Ezi-STEP® Plus-R

Micro Stepping System
with Network based Motion Co

Ezi-STEP® Plus-R MINI

Micro Stepping System
with Network Based Motion Controller

User Manual

Position Table

(Rev.08.04.026)

FASTECH

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1. Before Getting Started

Presented 「 Ezi-STEP Plus-R User Manual “ Position Table”」 explains position table functions of Ezi-STEP Plus-R. Here are 「 User Manual_ Text」, 「 User Manual_Communication Function 」 in this manual. Please utilize our product afterward understanding about proper usage method with reading these contents carefully.

The word as ‘Position Table’ can be presented as PT (Position Table) from the following text. In particular, Please don’t forget to memorize whole matters that requires attention about safety in 「 User Manual_ Text」 and should try to understand properly. Besides please be safe to do not use the products improperly in any case. At worst, serious damage can be occurred as like death.

We provide this instruction manual and other instruction manual as well. Please keep these manuals in appropriate place whenever you need to find and read comfortably.

This manual is commonly used for next products.

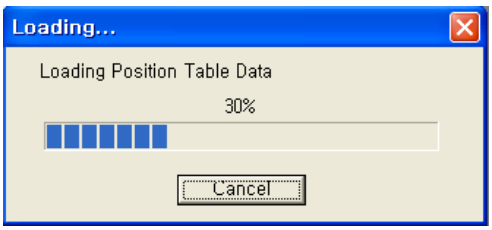
(1) **Ezi-STEP-PR**

(2) **Ezi-STEP-PR-MI**

2. Windows of Position Table

2 – 1. Loading Position Table Data

When click the ‘Pos Table’ button on main menu of User Program (GUI), then the system displays the following message box and loads data saved in RAM area of drive.



Functions of Position Table allows to process motions in the orders that were predefined by user. In the case of this Ezi-STEP Plus-R drive, up to 256 steps can be saved.

Major functions for saving items are shown as following:

(1) Editing function of Motion step (Input/Edit/Delete/Copy).

(2) Start and Stop function of Motion order at User Program (GUI).

(3) Start and Stop Motion function by signal input from outside drive.

(4) Teaching function.

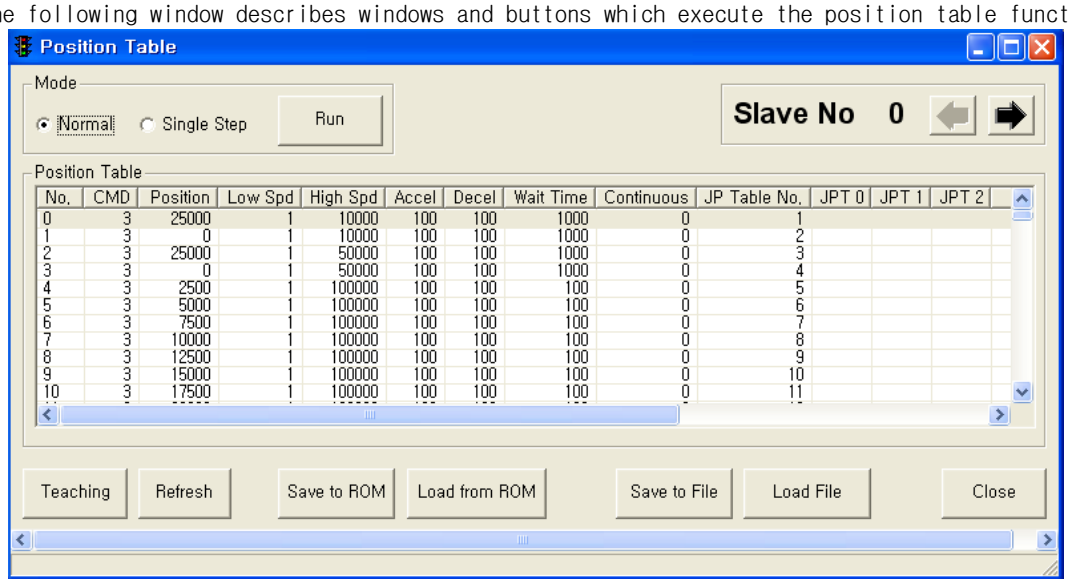
(5) Functions to save Motion steps as file and to load them from file.

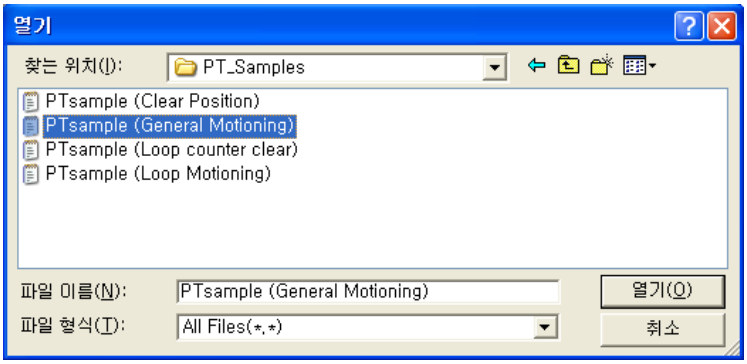
(6) View function of current Position Table order under execution status.

When electric power is supplied to drive, the Position Table data saved in ROM area of drive is copied to RAM area and once click the ‘Post Table’ button, then the system loads the data saved in RAM area of drive.

2 – 2. Main Window of Position Table

The following window describes windows and buttons which execute the position table function.

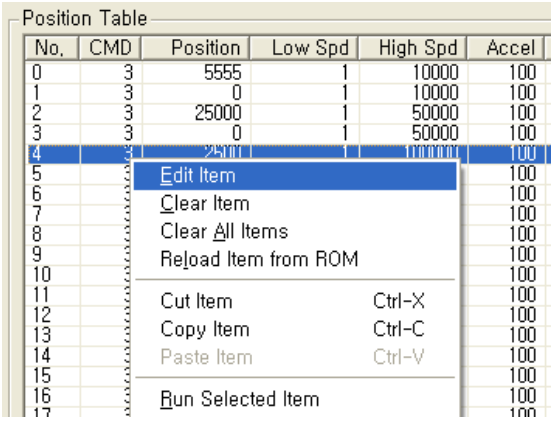


Button	Description
Normal/Single Step	The user can select modes to execute the position table. Normal : All position commands are in order executed according to conditions saved in the position table. Single Step : Only single position command is executed.
Run/Stop/Next	To run/stop items at the defined position table
Teaching	Teaching is executed by either using external input signal or user program. By clicking this button, the user can easily use teaching function at the user program window. For more information, refer to 'Teaching Function'.
Refresh	To display the position value measured by the teaching function. For more information, refer to 'Teaching Function'.
Save to ROM	To save current position table data in ROM drive.
Load from ROM	To open position table data saved in ROM drive
Save to file	To save current position table data to an external file (It is saved to a folder defined by the user with a file name defined by the user. The extension is *.txt.)
Load File	To read position table data saved in external file 

* Up to **256 position table** commands can be input and saved for **Ezi-STEP-PR**.
* Up to **64 position table** commands can be input and saved for **Ezi-STEP-PR-MI**.
* By using each position table command, the user can edit the file such as edit, copy, paste, and delete.

2 – 3. Position Table Editor

When click right mouse button on a selected Position Table data line, then the following popup menu is activated.



(1) Edit Item: You can edit data on the following dialog box shown as below.

(2) Clear Item: All the items of selected PT are cleared.
After executing this function all the items are shown as blank.

(3) Clear All Items: While above function "Clear Item" clears data for one selected order, this function clears data for all the orders of 256 Position Table.

(4) Reload Item from ROM: The data shown on the screen are values saved in the RAM. This function is used for reload data saved in ROM area.

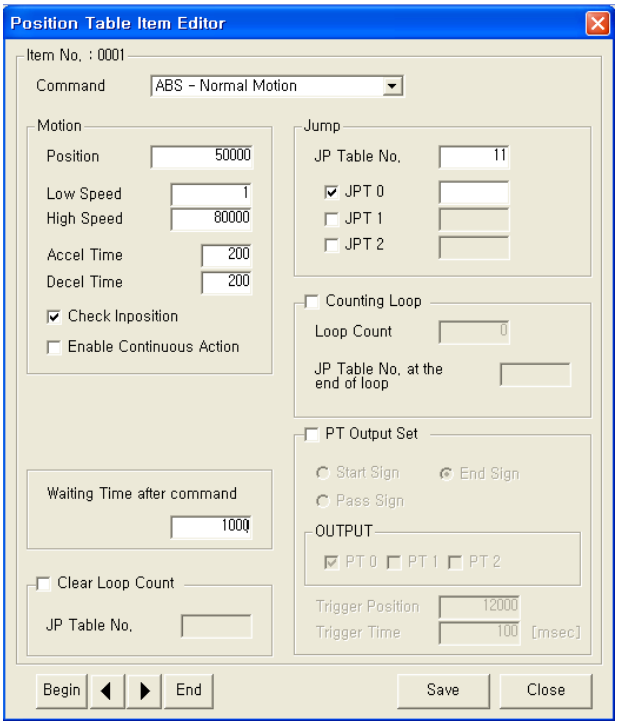
(5) Cut Item: Used to cut selected item data of PT in order to paste on other position.

(6) Copy Item: Used to copy selected item data of PT in order to paste on other position.

(7) Paste Item: Paste the copied data to clipboard by " Cut" or "Copy" to other selected position.

(8) Run Selected Item: Execute motion order from the selected No. of Position Table.

Double click on selected line of Position Table data or click the "Edit Item" from popup menu button shown above figure, then the dialog box shown right is activated.

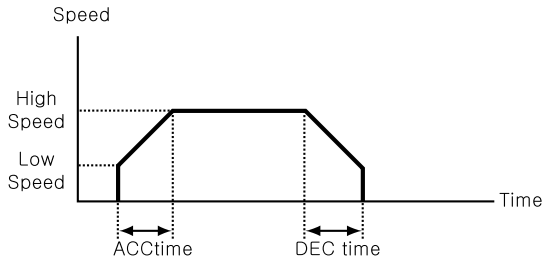
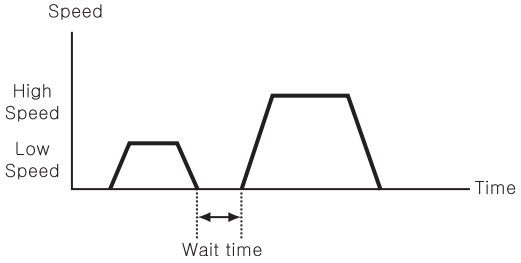


Once complete editing of each item, and then you move and select other items to edit by using right/left arrow key.

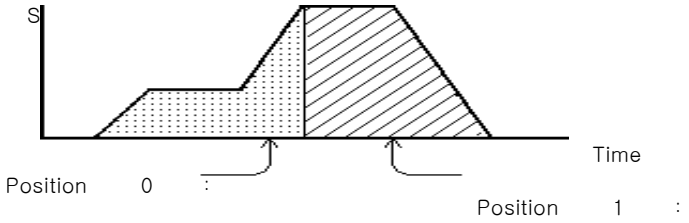
After editing of all data completely, click 'Save' button to save data to RAM. In order to save data to ROM area, click 'Save to ROM' button on main screen of Position Table.

3. Position Table Item

3 - 1. Explanation of Position Table Item

Designated Item	Description	Unit	Lower limit	Upper limit
Command	Specifies type of motion. For more details, refer to 「3.2 Command」.	-	0	9
Position	Specifies position/movement scale by number of pulse.	pulse	-134,217,728	+134,217,727
Low Speed	Specifies low speed by number of pulse in accordance with type of motion. For more details, refer to 「3.2 Command」.	pps	0	500,000
High Speed	Specifies high speed by number of pulse in accordance with type of motion. For more details, refer to 「3.2 Command」.	pps	0	500,000
ACC time	Specified acceleration time by msec when starting motion.	ms	1	9,999
DEC time	Specified acceleration time by msec when stopping motion.	ms	1	9,999
				
Wait time	Specifies waiting time by msec for starting motion of next PT when specifying PT No. for jump/skip. If JP Table No. is specified as blank or 'Continuous Action' is specified, this is ignored.	ms	0	60,000
				

Note) Even if Wait Time is specified as 0[ms], the system waits for the completion signal of position setting (INP signal) or motor stop signal before starting next Position Table

<table>
<tr><td>Continuous action</td><td>If this item is checked as ‘check (1)’, the system continues action of current position and next position.</td><td>-</td><td>0</td><td>1</td></tr>
<tr><td colspan="5">Condition) For this function the ‘Command’ item value must be ‘0~3’.
This function have to be used in sequencially increased goal position or sequencially decreased Goal position.
Example) When Position No. 0, 1 are specified as under, that is, position 0 is specified as Continuous Action,
<table><tr><th>PT No.</th><th>Cont Act</th><th>JPT No.</th></tr><tr><td>Position 0</td><td>1</td><td>1</td></tr><tr><td>Position 1</td><td>0</td><td>-</td></tr></table>  </td></tr>
<tr><td rowspan="2">JP Table No.</td><td rowspan="2">When this item specified, the system jumps to JP Table No. and execute it after completing action of current position. If Position No. is specified as 10XXX, system jumps to Position No. XXX as soon as ‘JPT Start’, one of the input digital signal begins from controller to outside, becomes ON.
For program exit, specify as blank.
For more details, refer to 「4.4 Input Condition - Jump」.</td><td>-</td><td>0</td><td>255</td></tr>
<tr><td></td><td>10,000</td><td>10,255</td></tr>
<tr><td>JPT 0</td><td rowspan="3">If any of these items is checked and there are corresponding input signals of JPT input0, JPT input1 or JPT input2, system jumps to JPT 0, JPT 1 or JPT 2 accordingly regardless of specified ’ Jump Table No.’.
For more details, refer to 「4.4 Input Condition Jump」.</td><td rowspan="2">-</td><td>0</td><td>255</td></tr>
<tr><td>10000</td><td>10255</td></tr>
<tr><td>JPT 1</td><td rowspan="2"></td><td>0</td><td>255</td></tr>
<tr><td></td><td>10000</td><td>10255</td></tr>
<tr><td>JPT 2</td><td rowspan="2"></td><td>0</td><td>255</td></tr>
<tr><td></td><td>10000</td><td>10255</td></tr>
<tr><td colspan="5"><table><tr><th>Input signal</th><th>Corresponding Input Jump Position</th></tr><tr><td>JPT input0</td><td>Input Jump Position No. 0</td></tr><tr><td>JPT input1</td><td>Input Jump Position No. 1</td></tr><tr><td>JPT input2</td><td>Input Jump Position No. 2</td></tr></table></td></tr>
<tr><td>Loop Count</td><td rowspan="2">If these items are specified, system repeats action of the position under specified times (Loop Count) and after then jumps to corresponding position to Loop Jump Table No. regardless of specified ’ Jump Table No.’. For more details, refer to 「4.5.1 Loop Setting」.</td><td>-</td><td>0</td><td>100</td></tr>
<tr><td>Loop Jump Table No.</td><td></td><td>0</td><td>255</td></tr>
<tr><td></td><td></td><td>10,000</td><td>10,255</td></tr>
<tr><td>PT set</td><td>Specifies output signals such as PT Output0, PT Output1, PT Output2 in order to confirm the start, pass or end of motor operation for each position.

0,8,16 : Not use output signal
1~7 : Specifies output function when starting operation
9~15 : Specifies output function when completing operation
17~23: Specifies output function when the position reach to ‘Trigger</td><td></td><td>0</td><td>15</td></tr>
</table>

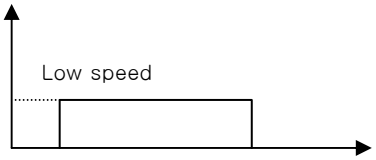
	Position' For more details, refer to 「4.7 Start/Pass/End Signal Function」.			
Loop Counter Clear	If this item is checked, Loop Count of specified No. of PT is to be cleared. For more details, refer to 「4.5.1 Loop Setting」.	-	0	255
Trigger Pos	Specifies position where the PT Output0, PT Output1, PT Output2 signal is ON in case of 'PT set' is 17~23. For more details, refer to 「4.7 Start/Pass/End Signal Function」.	pulse	-134,217,728	+134,217,727
Trigger Time	Specifies pulse width where the PT Output0, PT Output1, PT Output2 signal is ON in case of 'PT set' is 17~23. For more details, refer to 「4.7 Start/Pass/End Signal Function」.	ms	0	65535

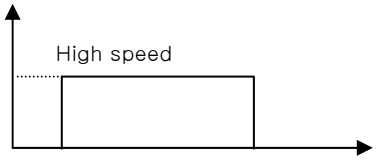
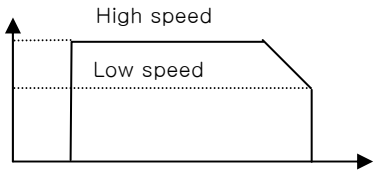
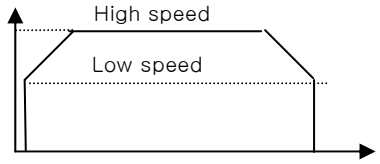
3 - 2. Type of Command

Item "Command" specifies type of action pattern to be executed for each position and the followings in the table are list of commands.

Command Name	Specified Value	Remark
Abs Move low speed.	0	The value in the item "Position" is value for absolute position. 'Teaching' function can be used. 'Continuous Action' function can be used.
Abs Move high speed	1	
Abs Move high speed with deceleration.	2	
Abs Move with acceleration and deceleration.	3	
Inc Move low speed.	4	The value in the item "Position" is value for relative position. 'Teaching' function is not supported. 'Continuous Action' is not supported .
Inc Move high speed	5	
Inc Move high speed with deceleration.	6	
Inc Move with acceleration and deceleration.	7	
Move to Origin	8	Execute the command to move to origin based on the specified current parameters.
Clear Position	9	Reset 'command position' value and 'actual position' value based on current position and clears the values as 0.

The following table shows speed patterns for each action of command.

Command Name	Specified Value	Speed Pattern
Abs Move low speed.	0	
Inc Move low speed.	4	

Abs Move high speed	1	
Inc Move high speed	5	
Abs Move high speed with deceleration.	2	
Inc Move high speed with deceleration.	6	
Abs Move with acceleration and deceleration.	3	
Inc Move with acceleration and deceleration.	7	

4. Execution of Position Table

When installing User Program(GUI), the following files are saved in the folder named as "WWFASTECHWWEziMOTION PlusR WWPT_SamplesWWEzi-STEP ST or Ezi-STEP MINI" for version 6 "WWFASTECHWWEziMOTION PlusR V8WWPT_SamplesWWEzi-STEP ST or Ezi-STEP MINI" for version 8 level as sample files to test Position Table.

1) PTsample (General Motioning).txt
2) PTsample (Loop Motioning).txt
3) PTsample (Loop counter clear).txt
4) PTsample (Clear Position).txt

4 - 1. How to start Position Table

Position Table operation is executed by input signal or communication command. The followings are example of Position Table operation by input signal to be explained step by step.
In the case of Position Table operation by communication command, the system is executed by sending the communication commands corresponding to the control input signal.

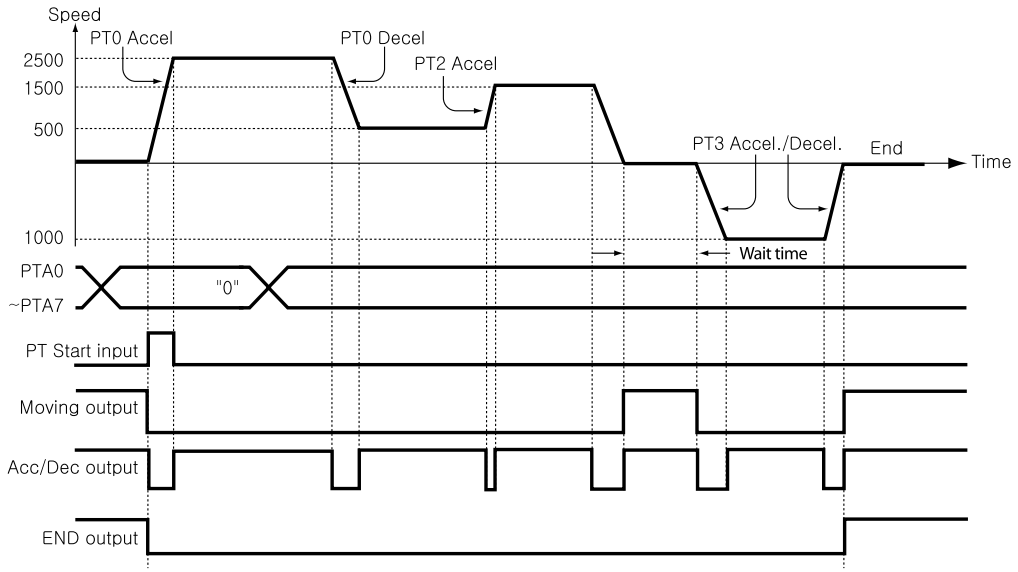
1. Specify Position Table No. (0~255) operated by PT A0~PT A7.
2. If the motor is STEP OFF, click STEP ON.
3. Signal ON of PTStart input to start operation.

4 - 2. Example for general operation

Specify PT No. through input data for PT A0 ~ PTA7 and then input 'PT Start' signal to start speed control operation.

【Specifying Position Table 】

PT No.	Command type	Position	Low Speed	High Speed	Accel time	Decel. time	Wait time	Continuous Action	JP Table No.
0	3	10000	1	2500	50	300	0	1	1
1	3	1000	1	500	-	-	0	1	2
2	3	5000	1	1500	50	300	300	0	3
3	3	-2500	1	1000	300	300	0	0	-



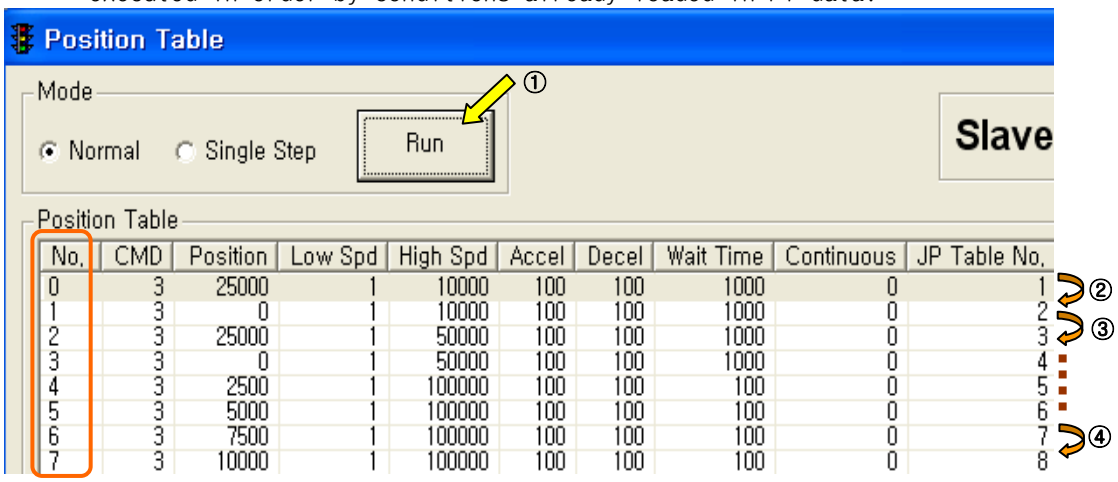
* Refer to the sample file for testing Position Table, 'PTsample (General Motioning).txt'.

4 - 3. Operation Modes

Position Table commands can be executed by two modes as follows.

4 - 3 - 1. Normal

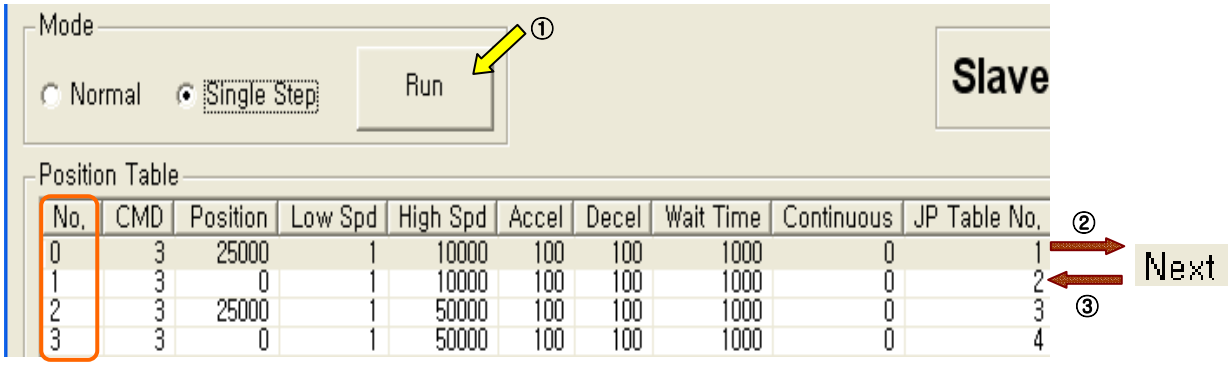
Select 'Normal' at the main window of position table, and all commands will be executed in order by conditions already loaded in PT data.



1) While Normal mode is selected, the user sets PT number to 0 and click 'Run' and then PT 0 is executed.
2) PT 1 is executed by PT data jump conditions.
3) PT 2 is executed by PT data jump conditions.
4) As mentioned above, next PT number is automatically executed by position data jump conditions.
5) Click 'Stop' to stop operating.

4 - 3 - 2. Single Step

Select 'Single Step' at the main window of position table, and only corresponding PT command will be executed and next PT commands will be on stand-by. This mode can be easily used when the user executes testing for each position command. And it is available at User Program(GUI) only.



1) While Single Step Mode is selected, the user sets PT number to 0 and click 'Run' and then PT 0 is executed.
2) After execution is stopped, 'Run' icon is changed into 'Next' and next command is on stand-by.
3) Click 'Next' button, and PT 1 will be executed.
4) When pressing each 'Next' button, one PT command is executed.
5) Click 'Stop' to stop operation. After operation is stopped, the user can set new PT number and click 'Run' button to start the program again.

4 – 4. Teaching Function

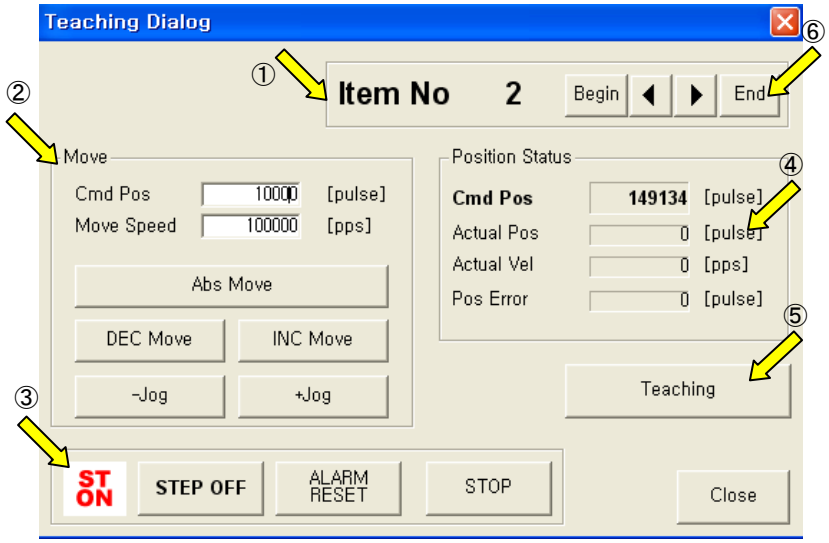
Teaching signal functionalizes that the position value[pulse] being working can be automatically inputted into a 'position' value of a specific position table.

The following table shows type of commands and whether teaching function can be used or not.

Command Name	Value	To be used or not
Abs Move low speed.	0	'Teaching' can be used.
Abs Move high speed	1	
Abs Move high speed with deceleration.	2	
Abs Move with acceleration and deceleration.	3	
Inc Move low speed.	4	'Teaching' cannot be used.
Inc Move high speed	5	
Inc Move high speed with deceleration.	6	
Inc Move with acceleration and deceleration.	7	
Move to Origin	8	
Clear Position	9	

4 – 4 – 1. Teaching by user program

When click 'Teaching' button on Position Table screen, the following dialog box is activated.



① Select Position Table No., the figure shows that No. 6 of PT is selected among 256 Position Tables.

② Specify position of motor where to teach and move it.

③ Turn ON or OFF of Servo during teaching.

④ Displays current position information and the value displayed in "Cmd Pos(ition)" is to be teaching value.

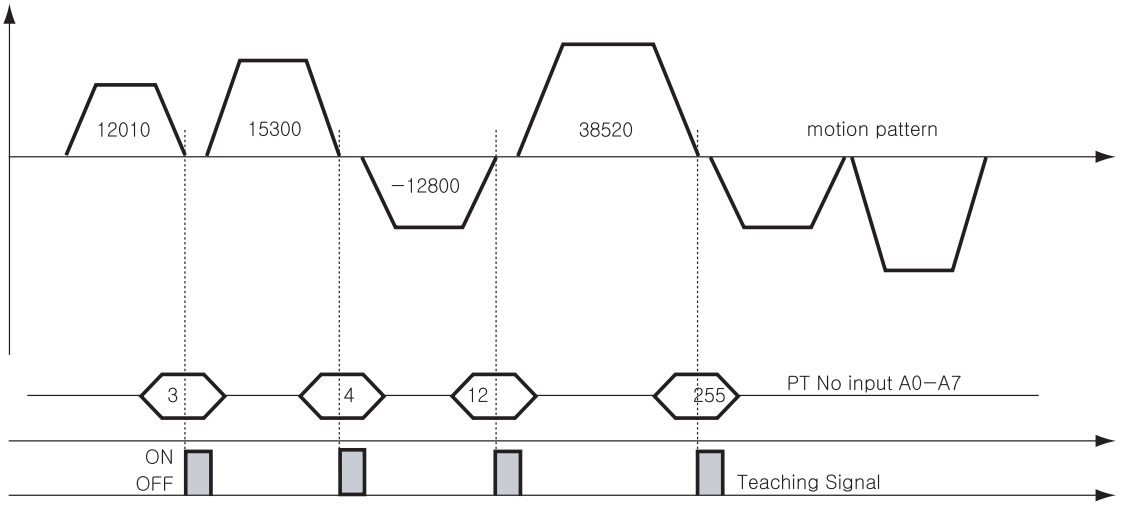
⑤ When clicking this "Teaching" button, current value displayed in "Cmd Pos" will be saved in the item "Position" of the current PT (No. 6 above case). The values are to be saved on RAM and click 'Save to ROM' button in order to save on ROM.

⑥ In order to move to the next position, select PT No. by using arrow keys.

4 - 4 - 2. Teaching by Input signal

You can save current position information to the Position Table data by Turning ON teaching control input signal. Also when executes teaching, position value (No. of pulse) is specified as absolute position value. Teaching is carried out by following orders:

1. Select PT No. to save data and specify items like "Command", etc. (except item 'Position' only)
2. Move motor to the position where you want to save data of it.
3. Specify PT No.'s that teaching is carried out by 'PT A0~PT A7'.
4. Turn ON teaching signal to save current position value into item 'Position' of Position Table data.
5. If you want to apply the saved value, you need to 'Refresh' PT data in order to verify the value on the User Program(GUI) screen.
6. The values are to be saved on RAM and click 'Save to ROM' button in order to save on ROM.



PT No. (CMD)	Position Value for each PT [pulse]
Position 3	12010
Position 4	15300
Position 12	-12800
Position 255	38520

4 – 5. Input Condition Jump

Among the items to be specified, “JP Table No.”, “JPT 0”, “JPT 1” and “JPT 2” are used to specify next PT No. to be executed. Specified next PT No. to be executed, there are two different methods depending on the control signal as followings:

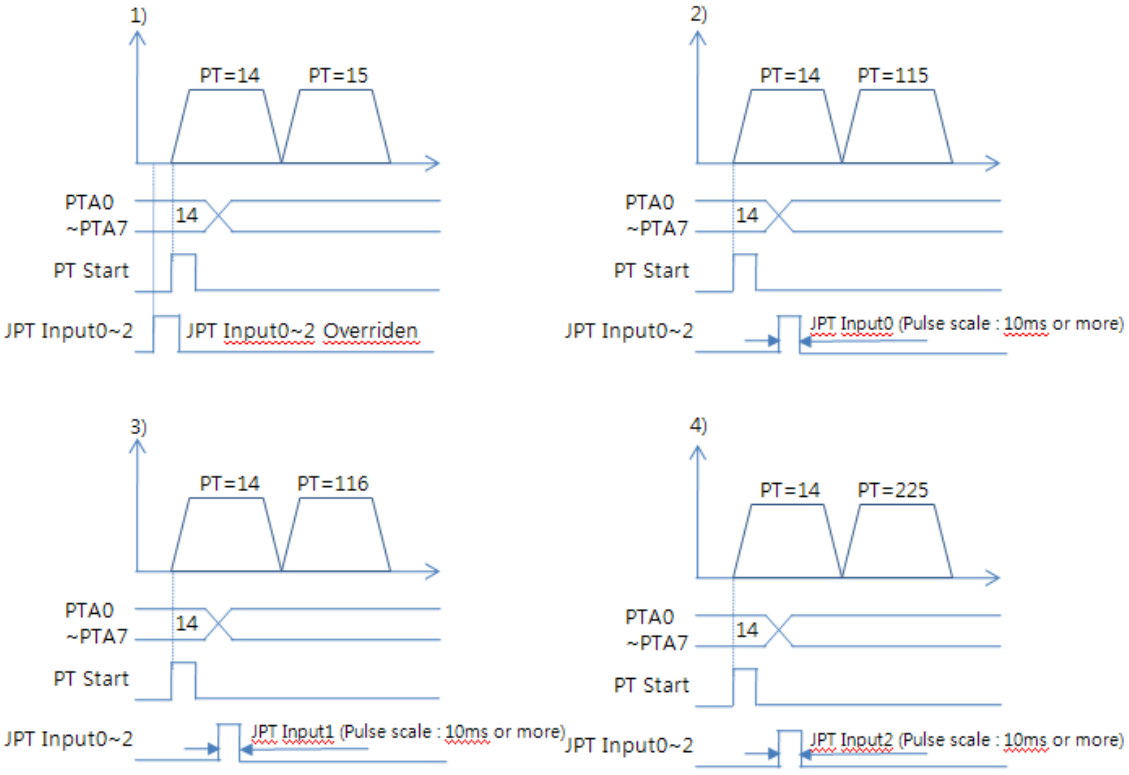
4 – 5 – 1. Automatic Jump

This is the method to specify next action pattern (PT No.) by input condition.
System jumps to next PT No. to be executed automatically according to procedure.

For example as shown in the following figure, when PT No. 14 is executing, 1) if there is no input signal, next action pattern is to be executed by PT No. 15 as shown in figure 1). However, if any of input signal is ON such as JPT Input0, JPT Input1 or JPT Input2 during the operation of PT No. 14, then system jumps to JPT 0, JPT 1 or JPT2 accordingly and execute it that is specified in the Position Table data as shown in the figure 2) ~ 4).

Data for PT No. 14

PT No (CMD)	Position Table No to jump (JP Table No.)	Input Jump Position No 0 (JPT 0)	Input Jump Position No 1 (JPT 1)	Input Jump Position No 2 (JPT 2)
14	15	115	116	225



* Refer to the sample file for testing Position Table, ‘PTsample (Loop Motioning).txt’.

4 – 5 – 2. Jump by External Signal

This is the method to specify next action pattern (PT No.) by input condition.
However, system does not jump to next PT No. to be executed automatically according to procedure, but executed by external signal ("JPT Start").

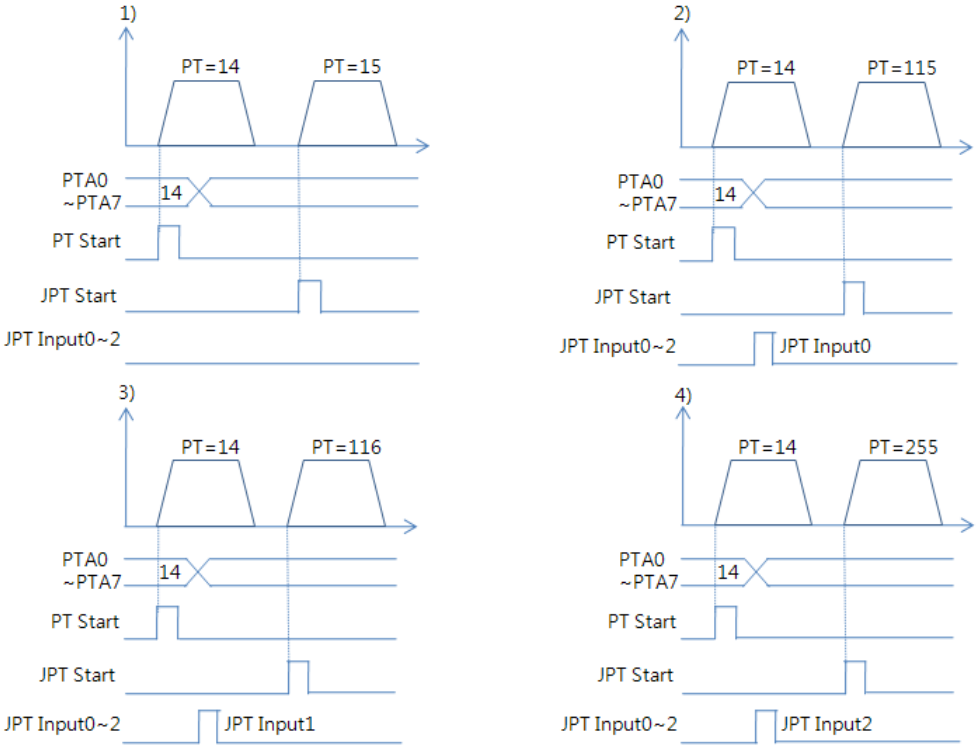
Difference from the function in 'section 4.5.1' executed by input signal JPT Input0~Input2

1) Jump Position No to jump need to have the format of 10XXX and
2) 'JPT Start' needs to be [ON] in order to execute the next action.

If specified "Wait Time" of PT data is more than 0, then the next action is to be executed after the specified time from the external signal.

Data for PT No. 14

PT No (CMD)	Wait Time (Wait Time)	Position Table No to jump (JP Table No.)	Input Jump Position No 0 (JPT 0)	Input Jump Position No 1 (JPT 1)	Input Jump Position No 2 (JPT 2)
14	0	10015	10115	10116	10255



* If more than 2 signals become [ON] of 3 'Input Jump Position No0 ~ Input Jump Position No2', the lower number (JPT0 > JPT1 > JPT2) has the high-priority and will be executed.

4 – 6. Loop Condition Jump

4 – 6 – 1. Specifying Loop

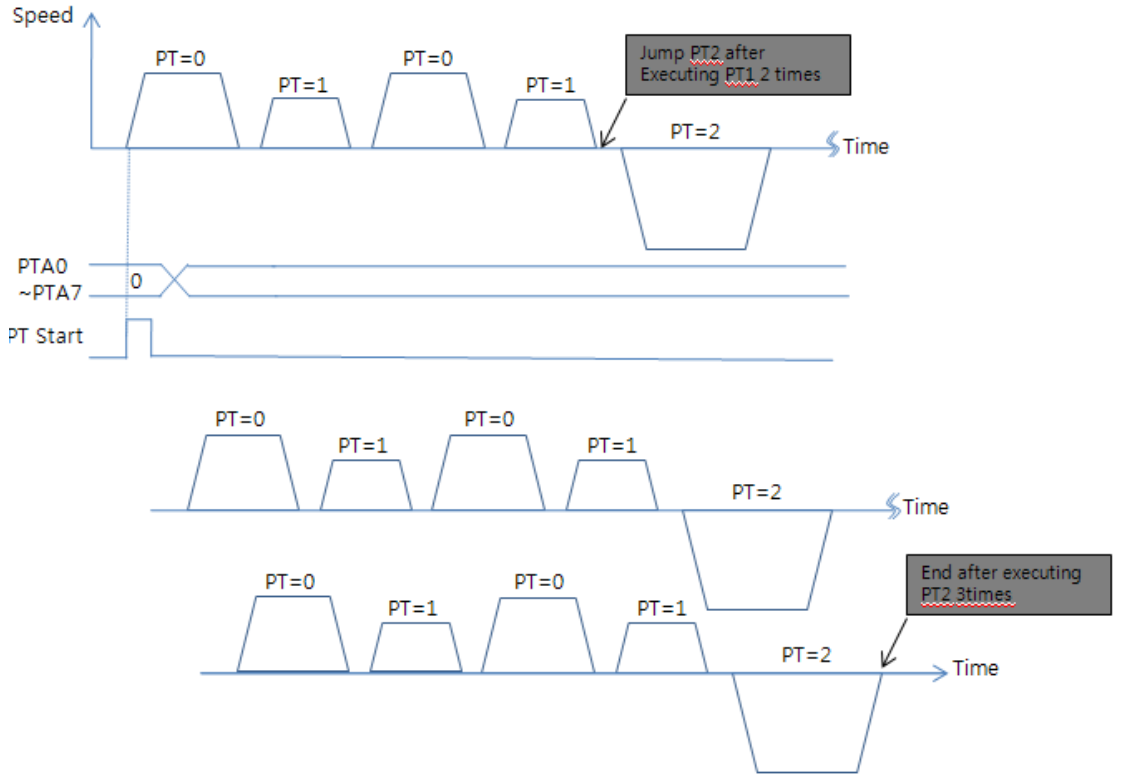
If 「Loop Count」and 「Loop Jump Table No」are specified, system repeats the action of position specified times (Loop Count) and then jumps to corresponding position to 「Loop Jump Table No. 」regardless of specified「Jump Position No」, that is, 「Jump Position No」 is ignored.

There are rules in specifying loop as following:

1) If '0' is specified for 「Loop Count」, loop function is cancelled.
2) If system needs to jump before repeating the specified times, it jumps to JP Table No.
3) If 'blank' is specified for 「Loop Jump Table No」, system exits in execution.
4) If 「Loop Jump Table No」is specified in the form of 10XXX, next action is executed by the external signal "JPT Start".

Following Table is one of example for specifying loop.

PT No (CMD)	Movement Scale (Position)	Position Table No to jump (JP Table No.)	No of Loop (Loop Count)	Position Table No to jump after completing loop (Loop Jump Table No)	Loop Counter Clear (Loop Counter Clear)
0	8000	1	0	0	–
1	4000	0	2	2	–
2	0	0	3	–	1



* Refer to the sample file for testing Position Table, 'PTsample (Loop Motioning).txt

4 – 6 – 2. Loop Counter Clear

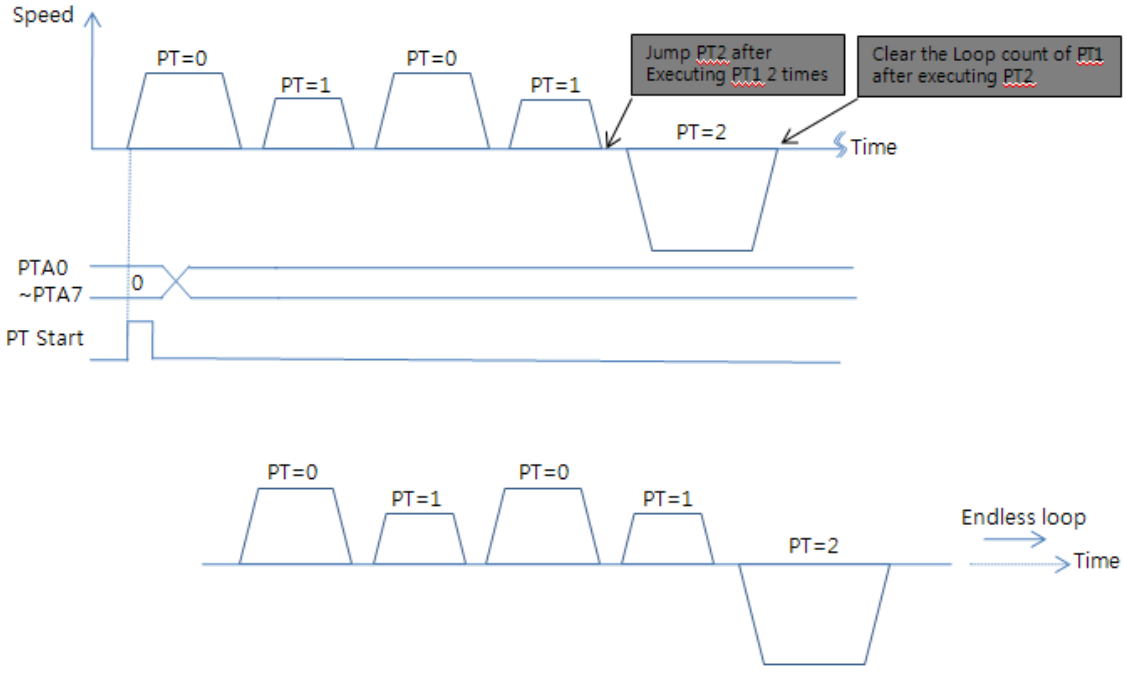
"Loop Counter" is internal counter in drive to compare No. of repeat with the No. specified in the item "Loop Count" of PT data.

This function clears "Loop Counter" to 0 (zero) of the specified PT data after completion of looping. If 「Loop Counter Clear」 is specified as blank, this function is cancelled.

Following table shows an example of specifying Loop Counter Clear.

PT No (CMD)	Movement Scale (Position)	Position Table No to jump (JP Table No.)	No of Loop (Loop Count)	Position Table No to jump after completing loop (Loop Jump Table No)	Loop Counter Clear (Loop Counter Clear)
0	8000	1	0	0	–
1	4000	0	2	2	–
2	0	0	0	0	1

1) Specify "Loop Counter Clear" of PT No 2 as PT No '1'.
2) Start operation from PT No 0.
   When starts operation, system reset all "Loop Count" values as 0 (zero).
3) After repeats the loop block PT No 0 ~ PT No 1 two times, the "Loop Counter" becomes 2 (two) same as specified "Loop Count" so system completes looping and jumps to PT No 2.
4) After executing PT No 2, system jumps to PT No 0.
   Before jumping to PT No 0, system clears "Loop Counter" - the internal counter as 0 (zero).
5) Then paragraph 3) and 4) are repeated infinitely.
6) If the "Loop Counter Clear" of PT No 2 was not specified, "Loop Counter" increased continuously and so jumping to PT No 2 occurs only once at the first time and then repeats the loop block PT No 0 ~ PT No 1 infinitely because the internal counter "Loop Counter" value will never meet the specified "Loop Count" value.



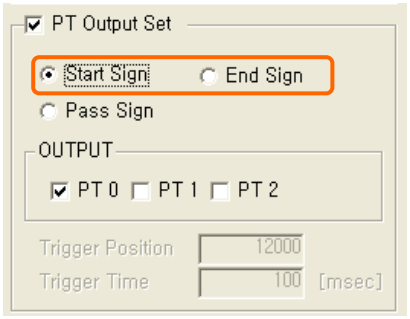
* Refer to the sample file for testing Position Table, 'PTsample (Loop counter clear).txt.

4 – 7. Start/Pass/End Signal Function

By specifying the item「Start/Pass/End Signal Function」, user can recognize the status of Position Table whether operation started, is under pass operation, or completed operation through control signal output.

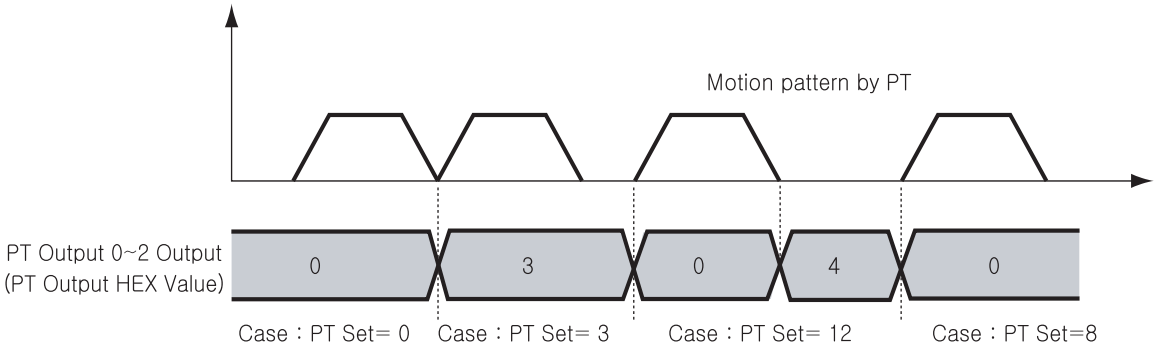
If you do not want to use 「Start/Pass/End Signal Function」, specify this item as 0,8 or 16.
If other value is specified, the position performs following actions depending on specified value.

4 – 7 – 1. Start/End Signal



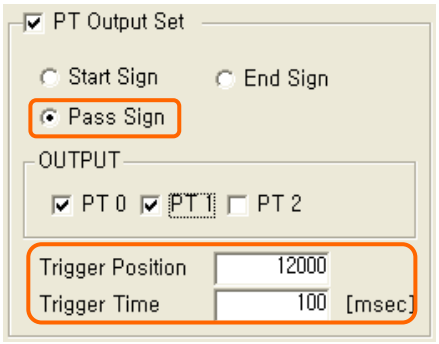
- If the value between 1 to 7(Start Sign) is specified for PT Set, PT Output HEX value is output through output of 'PT Output 0 ~ PT Output 2' at the time of starting operation.
- If the value between 9 to 15(End Sign) is specified for PT Set, PT Output HEX value is output through output of 'PT Output 0 ~ PT Output 2' after completion of operation.

PT Set Value	PT Output 2 Signal	PT Output 1 Signal	PT Output 0 Signal	PT Output HEX Value	Function
0	OFF	OFF	OFF	0	Not use output function of PT Output 0~2.
1	OFF	OFF	ON	1	PT Output 0~2 signals turn to [ON] at the time of starting operation of the corresponding PT.
2	OFF	ON	OFF	2	
3	OFF	ON	ON	3	
4	ON	OFF	OFF	4	
5	ON	OFF	ON	5	
6	ON	ON	OFF	6	
7	ON	ON	ON	7	
8	OFF	OFF	OFF	0	Not use output function of PT Output 0~2.
9	OFF	OFF	ON	1	PT Output 0~2 signals turn to [ON] after completion of operation of the corresponding PT.
10	OFF	ON	OFF	2	
11	OFF	ON	ON	3	
12	ON	OFF	OFF	4	
13	ON	OFF	ON	5	
14	ON	ON	OFF	6	
15	ON	ON	ON	7	



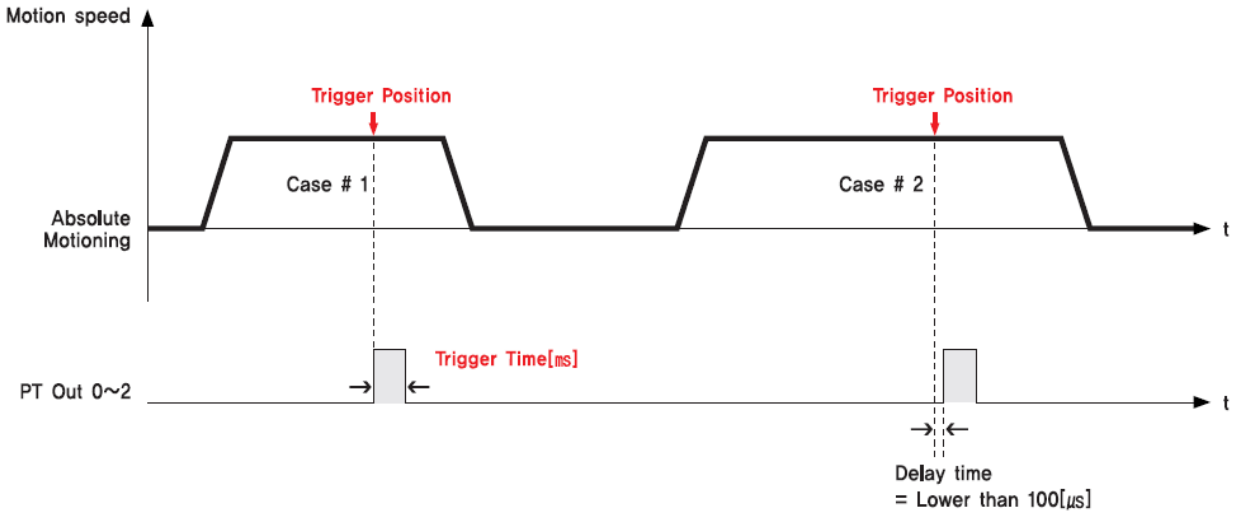
* PT Output signals are not working on next condition :
  (1) PT Set value : 9~15
  (2) at the same time using 'Jump' function
  (3) at the same time set 'Wait time = 0 [msec]'

4 – 7 – 2. Pass Signal



- If the value between 17 to 23(Pass Sign) is specified for PT Set, PT Output HEX value is output through output of 'PT Output 0 ~ PT Output 2' at the position of 'Trigger Position'.

PT Set Value	PT Output 2 Signal	PT Output 1 Signal	PT Output 0 Signal	PT Output HEX Value	Function
16	OFF	OFF	OFF	0	Not use output function of PT Output 0~2.
17	OFF	OFF	ON	1	PT Output 0~2 signals turn to [ON] for the time of trigger condition of the corresponding PT.
18	OFF	ON	OFF	2	
19	OFF	ON	ON	3	
20	ON	OFF	OFF	4	
21	ON	OFF	ON	5	
22	ON	ON	OFF	6	
23	ON	ON	ON	7	



* The signal pulse width of PT Output is set by 'Trigger Time' value.

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- Please note that the specifications are subject to change without notice due to product improvements.