

JANOME DESKTOP ROBOT

JR2000N Series

Operation Manual

Dispensing Specifications

Thank you for purchasing this Janome Robot.

- Before using your 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 having read this manual, store in a safe place that can be easily accessed at any time by the operator.
- This manual is written according to IEC 62079.

JANOME

PREFACE

The Janome Desktop Robot JR2000N Series are new, low-cost, high-performance robots. With these robots we succeeded in reducing the price while maintaining functionality. The combined use of stepping motors and specialized micro step driving circuits saves both energy and installation space. There are several manuals pertaining to these robots.

This manual describes dispensing specifications for the JR2000N Series. Other than this *Dispensing Specifications* operation manual, there are also operation manuals with common sections relevant to all robots in this series. Refer also to these manuals when operating this robot.

JR2000N Series

Setup	Explains how to set up the robot. ■ Make sure you read this manual ■ <u>NOTE</u> : 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 ■ <u>NOTE</u> : 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.
Quick Start	Explains the actual operation of the robot by creating and running simple programs.
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.
PC Operation	Explains how to use the PC software, JR C-Points.
Functions I	Explains point teaching.
Functions II	Explains commands, variables, and functions.
Functions III	Explains functions such as Run Mode parameters and sequencer programs.
Functions IV	Explains functions in Customizing Mode.
External Control I (I/O-SYS)	Explains I/O-SYS communication control.
External Control II (COM Communication)	Explains COM1 – COM3 communication control.
Camera/Sensor	Explains the functions of the attachable camera and Z position sensor.
Specifications	Outlines general specifications such as the robot's operating range, weight, etc.
Dispensing Specifications	This operation manual

Note: Product specifications are regularly updated; therefore the content of this manual may differ from the robot in your possession. Additionally, the menu items displayed on the TP and PC may vary from those listed in this manual.

For information regarding optional additions for this robot, refer to “15. Specifications” in the *Specifications* operation manual. Except for diagrams, details about optional additions are omitted from this manual.

Attention

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 this manual. Do not handle or operate the robot in ways not covered in this manual.

Attention

If you turn OFF the power after making changes to robot’s settings or 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.



Warning

Make sure that the **machine is grounded and do not use the machine if it is not grounded**. Make sure that the **ground resistance of the robot power supply is 100Ω or less**.

Using the machine without sufficient grounding can cause electric shock, fire, accidental operation and/or machine breakdown.



Warning

Make sure that the machine power supply is OFF before connecting the power cord.

Failure to do so could cause electric shock and/or injury.

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



Operation via the teaching pendant



Operation via PC (JR C-Points)

JANOME’S RESPONSE TO EC/EU DIRECTIVES

This robot is a semi-finished product, and includes a declaration to the EC/EU directives.

Janome implements its conformity testing through a third certification authority for each of the EMC, LVD, MD directives.

The applicable requirements of the MD and EMC Directives vary depending on the machine settings and systems. We conduct general confirmation tests through a model setup. Conduct your own final confirmation tests and risk assessments of your machine and its setup and make sure that it conforms to the MD and EMC Directives.

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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 list below for an explanation of these 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 list the nature of the danger and any necessary safety methods 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 cord
	Make sure the machine is grounded

FOR YOUR SAFETY

Danger



Do not use where flammable or corrosive gas is present.
Leaked gas accumulating around the unit can cause fire or an explosion.

Warning



Make sure that you securely install the unit in a place that can withstand both the mass of the machine and the usage conditions.

In addition, **for units with a cooling fan on the back, allow for 30cm or more clearance between the back of the unit and the wall.** If installation is inadequate, the unit may drop or fall over causing injury and/or unit breakdown.



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



Plug the power cord into the power outlet firmly.
Failure to do so may cause the plug to heat up and may result in fire.



Be sure to use the unit within its indicated voltage range.
Failure to do so may cause fire or unit malfunction.



When 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. Also, do not touch any of the power inlet pins within 5 seconds of removing the power cord. Failure to follow these steps causes electric shock or injury.

FOR YOUR SAFETY

Warning



Always make sure the unit is grounded to avoid possible electrical shocks. Do not use when the unit is not grounded.

Improper grounding may cause electric shock or fire.



Wipe the power plug with a clean, dry cloth periodically to eliminate dust.

Dust accumulation may deteriorate the electrical insulation and cause 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.



Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable.

Failure to do so may result in electric shock, fire, data loss, or unit malfunction.



Do not attempt to disassemble or modify the unit.

Disassembly or modification may cause electric shocks or unit malfunction.



Do not allow water or oil to come in contact with the unit or the power cord.

Contact with water or oil may cause electric shock, fire, or unit malfunction.

IP Protection Rating: IP30 (CE specifications : IP40)



If anything unusual occurs, such as a burning smell or unusual sound, stop operation and unplug the power cord immediately. Contact the dealer from whom you purchased the robot or the office listed on the last page of this manual.

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

FOR YOUR SAFETY

Caution



Do not drop or jar the unit during transport and/or installation.

This could cause injuries or damage the unit.



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



Use the unit in an environment between 0 and 40°C, with a humidity level of 20 – 90%, and without condensation.

Use outside of these conditions may result in unit malfunction or breakdown.

IP Protection Rating: IP30 (CE specifications: IP40)



Use the unit in an environment where no electrical noise is present.

Failure to do so may result in 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 an enclosure.

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 for the emergency stop switch. Also, for models with I/O-S circuits, regularly perform an I/O-S circuit function check.

If you perform work without making a circuit check, you or the operator will not be able to immediately and safely stop the robot in an emergency. This is potentially dangerous.

FOR YOUR SAFETY

Caution



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



When using the machine for extended periods of time, check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months. Failure to do so causes injury or breakdown.



Be sure to check the connections of the cords and cables to the main unit. Improper wiring may result in unit malfunction or breakdown.



Be sure to secure the movable parts of the unit before transportation. Failure to do so may result in 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 may cause 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.**

1. INSTALLATION

1.1 How to Mount the Dispenser (Example: 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:

Connect the dispenser unit's power cord to the outlet on the robot*¹

- No Outlet Models:

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 cutting off the power supply causes an error to occur (e.g. using a dispenser type for which it is not possible to cut off the power).

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

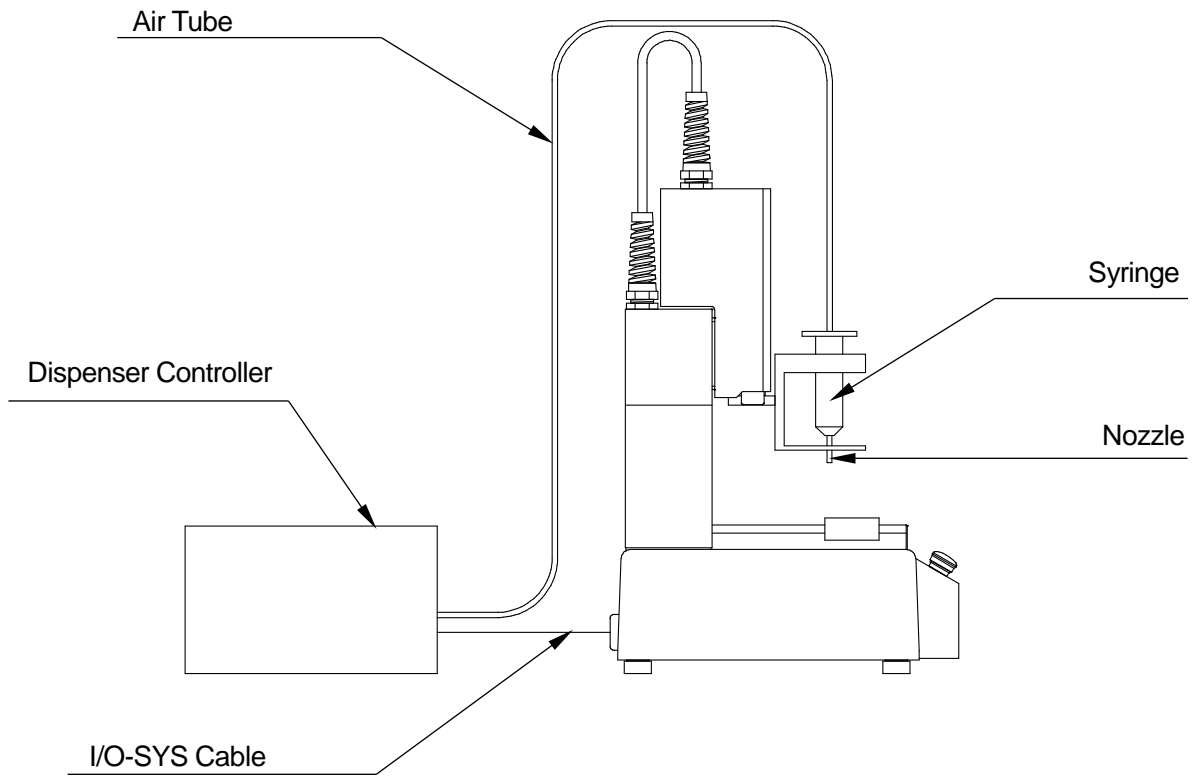
*1 Refer to the operation manual *External Control I* for details regarding the internal circuit and outlet function.

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

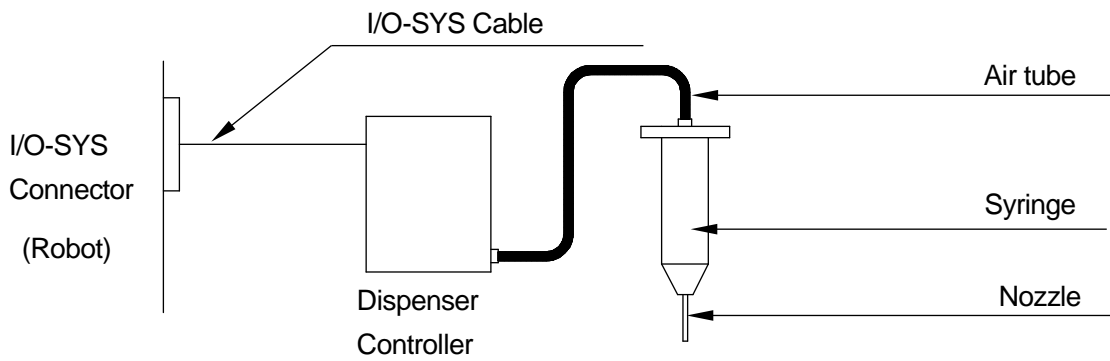
2. Mount the syringe on the Z-axis of the robot.

3. Connect the air tube to the syringe.

4. Connect the air tube to the dispenser controller.



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

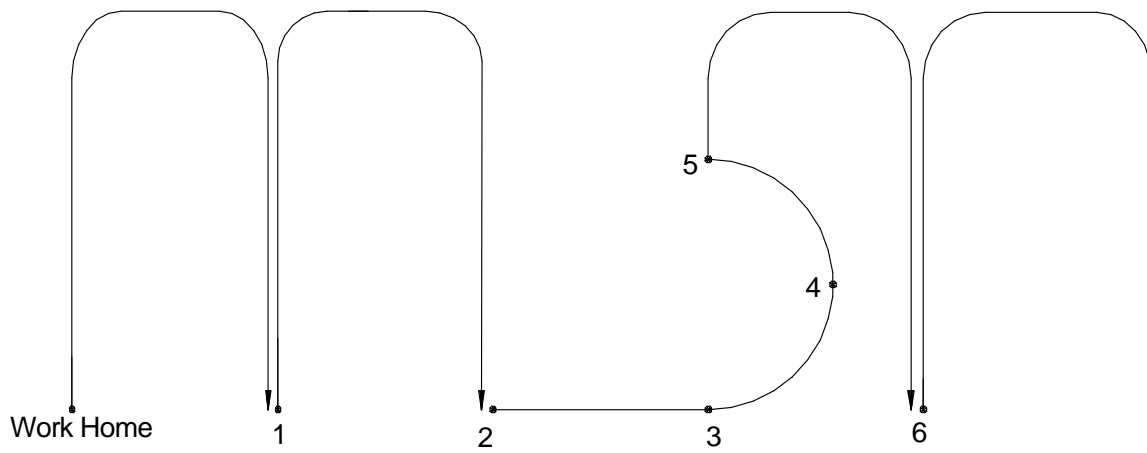


2. TEACHING DATA

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 18 point types:



1. Point Dispense

This performs point dispensing. A point dispensing time can be set for this. When point dispensing is finished, the “Type of retracting movement” as set in Dispense Conditions is performed. The robot makes a PTP movement to the next point.

2. Start of Line Dispense

Line dispensing starts from this point. The robot switches from PTP to a 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.

3. Line Passing

This point is used to change the direction or speed of the CP movement between the Start of Line Dispense and the End of Line Dispense points. You can set the dispenser ON/OFF and the line speed for this point.

4. CP Arc Point

This point is used to specify 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 "Type of retracting movement" set in Dispense Conditions once Line Dispensing (CP movement) finishes. The robot makes a PTP movement to the next point.

6. Wait Start Point

The robot waits at this position until the start button is pressed or until a start signal comes ON. The robot makes a PTP movement to the next point.

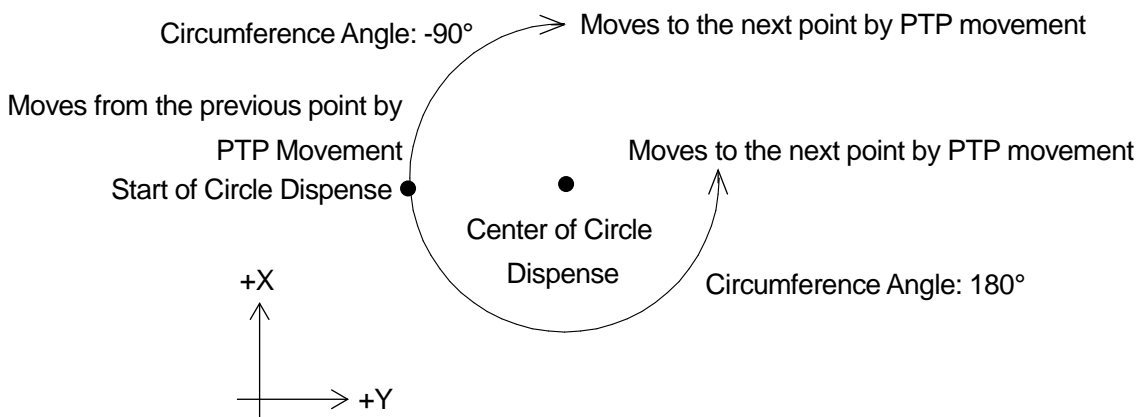
7. Start of Circle Dispense

8. Center of Circle Dispense

By moving in succession from a Start of Circle Dispense point → Center of Circle Dispense point the robot draws a circle or arc (CP movement). 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 the line speed to the Start of Circle Dispense, and a circle angle to the Center of Circle Dispense points.

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) as illustrated below. 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 moves to the circle or arc end position by CP movement. At the circle or arc end position, the robot executes the "Type of retracting movement" set in Dispense Condition.



NOTE

- If a circle or arc is drawn from the Start of Circle Dispense → Center of Circle points, the robot makes a PTP movement to the next point. If you want to move from a circle or arc by CP movement, use a CP Arc Point.
- Always teach the Start of Circle Dispense and Center of Circle Dispense points in succession. If any point other than the Center of Circle Dispense Point immediately comes after the Start of Circle Dispense point, an error will occur. In addition, because the robot makes a PTP movement from the arc to the next point, if the point following the Center of Circle Dispense point is a Line Passing point, End of Line Dispense point, or CP Arc Point, this becomes an error.

9. Circle Start Point

10. Circle Center Point

These two point types perform the same operations as the Start of Circle Dispense → Center of Circle Dispense points, except that the [Dispenser ON] signal does not change ON/OFF.

11. Zigzag Start Point

The robot zigzags and fills in the area of a rectangle specified by the [Zigzag Start Point] and [Rectangle End Point].

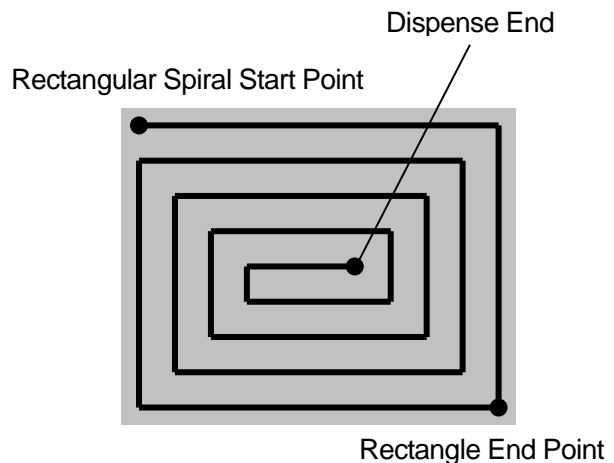
■ :Fill Area

Zigzag Start Point



12. 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.



13. 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.

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. The center of the rectangle is not filled in.

14. 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.

15. 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 dispenses in a spiral from the Spiral Start Point toward the center at the specified Painting Speed, and does so by executing line dispensing on a horizontal plane from the Spiral Start Point Z coordinates.

16. Hollow Spiral Start Point

The robot dispenses in a spiral toward the center at the specified "Painting Speed", and does so by executing line dispensing on a horizontal plane from the Hollow Spiral Start Point Z coordinates. However, line dispensing ends at the position where the robot exceeds the specified "Filling width". The center of the spiral is not filled in.

17. 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].

18. 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.

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 below indicates what items can be set to each point type.

(✓: Can be set, Blank: Cannot be set)

Point Type	Line Speed	*1Dispense Condition	*2Job Before Moving	*2Job while Moving	*2Point Job	*2Job while CP Moving	PTP Condition	CP Condition	Tool Data	Pallet Routine	Work piece Adjustment	Execute Conditions	Tag Code	Dispense Time	Dispense (ON/OFF)	Circle Angle	Direction	Painting Speed	The number of pitches	Line dispensing	Filling width
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					✓		✓				Δ	✓	✓			✓					
PTP Point		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓								
CP Start Point	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓								
CP Passing Point	✓				✓						✓	✓	✓								
CP Stop Point	✓				✓	✓		✓			✓	✓	✓								
CP End Point					✓		✓				✓	✓	✓								
PTP Evasion Point							✓			✓		✓									
Circle Start Point	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓								
Circle Center Point					✓		✓				Δ	✓	✓			✓					
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					✓		✓						✓								

Δ: When drawing an arc using Start of Circle Dispense – Center of Circle Dispense points or Circle Start Point – Circle Center Points, the “Workpiece Adjustment” set to a Start of Circle Dispense point or Circle Start Point is applied. Even if you set a “Workpiece Adjustment” to a Center of Circle Dispense or Circle Center Point it is not applied to the arc. Also, you cannot set “Workpiece Adjustment” to a Center of Circle Dispense or Circle Center Point from a PC (JR C-Points).

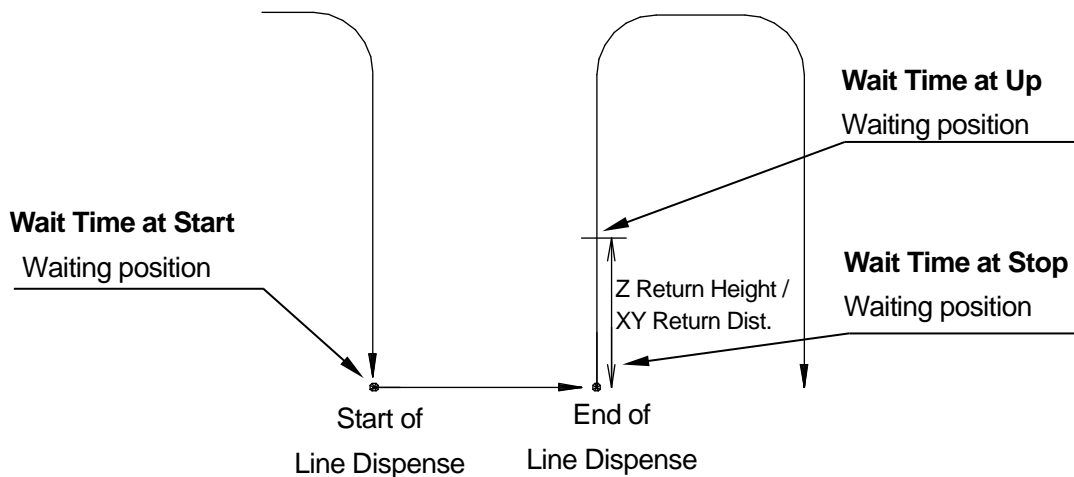
*1 This “Dispense Condition” is condition data. This is not “Dispense Condition” included in program data. For the differences between the two, refer to “2.2 Program Data (Dispense Condition).”

*2 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 Spiral Area 2”, the job/operation attached to that point type is not executed. For example, the Wait Start Point is a point where the robot waits until the start switch is pressed or until a start command is received; however, if the 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.

2.2 Program Data (Dispense Condition)

Within program data there are dispense conditions. These can be set for each program and the values set are valid only when that program is executed. The 5 dispensing conditions are as follows:



1. Wait Time at Start

This is the time the robot holds until it starts dispensing after the dispenser signal is turned ON.
(Holding point: 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.

(Holding point: Point Dispense/End of Line Dispense point/circle dispensing end position*)

3. Type of retracting movement

After dispensing ends, the Z axis is raised at the [Up 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 [Up Speed] to exactly the specified [Height Z retracting].
- 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 [Up Speed] to exactly the specified [Height Z retracting]. Thereafter, X and Y move by the exact [Distance of XY retracting] in the return direction (opposite to line dispensing).
- XYZ moving at a same time
After the end of dispensing, once the robot stands by for the prescribed [Wait Time at Stop], X and Y move by the exact [Distance of XY retracting] in the return direction while the Z axis ascends at the specified [Up Speed] to exactly the specified [Height Z retracting]. (XYZ move and rise simultaneously)

4. Height Z retracting

5. Distance of XY retracting

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]. However, with a [Point Dispense] operation, only the Z axis ascends and even if [Distance of XY retracting] is set, the robot does not move in the X and Y directions.

6. Up Speed

After the robot holds for the specified [Wait Time at Stop], the robot moves/raises each axis by the exact amount set in [Height Z retracting] / [Distance of XY retracting] at the speed specified here.

7. Wait Time at up

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 [Height Z retracting] / [Distance of XY retracting] at the speed specified in [Up Speed]).

(Hold position: (Point Dispense/End of Line Dispense point/circle dispensing end position*) + [Height Z retracting] / [Distance of XY retracting])


*Circle 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

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  [Dispenser]

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

1. I/O Function Assignment

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

- Dispenser ON: #sysOut10
- Dispenser Response: #sysIn13

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady

Dispenser Item Selection Screen

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 [Dispenser Type] is set to [No Response Signal], the robot runs in Steady Mode even if the [Dispenser Mode] is set to [Timer].

3. TEACHING OPERATION LEVEL

The teaching operation level is a setting used to simplify Teaching Mode operation and displays on the teaching pendant. You can select from between the following two levels:

- Expert Level
- Entry Level

■ How to Select the Teaching Operation Level

TP T.ENV [Teaching Operation Level]
[Expert Level]
[Entry Level]

NOTE

The Teaching Operation Level limits Teaching Mode operation if you are using the teaching pendant. It does not influence Teaching Mode operation if you are using a PC (JR C-Points). Also note that you cannot change the Teaching Operation Level settings from a PC.

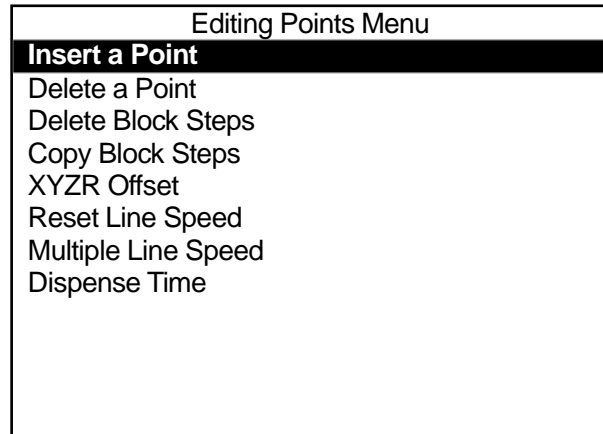
If you select Expert Level (default), you can see all the Teaching Mode menu items and use all the Teaching Mode functions.

If you select Entry Level, Teaching Mode is restricted and the displays etc., are simplified as follows:

- Only four items, “Brightness Adjustment”, “Display Language”, “Teaching Operation Level”, and “Coordinates Display” are displayed in the Teaching Environment Settings (T.ENV key).
- Only three items, “External Run Mode”, “Switch Run Mode”, and “Teaching Mode” are displayed in the changing mode menu (MODE key).
- The MONITOR key is deactivated. The Test Menu is not displayed.
- Only two items, “Program Data Settings” and “Dispense Condition” are displayed in the Teaching Mode menu. (MENU key).
- Only two items, “Dispense Condition” and “PTP Condition” are displayed on the Program Data Settings selection screen.
- Only six items, “Point Dispense”, “Start of Line Dispense”, “Line Passing”, “CP Arc Point”, “End of Line Dispense”, and “Wait Start Point” are displayed on the point type selection screen.

- If you press the **CURSOR↓** key on the point settings screen, the expanded content for the point job data and additional function data numbers are not displayed.
- Function keys other than the point run (P.EXEC) key are not displayed on the point settings screen. The keys do not function even if pushed (the J.EXEC key is disabled).
- Only 8 items: “Insert a Point”, “Delete a Point”, “Delete Block Steps”, “Copy Block Steps”, “XYZR Offset”, “Reset Line Speed”, “Multiple Line Speed”, and “Dispense Time” are displayed in the Editing Points Menu (**EDIT** key).

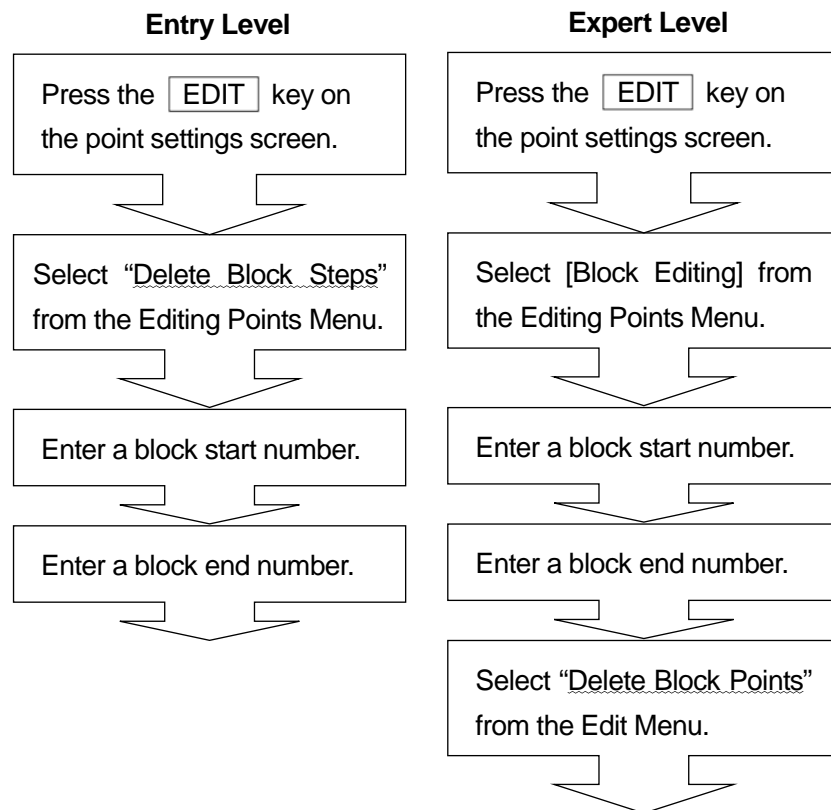
The operational methods for items included in [Block Editing] and [Block Setting Same Value] in the Expert level (Delete Block Points – Dispense Time) are as indicated below:



Editing Points Menu (Entry Level)

Example:

Delete Block Points



4. I/O FUNCTIONS

4.1 Switching I/O Types

There are two I/O types due to the different I/O-SYS function assignments: A (I/O-A) and B (I/O-B). You can switch between them.

Attention

If the I/O type is set to I/O-B, the operation mode is changeable only through I/O-SYS. You will no longer be able to switch modes via the teaching pendant.

■ How to Switch Between I/O types

TP

MODE

[Administration]

[Administration Settings Mode]

[I/O Type]

PC

You cannot switch I/O Type from a PC.

To switch from I/O type A to B, use the teaching pendant to perform the above procedure and select [I/O-B].

To switch from I/O type B to A, turn ON the robot with nothing connected to the I/O-SYS.

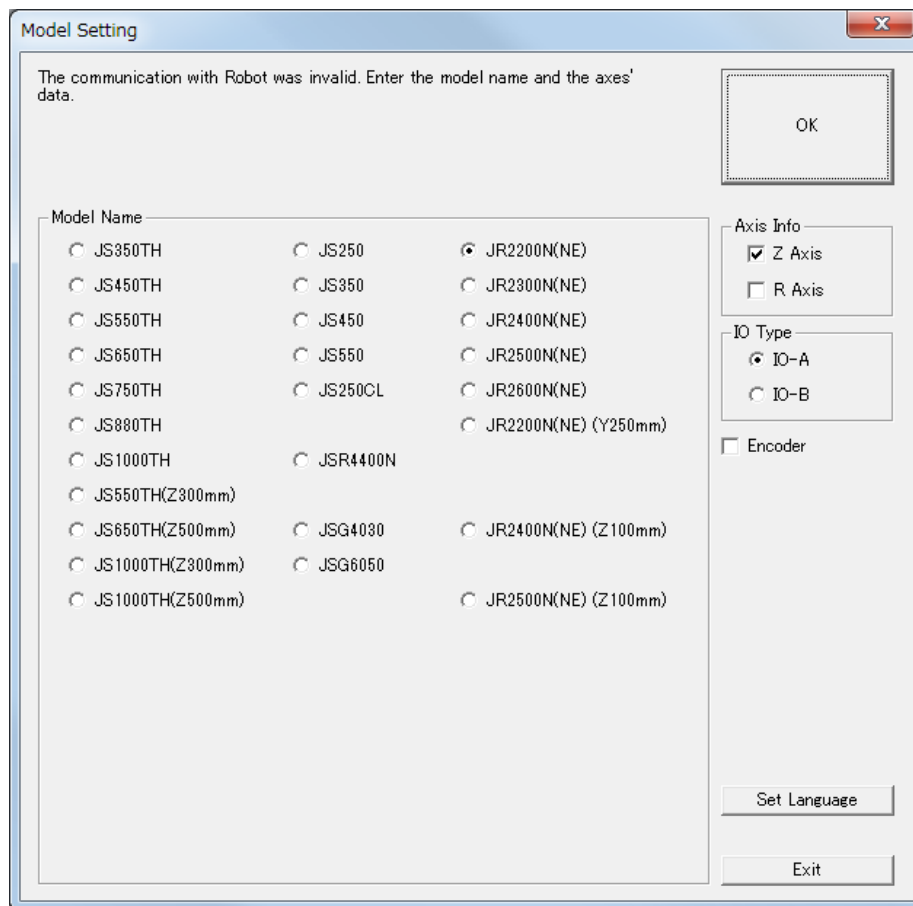
The robot starts in Administration Mode.


Once Administration Mode starts up, select [I/O-A] following the above procedure.

Administration Settings Mode	
Start Channel	I/O-SYS
Program Number Change	
COM Setting	
Back Light Auto OFF	
I/O Type	I/O-A
Clear All Data	

■ How to create I/O type B (I/O-B) C & T data when the PC cannot communicate with the robot
 Start up JR C-Points without connecting the PC to the robot. The dialog box pictured below is displayed. Select your robot's model, axis information and I/O type and then click [OK].
 (If JR C-Points is started when the PC can communicate with the robot, JR C-Points automatically reads the robot's model information etc., and creates a new C & T data file based on this.)

If robot information such as the I/O type is changed, a new C & T data file is created.
 Also, you cannot edit robot information in existing C & T data files. However, it is possible to load saved segments (Piece Data) regardless of the robot information.



 Never send C & T data with different I/O type settings to the robot.
 The robot will not be able to function correctly.

4.2 I/O-SYS Function Assignments A (I/O-A)

	Name	Function	Pin No.	Insulator Color	Spiral Mark
Input	Ext sysIn1	Start/Free	1	Black	
	sysIn2	Free/Start Inhibition/Stop-Start Inhibition/ Soft Lock/Emergency Stop	2	White	
	sysIn3	Program Number Load/Free	3	Red	
	sysIn4	Program Number 1/Free	4	Green	
	sysIn5	Program Number 2/Free	5	Yellow	
	sysIn6	Program Number 4/Free	6	Brown	
	sysIn7	Program Number 8/Free	7	Blue	
	sysIn8	Program Number 16/Free	8	Gray	
	sysIn9	Program Number 32/Free	9	Orange	
	sysIn10	Program Number 64/Free	10	Pink	
	sysIn11	Last Work/Error Reset/ Program Number 128/Free	11	Light blue	
	sysIn12	Temporary Stop/Free	12	Purple	
	Var sysIn13	Dispenser Response	13	White	Black
	Var sysIn14	Free/Start Inhibition/Stop-Start Inhibition/ Soft Lock/Emergency Stop	14	White	Red
	sysIn15	Free	15	White	Green
	sysIn16	Free	16	White	Blue
Output	Ext sysOut1	Ready for Start/Free	17	Black	White
	sysOut2	Robot Stopping/Free	18	Black	Red
	sysOut3	Program Number ACK/Free	19	Black	Green
	sysOut4	Program Number Error/Free	20	Black	Blue
	sysOut5	Running/Free	21	Red	White
	sysOut6	Error/Free	22	Red	Black
	sysOut7	Emergency Stop/Free	23	Red	Green
	sysOut8	Position Error/Free	24	Red	Blue
	sysOut9	Free	25	Green	White
	Var sysOut10	Dispenser ON/Free	26	Green	Black
	sysOut11	Free	27	Green	Red
	sysOut12	Free	28	Green	Blue
	sysOut13	Free	29	Yellow	White
	sysOut14	Free	30	Yellow	Black
	sysOut15	Free	31	Yellow	Red
	sysOut16	Free	32	Yellow	Green
	-	Not in use*	33	Yellow	Blue
Others	COM+	DC24V	34	Brown	White
	COM-	GND	35	Brown	Black
	COM-	GND	36	Brown	Red
	COM-	GND	37	Brown	Green

Ext: Activated only in External Run Mode.

Var: The arbitrary I/O function assignments can be changed. Change by selecting Teaching Mode →

key → [Dispenser] → [I/O Function Assignment].

* Do not connect wiring to pin no. 33

4.2.1 Input

- Start (#sysIn1)

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

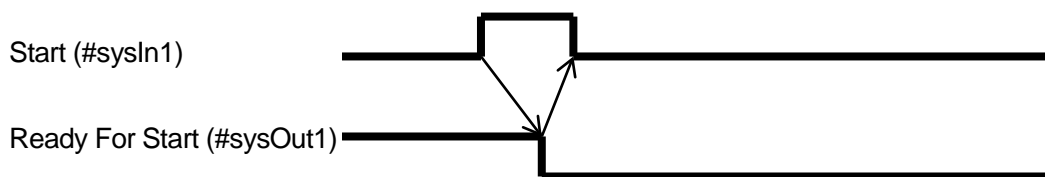
The Start (#sysIn1) signal performs mechanical initialization, starts, or restarts running programs with the robot under any of the following conditions when the I/O-S input is ON and when Start is not inhibited by the Start Inhibition (#sysIn2) signal in External Run Mode:

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 according to a point job *waitStart* command.

A Start (#sysIn1) signal with a pulse of 20msec or less is invalid due to noise elimination.

A pulse width of 30msec or wider is useable, however, rather than using time to establish the signal, we recommend to use the action of the Ready for Start (#sysIn1) 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 the “I/O-SYS Function Assignment”.

- Start Inhibition (#sysIn2)
Start is inhibited if Start Inhibit (#sysIn14) is set in "I/O-SYS Function Assignment". This signal functions when it is OFF (reverse logic).
If this signal is OFF and the Robot Stop (#sysOut2) signal is ON (when the robot is stopped), start is inhibited. Even if you try to start the robot, it will not move.
When the Robot Stopped (#sysOut2) signal is OFF (the robot is moving), this signal is invalid.
- Stop - Start Inhibition (#sysIn2)
This signal becomes a function to temporarily stop operation or inhibit start when Stop/Start Inhibition (#sysIn14) is set in "I/O-SYS Function Assignment". This signal functions when it is OFF (reverse logic).
If this signal is OFF and the Robot Stop (#sysOut2) 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 this signal OFF when the Robot Stop (#sysOut2) signal is OFF (when the robot is moving), the robot completes its current PTP movement and then holds. To restart, turn ON the start signal after turning ON this signal.
- Soft Lock (#sysIn2)
If Soft Lock (#sysIn2) is set in "I/O-SYS Function Assignment", this becomes a function to inhibit start and make emergency stops during operation. This signal functions when it is OFF (reverse logic).
If this signal is turned OFF when the Robot Stop (#sysOut2) signal is ON (the robot is stopped), then start is inhibited. Even if you try to start the robot, it will not move.
If this signal is turned OFF when the Robot Stop (#sysOut2) signal is OFF (the robot is moving), the robot makes an emergency stop.
- Stop (#sysIn2)
When Stop (#sysIn2) is set in "I/O-SYS Function Assignment", this becomes a function for making emergency stops. This signal functions when it is OFF (reverse logic).
If you turn OFF this signal in Run Mode, the robot makes an emergency stop.
- Program Number LOAD (#sysIn3)
This signal directs the loading of program numbers. When this signal goes ON, Program Number bit (#sysIn 4 to 10) is loaded. This function is enabled when [Administration Settings Mode] → [Program Number Change] → [I/O-SYS] is set to [Valid] and the Teaching Mode menu [Run Mode Parameter] → [I/O Settings] → [Program Number Switching Way] 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]:
 $67 = 64 (\text{\#sysIn10}) + 2 (\text{\#sysIn5}) + 1 (\text{\#sysIn4})$ = Turn ON signals #sysIn10, #sysIn5 and #sysIn4.
 This function is enabled when [Administration Settings Mode] → [Program Number Change] → [I/O-SYS] is set to [Valid]. If the Teaching Mode menu [Run Mode Parameter] → [I/O Settings] → [Program Number Switching Way] is set to [Loading at Start], start the program after specifying the program number with this signal.
- Last Work (#sysIn11)
 When the Teaching Mode menu [Program Data 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)
 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.
- Program Number 128 (#sysIn11)
 The highest bit number for Program Number 1 to 64 (#sysIn4 to #sysIn10) signals. When ON, this signal enables you to specify program numbers 128 and above.
- 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.

- Dispenser Response (#sysIn13)
This signal is invalid when [Dispenser Type] is set to [No Response Signal]. When set to [Busy Signal Operation], the robot is reckoned to be dispensing when this signal is ON. When set to [Finish Signal Operation] and this signal is ON, the robot is reckoned as having finished dispensing.
- Free (#sysIn14)
The default status for the sysIn14 signal is [Free]. You can use it as a free signal providing the function is not changed in "I/O-SYS Function Assignment".
The same as with the #sysIn2 signal, you can select from Free/Inhibit Start/Temporary Hold, Inhibit Start/Soft Lock and Emergency Stop for the signal function.

4.2.2 Output

- Ready for Start (#sysOut1)
In External Run Mode, when the Start (#sysIn1) signal is enabled, this signal goes ON in the following situations:
 - The robot is waiting to start mechanical initialization when the power is turned ON.
 - The robot is waiting to start moving to the work home position.
 - The robot is waiting to start running.
 - The robot is waiting to restart after a temporary stop.

When in External Run Mode and the start channel is I/O-SYS, when I/O-S input is ON and the start is not inhibited by Start Inhibit (#sysOut1), Ready for Start (#sysOut1) comes ON in the following conditions:

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. In other cases (4, 5 and 6), the robot's condition cannot be distinguished from signal alone.

When the Ready for Start (#sysOut1) signal is ON, the Robot Stopping (#sysOut2) 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 Stopping (#sysOut2) signal will be ON, but the Ready for Start (#sysOut1) signal will not go ON.

- Robot Stopping (#sysOut2)
When the robot is stopped this signal is ON, when the robot is moving, it is OFF. If you turn the Soft Lock (#sysIn2) signal OFF 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 Soft Lock (#sysIn2) signal OFF when this signal is OFF (the robot is moving), it will make an emergency 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 bit (#sysIn4 to #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 pushed, etc.) When this signal is ON, the Error (#sysOut6) signal comes ON at the same time.
- Position Error (#sysOut8)
If the Teaching Mode menu [Run Mode Parameter] → [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).

4.2.3 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 *External Control I (I/O-SYS)*.

- COM+(DC24V)
If I/O-SYS is set to [External], connect the COM+ pin to the DC24V plus pole.
If I/O-SYS is set to [Internal], DC24V (plus) is output.
- COM- (GND)
If I/O-SYS is set to [External], connect the COM- pin to the external power supply ground.
If I/O-SYS is set to [Internal], then use the pin as a common ground.



When I/O-SYS is set to [Internal] do not connect the robot to an external power supply. Doing so will cause unit malfunction and breakdown.

4.3 I/O-1 Function Assignment A (I/O-A)

	Name	Function	Pin No.	Color of Insulator	Spiral Mark
Input	genIn1	Free	1	Blue	
	genIn2	Free	2	Orange	
	genIn3	Free	3	Green	
	genIn4	Free	4	Brown	
	genIn5	Free	5	Gray	
	genIn6	Free	6	Red	
	genIn7	Free	7	Black	
	genIn8	Free	8	Yellow	
Output	genOut1	Free	9	Pink	
			10	Purple	
	genOut2	Free	11	White	
			12	Blue	Red
	genOut3	Free	13	Orange	White
			14	Green	White
	genOut4	Free	15	Brown	White
			16	Grey	White
	genOut5	Free	17	Red	White
	genOut6	Free	18	Black	White
	genOut7	Free	19	Yellow	Black
	genOut8	Free	20	Pink	Black
Others	COM+	DC24V	21	Purple	White
	COM+	DC24V	22	White	Blue
	COM-	GND	23	Blue	Red
	COM-	GND	24	Orange	White

4.4 I/O-SYS Function Assignment B (I/O-B)

	Name	Function	Pin No.	Insulator Color	Spiral Mark
Input	Auto sysIn1	Start	1	Black	
	sysIn2	Free/Start Inhibition/Stop-Start Inhibition/Soft Lock/Emergency Stop	2	White	
	sysIn3	Program Number LOAD	3	Red	
	sysIn4	Program Number 1/Free	4	Green	
	sysIn5	Program Number 2/Free	5	Yellow	
	sysIn6	Program Number 4/Free	6	Brown	
	sysIn7	Program Number 8/Free	7	Blue	
	sysIn8	Program Number 16/Free	8	Gray	
	sysIn9	Program Number 32/Free	9	Orange	
	sysIn10	Program Number 64 Temporary Stop/ Last Work/Free	10	Pink	
	sysIn11	Program Number 128/Free	11	Light blue	
	sysIn12	Initialize	12	Purple	
	sysIn13	Error Reset	13	White	Black
	sysIn14	Mode 1	14	White	Red
	sysIn15	Mode 2	15	White	Green
	sysIn16	Free/Start Inhibition/Stop-Start Inhibition/Soft Lock/Emergency Stop	16	White	Blue
Output	Auto sysOut1	Ready for Start/Free	17	Black	White
	sysOut2	Robot Stopping/Free	18	Black	Red
	sysOut3	Program Number ACK/Free	19	Black	Green
	sysOut4	Program Number Error/Free	20	Black	Blue
	sysOut5	Running/Free	21	Red	White
	sysOut6	Error/Free	22	Red	Black
	sysOut7	Emergency Stop/Free	23	Red	Green
	sysOut8	Free	24	Red	Blue
	sysOut9	Error Number 1	25	Green	White
	sysOut10	Error Number 2	26	Green	Black
	sysOut11	Error Number 4	27	Green	Red
	sysOut12	Error Number 8	28	Green	Blue
	sysOut13	Home	29	Yellow	White
	sysOut14	Teaching Mode	30	Yellow	Black
	sysOut15	Semi-Auto Mode	31	Yellow	Red
	sysOut16	Auto Mode	32	Yellow	Green
Others	-	No Connection*	33	Yellow	Blue
	COM+	DC24V	34	Brown	White
	COM-	GND	35	Brown	Black
	COM-	GND	36	Brown	Red
	COM-	GND	37	Brown	Green

Auto: Functions only in Auto Mode.

* Do not connect wiring to pin no. 33

The following signals are unique to I/O Type B (I/O-B):

(For other input/output signals, refer to the I/O type A (I/O-A) signals with the same names)

4.4.1 Input

- Initialize (#sysIn12)

This signal conducts mechanical initialization (returns to the home position).

It is valid in Auto Mode when the power is turned ON, when emergency stop is released, when the robot is waiting for a start signal, when it has been stopped temporarily, or when it is standing by after a run error.

- Mode 1, 2 (#sysIn14, #sysIn15)

The following table shows how to switch among the modes using the sysIn14 and sysIn15 signals:

sysIn14	sysIn15	Mode
ON	ON	Auto Mode
OFF	ON	Semi-Auto Mode
ON	OFF	Manual Mode
OFF	OFF	Administration

- Auto Mode
Run programs in this mode. (Send the start signal from I/O-SYS or COM1 to start running.)
- Semi-Auto Mode
Run programs in this mode. (Press the start switch to start running.)
- Manual Mode
Create programs in this mode.
- Administration
Perform maintenance or administrative settings in this mode.
Administration mode includes Customizing Mode. Data used to make up parts of programs is created in Customizing Mode.
When the teaching pendant is connected to the robot, the LED on the teaching pendant lights up according to the current mode.
 - E.RUN: External Running (Auto Mode)
 - RUN: Running (Semi-Auto Mode)
 - TEACH: Teaching (Manual Mode)
 - CUSTOM: Customizing (Customizing Mode)
 - ADMIN: Administration (Administration)

NOTE

The terms Auto Mode, Semi-Auto Mode, and Manual Mode are used only for the I/O-B specifications. In the operation manuals, they are referred to as the following:

- Auto Mode → External Run Mode
- Semi-Auto Mode → Switch Run Mode
- Manual Mode → Teaching Mode

4.4.2 Output

- Error No. 1 – 8 (#sysOut9 – #sysOut12)

Listed in the table below are the error numbers that are displayed by cause when a run error occurs (the sysOut6 Error signal is ON). Note that these error numbers differ from those displayed on the LED display.

No.	Error Message
1	Program is Empty.
2	Point Type Error
3	Position is out of range.
4	Point Job Command Error
5	CP Speed Over
6	–
7	Hardware Error (A Board)
8	Camera Data Error/Take Z Adjustment Data Error
9	Motor Power Supply Error
10	Initialization Error
11	–
12	Emergency Stop
13	Teaching Data Error (Incorrect Use/Incorrect Data Version)
14	Logical Error (Software Error)
15	N/A

- Home (sysOut13)

This signal is ON while the robot is at the work home position in the Semi-Auto Mode or Auto Mode. It turns OFF when a run starts. It turns ON when the robot returns to the work home position after one cycle. If the cycle is not completed successfully and the robot does not return to the work home position, this signal will not turn ON.

- Teaching Mode (sysOut14)

This signal is ON when in Manual Mode.

When in Manual Mode, this signal is also ON when the robot is waiting for mechanical initialization after being turned ON, when waiting for an emergency stop release, as well as when performing a test run or a point run.

It is OFF when in Semi-Auto or Auto Modes. This signal indicates the mode status and not whether the robot is moving or not.

- Semi-Auto Mode (sysOut15)

This signal is ON when in Semi-Auto Mode.

This signal is also ON when the robot is waiting for mechanical initialization after being turned ON, or when waiting for an emergency stop release.

It is OFF when in Manual and Auto Modes. This signal indicates the mode status and not whether the robot is moving or not.

- Auto Mode (sysOut16)

This signal is ON when in Auto Mode.

This signal is also ON when the robot is waiting for mechanical initialization after being turned ON, or when waiting for an emergency stop release.

It is OFF when in Manual or Semi-Auto Modes. This signal indicates the mode status and not whether the robot is moving or not.

4.5 I/O-1 Function Assignment B (I/O-B)

	Name	Function	Pin No.	Insulator Color	Spiral Mark
Input	Var genIn1	Dispenser Response	1	Blue	
	genIn2	Free	2	Orange	
	genIn3	Free	3	Green	
	genIn4	Free	4	Brown	
	genIn5	Free	5	Grey	
	genIn6	Free	6	Red	
	genIn7	Free	7	Black	
	genIn8	Free	8	Yellow	
Output	genOut1	Free	9	Pink	
			10	Purple	
	genOut2	Free	11	White	
			12	Blue	Red
	genOut3	Free	13	Orange	White
			14	Green	White
	genOut4	Free	15	Brown	White
			16	Grey	White
	Var genOut5	Dispenser ON	17	Red	White
	genOut6	Free	18	Black	White
genOut7	Free	19	Yellow	Black	
genOut8	Free	20	Pink	Black	
Others	COM+	DC24V	21	Purple	White
	COM+	DC24V	22	White	Blue
	COM-	GND	23	Blue	Red
	COM-	GND	24	Orange	White

Var: You can change the signal in use via [I/O Function Assignment].

4.5.1 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 is reckoned to be dispensing when this signal is ON. When set to [Finish Signal Operation] and this signal is ON, the robot is reckoned as having finished dispensing.

4.5.2 Output

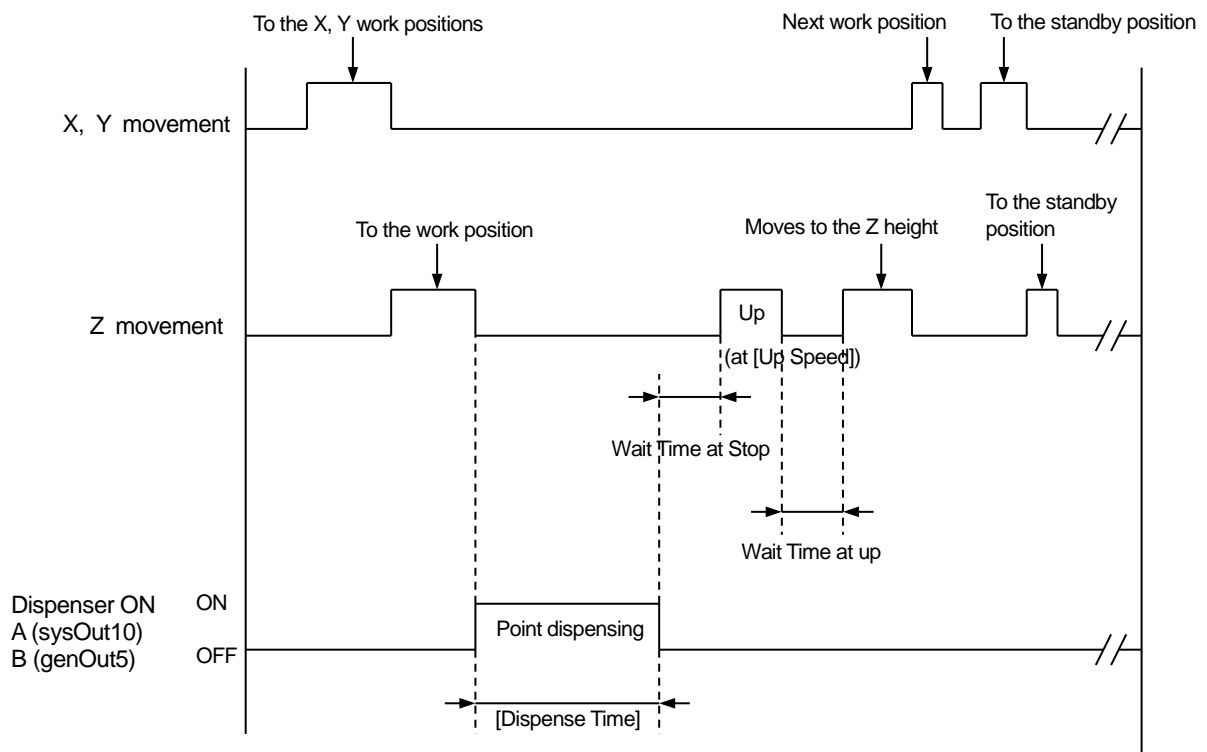
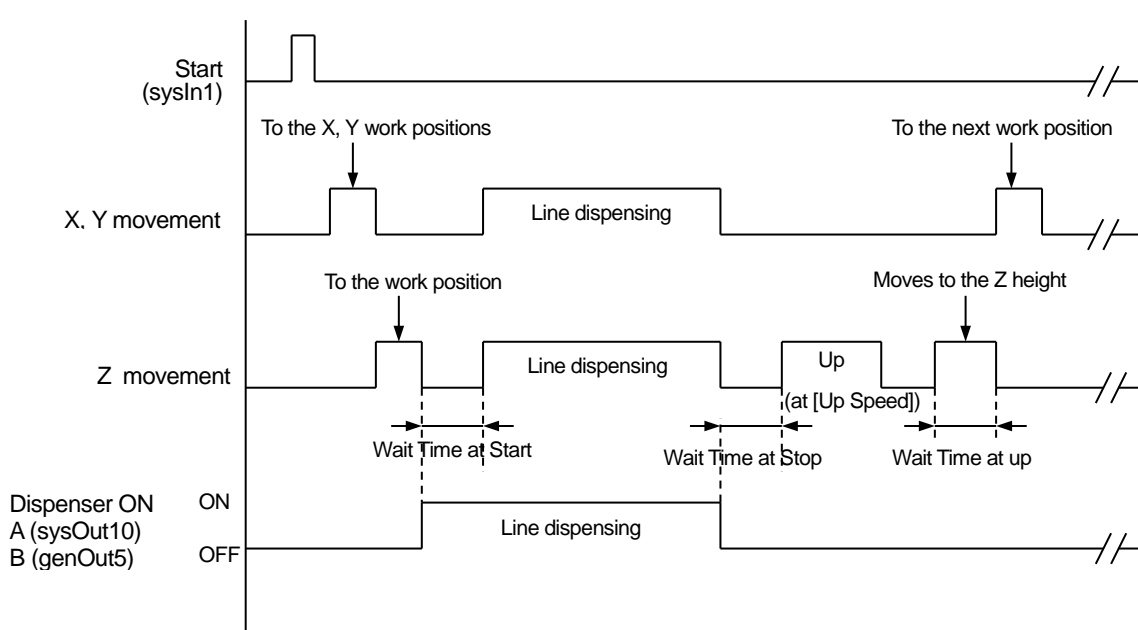
- Dispenser ON (#genOut5)

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

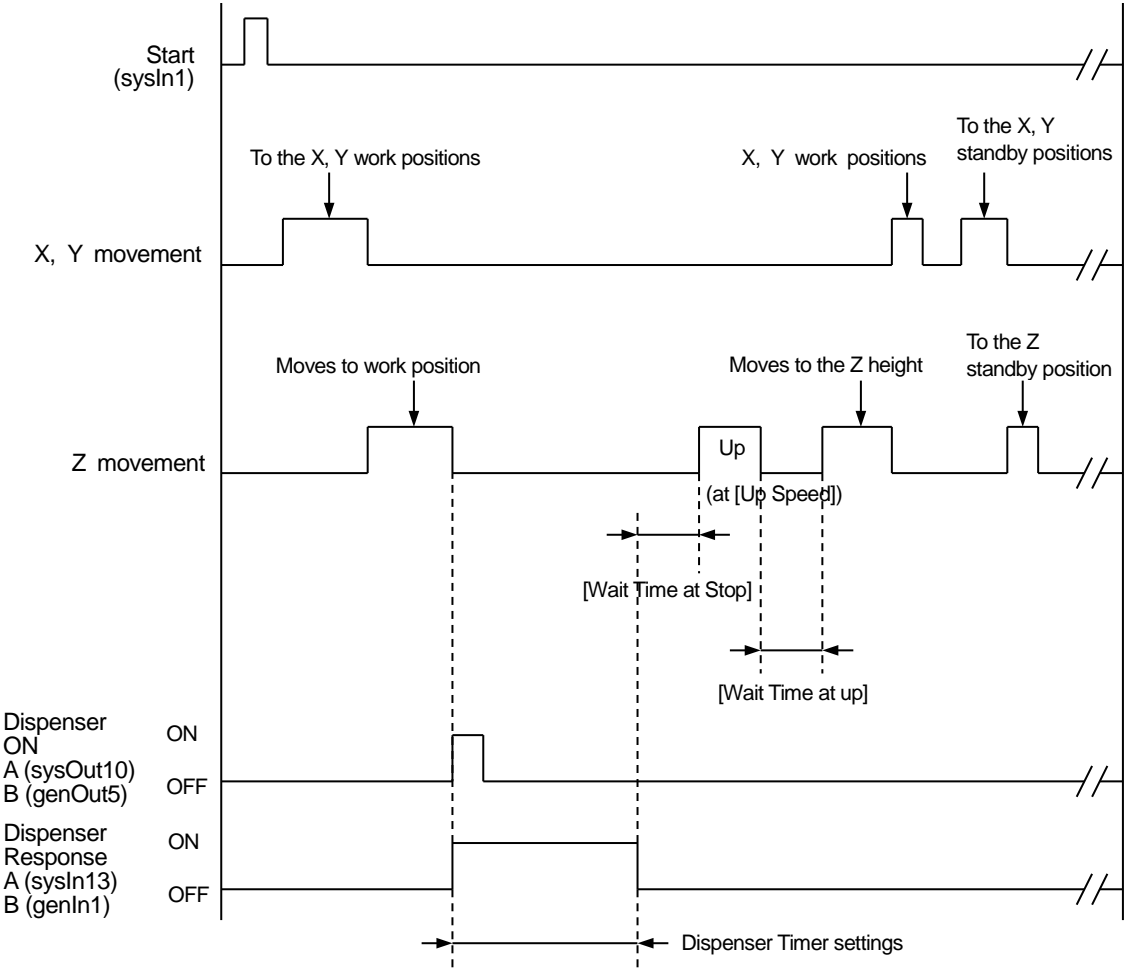
However, point dispensing when [Dispenser Type] is set to [Busy Signal Operation], is the only exception. For further details refer to “5. Timing Charts”.

5. TIMING CHARTS

5.1 Dispenser Type: No Response Signal Operations (Line Dispensing, Point Dispensing, Steady Mode)



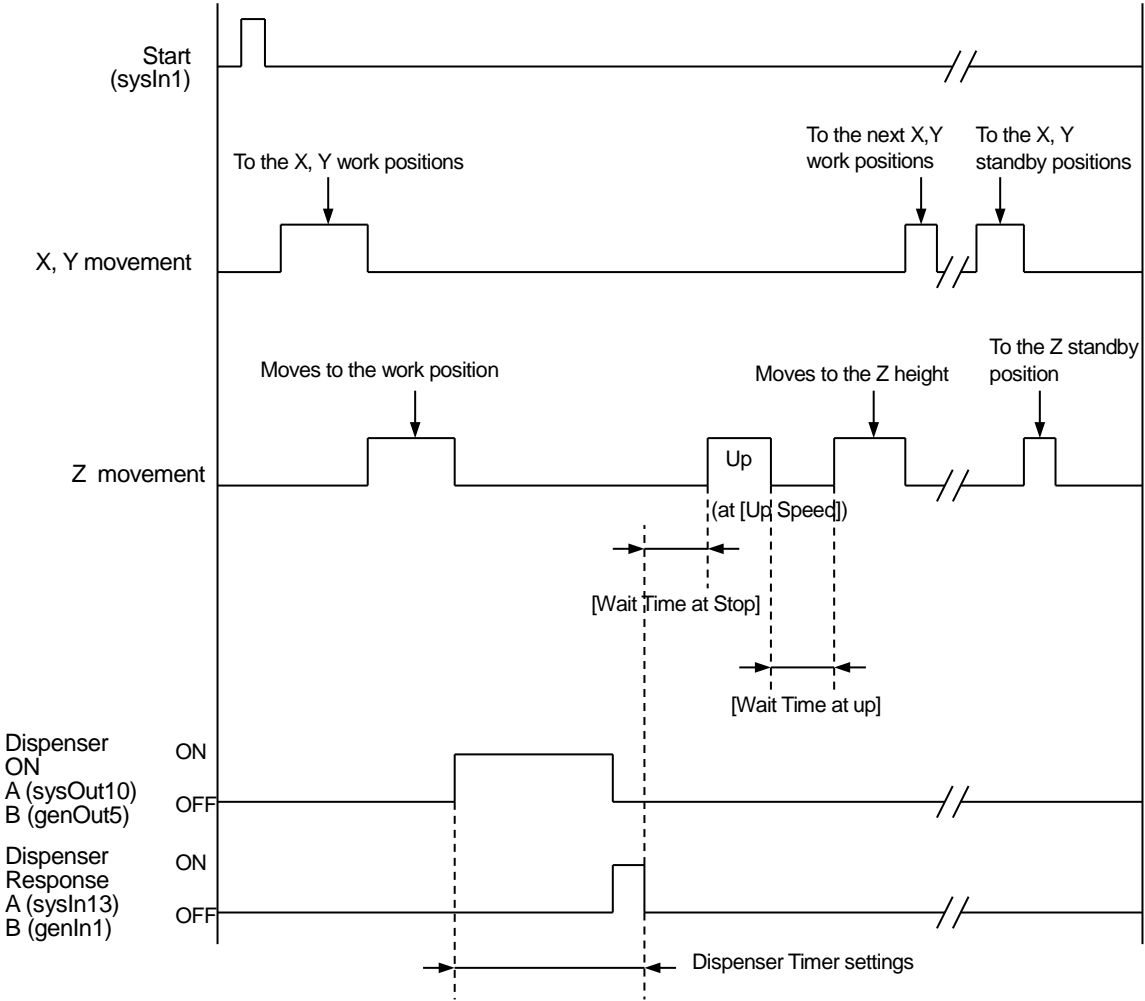
5.2 Dispenser Type: Busy Signal Operations (Timer Mode, Point Dispense)



The robot turns ON the [Dispenser ON] signal (I/O-A: sysOut10, I/O-B: genOut5) and waits until the [Dispenser Response] (I/O-A: sysIn13, I/O-B: genIn1) (Busy Signal Operation) comes ON. If the robot waits for 0.5 seconds and the Dispenser Response signal (I/O-A: sysIn13, I/O-B: genIn1) has not come ON, the robot determines that the dispenser is damaged or not connected to the robot causing an error and stopping the robot. If this happens, the Dispenser Error signal comes ON.

When the [Dispenser Response] (I/O-A: sysIn13, I/O-B: genIn1) comes ON, the robot determines that dispensing has started and turns OFF the [Dispenser ON] signal (I/O-A: sysOut10, I/O-B: genOut5). Afterward, the robot waits until the Dispenser Response signal (I/O-A: sysIn13, I/O-B: genIn1) goes OFF, and when it does so, the robot determines that dispensing is complete and moves to the next operation.

5.3 Dispenser Type: Finish Signal Operations (Timer Mode, Point dispense)



The robot turns ON the Dispenser ON signal (I/O-A: sysOut10, I/O-B: genOut5) and waits for the Dispenser Response pulse (I/O-A: sysIn13, I/O-B: genIn1) (Finish Signal Operation) to come. When the Dispenser Response signal (I/O-A: sysIn13, I/O-B: genIn1) is turned ON, the Dispenser ON signal (I/O-A: sysOut10, I/O-B: genOut5) turns OFF. After that if the Dispenser Response signal (I/O-A: sysIn13, I/O-B: genIn1) turns OFF, the robot determines that dispensing is finished and moves to the next operation.


6. POINT DISPENSE

For Point Dispense, the robot stops for the preset point dispensing time at the point position and turns ON the dispenser. To perform 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 submenu. 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.

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

Select Point Type	1/2
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	
PTP Point	
CP Start Point	
CP Passing Point	
CP Stop Point	

Point Type Selection Screen

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 by the dispenser timer.

- After dispensing, the robot moves according to the [Wait Time at Stop], [Type of retracting movement], [Height Z retracting], [Distance of XY retracting], [Up Speed], and [Wait Time at up] settings in program data/dispensing conditions, however, even if [Distance of XY retracting] is set to a Point Dispense point, the XY axes do not make a retracting movement.

7. LINE DISPENSE

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.

7.1 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].

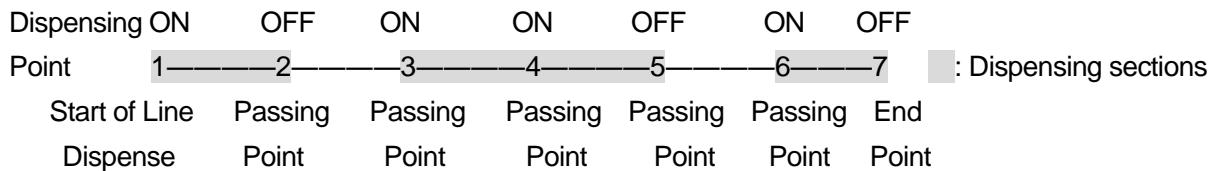
When you select [Start of Line Dispense], the entry screen for the line speed appears. Enter the line speed you want.

Select Point Type	1/2
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	
PTP Point	
CP Start Point	
CP Passing Point	
CP Stop Point	

Point Type Selection Screen

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

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

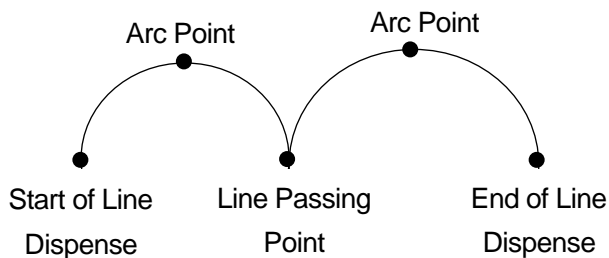
- At the Start of Line Dispense point, the robot holds according to the [Wait Time at Start] settings in the dispensing conditions of the program data. [Wait Time at Start] is only valid for the Start of Line Dispense and the Start of Circle Dispense points.
- For an End of Line Dispense point, the robot operates according to the [Wait Time at Stop], [Height Z retracting], [Distance of XY retracting], [Up Speed], and [Wait Time at up] settings in the dispensing condition of the program data.
- 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.

7.2 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]. An arc drawn from passing through these three points

By registering [Line Passing] instead of [End of Line Dispense], you can continue to draw arcs.

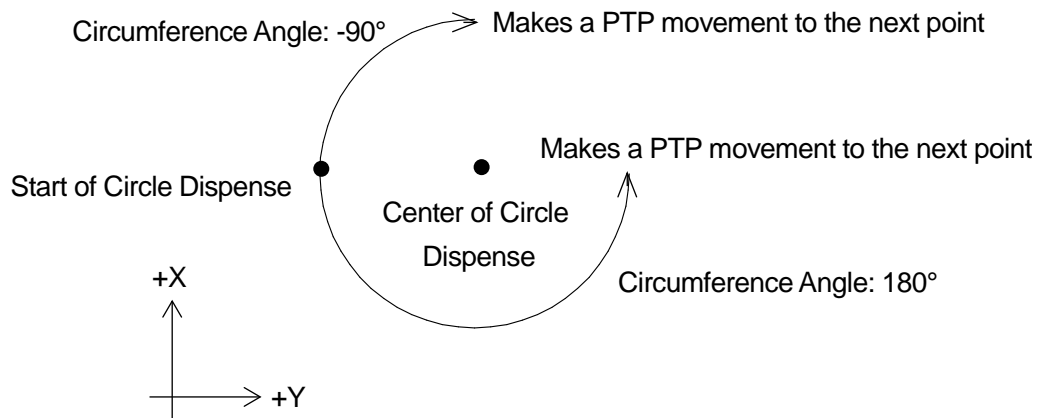


You can also draw an arc in line dispensing if you register the points [Start of Circle Dispense] → [Center of Circle Dispense] consecutively. However, the robot will make a PTP movement to the next point. If you want to continue line dispensing after drawing an arc, or move the robot by CP movement, 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 end position of the circle, or arc.



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

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

In order to set point types other than the ones shown above, 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.

8. DISPENSE FILLING

8.1 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 dispenses and 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.

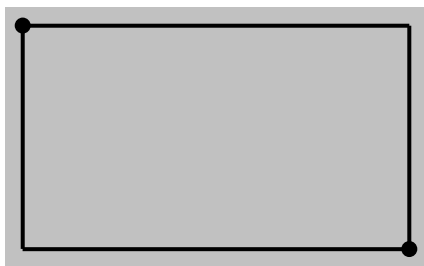
Specify the area that you want to fill in by registering the two points: [Zigzag Start Point] and [Rectangle End Point], or [Rectangular Spiral Start Point] and [Rectangle End Point]. If you want to use a donut shape pattern with an empty center, specify the area you want to fill in with the two points: [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	2/2
CP End Point	
PTP Evasion Point	
Circle Start Point	
Circle Center Point	
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	

Zigzag Start Point /

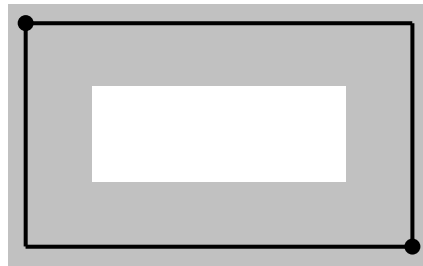
Rectangular Spiral Start Point



Rectangle End Point

 : Filling Area

Hollow Rectangle Start Point



Rectangle End Point

■ Zigzag Start Point – Rectangle End Point

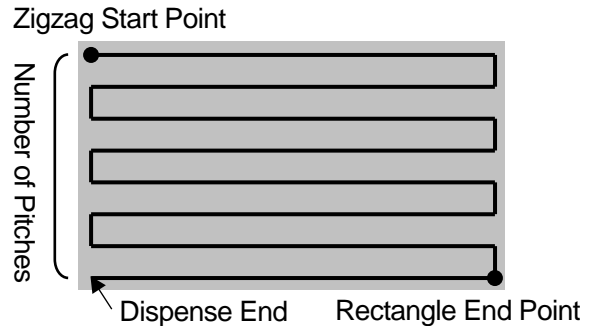
Specify the “Direction”, the “Painting Speed” and “The Number of Pitches” at the [Zigzag Start Point].

• 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.



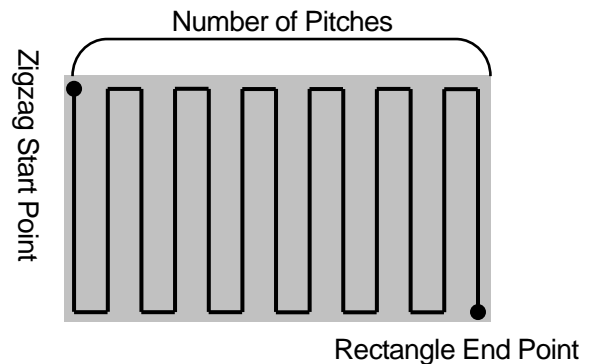
• Direction: X Direction

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”.

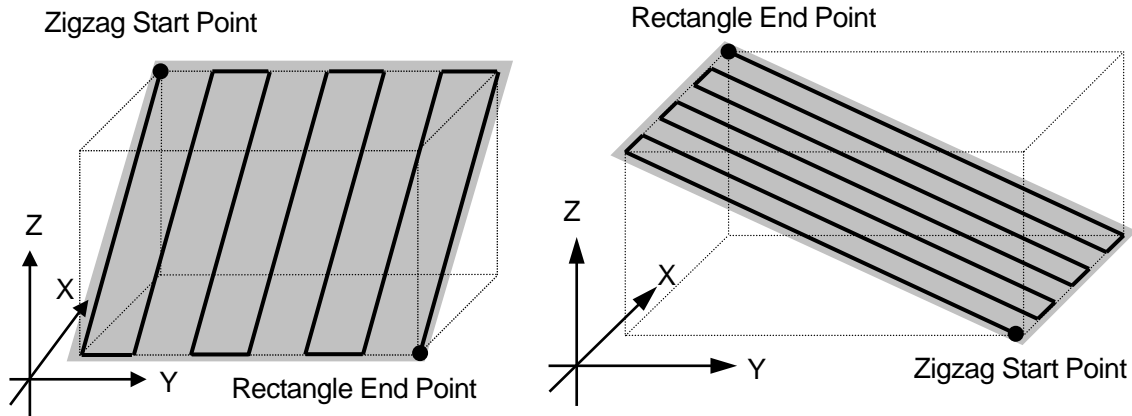
The pitch Count shown in the diagram on the right is 12. If the number of pitches is an even number, the Rectangle End Point becomes a Dispense End point.



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.



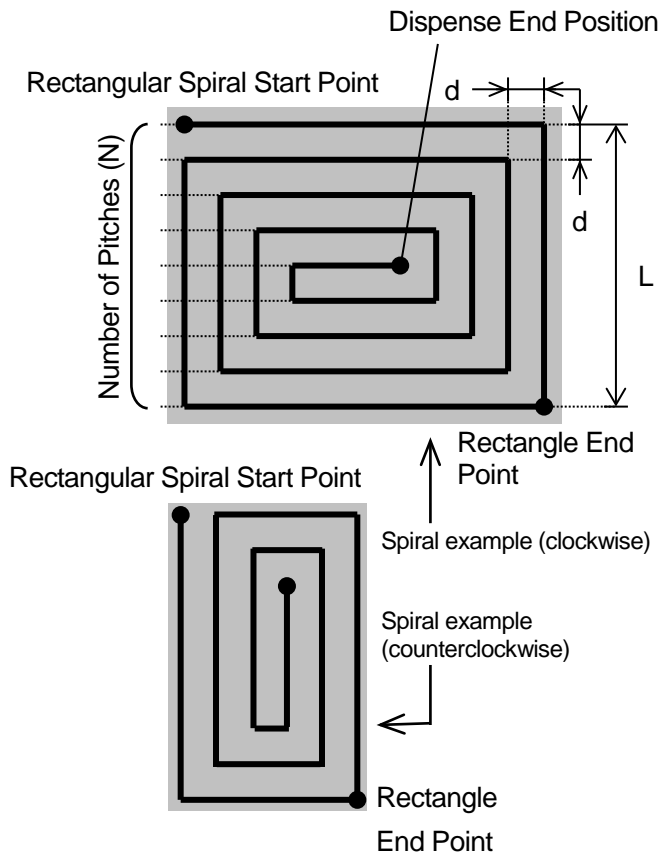
■ Rectangular Spiral Start Point – Rectangle End Point

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.

$$(L) \div (N) = (d)$$

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.

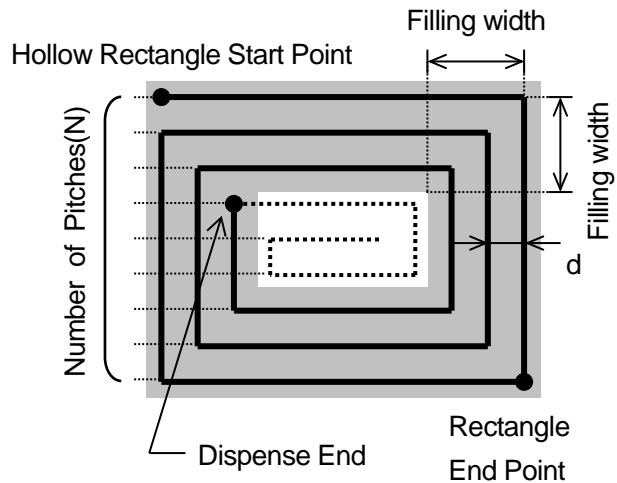


■ Hollow Rectangle Start Point – Rectangle End Point

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 the “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.

8.2 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 dispenses and 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

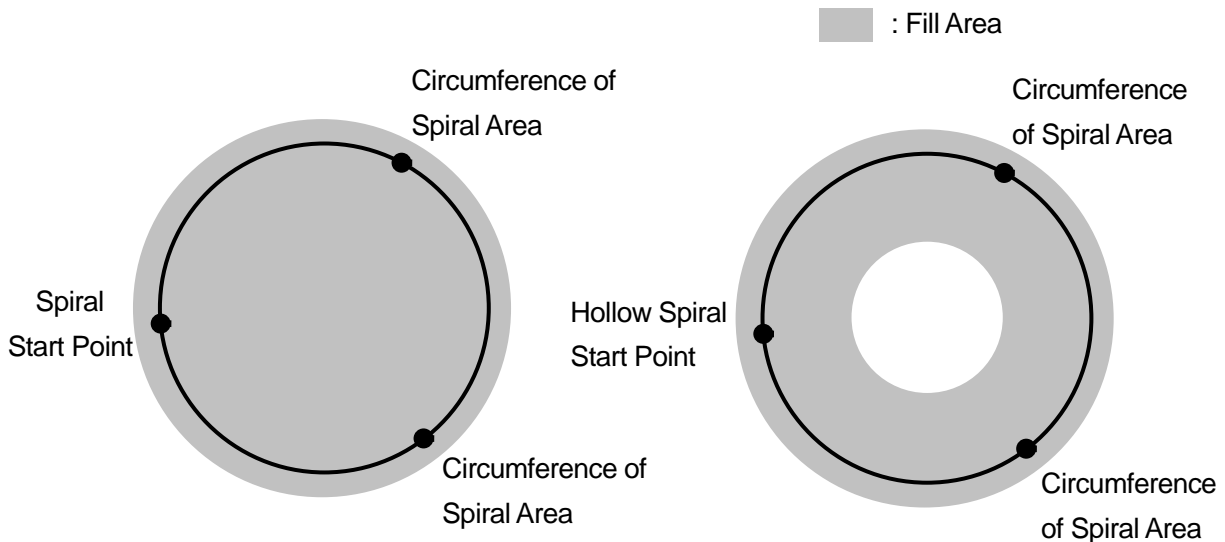
When line dispensing, if the arc is small, the line speed may slow down. Specifically, when filling in a spiral shape, the dispensing operation toward the center of the circle may slow down.

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 the "Line dispensing" at the start point. To perform a donut shape pattern with an empty center, specify the "Filling width" as well.

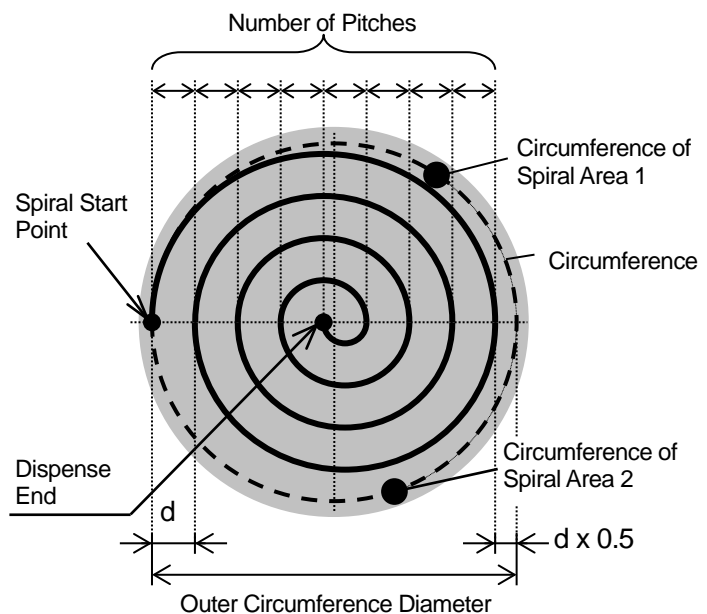
The grey areas in the diagrams below are the areas that are filled in.

Select Point Type	2/2
CP End Point	
PTP Evasion Point	
Circle Start Point	
Circle Center Point	
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	



■ 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”.

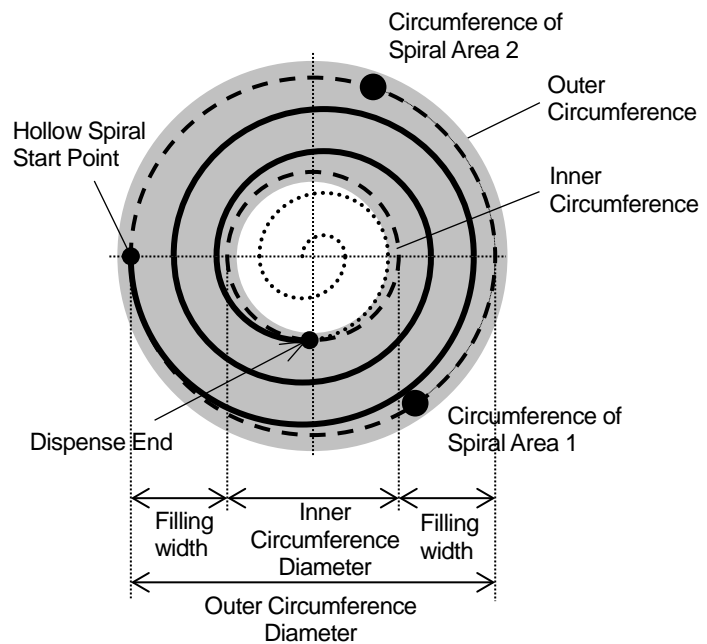
$$\text{Outer Circumference Diameter} \div (\text{Pitch Count} + 0.5) = d$$

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 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.
- CircumferenceDraws a spiral after line dispensing along the circumference of the circle.
- Inner circumferenceLine dispenses along the inner circumference of the circle at the end.
- Circumference, Inner circumferenceDraws a spiral after line dispensing along the circumference of the circle, and line dispenses along the inner circumference of the circle at the end.

9. HOW TO CONNECT THE DISPENSER

The [Dispenser Response] and [Dispenser ON] signals have fixed assignments to sysIn13 and sysOut10 respectively. There are intended for connecting to the dispenser to I/O-SYS.

If you want to connect a dispenser to I/O-1 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 to the right appears.

Dispenser	
I/O Function Assignment	
Dispenser Type	No Response Signal
Dispenser Mode	Steady

Dispenser Selection Screen

Select [I/O Function Assignment].
 The [I/O Function Assignment] selection screen shown to the right appears.
 Select the signal you wish to set or change.

I/O Function Assignment	
Dispenser ON	#sysOut10
Dispenser Response	#sysIn13

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 screen returns to I/O Function Assignment selection.

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.

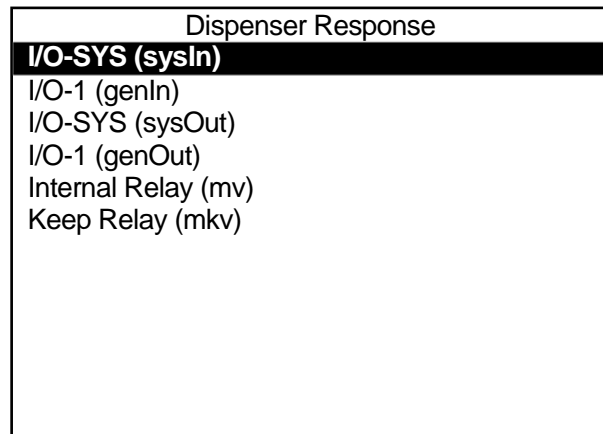
The default width is [1].

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.

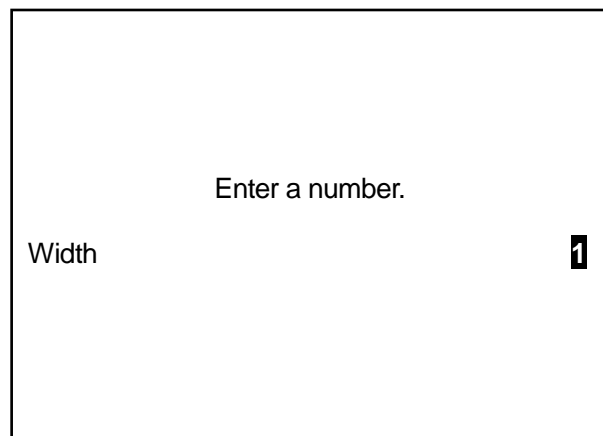
If the output width is set to [3], the Dispenser ON signal is output from genOut3, genOut4 and genOut5.

NOTE

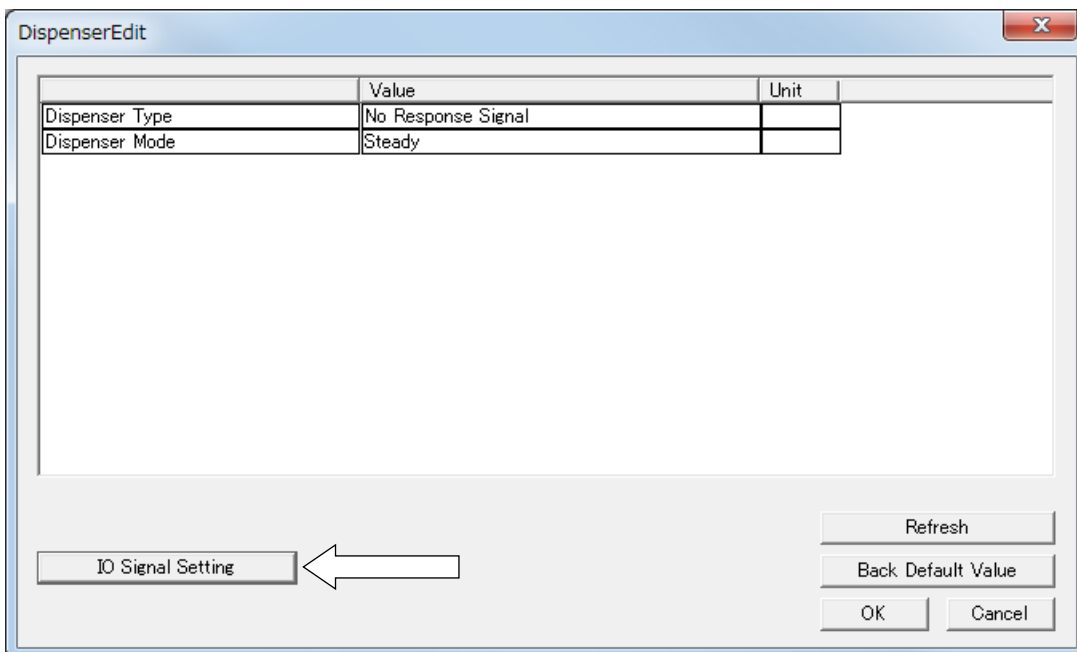
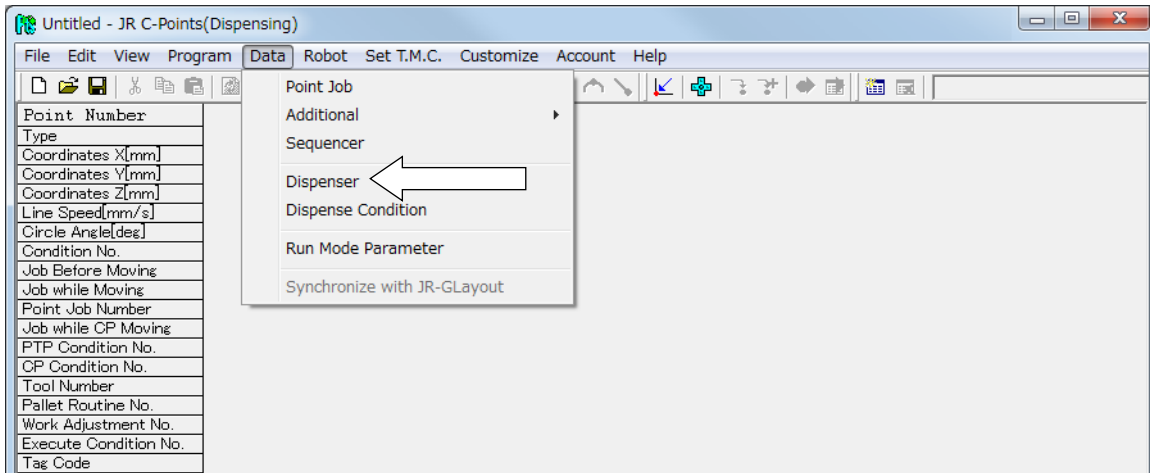
- The “Width” cannot be set to extend over different types of I/O, such as sysOut10 and genOut1. It is limited to I/O with consecutive numbers.
- If you wish to assign a dispenser-related signal to I/O-SYS, assign that signal to [Free] in the run mode parameter → “I/O Settings” → “I/O-SYS Function Assignment”.



Dispenser Response Type Selection Screen

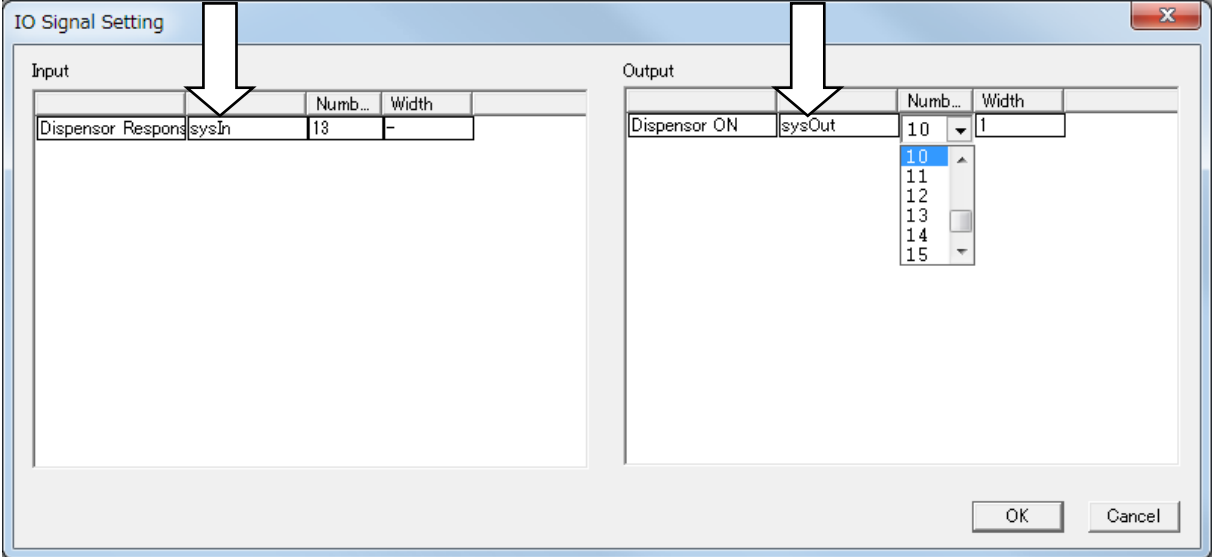


PC → [Data] → [Dispenser] → [I/O Signal Setting]



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

Set the connector (from the cells indicated by the white arrows), pin number (the [Number] cell), and the number of pins (the [Width] cell) for connecting the dispenser. Click each setting cell to select or enter the item you want.



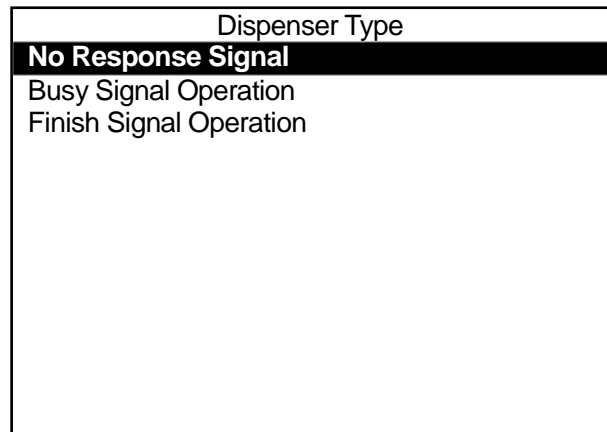
10. DISPENSER TYPE

When using this robot, you need to change and set the 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.

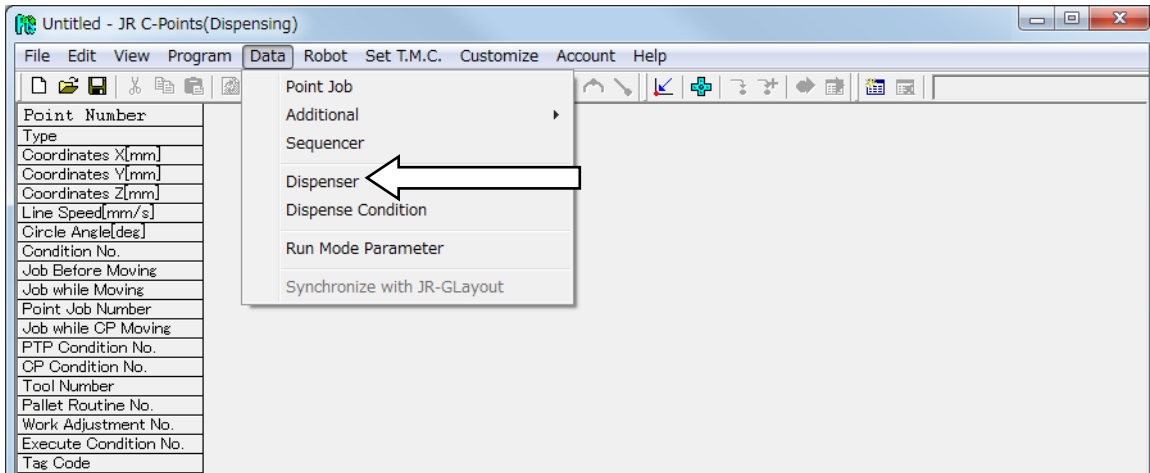
TP **MENU** [Dispenser]
[Dispenser Type]

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

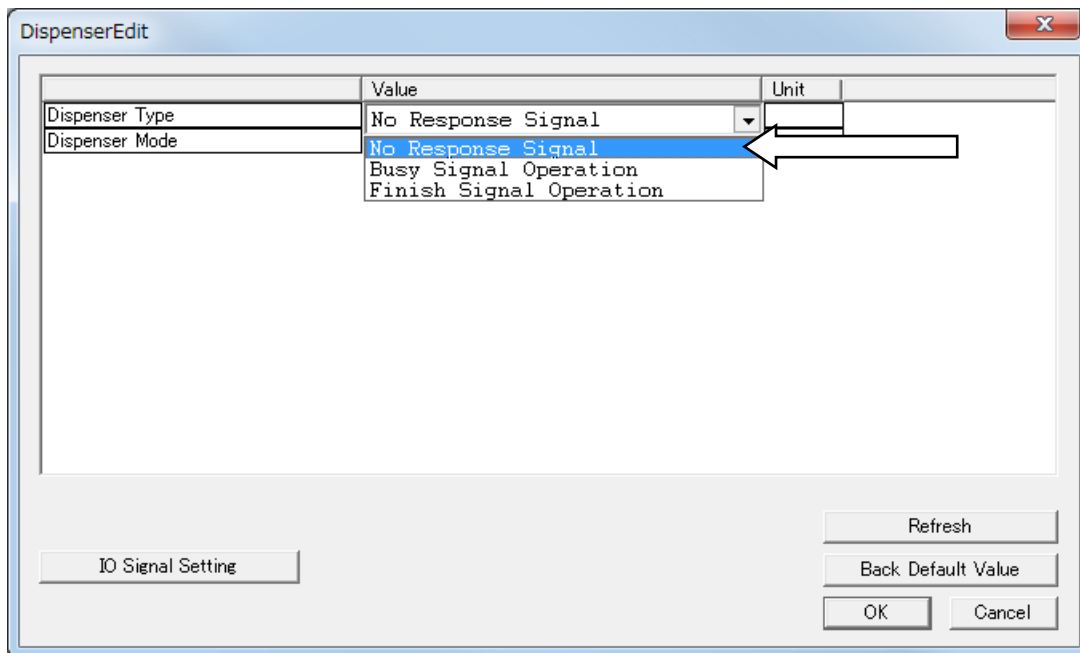


Dispenser Type Selection Screen

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



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



11. DISPENSER MODE

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

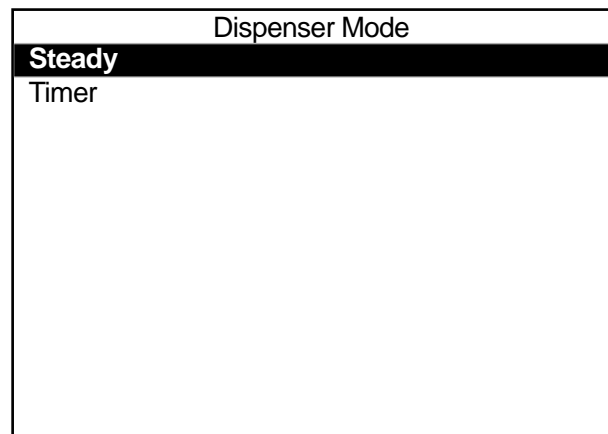
- Steady
The dispensing time is controlled by the robot.
- Timer
The dispensing time is controlled by the timer on the dispenser.
(However, during line dispensing or when [Dispenser Type] has been set to [No Response Signal], this setting is invalid. The robot runs in [Steady] mode even if [Dispenser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

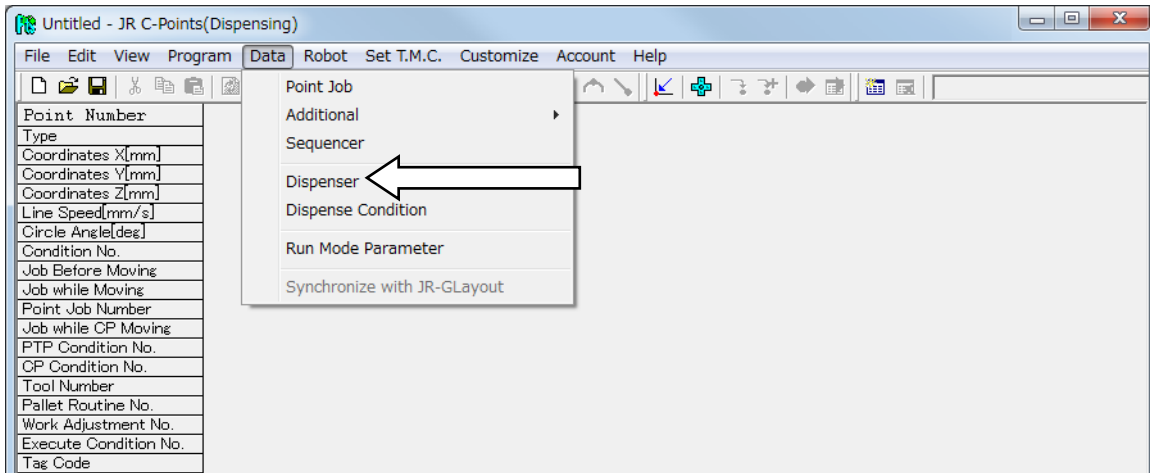


Dispenser Mode Selection Screen

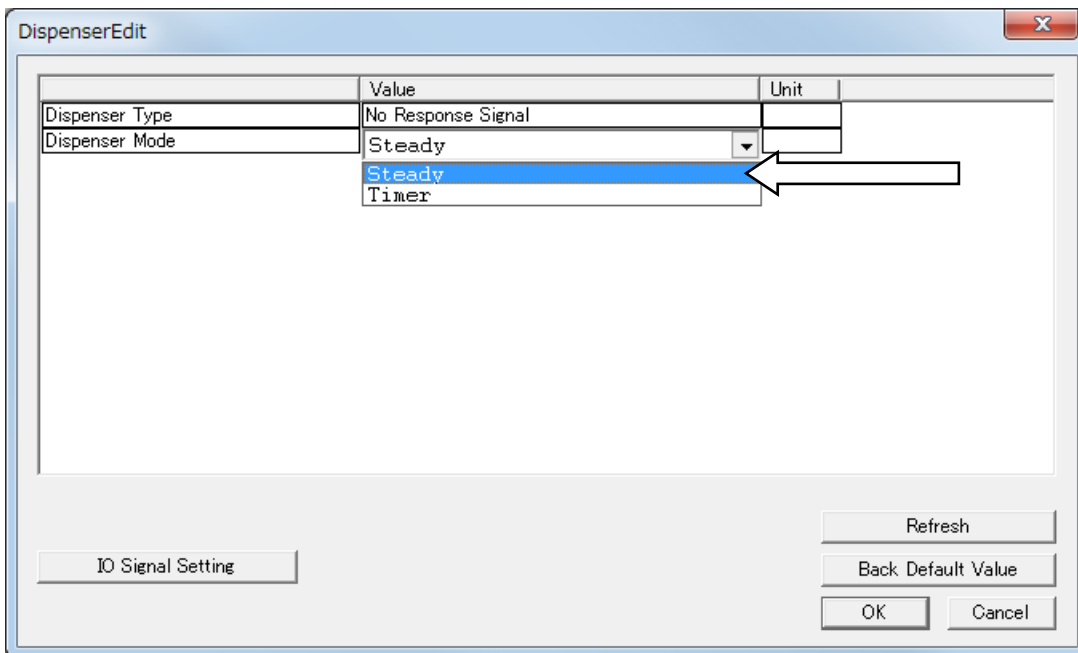
NOTE

If [Dispenser Mode] is set to [Timer], the settings entered for [Point Dispense Time] when teaching Point Dispense points are invalid. The same applies for the [Point Dispense Time] for Point Dispense points previously registered.

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



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

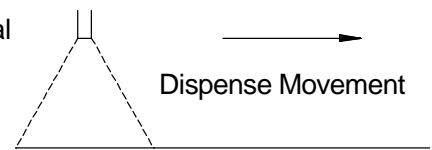


12. FUNCTIONS AT THE START/END OF LINE DISPENSING

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

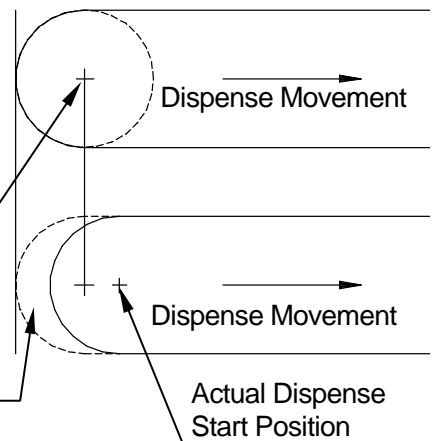
At a line dispensing start point*, if the X and/or Y axes (etc.) move before the actual dispensing operation starts and the dispensing agent fragments at the start section, or if you want the dispensing agent thicker at the start section, change/register [Wait Time at Start] in [Dispense Condition].

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 for the exact set time before moving.



If the start points of the line dispensing operations within a program are the majority, register these points with the program data [Dispense Condition].

If they are the minority, 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

Program Data Dispense Conditions

TP [Program Data Settings]
 [Dispense Condition]
 [Wait Time at Start]

Condition Data Dispense Conditions

TP [Dispense Condition]
 Number Entry
 [Wait Time at Start]

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

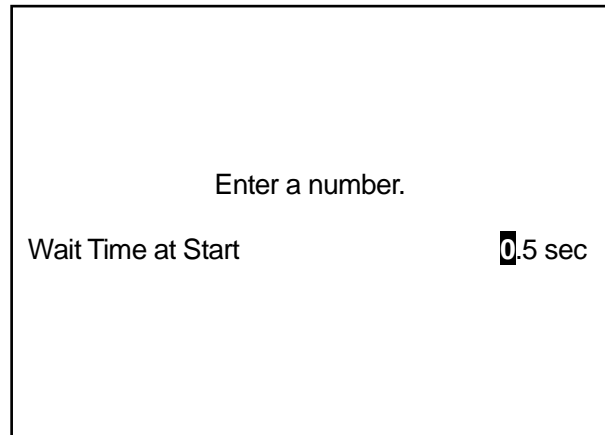
■ Program Data [Dispense Condition]

Press the **MENU** key, select [Program Data 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, 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 register.

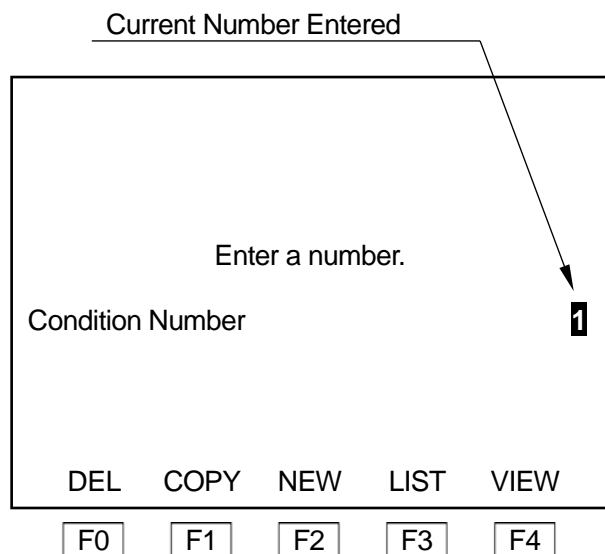
2. Bring up value setting screen for the point you want to register the dispensing condition to and select [Condition Number]. (Move the cursor (highlight bar) to a blank line on a point setting screen to display the settable point jobs and condition data.)

3. The condition number entry screen (as shown below) for the dispensing condition is displayed. Enter the dispensing condition number entered in 1. 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 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 being displayed to display 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.

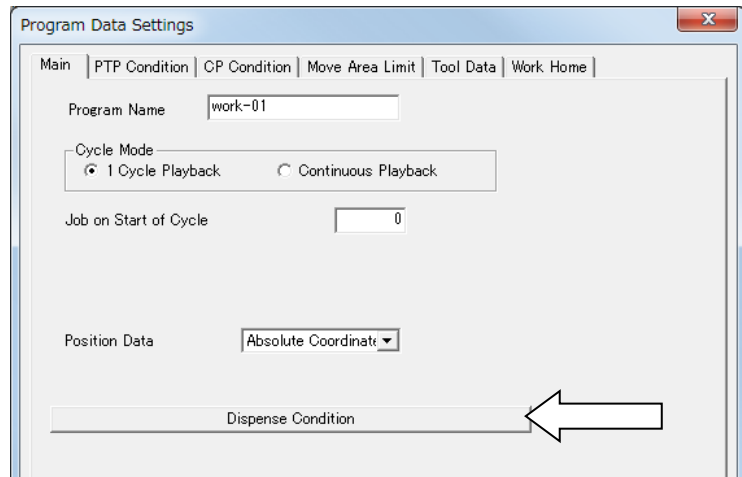
Program Data Dispense Conditions

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

Condition Data Dispense Conditions

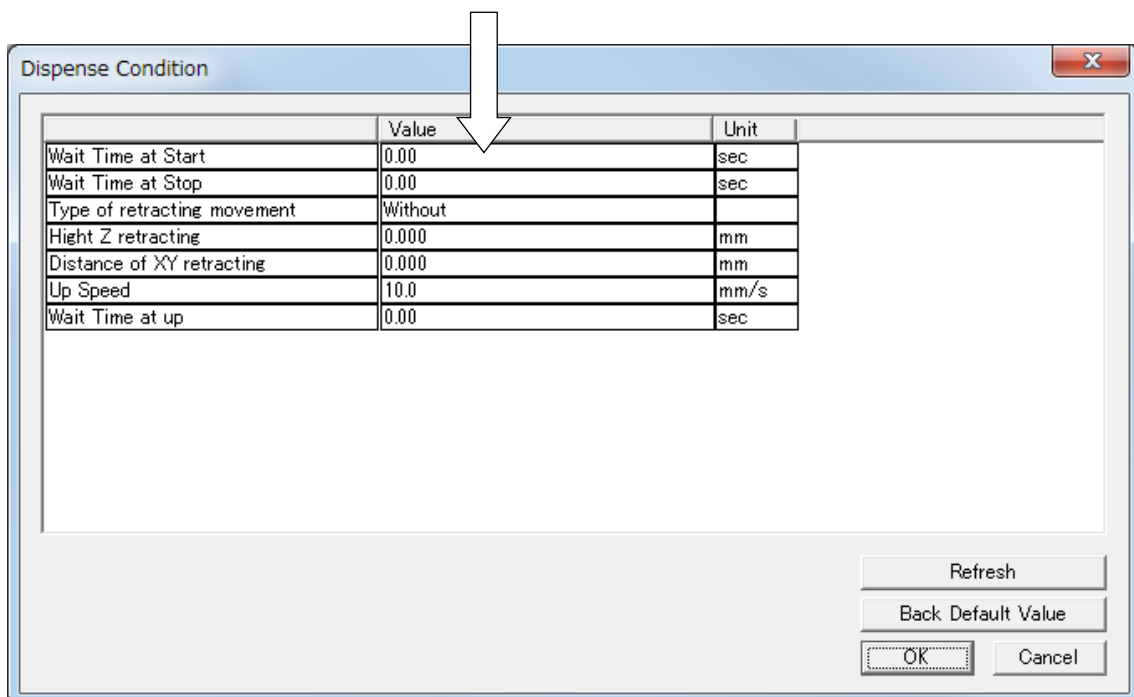
PC [Data] → [Dispense Condition] → [Wait Time at Start]

To register program data dispense conditions, select [Dispense Condition] from the [Program Data Settings] dialog box. The dialog below is displayed.



To register condition data dispense conditions, select [Dispense Condition] from the [Data] pull-down menu. A dialog such as the one below is displayed.

Enter the values you want to change in the dispense condition [Wait Time at Start].



12.2 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, change/register 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] point, an [End of Line Dispense] point, or at a dispensing end position*, the robot waits for the exact set time 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.

Program Data Dispense Conditions


TP  [Program Data Settings]
 [Dispense Condition]
 [Wait Time at Stop]

Condition Data Dispense Conditions

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

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

■ Program Data Dispense Conditions

Press the  key, select [Program Data Settings], and then select [Dispense Condition]. (Shown on the right).

Select [Wait Time at Stop].

The Wait Time at Stop entry screen is displayed.

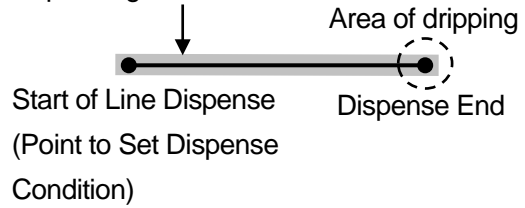
Enter the value you want to register.

Program 1	
Wait Time at Start	0.5 sec
Wait Time at Stop	0 sec
	XY moving after Z Up
Height Z retracting	10 mm
Distance of XY retracting	-30 mm
Up Speed	30 mm/s
Waiting Time at up	0 sec

■ Condition Data Dispense Conditions

1. Press the **MENU** key on the value setting screen for the point which starts the dispensing operation where you want to prevent the dispensing agent dripping at the end of line dispensing, such as a Start of Line Dispense point, and select [Dispense Condition] and enter the condition number.

The dispensing operation you want to prevent dripping at the end of line dispensing



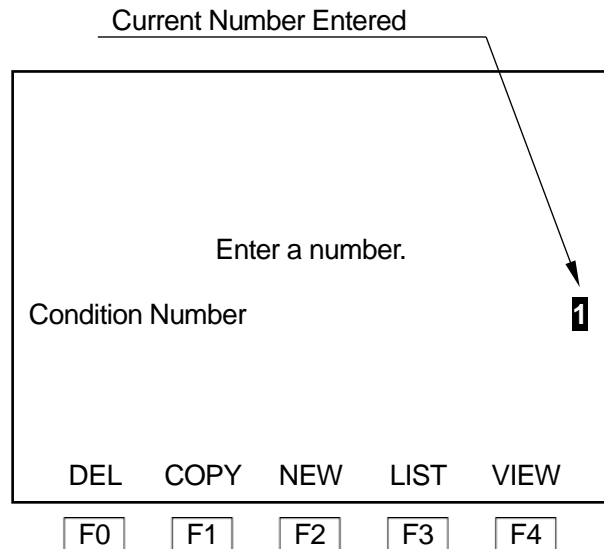
Select [Wait Time at Stop]. The screen for entering the wait time is displayed. Enter the value you want to register.

2. Bring up the value setting screen for the point for which you want to register the “Condition Number” and select the dispensing condition. (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. 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 the dispensing condition from the point setting screen, and press the **F4** (VIEW) key on the dispensing condition selection screen (image to the right) while the dispensing condition number you want to set is being displayed to call up the dispensing condition information for that number.

You can select the item you want to enter and also enter the values you want here.



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

Program Data Dispense Conditions

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

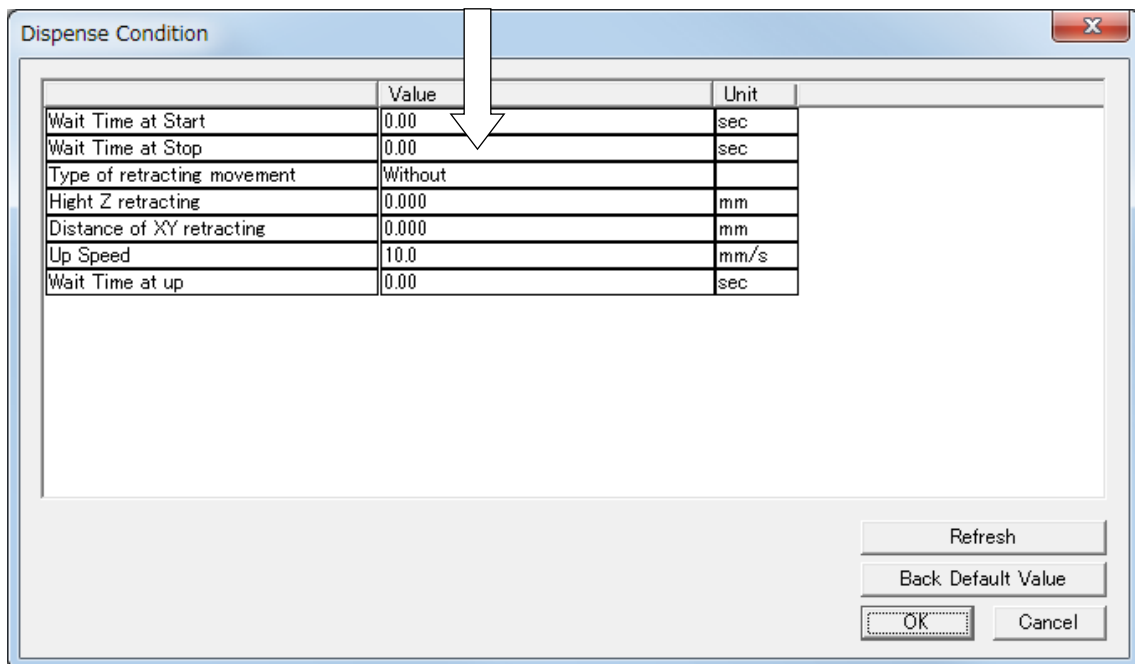
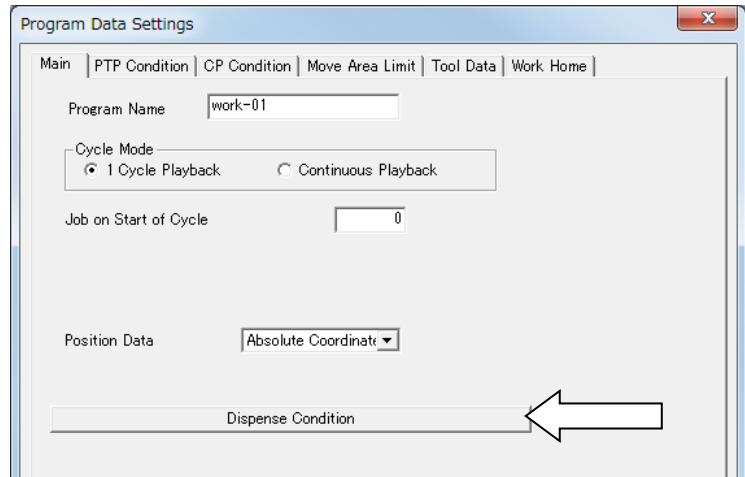
Condition Data Dispense Conditions

PC [Data] → [Dispense Condition] → [Wait Time at Stop]

Select [Dispense Condition] from the [Program Data Settings] dialog. The dialog below is displayed.

Enter the values you want to modify in [Wait Time at Stop].

To register condition 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].



12.3 Prevent Liquid Stringing at the End of Dispensing

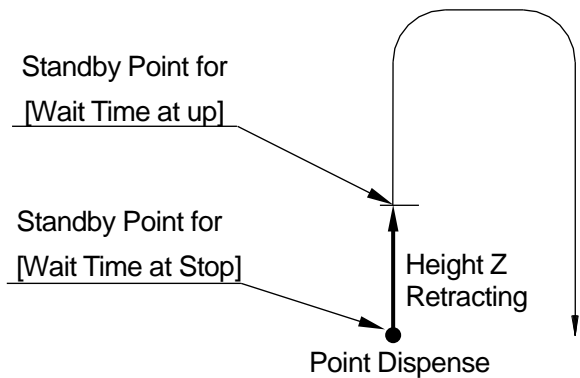
If liquid strings at a [Point Dispense], [End of Line Dispense], or dispense end position, you can set a stop time, or raise the Z axis at a slow speed to help reduce stringing.

Set the [Type of Retracting Movement], the [Height Z retracting], the [Distance of XY retracting], the [Up Speed] and the [Wait Time at up] in [Dispense Condition]. If you set [Dispense Condition] in program data, 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.

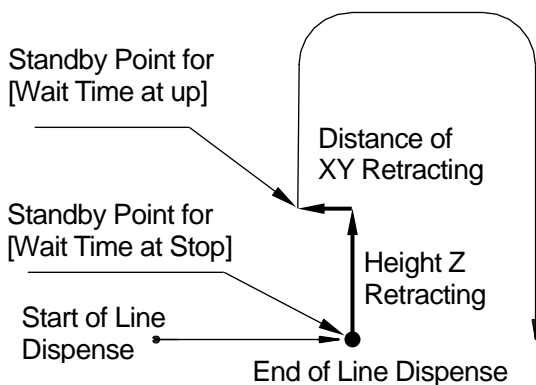
Type of retracting movement	Type of retracting movement at the <u>line dispensing end position</u> *
Without	After the robot stands by for [Wait Time at Stop], it moves to the next point.
Z up only	After the robot stands by for [Wait Time at Stop], the Z axis ascends exactly to [Height Z retracting] at the specified [Up Speed], and then waits the exact [Wait Time at up] 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 [Height Z retracting] at the specified [Up Speed], and then the X and Y axes move the exact [Distance of XY retracting] at the specified [Up Speed]. After this, the robot waits the exact [Wait Time at up] to move to the next point.
XYZ moving at a same time	After the robot stands by for [Wait Time at Stop], the X,Y, and Z axes move diagonally (synchronized) to [Height Z retracting] and [Distance of XY retracting] at the specified [Up Speed]. After this, the robot waits the exact [Wait Time at up] to move to the next point.

*With [Point Dispense], dispense filling, or a circle ([Start of Circle Dispense] – [Center of Circle Dispense]), a [Z up only] movement is conducted even if [XY moving after Z up] or [XYZ moving at a same time] is set. If [Without] is set, no retracting movement is performed.

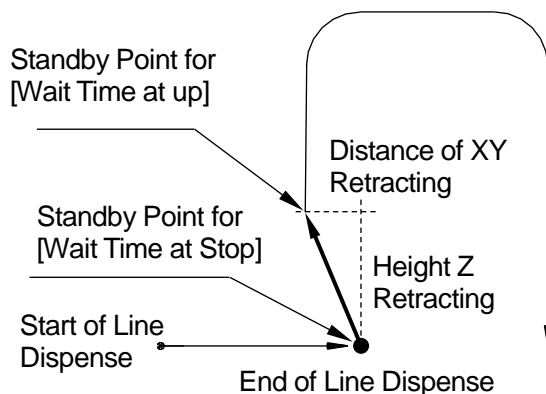
Type of retracting movement: Z Up Only



Type of retracting movement: XY moving after Z up



Type of retracting movement: XYZ moving at a same time



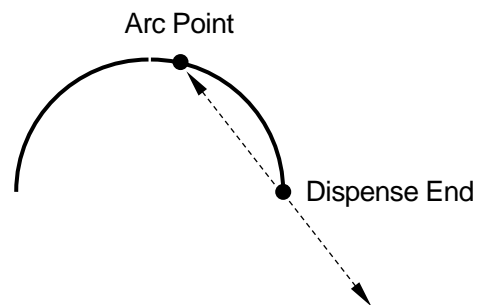
Set a positive (+) or negative (-) value for the [Distance of XY retracting].

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

**Distance of XY Retracting:
Positive**



**Distance of XY Retracting:
Negative**



Program Data Dispensing Conditions

- TP** **MENU** [Program Data Settings]
 [Dispense Condition]
 [Type of retracting movement]
 [Height Z retracting]
 [Distance of XY retracting]
 [Up Speed]
 [Wait Time at up]

NOTE

Even if values are set to [Height Z retracting] – [Wait Time at up], no retracting movement is performed if [Type of retracting movement] is set to [Without].

Press the **MENU** key, select [Program Data Settings], and then select [Dispense Condition]. The Dispense Condition settings screen is displayed as shown on the right.

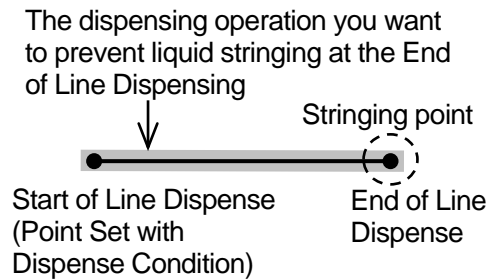
Select the [Type of retracting movement] and then select and set the movement you want. The display returns to the Dispense Condition settings screen.

After selecting [Height Z retracting], [Distance of XY retracting], [Up Speed], or [Wait Time at up], each entry screen appears accordingly. Enter and set the values you want to change. The display returns to the Dispense Condition settings screen.

Program 1	
Wait Time at Start	0.5 sec
Wait Time at Stop	0 sec
	XY moving after Z Up
Height Z retracting	10 mm
Distance of XY retracting	30 mm
Up Speed	30 mm/s
Wait Time at up	0 sec

Condition Data Dispensing Conditions

TP **MENU** [Dispense Condition]
Number Entry
[Type of retracting movement]
[Height Z retracting]
[Distance of XY retracting]
[Up Speed]
[Wait Time at up]



1. Press the **MENU** key on the value setting screen for the point which starts the dispensing operation where you want to prevent stringing at the end of the line dispensing, such as a Start of Line Dispense Point. Next select [Dispense Condition] and enter the condition number. Select and set the retraction movement you want. The display returns to the dispensing condition setting screen.
2. After selecting [Height Z retracting], [Distance of XY retracting], [Up Speed] or [Wait Time at up], each entry screen appears accordingly. Enter and set the values you want to change. The display returns to the Dispense Condition settings screen.
3. Bring up value setting screen for the point to which you want to register the dispensing condition and select the "Condition Number". (Move the cursor (highlight bar) to a blank line on a point setting screen to display the settable point jobs and condition data.) The dispenser 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 the dispensing condition from the point setting screen, and press the **F4** (VIEW) key on the dispensing condition selection screen while the dispensing condition number you want to set is being displayed to call up the dispensing condition information for that number.
You can select the item you want to enter and also enter the values you want here.

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

Program Data [Dispense Condition]

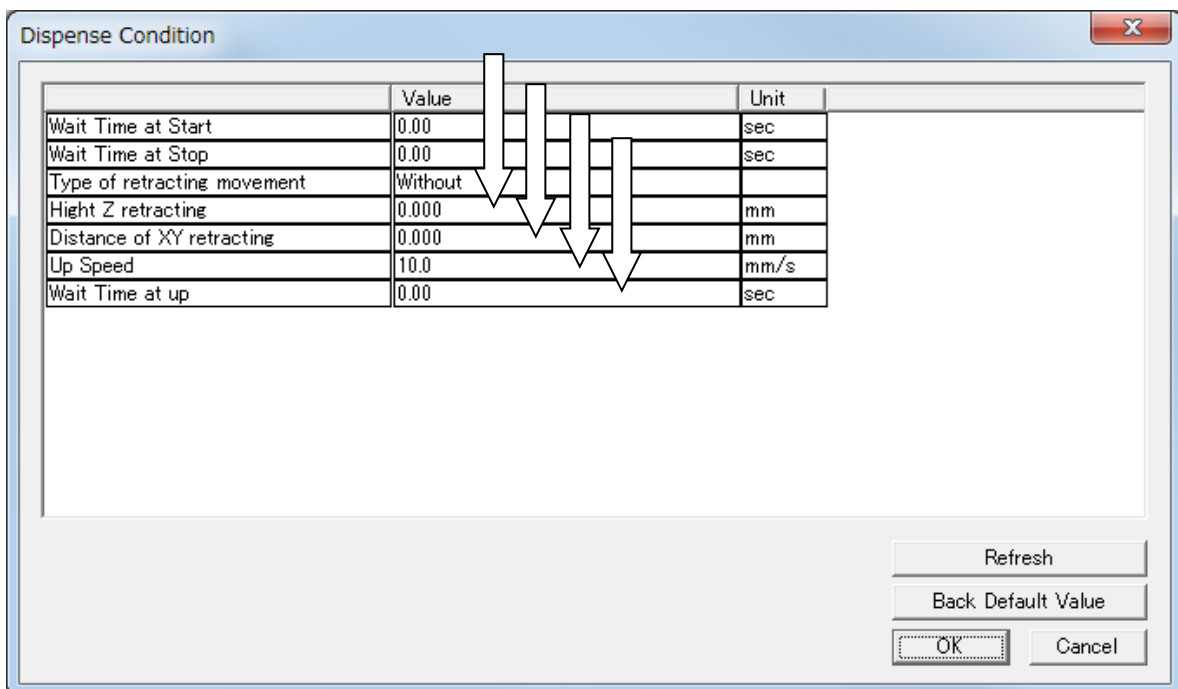
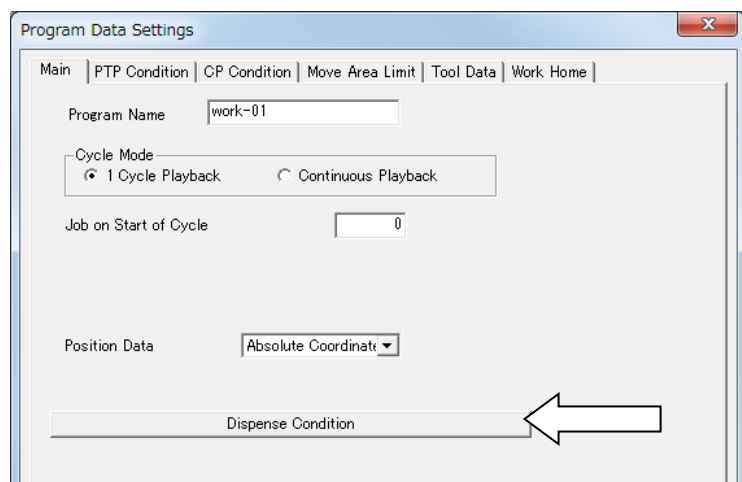
PC [Program] → [Program Data Settings] → [Dispense Condition] → [Height Z Retracting]
→ [Distance of XY retracting]
→ [Up Speed]
→ [Wait Time at up]

Condition Data [Dispense Condition]

PC [Data] → [Dispense Condition] → [Height Z Retracting]
→ [Distance of XY retracting]
→ [Up Speed]
→ [Wait Time at up]

Select [Dispense Condition] from the [Program Data Settings] dialog. The dialog below is displayed. Enter the values you want to modify in [Height Z retracting], [Distance of XY retracting], [Up Speed], and [Wait Time at up].

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



13. DISPENSING APPLICATION WORK ADJUSTMENT

If “Work Adjustment” is set, it applies from the Start of Line Dispense point, as one block of points, through to the End of Line Dispense point. (This is also true for a CP Start Point – CP End Point block of points).


However, for Dispensing Specifications, if Work Adjustment is set to the points shown below in gray, you can only apply a height (Z direction) adjustment to those points. 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 on 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	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	PTP Point	CP Start Point	CP Passing Point	CP Stop Point	CP End Point	PTP Evasion Point	Circle Start Point	Circle Center Point
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 applied to the X, Y, and R directions	7	7	7	7	7	7
Work Adjustment number applied 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 Affects the X, Y, and R directions	N/A	N/A	N/A	N/A	N/A	N/A
Work Adjustment Number Affects the Z direction	N/A	8	N/A	9	N/A	N/A

When drawing an arc from Start of Circle Dispense – Center of Circle Dispense points, or Circle Start Point – Circle Center Point, only the Work Adjustment data set to the Start of Circle Dispense or Circle Start Point applies. Even if you set Work Adjustment data to a Center of Circle Dispense or Circle Center Point it is not applicable.

Also note that you cannot set a Work Adjustment to the Center of Circle Dispense or Circle Center Points using a PC (JR C-Points).

TP  **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 [Work Adjustment Number] here, and register the workpiece adjustment number you created.

PC  [Data] → [Additional] → [Work Adjustment]

14. PURGING THE DISPENSING AGENT

You can purge the dispensing agent at your own discretion.

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

■ Switch Run Mode

1. Press the **PRG.NO** key, and set the robot to program number “-1”
2. Push the start switch. The Dispenser is ON while you are pushing the start switch. Release the start switch and the Dispenser goes OFF.

■ External Run Mode

1. Turn ON all I/O-SYS program number bit (sysIn4 – sysIn11), and turn ON the program number LOAD signal (sysIn3). Switch to program number “-1”.
2. Turn ON the start signal (#sysIn1). The Dispenser is ON when the start signal (#sysIn1) is ON. Turn OFF the start signal and the dispenser also goes OFF.

■ Teaching Mode

TP

Push the **F0** (FUNC) key on the point position entry screen and the line at the bottom of the screen switches to Manual Job. If the bottom line displays “Dispense” above the **F4** key, press the **F4** (Dispenser ON) key. The dispenser is ON while you are pushing this key.

However, by pushing the **F0** (FUNC) key just once when the robot is set to Manual Job, “Dispense” is not displayed. Depending on the number of Manual Jobs set, push the **F0** key up to 4 times.

PC

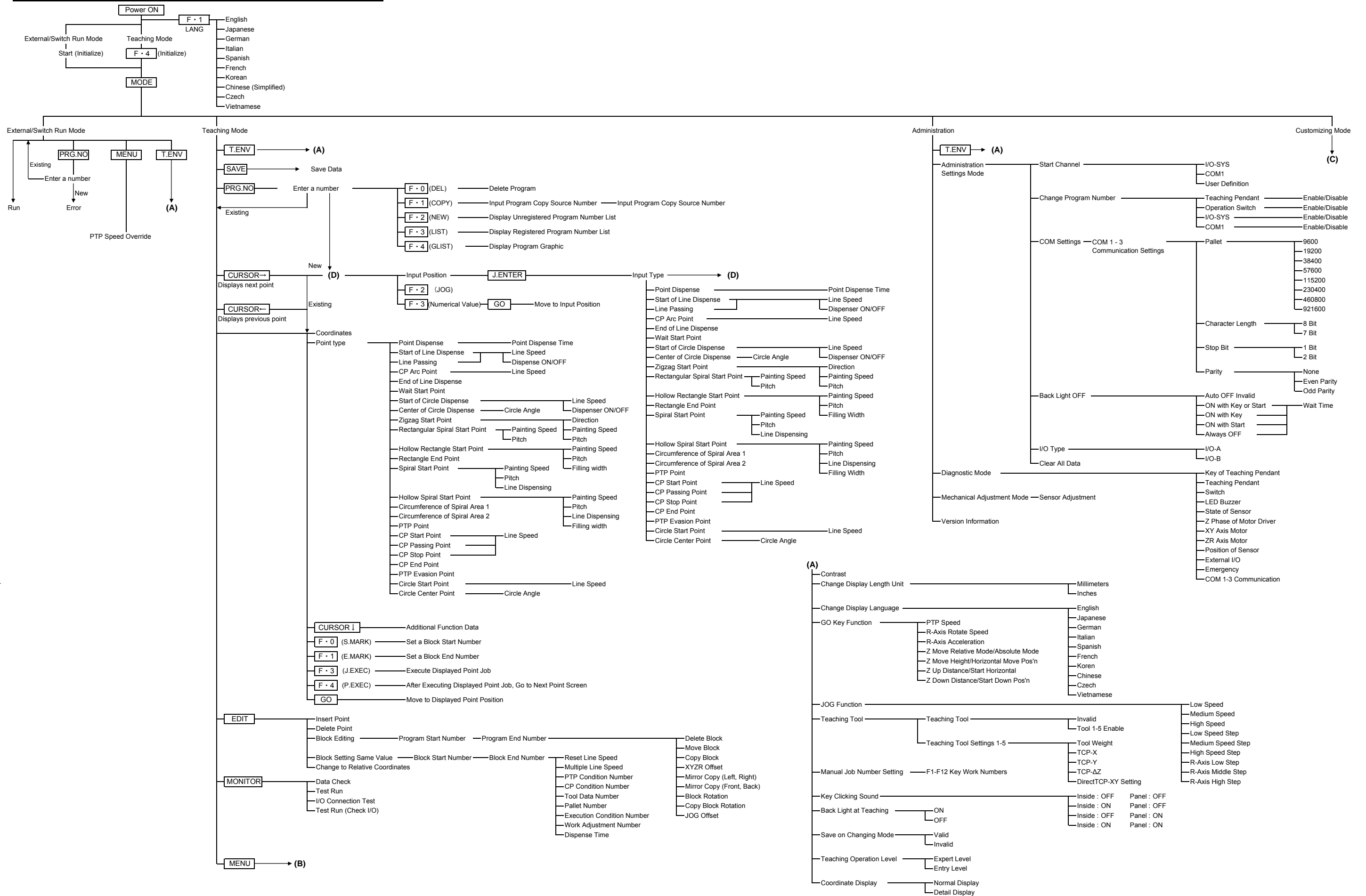
If you are operating the robot from a PC, create and use point job data that turns the dispenser ON and set the JOG operation dialog to [Point Job].

Point Job Example (the dispenser comes ON for 1 second when executed)

```
Set #sysOut10
Delay 1000
Reset #sysOut10
```

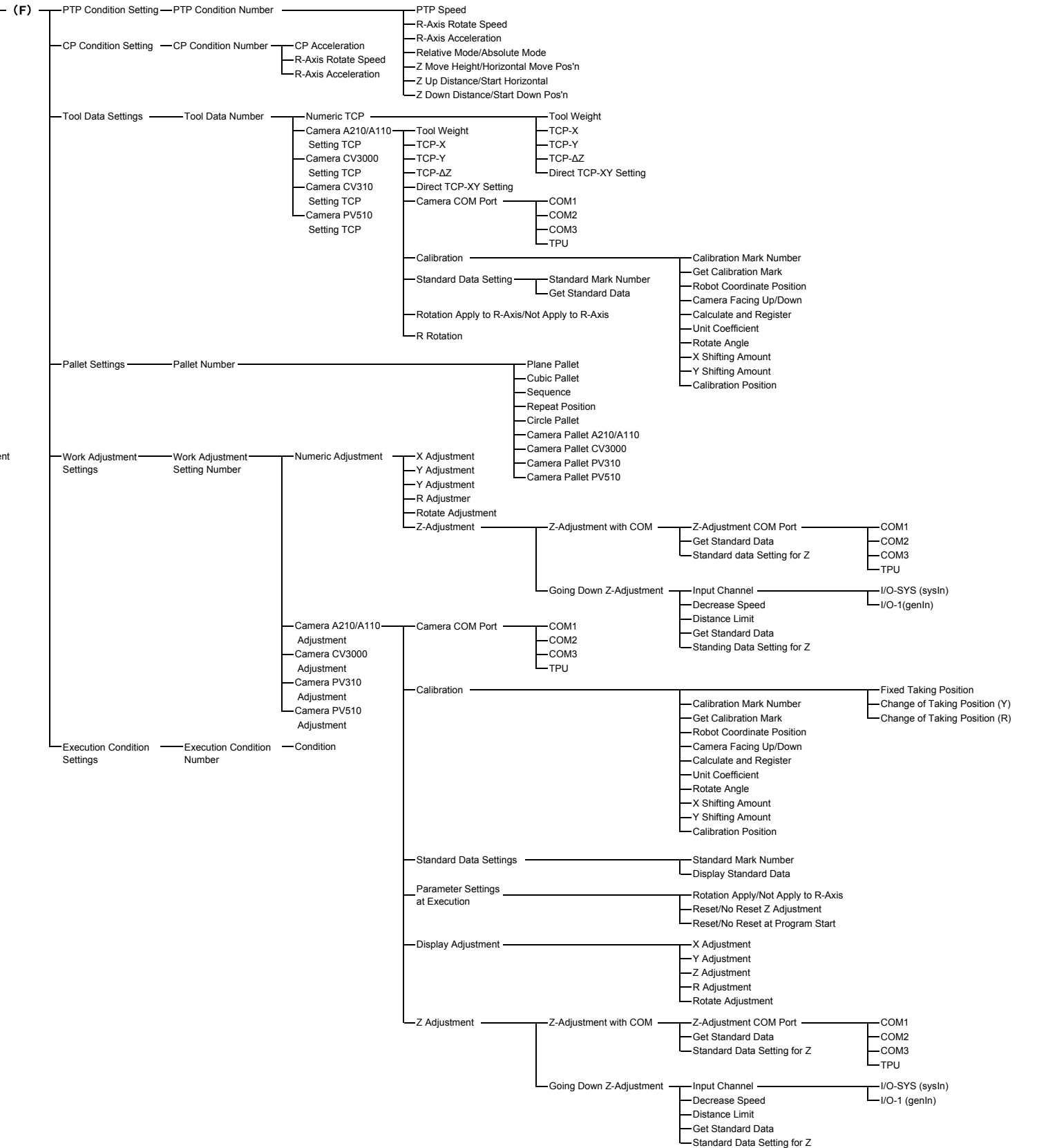
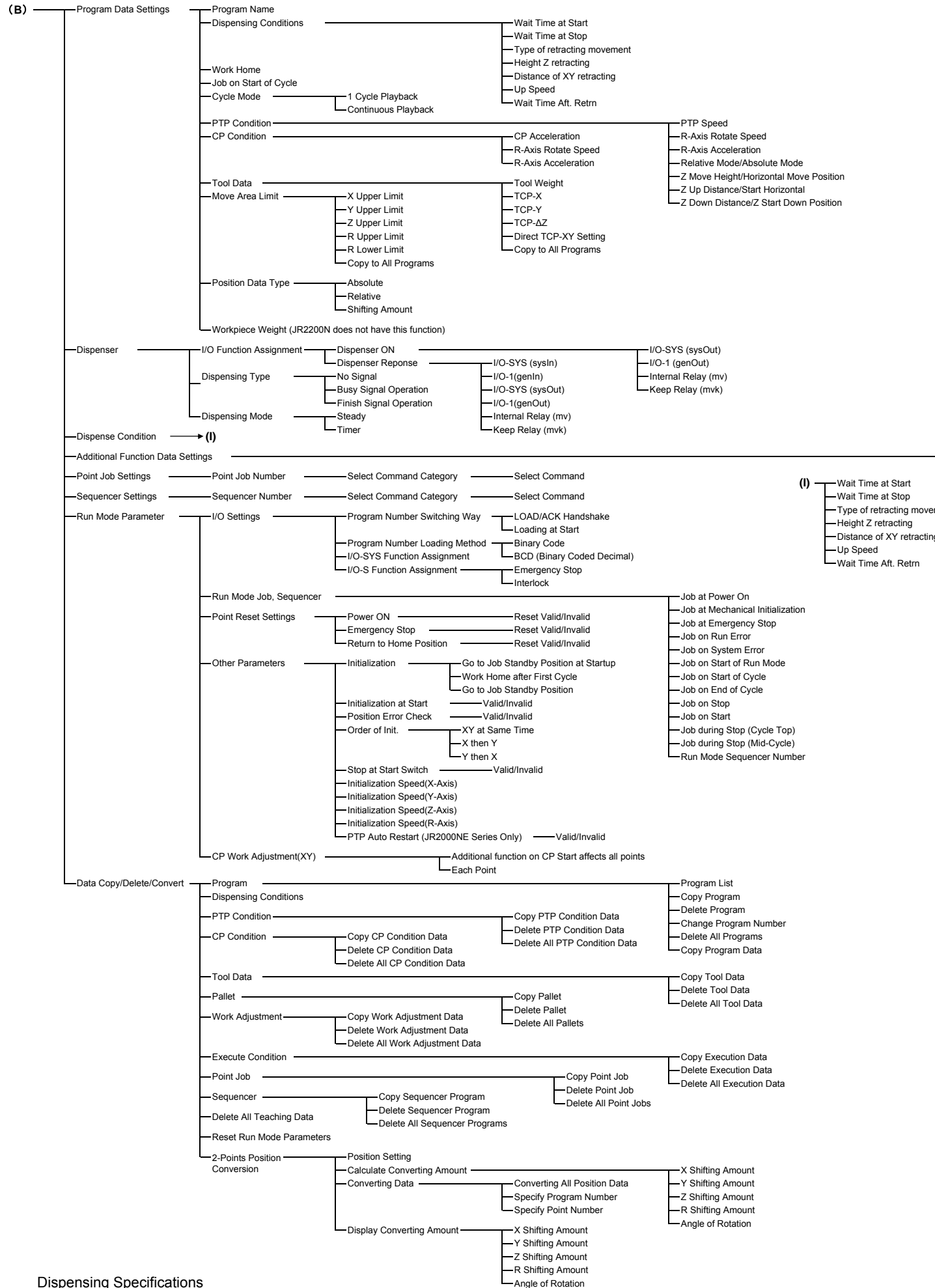
Operation Flowchart (Dispensing Specifications) Ver.10.3x 1/3

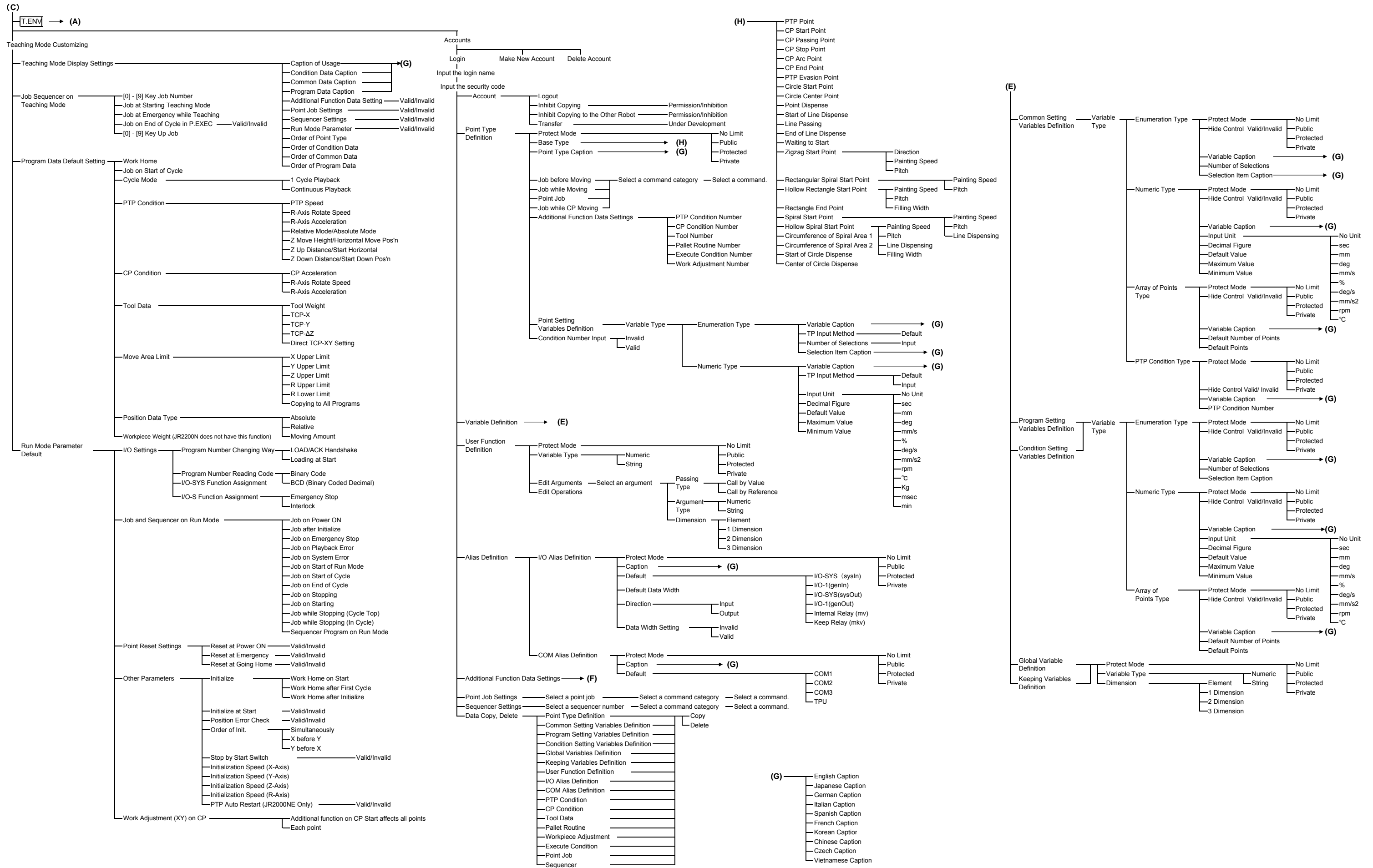
NOTE: This operation flowchart is when the teaching level is set to "Expert Level"



Operation Flowchart (Dispensing Specifications) Ver.10.3x 2/3

NOTE: This operation flowchart is when the teaching level is set to "Expert Level"





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