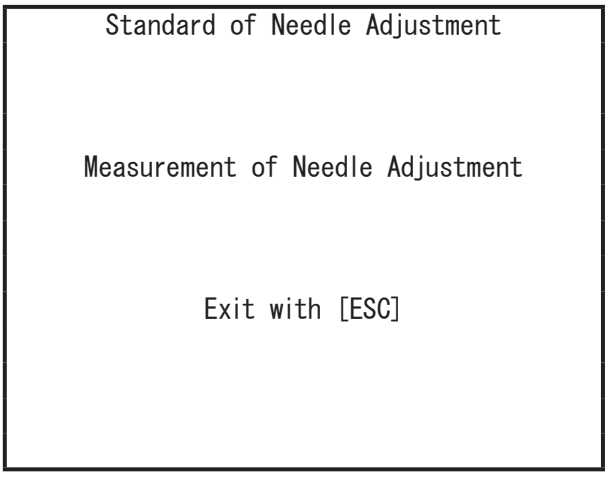
Press the [MENU] key to open the Teaching Mode menu, and select [Main-Tool Configuration].
The Main-Tool Configuration screen is displayed. Select [Standard of Needle Adjustment].
This item is displayed only when programs that include needle measuring points are selected.





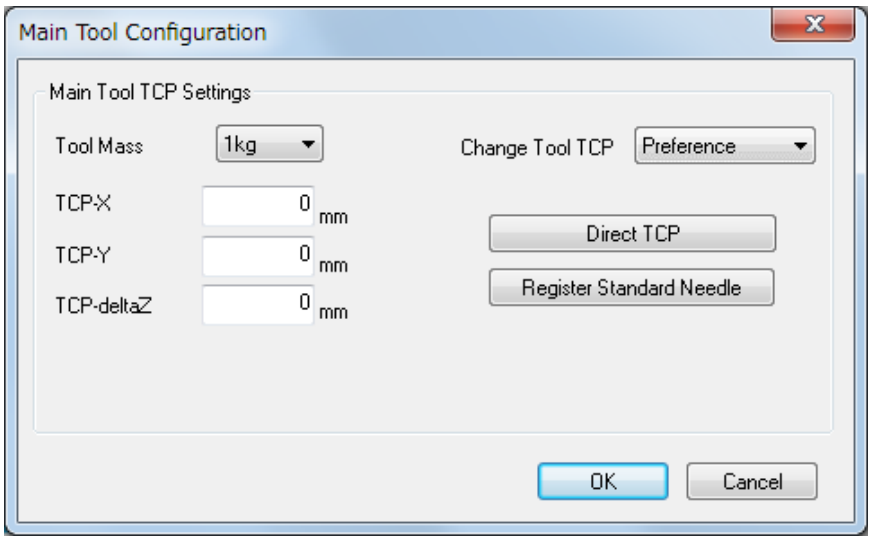
After you select [Standard of Needle Adjustment], the screen shown to the right appears and the axes move to the registered measuring points.

After the operation is complete, the teaching pendant returns to the base screen.



PC

After you enter the X and Y measuring points, register the needle standard position.
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.
From the main screen, click the [Main Tool]. The [Main Tool Configuration] dialog box is displayed.



(1) Set [Tool Mass].
Make sure to select a tool mass greater than the total mass of the tool and of the object which the tool is holding.

(2) Set the needle TCP using a needle measuring program.
Create a needle measuring program in advance and then mechanically initialize the robot before automatically setting the needle TCP.

(3) Click the [Register Standard Needle] after creating the measuring program.
The message “OK to transfer C&T data to robot?” is displayed. Click the [Yes] button. The [Send C&T Data] dialog box is displayed. Press the [Send] button. After the transfer is complete, the message “OK to perform test run” is displayed. Click the [OK] button. The robot moves to the measuring position, the standard position is then measured and the needle TCP is set to the robot. The screen then returns to the [Main Tool Configuration] dialog box.

(4) Click [OK] to finish Main Tool Configuration dialog box.

NOTE:

- The tool center point data values are applied to the following point types: [Point Dispense], [Start of Line Dispense], [Line Passing], and [End of Line Dispense], etc.
- After the measurement is made successfully and the nozzle position is calculated, the robot sounds a buzzer (for 2 seconds), and the program is successfully completed.

■ Manually Setting the Main Tool TCP

- Numerical Entry
  If you know the tool data information in advance, directly enter the values into [Main Tool TCP Settings] to set the needle tip position.
- [Direct TCP]
  Sets the needle tip position using JOG operation. Click the [Direct TCP] to display the direct TCP settings screen.

⚠ Caution

When you replace a needle after configuration (needle, camera, and height sensor) and teaching is complete, do not set [Register Standard Needle] again, but execute the needle measuring program from Run Mode or External Run Mode.

4. Execution

   Once you have replaced the nozzle, switch to Run Mode and execute the program that has [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2] registered. By running this program, the difference between the acquired nozzle position and the nozzle position measured/registered with [Standard of Needle Adjustment] is registered as [TCP-X], [TCP-Y] and [TCP-deltaZ] for tool data in main tool. (However, this does not include the program for the needle adjuster measuring points.)

NOTE:

- If measurement cannot be made correctly with [X Needle/4 Axis TCP Measure Point 1] or [Y Needle/4 Axis TCP Measure Point 2], error No.056 “Needle Measurement Error” occurs. If this happens, re-register the measurement points.
  If this error still persists, the sensor printed circuit board may have malfunctioned and needs replacing.
- The Needle Adjuster 2 functions do not affect the [Tool Data] values in Additional Function Data.
- If there is a point near the end of the operating range (the X/Y coordinates are close to either 0 or their maximum value), the point position may go out of range (error No.007 “Position is Out of Range”) while adjusting using Needle Adjuster 2. Do not register points near the ends of the operating range when using Needle Adjuster 2.

19.3 JC-3 Series

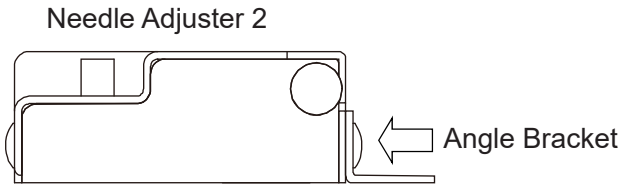
19.3.1 Needle Adjuster 2 Installation

⚠ Caution

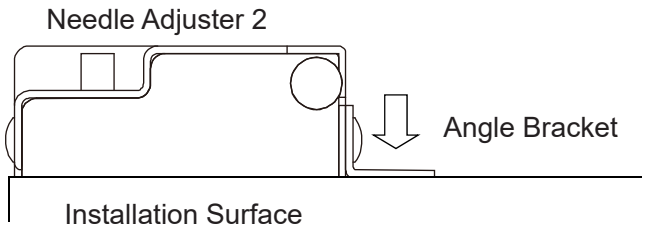
When attaching the angle bracket to Needle Adjuster 2, make sure to use the 2 screws included with Needle Adjuster 2, or the equivalent (M3×3).
Using screws any longer can internally damage Needle Adjuster 2.

The screws for attaching Needle Adjuster 2 to the installation surface are not included. Use 2 M4 screws per angle bracket.
If there is a gap between Needle Adjuster 2 and the surface to which you are attaching it, you can attach angle brackets to both sides of Needle Adjuster 2 to firmly secure it. (2 angle brackets are included). Refer to “19.5 Needle Adjuster 2 External Dimensions”.

(1) Loosely screw the angle bracket(s) to Needle Adjuster 2 using the screws included (so there is still some movement with the angle bracket).



(2) Place Needle Adjuster 2 on the installation surface, and firmly screw the angle bracket(s) to Needle Adjuster 2 while adjusting it so that it sits flush on the installation surface.



(3) Use 2 M4 screws (not included) per angle bracket to screw down the angle bracket(s) to the installation surface.

19.3.2 Connecting Needle Adjuster 2

- I/O-1

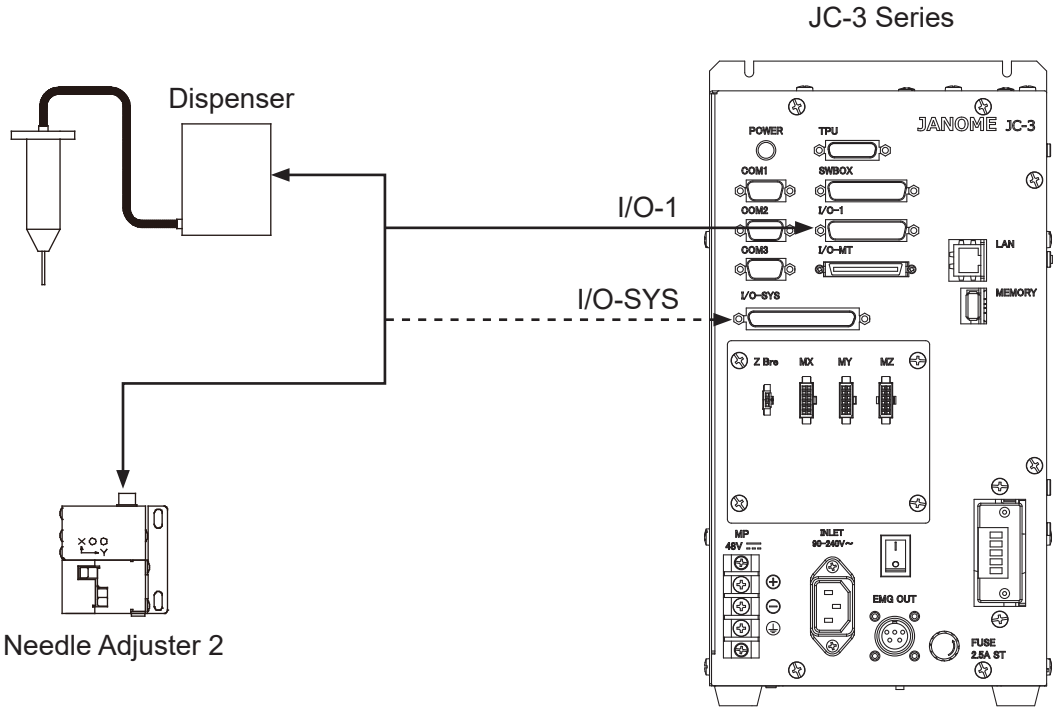
  Connect Needle Adjuster 2 to the I/O-1 connector on the robot controller side using the cable included. Create a split cable for connecting the dispenser and Needle Adjuster 2 to the I/O-1 connector on the robot controller.

- I/O-SYS

  Connect Needle Adjuster 2 to the I/O-SYS connector on the robot controller side using the cable included. If you also want to connect the dispenser to I/O-SYS, create a split cable for connecting the dispenser and Needle Adjuster 2 to the I/O-SYS connector on the robot controller.

NOTE: Modify the I/O function assignment for the X Needle Sensor and Y Needle Sensor signals from I/O-1 (genIn) to I/O-SYS (sysIn).

Connection Example



⚠ Caution

Turn OFF the power to the controller before making connections.
Failure to do so can cause breakdown.

■ Signals

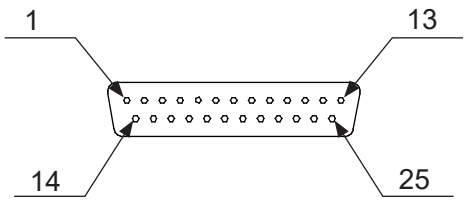
- X Needle Sensor (I/O-1: #genIn7, I/O-SYS: #sysIn15 as per the example in the table below)
  If the nozzle is at the [X Needle/4 Axis TCP Measure Point 1], this signal is OFF.
  This signal is also OFF if the X sensor is blocked (X_LED is OFF) with Needle Adjuster 2.
  This signal is normally ON at all other times.
- Y Needle Sensor (I/O-1: #genIn8, I/O-SYS: #sysIn16 as per the example in the table below)
  If the nozzle is at the [Y Needle/4 Axis TCP Measure Point 2], this signal is OFF.
  This signal is also OFF if the Y sensor is blocked (Y_LED is OFF) with Needle Adjuster 2.
  This signal is normally ON at all other times.

■ Cable

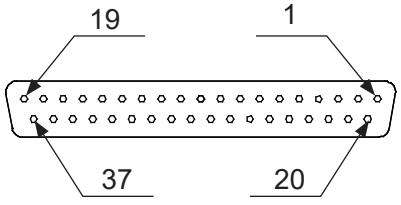
I/O-1		I/O-SYS		Function	Needle Adjuster 2 Cable	
I/O-1 Pin No.	Name	I/O-SYS Pin No.	Name		Insulator Color	Dot Color
7	#genIn7	15	#sysIn15	X Needle Sensor	Orange	Red
8	#genIn8	16	#sysIn16	Y Needle Sensor	Gray	Black
21, 22	COM+	34	COM+	DC 24 V	Orange	Black
23, 24	COM−	35 – 37	COM−	GND	Gray	Red

- I/O-1
  Connect the DC24V to either pin number 21 or 22 and a ground wire to either pin number 23 or 24.
- I/O-SYS
  Connect a ground wire to one of the 35, 36 or 37 pins.

■ Robot Side Pin Number



I/O-1



I/O-SYS

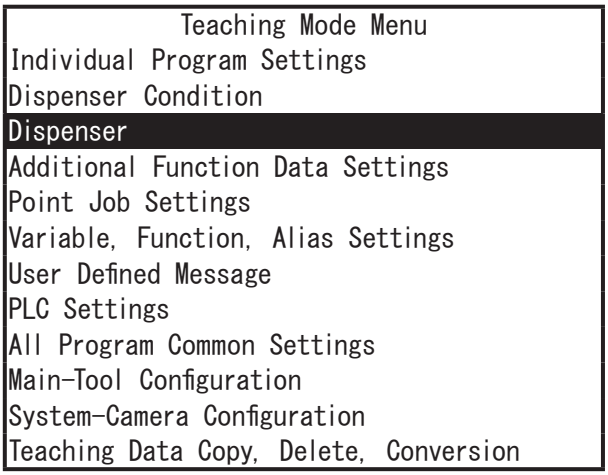
■ Setting the Signals

When one of the lights emitted from Needle Adjuster 2 is blocked (the LED goes OFF), the I/O-1 signal #genIn7 or #genIn8 turns OFF.

You can make settings so that these signals are assigned to and turn OFF using I/O-SYS.

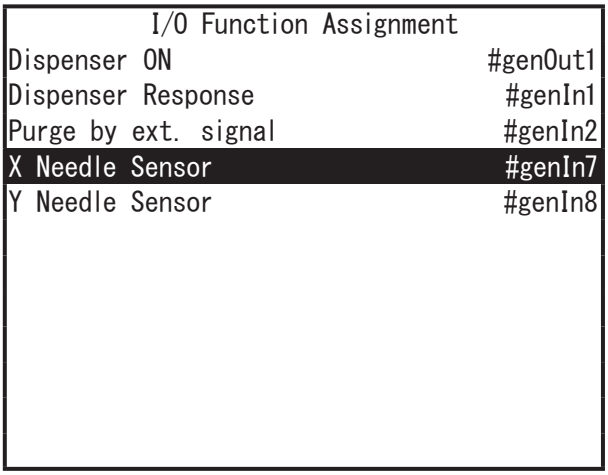
If these two signals are assigned to I/O-SYS, you can connect Needle Adjuster 2 and the dispenser to the robot using two different cables.

Press the MENU key in Teaching Mode to display the Teaching Mode Menu screen and select [Dispenser].



Select [I/O Function Assignment] from the Dispenser menu screen to display the I/O signal selections for [X Needle Sensor] and [Y Needle Sensor] shown to the right.

Select [X Needle Sensor] or [Y Needle Sensor] to modify the connector and signal assignments.



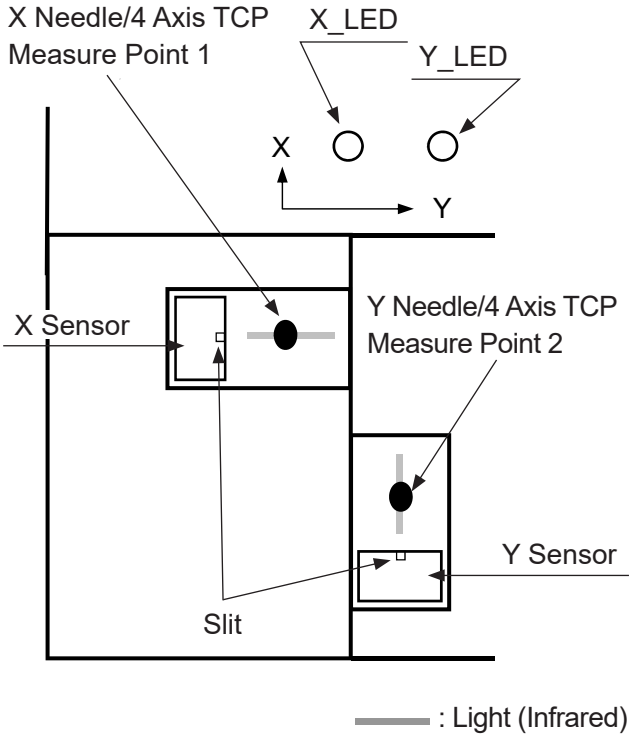
NOTE: Only signals set to [Free] in [I/O-SYS Function Assignment] can be selected here.
You can also modify the signal assignment of the [Dispenser ON] and [Dispenser Response] signals in the same way as the needle sensor signals.

19.3.3 Teaching and Making Standard Registration of Measuring Points

Make sure the robot and Needle Adjuster 2 are properly connected and set the nozzle the same as it is during a run.

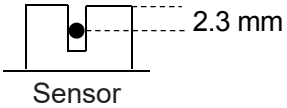
1. New Program
   Open a new program.
   Create a dedicated measuring program separate from programs that are used to actually perform jobs.

2. Point Teaching
   Switch the tool for teaching to [No Tool] before teaching the measuring points.
   Register the measuring points as the first and second points in the program.



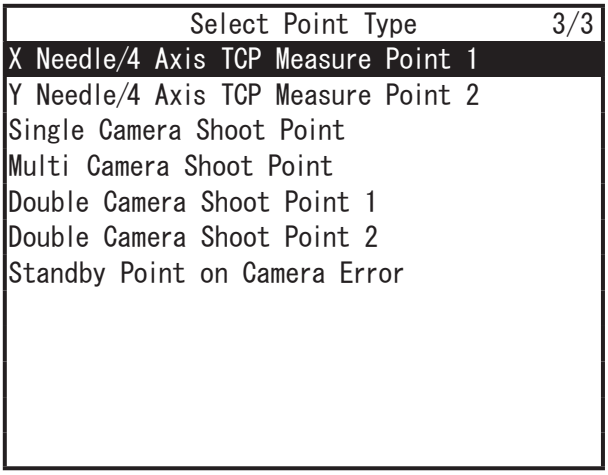
   Register a total of two points: the nozzle measuring position for the X direction to [X Needle/4 Axis TCP Measure Point 1] and the nozzle measuring position for the Y direction to [Y Needle/4 Axis TCP Measure Point 2]. You can also register the [Y Needle/4 Axis TCP Measure Point 2] first.
   Register the measuring points so that the nozzle is at a height where it blocks the light.
   If the light is blocked, the corresponding LED turns OFF.
   (When the light is blocked at the X measuring point, the X_LED turns OFF and the Y_LED turns OFF when the light is blocked at the Y measuring point).

   Teaching Height Reference



   (The approximate needle detection area is 2.3 mm from the top of the sensor. However, note that there may be position deviation depending on the needle shape and/or material, and the locations of [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2].)

When you enter point coordinates, the point type selection screen is displayed. Use the [CURSOR ▽] to move down the screen or the [.] key to display the screen to the right. Select [X Needle/4 Axis TCP Measure Point 1] or [Y Needle/4 Axis TCP Measure Point 2].

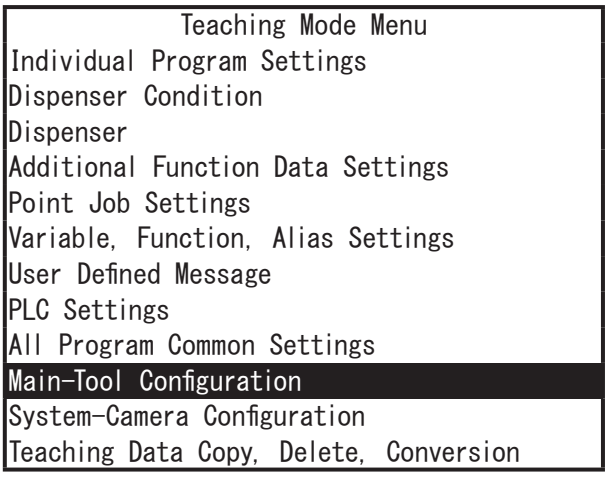


3. Standard Registration

After you enter the X and Y measuring points, register the needle standard position.

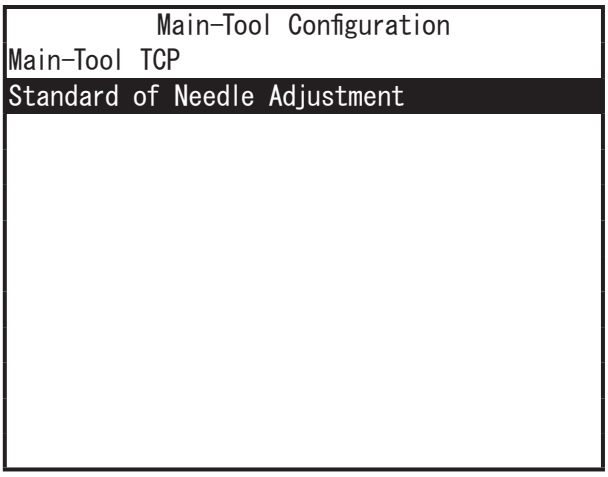
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.

Press the [MENU] key to open the Teaching Mode menu, and select [Main-Tool Configuration].



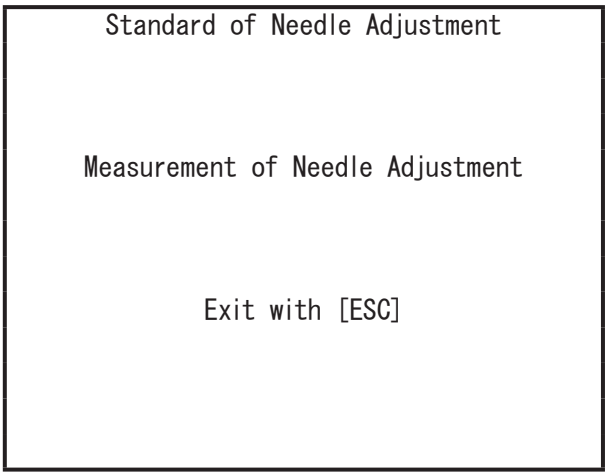
The Main-Tool Configuration screen is displayed. Select [Standard of Needle Adjustment].

This item is displayed only when programs that include needle measuring points are selected.



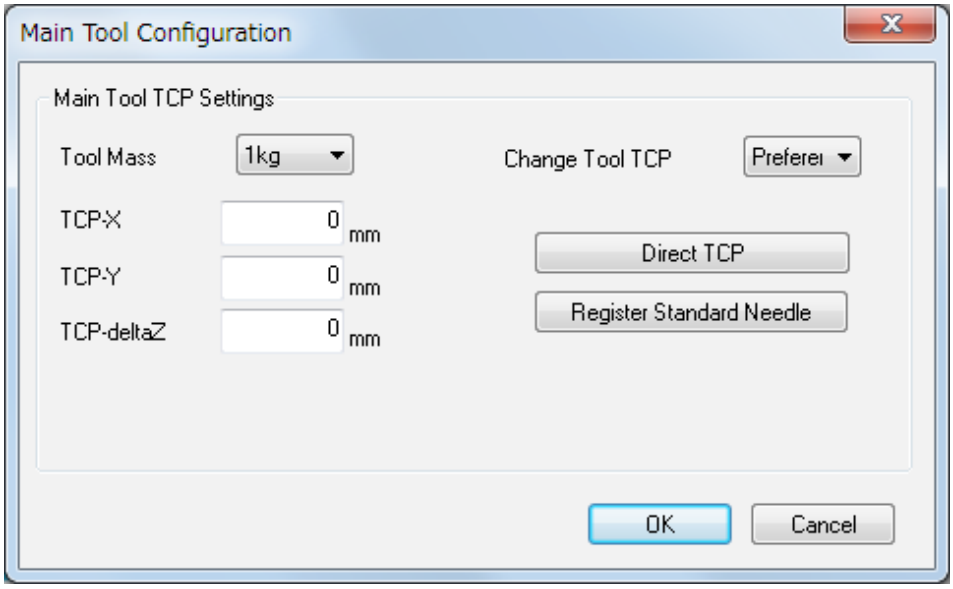
After you select [Standard of Needle Adjustment], the screen shown to the right appears and the axes move to the registered measuring points.

After the operation is complete, the teaching pendant returns to the base screen.



PC

After you enter the X and Y measuring points, register the needle standard position.
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.
From the main screen, click the [Main Tool]. The [Main Tool Configuration] dialog box is displayed.



(1) Set [Tool Mass].
Make sure to select a tool mass greater than the total mass of the tool and of the object which the tool is holding.

(2) Set the needle TCP using a needle measuring program.
Create a needle measuring program in advance and then mechanically initialize the robot before automatically setting the needle TCP.

(3) Click the [Register Standard Needle] after creating the measuring program.
The message “OK to transfer C&T data to robot?” is displayed. Click the [Yes] button. The [Send C&T Data] dialog box is displayed. Press the [Send] button. After the transfer is complete, the message “OK to perform test run” is displayed. Click the [OK] button. The robot moves to the measuring position, the standard position is then measured and the needle TCP is set to the robot. The screen then returns to the [Main Tool Configuration] dialog box.

(4) Click [OK] to finish Main Tool Configuration dialog box.

NOTE:

- The tool center point data values are applied to the following point types: [Point Dispense], [Start of Line Dispense], [Line Passing], and [End of Line Dispense], etc.
- After the measurement is made successfully and the nozzle position is calculated, the robot sounds a buzzer (for 2 seconds), and the program is successfully completed.

■ Manually Setting the Main Tool TCP

- Numerical Entry
  If you know the tool data information in advance, directly enter the values into [Main Tool TCP Settings] to set the needle tip position.
- [Direct TCP]
  Sets the needle tip position using JOG operation. Click the [Direct TCP] to display the direct TCP settings screen.

⚠ Caution

When you replace a needle after configuration (needle, camera, and height sensor) and teaching is complete, do not set [Register Standard Needle] again, but execute the needle measuring program from Run Mode or External Run Mode.

4. Execution

   Once you have replaced the nozzle, switch to Run Mode and execute the program that has [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2] registered. By running this program, the difference between the acquired nozzle position and the nozzle position measured/registered with [Standard of Needle Adjustment] is registered as [TCP-X], [TCP-Y] and [TCP-deltaZ] for tool data in main tool (However, this does not include the program for the needle adjuster measuring points.)

NOTE:

- If measurement cannot be made correctly with [X Needle/4 Axis TCP Measure Point 1] or [Y Needle/4 Axis TCP Measure Point 2], error No.056 “Needle Measurement Error” occurs. If this happens, re-register the measurement points.
  If this error still persists, the sensor printed circuit board may have malfunctioned and needs replacing.
- The Needle Adjuster 2 functions do not affect the [Tool Data] values in Additional Function Data.
- If there is a point near the end of the operating range (the X/Y coordinates are close to either 0 or their maximum value), the point position may go out of range (error No.007 “Position is Out of Range”) while adjusting using Needle Adjuster 2. Do not register points near the ends of the operating range when using Needle Adjuster 2.

19.4 Replacing the Sensor Circuit Board

If the sensor gets dirty, etc., and cannot detect nozzle positions, replace the sensor circuit board with the spare sensor circuit board included. For extra sensor circuit boards, contact Janome or a Janome dealer.

NOTE: Refer to "19.6 Needle Adjuster 2 Specifications" for details regarding the specifications of this device.

Fig. 1

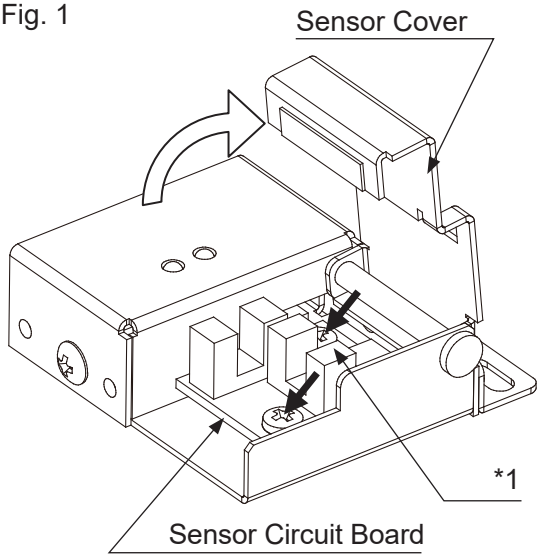
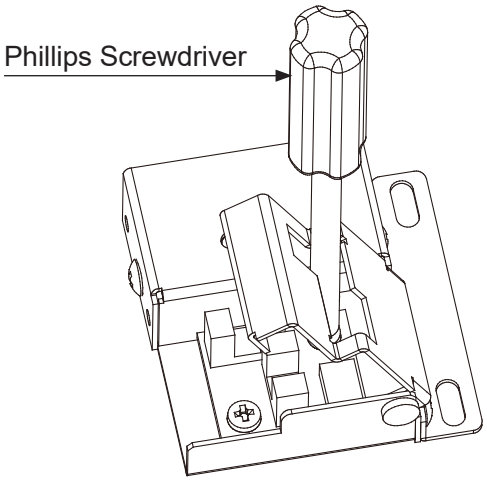
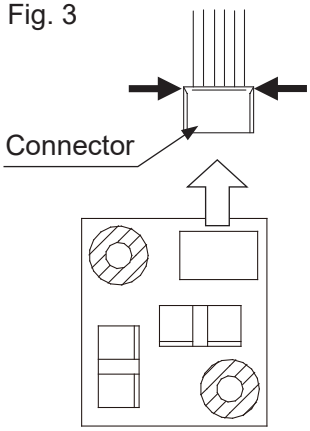


Fig. 2



1. Open the sensor cover, and then remove the two screws securing the sensor circuit board, indicated by the black arrows in Fig. 1. To remove the screw at the back (*1), insert a Phillips screwdriver into the hole in the sensor cover. (refer to Fig. 2)
2. Remove the connector from the sensor circuit board. Press in the connector on both sides (as shown in Fig. 3) to pull it up and remove it.
3. Connect the connector to the new sensor board.
4. Use the screws removed in 1 to secure the new sensor circuit board where the old sensor circuit board was located. Refer to Fig. 1 for the correct orientation of the sensor circuit board.
5. Close the sensor cover.

Fig. 3



NOTE: After you have replaced the sensor board, make sure to re-register the measuring points.

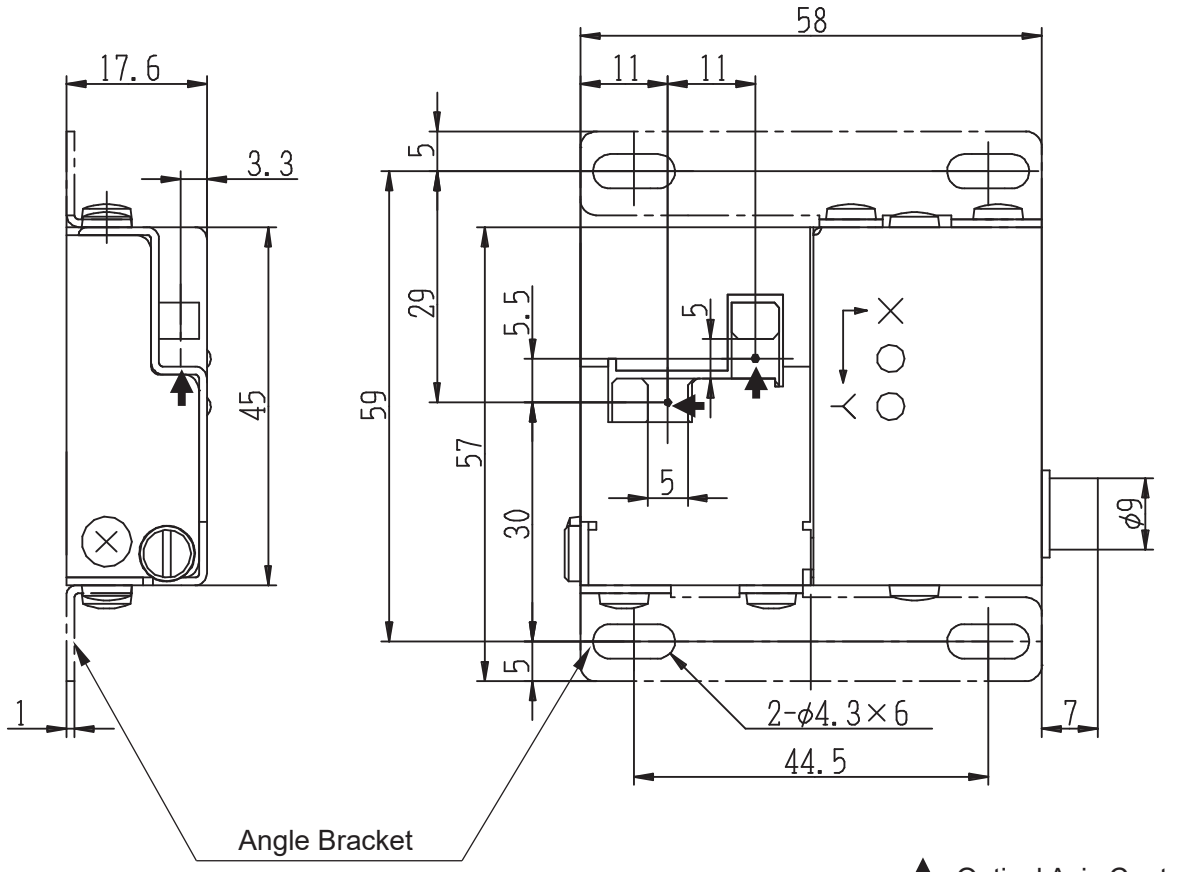
⚠ Caution

Turn OFF the power to the robot before making connections.
Failure to do so can cause breakdown.

19.5 Needle Adjuster 2 External Dimensions

Needle Adjuster 2 Unit (Standard (PR-1))

(unit: mm)



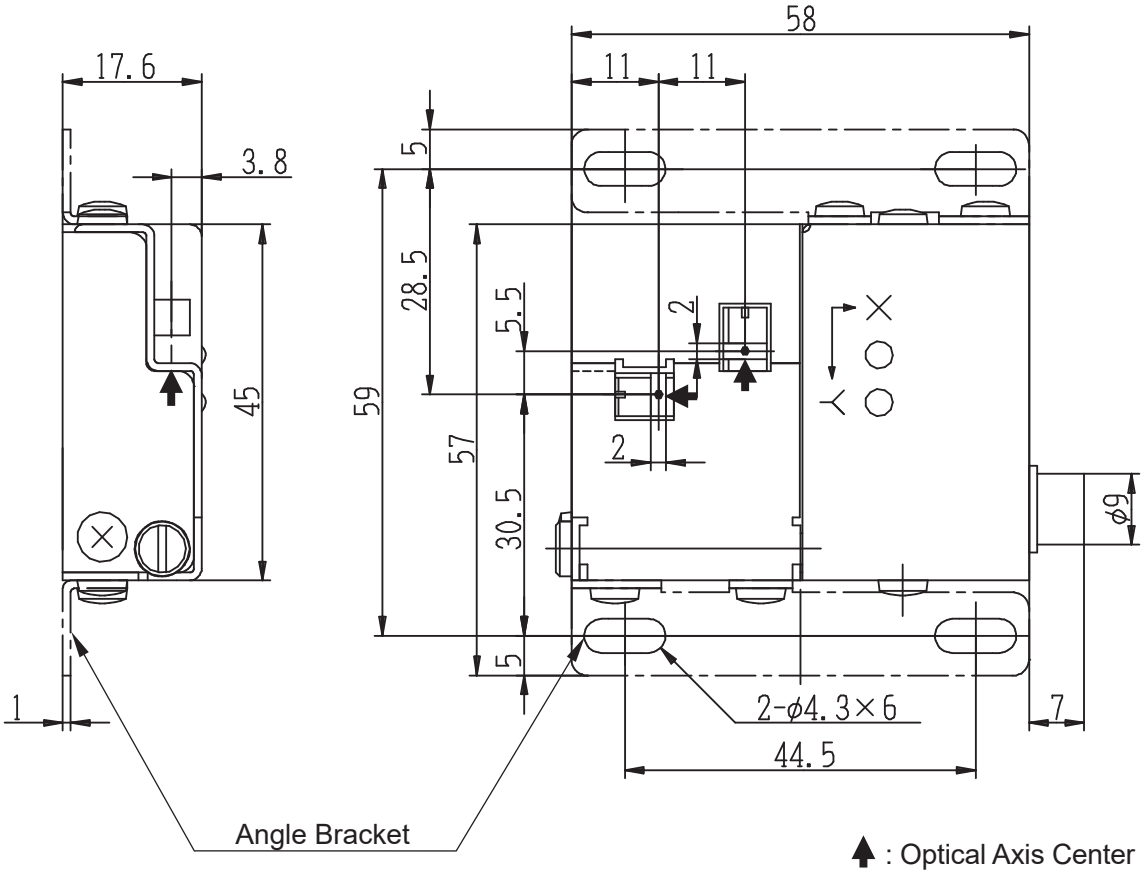
NOTE: You can attach angle brackets to either one side or both sides (shown at the top and bottom of the diagrams above) of Needle Adjuster 2. Securing angle brackets to both sides of Needle Adjuster 2 can allow you to firmly secure it.

⚠ Caution

When attaching the angle bracket to Needle Adjuster 2, make sure to use the 2 screws included with Needle Adjuster 2, or the equivalent (M3x3).
Using screws any longer can internally damage Needle Adjuster 2.

Needle Adjuster 2 Unit (EXF (PR-2))

(unit: mm)



NOTE: You can attach angle brackets to either one side or both sides (shown at the top and bottom of the diagrams above) of Needle Adjuster 2. Securing angle brackets to both sides of Needle Adjuster 2 can allow you to firmly secure it.

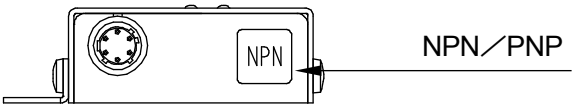
⚠ Caution

When attaching the angle bracket to Needle Adjuster 2, make sure to use the 2 screws included with Needle Adjuster 2, or the equivalent (M3x3).
Using screws any longer can internally damage Needle Adjuster 2.

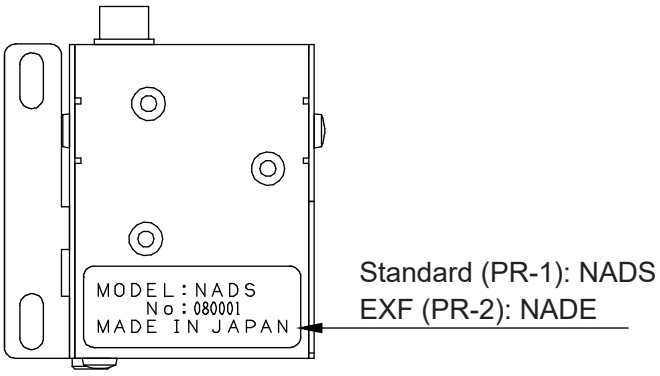
19.6 Needle Adjuster 2 Specifications

Item	Specifications
External Dimensions	58×45×17.66 mm (not including connectors)
Unit Mass	90 g
Compatible Nozzle Size	Standard (PR-1): 14 – 27 Gauge (outer diameter ø0.35 – 2.5 mm) EXF (PR-2): 20 – 32 Gauge (outer diameter ø0.2 – 1.0 mm) NOTE: Use needle or tapered nozzles only. Infrared-transparent nozzles or nozzles with extremely bent tips cannot be used.
Robot Connection	I/O-SYS connector (using the robot cable)

Check the specifications of your Needle Adjuster 2 using the stickers indicated below.



Needle Adjuster 2 Side View



Needle Adjuster 2 Bottom View

NOTE: For extra sensor circuit boards, contact Janome or a Janome dealer.
However, note that you cannot use an EXF (PR-2) sensor circuit board with a Standard (PR-1) type Needle Adjuster 2. The same applies for the reverse as well.

Standard (PR-1) Part No: 963576004
EXF (PR-2) Part No: 963577005

20. USING NEEDLE ADJUSTER (4-AXIS MODELS)

NOTE:

- For the 3-axis JR3000/JC-3 Series, refer to the “19. USING NEEDLE ADJUSTER 2 (3-AXIS MODELS)” for details.
- This section explains regarding the JS3 Series.

■ Precautions

- Needle nozzles which are severely bent might be undetectable by the sensor (this can particularly occur when using fine needles).
- Transparent taper nozzles (plastic translucent nozzles, etc.), might be undetectable by the sensor. Also, errors may still occur even if the needle is detected.
- Before you use the needle adjuster functions, check to make sure that there is no dispensing agent dripping from the nozzle. If the sensor area gets dirty, it cannot detect nozzles.
- The sensor should be a dedicated 4 axis desktop robot device.
- Multiple nozzles of various dimensions cannot be detected during the same job. If the nozzle dimensions change, reteach the points or adjust the positions using [XYZR Offset]*.
- If you want to use needle adjuster functions with an existing program, perform standard registration of the needle adjuster functions after adjusting the point positions using [XYZR Offset]*.

* For further details regarding [XYZR Offset], refer to “7.1.3 Block Editing” in the operation manual *Teaching Pendant Operation*.

20.1 Connecting Needle Adjuster (NPN Specifications)

■ Sensor*

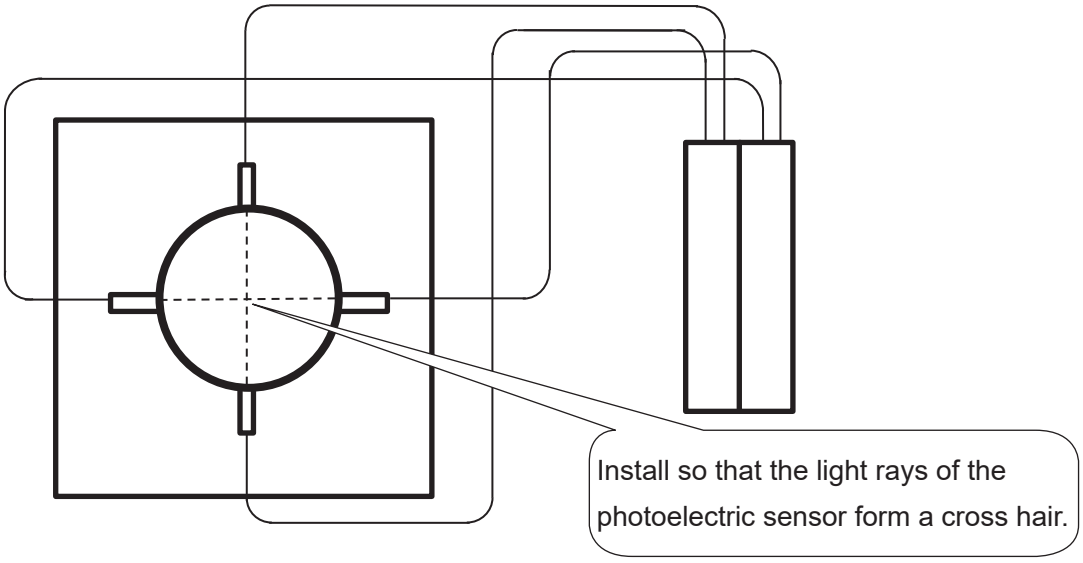
To use the 4 axis needle adjuster functions, you need a sensor configuration such as the one below.

Photoelectric sensor (2ch) ･･･X direction and Y direction

Example: Keyence: FS-N Series (digital fiber sensor: uses a transmission type sensor)

NOTE: Select and use a fiber sensor which matches the size of the tool tip you are using.

Photoelectric sensor - sensor mounting fixture (design and assemble on your side)



NOTE:

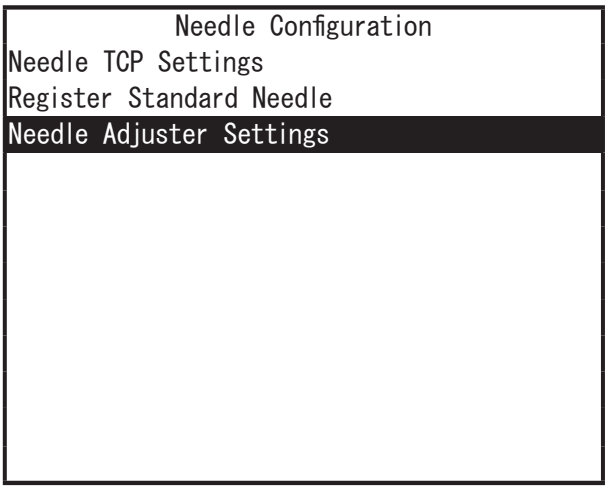
- With the JR3000 Series, completely secure the sensor* to the X-table.
- With the JC-3 Series, completely secure the sensor* to the installation surface.
- With the JS3 Series, completely secure the sensor* to the floor.

* To use the 4 axis needle adjuster functions, you need to prepare the sensor on your side.

■ Signal type settings

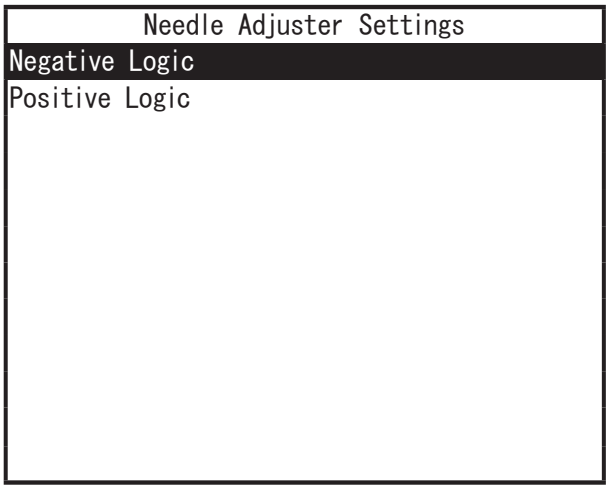
There are two types of output signals for 4-axis needle adjuster: positive logic and negative logic. You need to set this in advance.

In teaching mode, press MENU key to open the [Main Tool Configuration] and select the [Needle Adjuster Settings].



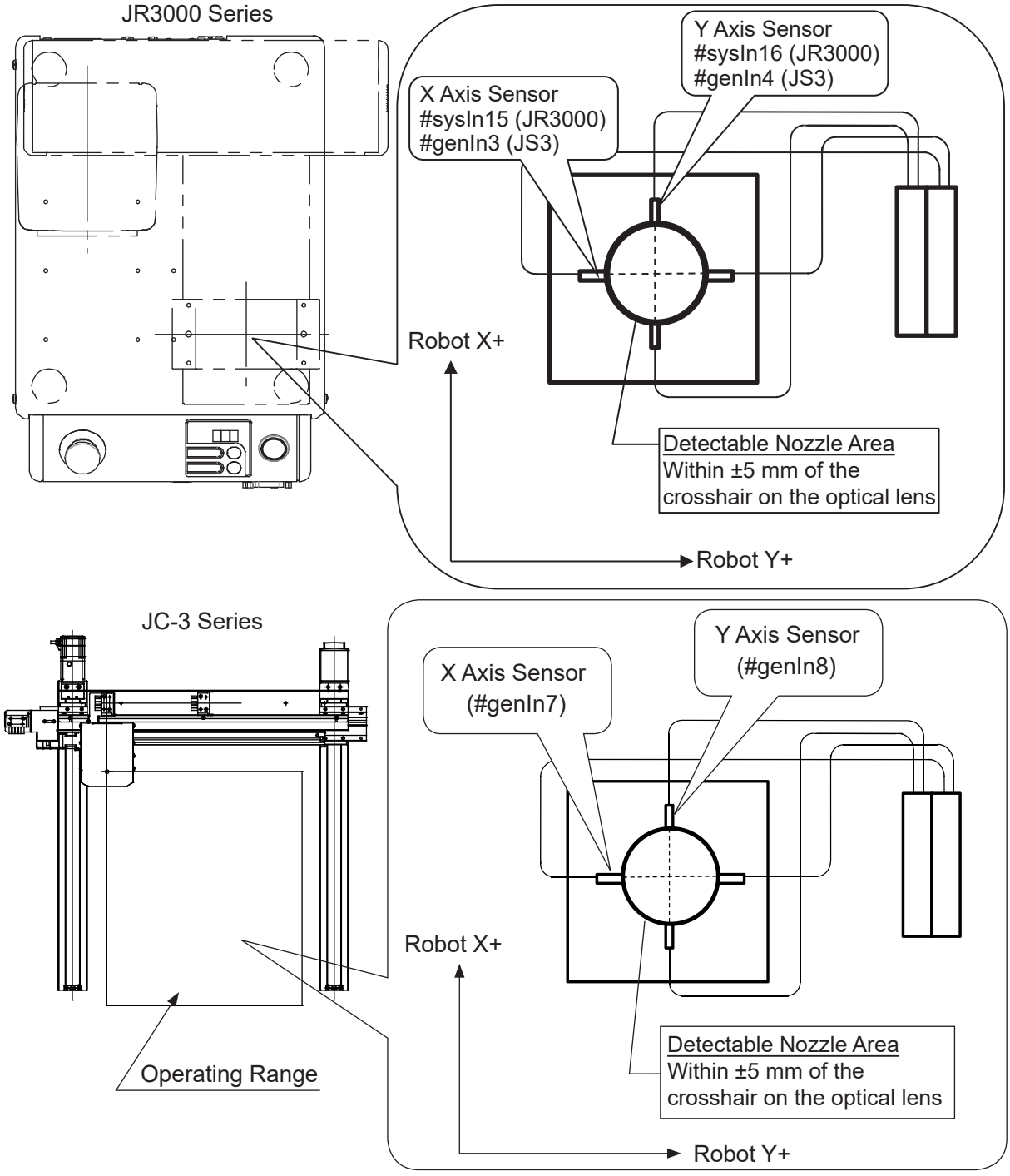
If you select the [Needle Adjuster Settings], the diagram to the right appears. Set as follows.

- 4-axis needle adjuster that the sensor signal comes ON when the sensor is blocked : Set to [Positive Logic]
- 4-axis needle adjuster that the sensor signal comes OFF when the sensor is blocked : Set to [Negative Logic]



20.2 4-Axis Needle Adjuster Overview

Secure the sensor you are using for the needle adjuster functions to the X-table for the JR3000 Series or to the installation surface for the JC-3 Series or to the floor for the JS3 Series. The illustration below shows an example of the JR3000/JC-3 Series.
If you teach a program such as the one shown below only containing 2 points and then load the nozzle position as standard data, you can automatically adjust the nozzle position by simply running the program after you replace the nozzle.
(You need to run this program every time you replace the nozzle.)



1. Switch the tool for teaching to [No Tool].
2. Register [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2] to a given program number.

NOTE: [X Needle/4 Axis TCP Measure Point 1] makes a nozzle tip position measurement when the R axis angle is 0°, and conversely, [Y Needle/4 Axis TCP Measure Point 2] makes a nozzle tip position measurement when the R axis angle is 180° (or when the R axis angle is +180° in comparison to [X Needle/4 Axis TCP Measure Point 1]).

3. Register the nozzle tip height for the measuring point and the standard positions for the X/Y orientations in the Teaching Mode menu.
4. When replacing the nozzle, and you run this program, Needle Adjuster makes adjustment (overwrites the tool data) for the position of the new nozzle tip position by comparing it to the registered standard position data.

NOTE: For further details, refer to “20.3 Teaching and Making Standard Registration of Measuring Points”.

20.3 Teaching and Making Standard Registration of Measuring Points

Make sure the robot and the sensor are properly connected and set the nozzle the same as it is during a run.

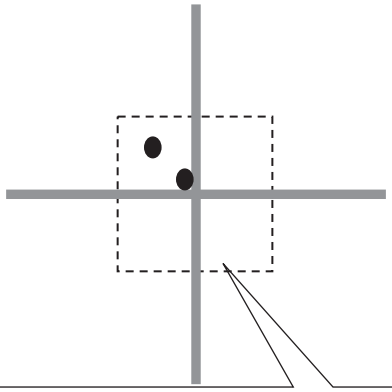
20.3.1 New Program

Open a new program.
Create a dedicated measuring program separate from programs that are used to actually perform jobs.

20.3.2 Point Teaching

Switch the tool for teaching to [No Tool] before teaching the measuring points.
Register the measuring points as the first and second points in the program.

Register a total of two points: the start position of the nozzle tip measurement with an R axis 0° angle to [X Needle/4 Axis TCP Measure Point 1] and the start position of the nozzle tip measurement with an R axis 180° angle to [Y Needle/4 Axis TCP Measure Point 2]. These points can be registered in any order.



Detectable Nozzle Area

Teach the points so that the nozzle tip comes within ±5 mm of the XY orientation and ±5 mm of the Z orientation from the crosshair on the optical lens.

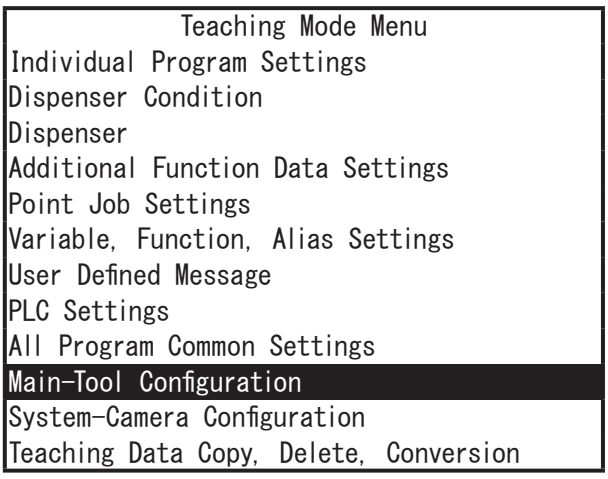
When you enter point coordinates, the point type selection screen is displayed.
Use the CURSOR ▽ to move down the screen or the . key to display the screen to the right.
Select [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2].

Select Point Type	3/3
X Needle/4 Axis TCP Measure Point 1	
Y Needle/4 Axis TCP Measure Point 2	
Single Camera Shoot Point	
Multi Camera Shoot Point	
Double Camera Shoot Point 1	
Double Camera Shoot Point 2	
Standby Point on Camera Error	

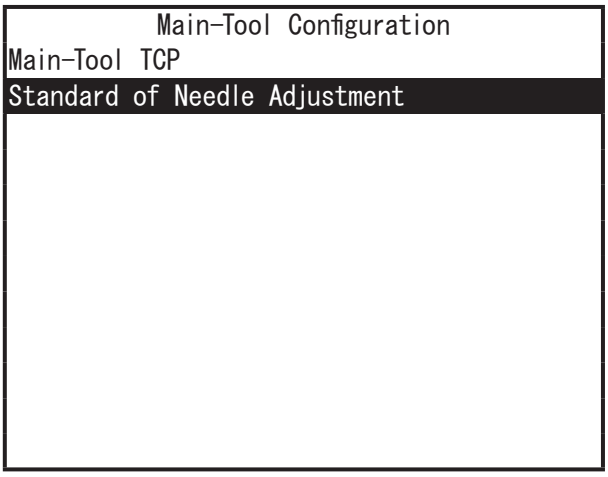
20.3.3 Standard Registration

TP

After you enter the X and Y measuring points, register the needle standard position.
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.



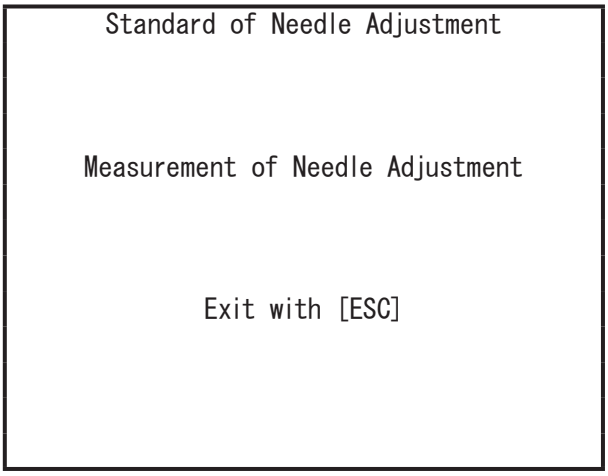
- JR3000/JC-3 Series
  Press the MENU key to open the Teaching Mode menu, and select [Main-Tool Configuration]. The Main-Tool Configuration screen is displayed. Select [Standard of Needle Adjustment].
  This item is displayed only when programs that include needle measuring points are selected.



- JS3 Series
  Press the MENU key to open the Teaching Mode menu, and select [Main-Tool Configuration]. Select [Standard of Needle Adjustment]. When the motor power is OFF, the [Standard of Needle Adjustment] is not started.
  This item is displayed only when programs that include needle measuring points are selected.

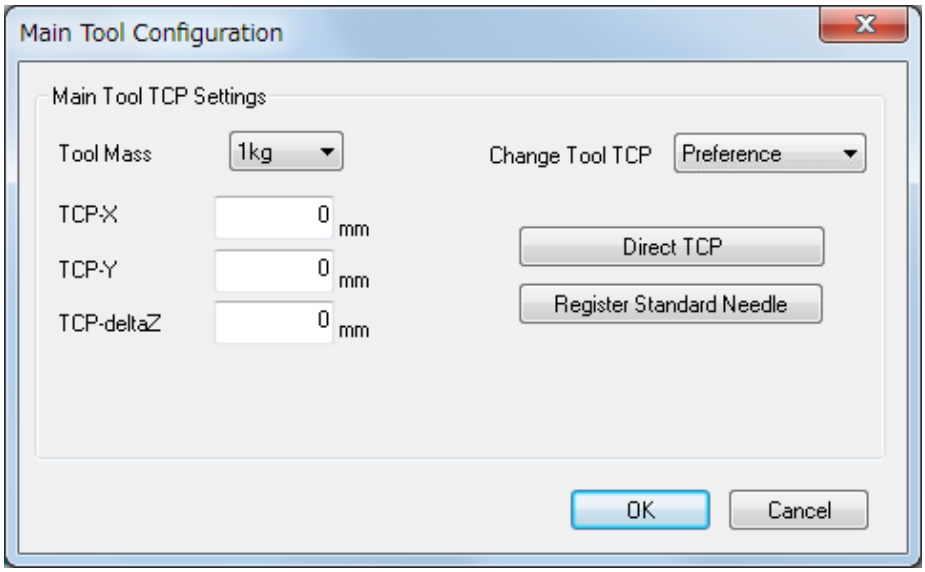
After you select [Standard of Needle Adjustment], the screen shown to the right appears and the axes move to the registered measuring points.

After the operation is complete, the teaching pendant returns to the base screen.



PC

After you enter the X and Y measuring points, register the needle standard position.
When you use the needle adjuster functions, the robot calculates the adjustment by comparing the position of the needle with the values registered here.
From the main screen, click the [Main Tool]. The [Main Tool Configuration] dialog box is displayed.



1. Set [Tool Mass].
   Make sure to select a tool mass greater than the total mass of the tool and of the object which the tool is holding.

2. Set the needle TCP using a needle measuring program. Create a needle measuring program in advance and then mechanically initialize the robot before automatically setting the needle TCP.

3. Click the [Register Standard Needle] after creating the measuring program. The message “OK to transfer C&T data to robot?” is displayed. Click the [Yes] button. The [Send C&T Data] dialog box is displayed. Press the [Send] button. After the transfer is complete, the message “OK to perform test run” is displayed. Click the [OK] button. The robot moves to the measuring position, the standard position is then measured and the needle TCP is set to the robot. The screen then returns to the [Main Tool Configuration] dialog box.

4. Click [OK] to finish Main Tool Configuration dialog box.

NOTE:

- The tool center point data values are applied to the following point types: [Point Dispense], [Start of Line Dispense], [Line Passing], and [End of Line Dispense], etc.
- After the measurement is made successfully and the nozzle position is calculated, the robot sounds a buzzer (for 2 seconds), and the program is successfully completed.
- For details on the Needle Adjuster Settings, refer to the “Signal type settings” in “20.1 Connecting Needle Adjuster (NPN Specifications)”.

■ Manually Setting the Main Tool TCP

- Numerical Entry
  If you know the tool data information in advance, directly enter the values into [Main Tool TCP Settings] to set the needle tip position.
- [Direct TCP]
  Sets the needle tip position using JOG operation. Click the [Direct TCP] to display the direct TCP settings screen.

⚠ Caution

When you replace a needle after configuration (needle, camera, and height sensor) and teaching is complete, do not set [Register Standard Needle] again, but execute the needle measuring program from Run Mode or External Run Mode.

20.3.4 Execution

Once you have replaced the nozzle, switch to Run Mode and execute the program that has [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2] registered. By running this program, the difference between the obtained nozzle position and the nozzle position measured/registered with [Standard of Needle Adjustment] is registered to the tool data in main tool as [TCP-X], [TCP-Y] and [TCP-deltaZ].

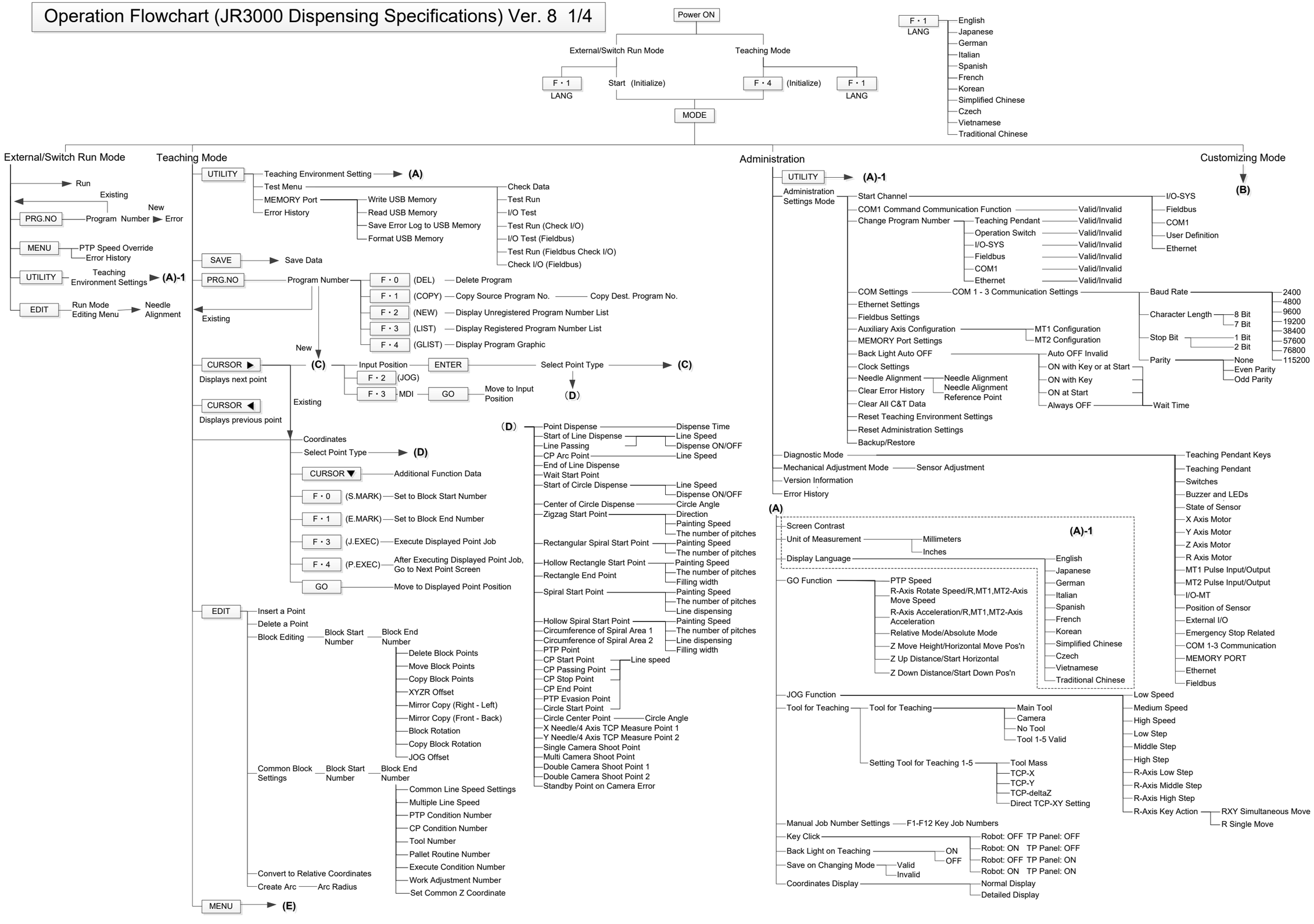
NOTE:

- After the measurement is made successfully and the nozzle position is calculated, the robot sounds a buzzer (for 2 seconds), and the program is successfully completed.
- If measurement cannot be made correctly with [X Needle/4 Axis TCP Measure Point 1] and [Y Needle/4 Axis TCP Measure Point 2], an error occurs. If this happens, re-register the measurement points.
  If the error still persists, it is possible that the sensor has malfunctioned. Replace the sensor.
- The 4 axis needle adjuster functions do not affect the additional function [Tool Data] values.
- If there is a point near the end of the operating range (the X/Y coordinates are close to either 0 or the maximum value), the point position may go out of range (error No.007 “Position is Out of Range”) while adjusting using the 4 axis needle adjuster functions. Do not register points near the ends of the operating range when using the 4 axis needle adjuster functions.

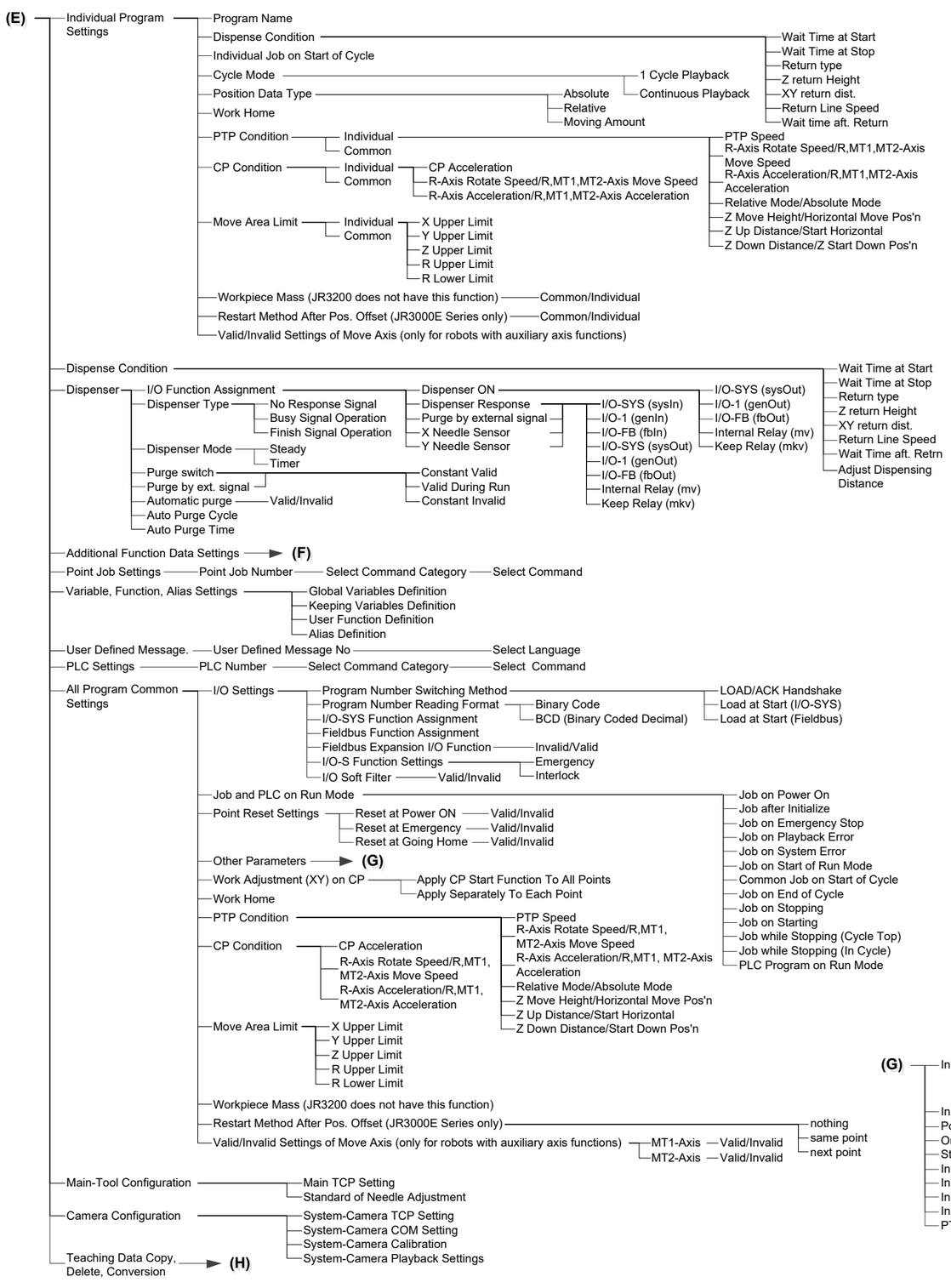
21. OPERATION FLOWCHART (JR3000)

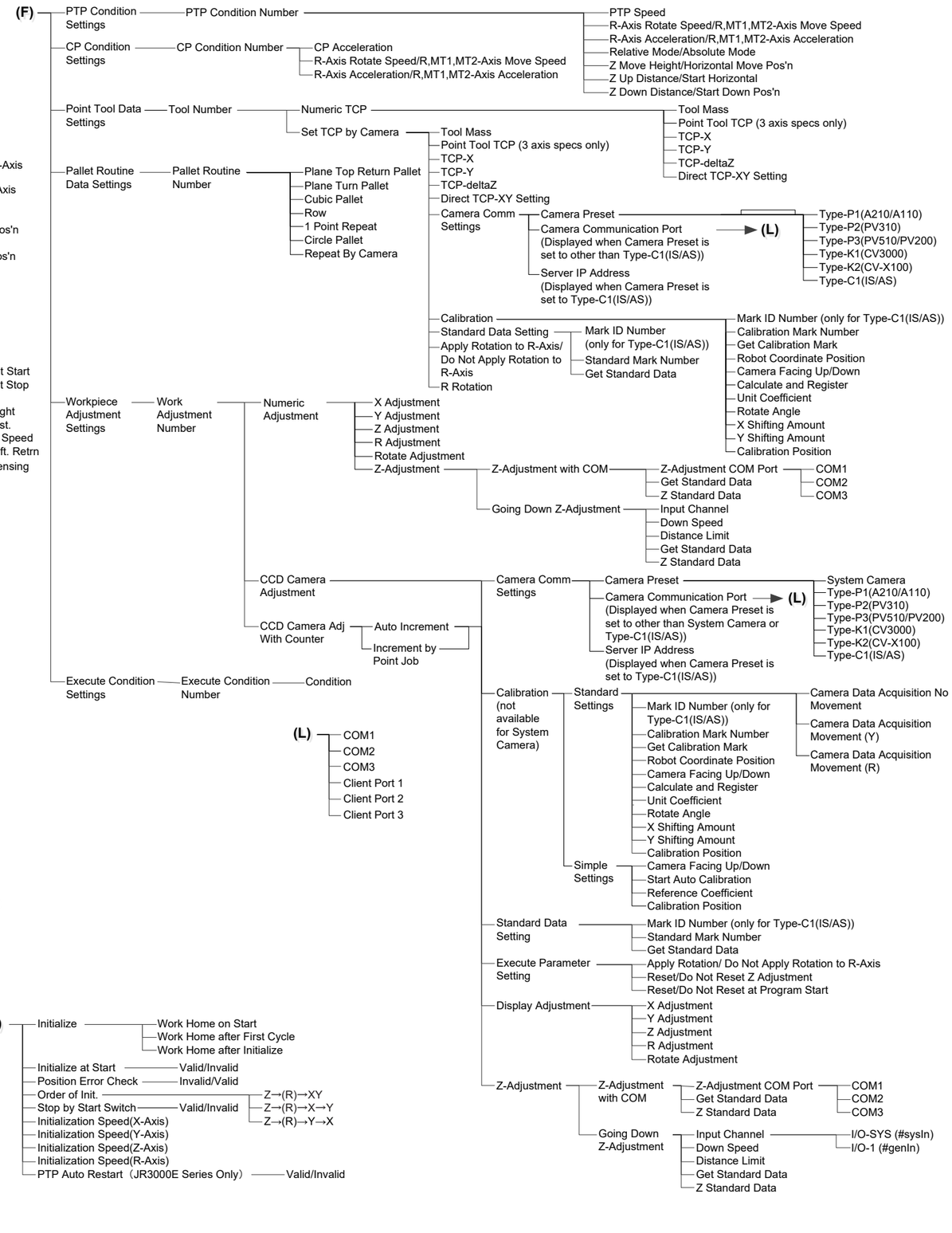
- The menu items displayed may vary depending on the model or functions of your robot.
- Items related to the R-axis are generally only displayed for 4-axis models. Some R-axis related items may be displayed for 3-axis models, however they do not function when set on a 3-axis model.
- Items that include the identifier “MT” are only displayed for models with auxiliary axis functions.

Operation Flowchart (JR3000 Dispensing Specifications) Ver. 8 1/4

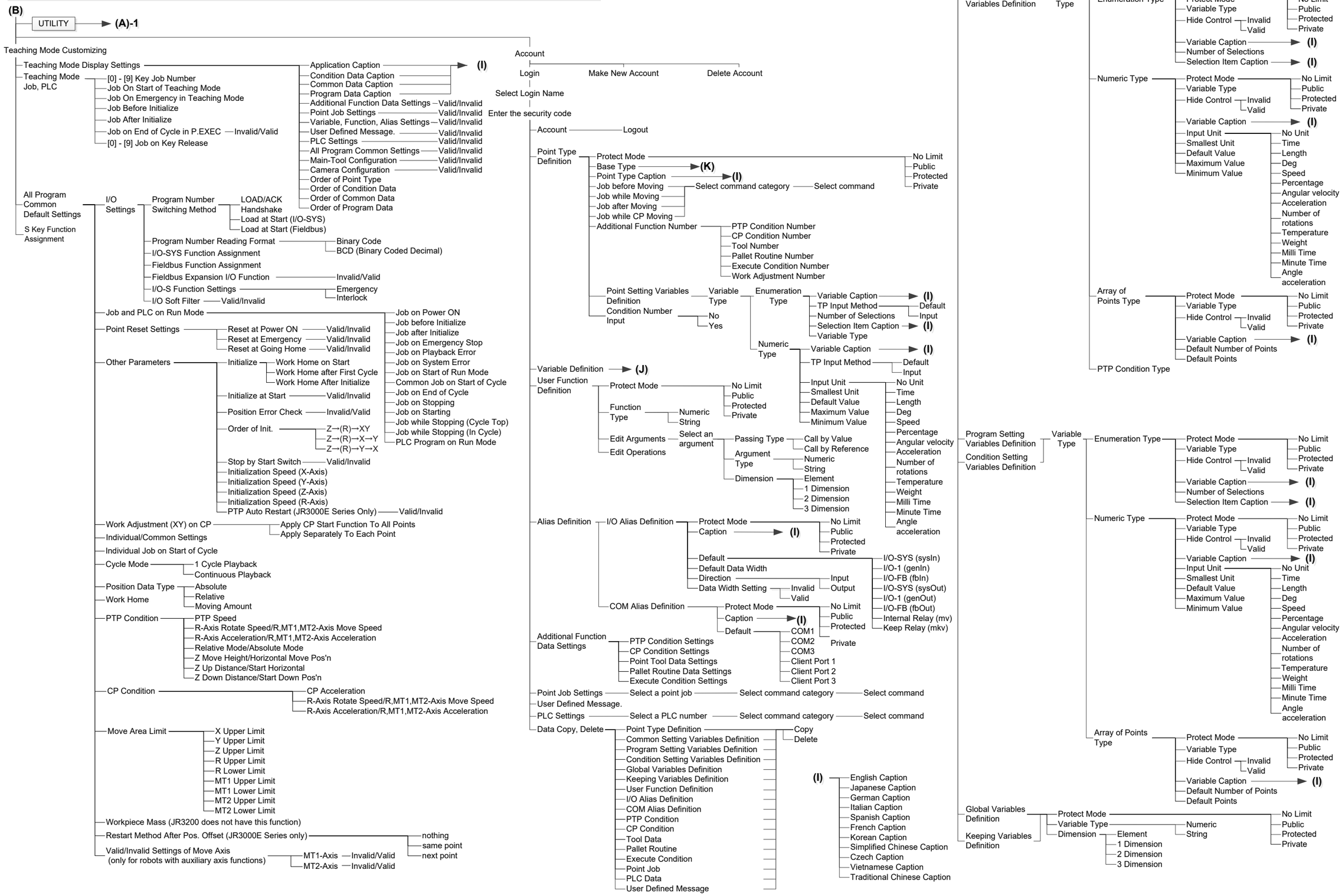


Operation Flowchart (JR3000 Dispensing Specifications) Ver. 8 2/4

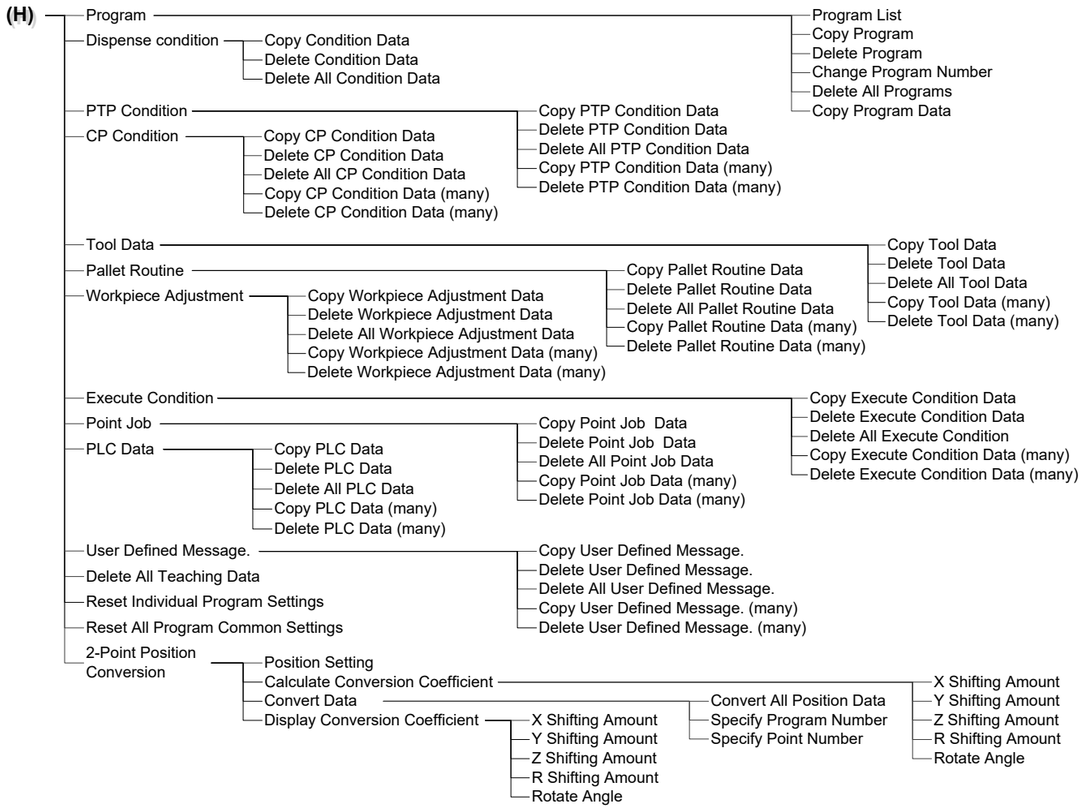


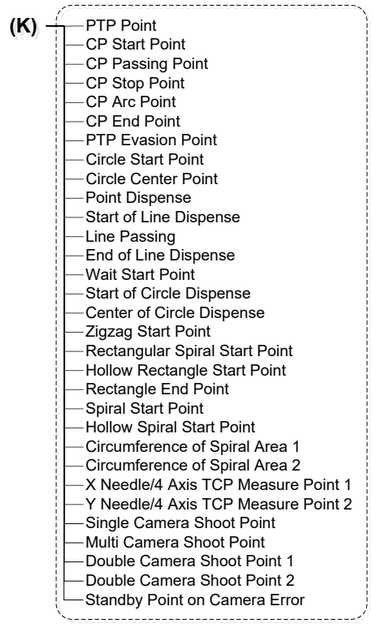


Operation Flowchart (JR3000 Dispensing Specifications) Ver. 8 3/4



Operation Flowchart (JR3000 Dispensing Specifications) Ver. 8 4/4



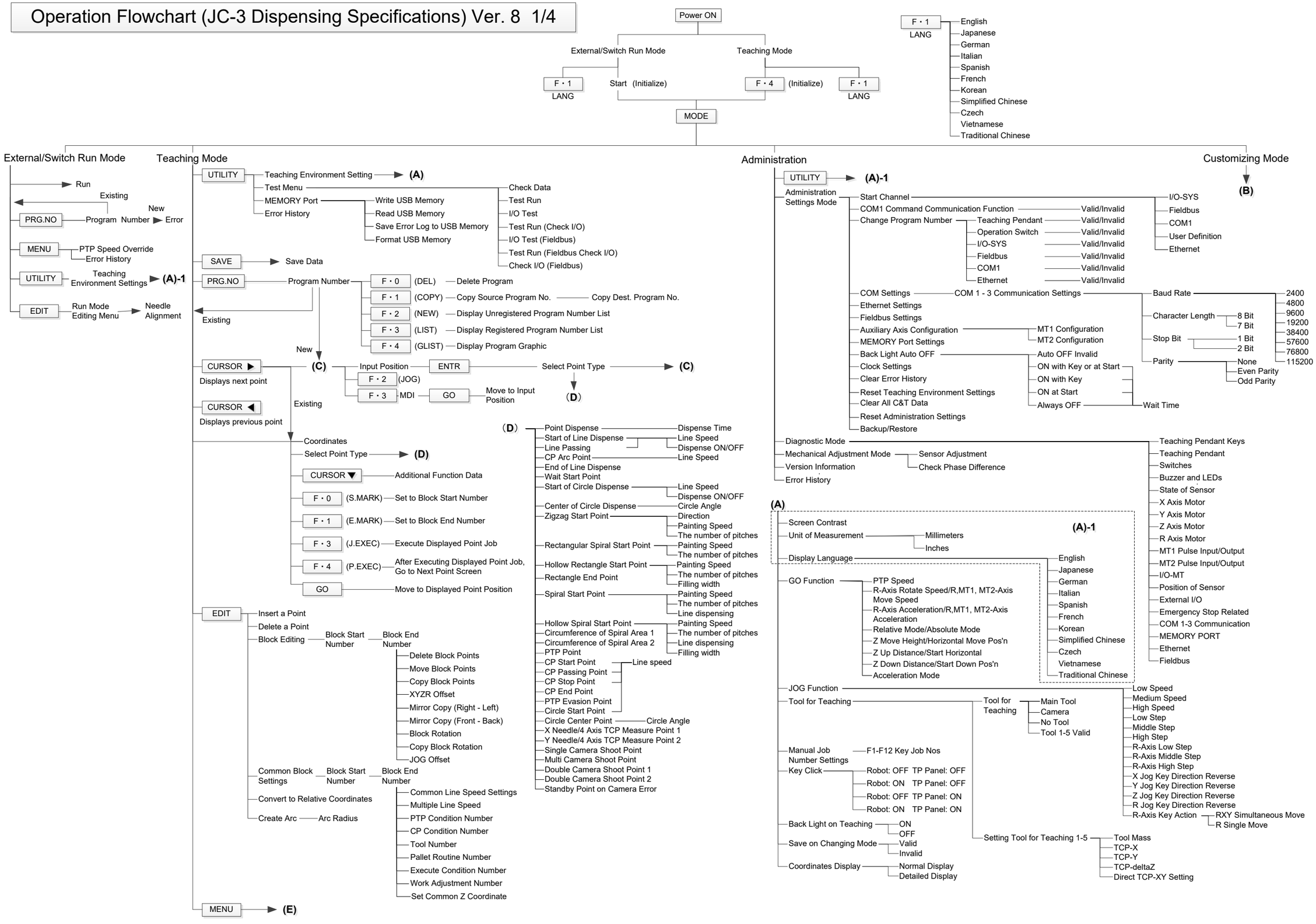


NOTE: An identifier is listed on the left and the point name is listed on the right.
However, the point name may be omitted if the identifier requires the character spacing.

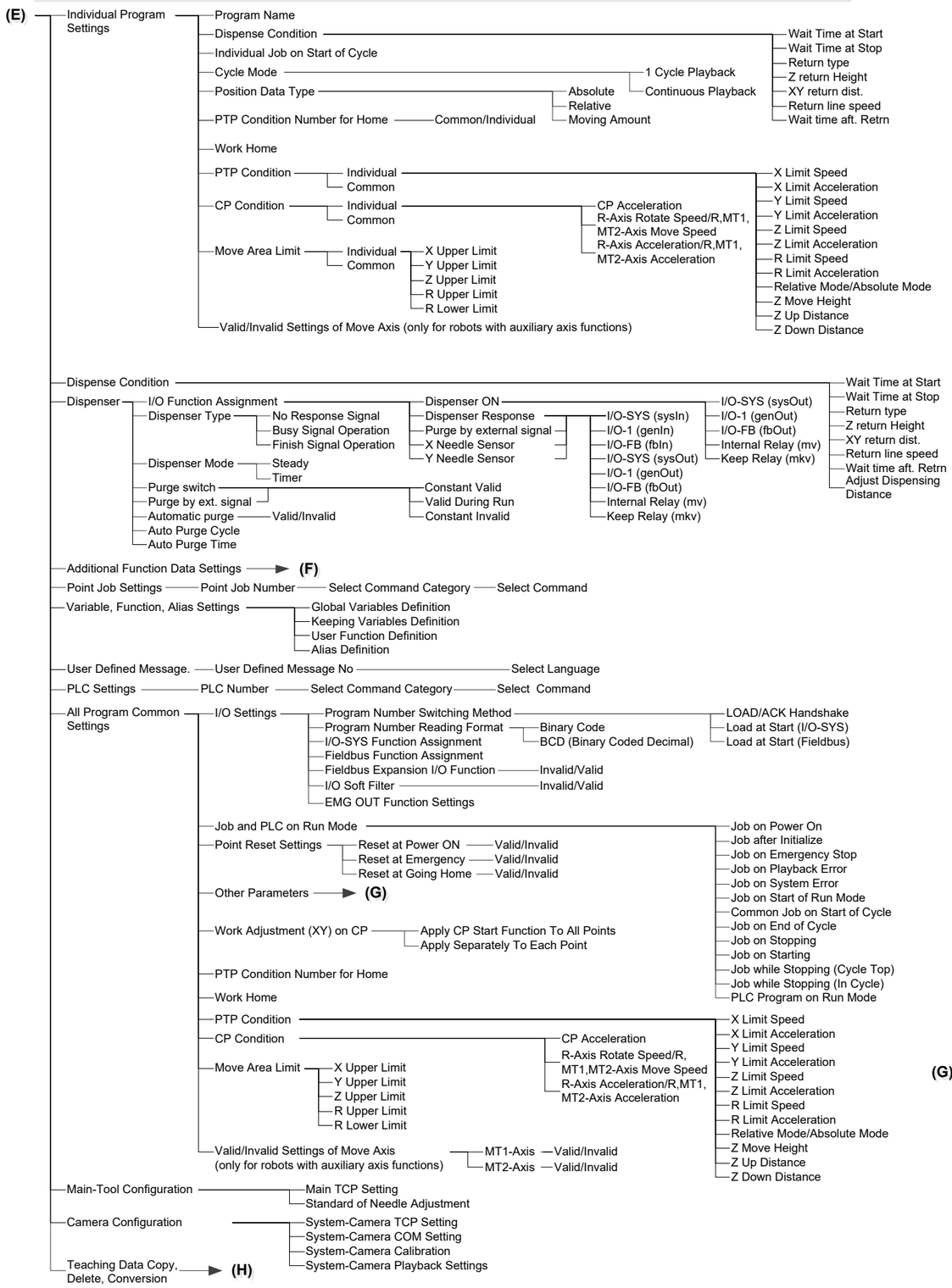
22. OPERATION FLOWCHART (JC-3)

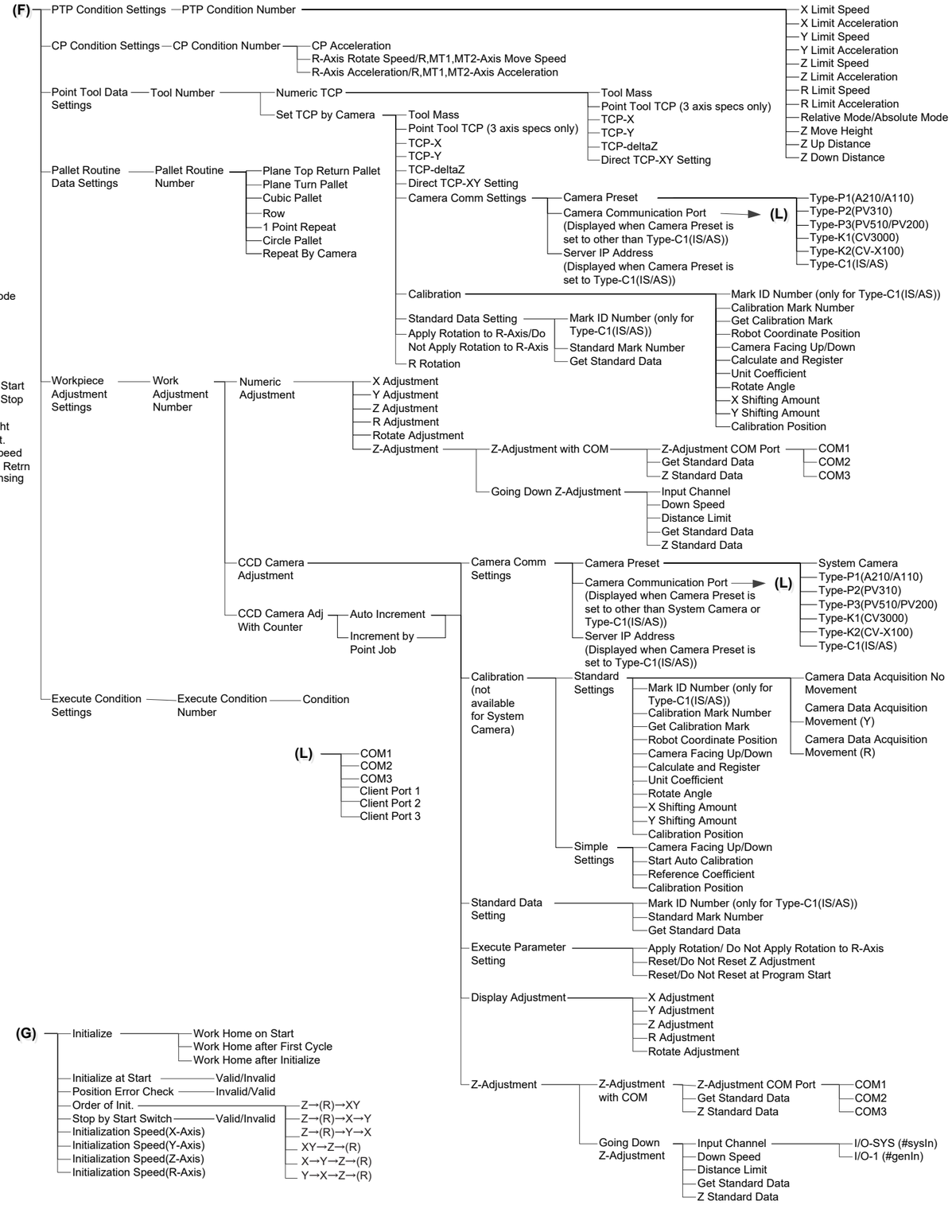
- The menu items displayed may vary depending on the model or functions of your robot.
- Items related to the R-axis are generally only displayed for 4-axis models. Some R-axis related items may be displayed for 3-axis models, however they do not function when set on a 3-axis model.
- Items that include the identifier “MT” are only displayed for models with auxiliary axis functions.

Operation Flowchart (JC-3 Dispensing Specifications) Ver. 8 1/4

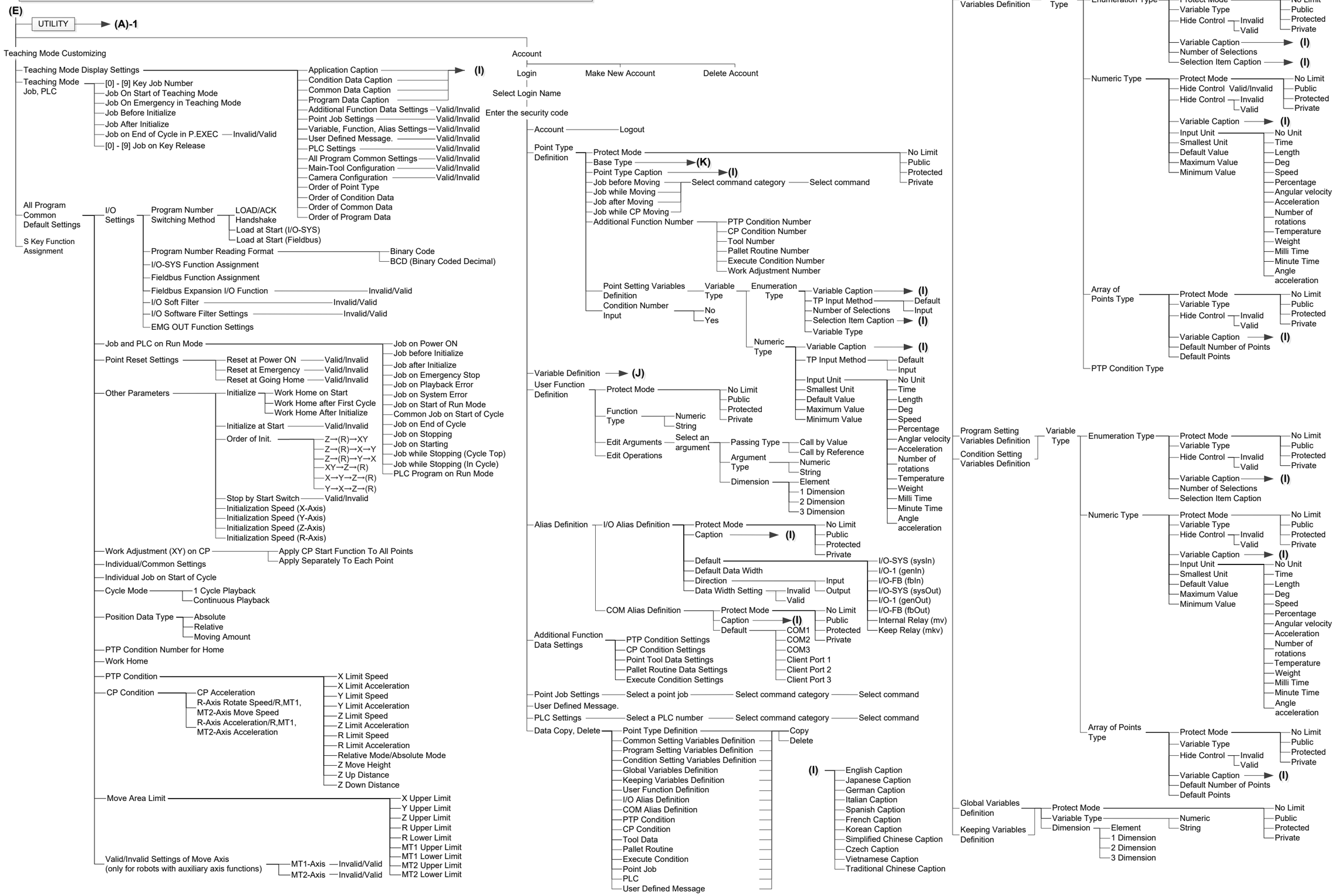


Operation Flowchart (JC-3 Dispensing Specifications) Ver. 8 2/4

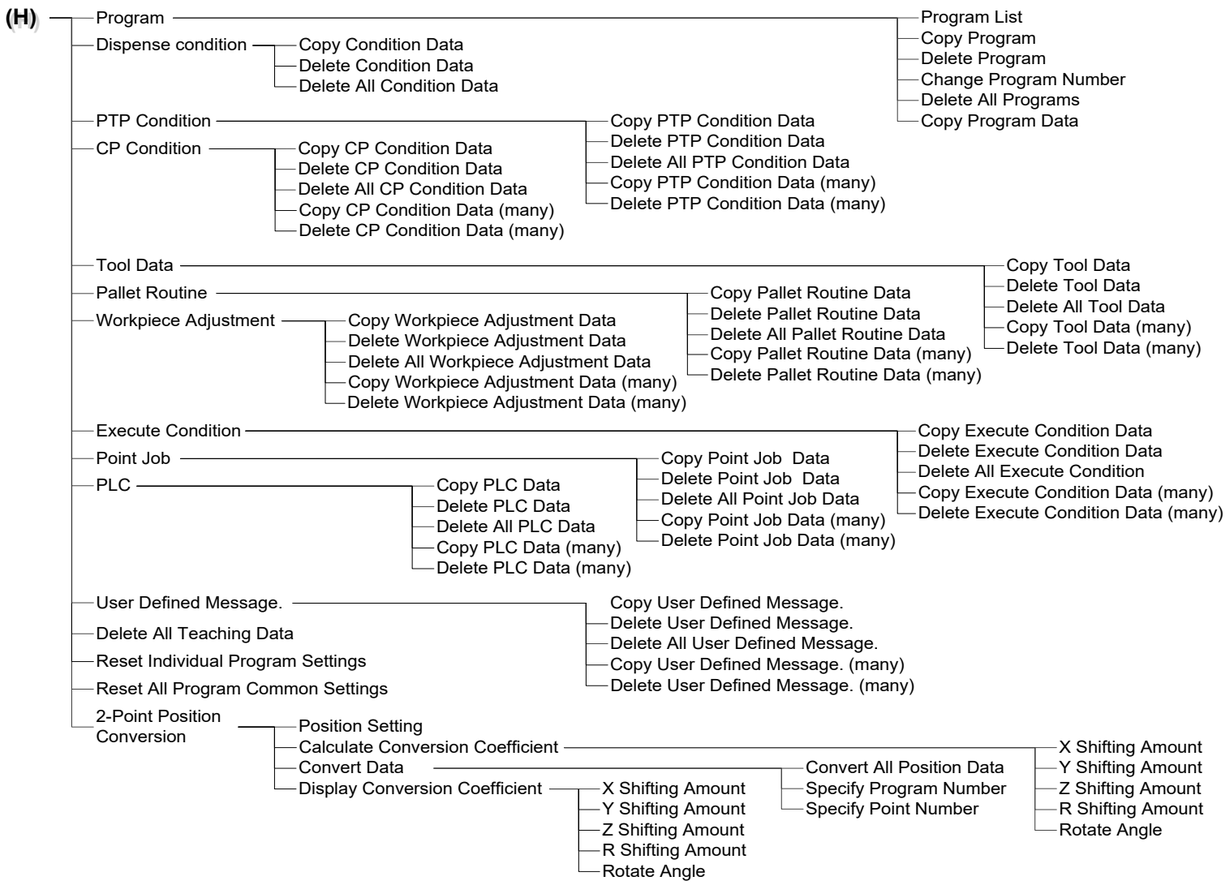


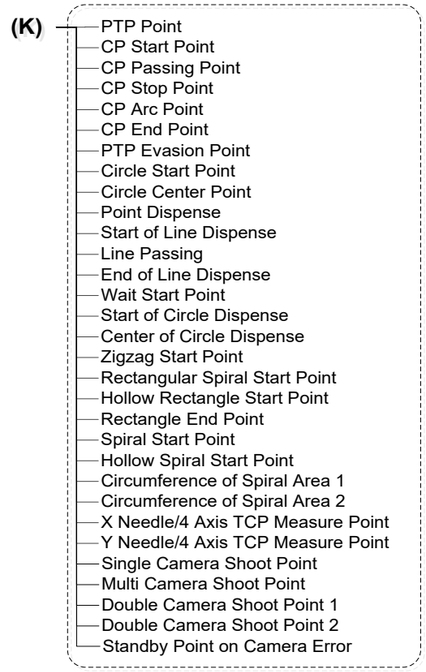


Operation Flowchart (JC-3 Dispensing Specifications) Ver. 8 3/4



Operation Flowchart (JC-3 Dispensing Specifications) Ver. 8 4/4



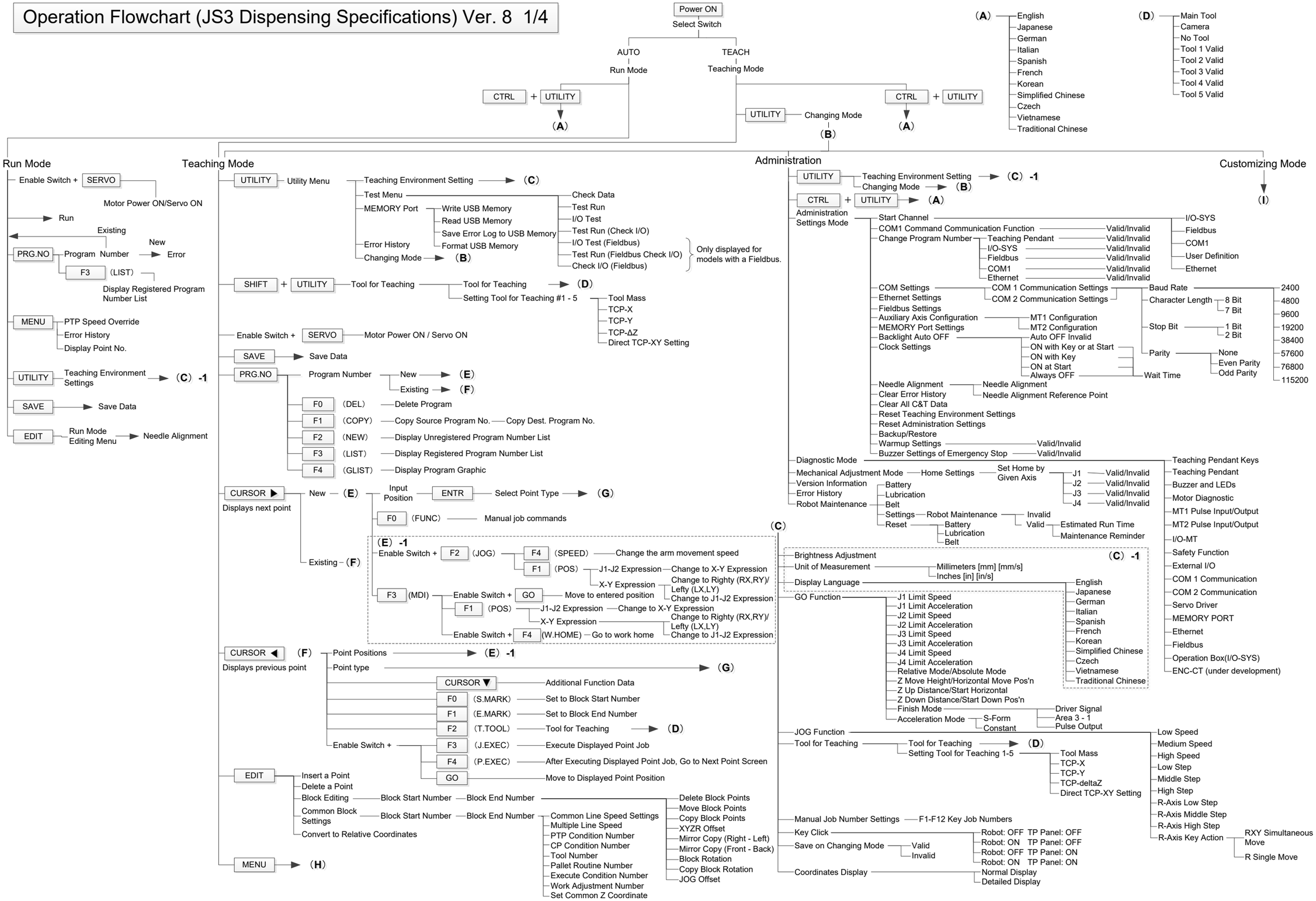


NOTE: An identifier is listed on the left and the point name is listed on the right.
However, the point name may be omitted if the identifier requires the character spacing.

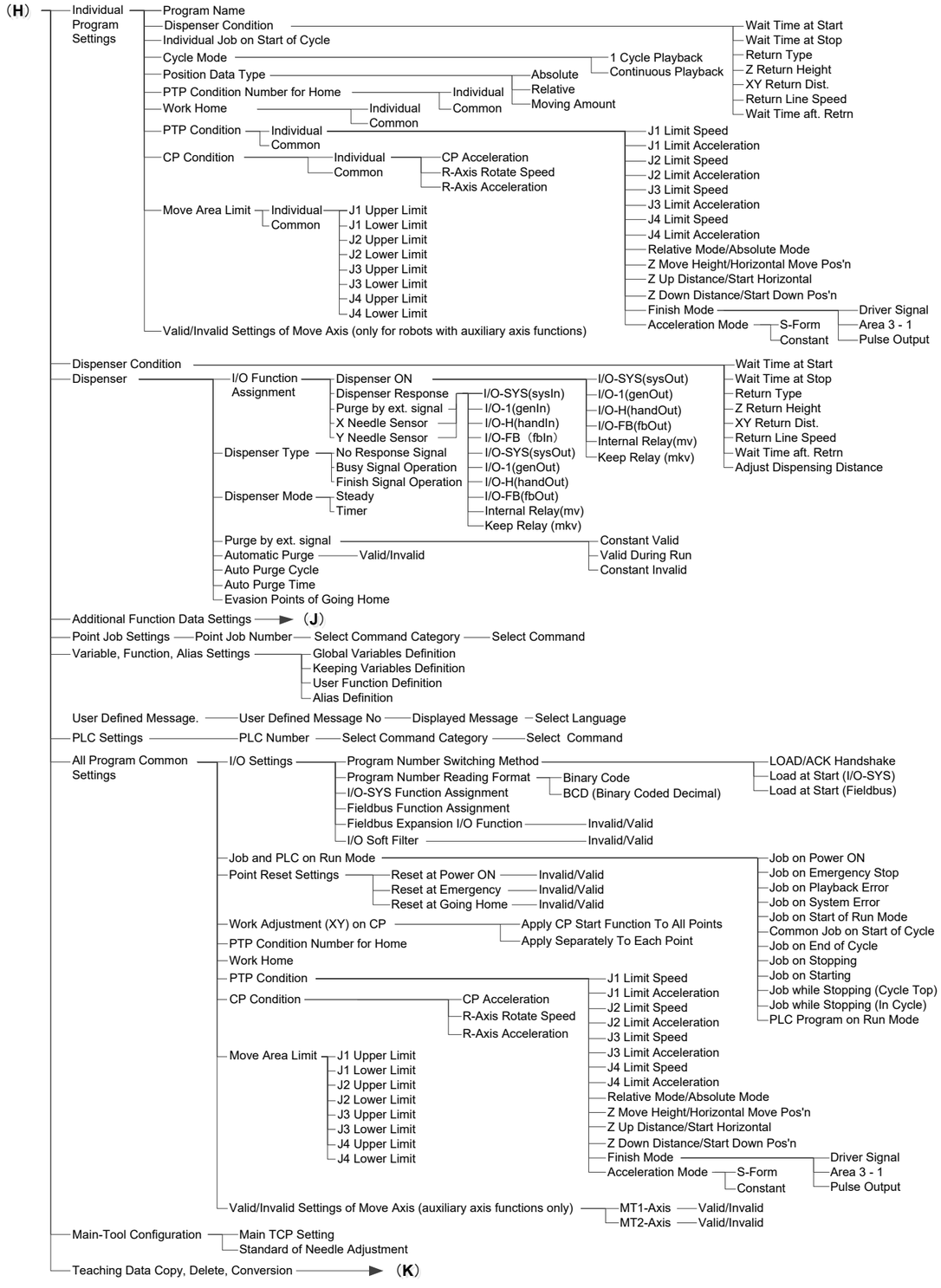
23. OPERATION FLOWCHART (JS3)

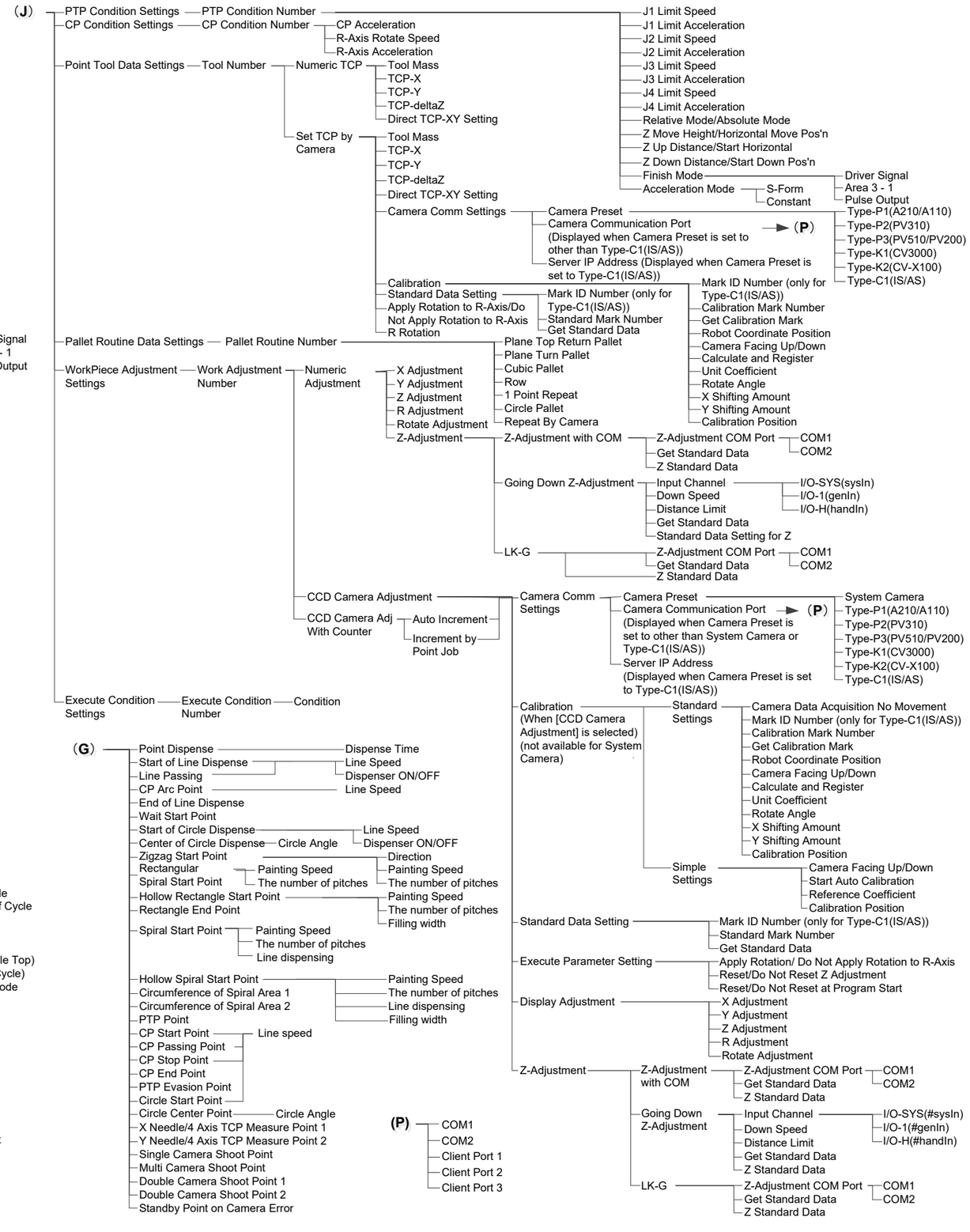
- The menu items displayed may vary depending on the model or functions of your robot.
- Items that include the identifier “MT” are only displayed for models with auxiliary axis functions.

Operation Flowchart (JS3 Dispensing Specifications) Ver. 8 1/4

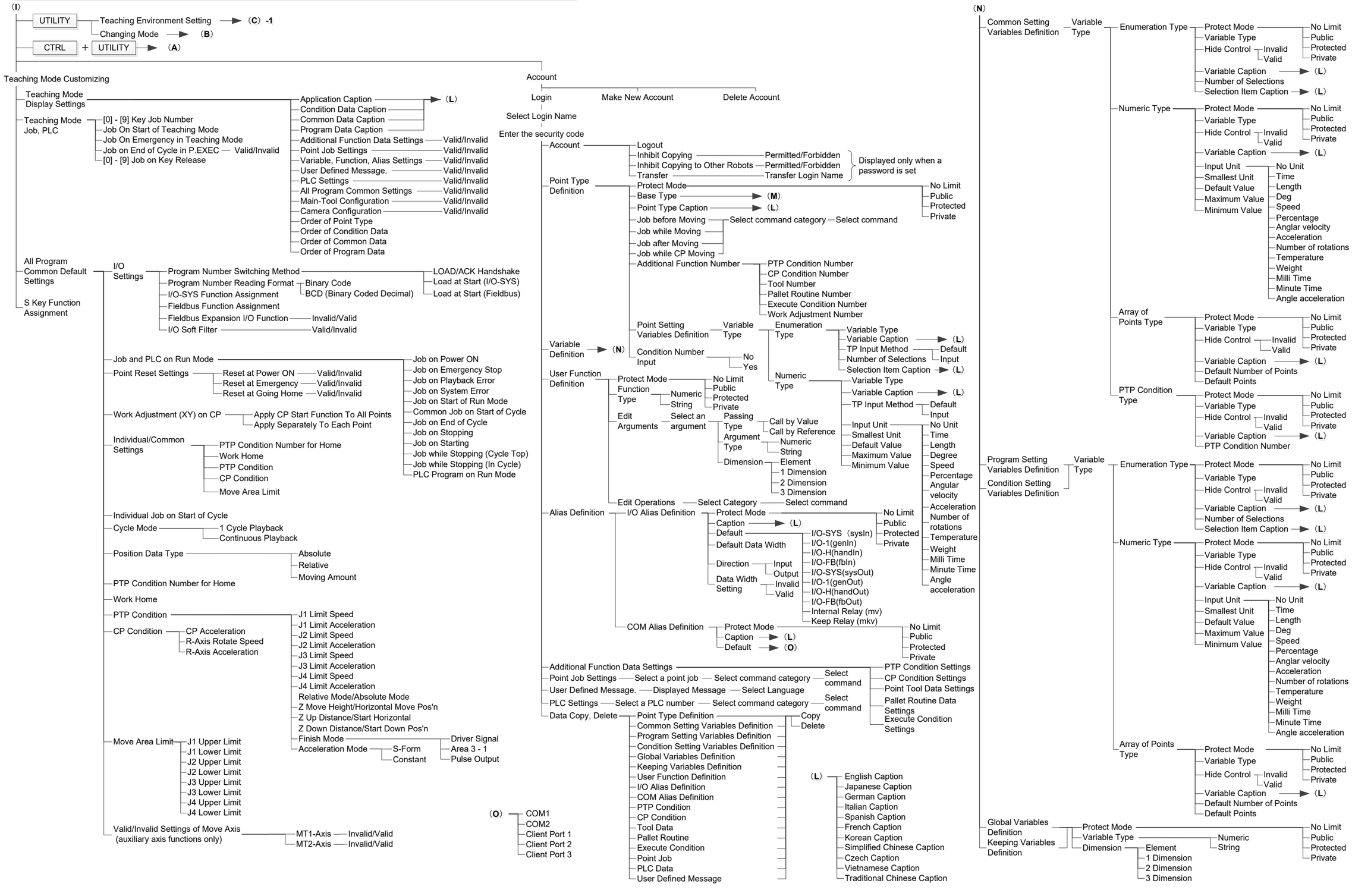


Operation Flowchart (JS3 Dispensing Specifications) Ver. 8 2/4

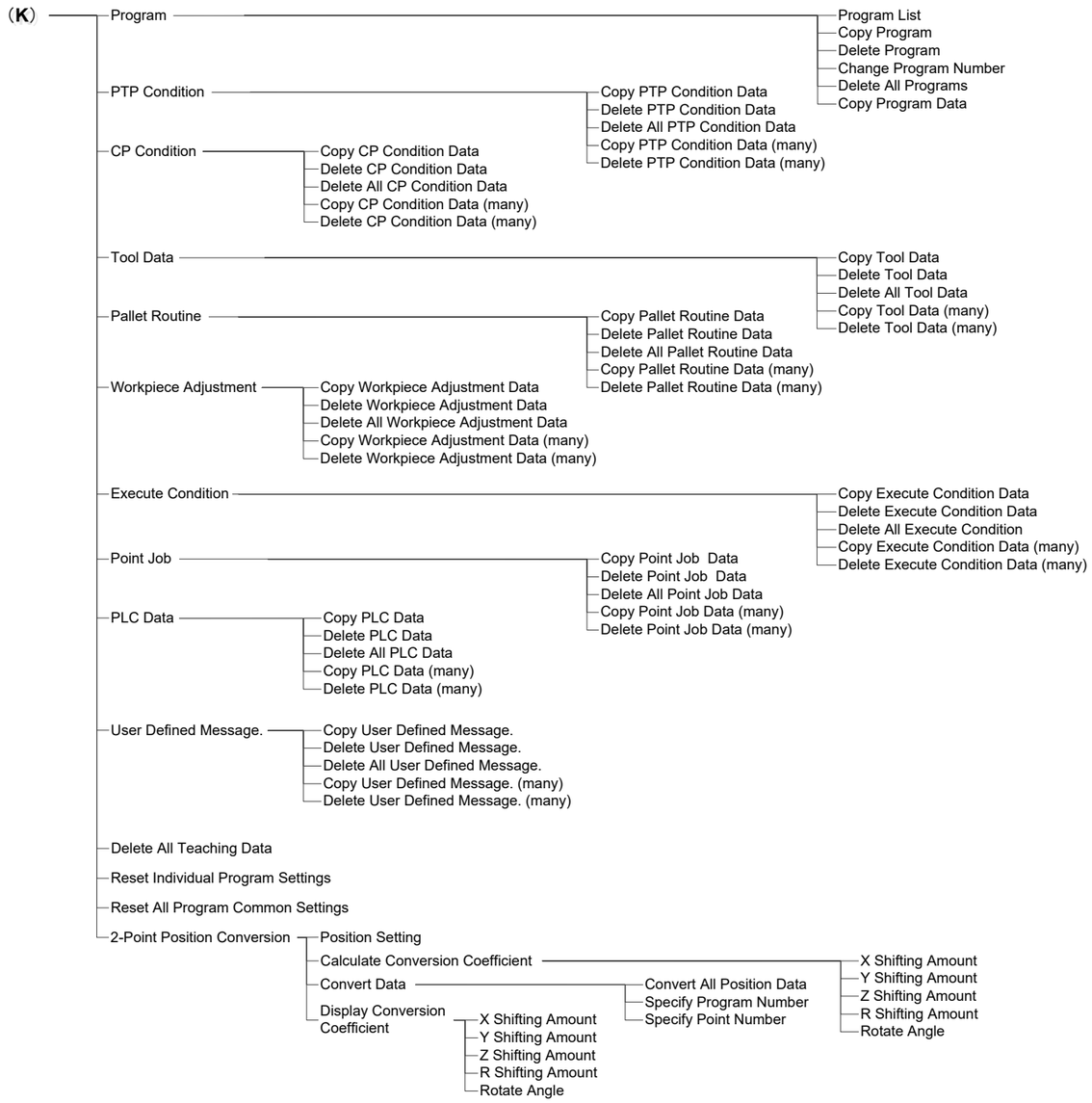


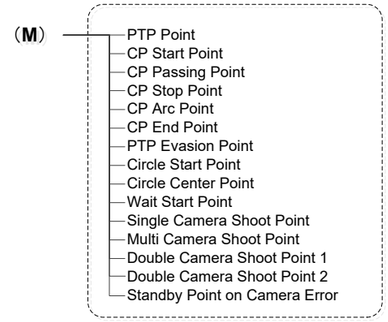


Operation Flowchart (JS3 Dispensing Specifications) Ver. 8 3/4



Operation Flowchart (JS3 Dispensing Specifications) Ver. 8 4/4





NOTE: An identifier is listed on the left and the point name is listed on the right.
However, the point name may be omitted if the identifier requires the character spacing.

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