

NEL-SYSTEM
WAFER CARRYING UNIT
(ROBOT)
MANUAL

BEFORE USING THE UNT

Before using the wafer carrying unit and teach pendant be sure to read thoroughly the Operation Manual so as to acquire the required information.

NOTE
The teach pendant must be used only by the maintenance personnel. The operator must not use it.

INTRODUCTION

The Operation Manual has been written to give you step-by-step procedures that teach you how to use the teach pendant of the wafer carrying unit.

This manual contains the information necessary for teach pendant operations and adjustments. Its information is useful for the maintenance personnel.

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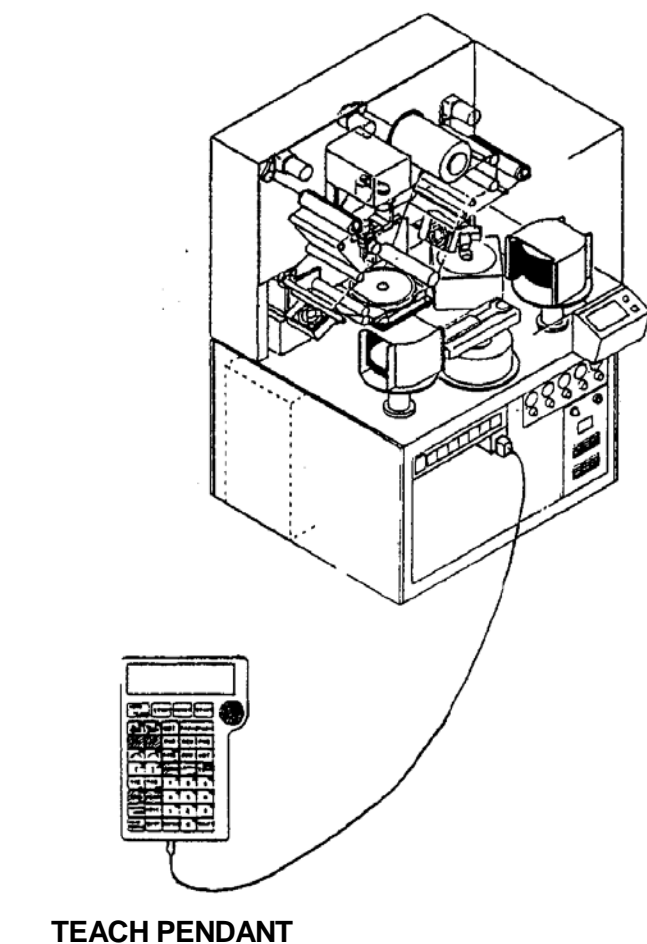
ROBOT TROUBLESHOOTING MANUAL

ALIGNER TROUBLESHOOTING MANUAL

1. SAFETY

The safety must be as stated in the Section 1.1 SAFETY INFORMATION of Operation Manual for the unit.

2. OUTLINE OF WAFER CARRYING UNIT (HEREINAFTER REFERED TO AS ROBOT)



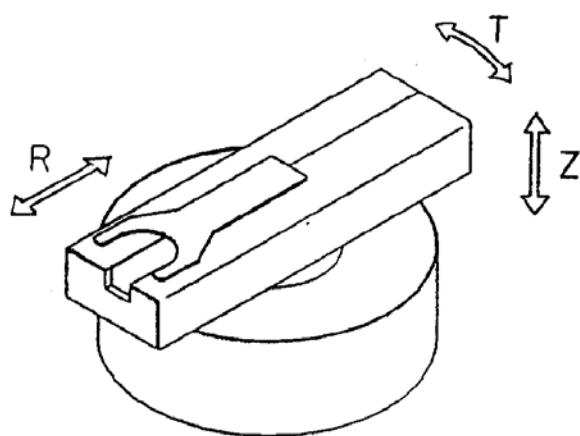
Composition of robot

The robot consists of robot body and teach pendant.

Operations of robot

1. R-axis direction (arm extension and retraction)
2. T-axis direction (turning)
3. Z-axis (up-down)

Each axis is driven by the pulse motor (with encoder).



Functions of robot

The front end of arm catches (chucks) a wafer.

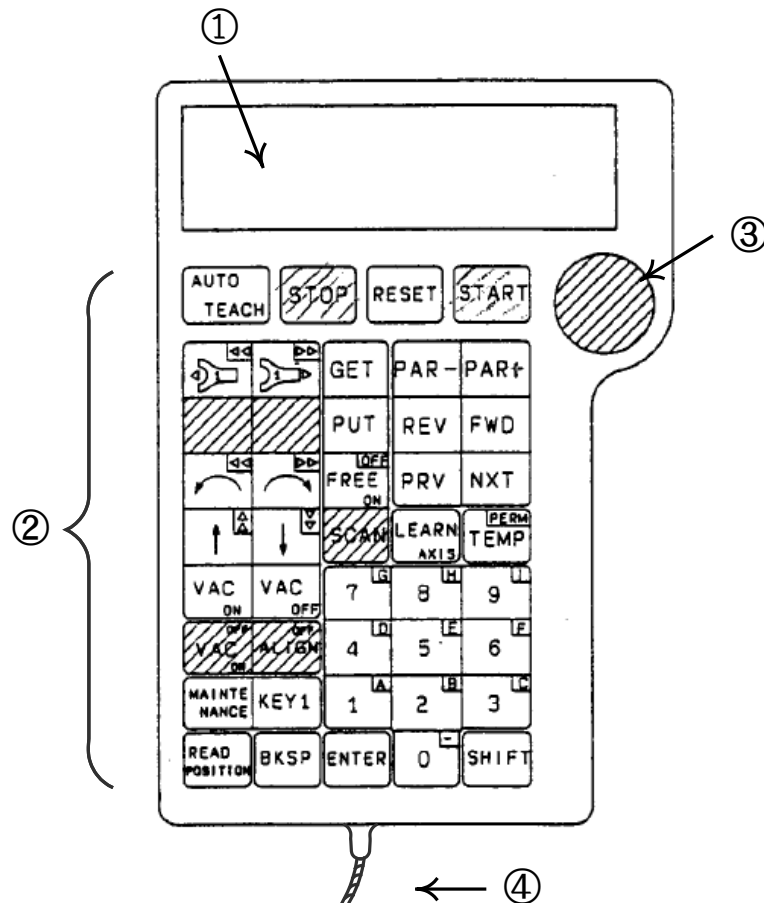
The wafer is carried.

Refer to below for Parameter value and robot stroke

- R-axis: 1 count = Move $27.1\mu\text{m}$
- T-axis: 1 count = Turn 0.072 degrees
- Z-axis: 1 count = Move $25.0\mu\text{m}$

3. FUNCTIONS OF TEACH PENDANT

3.1 OUTLINE OF FUNCTIONS



The teach pendant consists of:

1. LCD
2. Keyboard
3. Emergency stop switch
4. Cable

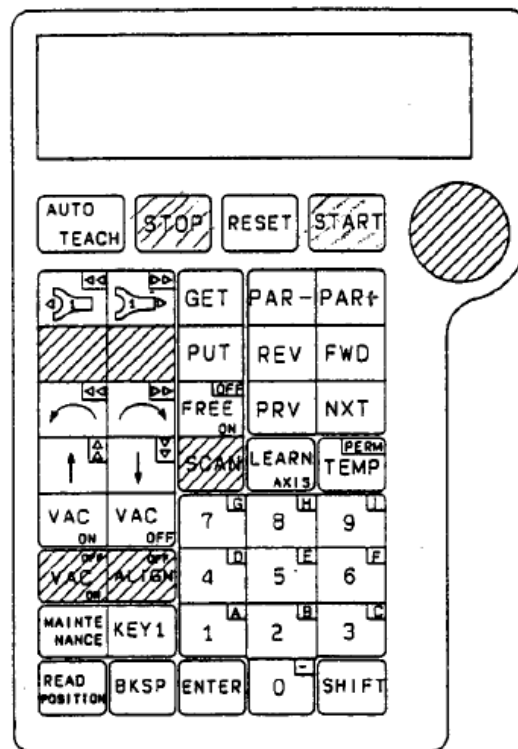
The functions of teach pendant are:

- Manual operation of robot
- Input and storage of data such as robot wafer carrying points, etc.
- Checking of operation after data input.

* The hatched keys and switches are inoperative.

3.2 FUNCTIONS OF KEYS

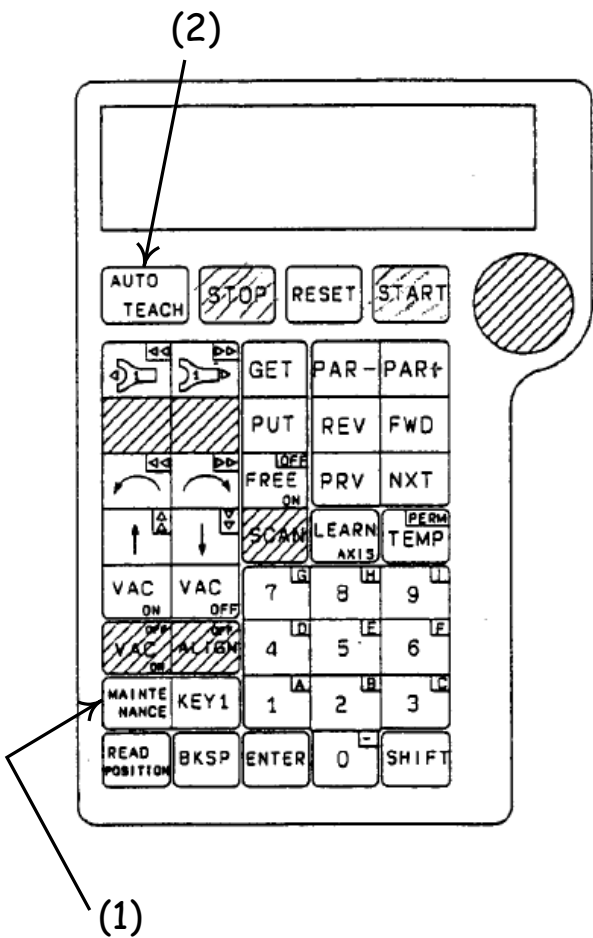
3.2.1 Applicable keys



The functions of keys are explained in the following pages.

- [1] [MODE SELECT] keys
- [2] [CONTROL] keys
- [3] [MANUAL OPERATION] keys
- [4] [OPERATION] keys
- [5] [PARAMETER SELECTION] keys
- [6] [DATA INPUT] keys
- [7] [MEMORY] keys

3.2.2 Functions of [MODE SELECT] key



[Maintenance] key (1)

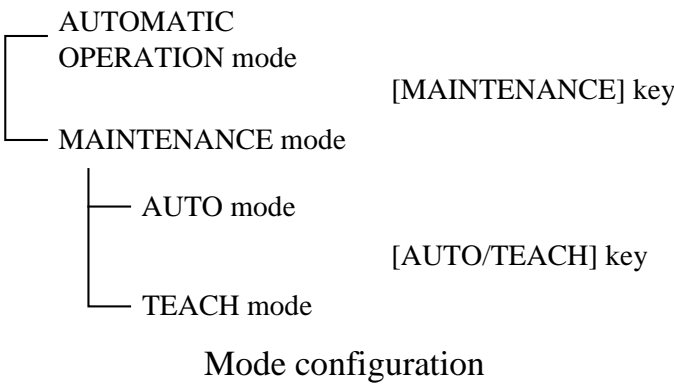
This switch is used to select AUTOMATIC OPERATION mode or MAINTENANCE mode.

[AUTO / TEACH] key (2)

This key is used to select AUTO mode or TEACH mode.

The functions of each mode are as follows.

Mode		Individual Operation	Teaching
Automatic operation		×	×
Maintenance	AUTO	○	×
	TEACH	○	○



3.2.3 Functions of [CONTROL] keys

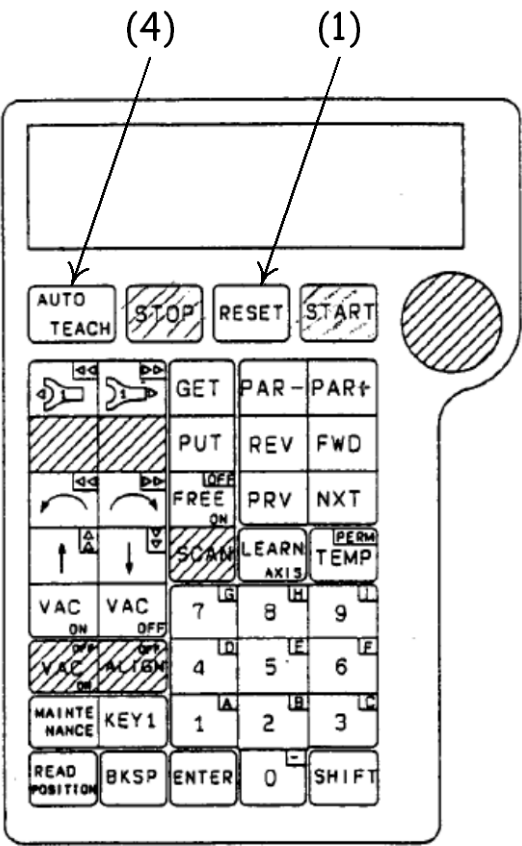


Fig. 1

BUSY

RESETTING ROBOT

Fig. 2

RANDOM

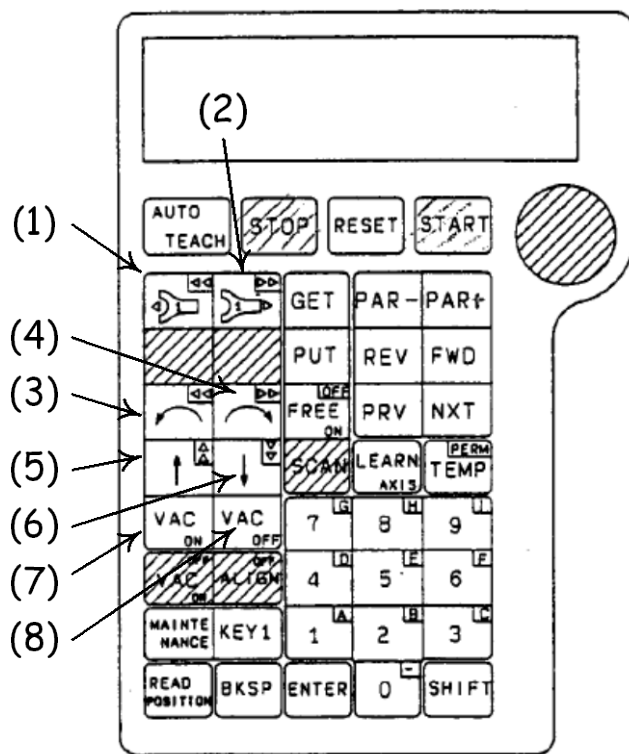
RESET DONE , READY

Fig. 3

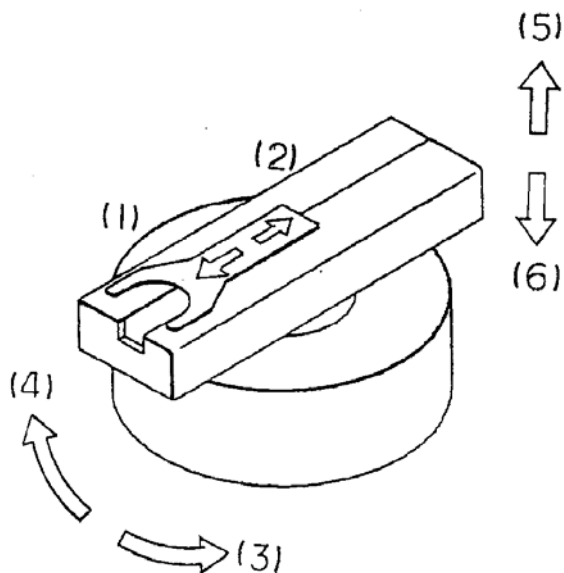
[RESET] key (1)

This key is used to move the robot to the home position.
During move to the home position the display shown in Figure 2 appears.
After move the display shown in Figure 3 appears.
To restart the AUTO mode operation after resetting, press the [AUTO/TEACH] key (4).

3.2.4 Functions of [MANUAL OPERATION] keys



- (1) To move the arm from the center to the outer side.
- (2) To move the arm toward the center.
- (3) To return counterclockwise in the T-axis direction.
- (4) To turn clockwise in the T-axis direction.
- (5) To rise in the Z-axis direction.
- (6) To lower in the Z-axis direction.
- (7) To return on the arm chuck.
- (8) To return off the arm chuck.

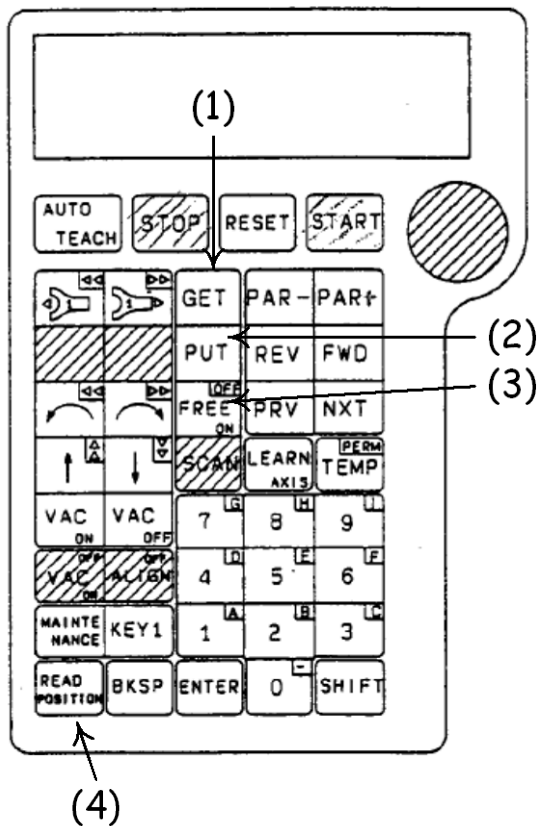


For numbers (1) to (6):

If only the [MANUAL OPERATION] key is pressed, the low speed operation is performed.

If the [MANUAL OPERATION] key is pressed while the [SHIFT] key (9) is pressed, the high speed operation is performed.

3.2.5 Functions of [OPERATION CHECK] keys



[GET] key (1)

When STATION No. and SLOT No. are input, one wafer in the specified position is taken out.

This key is used to check the operation after teaching.

[PUT] key (2)

When STATION No. and SLOT No. are input, one wafer is carried to the specified position. This key is used to check the operation after teaching.

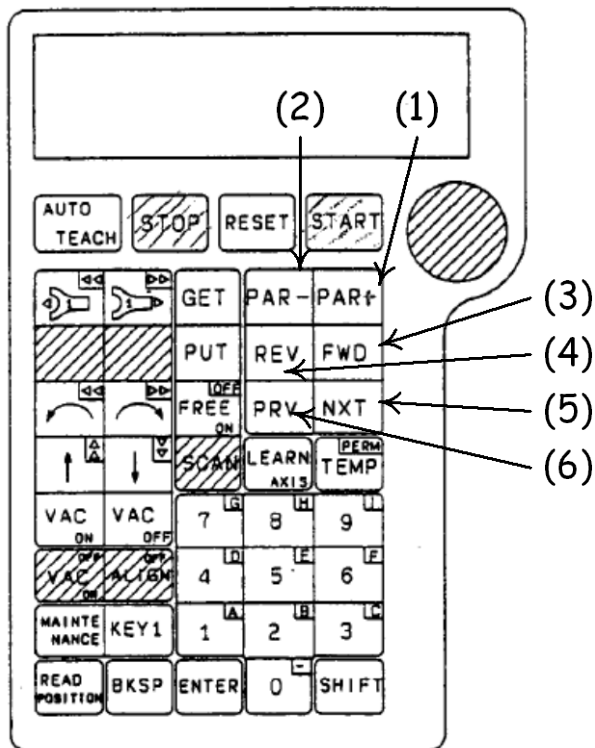
[FREE] key (3)

This key is used to release the motor brake of R-axis and T-axis. As a result, the robot can be moved freely by hand in the R-axis and T-axis direction. If the [FREE] key is pressed while the [SHIFT] key (5) is pressed, brake is applied again.

[READ POSITION] key (4)

This key is used to indicate the current position of all axes of robot on the LCD.

3.2.6 Functions of [PARAMETER SELECT] keys



The keys described below are used to select each parameter.

[PAR+] key (1)

This key is used to scroll the main parameter groups in ascending order.

[PAR-] key (2)

This key is used to scroll the main parameter groups in descending order.

[FWD] key (3)

This key is used to scroll the minor parameter groups in ascending order.

[REV] (4)

This key is used to scroll the minor parameter groups in descending order.

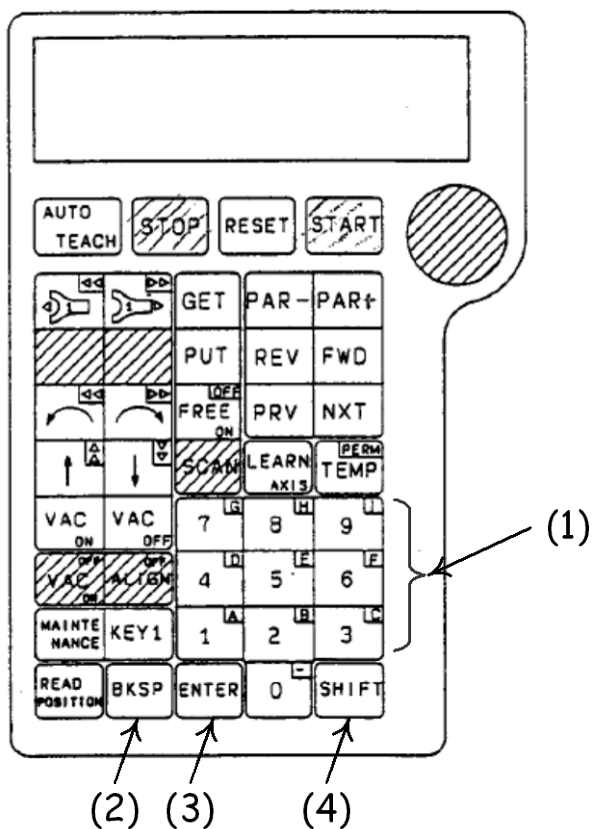
[NXT] key (5)

This key is used to scroll parameters in ascending order.

[PRV] key (6)

This key is used to scroll parameters in descending order.

3.2.7 Functions of [DATA INPUT] keys



The keys described below are used to enter setting data into each parameter.

[Numeric input] keys (1)

This key is used to enter numeric dates. Pressing the key with holding down [SHIFT] key enters each alphabet indicated on upper right of each key.

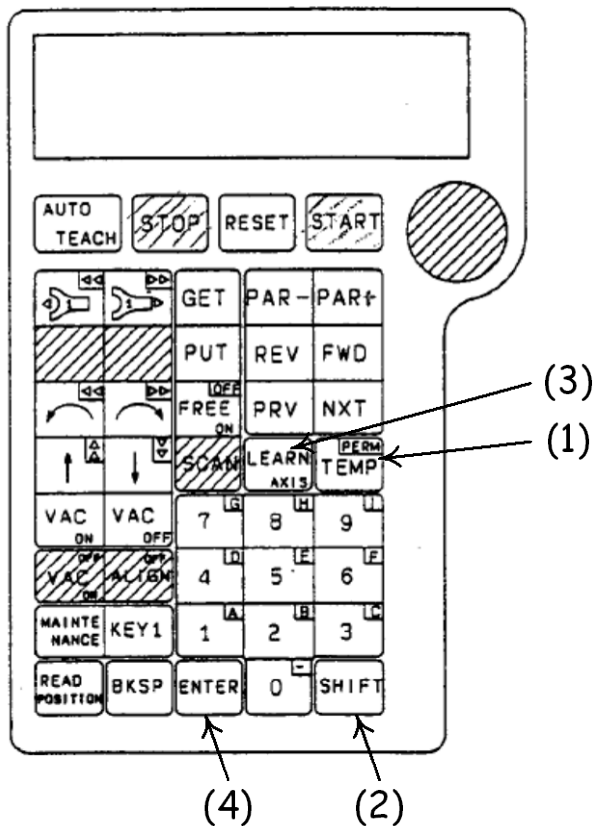
[BKSP] key (2)

This key is used to moves the cursor backward one character space or delete the character.

[ENTER] key (3)

This key is used to enter input data. After entering each data, press the key.

3.2.8 Functions of [MEMORY] keys



The keys described below are used to store the input data.

[TEMP] key (1)

This key is used to store current data temporarily in RAM.

When the power is turned off or [RESET] key is pressed, the data is erased and data is loaded from backup RAM.

While holding down the [SHIFT] key (1), press [TEMP] key (2).

To store all parameter data permanently in RAM, follow the instruction below.

[LEARN] (3) → [ENTER] (4) →
[TEMP] (1)

If the data is stored permanently, the data is not erased after turning off the power. The data is kept unless overwriting.

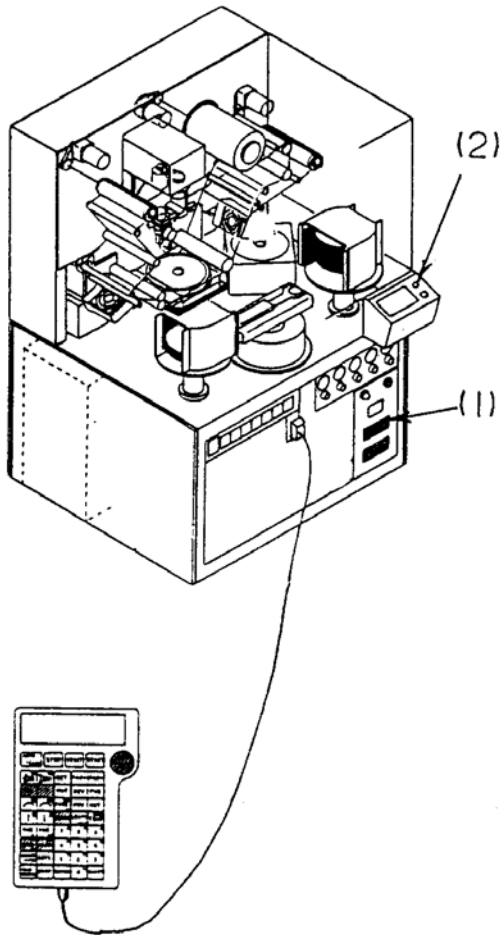
To overwrite the data, press [TEMP] key (1) with holding down [SHIFT] key (2).

At current position of the robot, store the data which is indicated on LCD in RAM.

However, “HOME” (“POSITION” of main parameter group) is not applicable.

4. OPERATION OF TEACH PENDANT

4.1 START-UP



Step 1:

Set [HEATER] CP (1) of power box (provided at the front side of the machine) to OFF.

Step 2:

For the model DR-8500, remove the cutter holder.

Step 3:

Start the machine.

Step 4:

Connect the teach pendant to the teach pendant connector of the machine.

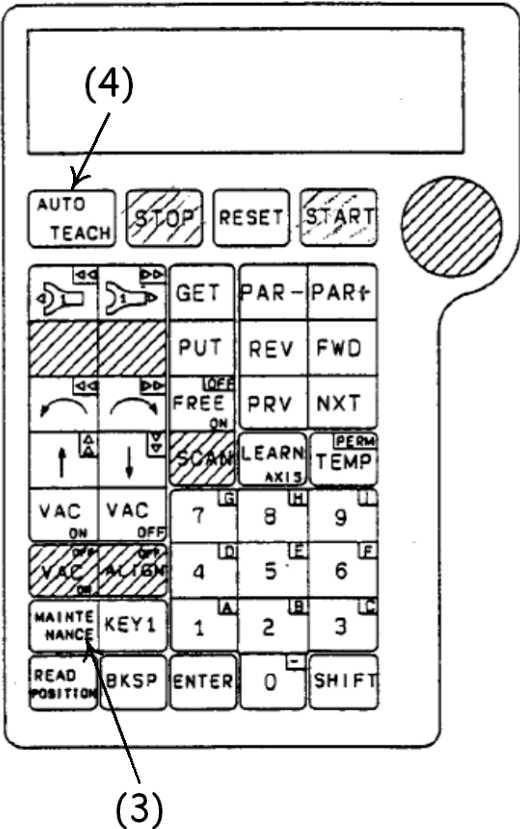
Step 5:

Press the [Q. STOP] switch (2) provided on the operation panel. (The individual operation causing machine quick stop is enabled only in this quick stop state.)

Step 6:

Press [TEACH MODE] key on operation panel.

4.1 START-UP (Continued)



RANDOM

Fig. 1

TCHRBT

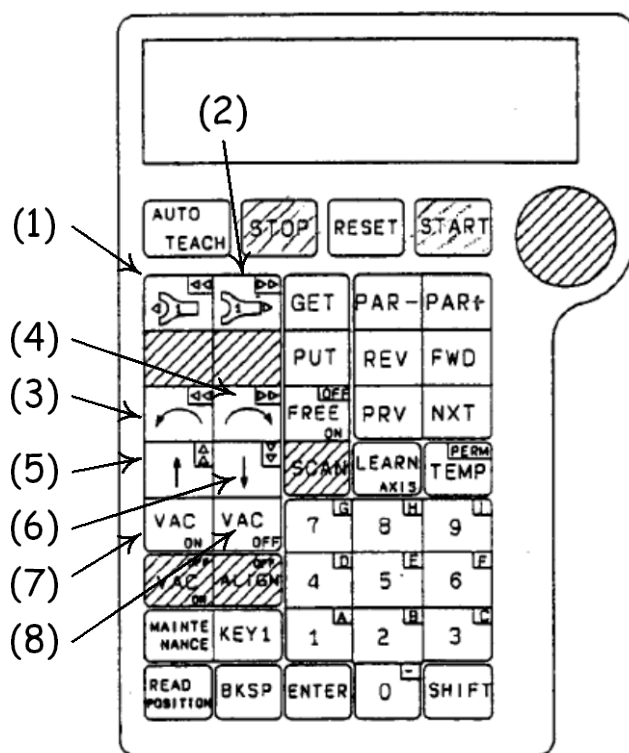
Fig. 2

Step 7:
 Press [MAINTENANCE] key.
 (Thereby, the AUTO mode of
 MAINTENANCE mode is set.)
 (The display shown in Figure 1
 appears.)

Step8:
 Press [AUTO / TEACH] key (4).
 (The TEACH mode of
 MAINTENANCE mode is set.)
 (The display shown in Figure 2
 appears.)

* The teach pendant operation must be
 performed in the TEACH mode.
 The following explanation is described
 on the assumption that the current
 mode is TEACH mode.

4.2 MANUAL OPERATION PROCEDURE



The following keys are used for the manual operation.

For low speed operation:

Press only the [MANUAL OPERATION] keys (1) ~ (8).

For high speed operation:

Press the [MANUAL OPERATION] key, pressing the [SHIFT] key (9).

To move the arm from the center to the outer side, press (1).

To move the arm toward the center, press (2).

To turn counterclockwise the robot, press (3).

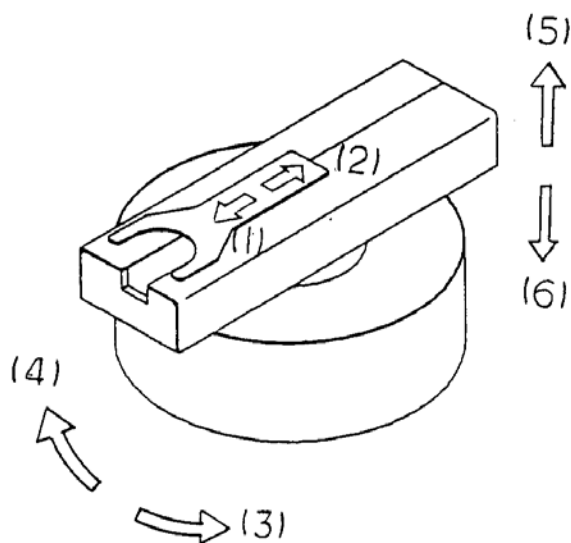
To turn clockwise the robot, press (4).

To raise the robot, press (5).

To lower the robot, press (6).

To chuck wafer, press (7).

To release chucked wafer, press (8).



4.3 TEACHING POINT MEASUREMENT PROCEDURE

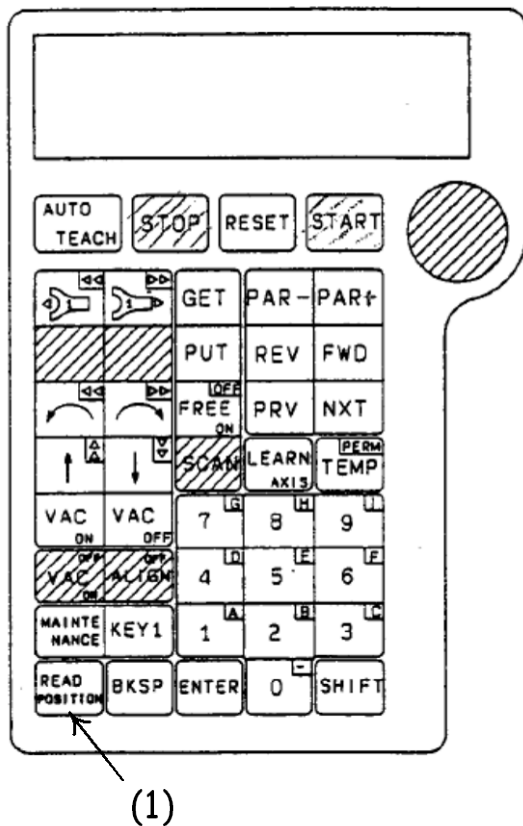
The purpose of teaching point measurement is to get positioning parameter data for the robot arm.

Teaching of obtained data to the robot is executed.

(“Teaching” is an operation to input and store the pertinent parameter data.)

4.3 TEACHING POINT MEASURING PROCEDURE (Continued)

[1] Measurement of T-axis in center position of left/right wafer table, aligner and chuck table.



Step 1:

As figure 1 shown below, apply adhesive cellophane tape onto the end of the robot arm, and mark up the center with marker.

Step 2:

Move the robot arm, using the manual operation keys, align the mark and center of table looking at them from straight above.

Step 3:

Press the [READ POSITION] key (1). (The current position of robot is indicated as shown in Figure 2) Read the indicated value of T, and enter it under the column T (left cassette table) in the data sheet.

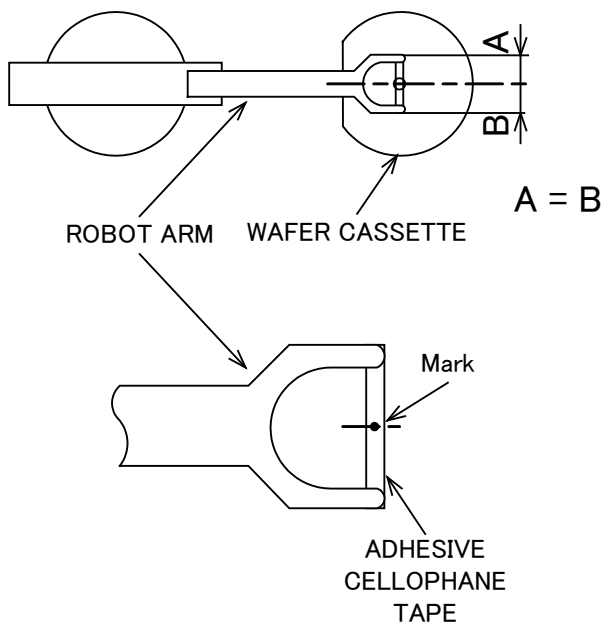


Fig. 1

TCHRBT	
R1	9014
T	18760, Z308

Fig. 2

4.3 TEACH POINT MEASURING PROCEDURE (Continued)

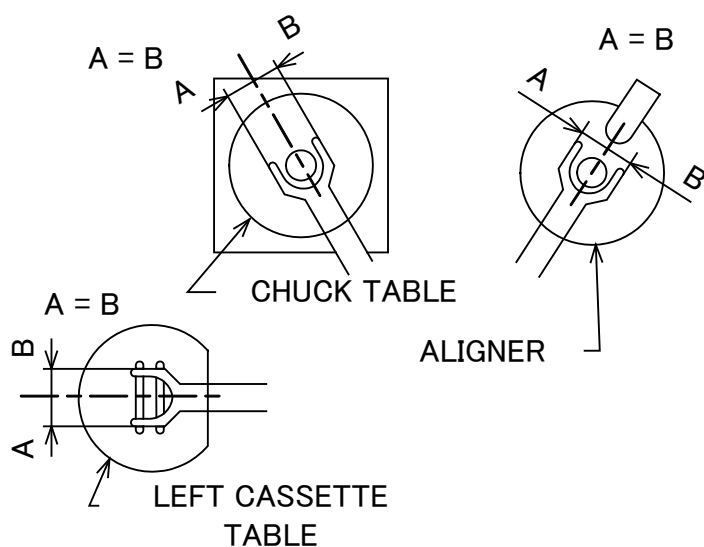


Fig. 3

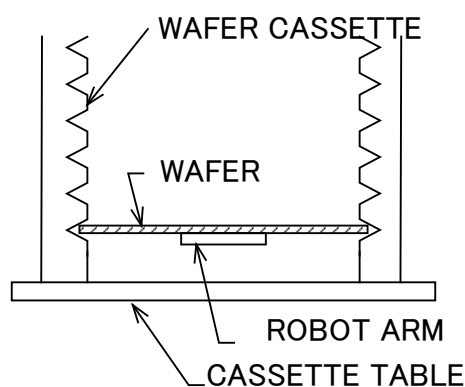


Fig. 4

TCHRBT			
R1	9014,		
T	6500,	Z	471

Fig. 5

Step 4:

Measuring the value of T-axis in center position of right cassette table, aligner and chuck table, and enter the obtained value.

[2] Measurement of Z-axis position of left/right cassette table.

Step 5:

Set a wafer at the lowest stage of 4-in cassette, and put it on the right cassette table.

Step 6:

Move the robot arm, using the manual operation keys, until the upper surface of arm contacts the lower surface of wafer (See figure 4).

Step 7:

Press the [READ POSITION] key (1). (The display shown in figure 5 appears.)

Step 8:

Read the indicated value of Z, and enter it under the column Z on the line "4-in" of right cassette table in the data sheet.

Step 9:

Perform the same procedure for 5-in, 6-in and 8-in cassettes.

Step 10:

Perform the same procedure for the left cassette table.

4.3 TEACH POINT MEASURING PROCEDURE (Continued)

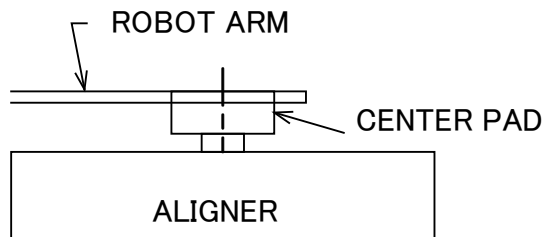


Fig. 6

TCHRBT			
R1	9014,		
T	13750,	Z	308

Fig. 7

[3] Measurement of Z-axis of aligner.

Step 11:

Arrange the robot arm, using the manual operation keys, so that the upper surface of robot arm aligns with aligner (see Figure 6).

Step 12:

Press the [READ POSITION] key (1).
(The display shown in Figure 7 appears).

Step 13:

Read the indicated value of Z, and enter it under the column Z of line “Aligner” in the data sheet.

4.3 TEACH POINT MEASURING PROCEDURE (Continued)

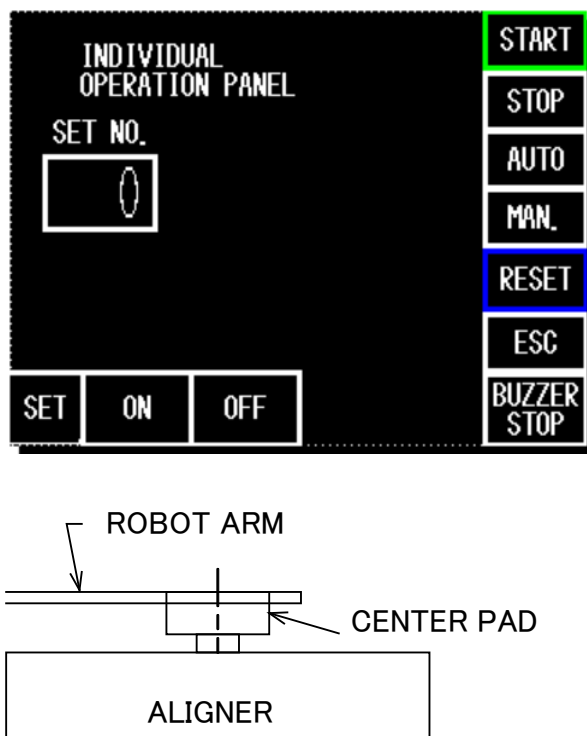


Fig. 8

TCHRBT			
R1	9014,		
T	13750,	Z	1620

Fig. 9

[4] Measurement of Z-axis of chuck table

Step 14:

Display the individual operation screen on the machine operation panel.

Step 15:

Enter SET. NO. to move the table pad upward.

Step 16:

Using the manual operation keys of teach pendant, move the chucking pad so that the upper surface of chucking pad aligns with the upper surface of end robot arm (See Figure 8).

Step 17:

Press the [READ POSITION] key (1). (The display shown in Figure 7 appears.)

Step 18:

Read the indicated value of Z, and enter it under the column “Z” on the line “Chuck table” in the data sheet.

Step 19:

Move the table pad downward using operation panel.

Thereby the teach point measurement has been completed.

4.4 TEACHING PROCEDURE (Continued)

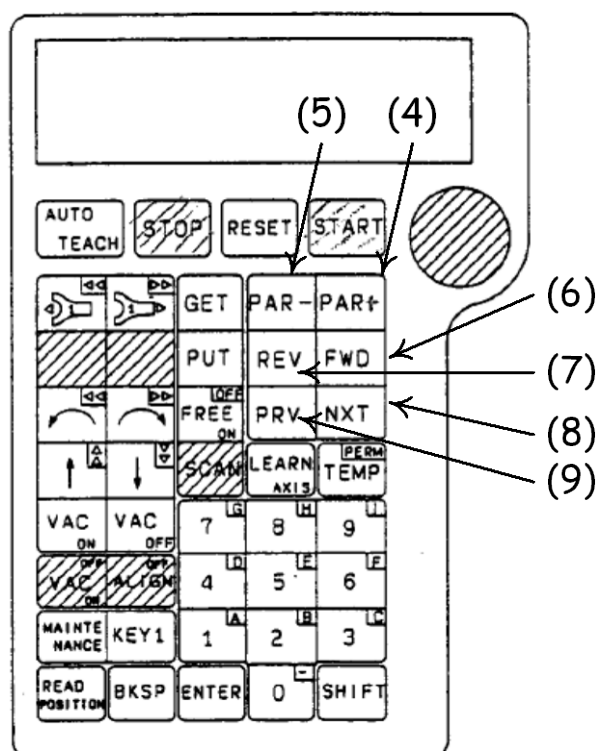


Fig. 1

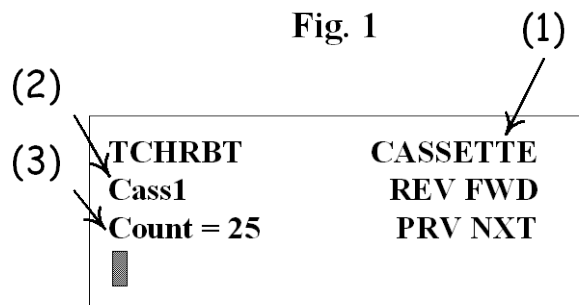


Fig. 2

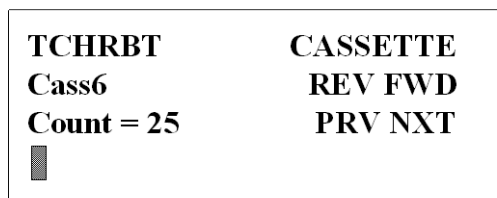


Fig. 3

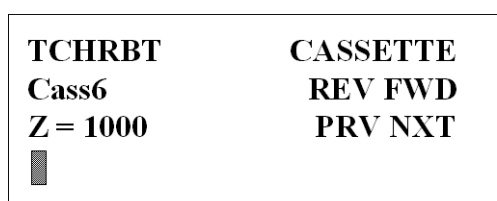


Fig. 4

The teaching is intended to input and store each parameter data.

On the LCD panel

The main parameter group name (1) is indicated on the first line at the right end.

The minor parameter group name (2) is indicated on the 2nd line at the left end.

The parameter name (3) is indicated on the 3rd line at the left end.

Step 1:

Press the [PAR+] (4) key or [PAR-] key (5) to select a main parameter group.

An example:

To select CASSETTE, press [PAR+] three times or press [PAR-] 6 times. Then, the display shown in Figure 2 appears.

Step 2:

Press the [FWD] key (6) or [REV] key (7) to select a minor parameter group.

An example:

To select CASS.6, press [FWD] 5 times or press [REV] 11 times. The display shown in Figure 3 appears.

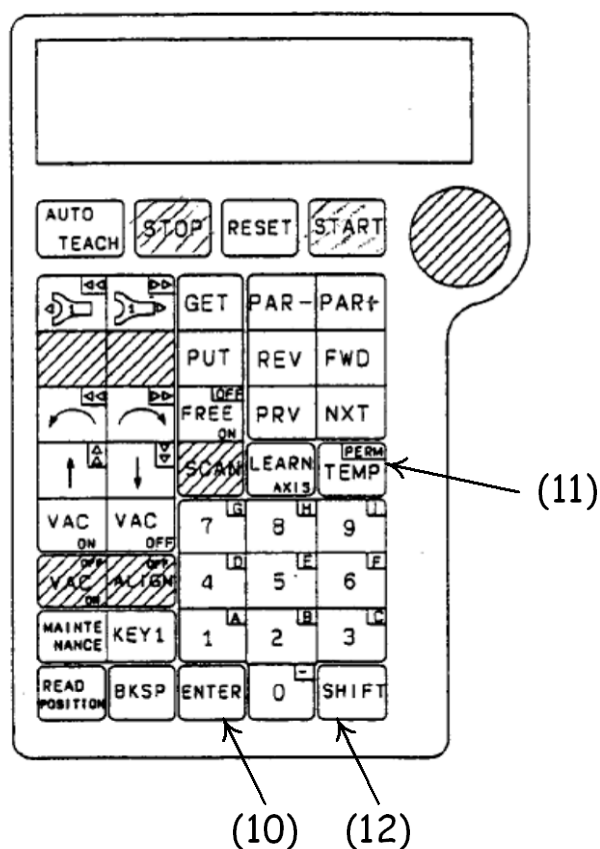
Step 3:

Press the [NXT] key (8) or [PRV] key (9) to select a parameter.

An example:

To select Z pos., press [NXT] key 4 times or press [PRV] 3 times. The display shown in Figure 4 appears.

4.4 TEACHING PROCEDURE (Continued)



Step 4:

Using the numeric input keys, input a parameter value.

An example:

To input 1200 for Z, press the keys in order of [1]-[2]-[0]-[0].

Then, the display shown in Figure 5 appears.

Step 5:

Press the [ENTER] key (10).

(The display shown in Figure 6 appears.)

Step 6:

Press the [TEMP] key (11).

(The input parameter value is stored in RAM. The display shown in Figure 7 appears.)

TCHRBT	CASSETTE
Cass6	REV FWD
Z = 1000	PRV NXT
1200	

Fig. 5

TCHRBT	CASSETTE
Cass6	REV FWD
Z = 1000	PRV NXT
1200	

Fig. 6

TCHRBT	CASSETTE
Cass6	REV FWD
Z = 1200	PRV NXT

Fig. 7

Step 7:

For all the parameters which you want to input, perform the Steps 2 to 6.

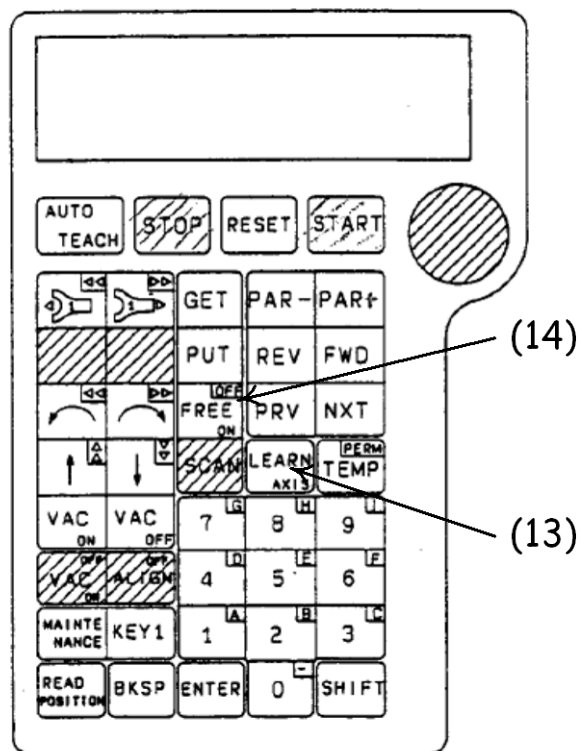
If you want to keep the stored parameter after the power is turned off, perform the Step 8.

Step 8:

Press the [TEMP] and [SHIFT] keys (12).

(All the parameter values are stored in the BACK UP RAM and kept even after the power supply is turned off.)

4.4 TEACHING PROCEDURE (Continued)



If you want to input and store not the numeric data but the current position of robot, use the [LEARN] key (13) and follow the procedure stated below.

At first, select the pertinent parameter, and then move the robot to the teaching position. After that, perform the teaching operation.

Step 1:

Using the manual operation keys, move the robot to the teaching position. Or using the [FREE] key (14), manually move the robot.

Step 2:

After moving the robot to the specific position press the [FREE] and [SHIFT] keys to turn on the brake if the [FREE] key has been pressed in Step 1 above.

Step 3:

Using the [PAR+] or [PAR-] key, select a proper main parameter group. (Figure 8 shows the selection of "CASSETTE".)

Step 4:

Using the [FWD] or [REV] key, select a proper minor parameter group. (Figure 9 shows the selection of "CASS. 4.")

Step 5:

Using the [NXT] or [PRV] key, select a proper parameter. (Figure 10 shows the selection of "T pos.".)

TCHRBT	CASSETTE
Cass1	REV FWD
Count = 25	PRV NXT
█	

Fig. 8

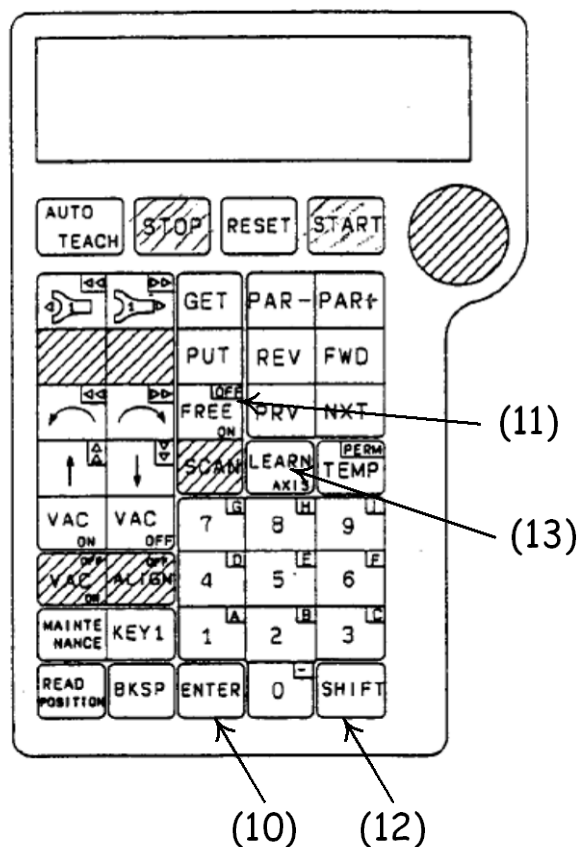
TCHRBT	CASSETTE
Cass4	REV FWD
Count = 25	PRV NXT
█	

Fig. 9

TCHRBT	CASSETTE
Cass4	REV FWD
Tpos = 3069	PRV NXT
█	

Fig. 10

4.4 TEACHING PROCEDURE (Continued)



Step 6:

Press the [LEARN] key (13).

(The display shown in Figure 11 appears, and the current position of robot is displayed at the left lower part.)

Step 7:

Press the [ENTER] (10) key.

(The display shown in Figure 12 appears.)

Step 8:

Press the [TEMP] (11) key.

(The display shown in Figure 13 appears, and the value being displayed for the current position is stored in RAM.)

Step 9:

If you want to keep the position data after the power supply is turned off, press the [TEMP] key, pressing the [SHIFT] key (12).

(Information is stored in the BACKUP RAM.)

TCHRBT	CASSETTE
Cass4	REV FWD
Tpos = 3069	PRV NXT
5688	

Fig. 11

TCHRBT	CASSETTE
Cass4	REV FWD
Tpos = 3069	PRV NXT
5688	

Fig. 12

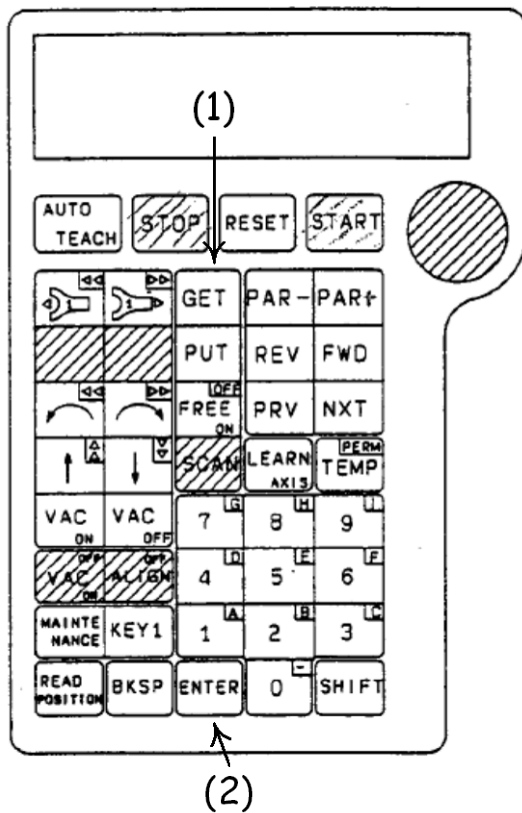
TCHRBT	CASSETTE
Cass4	REV FWD
Tpos = 5688	PRV NXT

Fig. 13

Thus, the teaching with the [LEARN] key has been completed.

4.5 OPERATION OF OPERATION CHECK KEYS

4.5.1 [GET] key operation procedure



The [GET] key is used to take out one wafer in the position specified by Station No. and Slot No.. The list of Station Nos. and Slot Nos. is shown in the last page of Section 4.5.

Step 1:

Press the [GET] key (1).

(The display shown in Figure 1 appears.)

Step 2:

Using the numeric input keys, input a Station No. (1 to 8).

An example:

If you press [2], a 5-in wafer of right cassette or a wafer of chuck table is selected.

Step 3:

Press the [ENTER] key (2).

(The display shown in Figure 2 appears.)

Step 4:

Using the numeric input key, input a Slot No. (0 to 25).

An example:

If you press [1] and [4], the 14th wafer (when counted from the bottom) is taken.

(The display shown in Figure 3 appears.)

Get Station =

Fig. 1

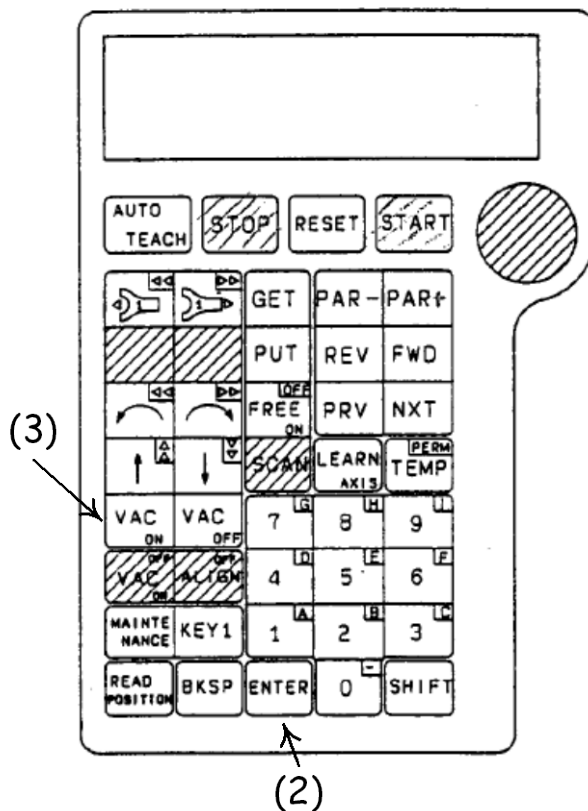
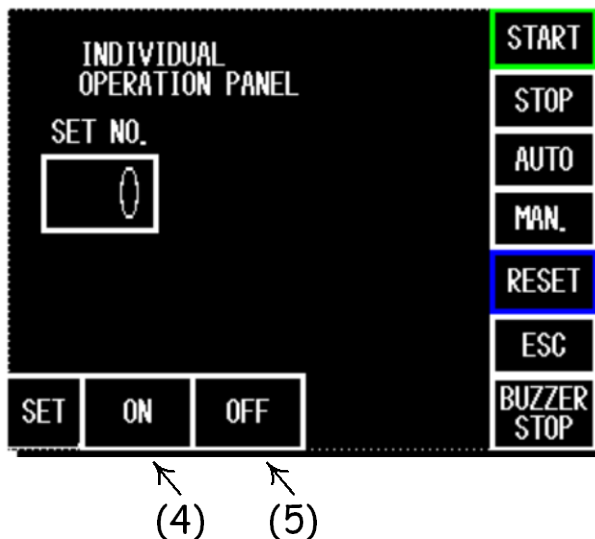
Get Station = 2
Slot =

Fig. 2

Get Station = 2
Slot = 14

Fig. 3

4.5.1 [GET] key operation procedure (Continued)



Step 5:

Cause the operation panel of the machine to display the individual operation screen.

Step 6:

Enter SET. NO. to turn on the vacuuming valve of robot arm.

Step 7:

Press the [ON] switch (4).

Step 8:

Press the [VAC ON] switch (3) of teach pendant.

(The robot arm chucking is set to ON.)

Step 9:

Press the [ENTER] key (2) of teach pendant.

(The robot moves to the specified position to take out the wafer.)

After the wafer is taken out, the robot moves to the P4 position and stops here but the chucking is kept in ON state. If you want to set the chucking to OFF and take out the wafer from the arm, perform the Step 10.

Step 10:

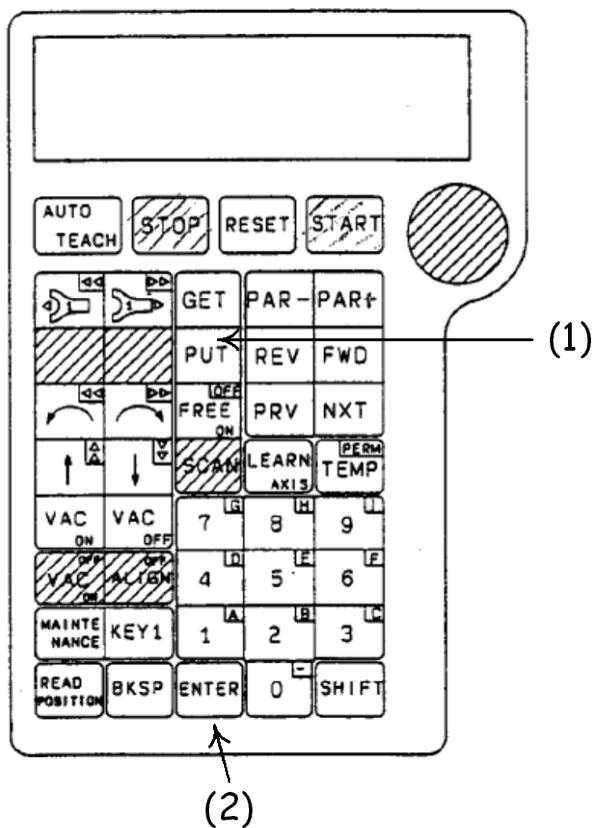
Press the [OFF] switch on operation panel.

NOTE

Be careful so that the wafer does not fall down when the chucking is released.

Thus, the [GET] key operation has been completed.

4.5.2 [PUT] key operation procedure



The [PUT] key is used to put one wafer in the position specified by Station No. and Slot No.

Step 1:

Press the [PUT] key (1).
(The display shown in Figure 1 appears.)

Step 2:

Using the numeric input key, input a Station No. (1 to 8).

An example:

When [1] is pressed, an operation to set a wafer in right table 4-in cassette or aligner is selected.)

Step 3:

Press the [ENTER] key (2).
(The display shown in Figure 2 appears.)

Step 4:

Using the numeric input key, input a Slot No. (0 to 25).

An example:

If [0] is pressed, an operation to set a wafer in the aligner is selected.

(The display shown in Figure 3 appears.)

Put Station =

Fig. 1

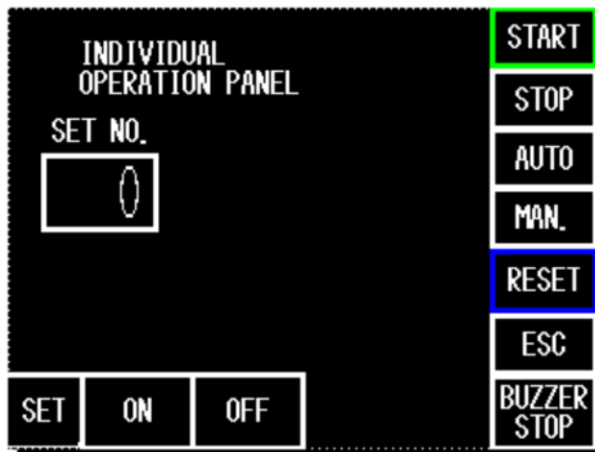
Put Station = 1
Slot =

Fig. 2

Put Station = 1
Slot = 0

Fig. 3

4.5.2 [PUT] key operation procedure (Continued)



(4)

Step 5:

Cause the operation panel of the machine to display the individual operation screen.

Step 6:

Enter SET. NO. to turn on the vacuuming valve of robot arm.

Step 7:

Press the [ON] switch (4) of operation panel.

Step 8:

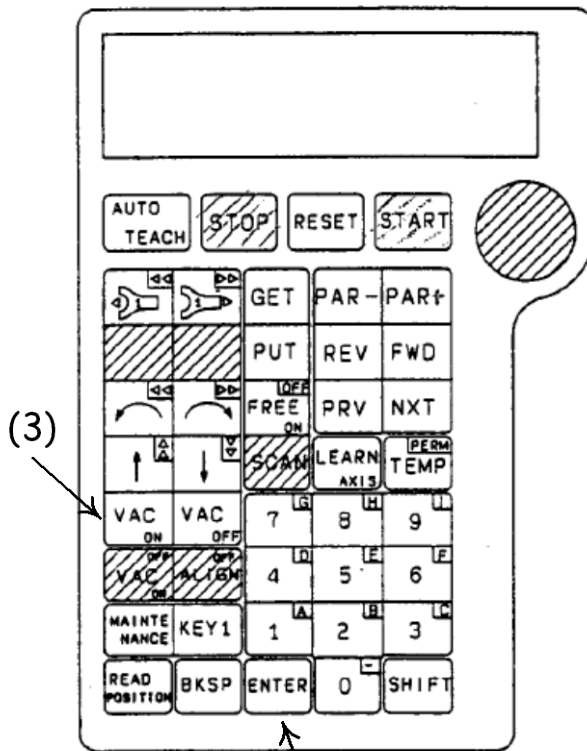
Press the [VAC ON] switch (3) of teach pendant.

(The robot arm chucking is set to ON.)

When you put the wafer onto chuck table, perform Step 9.

Step 9:

Enter SET. NO. to move the table pad upward.



(2)

4.5.2 [PUT] key operation procedure (Continued)

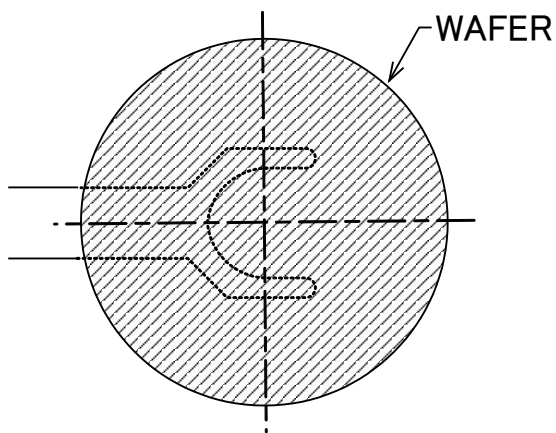


Fig. 4

Step 10:

Put a wafer so that its center aligns with the center of robot arm (see Figure 4).

Step 11:

Press the [ENTER] key (2) of teach pendant.

(The robot moves to the specified position to take out the wafer.)

After the wafer is taken out, the robot arm moves to the P4 position, and the arm chucking is automatically turned off.

Thus, the [PUT] key operation has been completed.

4.5 ATTACHED DOCUMENTS

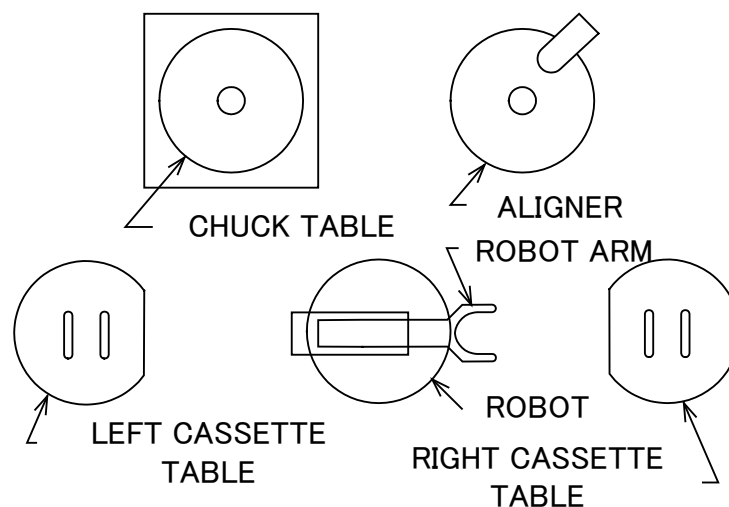
Station	Cassette	Wafer size	
1	Right	4 INCH	Or aligner Or chuck table
2	Right	5 INCH	
3	Right	6 INCH	
4	Right	8 INCH	
5	Left	4 INCH	
6	Left	5 INCH	
7	Left	6 INCH	
8	Left	8 INCH	

Slot No.	
0	Aligner or chuck table
1	1st wafer when counted from bottom
2	2nd wafer when counted from bottom
.	.
.	.
.	.
25	25th wafer when counted from bottom

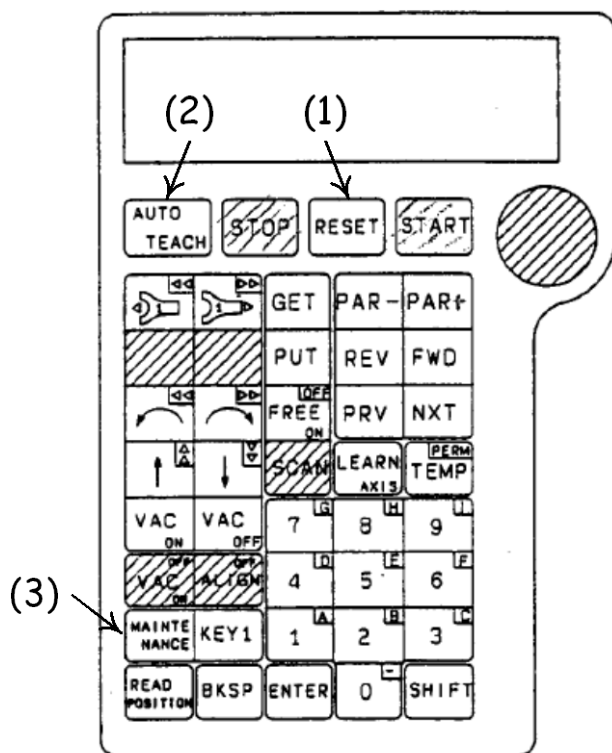
Accordingly,

To select the aligner, specify Station No.1 and Slot No.0.

To select the chuck table, specify Station No.2 and Slot No.0.



4.6 TEACH PENDANT STOPPING PROCEDURE



After completion of required operations such as manual operations, data input and storage, stop the machine in the following procedure.

Step 1:

Press the [RESET] key (1).

(The robot moves to the home position.)

Step 2:

Press the [AUTO/TEACH] key (2).

Step 3:

Press the [MAINTENANCE] key (3).

(The [MAINTENANCE] mode is changed to the AUTOMATIC OPERATION mode.)

Step 4

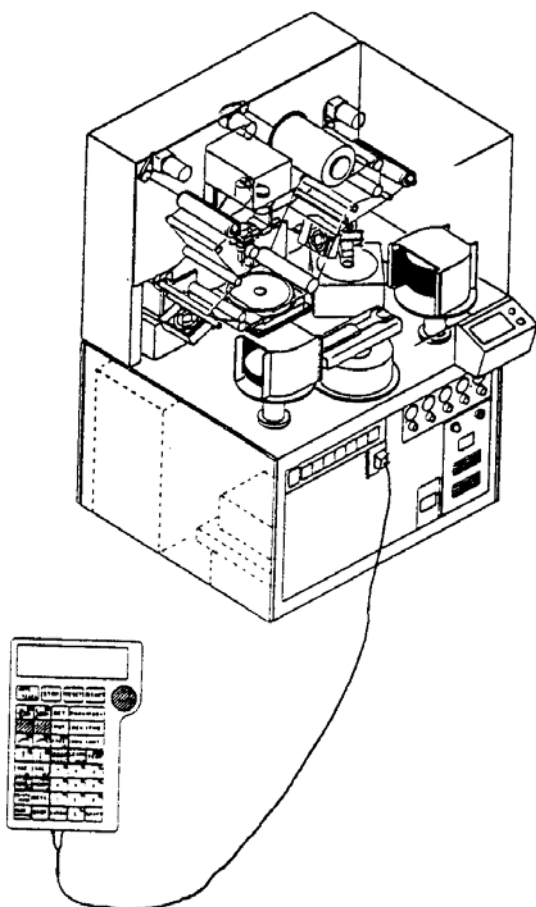
Remove the teach pendant from the machine.

Step 5:

Stop the machine.

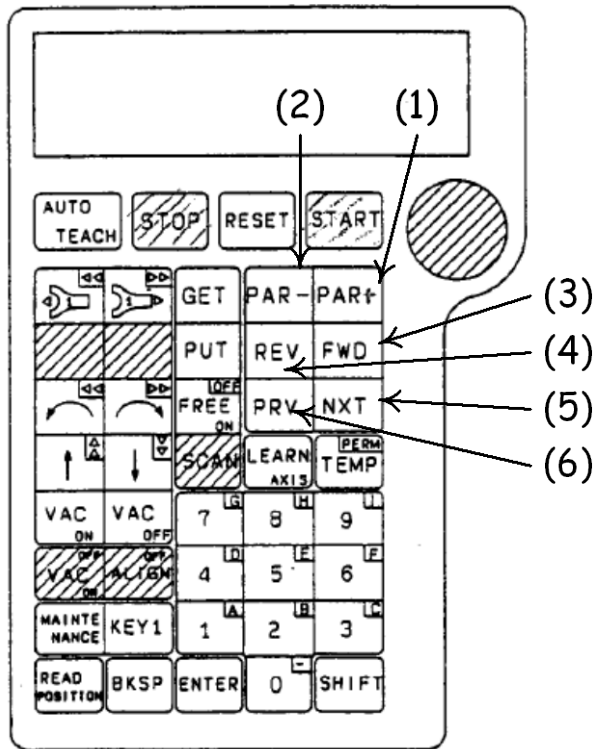
(➤[OPE] 8.6 STOPPING PROCEDURE)

Thus, the teach pendant stopping has been completed.



5. PARAMETERS

5.1 CONFIGURATION OF PARAMETERS



There are 9 main parameter groups.

Each main parameter group contains minor parameter groups. Each minor parameter group contains several parameters.

[PAR+] (1)

This key is used to scroll the main parameter groups in ascending order, allowing you to select a main parameter group.

[PAR-] (2)

This key is used to scroll the main parameter groups in descending order, allowing you to select a main parameter group.

[FWD] (3)

This key is used to scroll the minor parameter groups in ascending order, allowing you to select a minor parameter group.

[REV] (4)

This key is used to scroll the minor parameter groups in descending order, allowing you to select a minor parameter group.

[NXT] (5)

This key is used to scroll parameters in ascending order, allowing you to select a required parameter.

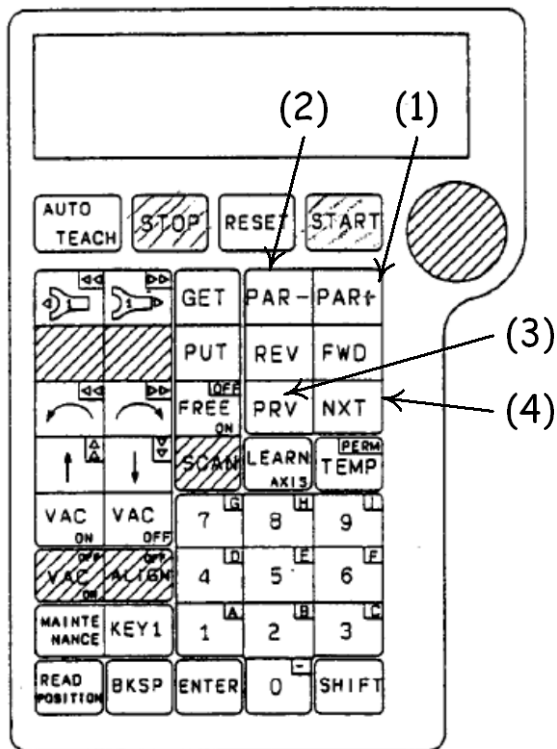
[PRV] (6)

This key is used to scroll parameters in descending order, allowing you to select a required parameter.

5.2 Parameter list

Main parameter	Minor parameter	Parameter
(1) RUN MODE		Random Test
(2) WF MODE		Vac sensor No sensor
(3) POSITIONS	Home	R 1 T Z
	Max	R 1 T Z
(4) CASSETTE	Cass 1	Count Pitch R 1 T Z Stroke Offset
	Cass 2	Same as above Cass1
	Cass 24	Same as above Cass1
(5) SCROLL CASSETTE	Cass 1	Pos 1 Pos 2 Pos 3 Pos 4
	Cass 2	Same as above Cass1
	Cass 24	Same as above Cass1
(6) STAGE	Stage1	R 1 T Z Stroke1 Stroke2 Offset
	Stage2	Same as above Stage1
	Stage8	Same as above Stage1
(7) SCROLL STAGE	Stage 1	Pos 1 Pos 2 Pos 3 Pos 4 Pos 5 Pos 6
	Stage 2	Same as above Stage1
	Stage 8	Same as above Stage1
(8) SPEED	Cass, T 1	R 1 Min R 1 Max R 1 Acc Z Min Z Max Z Acc
	Cass, T 2	Same as above Cass, T 1
	Cass, T 3	Same as above Cass, T 1
	Stage, T 1	R 1 Min R 1 Max R 1 Acc Z Min Z Max Z Acc
	Stage, T 2	Same as above Stage1
	Stage, T 3	Same as above Stage1
	Theta, Z, T 1	T Min T Max T Acc Z Min Z Max Z Acc
	Theta, Z, T 2	Same as above Theta, Z, T 1
	Theta, Z, T 3	Same as above Theta, Z, T 1

5.3 RUN MODE



The main parameter group RUN MODE is a robot operation mode.

It has the following parameters:

- RANDOM: Automatic operation mode
- TEST: Cycle operation mode at which only the robot is operated

Be sure to set RANDOM mode.

Setting Procedure

Step 1:

Press the [PAR+] key (1) or [PAR-] key (2) several times to select the main parameter group “RUN MODE”.

Step 2:

If the LCD panel displays the indication shown in Figure 1, leave it as it is.

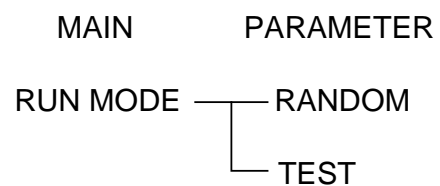
If it displays the indication shown in Figure 2, once press [PRV] (3) or [NXT] key (4) to set a parameter “Random”.

TCHRBT	RUN MODE
Random	PRV NXT

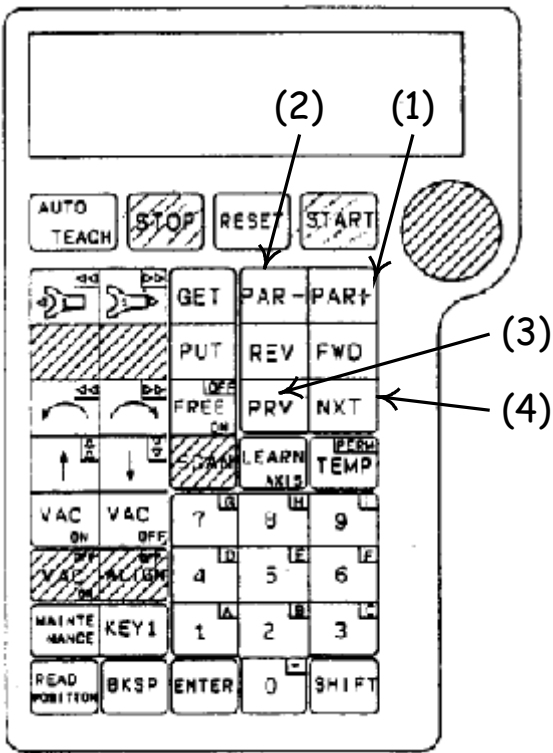
Fig. 1

TCHRBT	RUN MODE
Test	PRV NXT

Fig. 2



5.4 WF SENSOR



The main parameter group WF SENSOR is used to select a wafer vacuum sensor.

Usually, set it to VAC SENSOR.

Setting Procedure

Step 1:

Press [PAR+] (1) or [PAR-] (2) key several times to select the main parameter group “WFSENSOR”.

Step 2:

If the LCD panel displays the indication shown in Figure 1, leave it as it is.

If it displays the indication shown in Figure 2, once press [PRV] (3) or [NXT] key (4) to set a parameter “VACSENSOR”.

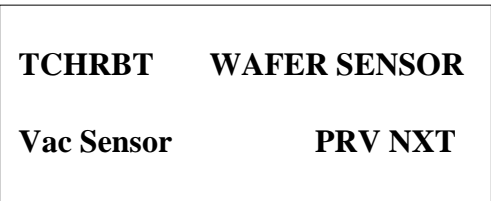


Fig. 1

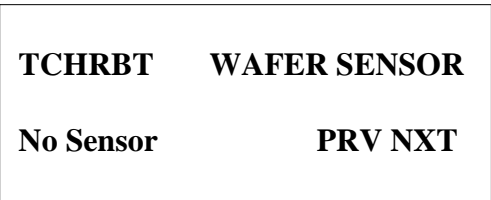
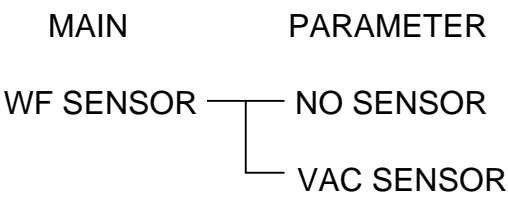
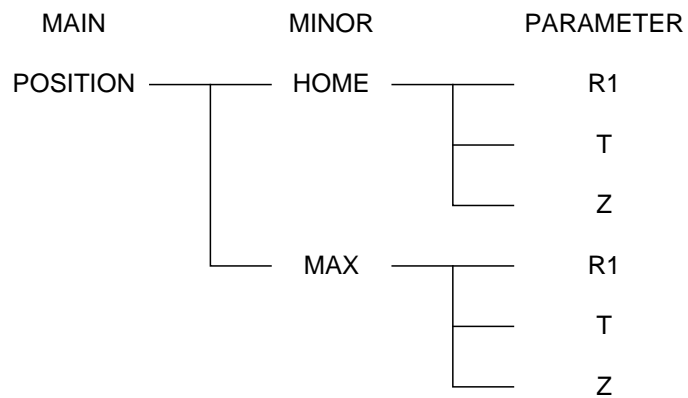


Fig. 2

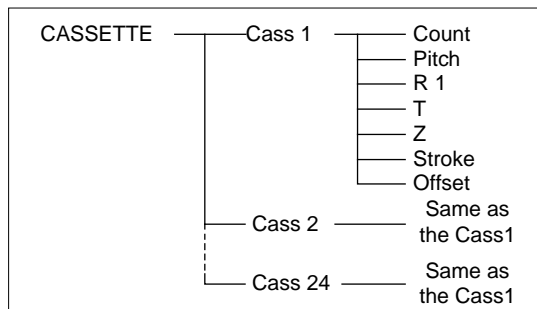
5.5 POSITION




The parameters of the minor parameter group HOME indicate the robot position in the state where the initial resetting of the machine has been completed.

The parameters of the minor parameter group MAX indicate the maximum motion limits of robot.

5.6 CASSETTE



TCHRB
Cass4
Count = 25


CASSETTE
REV FWD
PRV NXT

The main parameter group CASSETTE has many parameters characterizing the wafer cassettes.

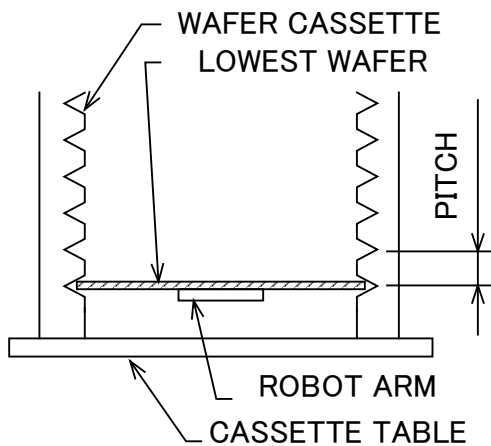
The minor parameter groups are classified by:

- Cassette table position (right/left)
- Wafer size
- Number of cassette slots

The minor parameter groups of the standard machine are as follows.

Parameter	Wafer size	Table	Slot
CASS 1	4-inch	Right	25
CASS 2	5-inch		
CASS 3	6-inch		
CASS 4	8-inch		
CASS 5	4-inch	Left	
CASS 6	5-inch		
CASS 7	6-inch		
CASS 8	8-inch		
CASS 9	4-inch	Right	12
CASS 10	5-inch		
CASS 11	6-inch		
CASS 12	8-inch		
CASS 13	4-inch	Left	
CASS 14	5-inch		
CASS 15	6-inch		
CASS 16	8-inch		
CASS 17	4-inch	Right	12
CASS 18	5-inch		
CASS 19	6-inch		
CASS 20	8-inch		
CASS 21	4-inch	Left	
CASS 22	5-inch		
CASS 23	6-inch		
CASS 24	8-inch		

5.6 CASSETTE (Continued)



The following parameters are used.

Refer to 4.4 TEACHING PROCEDURE.

(1) COUNT

The parameter COUNT specifies the number of slots of wafer cassette. To set it, input the number of slots of pertinent cassette.

(2) PITCH

This parameter specifies the distance between slots of wafer cassette.

(3) R pos

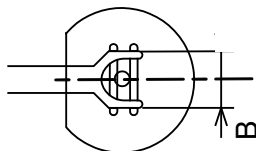
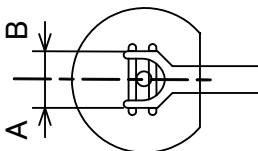
This parameter specifies the value of R-axis in the position where the center of arm.

(4) T pos

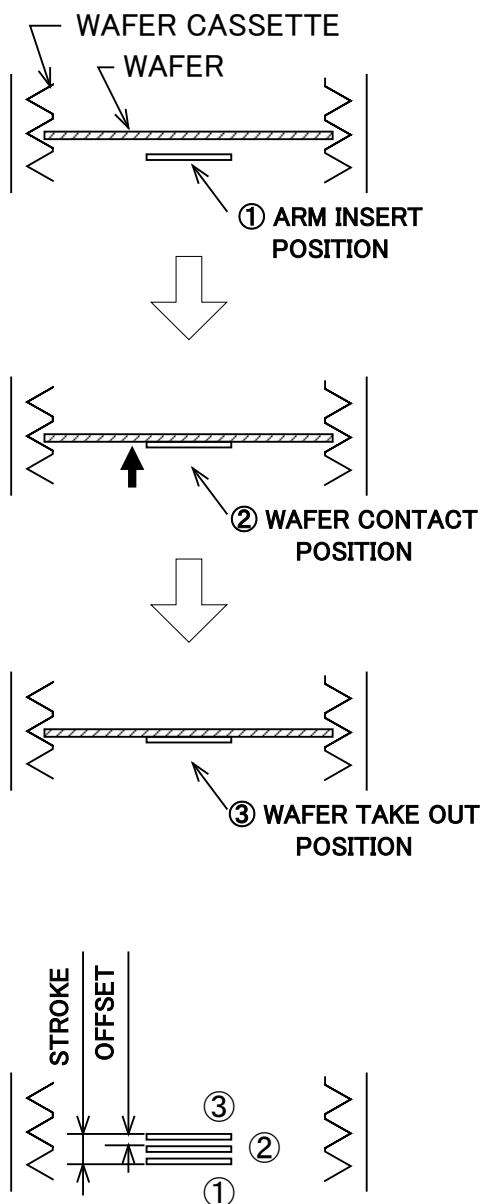
This parameter specifies the value of T-axis in the position where the center of wafer stored in the pertinent cassette aligns with the center of arm.

(5) Z pos

This parameter specifies the value of Z-axis in the position where the bottom surface of lowest wafer contacts the upper surface of arm.



5.6 CASSETTE (Continued)



(6) STROKE

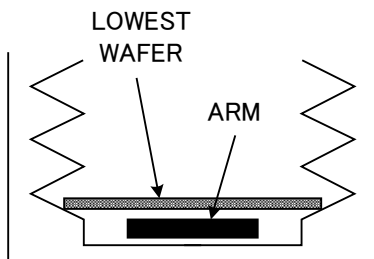
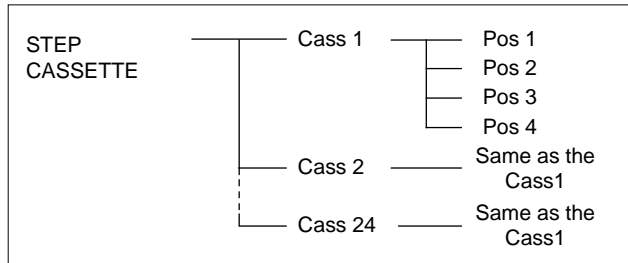
This parameter specifies the full-shift distance in the Z direction in the state where the arm is going to take out one wafer from the wafer cassette.

(7) OFFSET

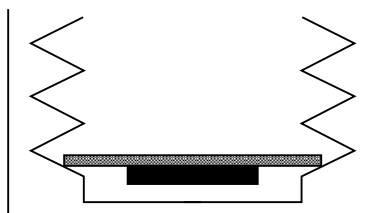
This parameter specifies the distance of rise further from the position where the arm contacts the wafer when the wafer is taken out.

5.7 STEP CASSETTE

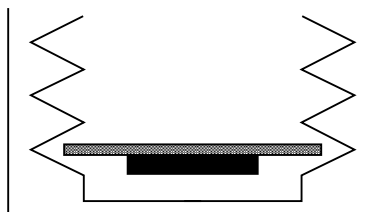
5.7.1 Function of STEP CASSE



P1
(ARM INSERTED
POSITION)



P2
(WAFER
CONTACTED
POSITION)



P3
(WAFER TAKEN
OUT POSITION)



P4
(R-AXIS INITIAL
RESET POSITION)

The main parameter group STEP CASSE is used to check the operations after the parameters of CASSETTE have been set.

The operations to take out and put in the lowest wafer from and into the wafer cassette are executed as 4-step motion.

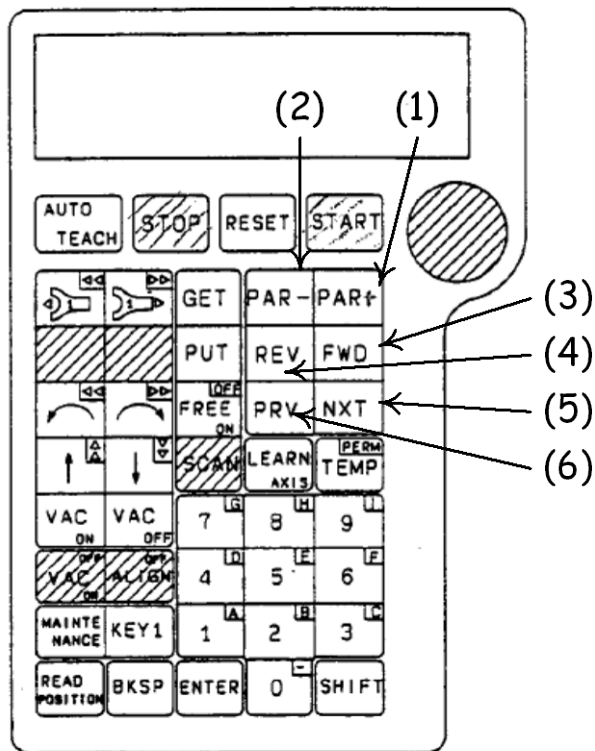
This main parameter group has the same minor parameter groups as those of CASSETTE.

For the parameters P1 to P4, the values which have been input for CASSETTE must be used.

These parameters represent the coordinates of 3 axes of robot.

- (1) P1
 - $Rp1 = R \text{ pos}$
 - $Tp1 = T \text{ pos}$
 - $Zp1 = Z \text{ pos} + \text{OFFSET} - \text{STROKE}$
- (2) P2
 - $Rp2 = R \text{ pos}$
 - $Tp2 = T \text{ pos}$
 - $Zp2 = Z \text{ pos}$
- (3) P3
 - $Rp3 = R \text{ pos}$
 - $Tp3 = T \text{ pos}$
 - $Zp3 = Z \text{ pos} + \text{OFFSET}$
- (4) P4
 - $Rp4 = R\text{-axis initial reset position}$
 - $Tp4 = T \text{ pos}$
 - $Zp4 = Z \text{ pos} + \text{OFFSET}$

5.7.2 STEP CASSE. Operation checking procedure



STEP CASS perform the operation check in 4 steps in order of P1 - P2 - P3 - P4 or P4 - P3 - P2 - P1. After teaching the parameters follow the procedure shown below.

Step 1:

Using the [PAR+] key (1) or [PAR-] key (2), set the main parameter group STEP CASSE.

(The display shown in Figure 1 appears.)

Step 2:

Using the [FWD] (3) or [REV] key (4), select a minor parameter group.

(If you have selected CASS. 6, the display shown in Figure 2 appears.)

TCHRBT	STEP CASS
Scroll Cass	REV FWD
	PRV NXT

Fig. 1

TCHRBT	STEP CASS
Cass 6, 1	REV FWD
PUT = REV,	GET = NXT

Fig. 2

TCHRBT	STEP CASS
Cass 6, 1	REV FWD
PUT = PRV,	GET = NXT
P1	

Fig. 3

NOTE

If the [PRV] key or [NXT] key is pressed in Step 3, the robot moves to the position specified by the selected parameter. Therefore due care must be taken.

Step 3:

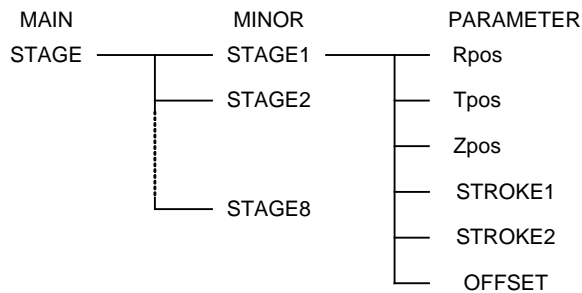
To perform the wafer carrying-in operation, press the [PRV] key (5).

To perform the wafer taking-out operation, press the [NXT] key (6).

(Whenever the [NXT] key is pressed, the robot moves in order of P1=>P2=>P3=>P4.)

(The current position of robot is indicated at the lower left part of LCD screen.)

5.8 STAGE



The main parameter group STAGE has various parameters relating to the chuck table and aligner. It contains the following minor parameter groups.

- (1) STAGE 1
Wafer carrying to aligner/taking-out position
- (2) STAGE 2
Wafer carrying position (to chuck table)
- (3) STAGE 3
- (4) STAGE 4
Wafer carrying to UV unit/taking-out position (option)
- (5) STAGE 5
- (6) STAGE 6
Wafer taking-out position (from chuck table)
- (7) STAGE 7
Waiting position before taking out wafer from chuck table.
- (8) STAGE 8
Waiting position after taking out wafer from chuck table.

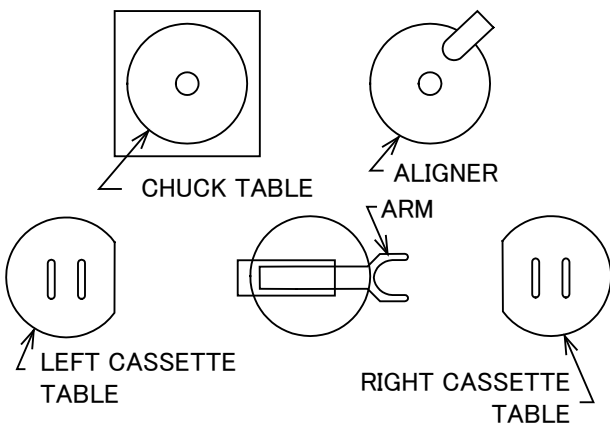



Fig. 1

TCHRBT	STAGE
Stage 1	REV FWD
R1 = 0	PRV NXT
	

5.8 STAGE (Continued)

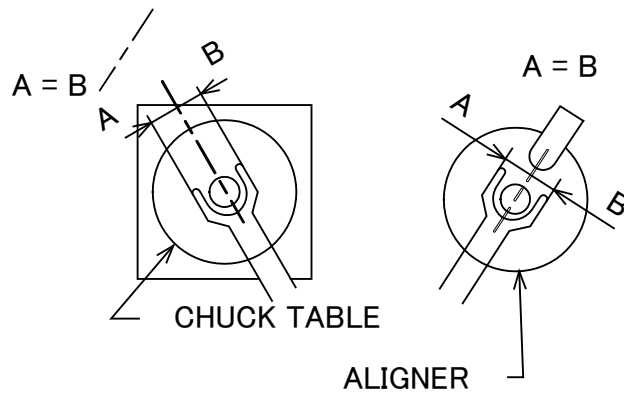


Fig. 2

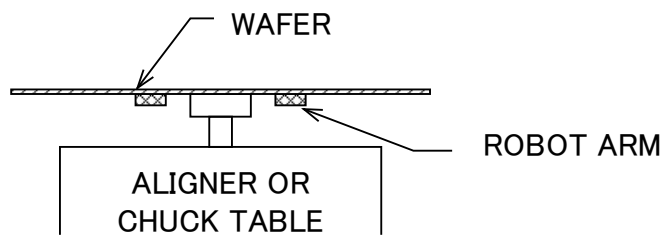


Fig. 3

The following parameters are used.

- (1) **R pos**
Value of R-axis in the position (Figure 2) where the center of aligner or chuck table axis aligns with the arm center.
The value obtained in item 4.3 TEACH POINT MEASURING PROCEDURE is used.
- (2) **T pos**
Value of T-axis in the same position as that stated in item (1) above.
- (3) **Z pos**
Value of Z-axis in the position where the upper surface of arm contacts the lower surface of wafer (Figure 3).

5.8 STAGE (Continued)

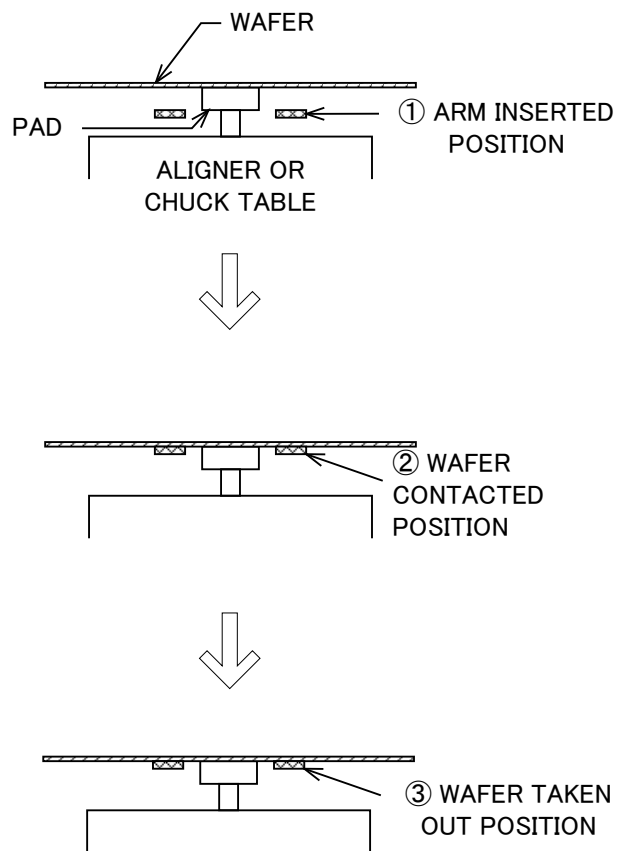


Fig. 4

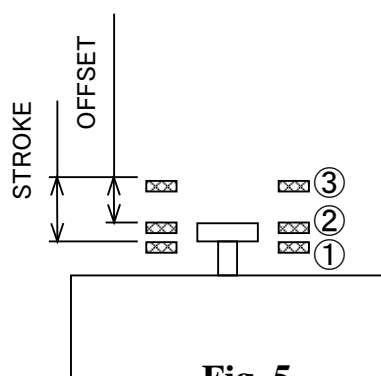
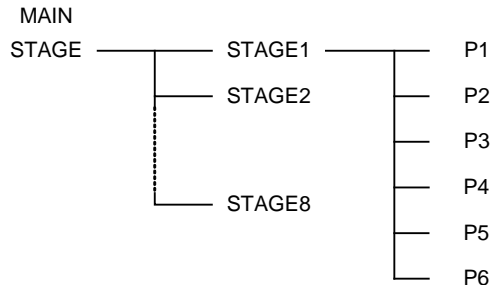


Fig. 5

- (4) **STROKE 1**
Total shift distance in Z direction when the arm takes out a wafer from the aligner or chuck table
- (5) **STROKE 2**
Option
- (6) **OFFSET**
Further raising distance of arm after it contacts a wafer on the aligner or chuck table

5.9 STEP STAGE

5.9.1 Functions of STEP STAGE

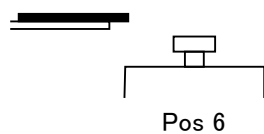
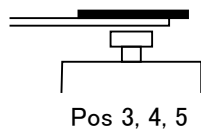
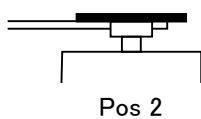
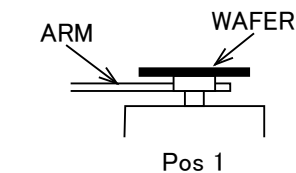


The main parameter group STEP STAGE is used to check the operations after the parameters of STAGE have been set.

The wafer taking-out from aligner and chuck table and carrying are performed in 4 steps.

The minor parameter groups are identical with those of STAGE.

The parameters P1 to P6 which have been specified for STAGE are used. Those parameters represent the coordinates of 3 axes of robot.



- P1

$$Rp1 = R \text{ pos}$$

$$Tp1 = T \text{ pos}$$

$$Zp1 = Z \text{ pos} - (\text{STROKE} - \text{OFFSET})$$

- P2

$$Rp2 = R \text{ pos}$$

$$Tp2 = T \text{ pos}$$

$$Zp2 = Z \text{ pos}$$

-P3, P4, P5

$$Rp3 = Rp4 = Rp5 = R \text{ pos}$$

$$Tp3 = Tp4 = Tp5 = T \text{ pos}$$

$$Zp3 = Zp4 = Zp5 = Z \text{ pos} + \text{OFFSET}$$

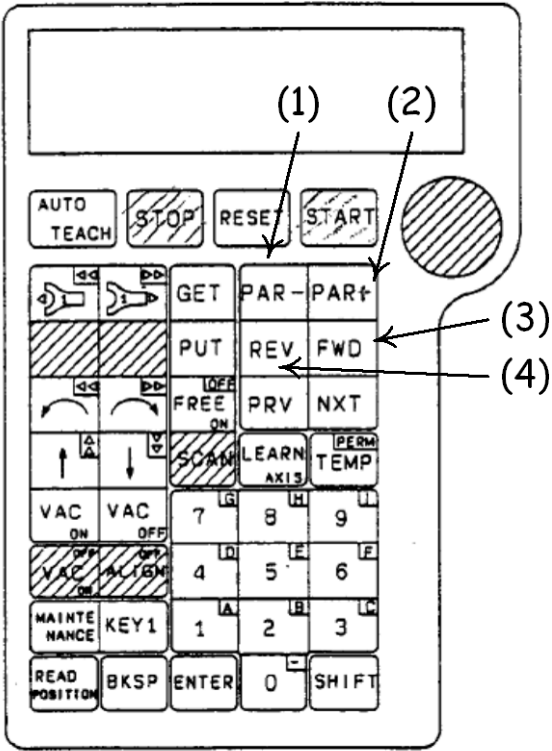
- P6

$$Rp6 = R \text{ home}$$

$$Tp6 = T \text{ pos}$$

$$Zp6 = Z \text{ pos} + \text{OFFSET}$$

5.9.2 STEP STAGE operation checking procedure



After teaching parameters in the STAGE mode follow the procedure stated below.

Step 1:

Using the [PAR+] (1) or [PAR-] key (2), select the main parameter group STEP STAGE.

(The display shown in Figure 1 appears.)

Step 2:

Using the [FWD] (3) or [REV] key (4), select a minor parameter group.

(The display shown in Figure 2 appears if STAGE 2 has been selected.)

TCHRBT	STEP STAGE
Scroll Stage	REV FWD
	PRV NXT

Fig. 1

TCHRBT	STEP STAGE
Cass 1, 1	REV FWD
PUT = REV,	GET = NXT

Fig. 2

TCHRBT	STEP STAGE
Cass 1, 1	REV FWD
PUT = PRV,	GET = NXT
Pos 2	

Fig. 3

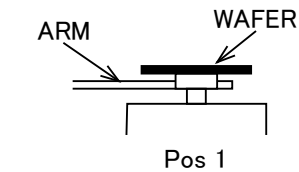
NOTE

If the [PRV] key or [NXT] key is pressed in Step 3, the robot moves to the position specified by the selected parameter. Therefore due care must be taken.

Press the [NXT] key or [PRV] key.

If the keys are pressed, the robot moves to the P1 position, and the display shown in Figure 3 appears.

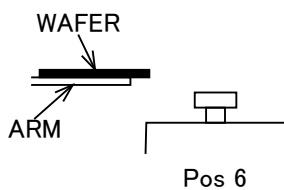
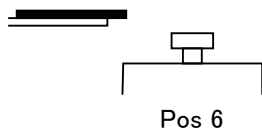
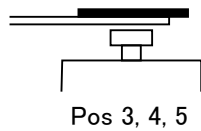
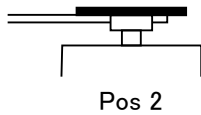
5.9.2 STEP STAGE operation checking procedure



(A) Press the [NXT] key
GET operation (take out a wafer).

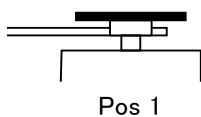
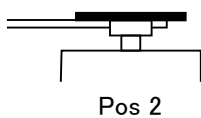
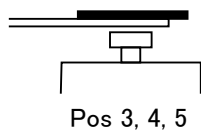
Pressing [NXT] key to check the operation.
The robot arm moves in order of
 $P1 \Rightarrow P2 \Rightarrow P3 \Rightarrow P4 \Rightarrow P5 \Rightarrow P6$.

(P3, P4, P5 are on same position)

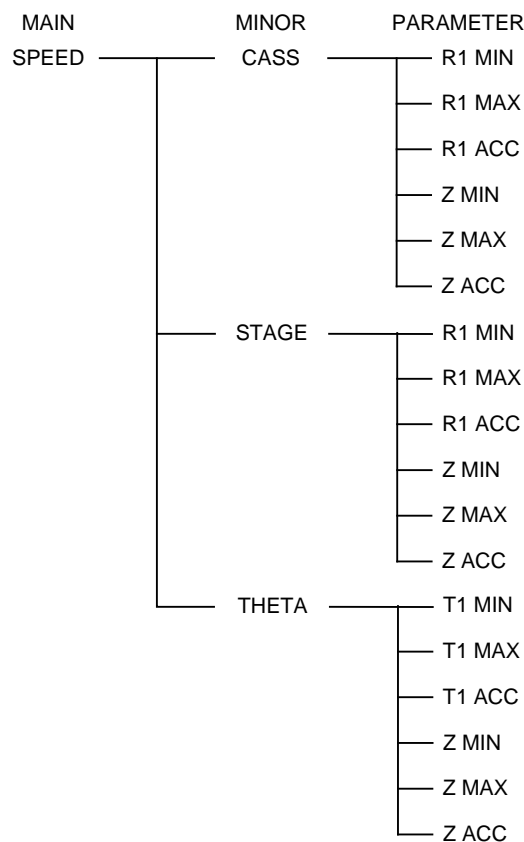


(B) Press the [PRV] key
PUT operation (put a wafer).

Pressing [PRV] key to check the operation.
The robot arm moves in order of
 $P6 \Rightarrow P5 \Rightarrow P2 \Rightarrow P1$.



5.9.2 STEP STAGE operation checking procedure



TCHRBT	SPEED
Cass	REV FWD
R1min = 100	PRV NXT

The main parameter group SPEED has the parameters relating to operation speed of robot.

It has the following minor parameter groups.

(1) CASS

CASS has the parameters specifying the wafer cassette wafer taking-out speed and wafer putting-in speed.

(2) STAGE

STAGE has the parameters specifying the aligner and chuck table wafer taking-out/putting-in speed.

(3) THETA

THETA has the parameters specifying the operation speed of robot excepting wafer cassette, aligner and chuck table wafer taking-out/putting –in operations.

The parameters are used as follows.

MIN:

MIN specifies the starting speed.

(An example: Z MIN of CASS specifies the initial speed of Z-axis when the wafer cassette wafer is taken out or put in.)

MAX:

MAX specifies maximum speed.

ACC:

ACC specifies acceleration from starting speed up to maximum speed.

* The parameter values must be percent values (1 to 100%).

100% PPS