

# **JANOME DESKTOP ROBOT**

## **JR2000N/JR-V2000 Series**

# **Operation Manual**

## **Quick Start**

Thank you for purchasing a Janome Robot.

- Read this manual thoroughly in order to ensure proper use of this robot. Be sure to read “For Your Safety” before you use the robot. The information will help you protect yourself and others from possible dangers during operation.
- After reading this manual, keep it in a handy place so that you or the operator can refer to it whenever necessary.
- This manual is written according to IEC 62079.

# **JANOME**

# PREFACE

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The Janome Desktop Robot JR2000N Series is a new low-cost, high-performance robot. We have succeeded in reducing the price while maintaining functionality. Energy- and space-saving qualities have been made possible through the combined use of stepping motors and special micro step driving circuits.

This manual describes standard applications of the JR2000N Series. Refer also to the following individual manuals during actual operation of this robot.

## JR2000N Series

Setup	Explains how to set up the robot. <b>Be sure to read this manual before you operate the robot.</b>
Maintenance	Explains maintenance procedures for the robot. <b>Be sure to read this manual before you operate the robot.</b>
Basic Instructions	Provides part names, data structures, and the basic knowledge necessary to operate the robot.
Quick Start	Explains the actual operation of the robot with simple running samples.
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.
Features I	Explains point teaching.
Features II	Explains commands, variables, and functions.
Features III	Explains features such as run mode parameters, sequencer programs, etc.
Features IV	Explains features in the Customizing mode.
External Control I (I/O-SYS)	Explains the I/O-SYS control.
External Control II (COM Communication)	Explains the COM communication control system (COM1 – COM3).
Monitoring Camera & Sensors	Explains the optional CCD Camera used for monitoring operations and the Z-Axis Sensor.
Specifications	Provides comprehensive specifications, including mechanical and electrical requirements.
Applications	Explains the function specifications for each specialized application.

Note: The product specifications in these manuals may differ from those of the machine you have received due to product updates.

These manuals are based on the standard applications. Menu items may vary depending on the model.

JR-V2000 Series

JR-V2000 Setup & Maintenance	Explains setup and maintenance procedures for the robot. <b>Be sure to read this manual before you operate the robot.</b>
Basic Instructions	Provides part names, data structures, and the basic knowledge necessary to operate the robot.
Quick Start	Explains the actual operation of the robot with simple running samples.
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.
Features I	Explains point teaching.
Features II	Explains commands, variables, and functions.
Features III	Explains features such as run mode parameters, sequencer programs, etc.
Features IV	Explains features in the Customizing mode.
External Control II (COM Communication)	Explains COM communication control. (The External Control I manual is not applicable to the JR-V2000 Series)
JR-V2000	Explains features found only in the JR-V2000 Series.

Note: The product specifications in these manuals may differ from those of the machine you have received due to product updates.

**Note**

Do not operate or handle this machine in a way that is not indicated in these manuals. Be sure to follow the instructions in these manuals. Proper use of the machine will ensure continued functionality and high performance.

**Note**

Be careful whenever shutting down the robot after making changes to the settings or data. If the robot is shut down without saving the changes, such changes will be lost and the robot will return to its former settings. Be sure to save all changes before shutting down.



**Warning**

**Make sure the ground is connected. Do not use the robot with the ground disconnected.** Please set the grounding resistance for the robot's power source to **100Ω or less**.

Failure to properly ground the robot can cause electric shock, fire, malfunction, or damage to the robot.



**Warning**

**Make sure that the power to the robot is OFF before plugging in the power cord.**

Failure to do so could cause electric shock or injury.

Note: In this manual, the operation procedures are indicated as follows:



Teaching Pendant operation method



PC-based operation method (using JR C-Points software)

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## Quick Start

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# FOR YOUR SAFETY




The precautions in this manual are provided for the customer to make the best use of this product safely, and to provide preventive measures against injury to the customer or damage to property.

• • • • • **Be sure to follow the instructions** • • • • •

Various symbols are used in this manual. Please read the following explanations of each symbol.











## ● Symbols Indicating the Degree of Damage or Danger

The following symbols indicate the degree of damage or danger which may be incurred if the safety notes are ignored.

	<b>Danger</b>	The Danger symbol indicates the imminent risk of death or serious injury.
	<b>Warning</b>	The Warning symbol indicates the possibility of death or serious injury.
	<b>Caution</b>	The Caution symbol indicates the possibility of accidental injury or damage to property.

## ● Symbols Indicating Details of Danger and Preventive Measures

The following symbols indicate the type of safety measure that should be taken:

	Indicates the safety measures that should be taken.
	Be careful. (General caution)
	Indicates a forbidden action.
	Never do this. (General prohibition)
	Do not disassemble, modify, or attempt to repair.
	Do not touch. (Contact prohibition)
	Indicates a necessary action.
	Be sure to follow instructions.
	Be sure to unplug power cord from wall outlet.
	Be sure to check that the machine is grounded.

## FOR YOUR SAFETY

### Danger



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

### Warning



**Install the unit in a place appropriate for its weight and conditions while running.**

Placing the unit on a surface that is unstable, or not strong enough to support its weight may cause the unit to fall, overturn, or break down. This could result in operator injury. Be sure to leave a space of at least 30cm between the back of the robot (equipped with a cooling fan) and the wall. Insufficient space can lead to overheating or fire.



**Power the unit only with the rated voltage.**

Failure to do so may cause electric shock, fire, or unit malfunction.



**Plug the power cord into the wall 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 the voltage range indicated.**

Failure to do so may cause fire or unit malfunction.



**Turn off all sources of electricity.**

Before performing inspections or oiling the unit, please be sure to unplug the plug from the electrical outlet, remove the power cord from the main unit. Also, after cutting off the electrical power, please do not touch the prongs of the electrical inlet for at least 5 seconds. Contact with the prongs could result in electrical shock or injury.

## FOR YOUR SAFETY

### **Warning**



**Be sure to check grounding before you use the unit.**  
Improper grounding can cause electric shock or fire.



**Wipe the power plug with a clean, dry cloth periodically to eliminate dust.**  
Dust accumulation can 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 can cause fire.



**Be sure to turn off the unit before inserting or removing 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 cable.**  
Contact with water or oil can cause electric shock, fire, or unit malfunction.  
IP Protection Rating: IP30 (IP40 for CE specification model)



**If anything unusual occurs (e.g. a burning smell or unusual sound), stop operation and unplug the cable immediately. Contact the dealer from whom you purchased the robot or the office listed on the last page of this manual.**  
Continuous use without repair can cause electric shock, fire, or unit malfunction.



## FOR YOUR SAFETY

### **Caution**



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



**Before operating the unit, be sure to check that there is no danger in or around the operating range.**  
Failure to do so may result in injury.



**Use the unit in an environment between 0 and 40 degrees centigrade with a humidity level of 20 to 90 percent and without condensation.**  
Use outside these conditions may result in unit malfunction.  
IP Protection Rating: IP30 (IP40 for CE specification models)



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



**If the unit is equipped with the I/O-S, install an area sensor or a safety barrier of adequate strength.**  
Otherwise, a person entering anywhere within the robot's operating range may be injured.



**Please make sure the emergency stop button is always placed within the operator's reach whenever you operate the unit.**  
Failure to do so may be dangerous since it may not be possible to stop the robot immediately and safely.



**Regularly check that the emergency stop switch works properly.**  
**For models with I/O-S circuits, also check that they work properly.**  
Failure to do so may be dangerous since it may not be possible to stop the robot immediately and safely.

## FOR YOUR SAFETY



### Caution



**Be sure to confirm that tools such as the electric screwdriver unit are properly connected.**

Failure to do so may result in injury or breakdown.



**Check the mounting screws regularly so that they are always firmly tightened.**

Loose screws may cause injury or breakdown.



**Be sure to check the wiring 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.



**Use the unit in an environment that is not exposed to direct sunlight.**

Direct sunlight may cause unit malfunction or breakdown.

**MEMO**

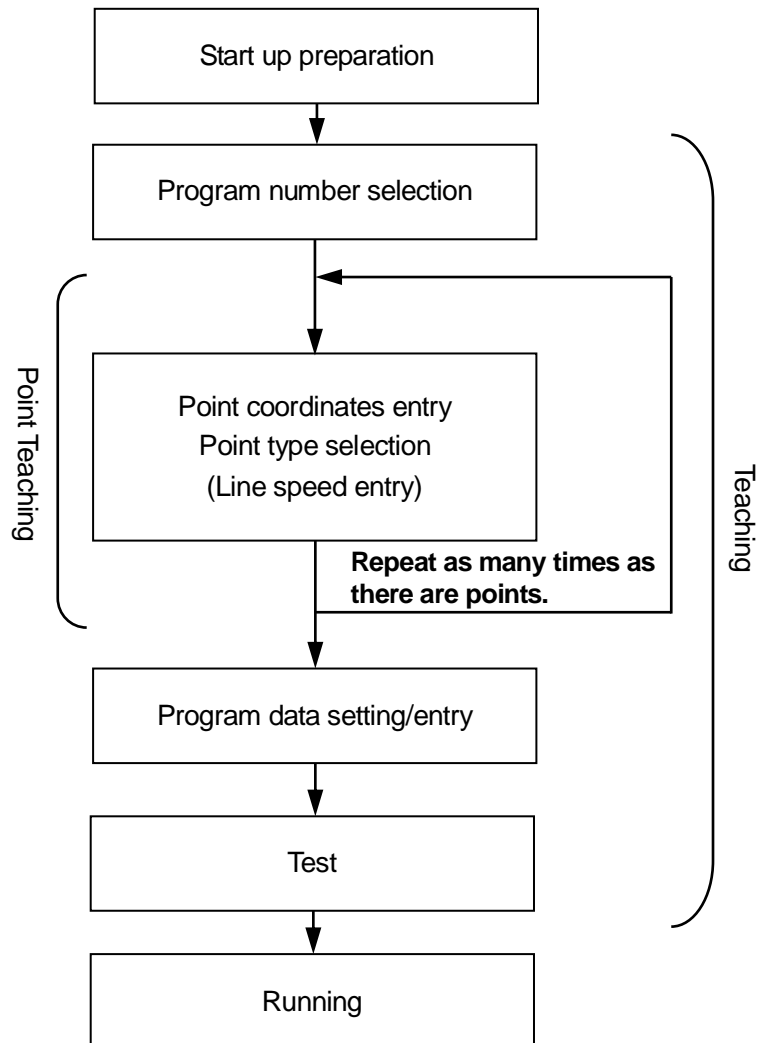
# 1. OPERATION PROCESS

The robot performs a variety of different movements when running a program. To make the robot function, the first thing to do is to create its operating program.

A summary of the procedures leading up to actual robot operation are summarized on the right.

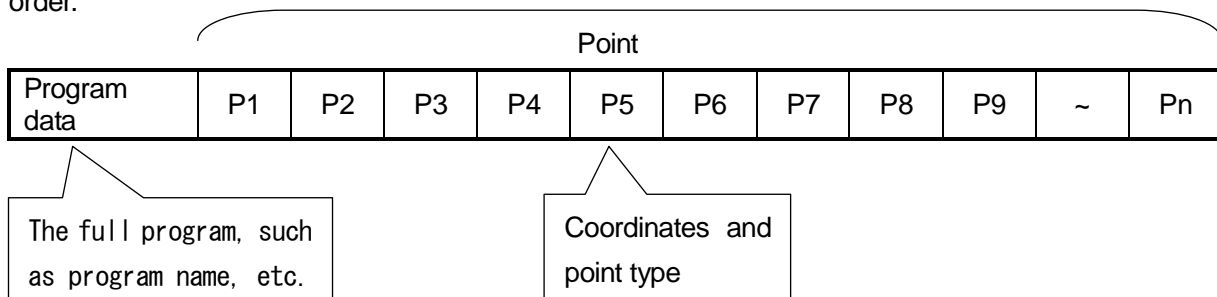
Creating an operational program, setting options and entering them into the Robot is called teaching.

(You can set and enter program data before performing point teaching.)



A program is made up of point data which is organized to form a body of program data. Point data consists of the data related to a given location, or “coordinate” as well as the “point type” which describes the method of the Robot’s movement to the next point. These form the skeleton of the program, while the point job data (the data consisting of commands to perform operations) which is set to each point adds muscle to the program.

When the Robot begins running the program, each axis moves to the point coordinates in numerical order.



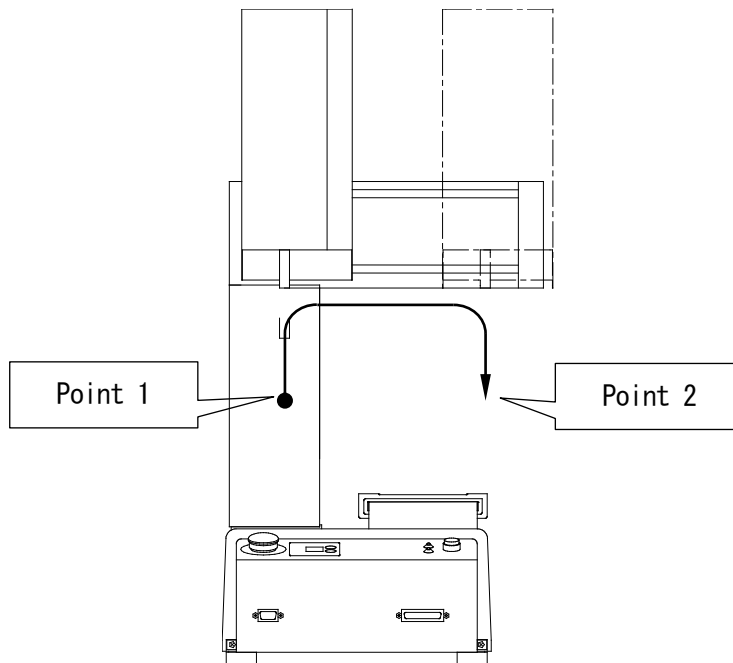
## 2. HOW TO OPERATE THE ROBOT PART 1

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This section describes how to run a simple program and operate the robot.

The first program makes the robot Axes shift between the following two points:

Point Number	Coordinates	Point Type
1	X: 20mm, Y: 80mm, Z: 30mm, R: 0deg	PTP Point
2	X: 70mm, Y: 120mm, Z: 30mm, R: 0deg	PTP Point



Each point has its respective point type, and the method of movement to the next point varies according to point type. The PTP point type, for example, describes a point which makes a PTP movement to the next point.

A PTP drive the Z axis rises vertically, then the XY axes move over the next point and the Z axis lowers onto the next point.

## 2.1 Preparation

1. Read the *Setup* operation manual thoroughly to install the robot properly and securely.  
In this example, **the teaching pendant** is connected to the robot.



### **Warning**

**Be sure to check the grounding before you use the unit.**  
Improper grounding may cause electric shock or fire.

2. Turn on the power switch at the rear of the robot.
  3. If the message [Teaching Mode] is displayed on the top line of the teaching pendant LCD, go to Step 4. If other messages are displayed, press the **MODE** key.  
Highlight [Teaching Mode] and press the **ENTR** key. Press the **CURSOR↓** and **CURSOR↑** keys to shift the highlight.
  4. Press the **F4** key on the teaching pendant.
  5. Each robot Axis will shift for mechanical initialization.  
The mechanical initialization process allows the robot to recognize its current position. It is absolutely necessary to perform initialization after turning on the power or releasing the emergency stop switch.
- In the Teaching mode, you can create programs and various settings.

When the JR-V2000 Series is in Teaching mode, there may be some vibration and excitation noise from the motor, but this is not a malfunction.

## 2.2 Teaching

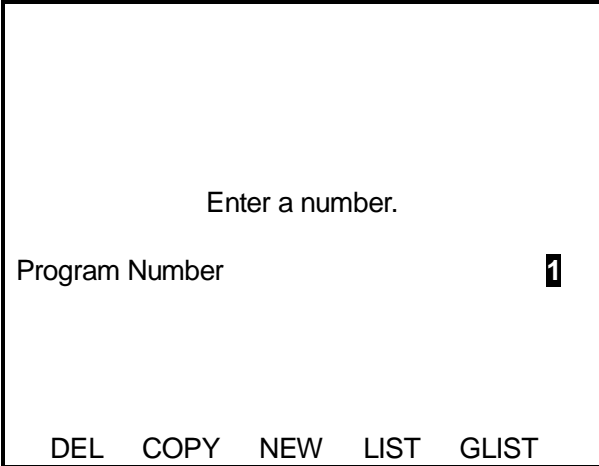
### 2.2.1 How to Select the Program Number

In this example, select the Program Number 3 (unregistered).

1. First, select a program number for teaching.

If there is no registered program, the Program Number entry screen shown to the right will appear when the teaching mode is started up.

If the Program Number entry screen does not appear even after the Teaching mode starts, press the **PRG.NO** key.



Enter a number.

Program Number **1**

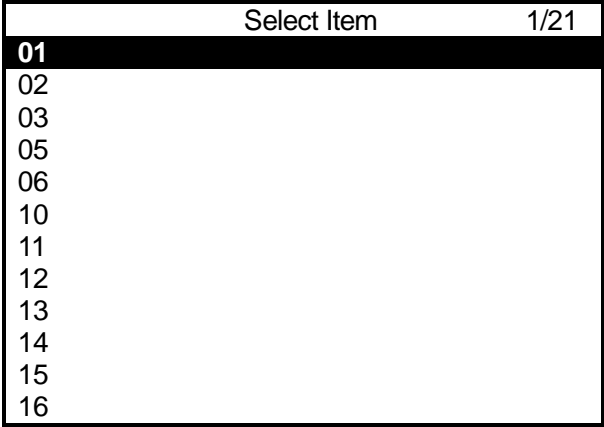
DEL COPY NEW LIST GLIST  
F0 F1 F2 F3 F4

**Program Number Entry Screen**

2. When the Program Number entry screen is displayed, press the **F2** (NEW) key. The unregistered program number list shown to the right will appear.

Press the **CURSOR↓** key twice to highlight [03] and then press the **ENTR** key.

The highlight will shift downward every time the **CURSOR↓** key is pressed.



Select Item 1/21

**01**  
02  
03  
05  
06  
10  
11  
12  
13  
14  
15  
16

**Unregistered Program Number List**

- In the operation manuals, highlighting an item and pressing the **ENTR** key is referred to as *Select*. Use the *Select* function to set an item.
- While the Program Number entry screen is displayed, press the **F3** (LIST) key. The registered program number list will appear.
- You can enter a program number for teaching directly on the Program Number entry screen.

3. After selecting the program number, the new position entry screen for Point Number 1, shown to the right, will appear.

Program 3	P1
X	0mm
Y	0mm
Z	0mm
R	0deg
FUNC	<b>JOG</b>
MDI	INIT

**New Position Entry Screen**



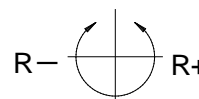
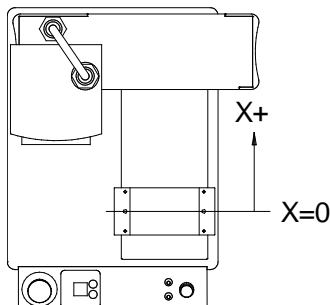
## 2.2.2 How to Enter the Point Position

- Next, enter the coordinates of the point using the JOG keys as described below.

The currently selected position entry mode ([JOG] or [MDI]) is highlighted.

If [JOG] is not highlighted, press the **F2** key to switch to the JOG mode.

### Coordinate System

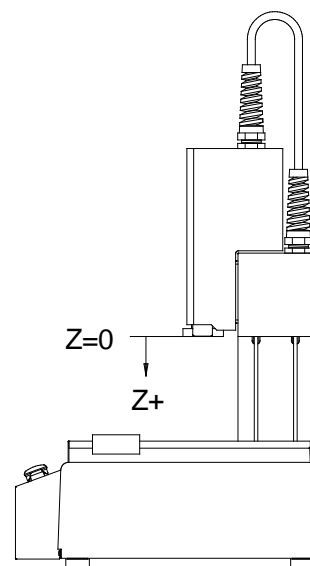
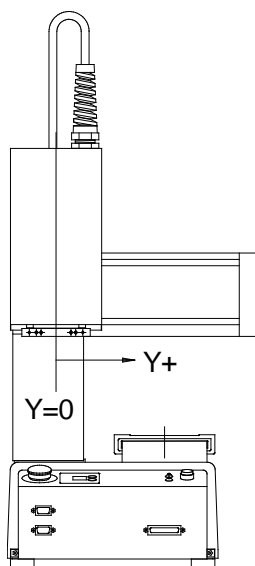


This example explains how to enter the position coordinates of Point 1.

Shift each Axis using the JOG keys to the desired position (coordinates).

The current tool center point position (coordinates) will be displayed on the LCD.

Check that the LCD displays the desired positions and press the **J.ENTR** key to set the coordinates.



Point Number	Coordinates	Point Type
1	X: 20mm, Y: 80mm, Z: 30mm, R: 0deg	PTP Point

**X↓** ..... Shifts the X-Axis in the -X direction.

**X↑** ..... Shifts the X-Axis in the +X direction.

**←Y** ..... Shifts the Y-Axis in the -Y direction.


**Y→** ..... Shifts the Y-Axis in the +Y direction.

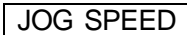
**↑Z** ..... Shifts the Z-Axis in the -Z direction.


 ..... Shifts the Z-Axis in the +Z direction.

 ..... Rotates the R-Axis in the –R direction. (4-Axis model only)

 ..... Rotates the R-Axis in the +R direction. (4-Axis model only)

- The Axis shifting distance, each time the above JOG keys are pressed, and the Axis shifting speed, when the keys are continuously pressed, can be entered in the Teaching Environment Setting menu [JOG Speed] using the numeric keys. (Press the  key in the Teaching mode to display the menu.)



 ..... Changes the shifting distance (referred to as *step*) and shifting speed of each Axis when entering positions using the JOG keys in the Teaching mode.

 ..... Enter the coordinates. The Point Type selection screen will be displayed when entering a new point. The screen will return to the point settings screen (referred to as *base condition*) when modifying the registered point.



## Caution

Always pay special attention to the robot's movement in the Teaching Mode.  
Doing so may cause injury and unit malfunction.

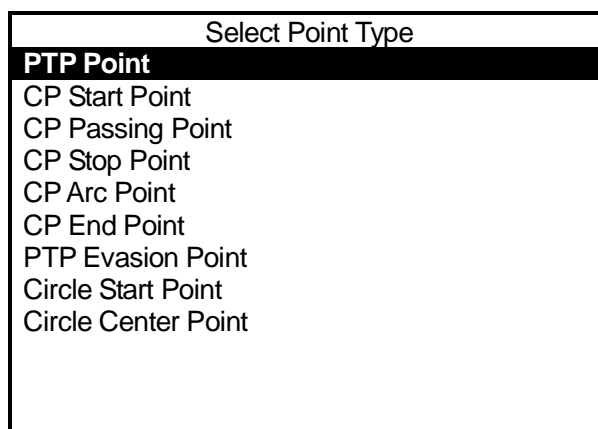
- When using a teaching pendant equipped with the optional enable switch, to move the axes it is necessary to press and hold down the enable switch while using the operation keys.  
The enable switch has three stages: “release”, “press” and “press-in”, and **the switch must be in the “press” stage in order to enable the directional keys to function and move the robot axes.** In addition, the enable switch must be pressed continually to keep the axes moving. If the enable switch is released or pushed in, as a safety measure the robot will stop moving.
- The Axis movement in the JOG mode is limited by the **move area limit**. If the Axis is not able to go over certain coordinates, check the [Move Area Limit] in the [Default Program Data] menu.
- There are two position entry modes: **JOG** and **MDI**.  
To switch between each mode, press the following keys on the position entry screen:
  - JOG mode:  key
  - MDI mode:  key

## 2.2.3 Point Type

1. After entering the coordinates, press the **J.ENTR** key.

The coordinates are fixed and the Point Type selection screen shown to the right will appear.

2. Select [PTP Point].



- Point types vary depending upon robot specifications. Accordingly, the Point Type selection screen can differ from the example in the diagram to the right.
3. After fixing the point type, the position entry screen for the next point (current point number + 1) will appear. Repeat the steps taken for registering Point 1, register Point 2 according to the following settings:

Point Number	Coordinates	Point Type
2	X: 70mm, Y: 120mm, Z: 30mm, R: 0deg	PTP Point

## 2.2.4 How to Set the Program Data

Enter the following work home position coordinates.

Point Number	Coordinates
Work Home	X: 100mm, Y: 30mm, Z: 30mm, R: 0deg

1. Register the work home position.  
The work home is the position where the Axis waits to start the next operation.

Press the  key twice on the point settings screen. (The screen shown to the right is an example of the setting screen for Point 2).

The setting screen for the work home position will appear.

Program 3			P2
X+20	Y+80	Z+30	R+0
Type			PTP Point
S.MARK E.MARK		J.EXEC P.EXEC	

On the point settings screen (base condition), pressing the  key once will display the settings screen for the previous point and pressing the  key will display the settings screen for the next point.

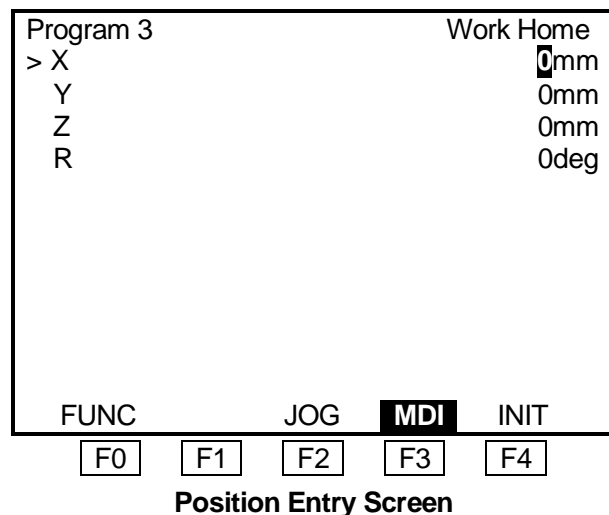
- The work home is the point directly before Point 1.

2. Select (highlight) the coordinate line on the point settings screen for the work home shown to the right.

Program 3			Work Home
X+0	Y+0	Z+0	R+0
Type			PTP Point
S.MARK E.MARK		J.EXEC P.EXEC	

**Point Settings Screen for Work Home**

3. The Position entry screen shown to the right will appear.  
In this example, enter the coordinates using the numeric keys. Select the MDI (Manual Data Input) mode.



The currently selected position entry mode ([JOG] or [MDI]) is highlighted.  
If [JOG] is highlighted, press the **F3** key.

A [>] symbol will appear next to the item to which the cursor is pointing. Enter the coordinates using the following keys. After entering all the X-, Y-, Z- and R-coordinates, press the **J.ENTR** key to set them.

**1** - **0** \_\_\_\_\_ Overwrites the figure under the cursor with the number pressed. If the cursor is hidden, the selected number will be entered as the last digit.

**.** \_\_\_\_\_ Enters a decimal point. This key is invalid if the figure already contains a decimal point or if no decimal fraction is possible.

**CLEAR** \_\_\_\_\_ Clears the entire value. The value becomes 0.

**DEL** \_\_\_\_\_ Deletes the figure or decimal point under the cursor.  
The cursor and the figure on the left side of the cursor then shift to the right. However, a decimal point cannot be deleted if the figure will exceed the entry range without the decimal point.  
If there is no cursor, the lowest figure of the decimal fraction will be deleted and the figures will shift to the right.

**F.3** \_\_\_\_\_ Each time this key is pressed, the cursor line (marked with >) will switch in the order of **X → Y → Z → R → X**.

**CURSOR↑** \_\_\_\_\_ Shifts the cursor upward.

**CURSOR↓** \_\_\_\_\_ Shifts the cursor downward.

**CURSOR←** \_\_\_\_\_ Shifts the cursor to the left.

**CURSOR→** \_\_\_\_\_ Shifts the cursor to the right.

**GO** \_\_\_\_\_ Shifts each robot Axis to the coordinates displayed on the LCD.  
(If your teaching pendant is equipped with the enable switch, press the enable switch and this key at the same time.)



### Caution

Always pay special attention to the robot's movement in the Teaching Mode.

Doing so may cause injury and unit malfunction.

**J.ENTR** \_\_\_\_\_ Sets the coordinates and returns the screen to the point settings screen.

**ESC** \_\_\_\_\_ The previous screen or the base screen is displayed by pressing this key.

- Each robot Axis will also move on the point settings screen if the **GO** key is pressed.

### Note

Be sure to save data whenever it is added or modified. **Otherwise, changes will not be saved when the power to the robot is cut off.** See "5. SAVE" on Page 36 for how to save data.

## 2.3 Program Test

After completing all the program data settings and point teaching, perform a program test.

After registering new programs or modifying registered programs, be sure to perform a point run and select [Checking Data] and [Test Run] from the Test Menu before starting an operation.

### 2.3.1 Point Run

1. Press the  key to display the settings screen for Point 1 shown to the right.

Program 3	P1			
<b>X+70</b>	<b>Y+120</b>	<b>Z+30</b>	<b>R+0</b>	
Type	PTP Point			
S.MARK	E.MARK	J.EXEC	P.EXEC	
<input type="button" value="F0"/>	<input type="button" value="F1"/>	<input type="button" value="F2"/>	<input type="button" value="F3"/>	<input type="button" value="F4"/>

**Point Settings Screen**

2. Press the  (P.EXEC) key. The robot will run the currently displayed point (Point 1) and the screen will change to the settings screen for the next point (Point 2). Press the  (P.EXEC) key to run Point 2.

Check that the position (coordinates) of the tool center point is the same as displayed in the coordinates line of the settings screen for Point 1 and Point 2.

After running Point 2 (the last point), the screen will return to the settings screen for the work home (the position the robot Axes will return to and wait for the next start instructions) or Point 1.



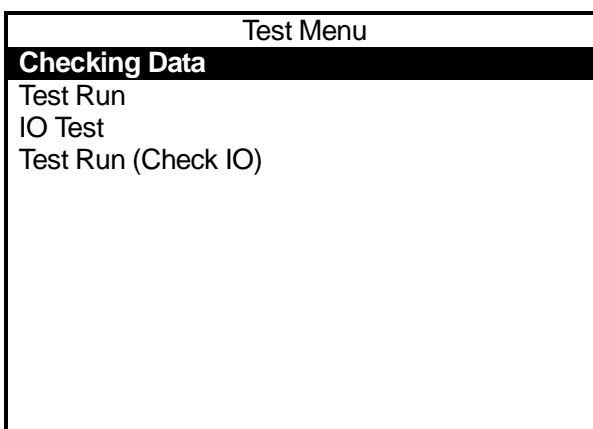
### **Caution**

Do not touch any moving parts on the robot.

Doing so may cause injury or unit malfunction.

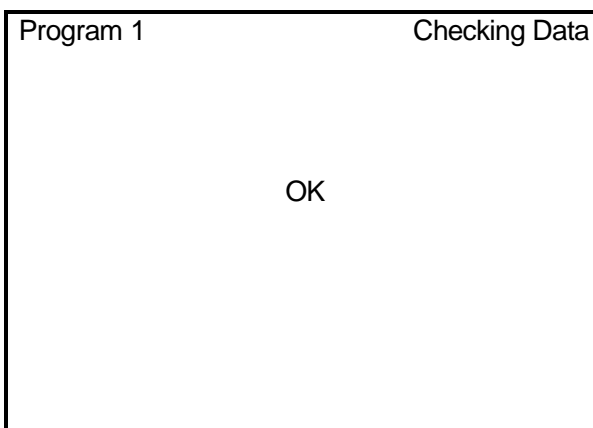
### 2.3.2 Data Check

1. Press the **MONITOR** key to display the Test Menu shown to the right.
2. Select [Checking Data].  
The shifting range and point type of the program will be checked.



3. If no error has been detected, the screen shown on the right will appear.

If any error has been detected, the error type and error point number will be displayed.



### 2.3.3 Test Run

Select [Test Run] from the Test Menu.

For your safety, the maximum speed is limited to 250mm/s in the [Test Run]; however, the robot will perform a cycle of operation in exactly the same way as an actual operation.

After registering new programs or modifying registered programs, be sure to perform a [Checking Data] procedure and a [Test Run] before starting operation.



#### **Caution**

Do not touch any moving parts on the robot.  
Doing so may cause injury or unit malfunction.



## **2.4 How to Run the Program**

Finally, run the registered program according to the following procedures:.

### **2.4.1 Changing Mode**

Press the **MODE** key to display the mode selection menu. Select [Switch Run Mode].

- External Run Mode \_\_\_\_\_ To run programs  
(Start running using a signal from the I/O-SYS or COM1)
- Switch Run Mode \_\_\_\_\_ To run programs  
(Start running by pressing the start switch)
- Teaching Mode \_\_\_\_\_ To create programs
- Customizing Mode \_\_\_\_\_ To create data that is used to compose programs
- Administration Mode \_\_\_\_\_ For administration and adjustment

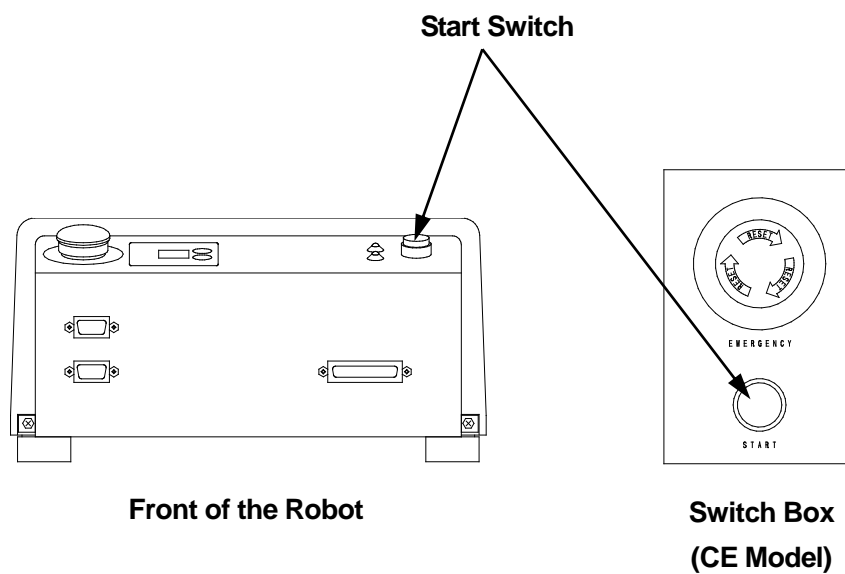
If the teaching pendant is connected, the LED corresponding to the currently activated mode will illuminate.

- E.RUN: External Run Mode
  - RUN: Switch Run Mode
  - TEACH: Teaching Mode
  - CUSTOM: Customizing Mode
  - ADMIN: Administration Mode
- If you press the **MODE** key while holding down the **SHIFT** key, the operation modes will switch in the following order:  
Switch Run Mode → External Run Mode → Teaching Mode → Switch Run Mode

## **2.4.2 Start**

Press the start switch on the front of the robot. (If you are using the CE model, the start switch is on the switch box.)

The robot will start running the program.



- Be sure to perform a test run before running a new program.
- If the start switch is pressed while the program is running, the robot will stop when shifting to the PTP drive. To restart the robot, press the start switch again. Depending on the [Run Mode Parameter] settings, if [#sysIn1] in the [IO-SYS Function Assignment] menu is set to [Start], the robot will not stop if the start switch is pressed.
- In the External Run mode, turn ON [#sysIn01] on the I/O-SYS to start the program.
- The switch box is not included with the JR-V2000 Series.



### **Caution**

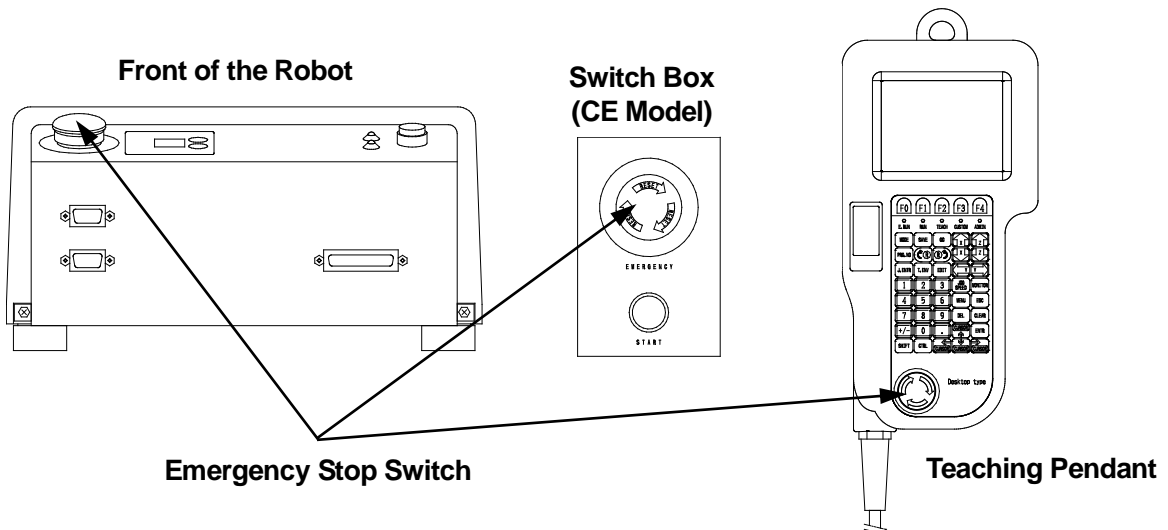
Do not touch any moving parts on the robot.  
Doing so may cause injury or unit malfunction.

### **2.4.3 Emergency Stop**

Use the emergency stop switch to stop the robot immediately if any accident occurs during operation. Power to the motor will be turned off and the robot will stop running if you press any of the switches indicated below:

- The emergency stop switch on the robot
- The emergency stop switch on the switch box (for the CE models)
- The emergency stop switch on the teaching pendant (option: See the picture below)

To release the emergency stop, depress the emergency stop switch and turn it clockwise. After mechanical initialization, the robot will stand by to run.



- The teaching pendant emergency stop switch is optional.
- The emergency stop switch on the teaching pendant and the switch box are not included with the JR-V2000 Series.

## USEFUL KEY FUNCTIONS

- Press the **SHIFT** key and one of the JOG keys at the same time when entering positions using the JOG keys (JOG mode). The robot Axis corresponding to the JOG key will move at a high speed.
- Press the **EDIT** key on the point settings screen or new position entry screen. You can edit (insert or delete) points. You can also delete, move, or copy a set of designated points (point block).
- Press the **GO** key on the point settings screen or when entering positions using the numeric keys (MDI mode). Each robot Arm will move to the coordinates displayed on the LCD if the current tool center position (coordinates) does not match the coordinates displayed on the LCD.
- Press the **F3** (J.EXEC) key on the point settings screen. The robot will perform the point job set to the current point.
- Press the **F4** (P.EXEC) key on the point settings screen. The robot will **run** the current point (move each Axis and perform any point job and additional function set at the point) and then the screen will change to the settings screen for the next point.
- Press the **CURSOR ←** or **CURSOR →** key on the point settings screen. The screen will change to the settings screen for the previous or next point, respectively.



### Caution

Always pay special attention to the robot's movement in the Teaching Mode.  
Doing so may cause injury and unit malfunction.

# 3. HOW TO OPERATE THE ROBOT PART 2

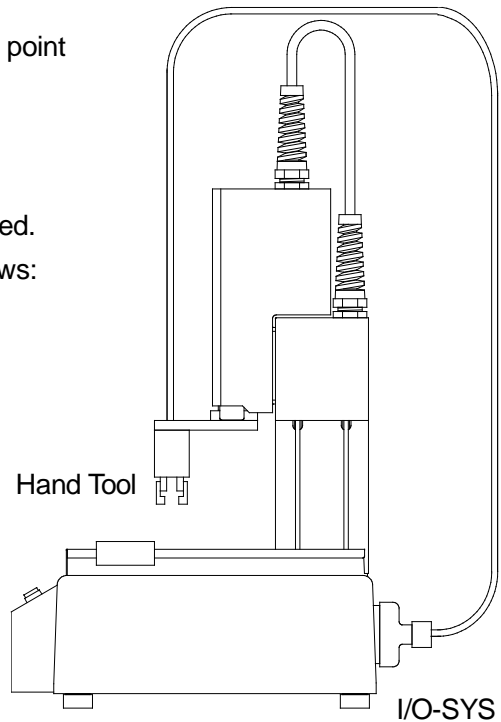
This chapter explains how to change the [PTP Condition] registered in the previous chapter “2. HOW TO OPERATE THE ROBOT PART 1” and perform the changed point job at a job point.

The [PTP Condition] is one of the program data items. It affects the shifting conditions in the PTP drive (e.g. speed) in a program.

The [Point Job Data] for a certain point is not entered directly. The data is registered individually and is selected from the point job number list on the point settings screen. You can select the same [Point Job Data] at multiple points and programs.

Register the point job data and then set the numbers for point jobs set to each point.

In this example, a pick and place operation will be performed. Settings for the hand tool attached to the robot are as follows:



I/O-1	
Output	
#sysOut15	#sysOut16
ON Pulse	—
Output	
#sysOut15	#sysOut16
—	ON Pulse

→ Pick

→ Place

And then →

And then →

I/O-1	
Input	
#sysIn15	#sysIn16
ON	OFF
Input	
#sysIn15	#sysIn16
OFF	ON

### **3.1 Preparation**

Start the robot in the Teaching mode according to “2.1 Preparation” on Page 3.

If the program displayed on the screen is different from the one that you created in the previous chapter (“2. HOW TO OPERATE THE ROBOT PART 1”), press the **PRG.NO** key and enter the program number that you created.

### **3.2 How to Set the Program Data**

Program data is used to control programs. In this example, set [PTP Speed] in the [PTP Condition] to 20%.

The speed of the tool center point will be 20% of the maximum speed when shifting between points.

1. To change the [PTP Speed] in the [PTP Condition] menu, press the **MENU** key.  
The Teaching Mode Menu shown to the right will appear.  
Select [Program Data Settings].

Teaching Mode Menu
<b>Program Data Settings</b>
Additional Function Data
Point Job Settings
Sequencer Settings
Run Mode Parameter
Teaching Data Copy, Delete, Conversion

- Depending on the settings in the Customizing mode, the Teaching Mode Menu items may be different from the above screen.

2. The Program Data Settings menu shown to the right will appear.  
Select [PTP Condition].

Program 3	
Program Name	
Work Home	
Job on Start of Cycle	0
Cycle Mode	1 Cycle Playback
PTP Condition	
CP Condition	
Tool Data	
Move Area Limit	
Position Data Type	Absolute

3. The PTP Condition settings screen shown to the right will appear.  
Select [PTP Speed].

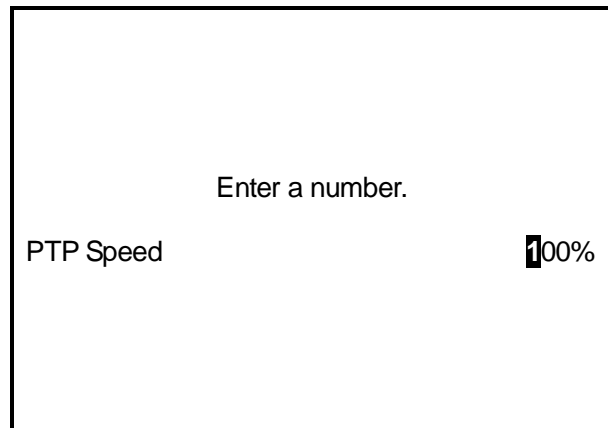
Program 3		PTP Condition
PTP Speed		100%
R-Axis Rotate Speed		100%
R-Axis Acceleration		100%
		Relative Mode
Z Move Height		100mm
Z Up Distance		100mm
Z Down Distance		100mm

- Depending on the settings, some menu items on the PTP Condition settings screen will be changed according to the following pattern:
  - [Relative Mode] → [Absolute Mode]
  - [Z Move Height] → [Horizontal Move Pos'n]
  - [Z Up Distance] → [Start Horizontal]
  - [Z Down Distance] → [Start Down Pos'n]

For example, changing [Absolute Mode] to [Relative Mode] will change the other three items automatically.

- The items “R-Axis Rotate Speed” and “R-Axis Acceleration” are not available in 3-Axis specification models or in the JR-V2000 Series.

4. After selecting [PTP Speed], the entry screen shown to the right will appear.  
Press the , , and  keys to enter 20%.  
Press the  key to set it.  
The screen will return to the PTP Condition settings screen.



- The recommended PTP speed setting is 20%. You can increase the speed after checking the actual operation.



### 3.3 Teaching: Point Job Data

In this example, set the following point jobs to the unregistered point job data (numbers 5 and 6).

- Point Job Number 5 (Pick: The job will be completed after outputting an ON pulse to sysOut15 and confirming the inputs of sysIn15 and sysIn16.)

Output ON pulse to sysOut15. (0.1sec)  
Wait (until the following condition is met.)  
    sysIn15 ON has been input.    ]  
    sysIn16 OFF has been input.    ] Condition  
End

Point Job 5
<b>001 pulse #sysOut15, 100</b>
002 waitCond
003    ld #sysIn15
004    ani #sysIn16
005 endWait
006

- Point Job Number 6 (Place: The job will be completed after outputting an ON pulse to sysOut16 and confirming the inputs of sysIn16 and sysIn15.)

Output ON pulse to sysOut16. (0.1sec)  
Wait (until the following condition is met.)  
    sysIn16 ON has been input.    ]  
    sysIn15 OFF has been input.    ] Condition  
End

Point Job 6
<b>001 pulse #sysOut16, 100</b>
002 waitCond
003    ld #sysIn16
004    ani #sysIn15
005 endWait
006

### **3.3.1 How to Select the Point Job Data Number**

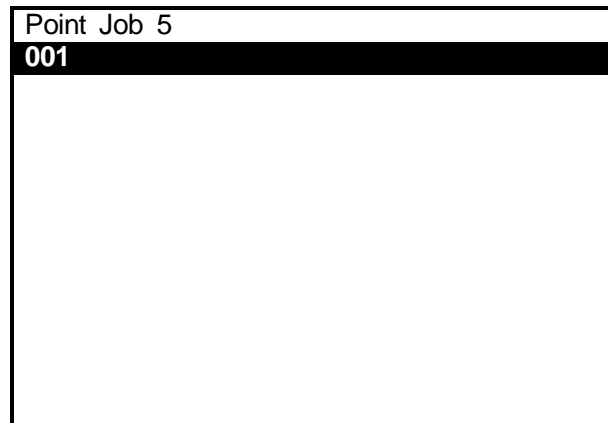
1. Press the **SHIFT** + **ESC** keys to display the base screen (point settings screen).
2. Press the **MENU** key to display the Teaching Mode Menu and then select [Point Job Settings].  
(Depending on the settings in the Customizing mode, the [Point Job Settings] might not be displayed on the Teaching Mode menu.)
3. The Point Job Number entry screen will appear. Press the **F2** (NEW) key.
4. The unregistered point job number list will appear. In this example, select the point job number 5 first.  
(To display the registered point job number list, press the **F3** (LIST) key.)

### **3.3.2 Output Command**

Enter a command in order to output an ON pulse (0.1 sec) to [#sysOut15].

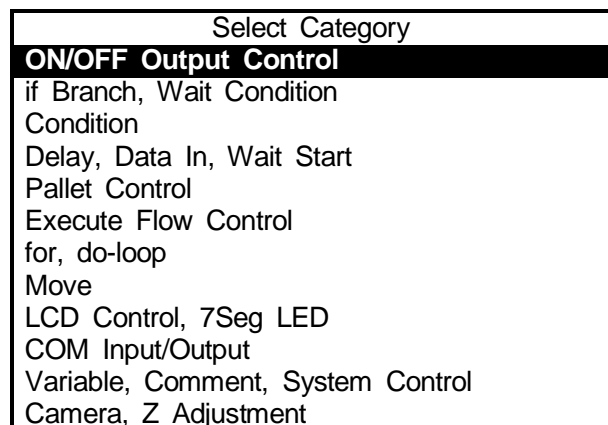
1. After entering or selecting the point job number, the Point Job settings screen shown to the right will appear.  
[001] is a command number.

Select [001].



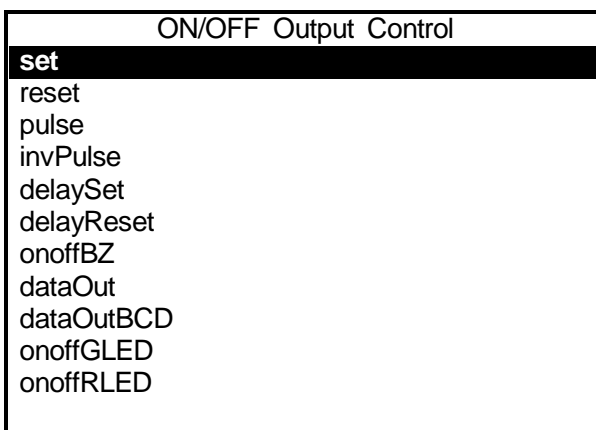
2. After selecting the command number, the Point Job Command Category shown to the right will appear.

Select [ON/OFF Output Control].



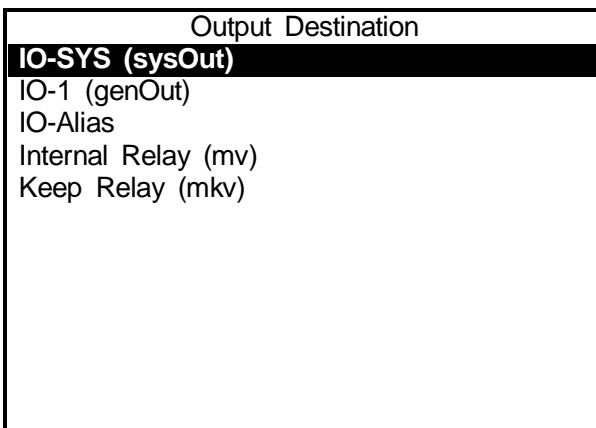
3. After selecting the command category, the Command selection screen shown to the right will appear.

Select [pulse].



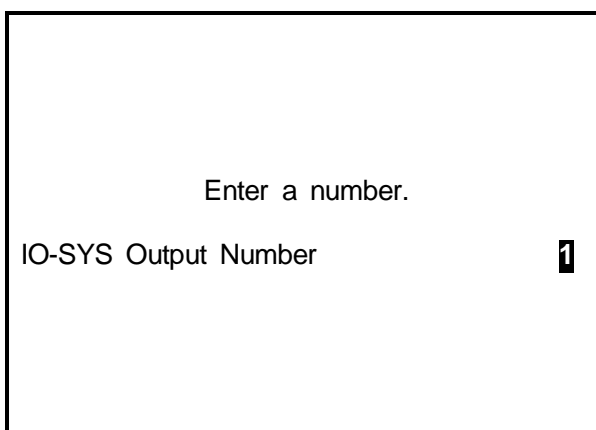
4. After selecting the point job command, the Parameter (Output Destination in this example) selection screen shown to the right will appear.

Select [IO-SYS (sysOut)].



5. After selecting the output destination, the Output Number entry screen shown to the right will appear.

Enter 15.



- A pulse command requires two parameters (output destination and pulse width). After entering the output number, the Pulse Width entry screen shown to the right will appear.

Enter 100. (0.1sec = 100msec)

Enter a number.

Pulse Width 1msec

### **3.3.3 Wait Condition Command**

Enter the wait condition command [waitCond]. The robot will wait until the condition between this command and the [endWait] command is met.

- After entering all the necessary parameters, the screen will return to the Point Job settings screen shown to the right. The command set to the Command Number 001 will be displayed.

Select Command Number 002.

Point Job 5

001 pulse #sysOut15, 100

**002**

- Selecting the command number will display the Point Job Command Category selection screen.

Select [if Branch, Wait Condition].

if Branch, Wait Condition

**If**

Then

Else

EndIf

WaitCondTime

timeUp

endWait

waitCond

- After selecting the command category, the Command selection screen shown to the right will appear.

Select [waitCond].

This command requires no parameters.

The screen will return to the Point Job settings screen.

### **3.3.4 Condition Command**

Enter a condition command.

1. Select Command Number 003.
2. Select [Condition] from the Point Job Command Category selection screen.
3. Select [Id] from the Command selection screen shown to the right.

Condition
<b>Id</b>
Idi
and
ani
or
ori
anb
orb

4. After selecting the point job command, the Parameter (Input Source in this example) selection screen shown to the right will appear.

Select [IO-SYS (sysIn)].

5. After selecting [IO-SYS (sysIn)], the Input Source Number entry screen will appear.

Input Source
<b>IO-SYS (sysIn)</b>
IO-1 (genIn)
IO-SYS (sysOut)
IO-1 (genOut)
IO-Alias
System Flag (sysFlag)
Internal Relay (mv)
Keep Relay (mkv)
Sequencer Timer (seqT)
Sequencer Counter (seqC)
Pallet (palletFlag)
Expression

Enter 15.

The screen will return to the Point Job settings screen.

6. Select Command Number 004 from the Point Job settings screen. Repeat the above Steps 2 – 5 to register the following settings:

- Point Job Command Category: [Condition]
- Point Job Command: [ani]
- Parameter Selection: [IO-SYS (sysIn)] and Number 16

Enter an end command [endWait] to terminate a wait condition.

Select Command Number 005.

Select [if Branch, Wait Condition] from the Point Job Command Category selection screen and then select [endWait] from the Command selection screen.

If the screen display is as shown to the right, the point job data teaching for Point Job Number 5 is completed.

```
Point Job 5
001 pulse #sysOut15,100
002 waitCond
003   Id #sysIn15
004   ani #sysIn16
005 endWait
006
```

Press the  key.

The screen will return to the Teaching Mode Menu.

After registering Point Job Number 5, register Point Job Number 6 according to the steps taken for registering the Point Job Number 5.

If the screen display is as shown to the right, the point job data teaching for Point Job Number 6 is completed.

```
Point Job 6
001 pulse #sysOut16,100
002 waitCond
003   Id #sysIn16
004   ani #sysIn15
005 endWait
006
```

Press the  key.

The screen will return to the Teaching Mode Menu.

### 3.4 How to Modify the Point Data

In this example, change the point job number created in the previous chapter “2. HOW TO OPERATE THE ROBOT PART 1” to the point job number created in the previous section “3.3 Teaching: Point Job Data”.

Point Number	Point Job Number
1	5
2	6

1. Press the **SHIFT** + **ESC** keys.  
The point settings screen will appear.  
If the settings screen is not for Point 1, press the **CURSOR→** or **CURSOR←** key to get to the settings screen for Point 1. Then press the **CURSOR↓** key twice to shift the highlight to a blank line under [Type]. The settable point job data or additional function data to the point will be displayed as shown to the right.

Program 3			P1 1/2
X+70	Y+120	Z+30	R+0
Type			PTP Point
Condition Number			
Job before Moving			
Job while Moving			
Point Job Number			
PTP Condition Number			
Tool Data Number			
Pallet Routine Number			
Work Adjustment Number			
Execute Condition Number			
S.MARK	E.MARK	J.EXEC	P.EXEC

2. Select [Point Job Number] from the settings screen.  
The Point Job Number entry screen shown to the right will appear.  
Enter the point job number that you want to set (in this example, enter 5) and press the **ENTR** key.  
The screen will return to the point settings screen.

Enter a number.

Point Job Number **1**

DEL    COPY    NEW    LIST    VIEW

**F0**    **F1**    **F2**    **F3**    **F4**

- On the Point Job Number entry screen, press the **F2** (NEW) key to display the unregistered point job data list. To display the registered point job data list, press the **F3** (LIST) key.  
Press the **F4** (VIEW) key to display the settings screen for the currently displayed point job data.  
If you press the **F0** (DEL) key, the point job data for which the number is displayed on the screen will be deleted. If you press the **F1** (COPY) key, the point job data for which the number is displayed on the screen will be copied to another point job number.

3. Display the settings screen for Point 2 and change the point job number to 6 according to the procedures taken for Point 1.

The point data modification is now completed.

### **3.5 Program Test and Test Run**

After registering all the points, perform the point run and then select [Checking Data] and [Test Run] from the Test Menu according to the procedures described in “2.3 Program Test” on Pages 12 – 13.

After the program test, run the program according to the procedures described in “2.4 How to Run the Program” on Page 14.



#### **Caution**

Do not touch any moving parts on the robot.

Doing so may cause injury or unit malfunction.



# Instruction Manuals Helpful for Teaching

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## Basic Instructions

Explains all of the Robot's parts and emergency stop procedures, etc. Explains the basic things users need to know about their Robot.

## Teaching Pendant Operation

Explains how to use the Teaching Pendant.

## Features I

Explains the point job data and point assignment data used for setting points.

## Features II

Explains the variables, functions and commands used in point job data.

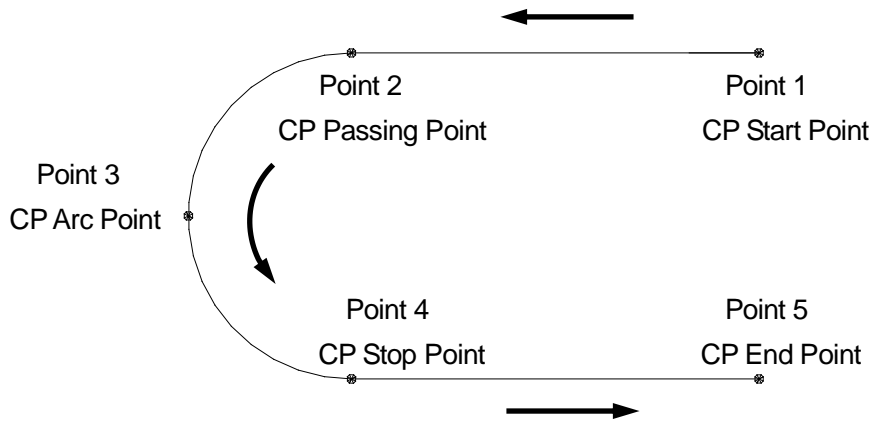
## Features III

Explains the robot settings used when running a program.

# 4. HOW TO OPERATE THE ROBOT PART 3

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This chapter explains how to register a program which is activated in CP drive.  
The program contains the following five points:



## 4.1 Program Number Selection

In this example, register Program Number 04 (unregistered). Select Program Number 04 according to the procedures described in the “2.2.1 How to Select the Program Number” on Page 4.

## 4.2 Program Data Settings

Enter the work home and then name the program.

First, enter the following work home coordinates according to the procedures described in the “2.2.4 How to Set the Program Data” on Page 9.

Point Number	Coordinates
Work Home	X: 20mm, Y: 20mm, Z: 30mm, R: 0deg

Then name the program.

1. Select [Program Name] from the Program Data Settings Menu shown to the right.

The character entry screen shown below will appear.

Program 4	
Program Name	
Job on Start of Cycle	0
Work Home	
Cycle Mode	1 Cycle Playback
PTP Condition	
CP Condition	
Tool Data	
Move Area Limit	
Position Data Type	Absolute

Character string display line



2. Enter characters using the keys as indicated.

After entering the name, press the **ENTR** key to exit the character entry.

The entered character string will be set as a program name and then the screen will return to the Program Data Settings menu.

Program 4		Program Name
[ ]		
[1]	[2]ABC	[3]DEF
[4]GHI	[5]JKL	[6]MNO
[7]PQRS	[8]TUV	[9]WXYZ
[-]	[0]SPACE	[.]_ <b>A</b>

**Example of the Character Entry Screen**

**[0] - [9] [+/-] [.]** \_\_\_\_\_ The corresponding characters will be entered according to the character assignment list on the screen.

In the example above, if you press the **[2]** key once, the letter A will be entered. If you press the key twice, the letter B will be entered.

If you want to enter the letters AB, enter the letter A first and press the **CURSOR→** key to shift the cursor to the right, and then enter B.

A key to which no character is assigned, like [1] above, is invalid.

**ESC** \_\_\_\_\_ Returns to the previous screen (without registering the character string).

**ENTR** \_\_\_\_\_ Press this key to end the character string entry and registration.

You cannot register a name if the number of characters entered exceeds the limit. Additionally, you cannot register a name which includes any unusable characters.

**F4** \_\_\_\_\_ Each time this key is pressed, the type of character assignment will change in this order:

**Roman capital letters → Roman small letters → numbers → symbols → Roman capital letters**

**SHIFT** + **F4** \_\_\_\_\_ Each time these keys are pressed at the same time, the type of character assignment will change in the reverse order:

**Roman capital letters → symbols → numbers → Roman small letters → Roman capital letters**

**CURSOR↑** \_\_\_\_\_ Shifts the cursor upward (in the character string).

**CURSOR↓** \_\_\_\_\_ Shifts the cursor downward (in the character string).

**CURSOR←** \_\_\_\_\_ Shifts the cursor to the left (in the character string).

**CURSOR→** \_\_\_\_\_ Shifts the cursor to the right (in the character string).

**SHIFT** + **CURSOR↑** \_\_\_\_\_ Shifts the cursor to the uppermost line.

**SHIFT** + **CURSOR↓** \_\_\_\_\_ Shifts the cursor to the lowermost line.

**SHIFT** + **CURSOR←** \_\_\_\_\_ Shifts the cursor to the top of the character string.

**SHIFT** + **CURSOR→** \_\_\_\_\_ Shifts the cursor to the end of the character string.

**DEL** \_\_\_\_\_ Deletes a character under the cursor. If the cursor is at the far right of the character string, the last character will be deleted.

**CLEAR** \_\_\_\_\_ Clears the entire character string.

- You can use 40 – 120 characters in combination to name the program. (Up to 120 characters can be entered when using the teaching pendant. When using a PC, the maximum number of characters will be 40, depending on the character type (e.g. Chinese characters).)

Up to 36 characters\* will be displayed on the registered program list and up to 40 characters\* (the maximum number of characters per line) will be displayed on the screen in the Ext. Run and Switch Run modes. The rest of the characters will be omitted.

(\*: Characters can be entered using the teaching pendant)

## 4.3 Point Data Entry

### 4.3.1 Point Position Entry

Enter the coordinates for Point 1.

Point Number	Coordinates	Point Type	Line Speed (mm/s)
1	X: 120mm, Y: 150mm, Z: 30mm, R: 0deg	CP Start Point	40

### 4.3.2 Point Type

After entering the coordinates, press the **ENTR** key to set it.

The Point Type selection screen shown to the right will appear.

Select the point type ([CP Start Point] in this example).

Select Point Type
<b>PTP Point</b>
CP Start Point
CP Passing Point
CP Stop Point
CP Arc Point
CP End Point
PTP Evasion Point
Circle Start Point
Circle Center Point

### 4.3.3 Line Speed

If the selected point type is either the [CP Start Point], [CP Passing Point], [CP Stop Point], or the [CP Arc Point], the Line Speed entry screen shown to the right will appear after the point job number has been set.

In this example, press the **CLEAR**, **4**, and **0** keys to enter 40.

Press the **ENTR** key to set the number.

Enter a number.
Line Speed <b>10</b> mm/s

- If you select a point type to go to the next point when using the CP drive, you need to enter the [Line Speed].

If you select a point type to shift to the next point in the PTP drive, the Line Speed entry screen will not appear. The position entry screen for the next point (current point number + 1) will appear instead.

After setting the line speed, the position entry screen for the next point (current point number + 1) will appear.

Repeat the steps taken to register Point 1, and register Points 2 – 5 according to the following settings:

Point Number	Coordinates	Point Type	Line Speed (mm/s)
2	X: 120mm, Y: 80mm, Z: 30mm, R: 0deg	CP Passing Point	40
3	X: 90mm, Y: 50mm, Z: 30mm, R: 0deg	CP Arc Point	40
4	X: 60mm, Y: 80mm, Z: 30mm, R: 0deg	CP Stop Point	40
5	X: 60mm, Y: 150mm, Z: 30mm, R: 0deg	CP End Point	–

#### **4.4 Program Test and Test Run**

After registering all the points, perform the point run and then select [Checking Data] and [Test Run] from the Test Menu according to the procedures described in “2.3 Program Test” on Pages 12 – 13.

After the program test, run the program according to the procedures described in “2.4 How to Run the Program” on Page 14.

- If the selected point is a CP start point, the robot will run a program from the CP start point through the CP end point, without stopping at the CP passing point or the CP arc point. (See “Point Run” on Page 40 of the *Teaching Pendant Operation* manual) In the example illustrated in this chapter, the robot runs from Point 1 (CP start point) to Point 5 (CP end point) without stopping. Note that the screen will not change.

Additionally, note that the test run is invalid for the CP middle points (CP passing point, CP stop point, and CP arc point) since the robot cannot start from these points.



### **Caution**

Do not touch any moving parts on the robot.  
Doing so may cause injury or unit malfunction.

## 5. SAVE

---

Save the registered program and point job data.

When saving data, save the teaching data along with the customizing data. This unit of saved data is referred to as *C & T data*.

The C & T data is stored in the robot temporarily; however, **it will be deleted automatically when the power to the robot is turned off**. Be sure to save whenever the teaching data and customizing data has been modified.

Press the  +  keys to display the base screen. (The point settings screen is shown to the right as an example of the base screen).

Press the  key.

Program 4	P5		
X+60	Y+150	Z+30	R+0
Type	CP End Point		
S.MARK	E.MARK	J.EXEC	P.EXEC

**Example of the Base Screen**

- To back up the data, send the C & T data from the robot to a PC using the PC software JR C-Points or JR C-Points Limited Edition.
- If you are using a PC for a teaching operation, send the data from the PC to the robot using the PC software JR C-Points or JR C-Points Limited Edition. The data sent from the PC will be stored in the robot automatically.

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27 November 2011

**\*ORIGINAL\***