LOCTITE

EQUIPMENT OPERATION MANUAL

Cartesian 200, 300, 400 and 500 Series

Quick Start

Thank you for purchasing a Loctite® Robot.

*Read this manual thoroughly in order to properly use this robot.
 Be sure to read "For Your Safety" before you use the robot. It will protect
 you from possible dangers during operation.
*After having read this manual, keep it in a handy place so that you or the
 operator can refer to it whenever necessary.

FOR YOUR SAFETY

Safety Precautions

The precautions stated 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 to understand what each symbol stands for.

Symbols indicating the Degree of Damage or Danger

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

⚠ **Warnings**	These "Warnings" indicate the possibility of death or serious injury.
⚠ **Cautions**	These "Cautions" indicate the possibility of accidental injury or damage to property.

Symbols indicating the type of Danger and Preventive Measures

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

	Indicates the type of safety measure that should be taken.
⚠	Take care. (General caution)
⊘	Indicates prohibition.
⊘	Never do this. (general prohibition)
⊘	Do not disassemble, modify or repair.
⊘	Do not touch. (contact prohibition)
●	Indicates necessity
❗	Be sure to follow instructions.
⬚	Be sure to unplug power supply from wall outlet.
⏚	Be sure to check grounding.

FOR YOUR SAFETY

⚠ Warnings

Be sure to check grounding.
Improper grounding can cause electric shock or fire.

Be sure to use within the voltage range indicated on the unit.
Failure to do so may cause electric shock or fire.

Plug the power cord into the wall outlet firmly.
Failure to do so can cause the input to heat up and may result in fire.
Make sure that the power plug is clean.

Be sure to unplug the power cord from the wall outlet when you examine or grease the machine.
Failure to do so may cause electric shock or fire.

Stop operation and unplug immediately whenever you sense any abnormalities, such as a pungent odor. Immediately contact the dealer from which you purchased the product.
Continued operation may result in electric shock, fire or malfunction.

Install the product in a place which can endure it's weight and conditions while running.
Be sure to leave a space greater than 30cm between the back of the robot (equipped with a cooling fan) and the wall.   Installation in an insufficient or unstable place can cause the unit to fall, overturn, breakdown, or overheat.

Be sure to take protective measures such as installing an area sensor or enclosure to avoid injury.
Entering the robot's work range during operation could lead to injury.

Do not attempt to disassemble or modify the machine.
Disassembly or modification may cause electric shocks, fire or malfunction.

FOR YOUR SAFETY

⚠ Warnings

🚫	**Use the machine indoors where no flammable or corrosive gas is present. Emission and accumulation of such gasses could lead to fire.** IP Protection Rating is "IP30." ("IP40" for CE specification)
🔌	Be sure to unplug the power cord from the wall outlet if the robot will remain unused for long periods of time. Gathered dust could lead to fire.
❗	**Be sure to use power in the proper voltage range.** Failure to do so may result in fire or malfunction.
🚫	**Keep the unit and the power cables away from water and oil.** Failure to do so may result in electric shock or fire.
❗	**Turn off the unit before inserting and removing cables.** Failure to do so may result in electric shock, fire, or malfunction of the unit. IP Protection Rating is "IP30." ("IP40" for CE specification)
❗	**Keep the emergency stop switch within reach of an operator while teaching and running the robot.** Failure to do so may lead to danger since the robot cannot be stopped 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 lead to danger since the robot cannot be stopped immediately and safely.

FOR YOUR SAFETY

⚠ Cautions

Be sure to check grounding.
Improper grounding may cause malfunction or defect.

Use the Benchtop Robot in an environment between 0 to 40 degrees centigrade with a humidity of 20 to 95 percent without condensation.
Failure to do so may result in malfunction.
IP Protection Rating is "IP30." ("IP40" for CE specification)

Use the machine in an environment where no electric noise is present.
Failure to do so may result in malfunction or defect.

Use the machine in an environment where it is not exposed to direct sunlight. Failure to do so may result in malfunction or defect.

Be sure to confirm that tools such as the electric screwdriver unit, etc. are properly connected.
Failure to do so may result in injury or defect.

Check the mounting screws regularly so that they are always firmly tightened.
Loose screws may cause injury or defect.

Be sure to check the wiring to the main unit.
Improper wiring may cause malfunction or defect.

Be sure to secure the movable parts of the robot before transportation.
Failure to do so may result in defect or injury.

Do not bump or jar the machine while it is being transported or installed.
This can cause defects.

PREFACE

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

The operation manual consists of the following volumes.

Setup	This volume explains how to set up the robot. **You must read this volume before you operate the robot.**
Maintenance	This volume explains how to maintain the robot.
Basic Instructions	This volume provides safety precautions, part names, and the basic knowledge necessary to operate the Benchtop Series. **You must read this volume before you operate the robot.**
Dispensing	This volume explains dispensing applications for the Benchtop Series robot.
Quick Start	This volume explains the actual operation of the Benchtop Series with simple running samples.
Teaching Pendant Operation	This volume explains how to operate the robot via the teaching pendant.
PC Operation	This volume explains how to operate the robot from a computer (LR C-Points.)
Features I	This volume explains point teaching.
Features II	This volume explains commands, variables, and functions.
Specifications	This volume provides comprehensive specifications, including mechanical or electrical requirements.

Please be sure to follow the instructions described in these volumes. Proper use of the robot will ensure continued functionality and high performance.

The contents described in this volume are based on the standard application. Menu items may vary depending on models.

BE SURE TO MAKE A PROPER GROUNDING WHEN YOU INSTALL THE ROBOT.

Be sure to save data whenever it is added or modified.
Otherwise, changes will not be saved if the power to the robot is cut off.

CONTENTS

Quick Start

1. OPERATION PROCESS

To run the robot, certain operations such as teaching are necessary.

The running procedure is as follows:

- You can execute "Program Data Setting/Entry" before "Point Teaching."

```
┌─────────────────────────────┐
│     Start up preparation     │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Program number selection   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│     Point coordinates entry   │
│      Point type selection     │
│       (Line speed entry)      │
└─────────────────────────────┘
           Repeat as many times as
           there are points.
              │
              ▼
┌─────────────────────────────┐
│   Program data setting/entry  │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│            Test              │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│           Running            │
└─────────────────────────────┘
```

Point Teaching

Teaching
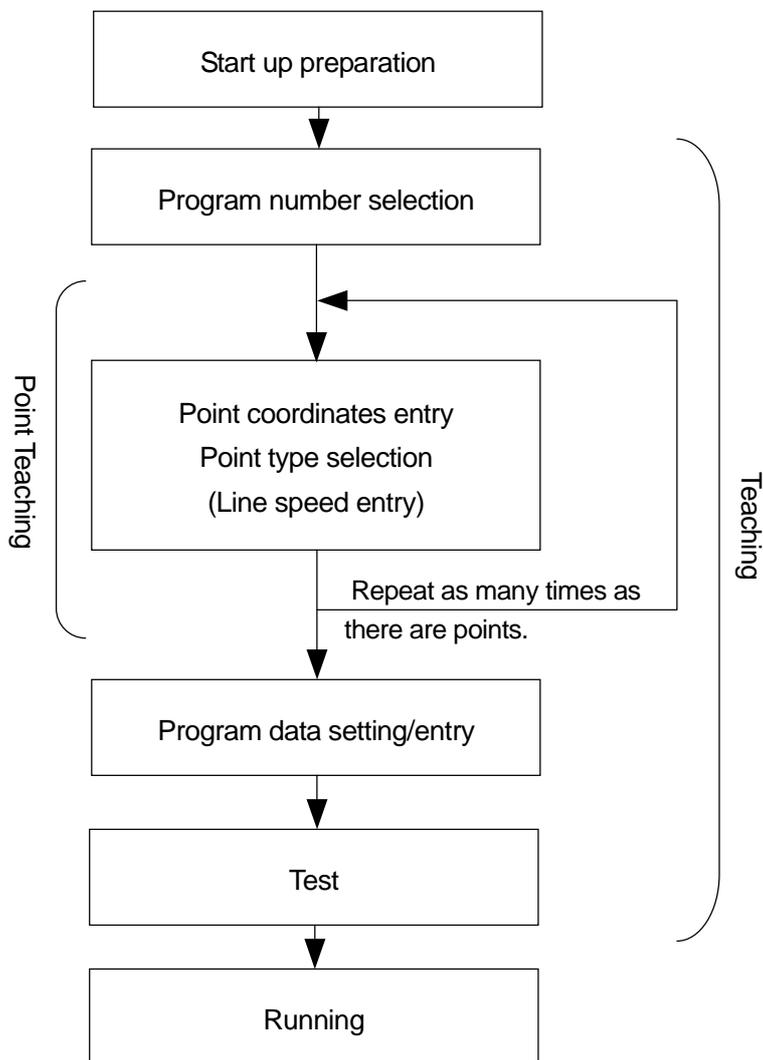
2. HOW TO OPERATE BENCHTOP ROBOT (1)

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

The first program makes the tool unit shift between the following two points.

[Point Number]	[Coordinates]	[Point Type]
0001	X: 70 mm, Y: 120 mm, Z: 80 mm, R: 0 deg	PTP Point
0002	X: 20 mm, Y: 80 mm, Z: 80 mm, R: 0 deg	PTP Point

2.1 Preparation

1) Read the instruction manual "Set-up and Maintenance" thoroughly to install the robot properly and securely.
In this example, the <u>teaching pendant</u> is connected to the body.

> ⚠ **Warning**   Confirm if the unit is properly grounded to avoid possible electric shock.

2) Turn the power switch on the body ON.

3) If the words "Teaching Mode" appear on the top line of the teaching pendant LCD, follow procedure 4).
If any other word appears, press the ⬚ MODE ⬚ key.
Highlight "Teaching Mode" and press the ⬚ ENTR ⬚ key. To shift the highlight, press the ⬚ CURSOR ⬚ /⬚ CURSOR ⬚ keys.

4) Press ⬚ F. 4 ⬚ on the teaching pendant.

5) The robot's arm shifts and the mechanical initialization is executed.

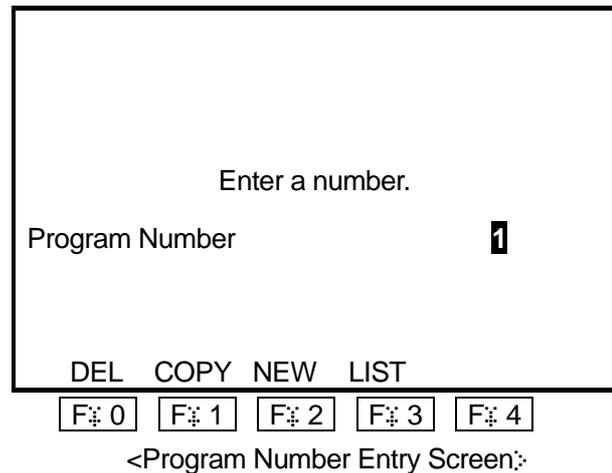In [Teaching Mode], you can create programs and various settings.

2.2 Teaching

2.2.1 Program Number Selection

In this example, select the Program Number 3 (un-entered.)

1） First, select a program number for teaching.

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

If the Program Number entry screen does not appear even after starting up the teaching mode, press the PRG.NO key.

```
┌─────────────────────────────────┐
│                                 │
│                                 │
│                                 │
│        Enter a number.          │
│                                 │
│  Program Number            1    │
│                                 │
│                                 │
│   DEL   COPY  NEW    LIST       │
└─────────────────────────────────┘
   F:0    F:1    F:2    F:3    F:4
       <Program Number Entry Screen>
```
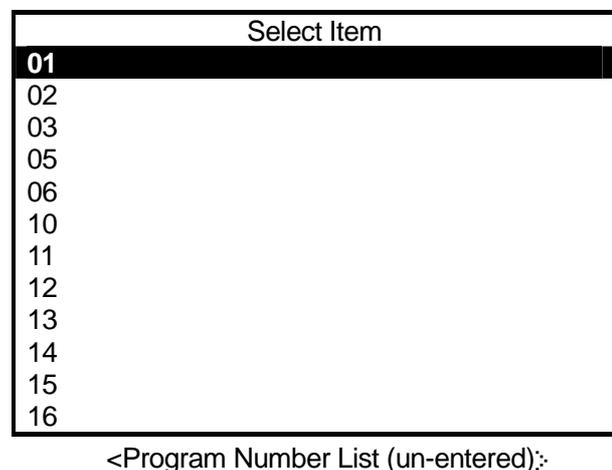
2） When the Program Number entry screen is displayed, press the F:2 (NEW) key. The un-entered program number list will appear. (See right)

In this case, 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            │
│ 01                              │
│ 02                              │
│ 03                              │
│ 05                              │
│ 06                              │
│ 10                              │
│ 11                              │
│ 12                              │
│ 13                              │
│ 14                              │
│ 15                              │
│ 16                              │
└─────────────────────────────────┘
     <Program Number List (un-entered)>
```

- **[Select] is to highlight a certain item and press the ENTR key (fix it.)**
- While the Program Number entry screen is displayed, press the F:3 (LIST) key.   The registered program number list will appear.
- You can enter a program number for teaching directly on the Program Number entry screen.
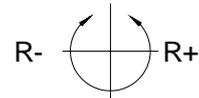
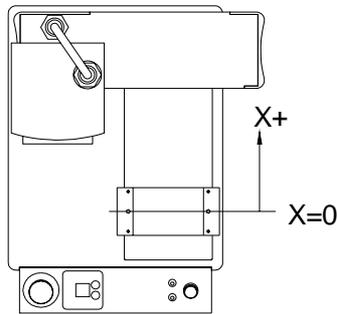Ξ） After selecting the program number, the new position entry screen for Point Number 1 will appear. (See right)

```
Program 3                    P1
  X                       0 mm
  Y                     350 mm
  Z                       0 mm
  R                       0 deg




     FUNC        JOG    MDI   INIT
```

<New Position Entry Screen>

2.2.2 Point Position Entry

1) Enter the coordinates of the point.   In this example, select the JOG mode.   Position entry mode ([JOG] or [MDI]) being selected is highlighted.   If [JOG] is not highlighted, press the F: 2 key.

Enter the position coordinates of Point 1.

Shift each Arm to the desired position (coordinates) using the following keys **while pressing the enable switch on the teaching pendant.**   The current position coordinates of the tool center point will be displayed on the LCD.   After shifting to the desired position, press the J.ENTR key to fix the coordinates.

X+

X=0

R-   R+

Y+

Y=0

Z=0

Z+
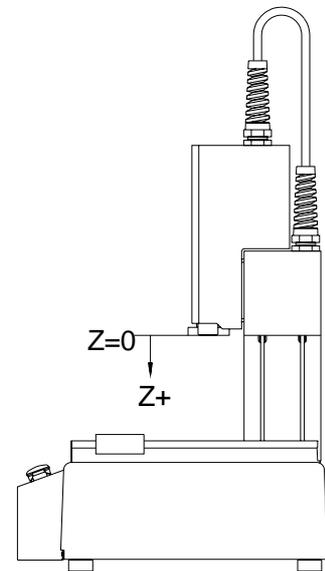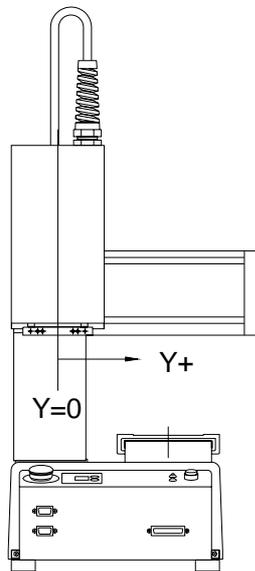
Coordinate System

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

X   ....   Shifts each Arm in the -X direction.

X   ....   Shifts each Arm in the +X direction.

Y   ....   Shifts each Arm in the -Y direction.

Y   ....   Shifts each Arm in the +Y direction.

Z   ....   Shifts each Arm in the -Z direction.

| Z | Shifts each Arm in the +Z direction. |

| R ↺ | Shifts each Arm in the -R direction. |

| R ↻ | Shifts each Arm in the +R direction. |

- You can enter the Arm shifting distance (each time the above JOG keys are pressed) and speed (when the keys are kept pressed) in the customizing mode.

| JOG SPEED | Changes the Arm shifting speed when the JOG key is held down between Low (low speed), Middle (medium speed) and High (high speed.) |

| J.ENTR | Fixes the coordinates.   Displays the Point Type selection screen when entering a new position.   Returns to the setting screen (base screen) when modifying a position. |

⚠ **Caution**   The operator must be careful of the robot's movement in teaching mode.

- The Arm movement in the JOG mode is limited by the **move area limit**.   If the Arm will not exceed a certain coordinates, check [Move Area Limit] in the program data setting menu.
- There are two position entry modes: **JOG mode**, and **MDI mode**.
  To switch between each mode, press the following keys on the position entry screen.
     JOG mode: F 2 key
     MDI mode: F 3 key

2.2.3 Point Type

1) After entering the coordinates, press the
   J.ENTR key (fix it.)
   The Point Type selection screen will
   appear. (See right)

2) Select [PTP Point] for the point.

```
┌─────────────────────────────────────┐
│ Program 3                    P1      │
│ PTP Point                            │
│ CP Start Point                       │
│ CP Passing Point                     │
│ CP Stop Point                        │
│ CP Arc Point                         │
│ CP End Point                         │
│ PTP Evasion Point                    │
│ CP Circle Point                      │
│                                      │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

● You can create point types in the customizing mode. Depending on the customizing
  mode data, the Point Type selection screen may be different from the above example.

3) After fixing the point type, the new position entry screen for the next point (current point number
   + 1) will appear.
   Repeating the same steps as Point 1, register Point 2 according to the following settings.

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

2.2.4 Program Data Settings

Enter the following work home position coordinates.

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

1) Register the work home position.
The work home is the position where the tool unit waits to start the next operation.

Press the ⎡MENU⎤ key.
The Teaching Mode menu will appear.
(See right)
  Select [Program Data Settings.]

```
Teaching Mode Menu
Program Data Settings
Condition Data Settings
Common Data Settings
Additional Function Data
Point Job Settings
Sequencer Settings
Run Mode Parameter
Teaching Data Copy, Delete, Conversion
```

● Depending on the settings created in the customizing mode, the teaching mode menu may be different from the above example.
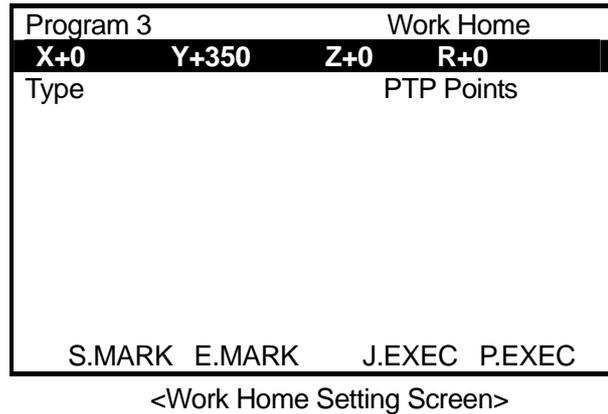
2) The Program Data Settings menu will appear. (See right)

  Select [Work Home.]

```
Program 3
Program Name
Work Home
Cycle Mode              1 Cycle Playback
PTP Condition
CP Condition
Tool Data
Move Area Limit
Position Data Type         Absolute
```

3) The Work Home setting screen will appear. (See right)

Select the coordinates line.

```
Program 3                    Work Home
X+0        Y+350      Z+0       R+0
Type                          PTP Points




        S.MARK  E.MARK      J.EXEC  P.EXEC
```
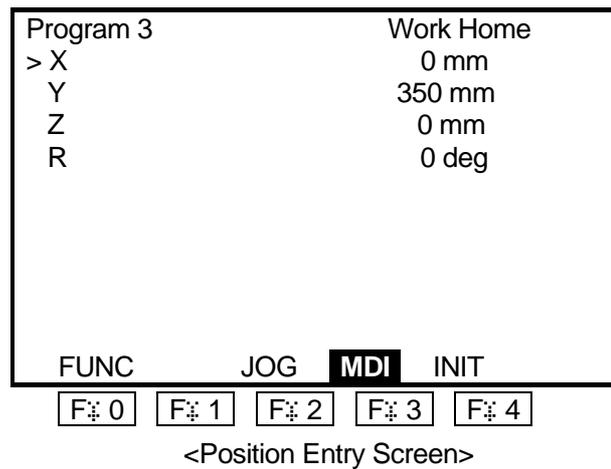<Work Home Setting Screen>

4) The position entry screen will appear. (See right)

In this example, enter the coordinates in the MDI mode.

The currently selected position entry mode ([JOG] or [MDI]) on the last line of the screen will be highlighted.

If [JOG] is highlighted, press the [F⋮ 3] key.

A ">" mark indicates the item which the cursor is pointing to.   Enter the coordinates using the following keys. After entering all the coordinates X, Y, Z, and R, press the [J.ENTR] key to fix them.

```
Program 3                    Work Home
> X                          0 mm
  Y                        350 mm
  Z                          0 mm
  R                          0 deg




  FUNC          JOG    MDI   INIT
  F⋮ 0    F⋮ 1    F⋮ 2    F⋮ 3    F⋮ 4
```
<Position Entry Screen>

[1] to [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 no decimal fraction is possible.

[CLEAR] .... Clears the entire value. The value becomes 0 (zero.)

DEL   ....Deletes the figure or decimal point under the cursor.
The cursor and the figure on the left side of the cursor then shift
rightward.   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 rightward.

F: 3   ....Each time this key is pressed, the enterable item
(indicated

by the " " mark) changes in the order **X → Y → Z → R → X**.

CURSOR   ....Shifts the cursor upward.

CURSOR   ....Shifts the cursor downward.

CURSOR   ....Shifts the cursor leftward.

CURSOR   ....Shifts the cursor rightward.

GO   ....Press this key while pressing the enable switch.   Each
Arm will shift to the coordinates displayed on the LCD.

⚠ **Caution**   The operator must be careful of the robot's movement in teaching mode.

J.ENTR   ....Fixes coordinates.   When entering a new position, displays the
point type selection screen.   When modifying a position,
returns to the setting screen (base screen.)

●   You can shift each Arm using the GO key on the point setting screen.
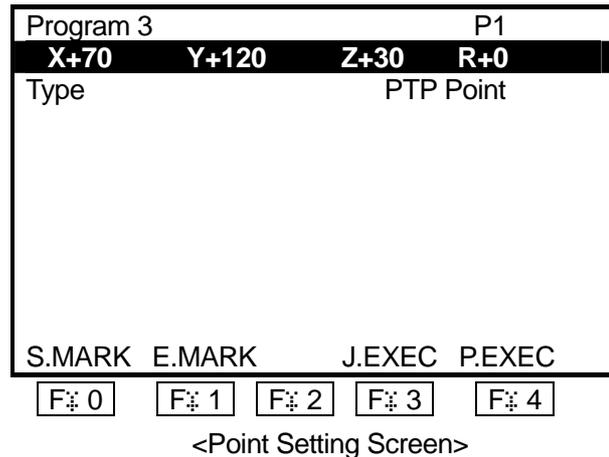
2.3 Program Test

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

If you register new programs or modify data, be sure to check the data and execute [Point Run] and [Test] before actual operation.

2.3.1 Point Run

1) Press the CURSOR key to highlight the setting screen for Point 1. (See right)

While the point setting screen is displayed (base condition), press the CURSOR key to display the setting screen for the previous point. To display the setting screen for the next point, press the CURSOR key.

```
Program 3                          P1
X+70        Y+120      Z+30      R+0
Type                            PTP Point




S.MARK   E.MARK        J.EXEC  P.EXEC
 F: 0      F: 1    F: 2    F: 3     F: 4
```
<Point Setting Screen>

● In this case, the work home is recognized as the previous point of Point 1.

2) Press the F: 4 (P.EXEC) key. The robot will run on the displayed point (Point 1) and then the screen will change to the setting screen for the previous point.

After pressing the F: 4 (P.EXEC) key, execute the test run on Point 2. Check if the tool center positions on Points 1 and 2 are the same as when entering the position.

After executing the test run on Point 2 (last point), the screen will change to the setting screen for the work home (where the tool unit waits to start the next operation.)
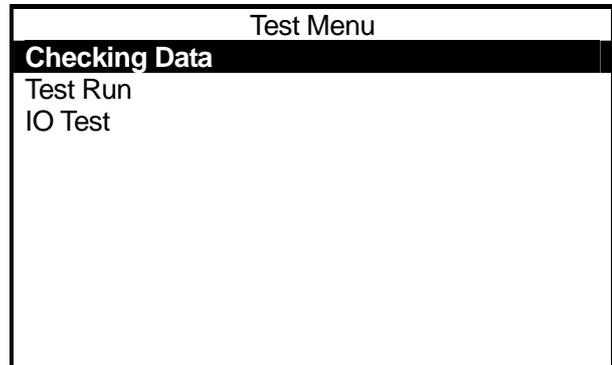
⚠ **Caution** The operator must be careful of the robot's movement in teaching mode.

2.3.2 Checking Data

1） Press the MONITOR key to display the Test menu. (See right)

```
                    Test Menu
Checking Data
Test Run
IO Test
```

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

```
Program 1                    Checking Data



                    OK


```
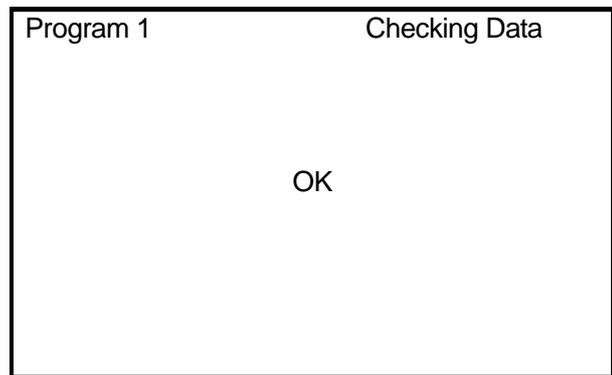
2.3.3 Test

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 execute one cycle of operation exactly the same way as the actual operation.

When registering a new program or modifying an existing program, be sure to check the data and then execute the [Test Run] before actual operation.

⚠ **Caution** The operator must be careful of the robot's movement in teaching mode.

USEFUL KEY FUNCTIONS

SHIFT + JOG Key: Position entry JOG mode
  Axes corresponding the JOG key shift at high speed.

EDIT key: Point setting screen or new position entry screen
  Using this key, you can insert or delete points.
  You can also delete, move, or copy a series of designated points (point block.)

GO key: Point setting screen or MDI mode
  When coordinates displayed on the LCD do not correspond to the actual tool center point
  position, press this key.   Each Arm will shift to the position displayed on the LCD.

F 3 (J.EXEC) key: Point setting screen
The "point job" set to the current point will be executed.

F 4 (P.EXEC) key: Point setting screen
The robot will run the current point (arm shifting, any point job set at the point and additional
function will be executed.) and then the screen will change to the setting screen for the next
point.

CURSOR / CURSOR key: Point setting screen
Using this key, you can display the setting screen for the previous/next point.

3. HOW TO OPERATE BENCHTOP ROBOT (2)

In this chapter, how to change the "PTP Condition" (in the program registered in the previous chapter "2. How To Operate Benchtop Robot (1)") and how to execute a point job on a point will be explained.

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

The "Point Job Data" to be executed on a point is not the data to be entered directly to a point. To execute a job on a point, register the "Point Job Data" separately from programs or points, and then set the "Point Job Data" number to a point and select the number. In this way, you can select the same "Point Job Data" from multiple points and programs.

First, register the point job data.   Next, select the point job numbers to be set to each point.

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

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

→ Pick   Then →

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

→ Place   Then →

3.1 Preparation

Start up the robot in the teaching mode with reference to the previous chapter "2.1. Preparation."
If the program displayed on the screen is different from that you created in the previous chapter ("2. How To Operate Benchtop Robot (1)"), press the PRG.NO key and enter the program number that you created in the previous chapter.

3.2 Program Data Settings

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 from a point to another point.
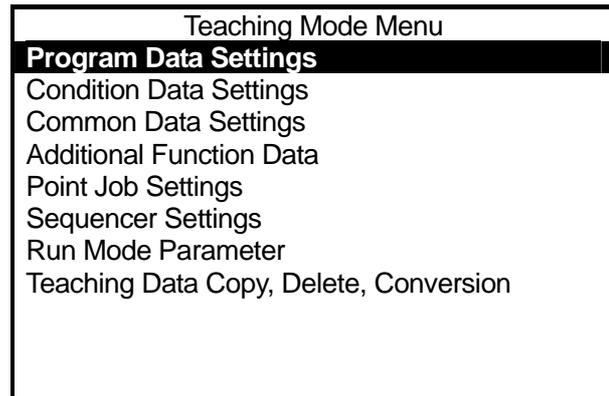
1)   Change the "PTP Speed" in the "PTP
      Condition" menu.
      Press the ⎡MENU⎤ key.
      The Teaching Mode menu will appear.
      (See right)
      Select [Program Data Settings.]

```
Teaching Mode Menu
Program Data Settings
Condition Data Settings
Common Data Settings
Additional Function Data
Point Job Settings
Sequencer Settings
Run Mode Parameter
Teaching Data Copy, Delete, Conversion
```

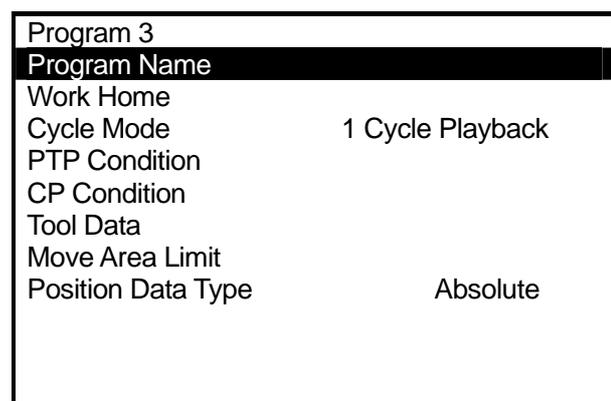●   Depending on the settings in the customizing mode, the Teaching Mode menu may be
     different from the above screen.

2)   The Program Data Settings menu will
      appear. (See right)
      Select [PTP Condition.]

```
Program 3
Program Name
Work Home
Cycle Mode               1 Cycle Playback
PTP Condition
CP Condition
Tool Data
Move Area Limit
Position Data Type              Absolute
```

3) The PTP Condition setting screen will appear. (See right)
Select [PTP Speed.]

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

- Depending on the settings, the displayed items on the PTP Condition setting screen will change as follows:
  [Relative Mode]   [Absolute Mode], [Z Move Height]   [Horizontal Move Pos'n], [Z Up Distance]   [Start Horizontal], [Z Down Distance]   [Start Down Pos'n]
  In this case, select [Absolute Mode] and change it to [Relative Mode.]   The other three items will change accordingly.

4) The PTP Speed entry screen will appear. (See right)
Press the ⌈CLEAR⌉, ⌈2⌉, and ⌈0⌉ keys to enter 20%.
Press the ⌈ENTR⌉ key to fix it.
The screen will return to the PTP Condition setting screen.

```
Program 3              PTP Condition



              Enter a number.

PTP Speed                     100%
```

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

3.3 Teaching: Point Job

In this example, select point job numbers 5 and 6 (un-entered) and register the following point jobs to them.

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

Output ON pulse to handOut1. (0.1sec)
Wait Condition (until the followings become "true")
  #sysIn15   ON Input
  #sysIn16   OFF Input
End of Condition

```
Point Job                          5
001 pulse #genOut1, 100
002 waitCond

003    ld #genIn1
004    ani #genIn2
005 endWait
006
```

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

Output ON pulse to #sysOut16. (0.1sec)
Wait Condition (until the followings become "true")
  #sysIn16   ON Input
  #sysIn15   OFF Input
End of Condition

```
Point Job                          6
001 pulse #genOut2, 100
002 waitCond

003    ld #genIn2
004    ani #genIn1
005 endWait
006
```

3.3.1 Point Job Data Number Selection

1) Press the ⎡SHIFT⎤ + ⎡ESC⎤ keys to enter the base condition (to display the point setting screen.)

2) Press the ⎡MENU⎤ key to display the Teaching Mode menu.   Select [Point Job Settings.]
   - Depending on the settings in the customizing mode, the [Point Job Settings] will not appear on the Teaching Mode menu.

3) The Point Job Number entry screen will appear.   Press the ⎡F⁚1⎤ (NEW) key.

4) The un-entered point job numbers list will appear.
   In this case, select the point job number 5 first.
   - To display the registered point job numbers list, press the ⎡F⁚3⎤ (LIST) key.

3.3.2 Output Command
Enter a command to output ON pulse (0.1 sec) to [#sysOut15.]

1) After entering or selecting the point job number, the Point Job setting screen will appear. (See right)
   [001] is a command number.
   Select the command number [001.]
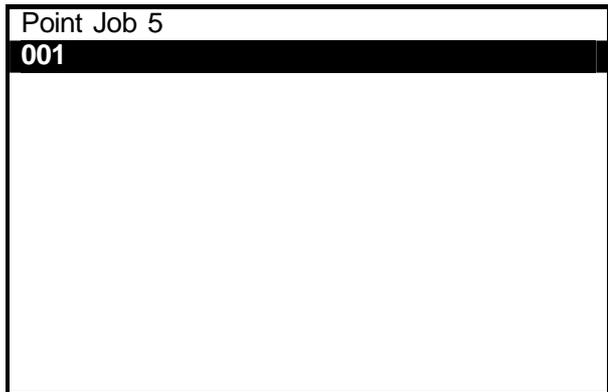
```
Point Job 5
001


```

2) After selecting the command number, the Point Job Command Category selection screen will appear. (See right)

```
              Select Category
ON/OFF Output Control
if Branch, Wait Condition
Condition
Delay, Data In, Wait Start
Pallet Control
Execute Flow Control
for, repeat
Move
LCD Control
COM Input/Output
Variable, Comment, System Control
Camera, Z Adjustment
```

Э〕 After selecting the command category, the Command Selection screen will appear. (See right)

Select [pulse.]

```
            ON/OFF Output Control
 set
 reset
 pulse
 invPulse
 delaySet
 delayReset
 onoffBZ
 dataOut
 dataOutBCD
```
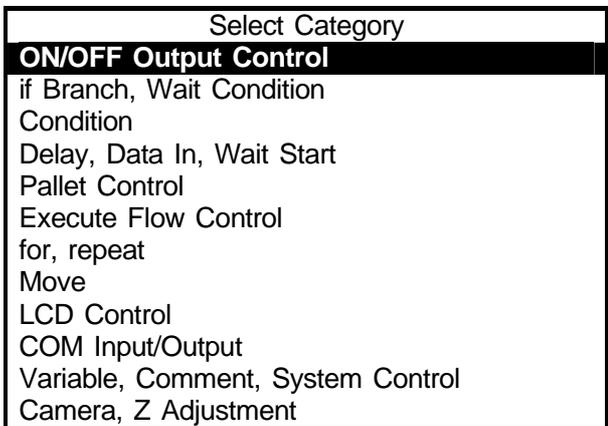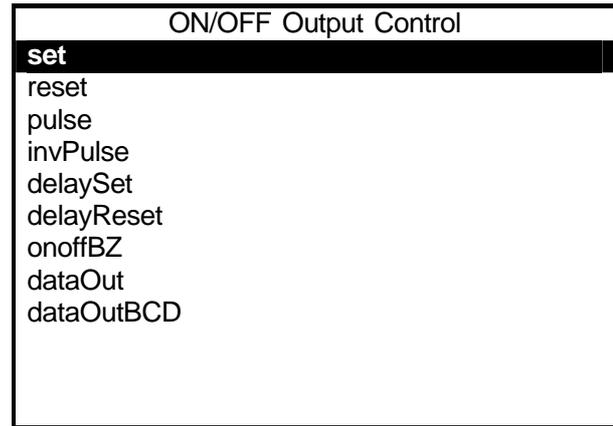
Ч〕 After selecting the point job command, the Parameter selection screen (the Output Destination screen in this example) will appear. (See right)

Select [IO-SYS (sysOut).]

```
               Output Destination
 IO-SYS (sysOut)
 IO-1 (genOut)
 IO-Alias
 Internal Relay (m)
 Buzzer (BZ)
```
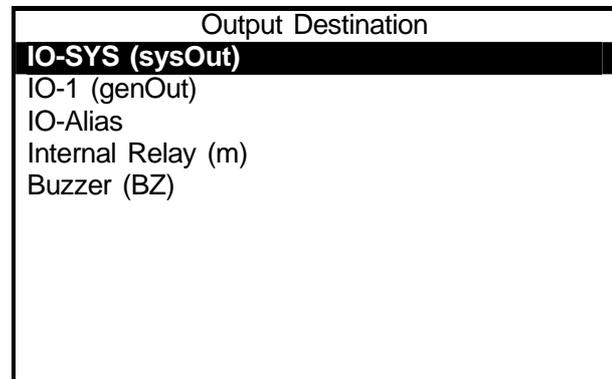
Ƽ〕 After selecting the output destination, the Output Number entry screen will appear. (See right)

Enter "15" as the output number.

```


              Enter a number.

 IO-SYS Output Number                    1

```
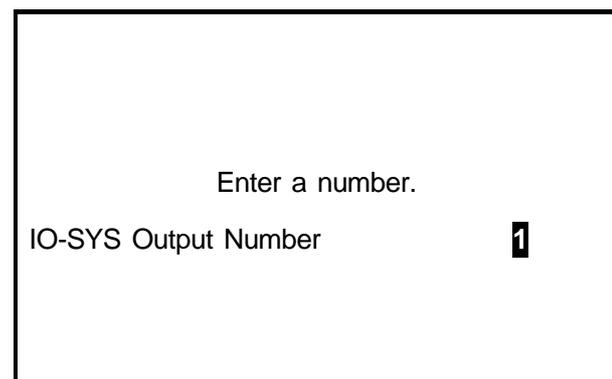
5) The pulse command requires two parameters (output destination and pulse width.)
After entering the output number, the Pulse Width entry screen will appear. (See right)

Enter "100." (0.1sec = 100msec)

```
┌─────────────────────────────────────┐
│                                      │
│                                      │
│           Enter a number.            │
│  Pulse Width                1 msec   │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

3.3.3 Wait Condition Command

Enter a wait condition command [waitCond.]   This command is used to wait until the condition command result, between this command and the [endWait] command, becomes "true."

1) After entering all the necessary parameters, the screen will return to the Point Job setting screen. (See right)
The command set to the Command Number 001 will be displayed.
Select Command Number 002.

```
┌─────────────────────────────────────┐
│ Point Job 5                          │
│ 001 pulse #sysOut15, 100             │
│ 002                                  │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

2) Entering the command number.   The Point Job Command Category selection screen will appear.
Select [if Branch, Wait Condition.]

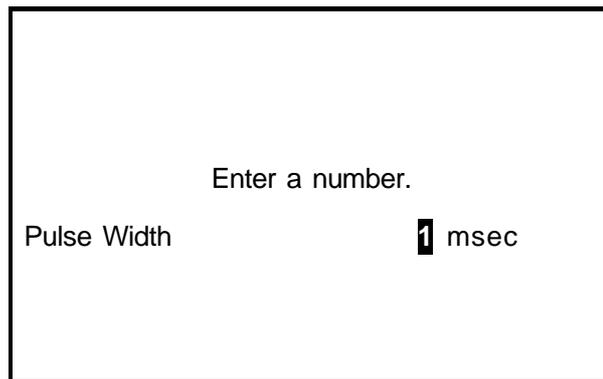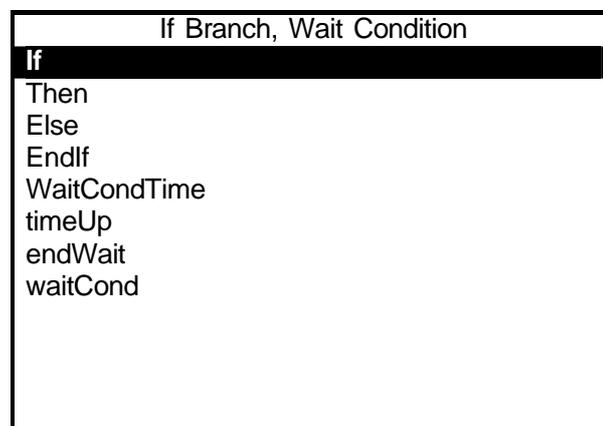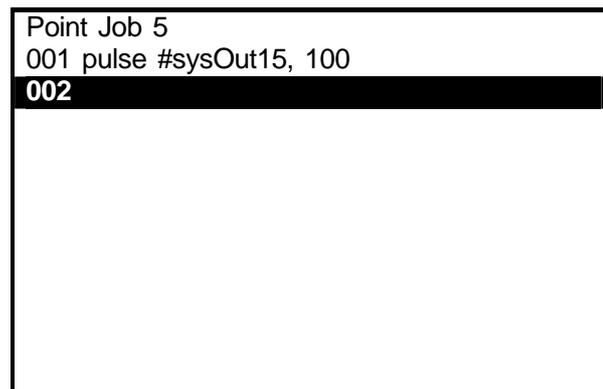3) After selecting the command category, the Command selection screen will appear. (See right)
Select [waitCond.]
This command requires no parameters.
The screen will return to the point setting screen.

```
┌─────────────────────────────────────┐
│       If Branch, Wait Condition      │
│ If                                   │
│ Then                                 │
│ Else                                 │
│ EndIf                                │
│ WaitCondTime                         │
│ timeUp                               │
│ endWait                              │
│ waitCond                             │
│                                      │
│                                      │
└─────────────────────────────────────┘
```
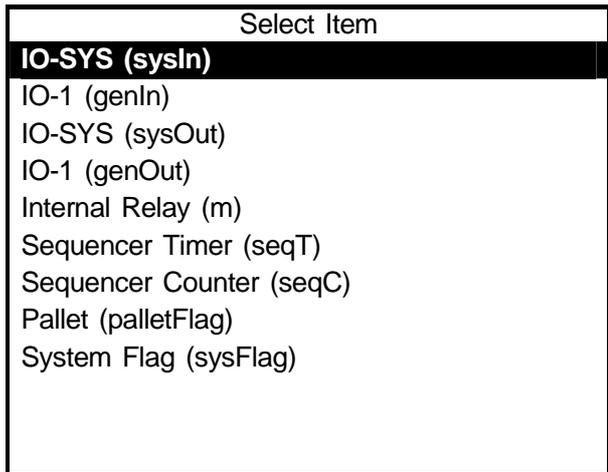
3.3.4 Condition Command

Enter a condition command.

1) Select Command Number 003.

<table>
<tr><td>ld</td></tr>
<tr><td>ldi</td></tr>
<tr><td>and</td></tr>
<tr><td>ani</td></tr>
<tr><td>or</td></tr>
<tr><td>ori</td></tr>
<tr><td>anb</td></tr>
<tr><td>orb</td></tr>
</table>

2) Select [Condition] form the Point Job Command Category selection screen.

3) Select [ld] from the Command selection screen. (See right)

4) After selecting the point job command, the Parameter selection screen (in this example, the Input Destination selection screen) will appear. (See right) Select [IO-SYS (sysIn).]

<table>
<tr><td align="center">Select Item</td></tr>
<tr><td>IO-SYS (sysIn)</td></tr>
<tr><td>IO-1 (genIn)</td></tr>
<tr><td>IO-SYS (sysOut)</td></tr>
<tr><td>IO-1 (genOut)</td></tr>
<tr><td>Internal Relay (m)</td></tr>
<tr><td>Sequencer Timer (seqT)</td></tr>
<tr><td>Sequencer Counter (seqC)</td></tr>
<tr><td>Pallet (palletFlag)</td></tr>
<tr><td>System Flag (sysFlag)</td></tr>
</table>

5) After selecting [IO-SYS (sysIn)], the Input Number entry screen will appear.
Enter "15" as the input number.
The screen will return to the point setting screen.

6) Select Command Number 004 from the Point Job setting screen.   Repeat the above steps 2) to 5) according to the following settings.

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

Enter an end command for a wait condition
[endWait.]

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 on the right,
the teaching for Point Job Number 5 is
completed.

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

Press the ESC key.   The screen will return to the Teaching Mode menu.

Using the above mentioned process, register
Point Job Number 6.

If the screen display is as shown on the right,
the teaching for Point Job Number 6 is
completed.

Press the ESC key.   The screen will
return to the Teaching Mode menu.

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

3.4 Point Data Modification

In this example, change the point job number created in the previous chapter "2. How To Operate Benchtop Robot (1)" to the point job number created in the previous section "3.3. Teaching: Point Job."

Point Number	Point Job Number
1	5
2	6

1) Press the SHIFT + ESC keys. The point setting screen will appear. If the setting screen is not for Point 1, press the CURSOR / CURSOR key to display the desired screen. Then press the CURSOR key to shift the highlight to a blank line (under the [Type].) The settable point job or additional functions to the point will be listed. (See right)

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

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

```
Program 3                          P1




              Enter a number.

Point Job                          1




  DEL    COPY   NEW    LIST
```

| F⋮ 0 | F⋮ 1 | F⋮ 2 | F⋮ 3 | F⋮ 4 |

● While the Point Job Number entry screen is displayed, press the F⋮ 2 (NEW) key to display the un-entered point job data list. To display the registered point job data list, press the F⋮ 3 (LIST) key.
If you press the F⋮ 0 (DEL) key, the point job displayed on the Point Job Number entry screen will be deleted. If you press the F⋮ 1 (COPY) key, the point job displayed on the Point Job Number entry screen will be copied to another point job number.

3) Display the setting screen for Point 2 and change the point job number to "6" as same as the example for Point 1.

The point data modification is now completed.

3.5 Program Test

After changing the point job numbers, execute the point run, data check, and test run according to the procedure described in the "2.3. Program Test."

When registering a new program or modifying an existing program, be sure to check the data and then execute the [Test Run] before actual operation.

⚠ **Caution** The operator must be careful of the robot's movement in the teaching mode.

3.6 Running

Finally, run the registered program.

3.6.1 Mode Change

Press the ⌈MODE⌉ key to display the mode selection menu.   Select [Switch Run Mode] to switch modes.

- External Run Mode ....To run programs
  (To start running from the I/O-SYS or COM1)
- Switch Run Mode ....To run programs
  (To start running from the stat button)
- Teaching Mode ....To create programs
- Customizing Mode ....To create data that is used to compose programs
- Administration Mode ....For administration and adjustment

If a teaching pendant is connected, the light on the LED corresponds to the currently activated mode.

- E.RUN: External Running
- RUN: Running
- TEACH: Teaching
- CUSTOM: Customizing
- ADMIN: Administration

If you press the ⌈MODE⌉ key while holding down the ⌈SHIFT⌉ key, the modes will switch in the following order.

External Run Mode → Switch Run Mode → Teaching Mode → External Run Mode

3.6.2 Start

Press the start switch on the front body of the robot (on the switch box for CE spec.)

The robot starts running the program.

Start Switch

Front

Switch Box
(CE spec)
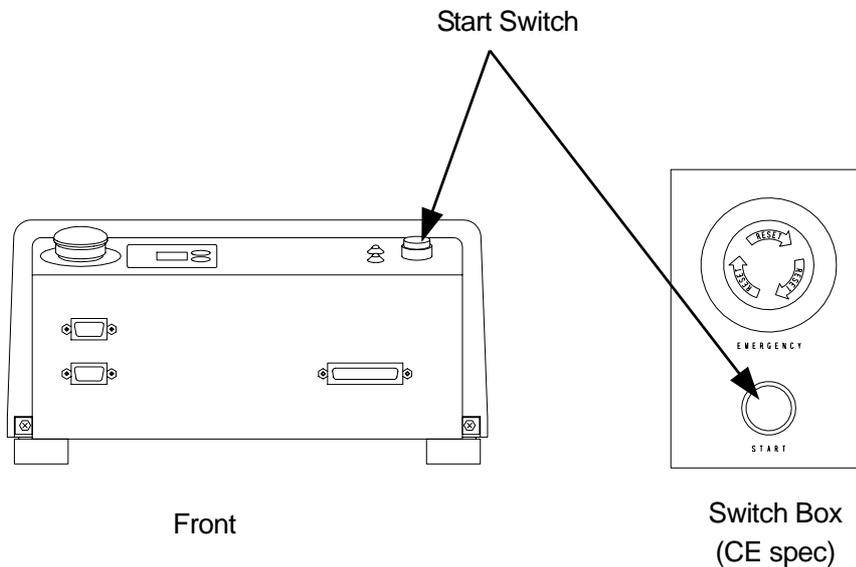
Be sure to execute a test run before you run a new program.

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 [Parameter (Playback)] 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 "#sysIn01" of I/O-SYS ON to start the program.

⚠ **Caution**   Do not touch moving parts of the robot while it is running.

3.6.3 Emergency Stop

Emergency stop is the function to stop operation immediately due to unexpected accidents. Three emergency stop switches are available for the Benchtop robot. Each button cuts the power to the motor and stops operation.

Press the emergency stop switch on the robot body.
Press the emergency stop switch on the switch box. (CE spec)
Press the emergency stop switch on the teaching pendant (Optional.)

How to Release: Turn the pressed emergency stop switch clockwise.
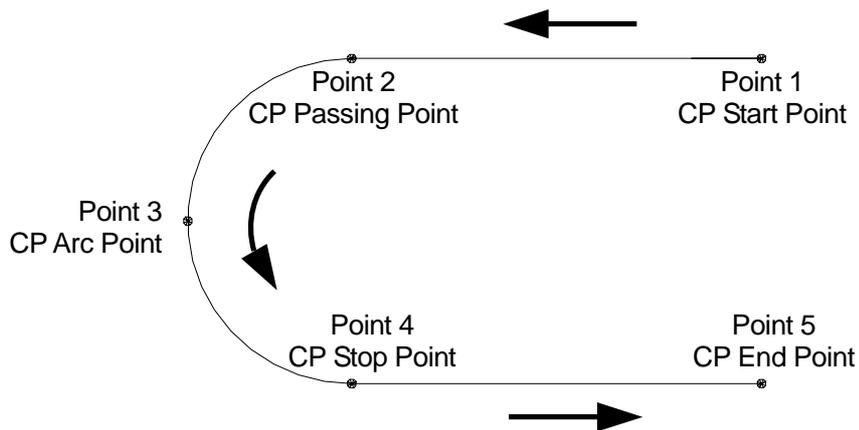After Mechanical Initialization, the robot stands by to start operation.

Front Body   Switch Box
(CE spec)

Teaching
Pendant

Emergency Stop Switch
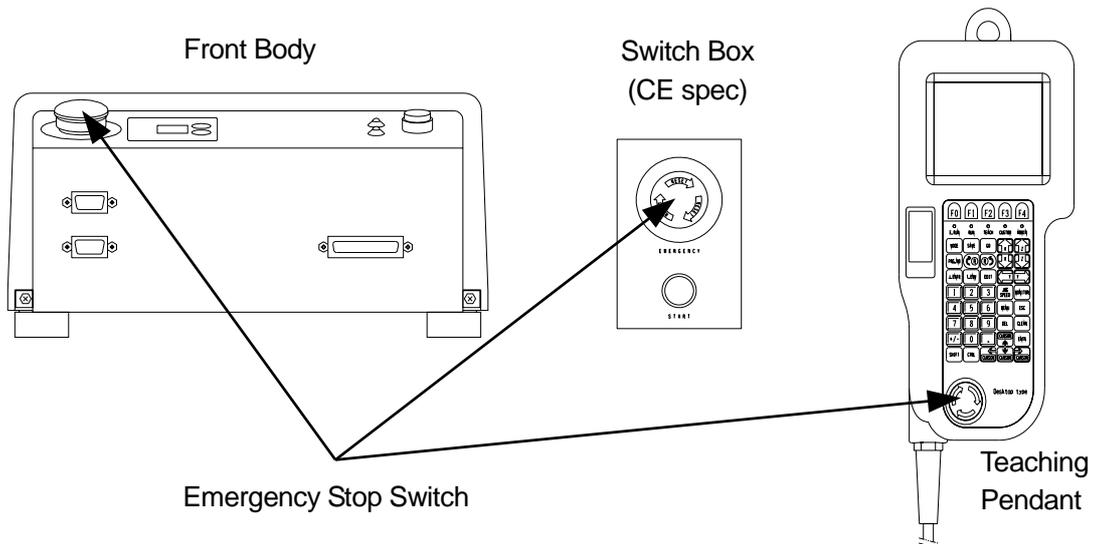
2. 4. HOW TO OPERATE BENCHTOP ROBOT (3)

In this chapter, how to register a program in the CP drive will be explained.

The program contains the following five points.

4.1 Program Number Selection

In this example, register Program Number 04 (un-entered.)   Select the Program Number 04 according to the procedure described in the "2.2.1. Program Number Selection."
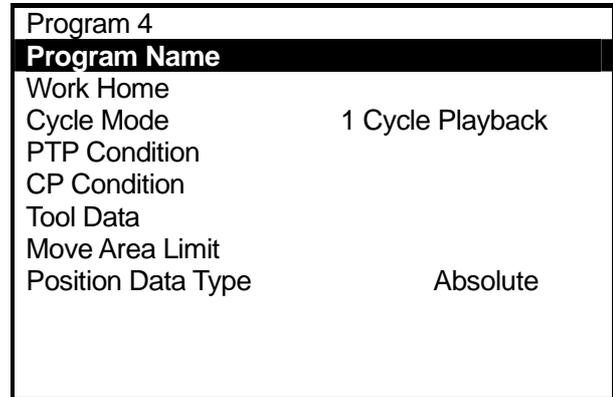
4.2 Program Data Settings

Enter the work home and then name the program.

First, enter the following work home coordinates according to the procedure described in the "2.2.4. Program Data Settings."

Point Number	Coordinates
Work Home	X 40 mm, Y 170 mm, Z 30 mm, R 0 deg

Name the program.

1) Select [Program Name] from the Program
   Data Setting menu. (See right)

```
┌─────────────────────────────────────────────────┐
│ Program 4                                        │
│ █Program Name█                                   │
│ Work Home                                        │
│ Cycle Mode                    1 Cycle Playback   │
│ PTP Condition                                    │
│ CP Condition                                     │
│ Tool Data                                        │
│ Move Area Limit                                  │
│ Position Data Type                  Absolute     │
│                                                  │
│                                                  │
└─────────────────────────────────────────────────┘
```

2) The Character entry screen will appear.
   (See right)

   Character string display ⇨

```
┌─────────────────────────────────────────────────┐
│ Program Name                                     │
│ █                                                │
│                                                  │
│                                                  │
│                                                  │
│  ┌────────────────────────────────────────────┐ │
│  │ [1]           [2]ABC        [3]DEF          │ │
│  │ [4]GHI        [5]JKL        [6]MNO          │ │
│  │ [7]PQRS       [8]TUV         [9]WXYZ        │ │
│  │ [-]           [0]           [.]      █A█    │ │
│  └────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────┘
```
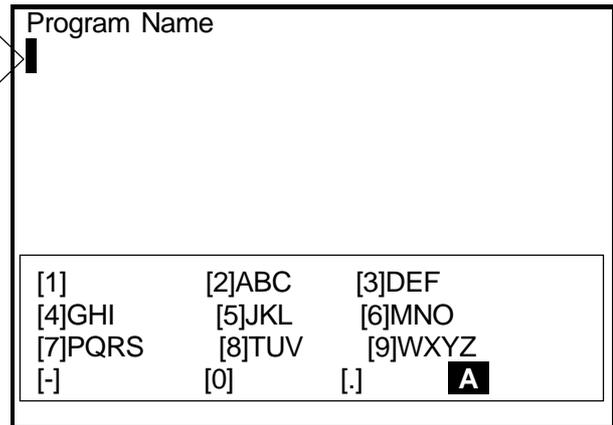
Enter characters using the following keys.
After entering the name, press the ⃞ ENTR ⃞
key to exit the character entry.
The entered character string will be set as a
program name and then the screen will
return to the Program Data setting screen.

<Example of Character Entry Screen>

⃞ 0 ⃞ to ⃞ 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", press the ⃞ CURSOR ⃞ key after
entering the letter "A."   Then shift the cursor rightward and enter "B."
Any key which no character is assigned to, like [1] above, is invalid.

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

ENTR .... End of the character string entry and registration.

You cannot register the name if the number of entered characters exceed thelimit. Also, you cannot register a name which includes any unusable character.

F: 4 .... Each time this key is pressed, the types of character assignment will switch in this order: **English uppercase characters   English lowercase characters   numbers   symbols   English uppercase characters**

SHIFT + F: 4 .... Each time this key is pressed, the types of character assignment will switch in this order: **English uppercase characters   English lowercase characters   numbers   symbols   English uppercase characters**

CURSOR .... Shifts the cursor upward (in the character string.)

CURSOR .... Shifts the cursor downward (in the character string.)

CURSOR .... Shifts the cursor leftward (in the character string.)

CURSOR .... Shifts the cursor rightward (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 on the rightmost of the character string, the last character will be deleted.

CLEAR .... Clears the entire character string.

● You can use up to forty English letters, numbers, and symbols in combination to name the program.

4.3 Point Data Entry

4.3.1 Point Position Entry

Enter the coordinates of Point 1.

Point Number	Coordinates	Point Type	Line Speed (mm/s)
1	X 20 mm, Y 190 mm, Z 30 mm, R 0 deg	CP Start Point	40

4.3.2 Point Type

After entering the coordinates, press the $\boxed{\text{ENTR}}$ key (to fix it.) The Point Type selection screen will appear. (See right)

Select the point type (in this case, select CP Start Point.)

```
Program 4                          P1
PTP Point
CP Start Point
CP Passing Point
CP Stop Point
CP Arc Point
CP End Point
PTP Evasion Point
CP Circle Point


```

4.3.3 CP Line Speed

If the selected point type is CP Start Point, CP Passing Point, CP Stop Point, CP Arc Point, or CP Circle Point, the CP Line Speed entry screen will appear after fixing the point job number. (See right)

In this case, press the $\boxed{\text{CLEAR}}$, $\boxed{4}$, and $\boxed{0}$ keys to enter "40."
Press the $\boxed{\text{ENTR}}$ key to fix the number.

```
Program 4                          P1



          Enter a number.

CP Line Speed              10 mm/s


```

- If you select a point type to shift the next point in the CP drive, you need to enter the CP line speed.
  If you select a point type to shift the next point in the PTP drive, the CP Line Speed entry screen will not appear. Instead, the new position entry screen for the next point (current point number + 1) will appear.

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

Register Points 2 – 5 according to the following settings. Refer to the above procedure.

Point Number	Coordinates	Point Type	Line Speed (mm/s)
2	X -20 mm, Y 190 mm, Z 30 mm, R 0 deg	CP Passing Point	40
3	X -40 mm, Y 170 mm, Z 30 mm, R 0 deg	CP Arc Point	40
4	X -20 mm, Y 150 mm, Z 30 mm, R 0 deg	CP Stop Point	40
5	X 20 mm, Y 150 mm, Z 30 mm, R 0 deg	CP End Point	-

4.4 Program Test/Test Run

After registering all the points, execute the point run and checking data according to the procedure described in the "2.3. Program Test."

After executing the program test, actually run the registered program according to the procedure described in "3.6. Running."

⚠ **Caution**   Do not touch moving parts of the robot while it is running.

5. SAVE

Save the registered program and point job data.

Save the teaching data in combination with the customizing data.   The unit of data is called "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 turns OFF**.   Be sure to "save" when the teaching data or customizing data is modified.

Press the SHIFT + ESC keys to enter the base condition. (See right)

Press the SAVE 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 Point Setting Screen>

● To back up the data, send the C & T data from the robot to a PC using the PC software "LR C-Points" or "LR C-Points Limited Edition."

● If you use a PC for teaching operation, send the teaching data from the PC to the robot using the "LR C-Points" software.   The data sent from the PC will be stored in the robot automatically.

Warranty

Henkel Corporation warrants, to the original Buyer for a period of one (1) year from date of delivery, that the Loctite® Equipment or System sold by it is free from defects in material and workmanship. Henkel will, at its option, replace or repair said defective parts. This warranty is subject to the following exceptions and limitations.

1. Purchaser Responsibilities – The Purchaser shall be responsible for:
    -Maintenance of the equipment as outlined in the Equipment Manual for the product.
    - Inventory of recommended maintenance parts established by Henkel;
    -Notification to Henkel within 6-8 hours of downtime.
    -Any cost of travel or transportation connected with warranty repair.
    -All cost associated with investigating or correcting any failure caused by the purchaser's misuse, neglect or unauthorized alteration or repair.
    -All costs attributed to accident or other factors beyond Henkel's control.

2. A thirty (30) day warranty will be extended on any items subject to normal wear, such as:
    -Pump Seals   -Tubing   -Wear Surfaces of Wiping Rollers
    -O-Rings   -Hoses

Purchased items used in Loctite® dispensing equipment are covered under warranties of their respective manufacturers and are excluded from coverage under this warranty. Typical purchased items are:

-Solenoids   -Electrical Relays   -Refrigeration Units
-Timers   -Fluid Power Cylinders   -Electrical Motors

3. No warranty is extended to perishable items, such as:
    -Fuses   -Dispensing Needles   -Dispensing Nozzles
    -Light Bulbs   -Lamps   -Product Barrels

Henkel reserves the right to make changes in design and/or improvements to its equipment without obligation to include these changes in any equipment previously manufactured.

Henkel's warranty herein is in lieu of and excludes all other warranties of Henkel and its affiliated and related companies (hereinafter the "seller companies"), express, implied, statutory, or otherwise created under applicable law including, but not limited to, any warranty or merchantability and/or fitness for a particular purpose of use. In no event shall the seller and/or the seller companies be liable for any direct, indirect, special, incidental or consequential damages, including, but not limited to, loss of profits. In addition, this warranty shall not apply to any products, which have been subjected to abuse, misuse, improper installation, improper maintenance or operation, electrical failure or abnormal conditions; and to products, which have been tampered with, altered, modified, repaired or reworked by anyone not approved by seller. Buyer's sole and exclusive remedy under this warranty shall be limited to, at seller's discretion, the replacement or repair of any defective product or part thereof, or a refund of the purchase price paid by for the product in exchange for buyer's return of the product to seller, free and clear of any and all liens and encumbrances of any nature.