

台達電子



THE MOTION FUNCTION OF ASDA-A2

To Audience

Material level

**This material is for the PR functions of ASDA-A2.
The audience should know the basic operation of
Delta Servo system in advance.**

Revision

February 21, 2011.

The Contents

System Information

System parameter, Monitor parameter, and Data array.

PR Mode

Homing mode, Constant speed mode, Position control mode, Jump mode, Write parameter mode, and PUU and PR instruction dispatching skeleton.

Capture

The settings and applications.

Compare

The settings and applications.

System Information (1)

System Parameter

Applied to function settings or commands, for example P1-01 control mode and output direction selections.

Monitor Parameter

For monitoring status of servo operating, for example, speed, position, torque...,etc.

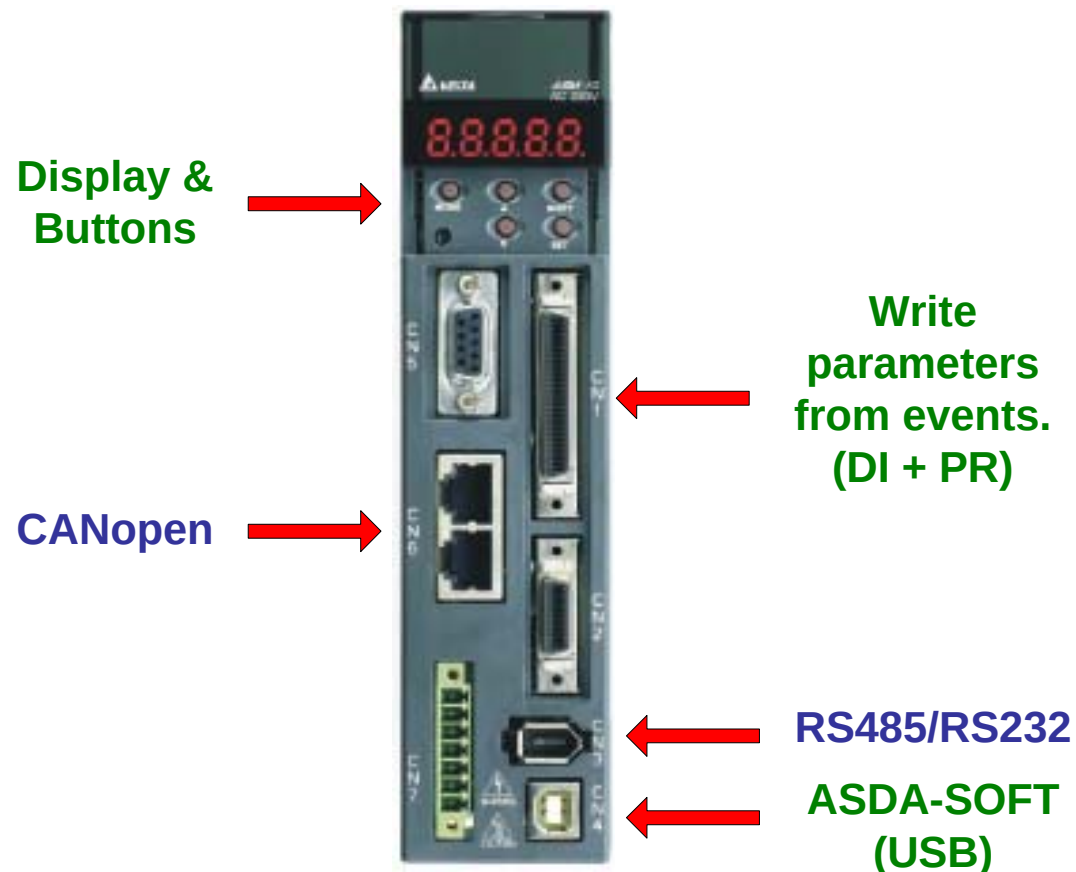
Data Array

The place to keep the data for functions of CAPTURE, COMPARE, and E-CAM.

System Information (2)

System Parameter

The format for parameter is P?-??. There are 16-bit and 32-bit parameters which can be read/written via several ways.



System Information (3)

Mapping Parameter (1)

An index to any parameters for block read/write and an example of 16-bit parameters mapped.

Index of Mapping Parameter
P0-35

0124h 0106h

16- bits
Parameters
P1-06

0x0123

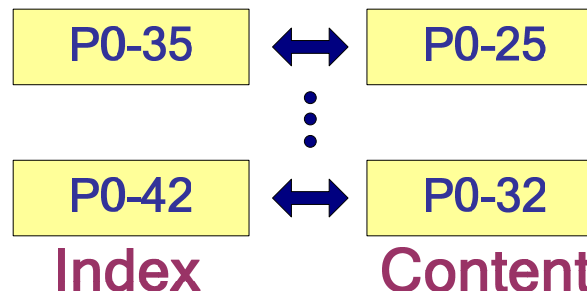
0x5678

P1-36

Mapping Parameter
P0-25

0x5678 0x0123

8 Mapping Parameters



Format of Data: 0GAB

G: Parameter Group

AB: Parameter # in Hex.

Mapping Parameter (2)

An example of 32-bit parameter mapped.

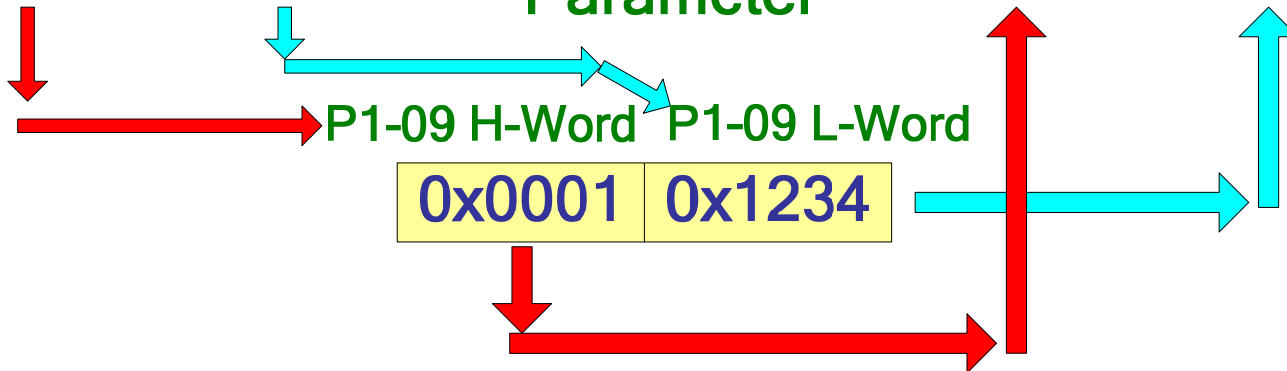
Index of Mapping Parameter
P0-35

0109h	0109h
-------	-------

32-bits
Parameter

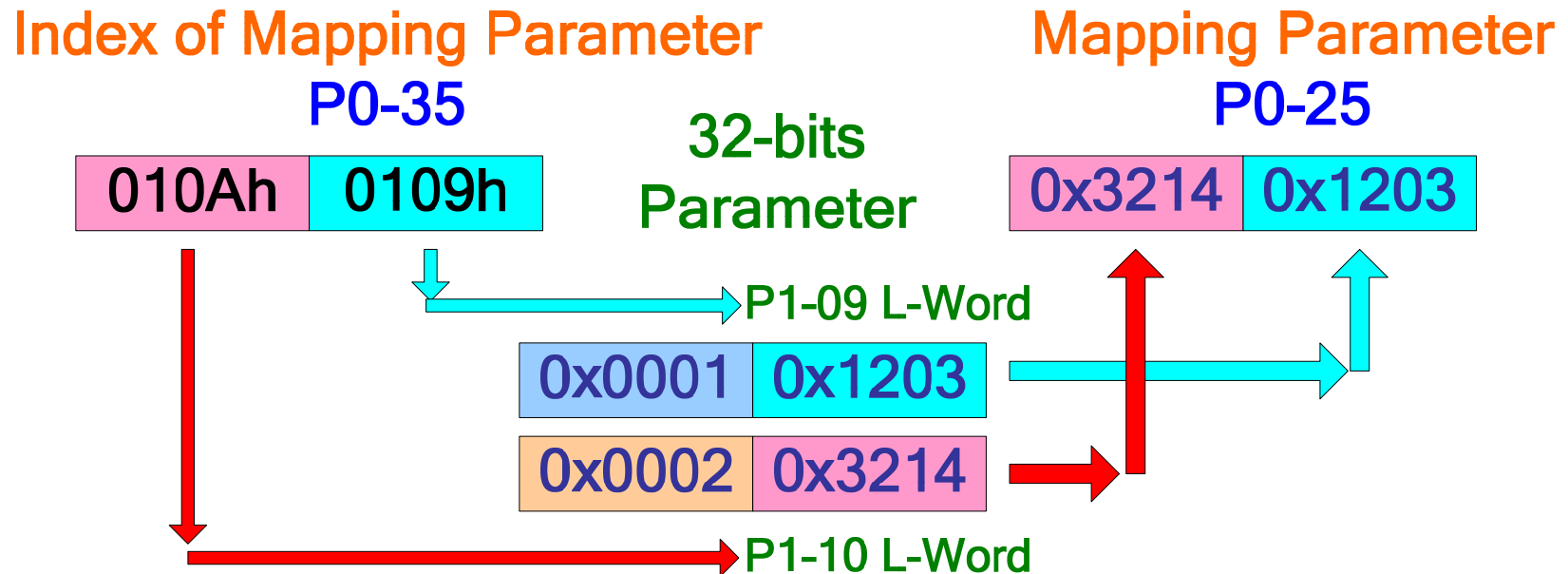
Mapping Parameter
P0-25

0x0001	0x1234
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Mapping Parameter (3)

An example of 32-bit parameters mapped partially.



Mapping Parameter (4)

On ASDA-Soft there is an easy way to configure mapping parameters while it is on-line.

Status Monitor

Run ASDA-A2 Servo Help

Monitor Items Select Monitor Items

Save Change ☒ Select All ☐ Cancel All

Easy to configure mapping parameters on ASDA-Soft.

Monitor Item Setting

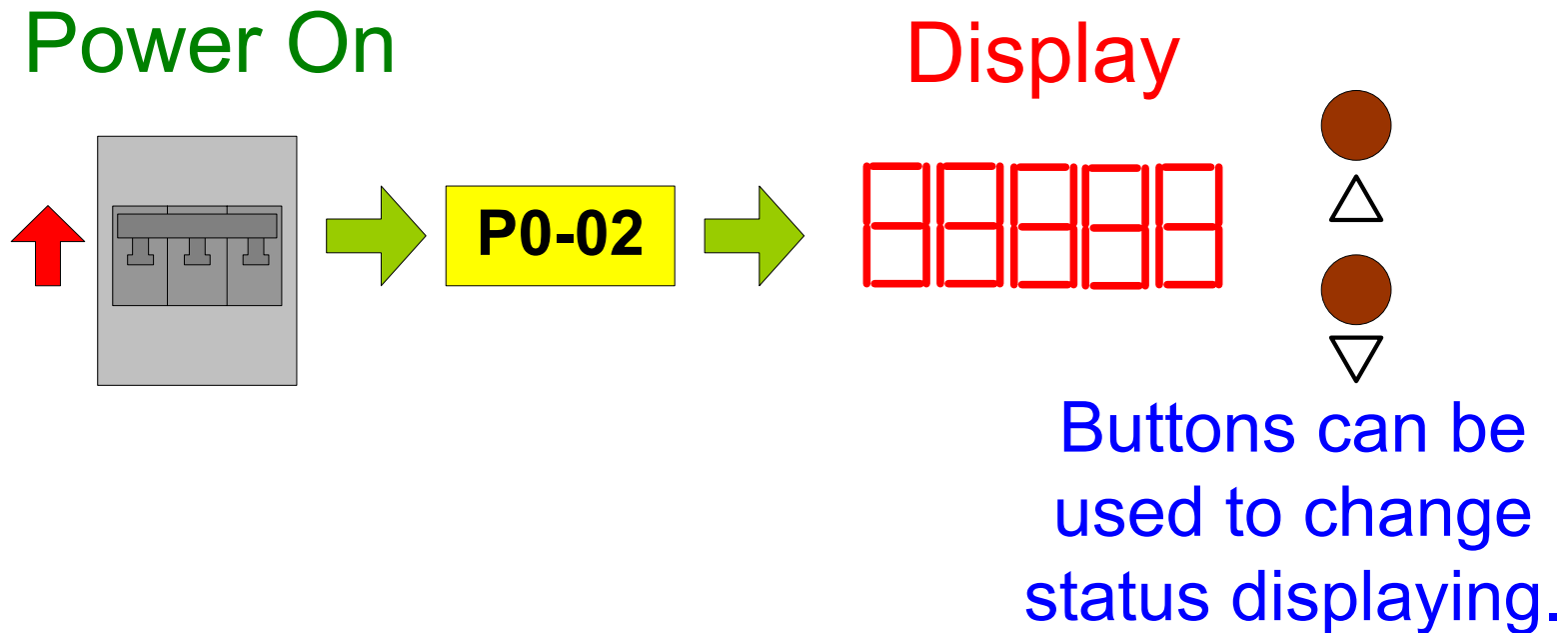
☒ Mapping Parameters Setting

☒ [MAPPING #1 : P0-25 <<-(*P0-35)	High Word Item : P 0	- 2	Low Word Item : P 0	- 2	☒ 32bit	
☒ [MAPPING #2 : P0-26 <<-(*P0-36)	High Word Item : P 3	- 4	Low Word Item : P 2	- 3	☐ 32bit	
☒ [MAPPING #3 : P0-27 <<-(*P0-37)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	
☒ [MAPPING #4 : P0-28 <<-(*P0-38)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	Change
☒ [MAPPING #5 : P0-29 <<-(*P0-39)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	
☒ [MAPPING #6 : P0-30 <<-(*P0-40)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	
☒ [MAPPING #6 : P0-31 <<-(*P0-41)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	
☒ [MAPPING #8 : P0-32 <<-(*P0-38)	High Word Item : P 0	- 0	Low Word Item : P 0	- 0	☒ 32bit	

Monitor Paramters Setting

Status Monitoring (1)

When power on, the status set in P0-02 will be shown on display. The up and down buttons can apply to change the status shown on display.



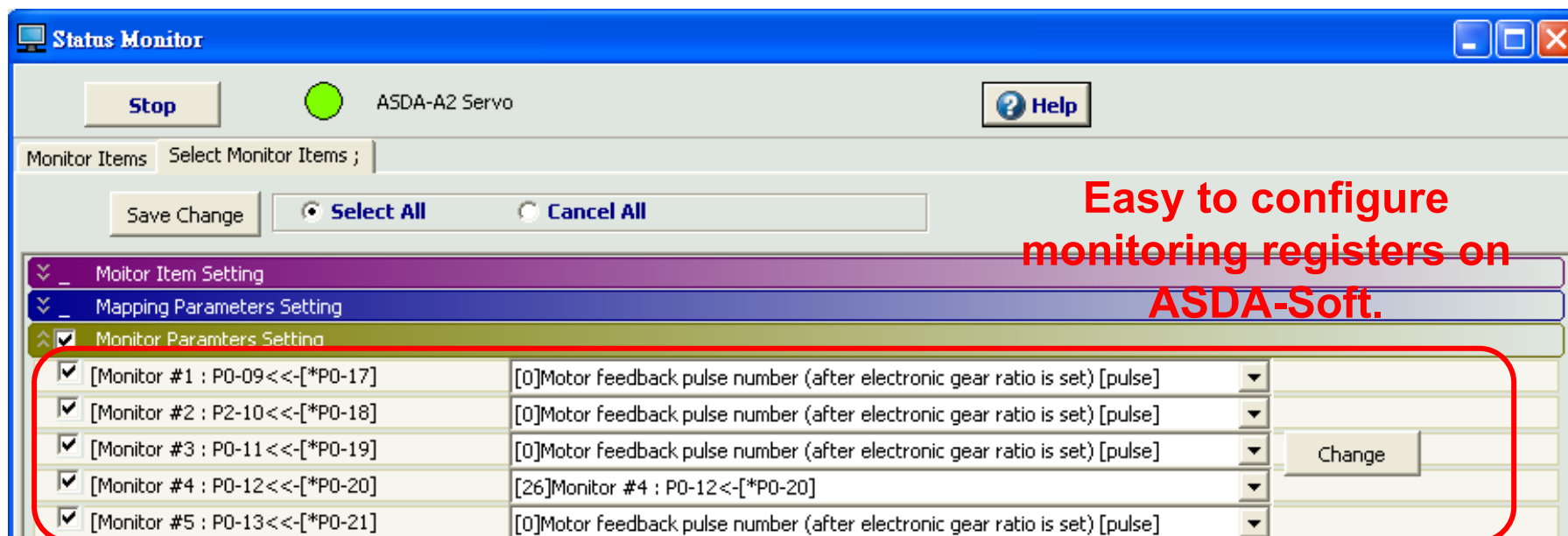
Status Monitoring (2)

There are 5 status monitoring registers and more than 60 items pre-defined in ASDA-A2 (listed in chapter 7 on manual) for accessing the internal status of servo drive.

Status Monitoring Registers		Item Assignment		For Examples
P0-09	1231	↔	P0-17	02: Position Error
P0-10	232682	↔	P0-18	03: Feedback Position
P0-11	303	↔	P0-19	07: Motor Speed
P0-12	0	↔	P0-20	26: Status Monitor #4
P0-13	12345	↔	P0-21	19: Mapping Parameter #1

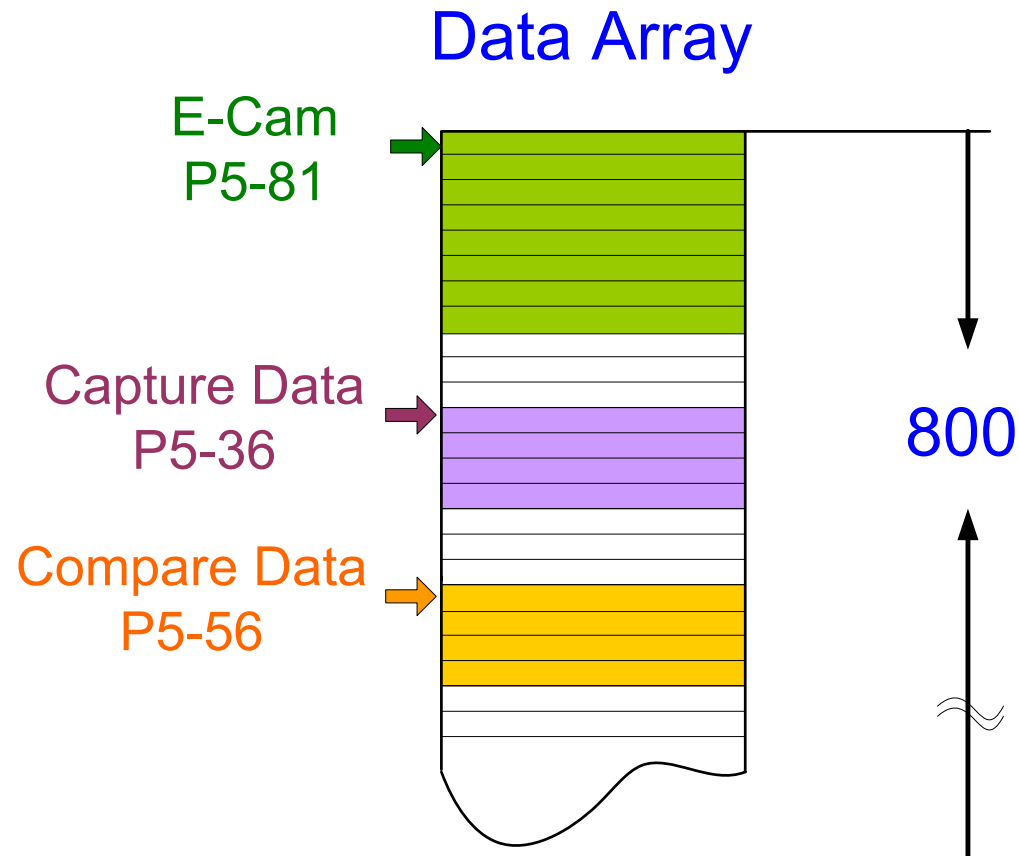
Status Monitoring (3)

While the PC is being connected to the servo drive, the ASDA-soft can be used to set up the monitoring registers.



Data Array

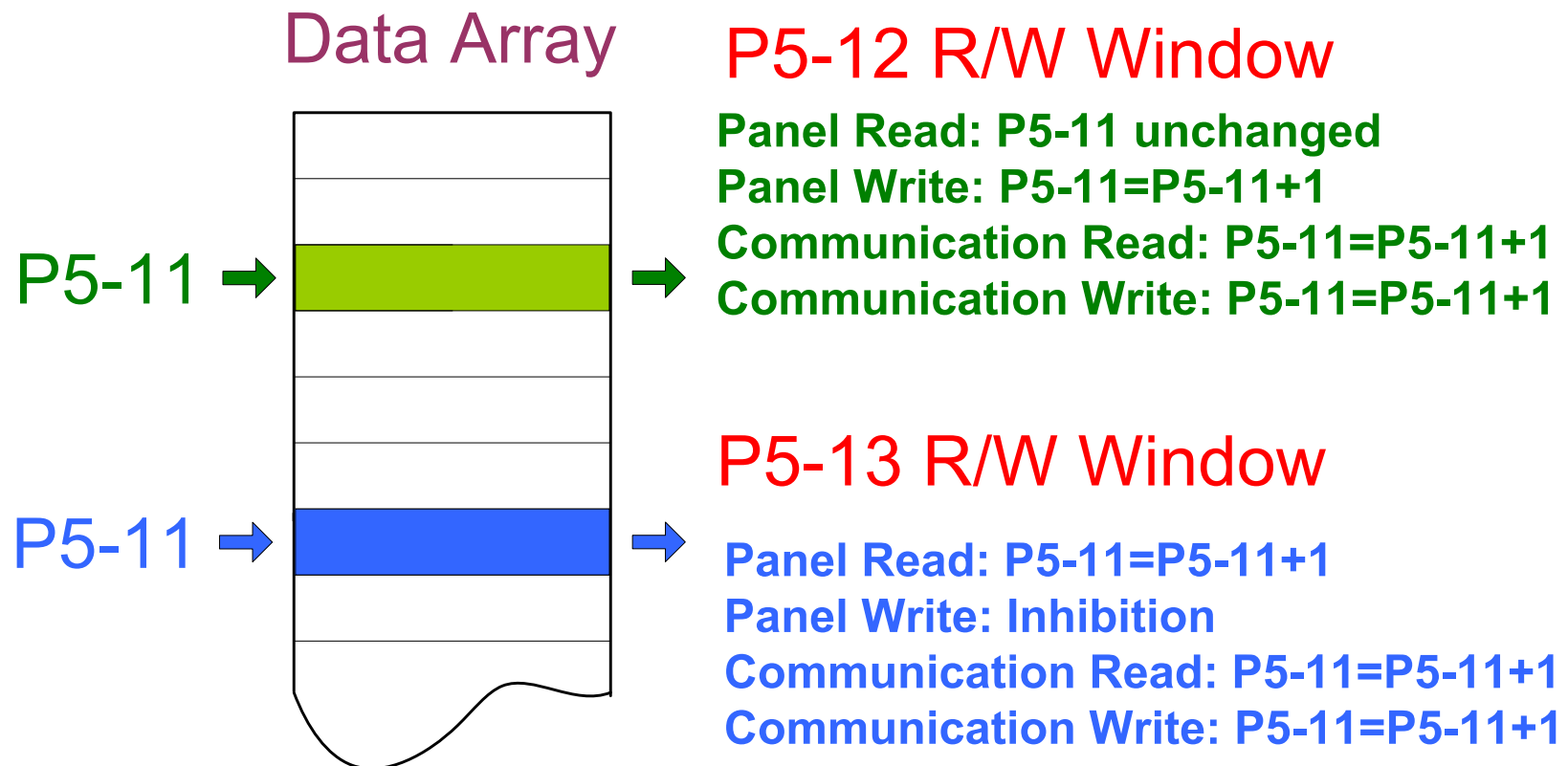
The data array can keep data for E-Cam, Capture function, and Compare function with maximum to 800 records (all together to max. 800 records).



System Information (11)

Access to Data Array

There is one index working along with two read/write windows for accessing data array. For some hosts resending data several times while communication, it had better to put the index P5-11 every time before read/write.





System Information (12)

Edit Data Array

The ASDA-Soft integrates convenient function for editing data array.

Data Array Editor

Load Data **Write To Servo**

Burn To EEPROM

Data Array Parameters

P5-10:Data Array Size	800	
P5-11:Data Array Read/Write Address	51	
P5-12:Data Array Read/Write #1	0	
P5-13:Data Array Read/Write #2	0	
P5-36:CAPTURE Data Array Start Address	0	Go
P5-38:CAPTURE Data Array Size	1	
P5-56:COMPARE Data Array Start Address	50	Go
P5-58:COMPARE Data Array Size	1	
P5-81:E-CAM Data Array Start Address	100	Go
P5-82:E-CAM Aread Size	5	

Update Array Address

Burn to EEPROM

[000]	0000000000	
[001]	0000000000	
[002]	0000000000	
[003]	0000000000	
[004]	0000000000	
[005]	0000000000	
[006]	0000000000	
[007]	0000000000	
[008]	0000000000	
[009]	0000000000	
[010]	0000000000	
[011]	0000000000	
[012]	0000000000	
[013]	0000000000	
[014]	0000000000	
[015]	0000000000	
[016]	0000000000	
[017]	0000000000	
[018]	0000000000	
[019]	0000000000	
[020]	0000000000	
[021]	0000000000	
[022]	0000000000	
[023]	0000000000	

Action

- ☒ Move
- ☐ Copy
- ☐ Swap

Source

Start 3

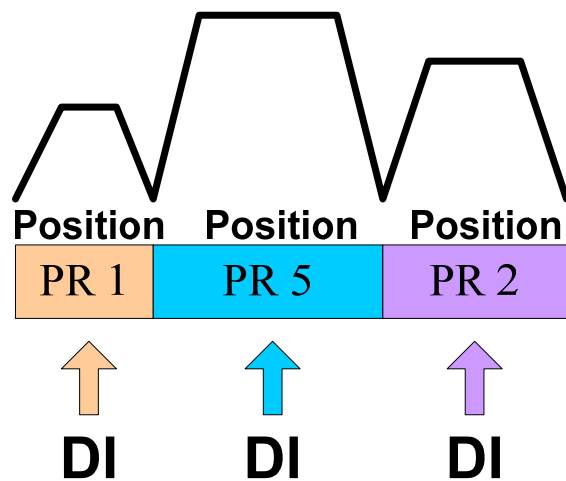
End 8

1

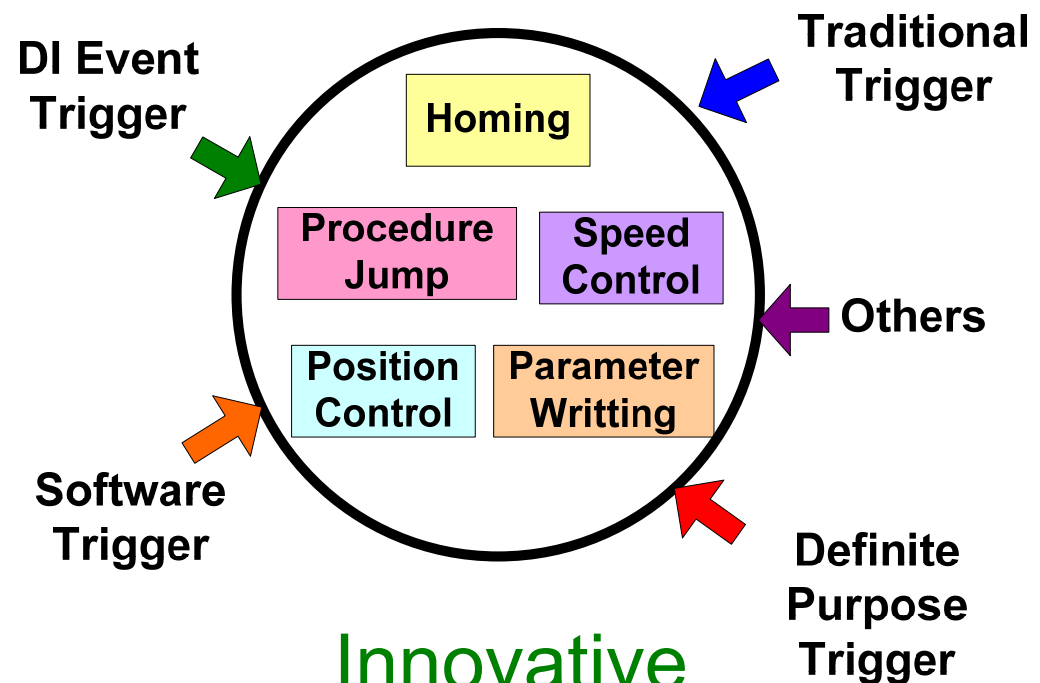
The New PR Mode

What's news?

The PR cannot be interpreted as “Point to Point” control. It does beyond that. The servo is capable to change its working profile under PR mode instantaneously. There are 64 PRs available.



Point-to-point
Control



Innovative
PR Mode



The Sub-modes Under PR Mode

Homing Mode

More than 35 selections are available.

Constant Speed Mode

Speed control function with profile pre-defined.

Position Control Mode

There are 4 types of commands under this mode, and they are absolute command, relative command, incremental command, and capture relative command.

Jump Mode

The jump command can go to any PR when executed.

Write Parameter Mode

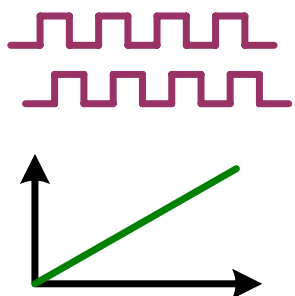
The system parameter can be changed by Write Parameter function any time.

The Direction

The New Definition

The **FORWARD** direction is defined as feedback PUU (position) increasing. The parameter **P1-01.Z** can change the definition of rotational direction.

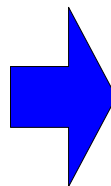
Positive
Command



In **P5-18**,
number is
increasing.

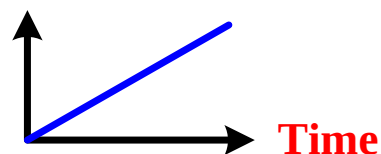
Positive Direction
Definition

P1-01.Z=0

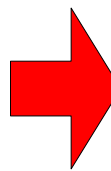


PC Scope

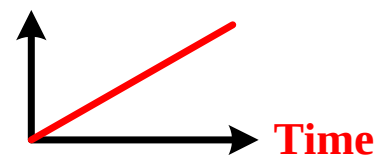
Feedback
PUU



P1-01.Z=1



Feedback
PUU



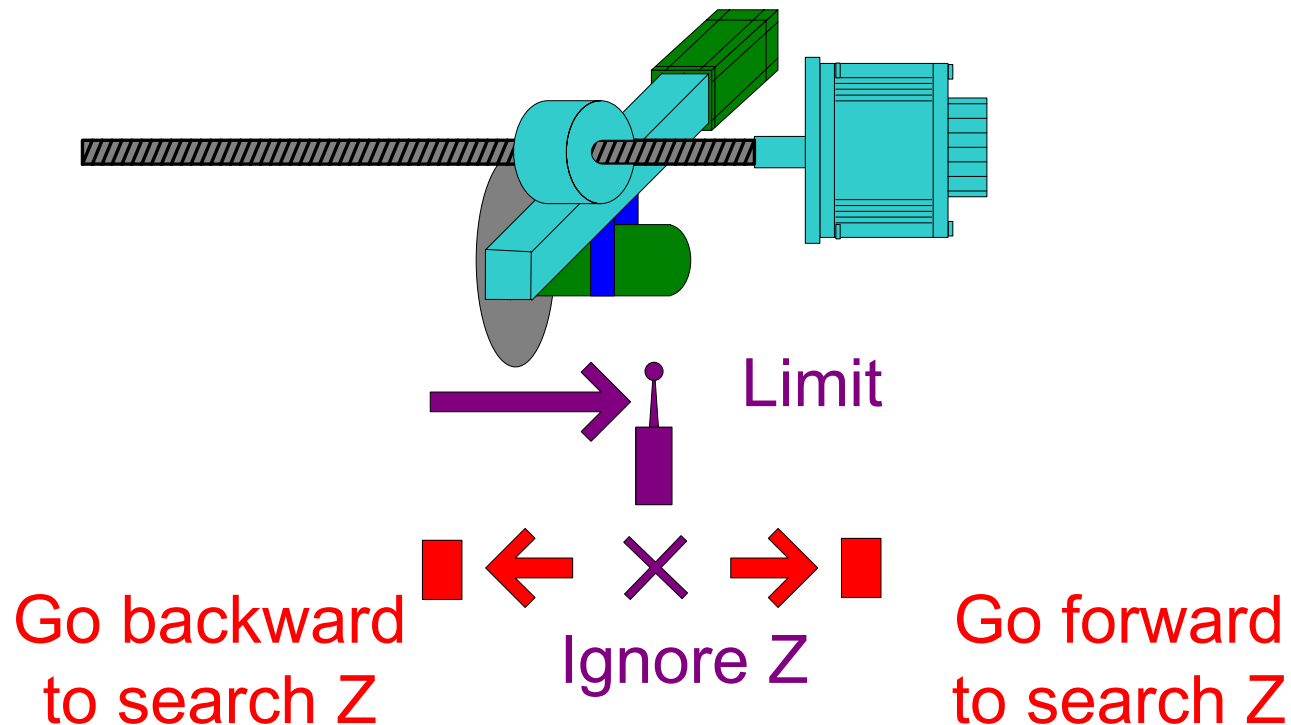
The Homing Mode (1)

Reference to Limit

X0: Move forward to PL assigned as home.

X1: Move backward to NL assigned as home.

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.



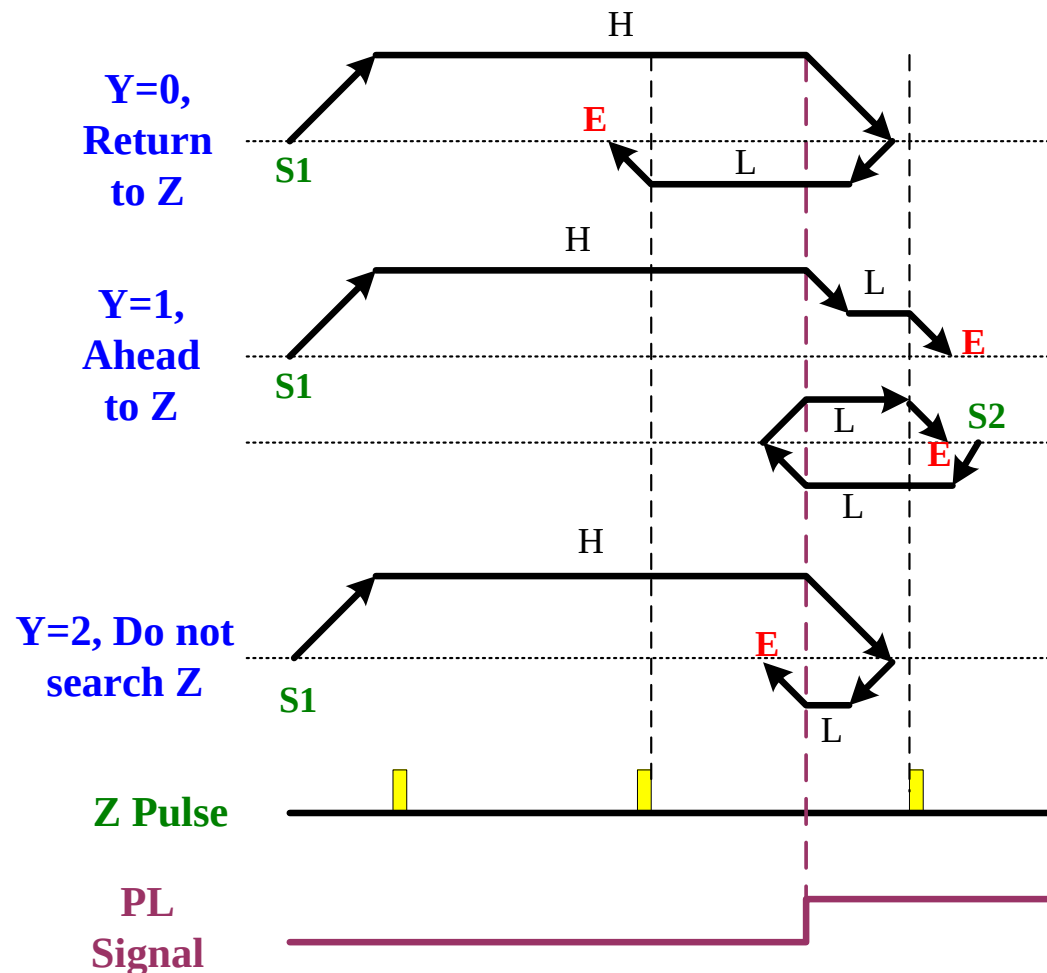
The Homing Mode (2)

Reference to Limit

X0: Move forward to PL assigned as home.

X1: Move backward to NL assigned as home.

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.



The Homing Mode (3)

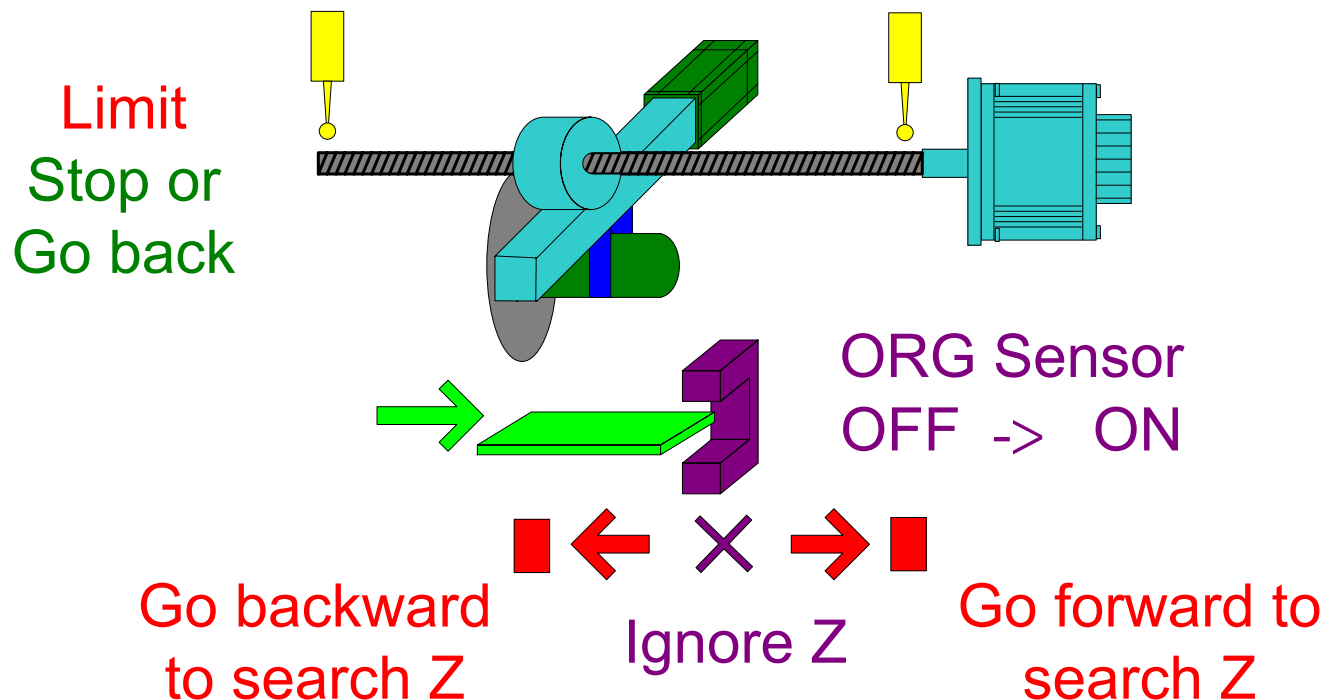
Reference to Home Sensor

X2: Move forward to home sensor (ORGP: OFF->ON).

X3: Move backward to home sensor (ORGP: OFF->ON).

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.

Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



The Homing Mode (4)

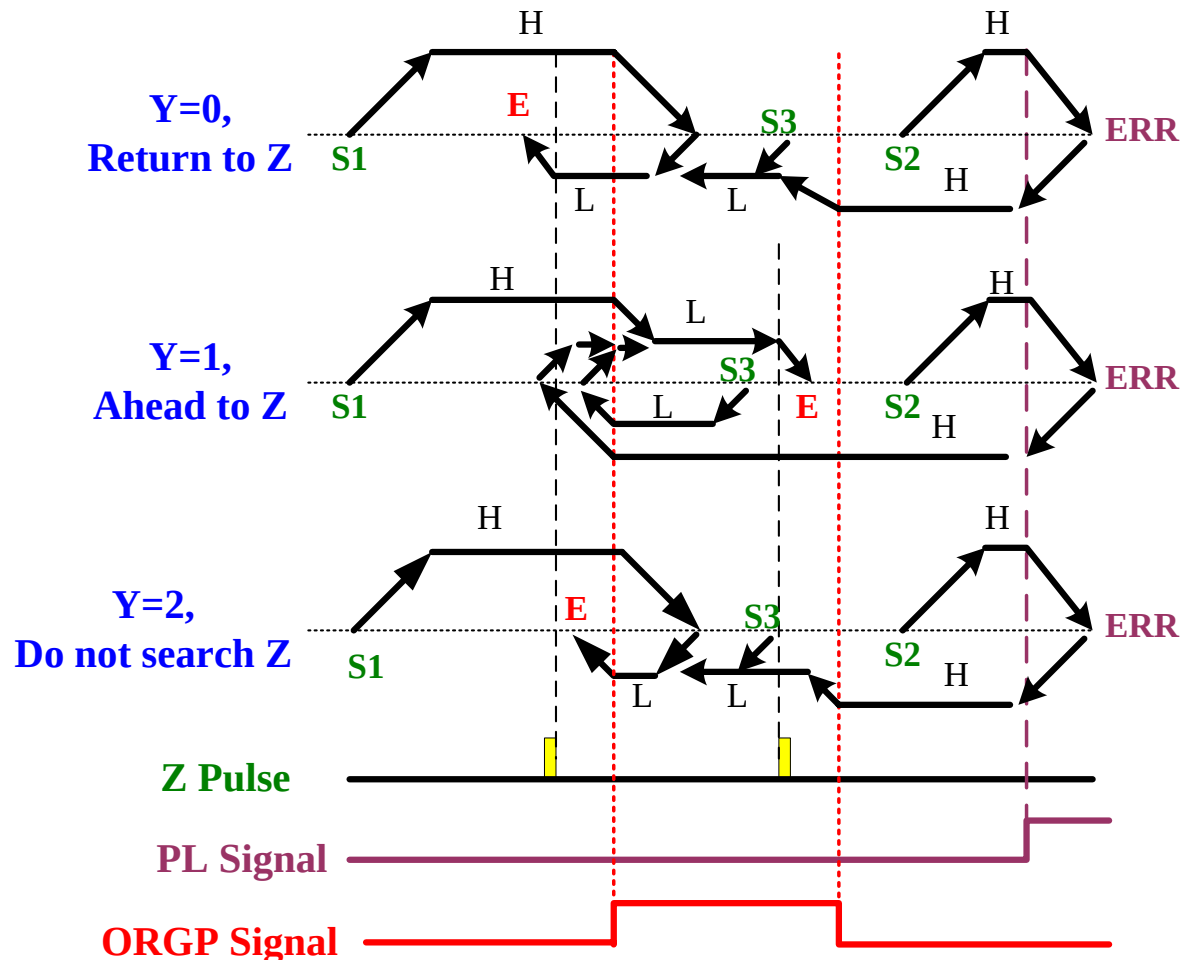
Reference to Home Sensor

X2: Move forward to home sensor (ORGP: OFF->ON).

X3: Move backward to home sensor (ORGP: OFF->ON).

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.

Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



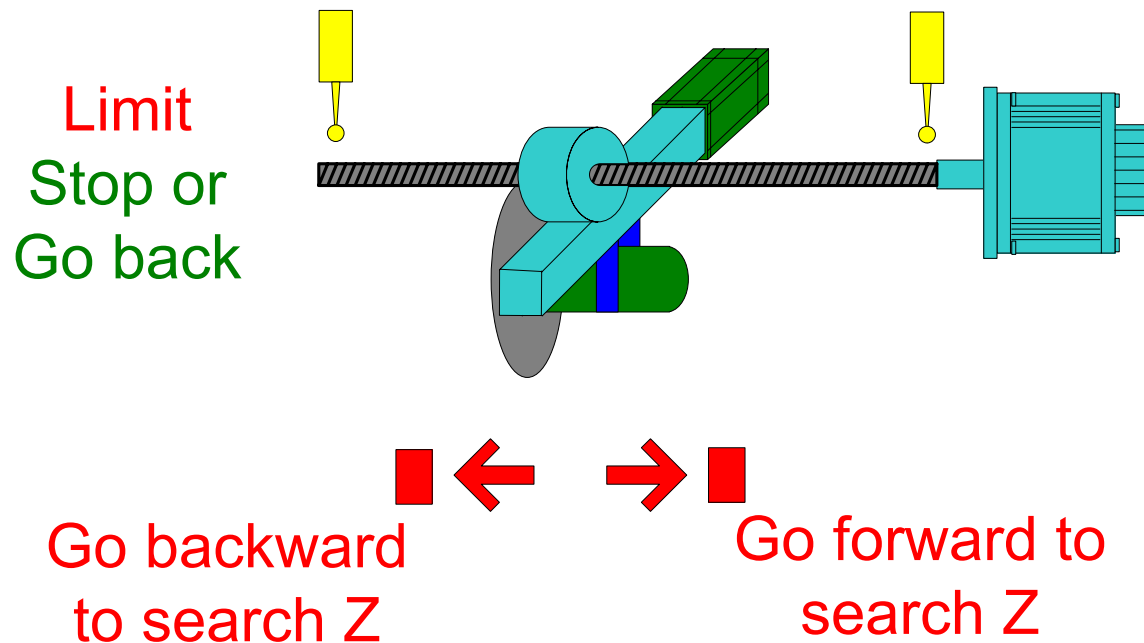
The Homing Mode (5)

Reference to Z Pulse

X4: Move forward to Z pulse.

X5: Move backward to Z pulse.

Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



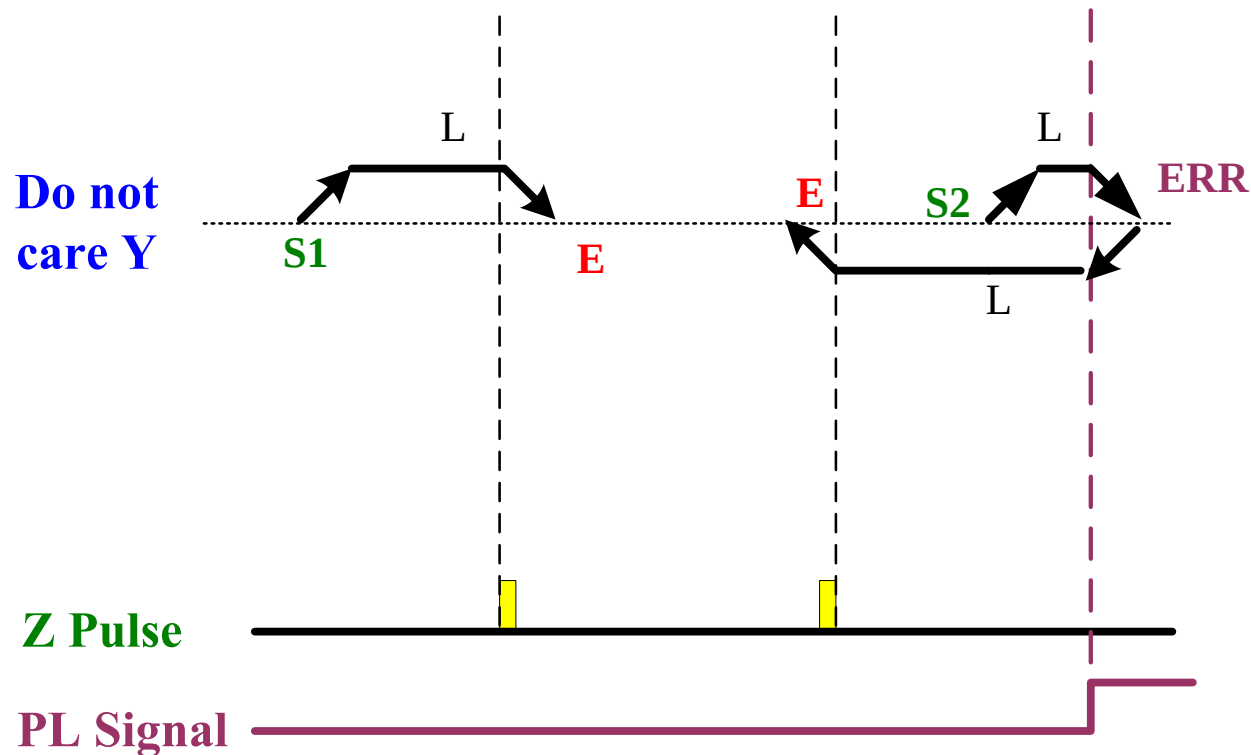
The Homing Mode (6)

Reference to Z Pulse

X4: Move forward to Z pulse.

X5: Move backward to Z pulse.

Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



The Homing Mode (7)

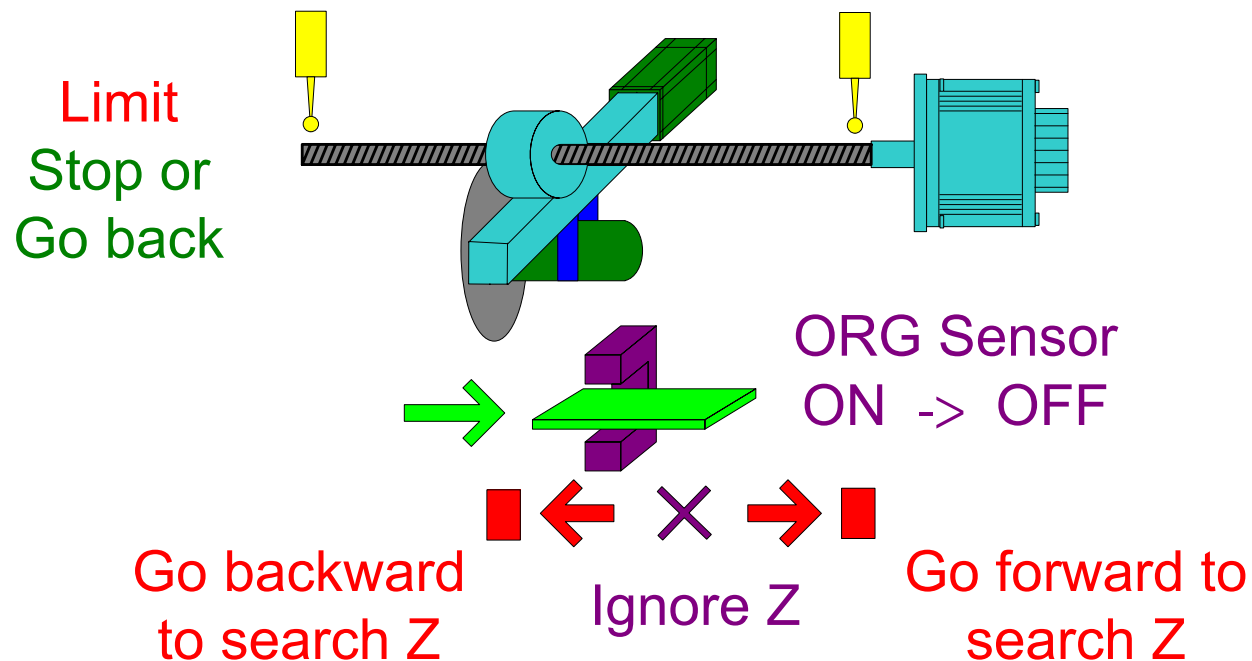
Reference to Home Sensor

X2: Move forward to home sensor (ORGP: ON->OFF).

X3: Move backward to home sensor (ORGP: ON->OFF).

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.

Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



The Homing Mode (8)

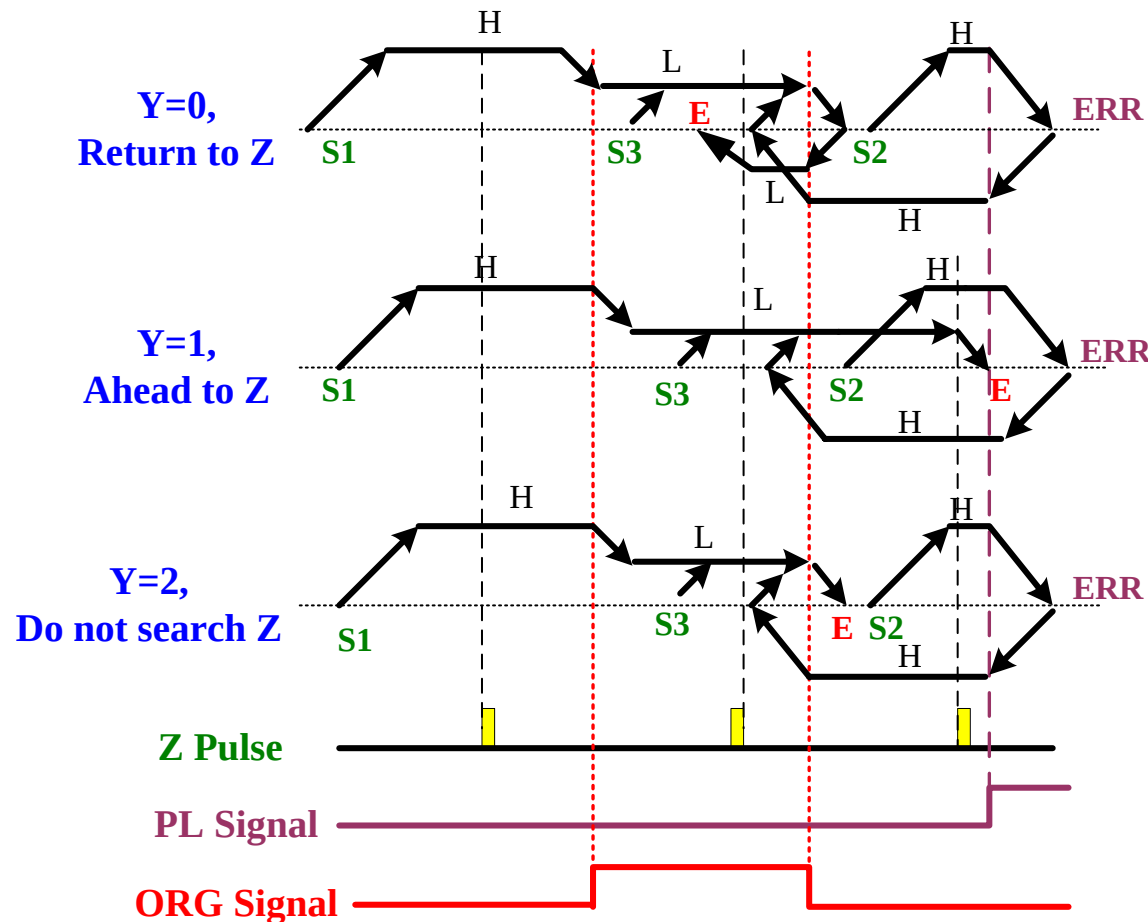
Reference to Home Sensor

X2: Move forward to home sensor (ORGP: ON->OFF).

X3: Move backward to home sensor (ORGP: ON->OFF).

Y: Y=0 Return to Z; Y=1 Go ahead to Z; Y=2 Do not search Z.

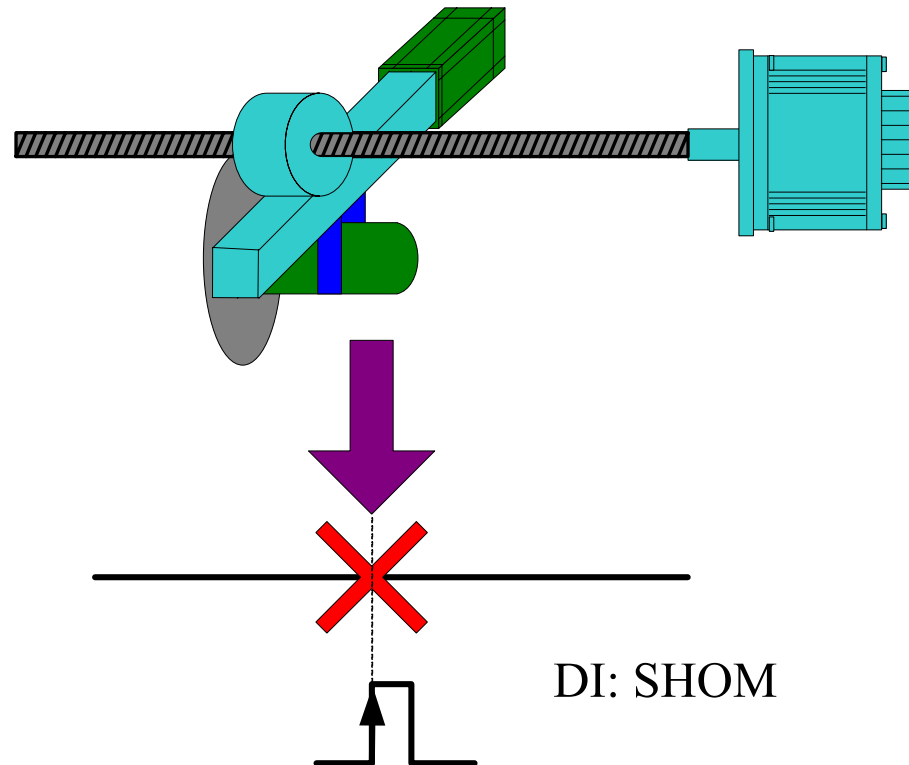
Z: Z=0 Stop and Warn; Z=1 Reverse automatically.



The Homing Mode (9)

Reference to Current Position

X8: Regarding current position as home position.



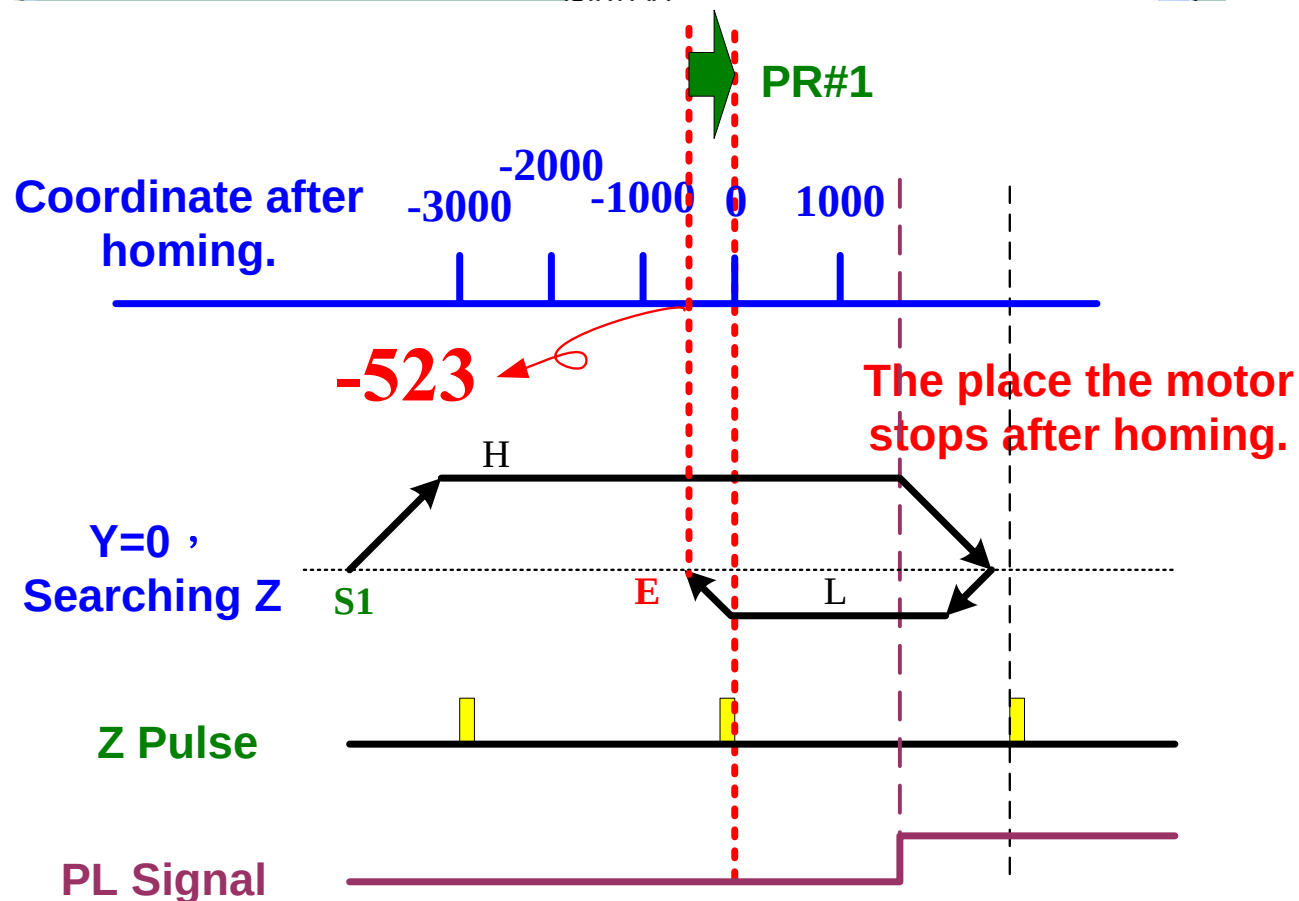
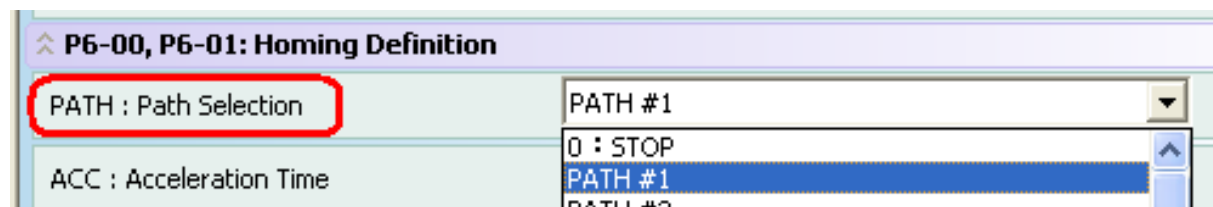
The home position is defined to the place the motor stops at the moment of SHOM signal triggered.

The Homing Mode (10)

The Position & Coordinate after Homing

after Homing

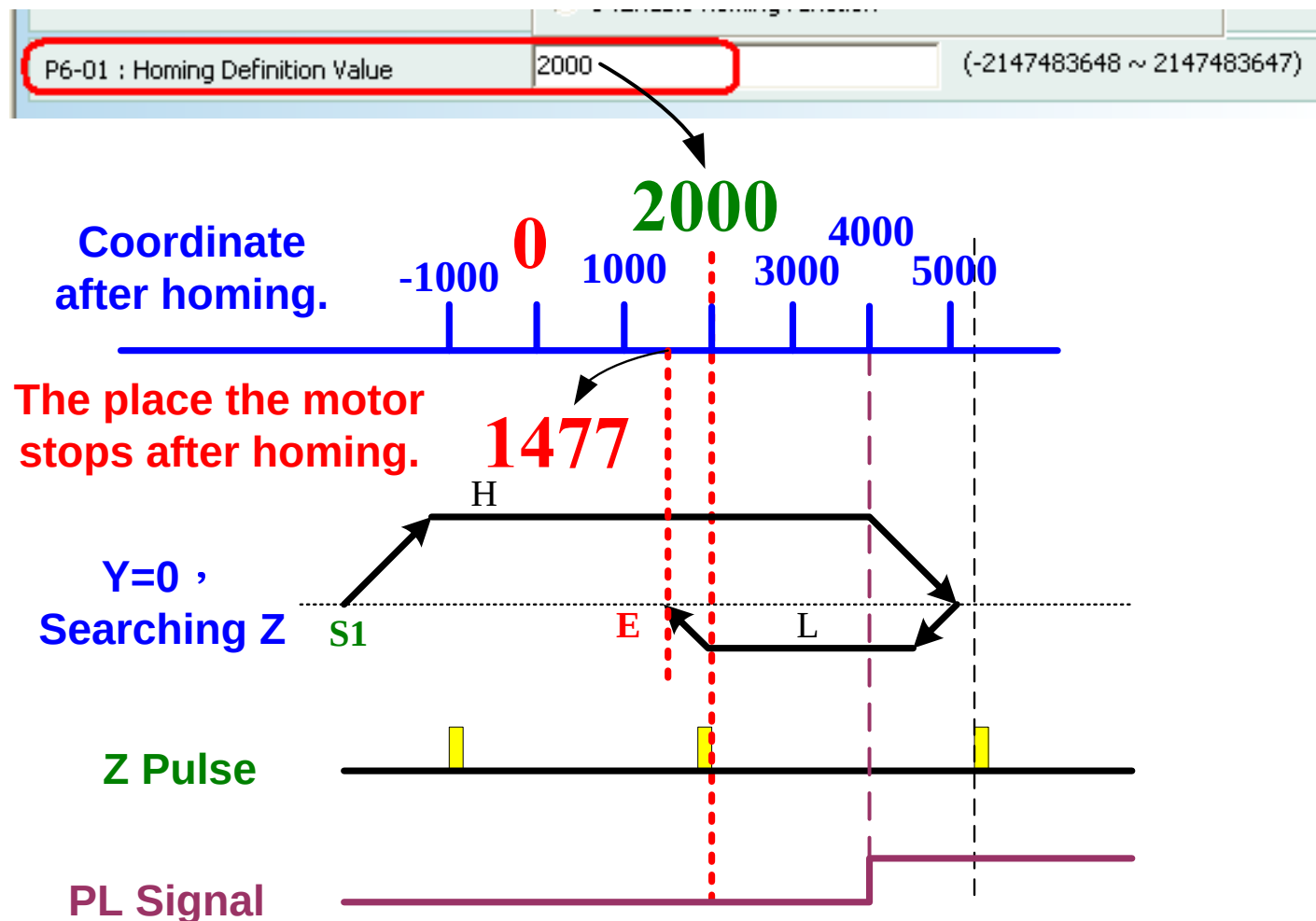
After homing, the motor will stop at a place close to home but not exactly at home except the mode X=8. Another PR can be called to move the motor to the coordinate zero or any place.



The Homing Mode (11)

Coordinate Offset

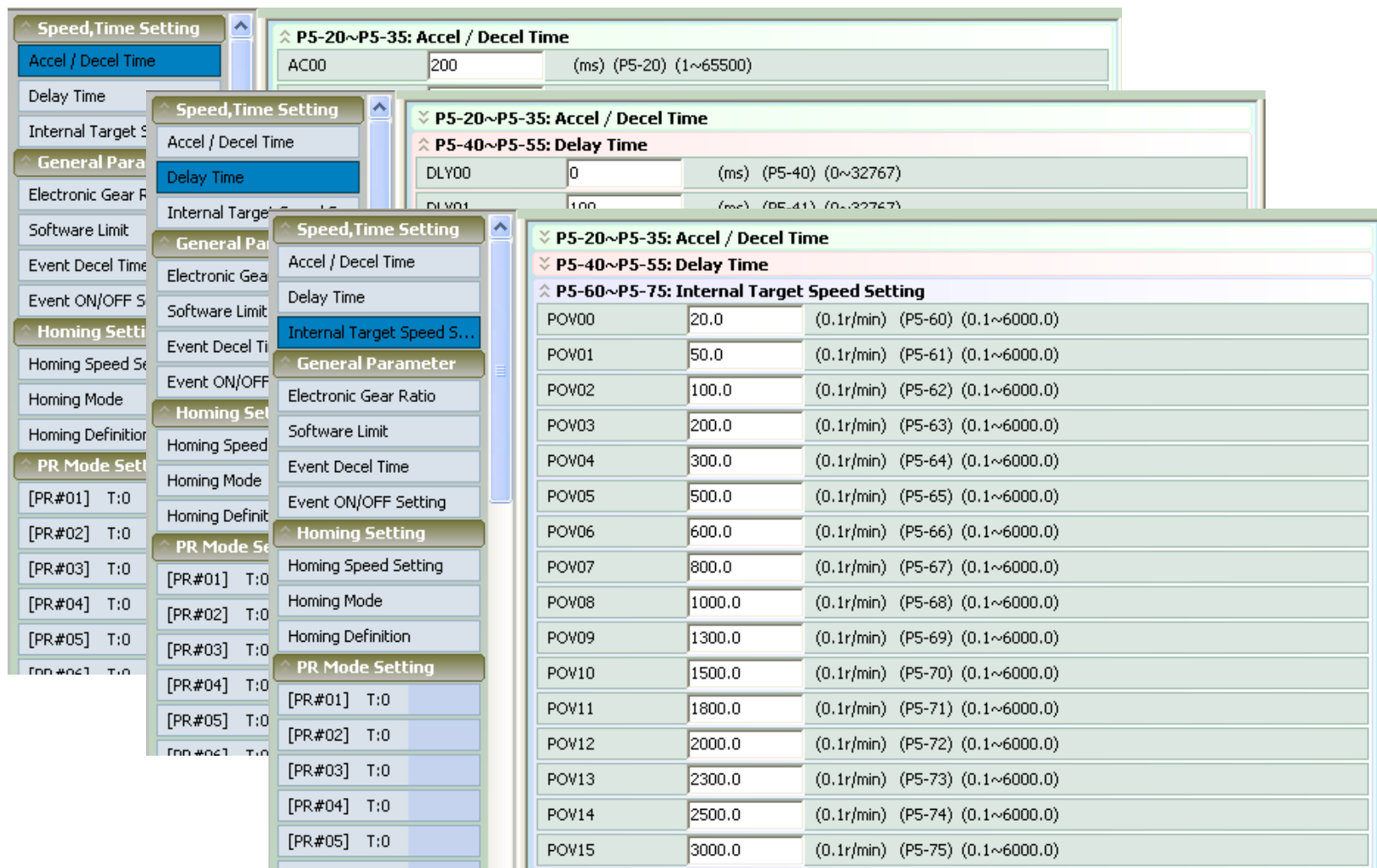
The home reference point can be defined to any value to its coordinate called the coordinate offset.



The Sharing Data

Data for All PRs

The acceleration/deceleration time, delay time, and target speed are shared with all 64 PRs.



The screenshot displays the DELTA software interface with multiple overlapping windows showing parameter settings. The left sidebar lists various settings categories: Speed, Time Setting; General Parameter; Homing Setting; and PR Mode Setting. The main area shows three overlapping windows:

- Speed, Time Setting - Accel / Decel Time:** Shows parameters for P5-20~P5-35: Accel / Decel Time (AC00) and P5-40~P5-55: Delay Time (DLV00).
- Speed, Time Setting - Delay Time:** Shows parameters for P5-20~P5-35: Accel / Decel Time (DLV00) and P5-40~P5-55: Delay Time (DLV01).
- General Parameter - Internal Target Speed Setting:** Shows parameters for P5-60~P5-75: Internal Target Speed Setting (POV00 to POV15).

The following table represents the data shown in the 'Internal Target Speed Setting' window:

Parameter	Value	Unit	PR Range	Range
POV00	20.0	(0.1r/min)	(P5-60)	(0.1~6000.0)
POV01	50.0	(0.1r/min)	(P5-61)	(0.1~6000.0)
POV02	100.0	(0.1r/min)	(P5-62)	(0.1~6000.0)
POV03	200.0	(0.1r/min)	(P5-63)	(0.1~6000.0)
POV04	300.0	(0.1r/min)	(P5-64)	(0.1~6000.0)
POV05	500.0	(0.1r/min)	(P5-65)	(0.1~6000.0)
POV06	600.0	(0.1r/min)	(P5-66)	(0.1~6000.0)
POV07	800.0	(0.1r/min)	(P5-67)	(0.1~6000.0)
POV08	1000.0	(0.1r/min)	(P5-68)	(0.1~6000.0)
POV09	1300.0	(0.1r/min)	(P5-69)	(0.1~6000.0)
POV10	1500.0	(0.1r/min)	(P5-70)	(0.1~6000.0)
POV11	1800.0	(0.1r/min)	(P5-71)	(0.1~6000.0)
POV12	2000.0	(0.1r/min)	(P5-72)	(0.1~6000.0)
POV13	2300.0	(0.1r/min)	(P5-73)	(0.1~6000.0)
POV14	2500.0	(0.1r/min)	(P5-74)	(0.1~6000.0)
POV15	3000.0	(0.1r/min)	(P5-75)	(0.1~6000.0)



The Constant Speed Mode (1)

Speed Control of PR

The acceleration/deceleration time along with target speed can be configured. The Delay Time is defined from the view of command.

TYPE settings

[1]: Constant speed control

OPT options

INS : Interrupt the previous path ☒ 0 : NO ☐ 1 : YES

AUTO : When completed, auto move to the next path: ☒ 0 : NO ☐ 1 : YES

UNIT : ☒ 0 : 0.1 rpm ☐ 1 : PPS (PUU per sec)

Speed, Time Setting

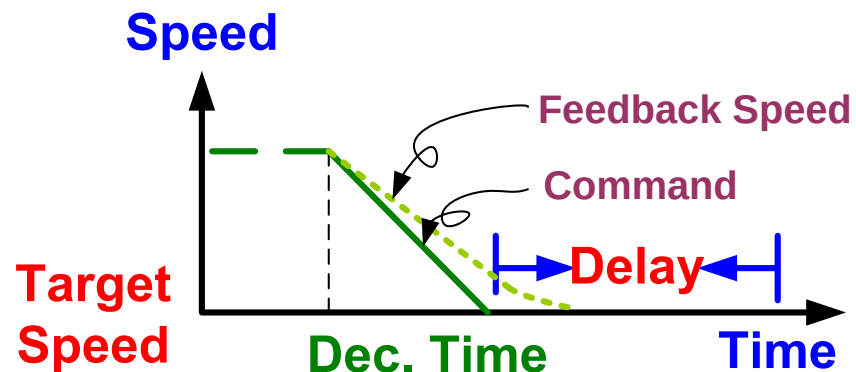
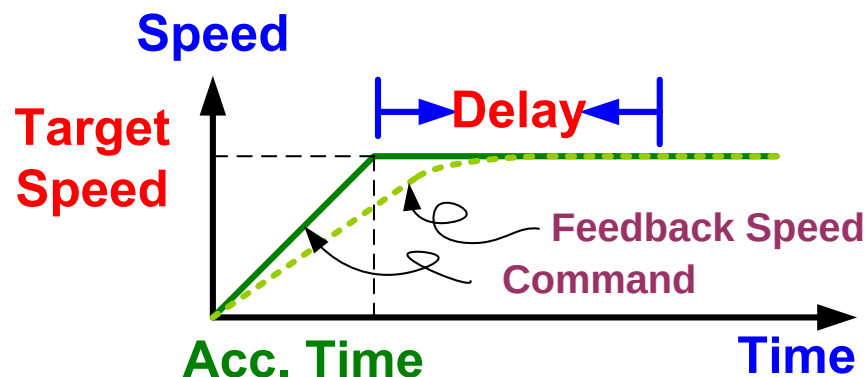
ACC : Time Index of accelerating to rated speed(3000rpm) AC00 : 200 (P5-20) Time=0.000 ms

DEC : Time Index of decelerating from rated speed(3000rpm) AC00 : 200 (P5-20) Time=0.000 ms

DLY : Delay time index DLY00 : 0 (P5-40)

Data

Target Speed 0 (0x0000 ~ 0xFFFF)



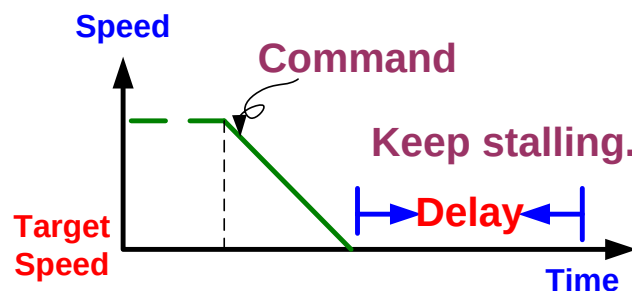
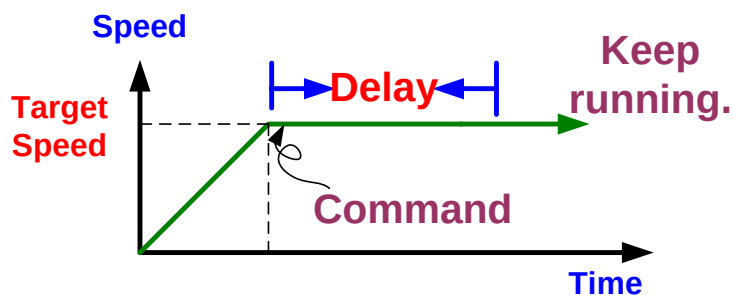
The Constant Speed Mode (2)

Move to the Next PR

The procedure can be set if it moves to the next PR when the current PR finished. The delay time will delay the timing of enforcement to the next PR.

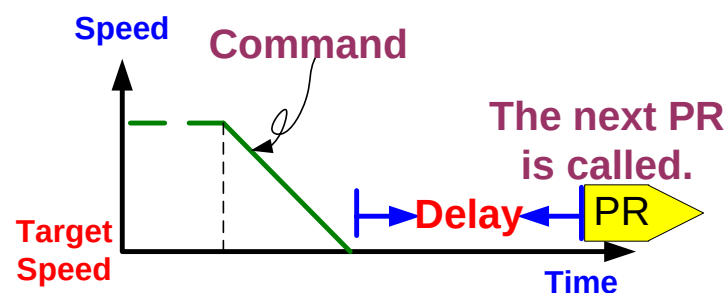
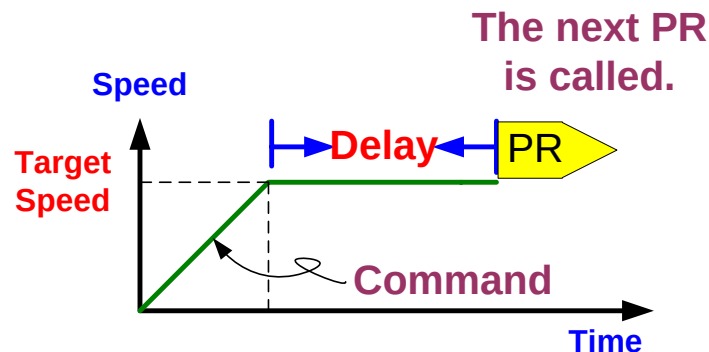
AUTO : When completed, auto move to the next path: ☒ 0 : NO ☐ 1 : YES

Stop at the current PR.



AUTO : When completed, auto move to the next path: ☐ 0 : NO ☒ 1 : YES

Call the next PR after finishing current PR.



The Position Mode (1)

Position Control of PR

There are two sub-types with 4 different kinds of position commands respectively under Position Control Mode.

Command	Type 2	Type 3
Absolute Command	✓	✓
Relative Command	✓	✓
Incremental Command	✓	✓
Cap. Relative Command	✓	✓

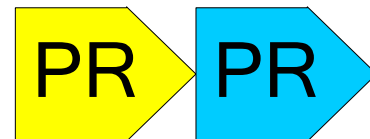
Type 2:

The procedure will be stopped after finishing the current PR.



Type 3:

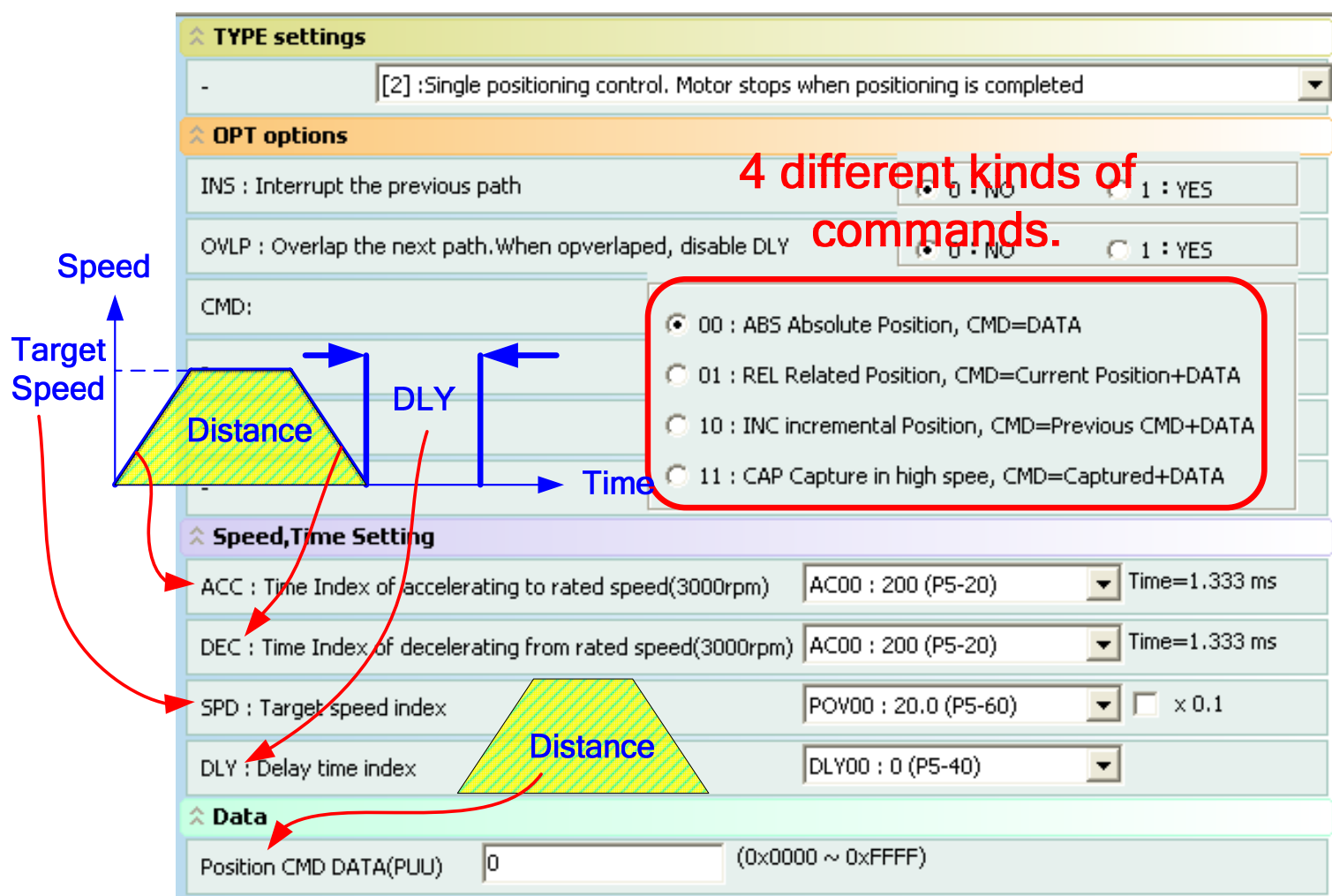
The NEXT PR will be called after finishing the current PR.



The Position Mode (2)

Motion Profile of Position Control

The Acceleration/Deceleration time, Target speed, Delay time and Distance can be set.



TYPE settings

[2] : Single positioning control. Motor stops when positioning is completed

OPT options

INS : Interrupt the previous path ☐ 0 : NO ☐ 1 : YES

OVLP : Overlap the next path. When overlapped, disable DLY ☐ 0 : NO ☐ 1 : YES

CMD:

☒ 00 : ABS Absolute Position, CMD=DATA

☐ 01 : REL Related Position, CMD=Current Position+DATA

☐ 10 : INC incremental Position, CMD=Previous CMD+DATA

☐ 11 : CAP Capture in high speed, CMD=Captured+DATA

Speed, Time Setting

ACC : Time Index of accelerating to rated speed(3000rpm) AC00 : 200 (P5-20) Time=1.333 ms

DEC : Time Index of decelerating from rated speed(3000rpm) AC00 : 200 (P5-20) Time=1.333 ms

SPD : Target speed index POV00 : 20.0 (P5-60) ☐ x 0.1

DLY : Delay time index DLY00 : 0 (P5-40)

Data

Position CMD DATA(PUU) 0 (0x0000 ~ 0xFFFF)

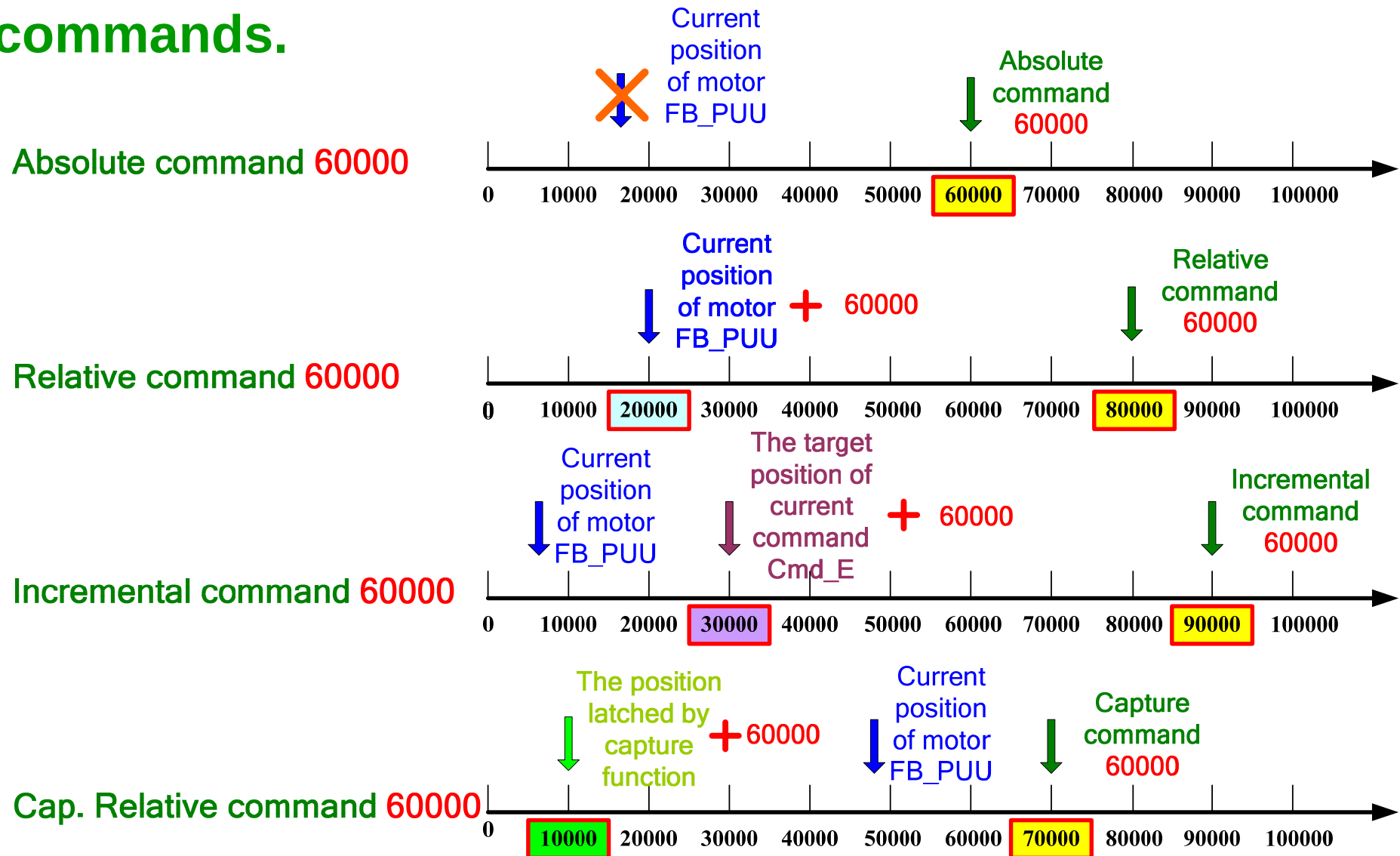
Diagram: A graph showing Speed vs. Time. The profile consists of an acceleration phase (trapezoid), a constant speed phase (rectangle), and a deceleration phase (trapezoid). The total distance is labeled 'Distance'. The target speed is labeled 'Target Speed'. The delay time is labeled 'DLY'.

4 different kinds of commands.

The Position Mode (3)

4 Different Types of Position Commands

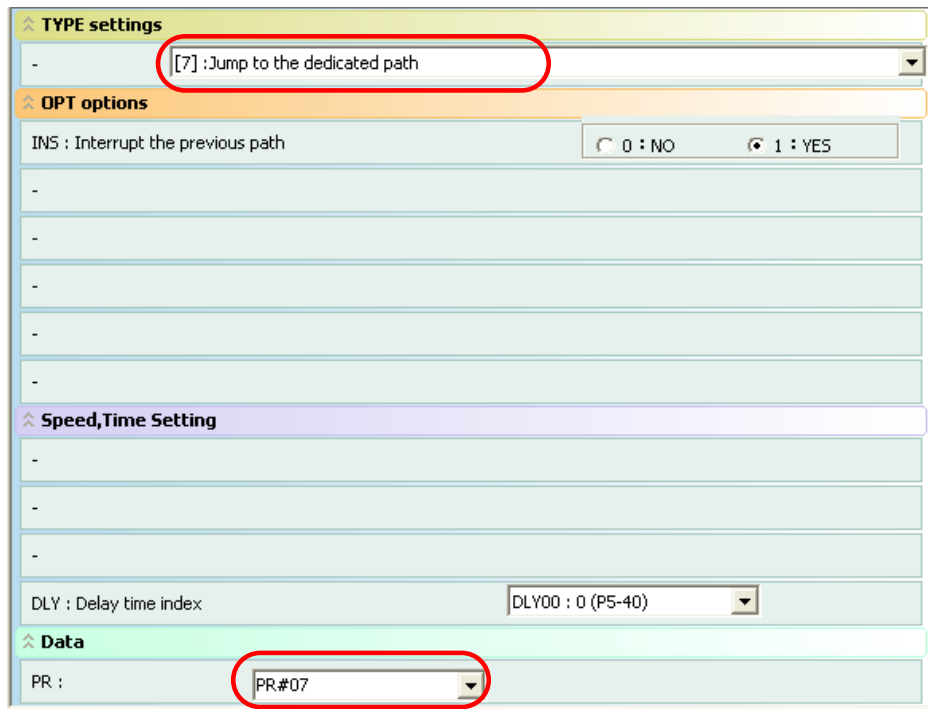
The Absolute, Relative, Incremental, and Capture Relative commands.



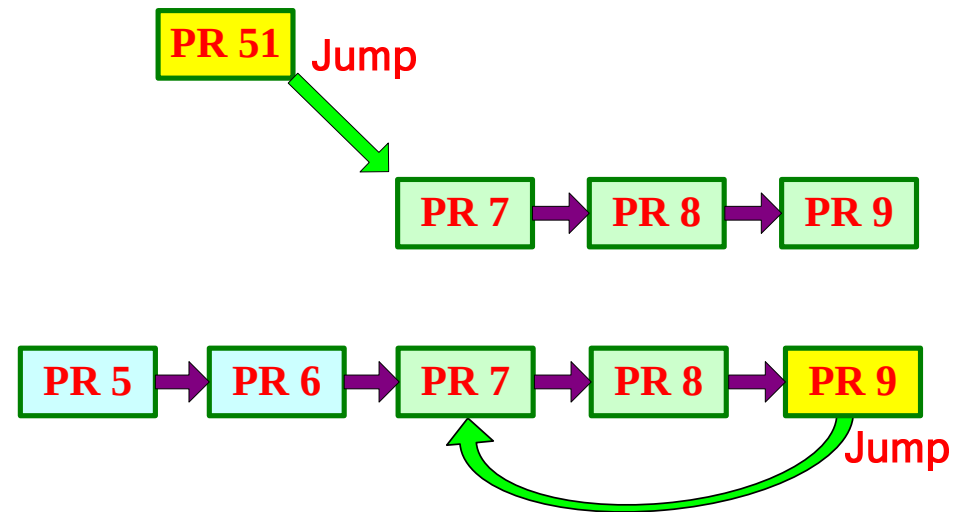
The Jump Mode

Switch the Procedure

The jump function can call any PR.



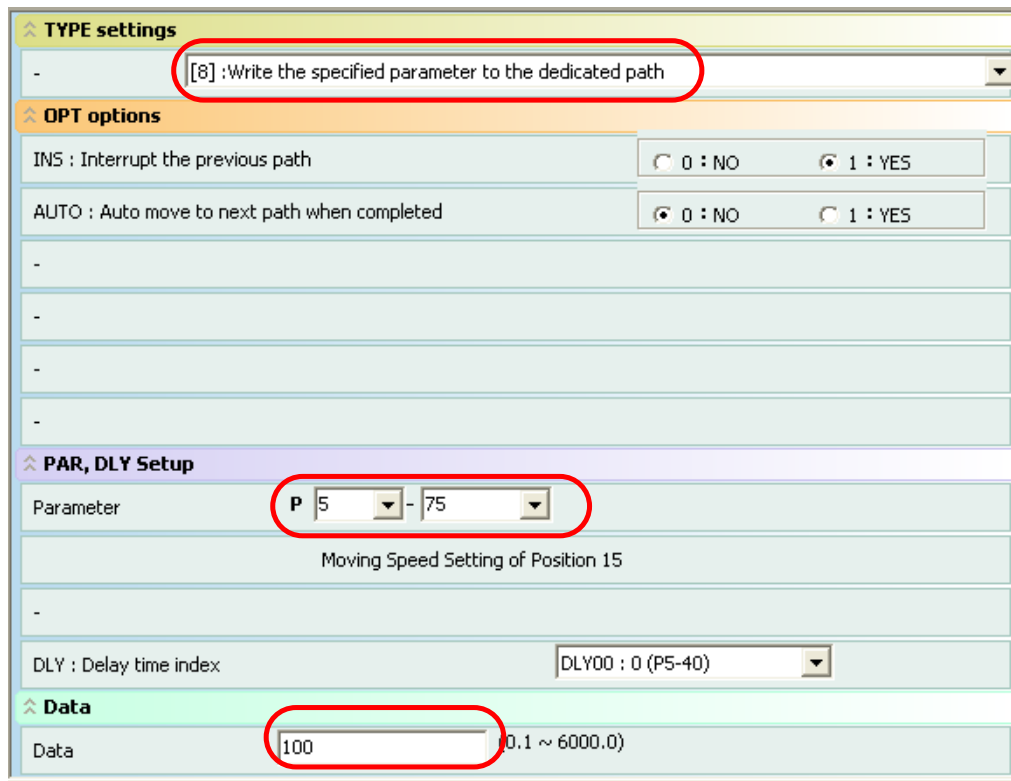
The screenshot shows the configuration window for a procedure. The 'TYPE settings' section has a dropdown menu set to '[7] : Jump to the dedicated path'. The 'OPT options' section has 'INS : Interrupt the previous path' with radio buttons for '0 : NO' and '1 : YES', where '1 : YES' is selected. The 'Speed, Time Setting' section has 'DLY : Delay time index' with a dropdown set to 'DLY00 : 0 (P5-40)'. The 'Data' section has 'PR :' with a dropdown set to 'PR.#07'. Red circles highlight the dropdown in 'TYPE settings' and the dropdown in 'Data'.



The Write Parameter Mode

Change Parameter with PR

The Write Parameter PR can be used to change any of parameters in the Servo Drive.



The screenshot shows the Delta Servo Drive parameter setting interface. The 'TYPE settings' section has a dropdown menu set to '[8] : Write the specified parameter to the dedicated path'. The 'OPT options' section has two rows of settings: 'INS : Interrupt the previous path' with radio buttons for '0 : NO' and '1 : YES' (selected), and 'AUTO : Auto move to next path when completed' with radio buttons for '0 : NO' (selected) and '1 : YES'. The 'PAR, DLY Setup' section has a 'Parameter' field with a dropdown set to 'P 5' and a text field set to '75', with the description 'Moving Speed Setting of Position 15' below it. The 'Data' section has a 'Data' field with a text box containing '100' and a range '(0.1 ~ 6000.0)' to its right. Red circles highlight the '[8] : Write the specified parameter to the dedicated path' dropdown, the 'P 5' dropdown, the '75' text field, and the '100' text box.

Current PR

Write P5-75=100

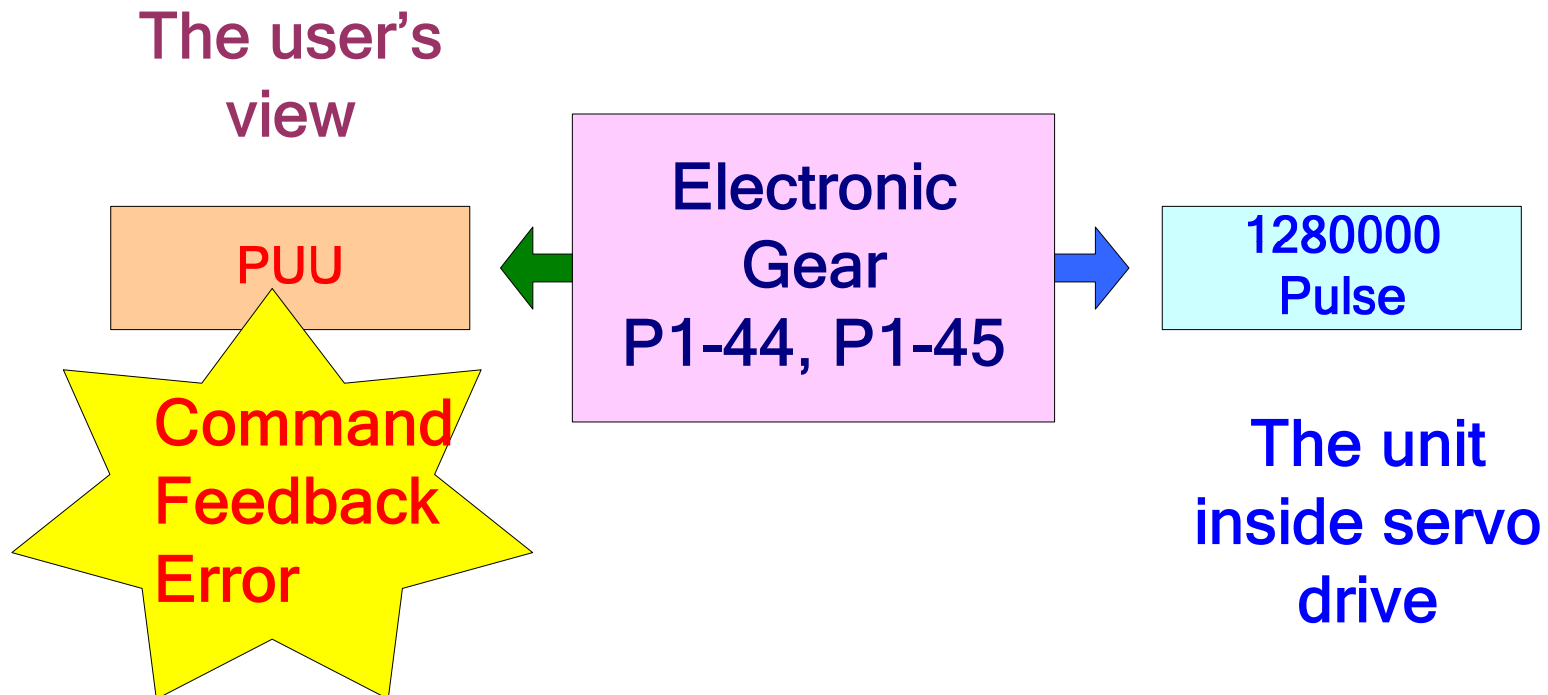
P5-75

100

What is PUU?

Pulse of User Unit

The PUU is a unit which is scaled by the electronic gear. This will bring out an advantage, and that is “**YOU SEE WHAT YOU COMMAND**”. For example, if you send 10000 PUU for command and you can read from the feedback 10000 PUU and ignore the Electronic Gear Ratio.



Some Monitoring Variables

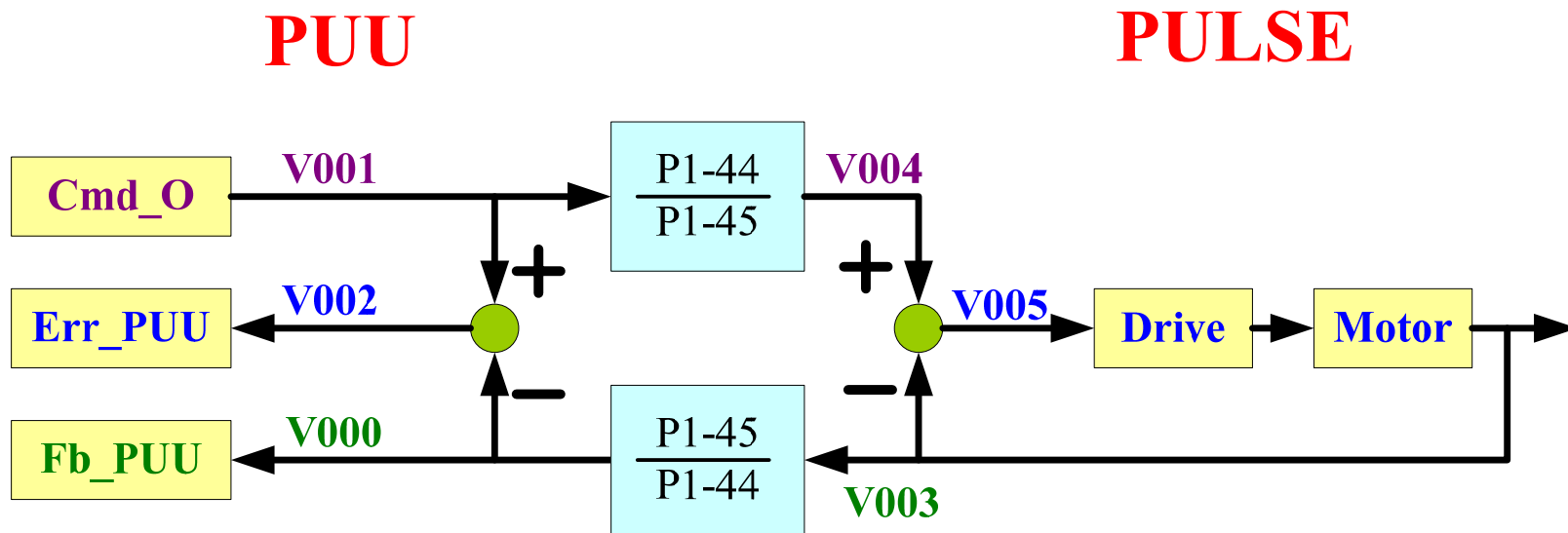
A Close Look to Command's Execution

Cmd_O: The intermediate command .

Cmd_E(V064): The target position of command.

Fb_PUU: The current (feedback) position of motor.

Err_PUU: The position error = (Cmd_O – Fb_PUU).

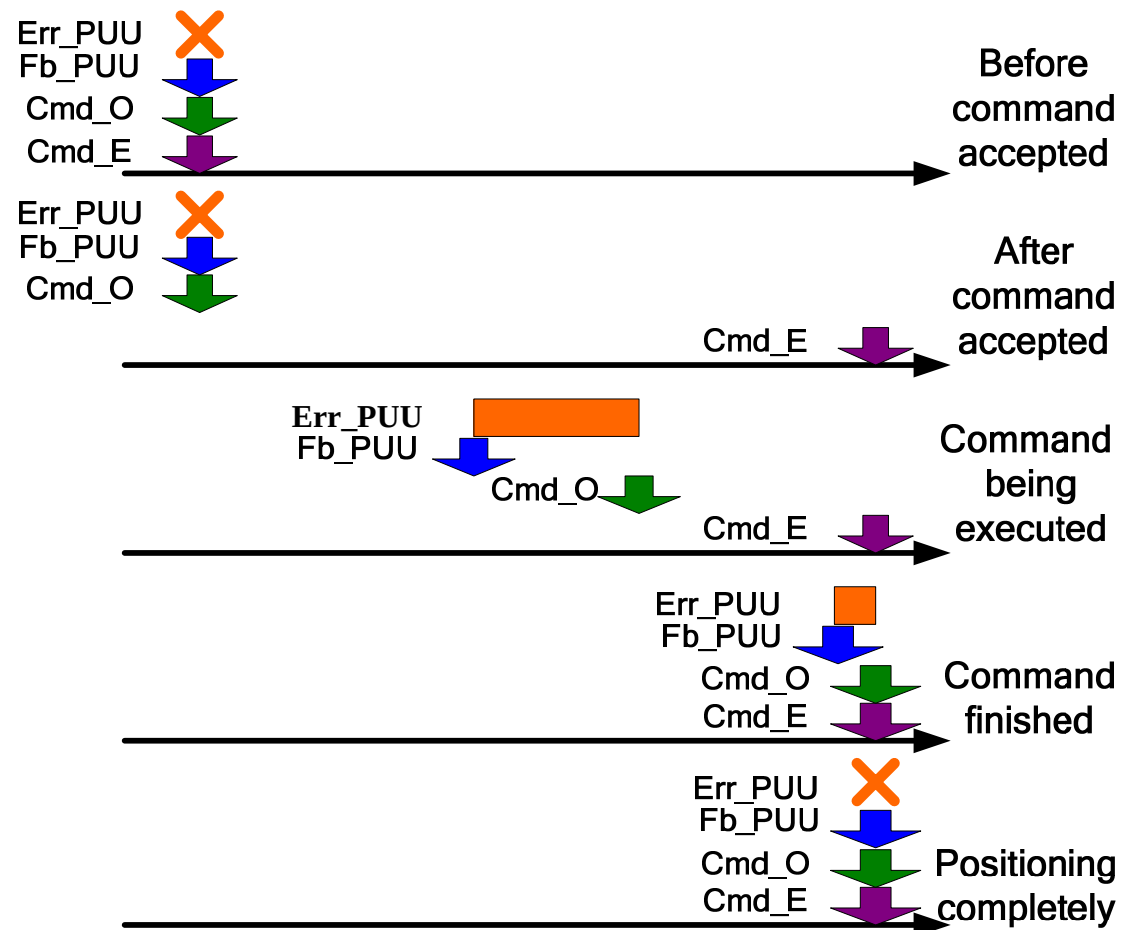




Example of Monitoring Variables(1)

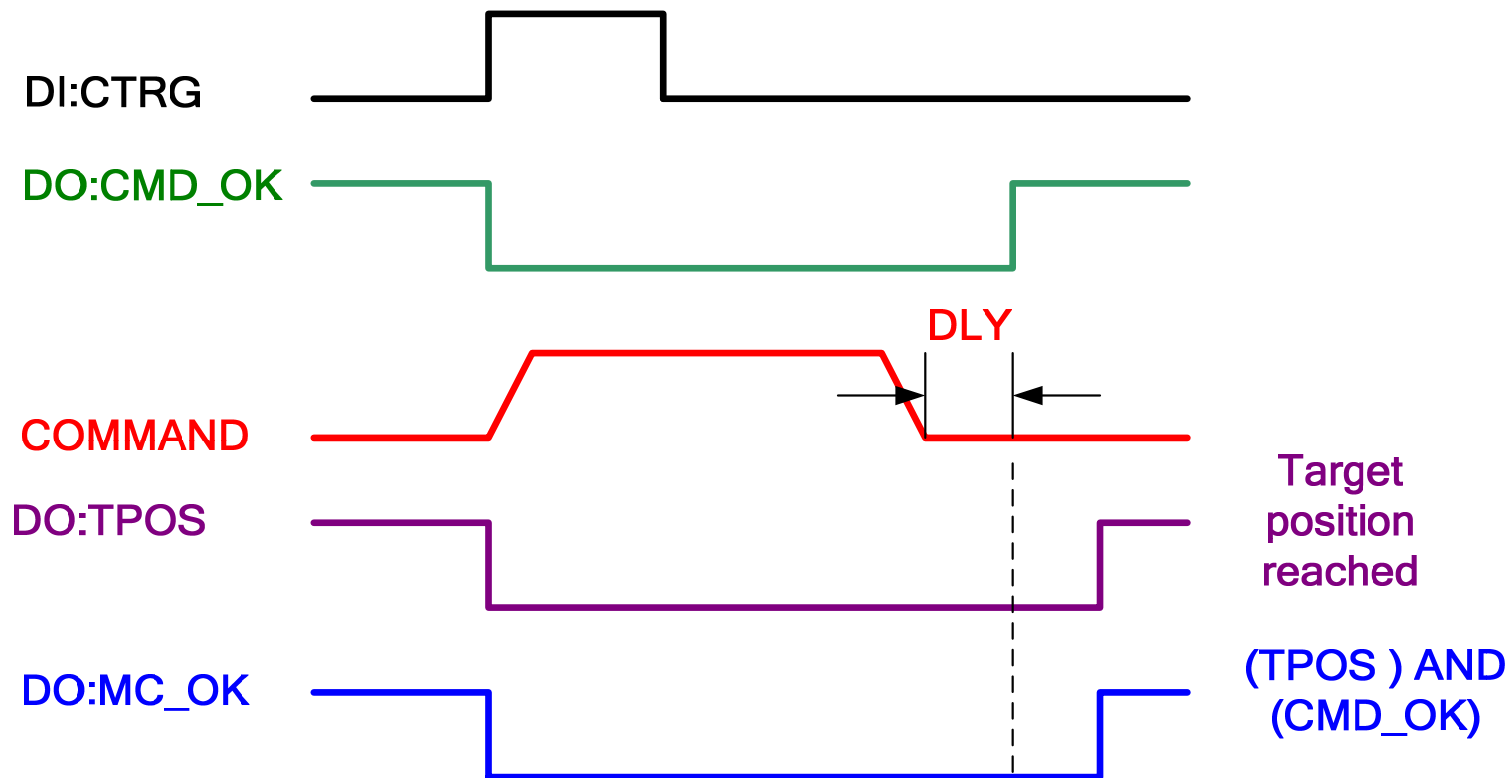
A Position Command Example

The final destination will be known at the moment command accepted, and the motor needs time to accomplish the command.



The Signal Out

A digital output called MC_OK is designed for signaling the completion of command.

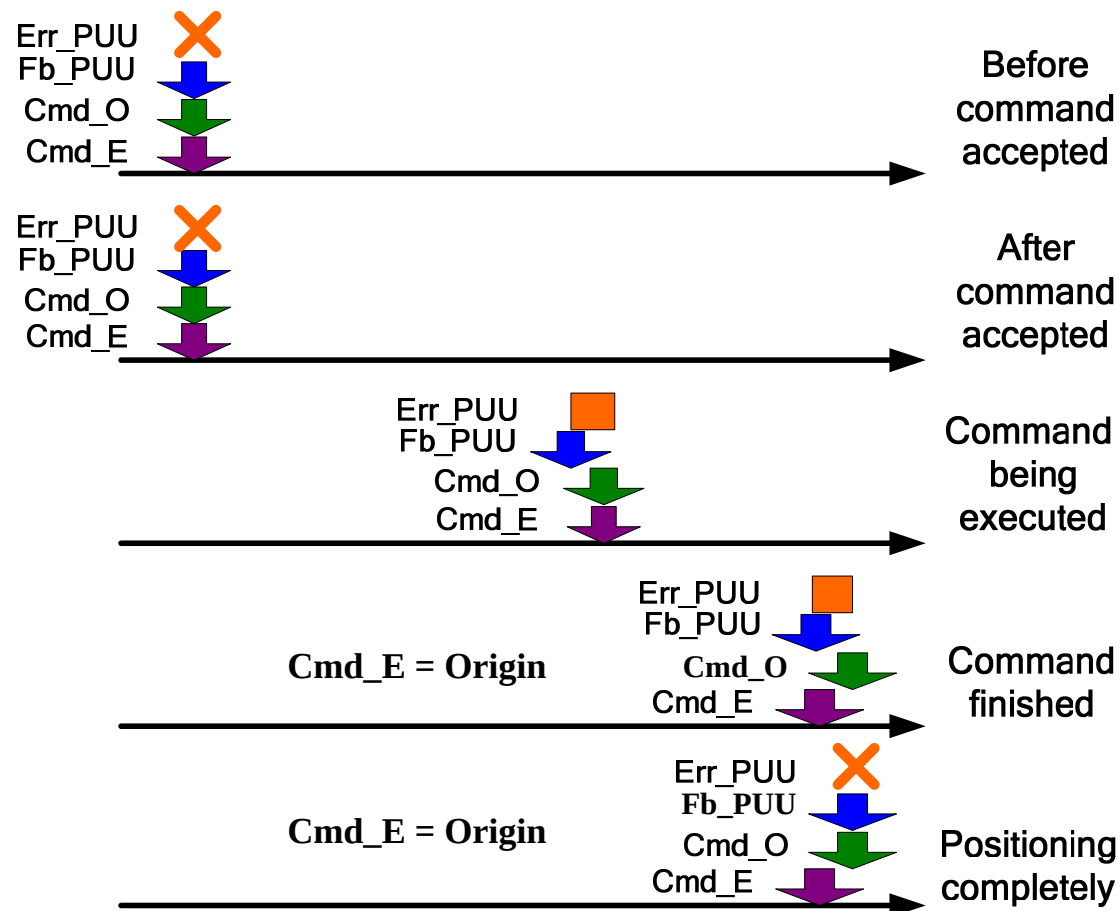




Example of Monitoring Variables(3)

A Homing Command Example

The final destination **Cmd_E** cannot be known until the motor travels across the home. Once the place known, it need a short distance to reduce its speed to zero.

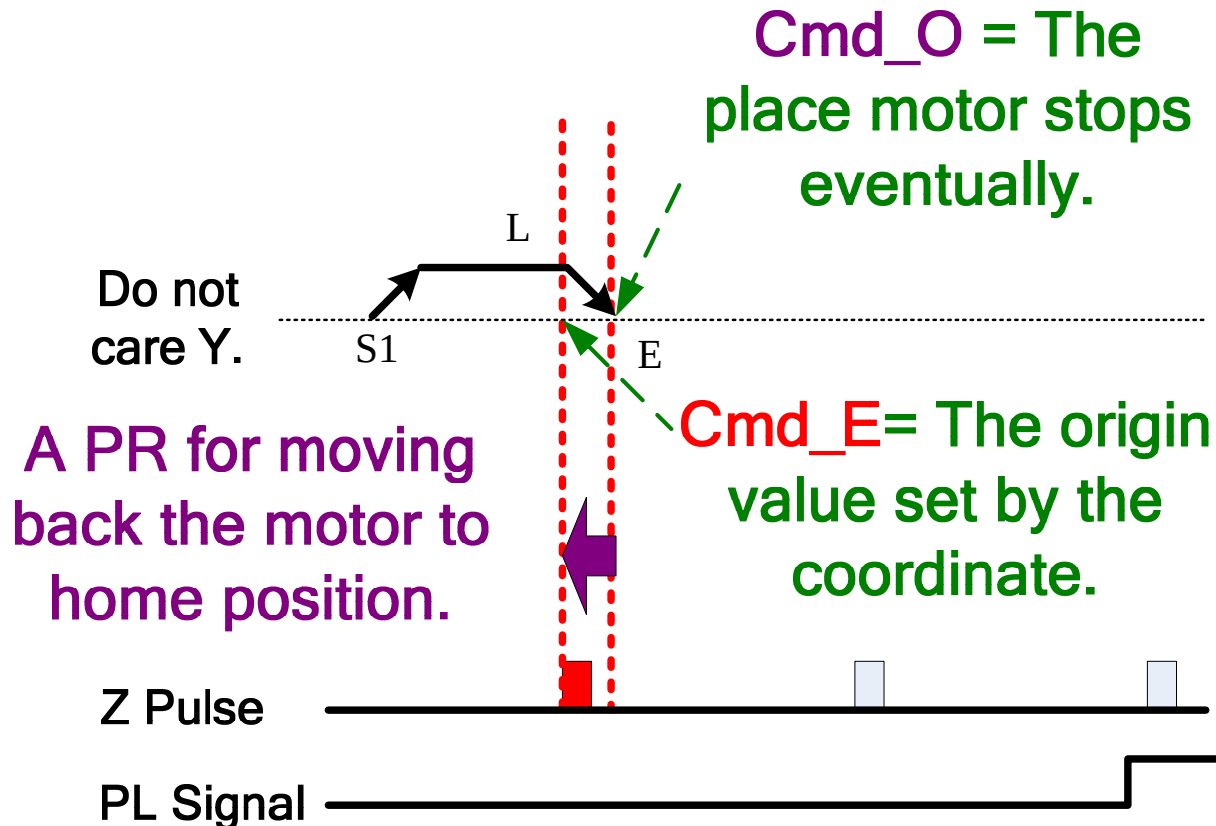




Example of Monitoring Variables(4)

A Homing Command Motion Profile

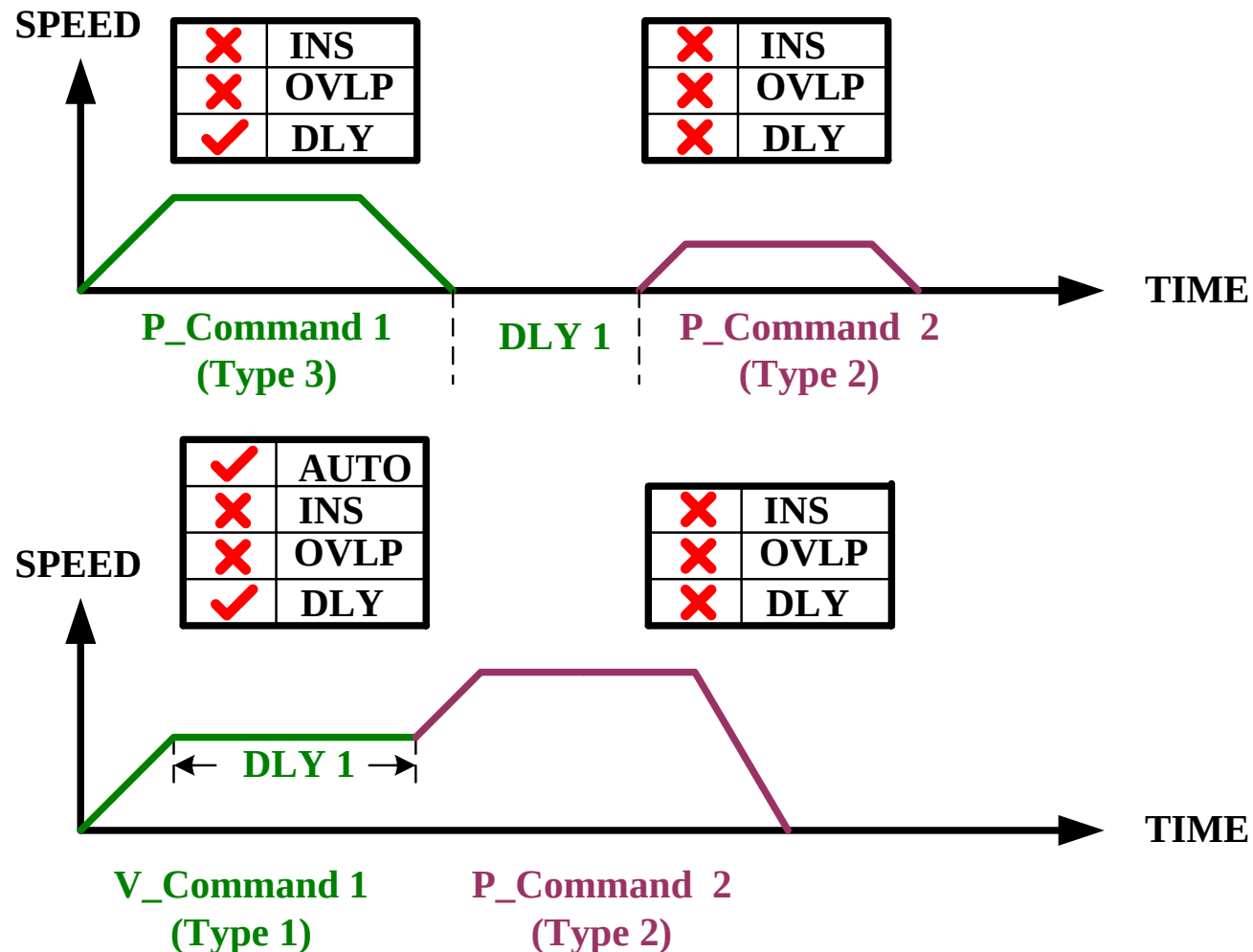
If there doesn't have any PR executed after homing, the Cmd_O and Cmd_E is not the same on ASDA-A2.



Motion Command (1)

Sequential Command on PR

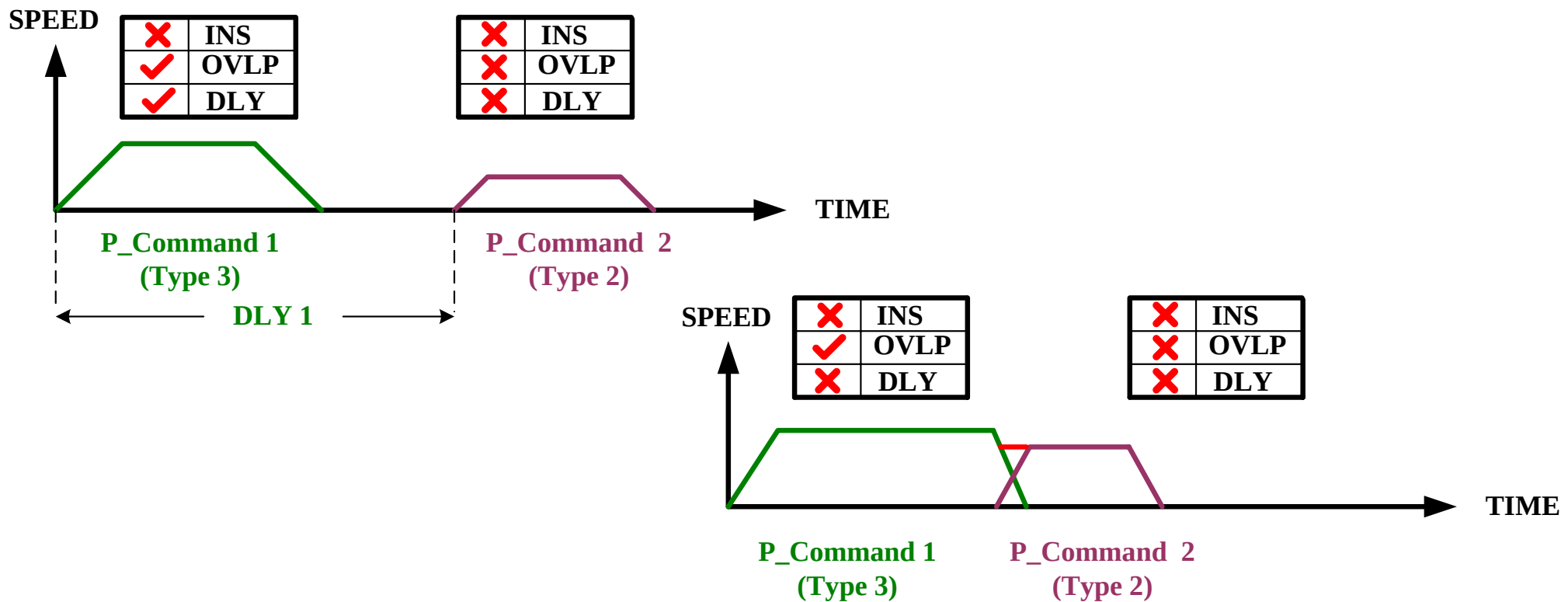
A command will be executed only when the previous command completed.



Motion Command (2)

Overlap Command on PR

The second command will be executed after delay time or during deceleration period. A long delay time at the first command will affect the timing of second command. Zero delay is recommended for overlap application.



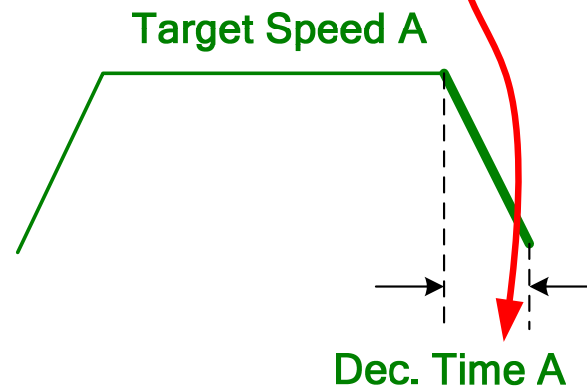
Motion Command (3)

How to Make Overlap Command on PR

If the ratio for deceleration in front command is the same as the ratio for acceleration in the tail command, it can form a good shape of overlap command .

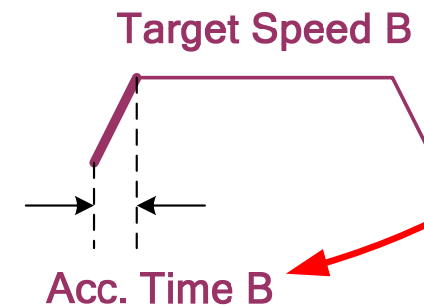
Speed,Time Setting

ACC : Time Index of accelerating to rated speed(3000rpm)	AC00 : 200 (P5-20)	Time=1.333 ms
DEC : Time Index of decelerating from rated speed(3000rpm)	AC00 : 200 (P5-20)	Time=1.333 ms



Speed,Time Setting

ACC : Time Index of accelerating to rated speed(3000rpm)	AC00 : 200 (P5-20)	Time=1.333 ms
DEC : Time Index of decelerating from rated speed(3000rpm)	AC00 : 200 (P5-20)	Time=1.333 ms

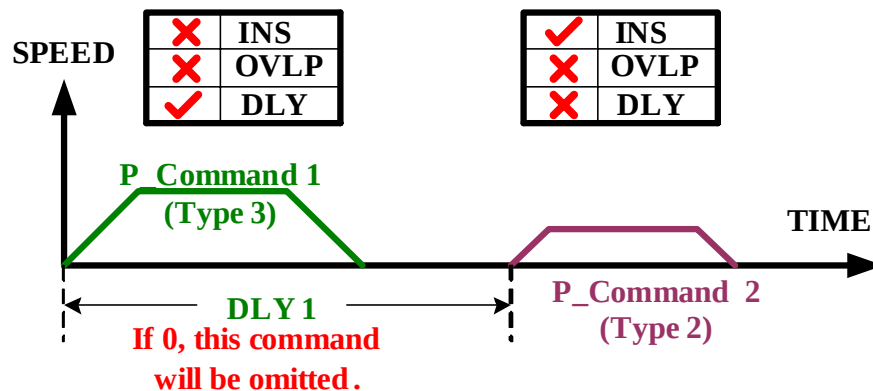


$$\frac{\text{Target Speed A}}{\text{Dec. Time A}} = \frac{\text{Target Speed B}}{\text{Acc. Time B}}$$

Motion Command (4)

Internal Insertion Command on PR

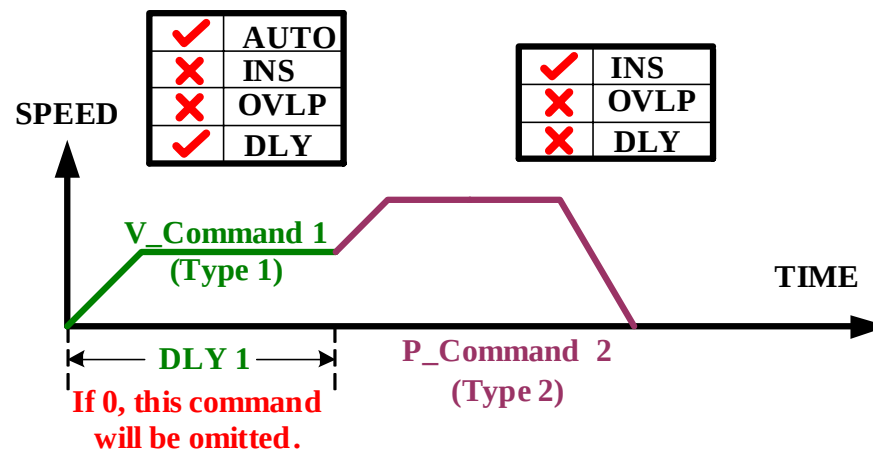
The second command will insert the first command to be a new command. The final result depends on the types of commands. The delay time gets function.



The final destination:

Absolute : $\text{Cmd_E} = \text{command}$

Relative, Incremental :
 $\text{Cmd_E} = \text{last Cmd_E} + \text{command}$



The final destination:

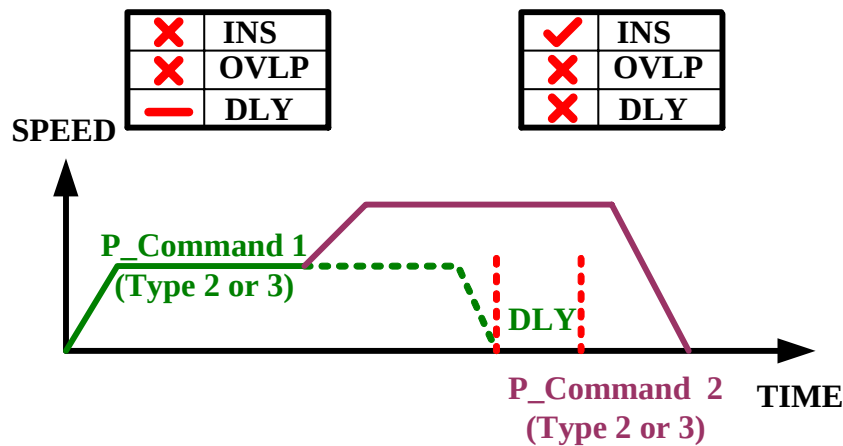
Absolute : $\text{Cmd_E} = \text{command}$

Relative, Incremental:
 $\text{Cmd_E} = \text{last Cmd_E} + \text{command}$

Motion Command (5)

External Insertion Command on PR

The external insertion will change the command being executed at the moment it inserted. The delay time is not a matter for external insertion.



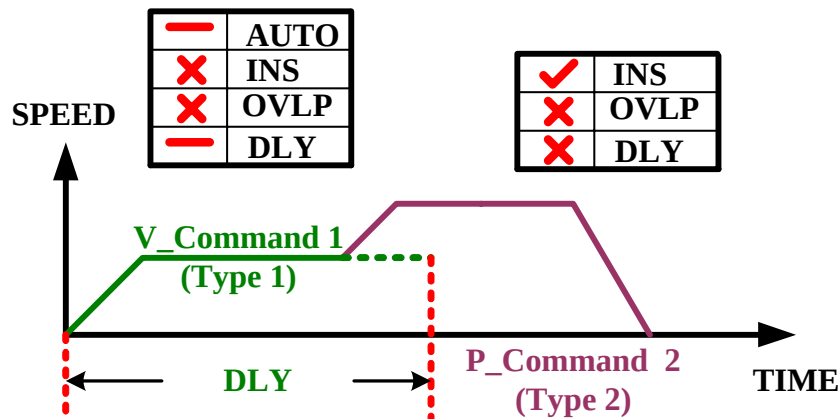
The final destination:

Absolute : $\text{Cmd_E} = \text{command}$

Relative : $\text{Cmd_E} = \text{Fb_PUU} + \text{command}$

Incremental : $\text{Cmd_E} = \text{last Cmd_E} + \text{command}$

Cap. Relative : Data captured + Command



The final destination:

Absolute : $\text{Cmd_E} = \text{command}$

Relative : $\text{Cmd_E} = \text{Fb_PUU} + \text{command}$

Incremental : $\text{Cmd_E} = \text{last Cmd_E} + \text{command}$

Cap. Relative : Data captured + Command

Triggering PR

The Ways to Call a PR

There are several ways to call a PR.

CTRG: Trigger the PR selected by DIs (POS0~POS5).

STP: Terminate the running PR .

P5-7: Use PR identification to call a PR.

SHOM: Start to run homing procedure (PR0).

EV1~4 (rising edge): Event can be used to call a PR.

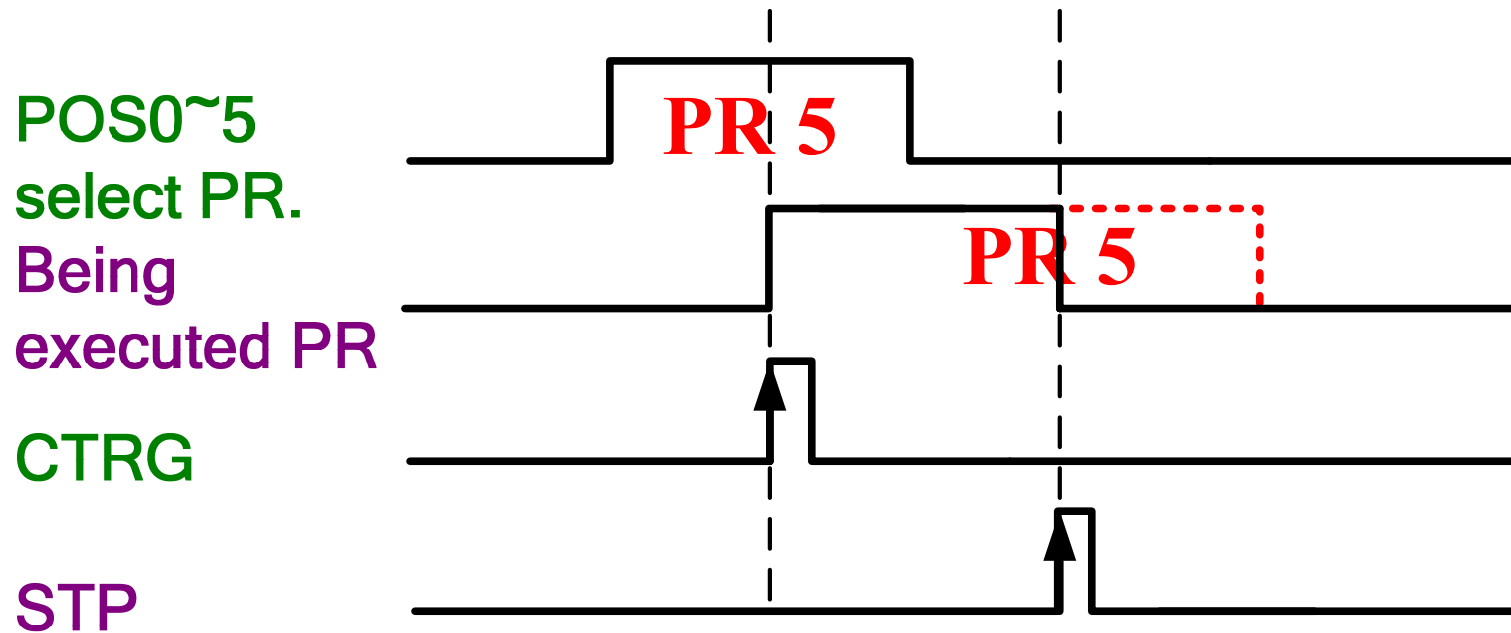
EV1~4 (falling edge): Event can be used to call a PR.

Others: PR#50 is called when Capture function finished, and a specific PR can be assigned after E-Cam disengaging.

CTRG and STP

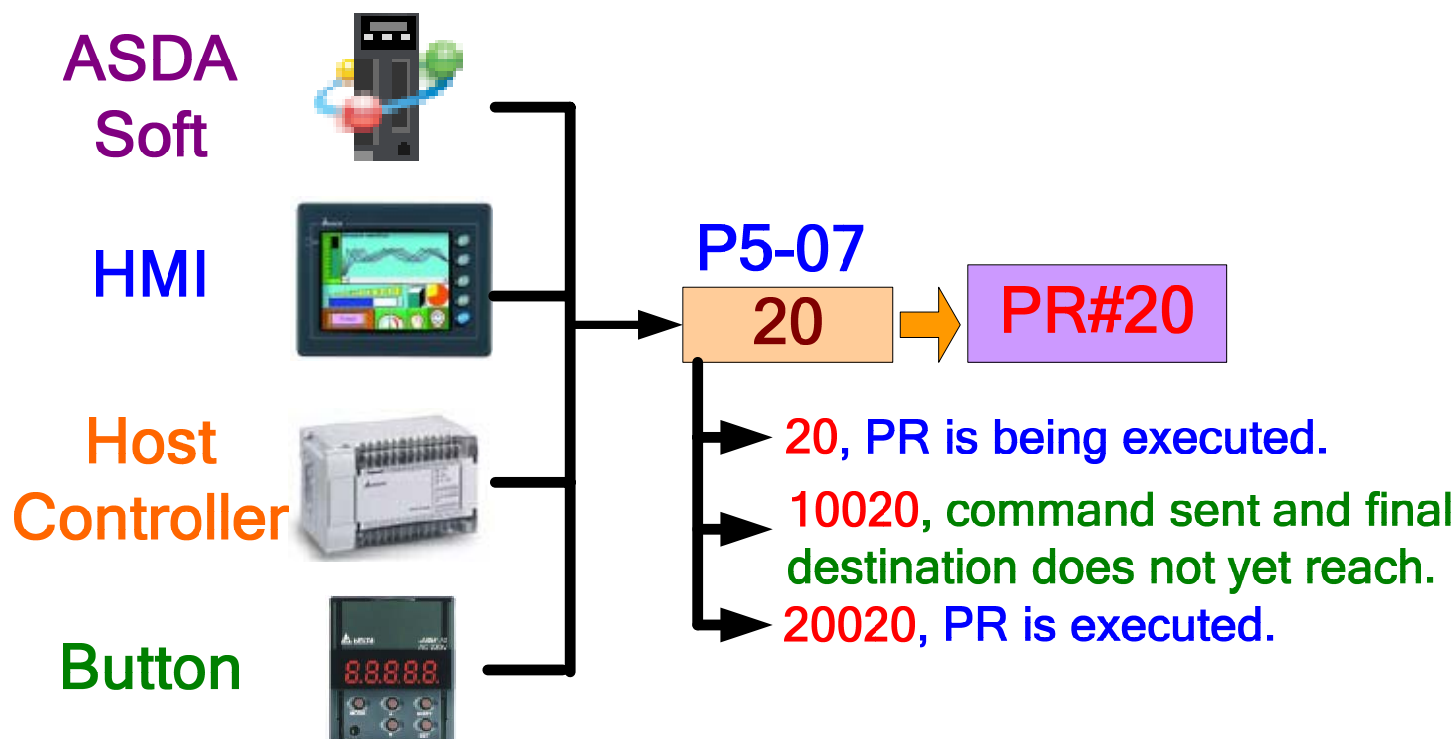
Digital DI to Trigger PR

The CTRG is used to trigger PR selected by POS0~5 where STP can stop a running PR.



Writing ID to Call PR

The number from 0 to 63 can be put into P5-07 to call a PR respectively. PR#0 is defined as homing procedure. The P5-07 will reply appropriate message about the result of executing PR.



Start Homing Procedure

The digital input function can be applied to start a homing procedure that is PR0 in ASDA-A2.

P5-04:Homing Mode	
X=> Homing Method:	X:4: Move forward and regard Z pulse as home sensor
Y=> Signal Setting:	X:0: Move forward to CCWL used as home
Z=> Limit Setting:	X:1: Move reverse to CWL used as home
	X:2: Move forward to dedicated home sensor (ORGP: OFF -> ON)
	X:3: Move reverse to dedicated home sensor (ORGP: OFF -> ON)
	X:4: Move forward and regard Z pulse as home sensor
	X:5: Move reverse and regard Z pulse as home sensor
	X:6: Move forward to dedicate home sensor (ORGP: ON -> OFF)
	X:7: Move reverse to dedicated home sensor (ORGP: ON -> OFF)
	X:8: Define current position as home sensor
Homing Speed Setting	
P5-05 : 1st Speed Setting of High Speed Homing	
P5-06 : 2nd Speed Setting of Low Speed Homing	20.0 (0.1 ~ 500.0)
P6-00, P6-01: Homing Definition	
PATH : Path Selection	0 : STOP
ACC : Acceleration Time	AC00 : 200 (P5-20)
DEC1 : 1st Deceleration Time	AC00 : 200 (P5-20)
DEC2: 2nd Deceleration Time	AC00 : 200 (P5-20)
DLY : Delay Time	DLY00 : 0 (P5-40)
BOOT : Boot mode, when power on:	☒ 0 :Disable homing function ☐ 1 : Enable homing function
P6-01 : Homing Definition Value	0 (-2147483648 ~ 2147483647)

SHOM



=

PR0

4 Events

There are 4 events with rising and falling edges can be set to trigger a specific PR.



DI=0x39(EV1),
0x3A(EV2),
0x3B(EV3), or
0x3C(EV4).

1 → P5-98 Rising edge events to PRs

EV4 EV3 EV2 EV1

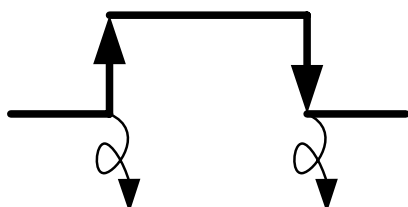
2 → P5-99 Falling edge events to PRs

EV4 EV3 EV2 EV1

Setting	1	2	3	4	5	6	7	8	9	A	B	C	D
PR#	51	52	53	54	55	56	57	58	59	60	61	62	63

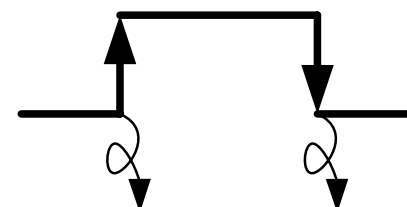
P5-98=0x0602

P5-99=0x0903



EV1=
PR#52

EV2=
PR#53



EV3=
PR#56

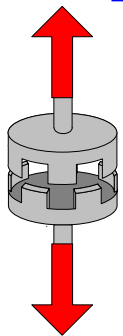
EV4=
PR#59

Other Triggers

E-Cam and Capture Function

The E-Cam function can call a specific PR when disengaged, where the Capture function will call PR#50 when finished.

E-Cam disengaged.

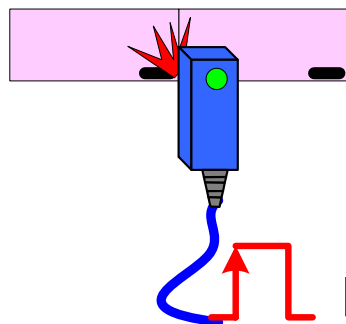


Disengaging conditions.
P5-88.U= 2,4, or 6



Call any PR set by
P5-88.BA.

Capture function finished.



→

P5-38 =
P5-38 - 1

→

P5-38= =0

True

→

Bit 3 of
P5-39.X
==1

True

→

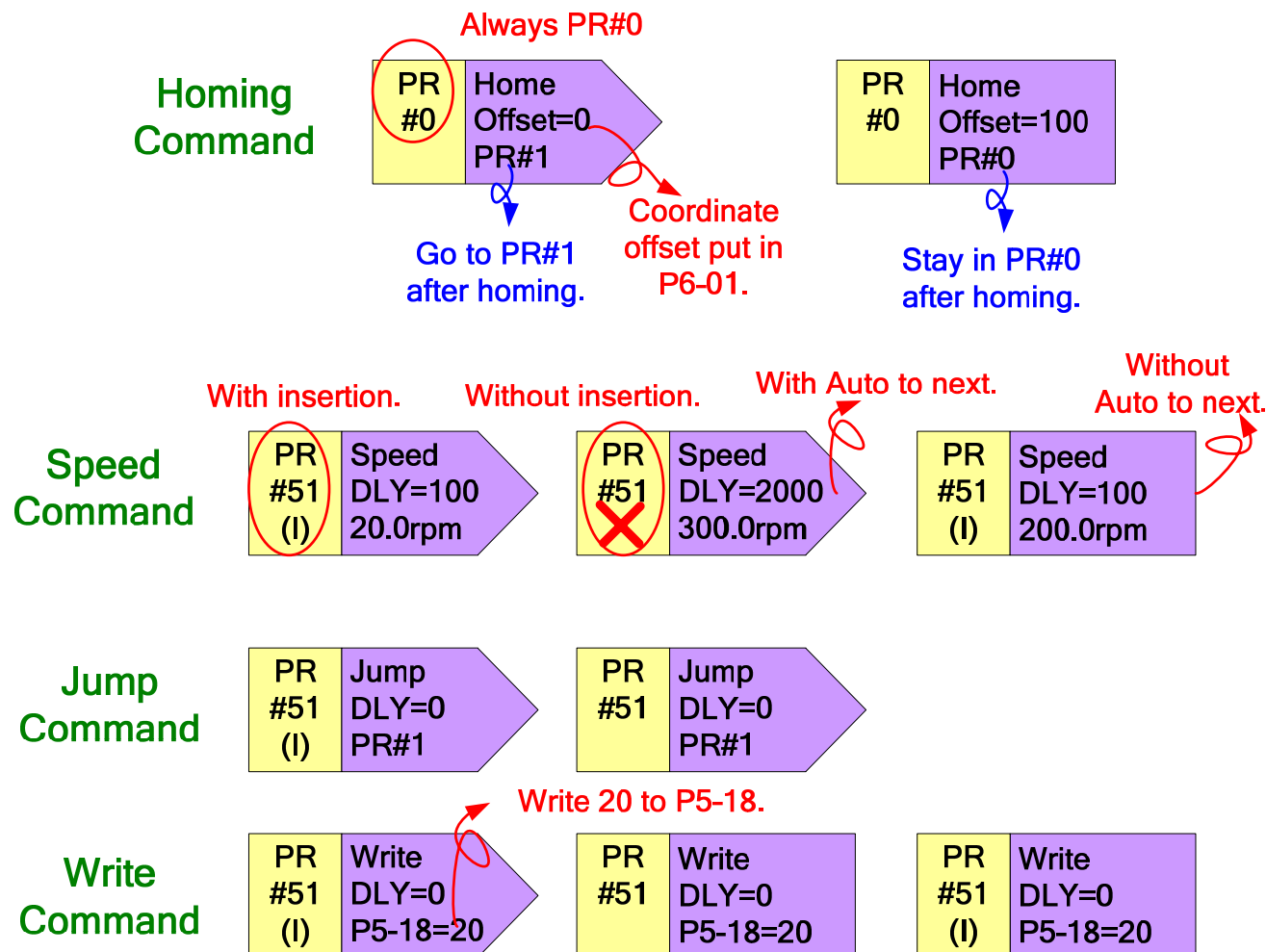
PR#50

DI7

Some Definitions (1)

In Convention We do

There will come with some notations that are commonly used in ASDA-A2 group.

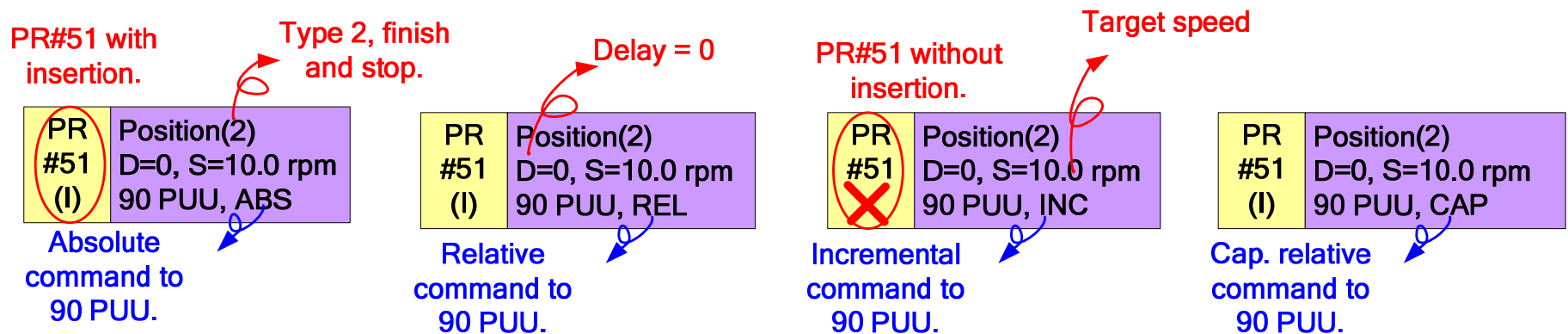


Some Definitions (2)

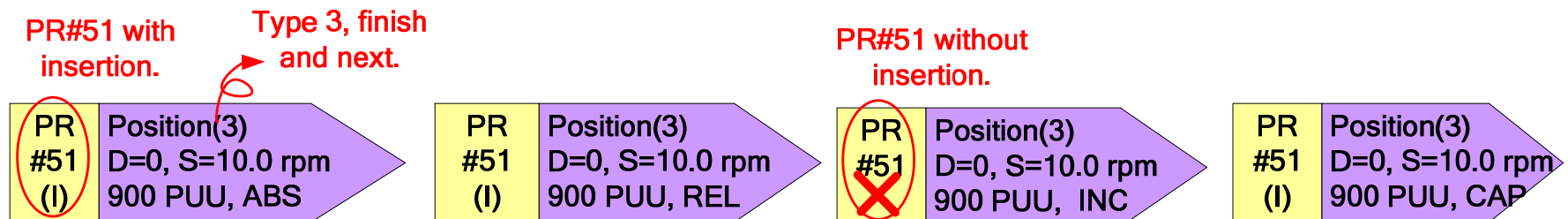
The Advantage We Get

Following the convention will be easier for other people in this group to understand your process.

Type 2 position command



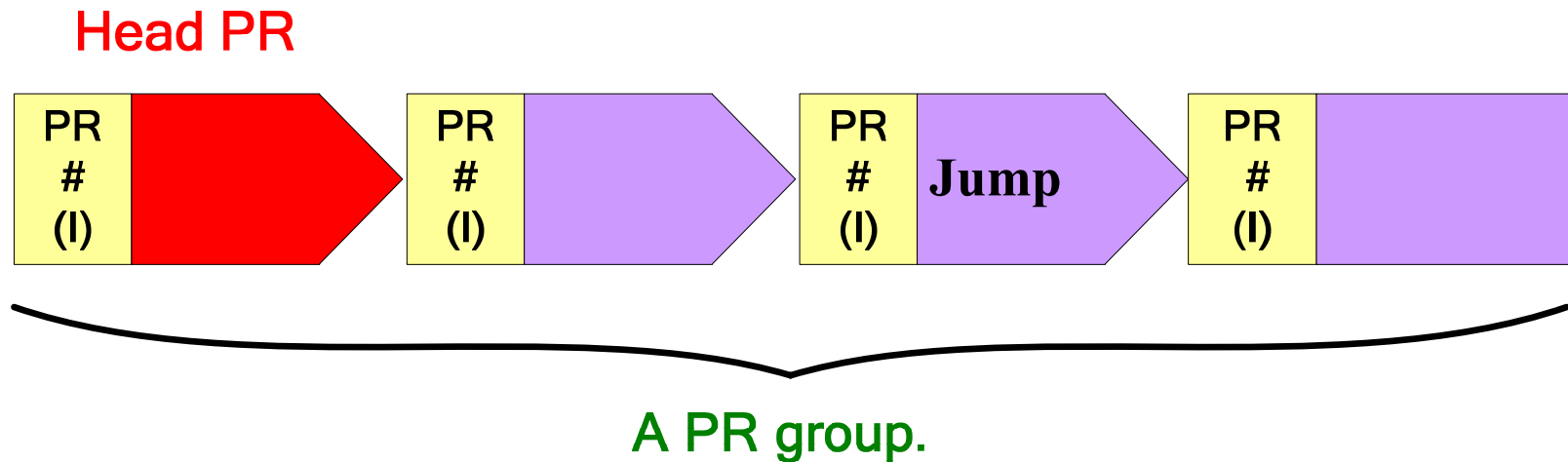
Type 3 position command



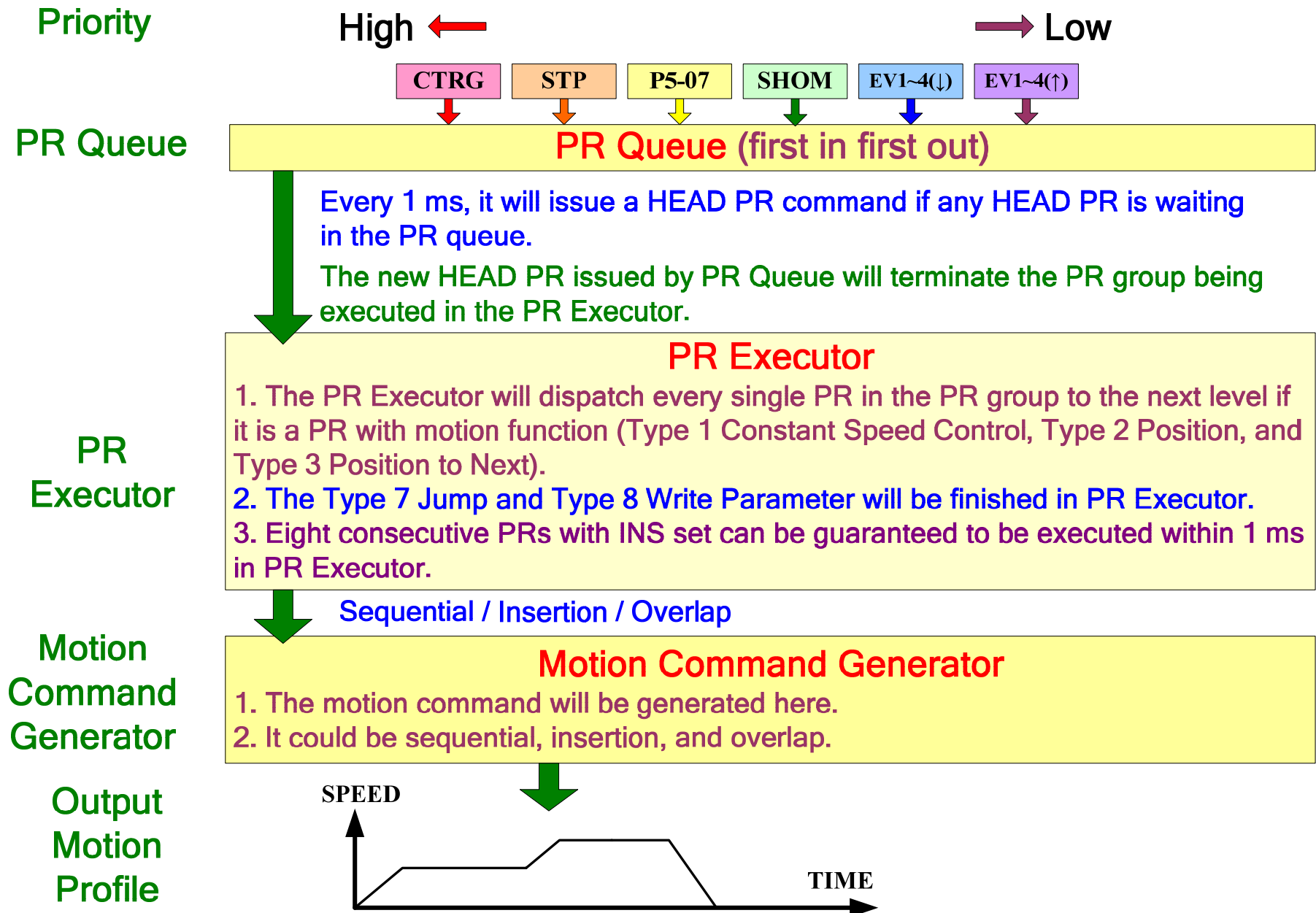
Some Definitions (3)

Head PR & PR group

The Head PR is the first PR in a PR group linked by AUTO or Jump command.



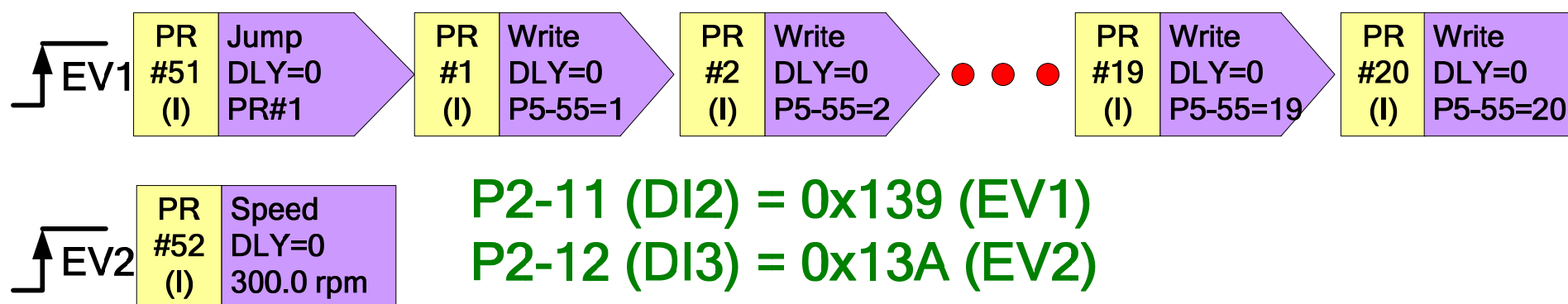
How the PR Arranged



Test Sample (1)

How many PRs?

This example can be used to test the PR Queue and how many PRs can be executed within one ms (8 PRs are guaranteed in Delta design specification) .



P2-11 (DI2) = 0x139 (EV1)

P2-12 (DI3) = 0x13A (EV2)

P5-98 = 0x21

P3-06 = 0x6

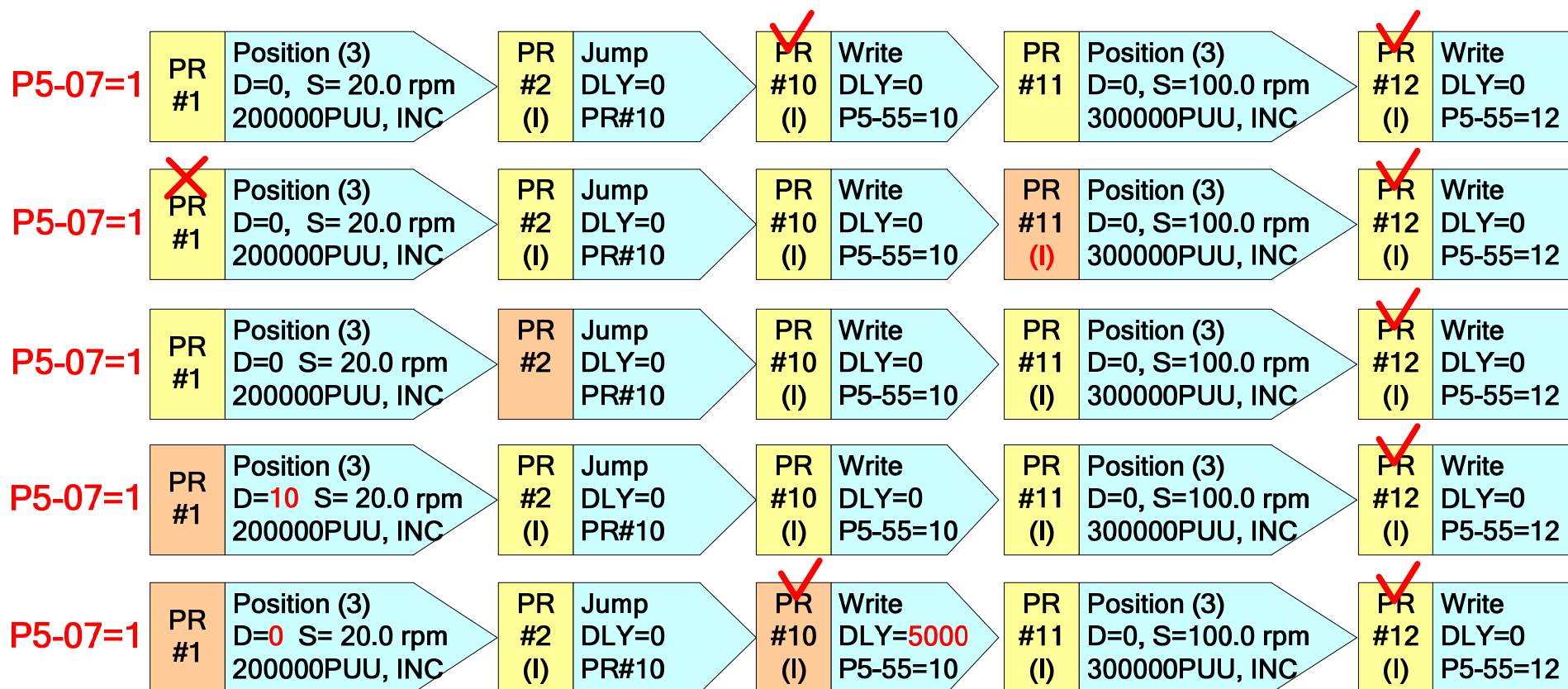
When P4-07=0x6, the EV1 and EV2 will be initiated simultaneously. Read P5-55.

Change DLY=1ms in PR#1, repeat the test and read P5-55 again.

Test Sample (2)

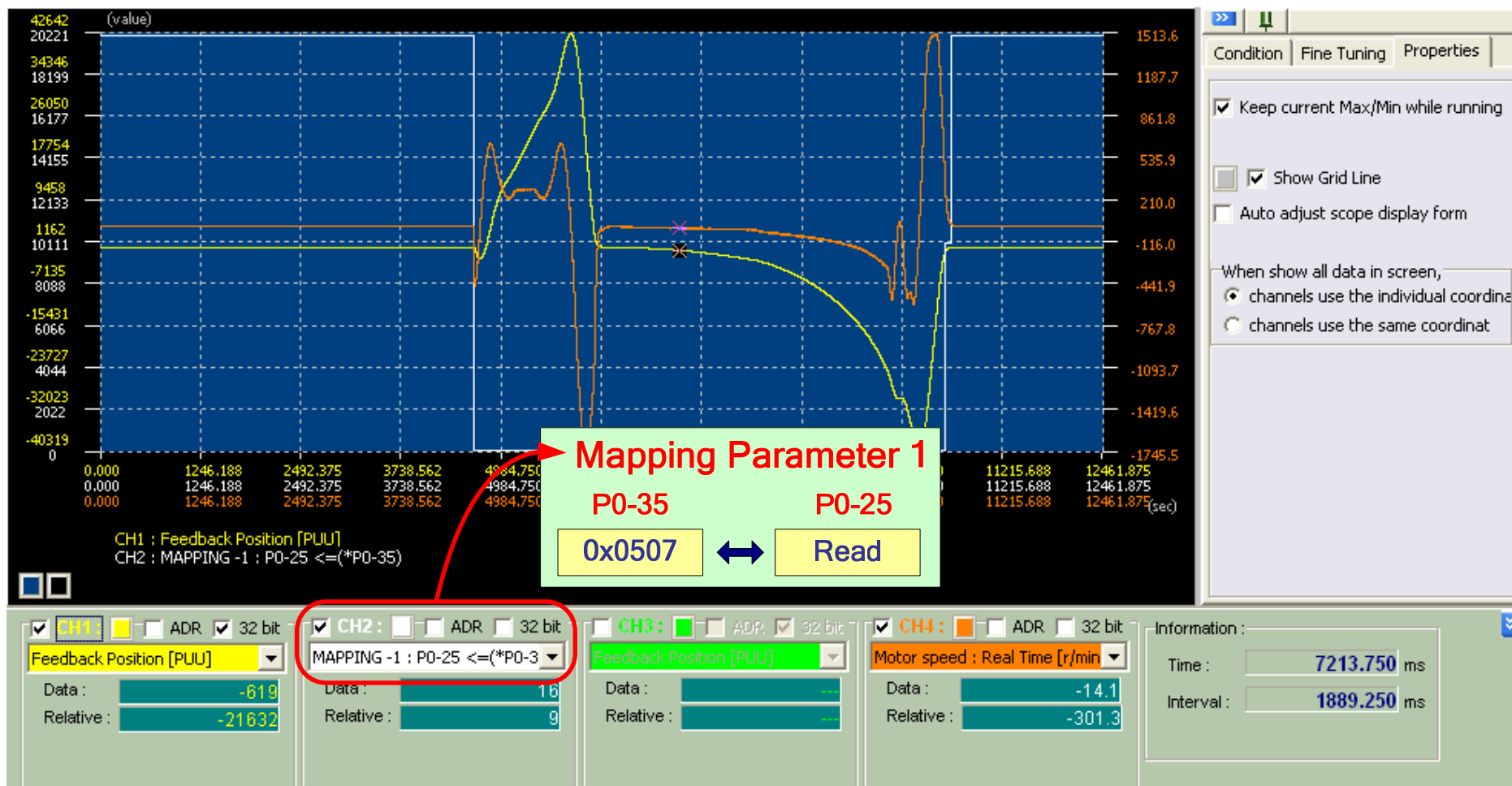
The Way of PR Executor

This example can explain the way of PR Executor . The PC scope is a good tool to examine the example.



To Monitor the PR Procedure

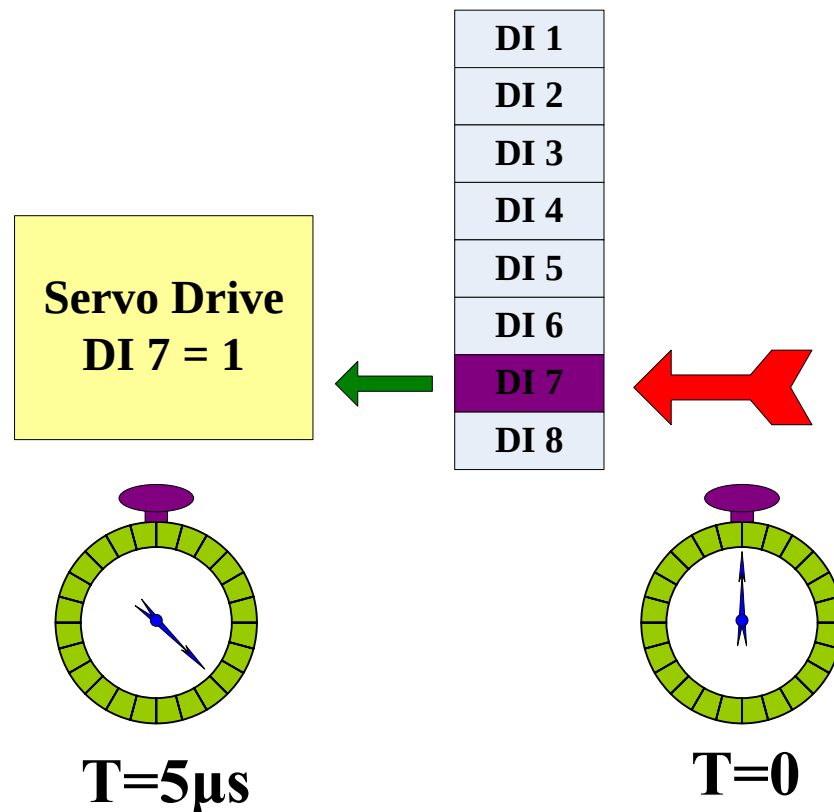
The execution of PR procedure can be monitored from PC scope via mapping parameters.



High Speed Digital Input

DI7

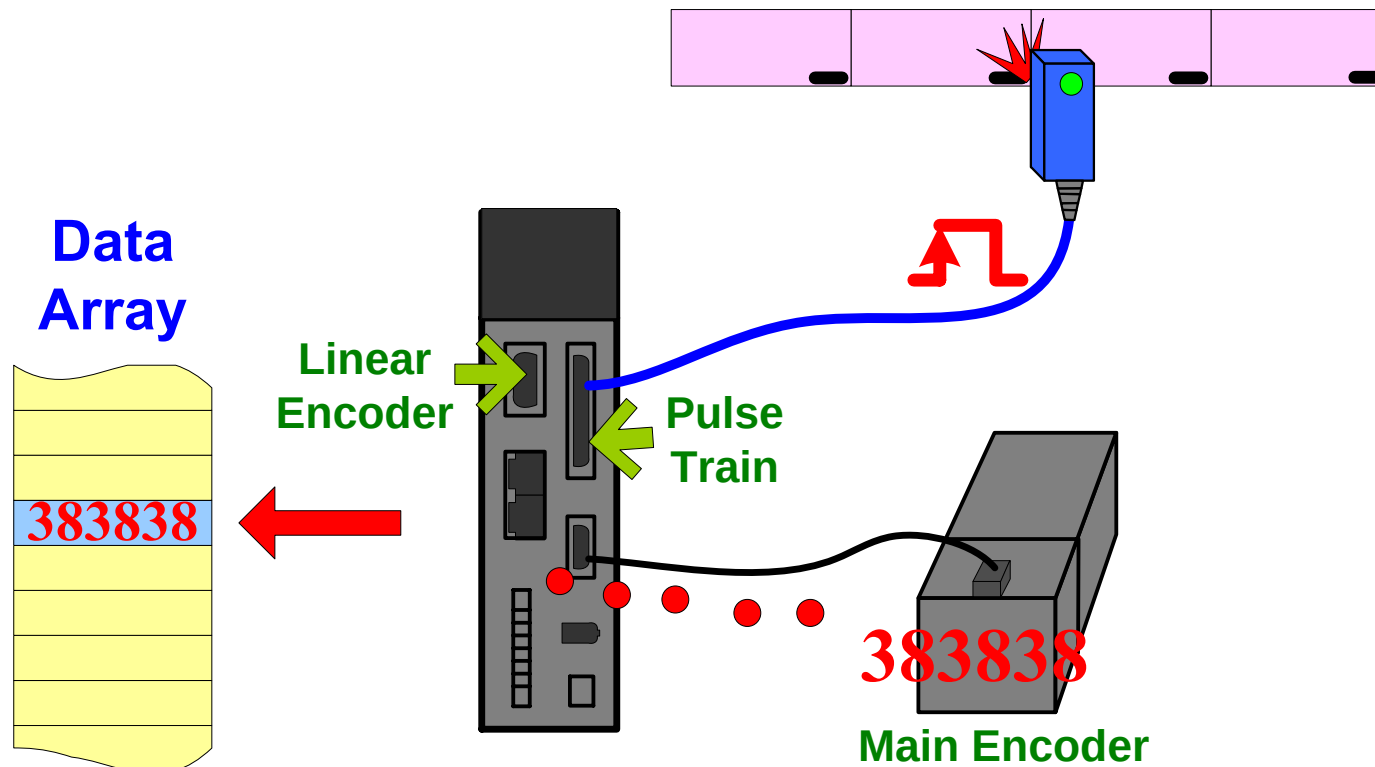
The DI7 is the only one high speed digital input in ASDA-A2. It takes only $5 \mu s$ to admit the signal changed. The other digital inputs need $0.5 ms$. This DI is obligated to use to do Capture job.



The Position Latch Function (1)

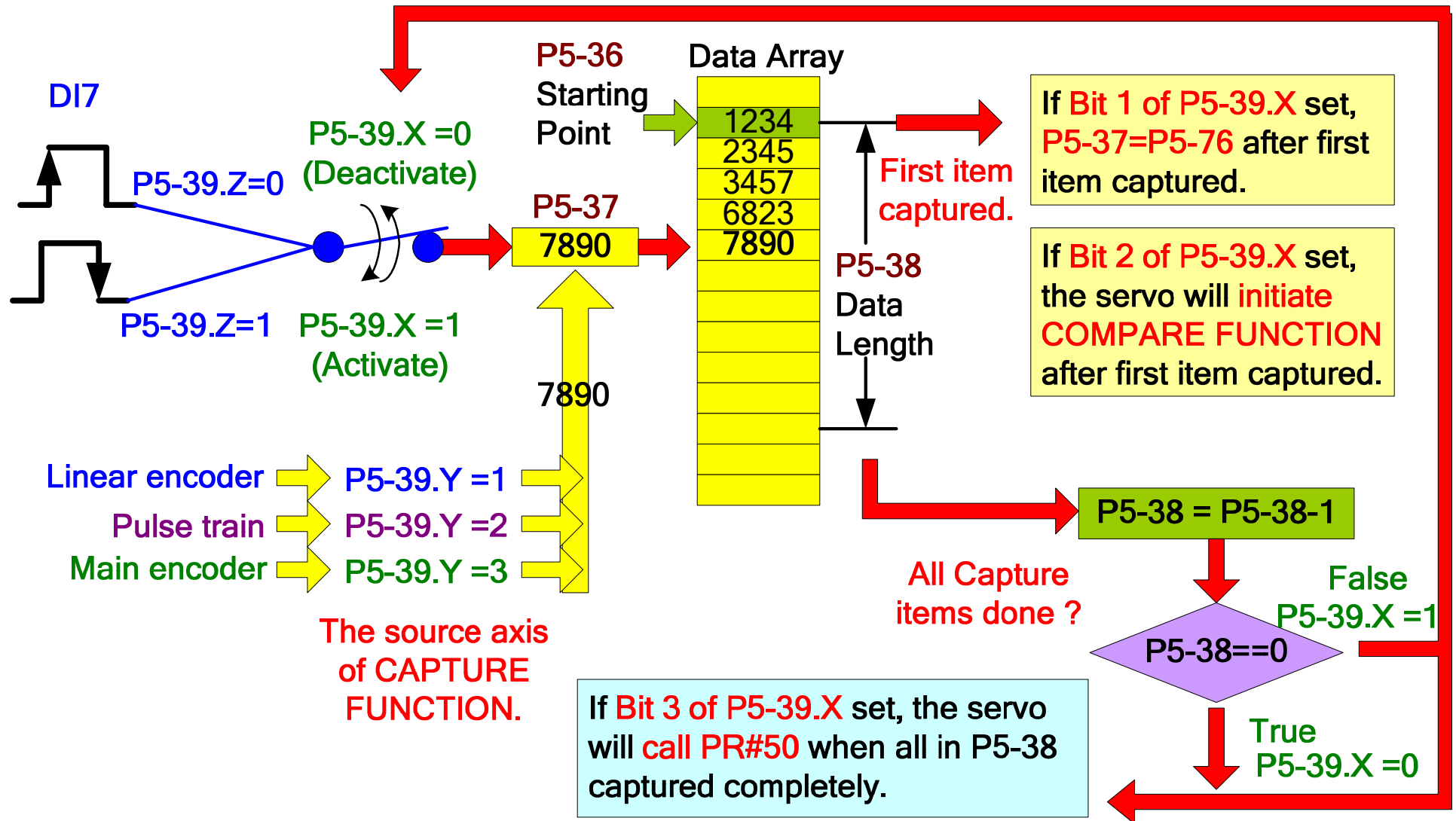
The Capture Function

The Capture function can be applied to latch a reference position which could be the signal of main encoder, linear encoder, or pulse train. It is possible to record 800 items with max. length of data array.



The Position Latch Function (2)

The Settings of Capture Function



The Position Latch Function (3)

The Capture Function on Software

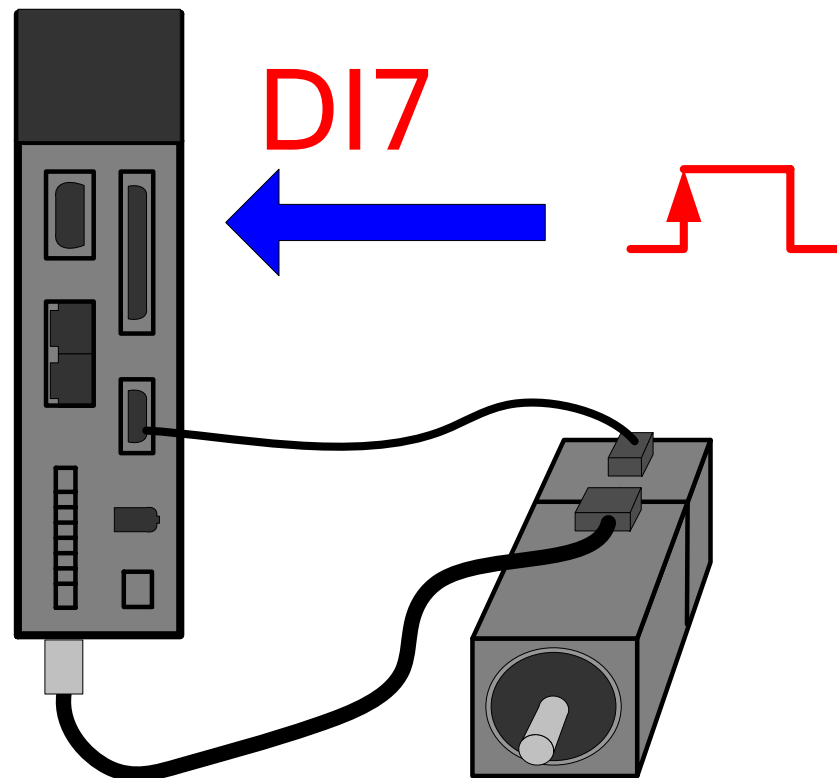
There is a convenient way to **TEST** Capture function.
Most of the application, you have to set the Capture from
PR with writing function.

^ Capture(CAP) Parameters	
P5-36 : Capture Array start address	0 (0~799)
P5-37 : Capture axle position	-1
P5-38 : Capture Amount	1 1
P5-39 : Capture Enable Control	P5-39 X : Capture Options ☐ 1:while capturing first point, auto set CAP axle as P5-76 0 ☐ 2:while capturing first point, enable CMP function ☐ 3:while finishing capturing, auto triggle process PR.#50 P5-39 Y : axle source ☐ 0:Capture Disable ☐ 2:Pulse CMD ☒ 1:Auxiliary Encoder ☐ 3:Main Encoder P5-39 Z : Trigger logic ☒ 0 : NO ☐ 1 : NC
P5-39 U : Trigger time interval 2 (0~15ms)	
☐ Enable ON-LINE Operation	Read CAP Parameters Write CAP Parameters Disabled

The Position Latch Function (4)

Physical Signal Only

The signal to DI7 for Capture function cannot be simulated from software. The **ONLY** one way is real signal to DI7.

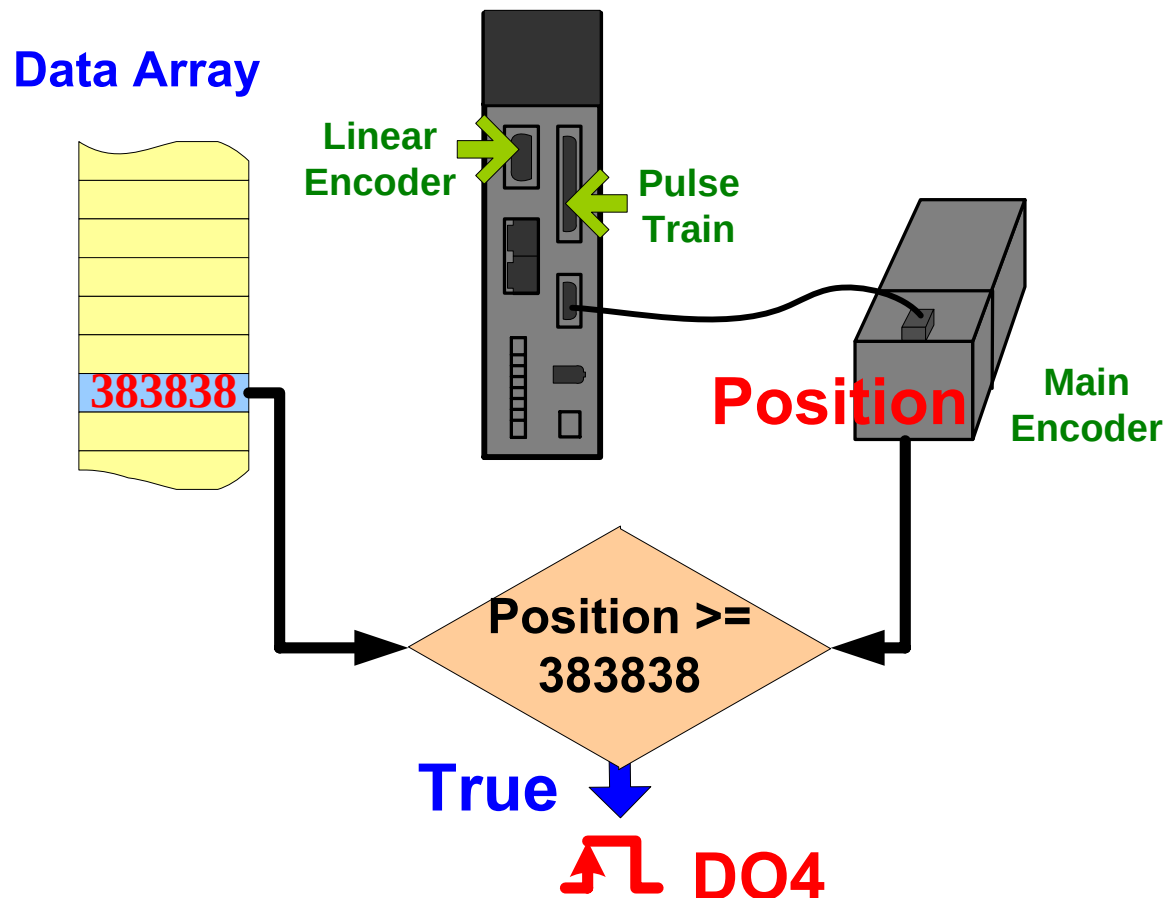




The Position Detection Function (1)

The Compare Function

The Compare function is a reverse process of the Capture function. The items stored in data array will be compared to the signal of a physical axis (main encoder, linear encoder, or pulse train).





```

graph TD
    Start([P5-56 Starting Point]) --> DA[Data Array]
    P558[P5-58 Data Length] --> DA
    DA --> Comp{Value >= 7890}
    P557[P5-57 Value] --> Comp
    Comp -- True --> Z0[P5-59.Z=0]
    Comp -- True --> Z1[P5-59.Z=1]
    Z0 --> DO4[DO4]
    Z1 --> DO4
    DO4 --> PW[P5-59.CBA Pulse width]
    Comp -- False --> Dec[P5-58 = P5-58-1]
    Dec --> Done{P5-58 == 0}
    Done -- True --> X0[P5-59.X = 0]
    Done -- False --> X1[P5-59.X = 1]
    X0 --> OR((OR))
    X1 --> OR
    OR --> P559X[P5-59.X = 1]
    P559X --> Bit3[If Bit 3 of P5-59.X set, P5-57=0.]
    P559X --> Bit2[If Bit 2 of P5-59.X set, the servo will initiate CAPTURE FUNCTION.]
    P559X --> Bit1[If Bit 1 of P5-59.X set, P5-58 is restored to its original setting and the servo keeps repeating the Compare function.]
  
```

Data Array

1234
2345
3457
6823
7890
9304
11020
32450
35120
43567
55123

Flowchart Logic:

- Starting Point:** P5-56
- Data Length:** P5-58
- Comparison:** Value >= 7890 (P5-57 Value)
- True Path:**
 - P5-59.Z=0 or P5-59.Z=1
 - P5-59.CBA Pulse width
 - DO4
- False Path:**
 - P5-58 = P5-58-1
 - P5-58 == 0?
 - True:** P5-59.X = 0
 - False:** P5-59.X = 1
- OR Gate:** Combines P5-59.X = 0 and P5-59.X = 1.
- Final Actions:**
 - If Bit 3 of P5-59.X set, P5-57=0.
 - If Bit 2 of P5-59.X set, the servo will initiate CAPTURE FUNCTION.
 - If Bit 1 of P5-59.X set, P5-58 is restored to its original setting and the servo keeps repeating the Compare function.

Source Axis of COMPARE FUNCTION:

- Capture axis: P5-59.Y = 0
- Linear encoder: P5-59.Y = 1
- Pulse train: P5-59.Y = 2
- Main encoder: P5-59.Y = 3



The Position Detection Function (3)

The Compare Function on Software

There is also a fast way to **TEST** Compare function from software. Most of the applications must be set by PR with writing function.

Compare(CMP) Parameters	
P5-56 : Compare Array start address	50 (0~799)
P5-57 : Compare axle position	-2
P5-58 : Compare Amount	1 2 <button>Create</button>
P5-59 : Compare Enable Control	P5-59Button3. X : Compare Options ☐ 1:after comparing the last point, restart from the first ☐ 2:after comparing the last point, enable CAP function
	P5-59 Y : axle source ☐ 0:Capture axle ☐ 2:Pulse Command ☒ 1:Auxiliary encoder ☐ 3:Main encoder
	P5-59 Z : Trigger logic ☒ 0 : NO ☐ 1 : NC
P5-59 CBA : Output pulse 100 (1~4095)	
☐ Enable ON-LINE Operation Read CMP Parameters Write CMP Parameters Disabled	

The Position Detection Function (4)

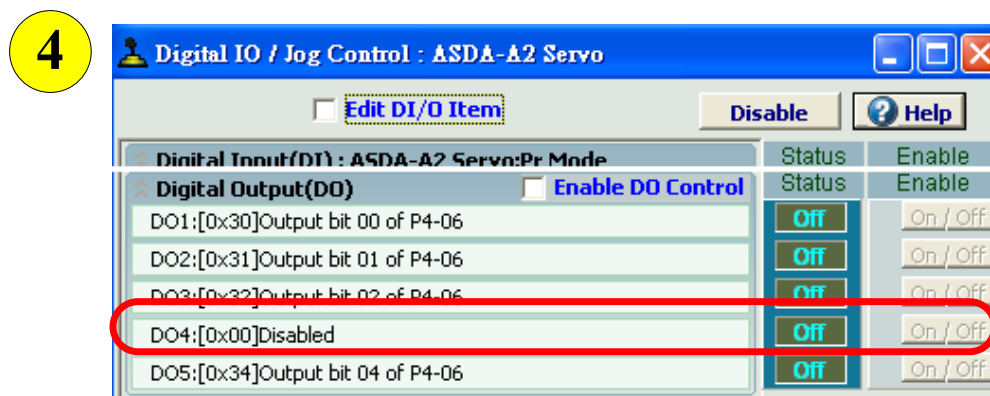
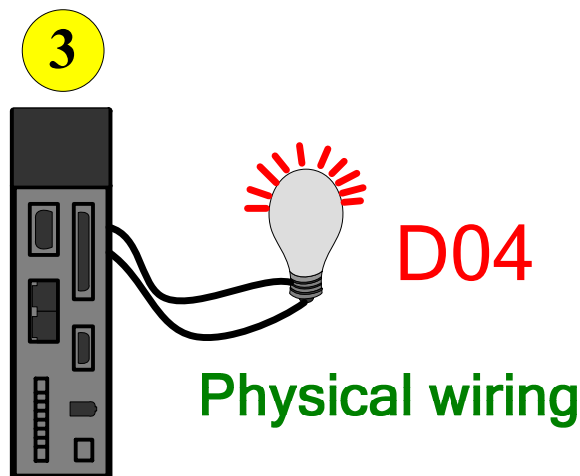
To Read the Output of Compare Function
There are several ways to read Compare output DO4.

Monitor Parameter

① P0-09 Read ↔ P0-17 40d

Mapping Parameter

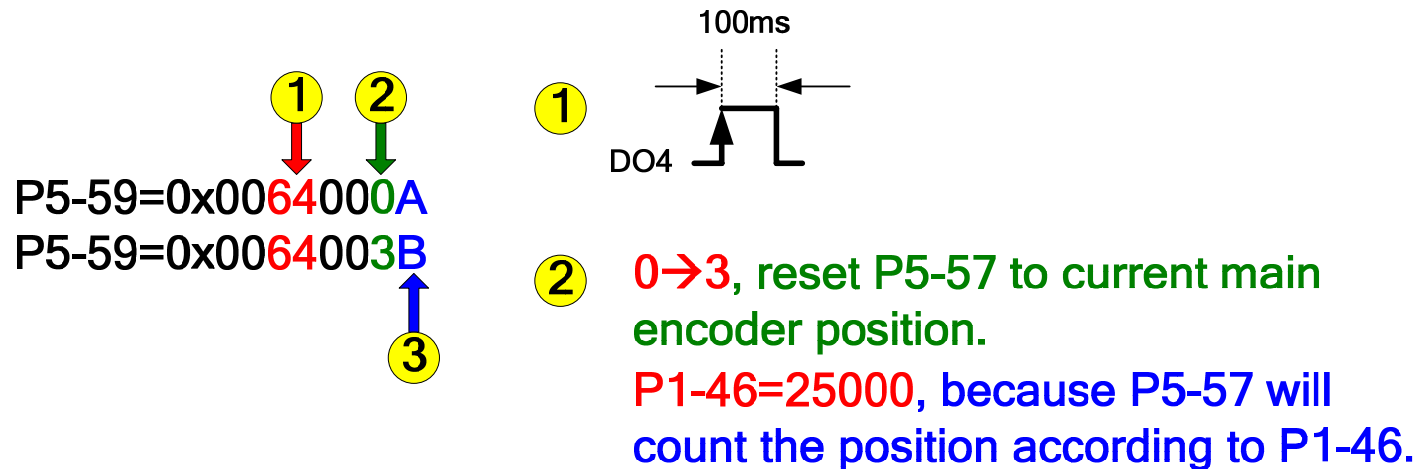
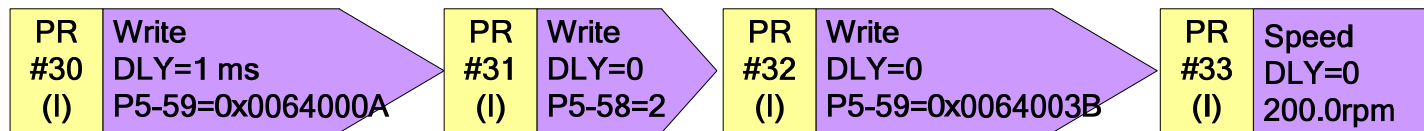
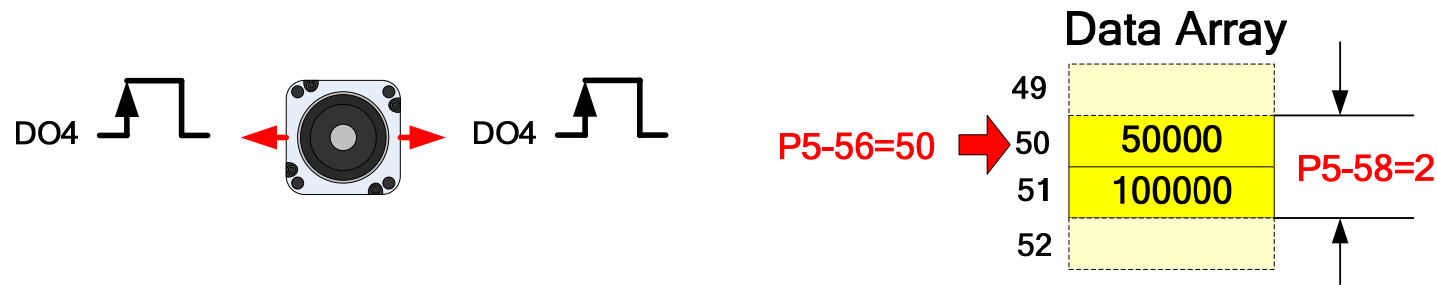
② P0-35 0x0409 ↔ P0-25 Read



Function code assigned is not needed.

The Compare Function

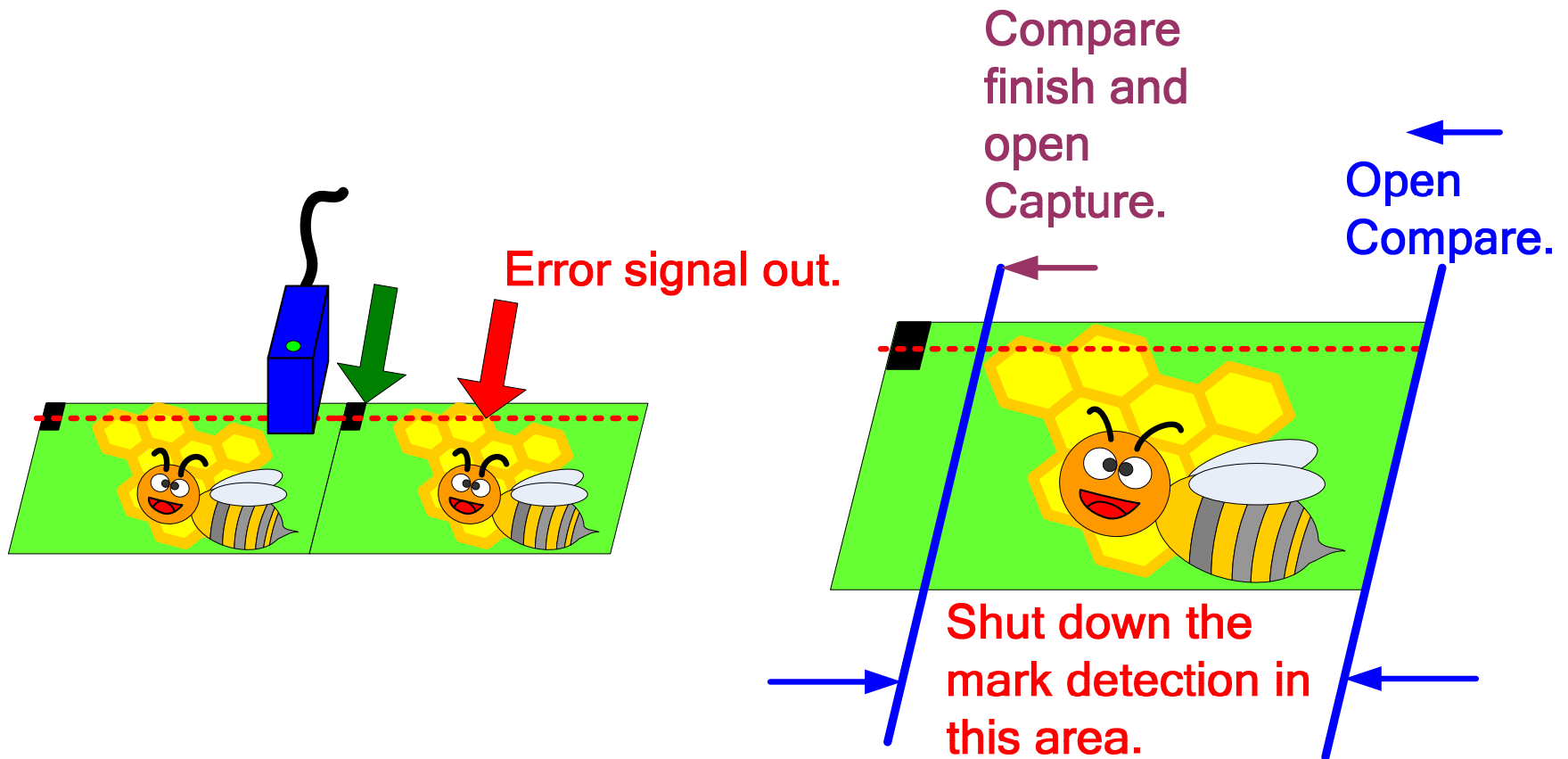
This application will send signal out every half a turn.



- 3** 0xA = 1010 (P5-57=0 when complete, 0, Repeating mode, Stop)
0xB = 1011 (P5-57=0 when complete, 0, Repeating mode, Start)

The Masking

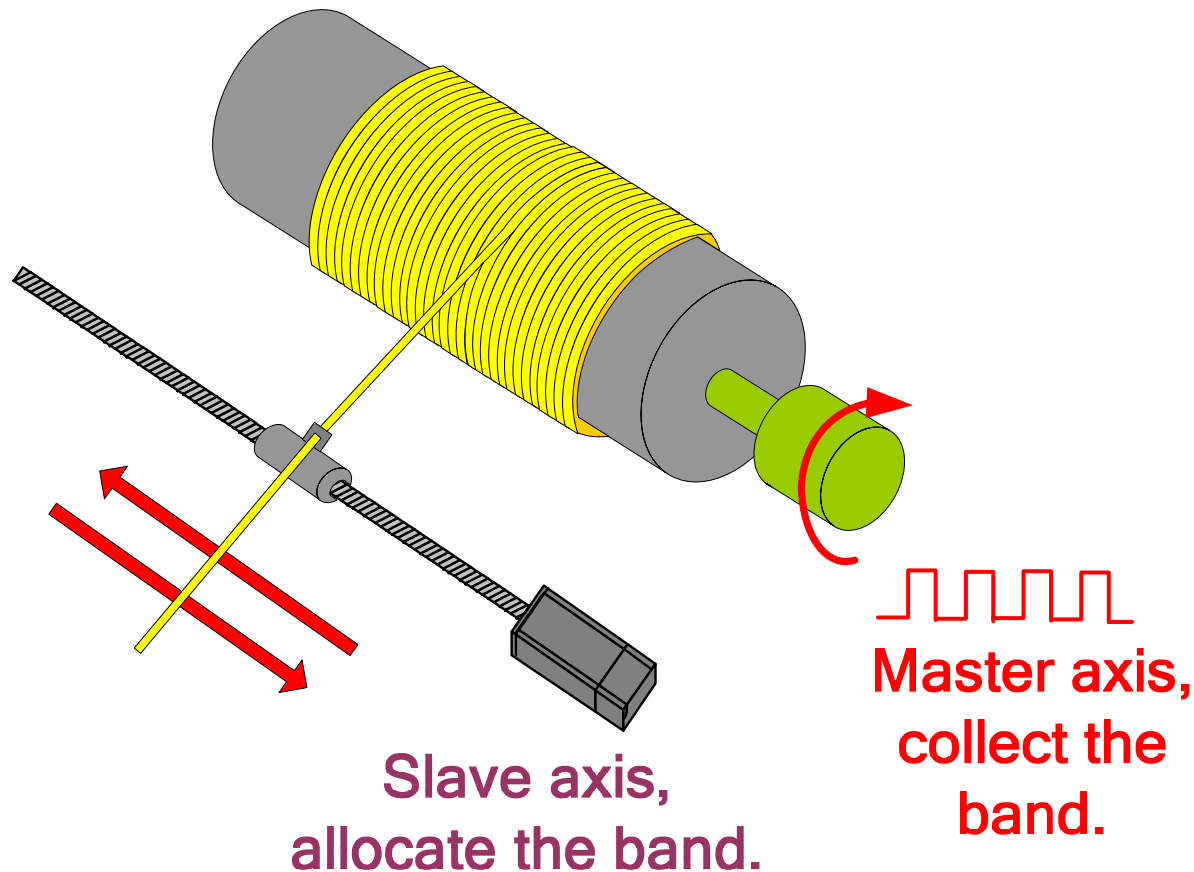
For some packing machines, there are always some patterns printed on the packing films. It is very important for the mark reading sensor to send out the right signal from mark.



A PR Example (1)

A Winding Machine

This example is going to demonstrate the powerful of PR, and it is a simplified demo compared to the real application.



A PR Example (2)

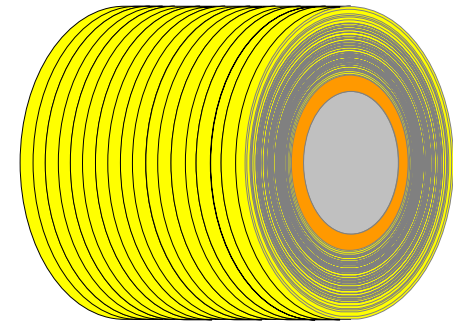
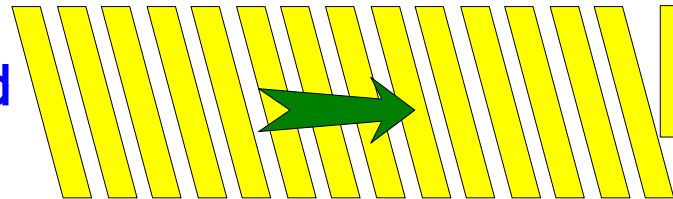
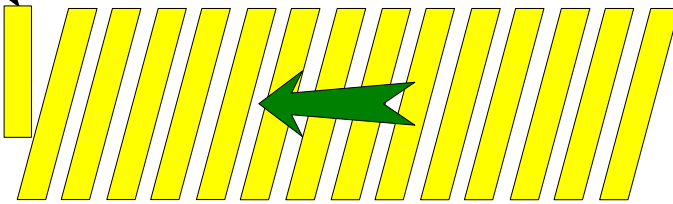
The Result and Different Layers

This final work is on the right hand side where it comes from layer overlapped by layer on the left hand side.

The stop turn

Forward
path

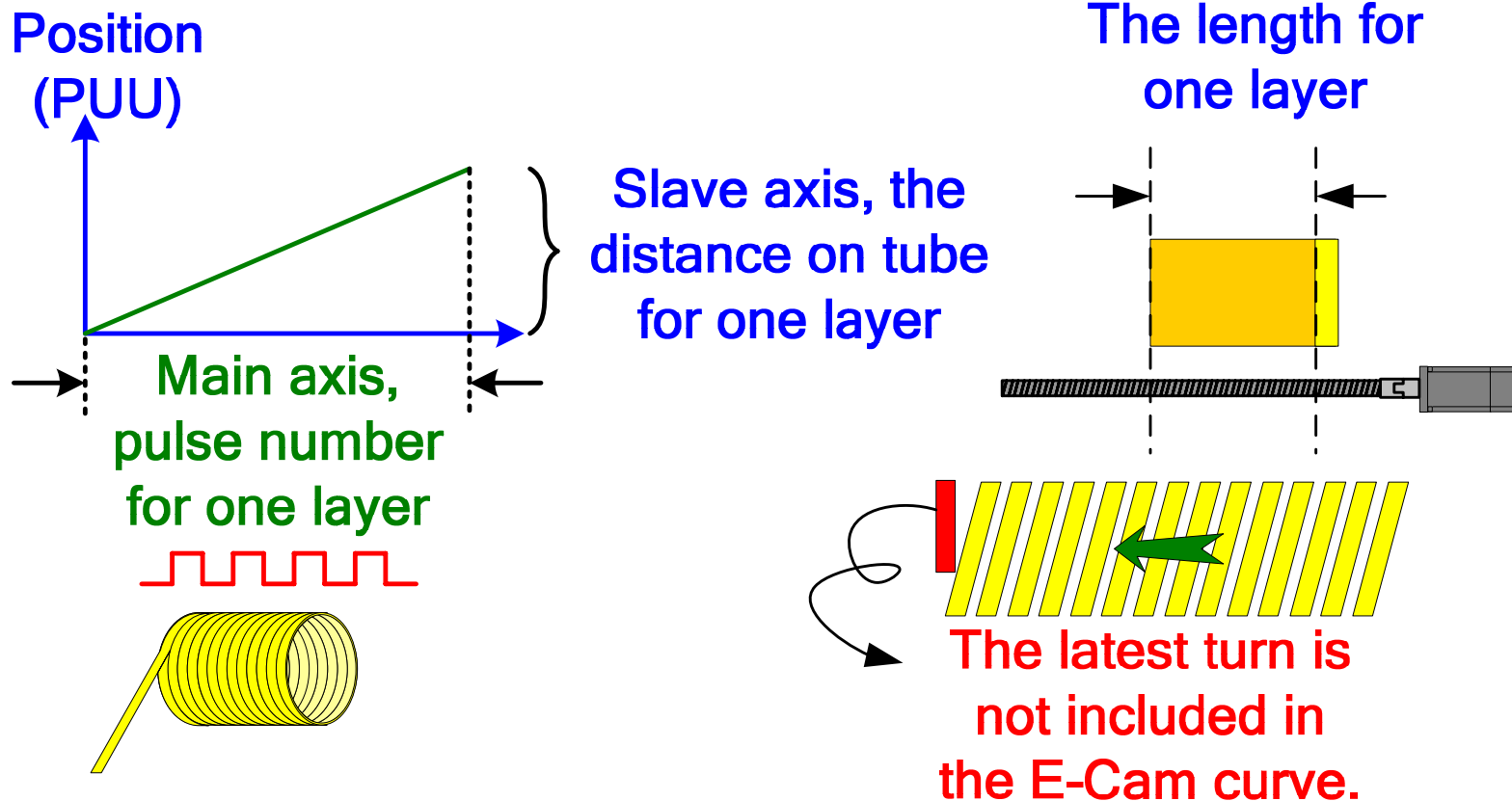
Backward
path



A PR Example (3)

A Quick Look at the E-Cam Curve

The horizontal axis stands for the main axis where the pulse will be sent out while winding and the vertical axis represents for the distance of allocating band on tube.

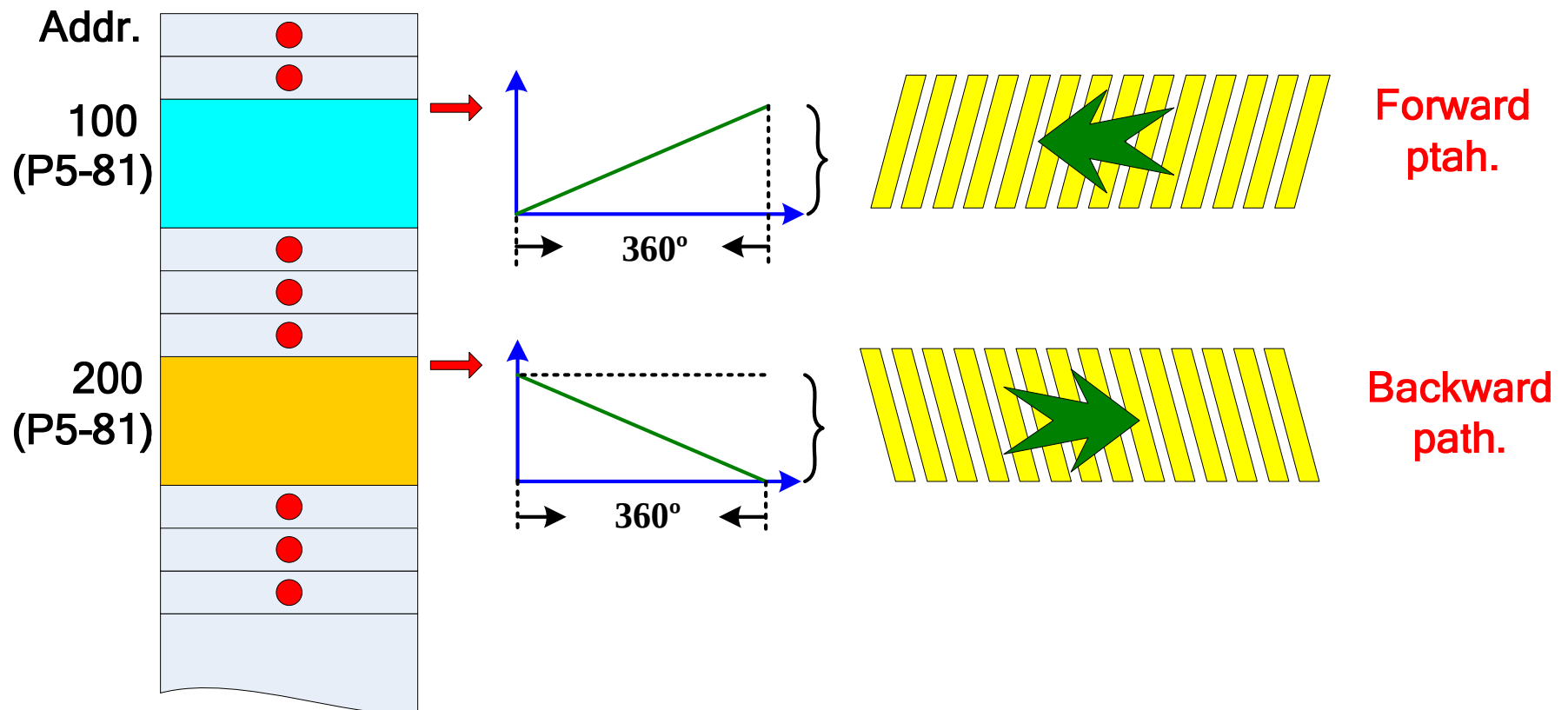


A PR Example (4)

Where are the E-Cam curves?

The E-Cam curves are stored in the data array as below.

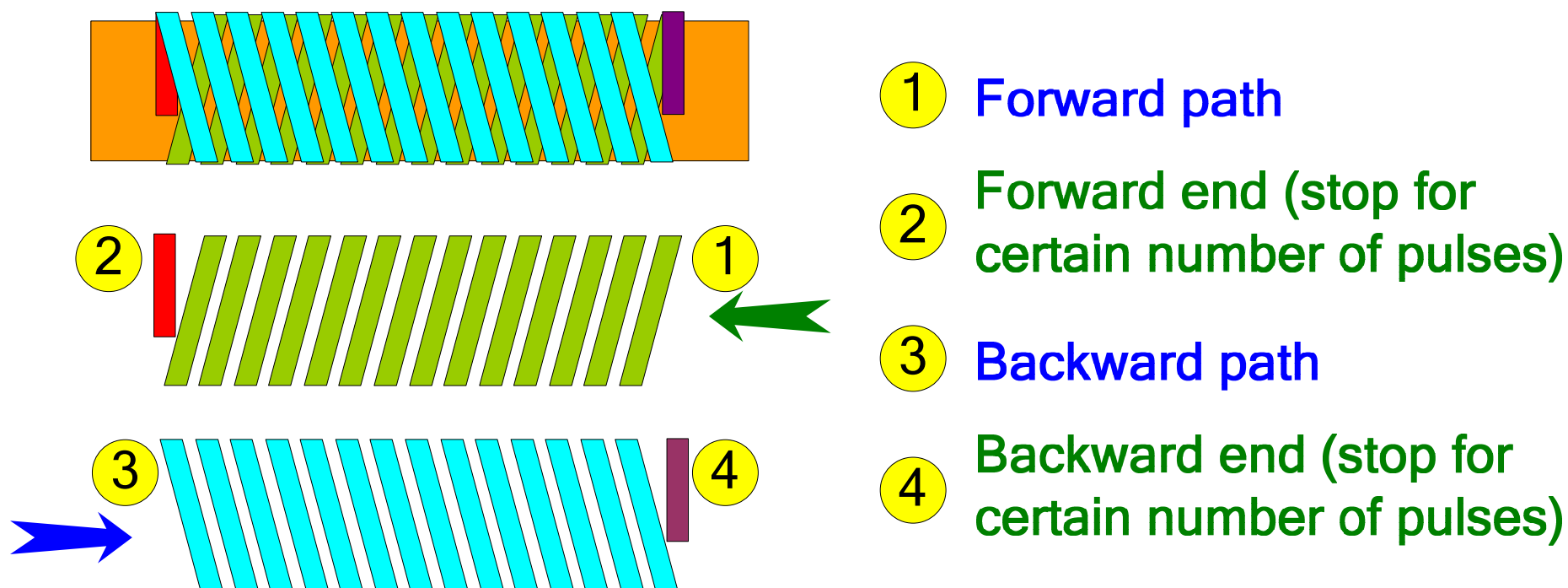
Data Array



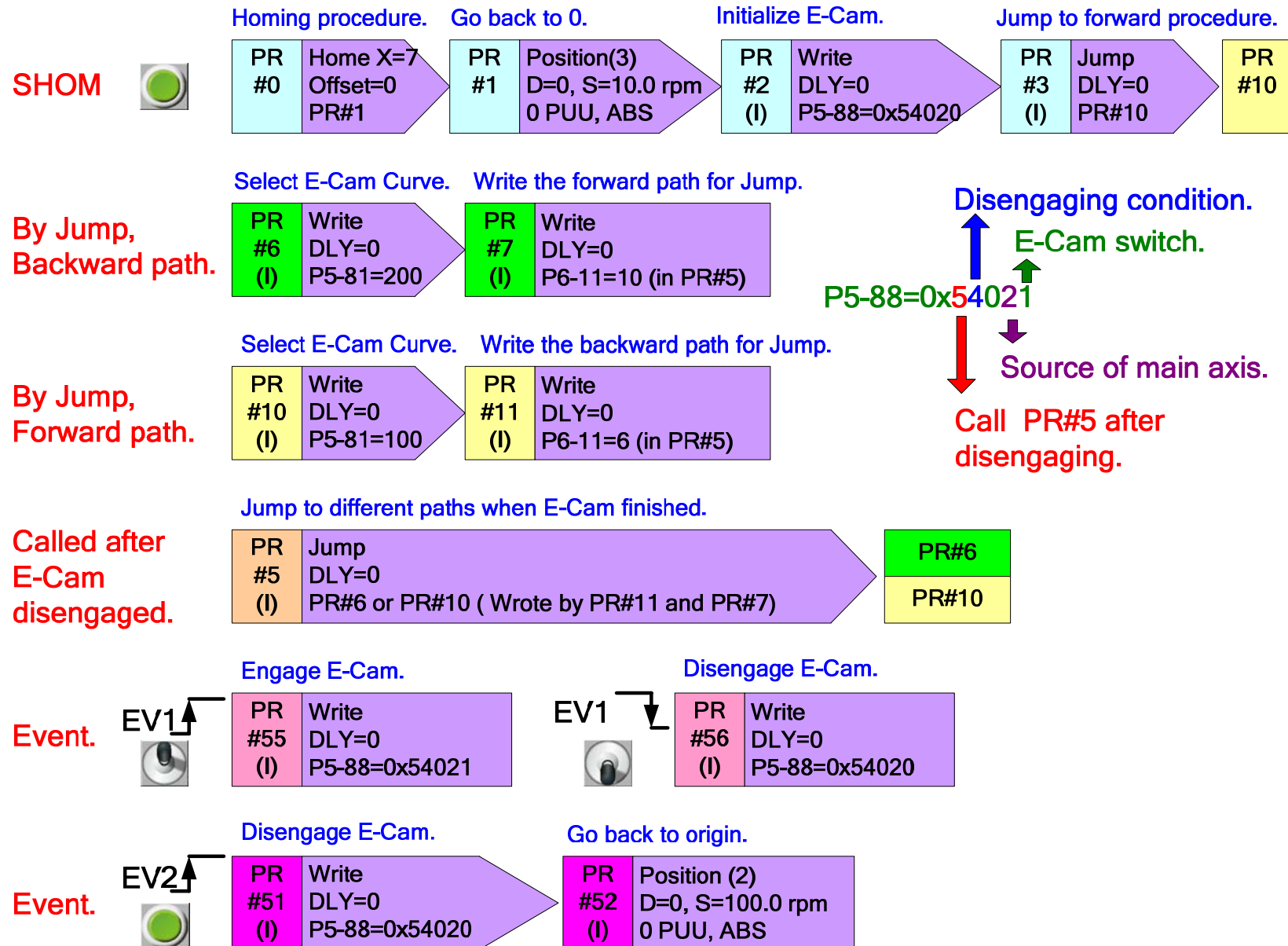
A PR Example (5)

How's the cycle?

The system will go forward, stop at the end, go backward, stop at the other end, and keep repeating the procedure until finishing the whole winding. The phase 2 and 4 are set by E-Cam function on ASDA-A2.



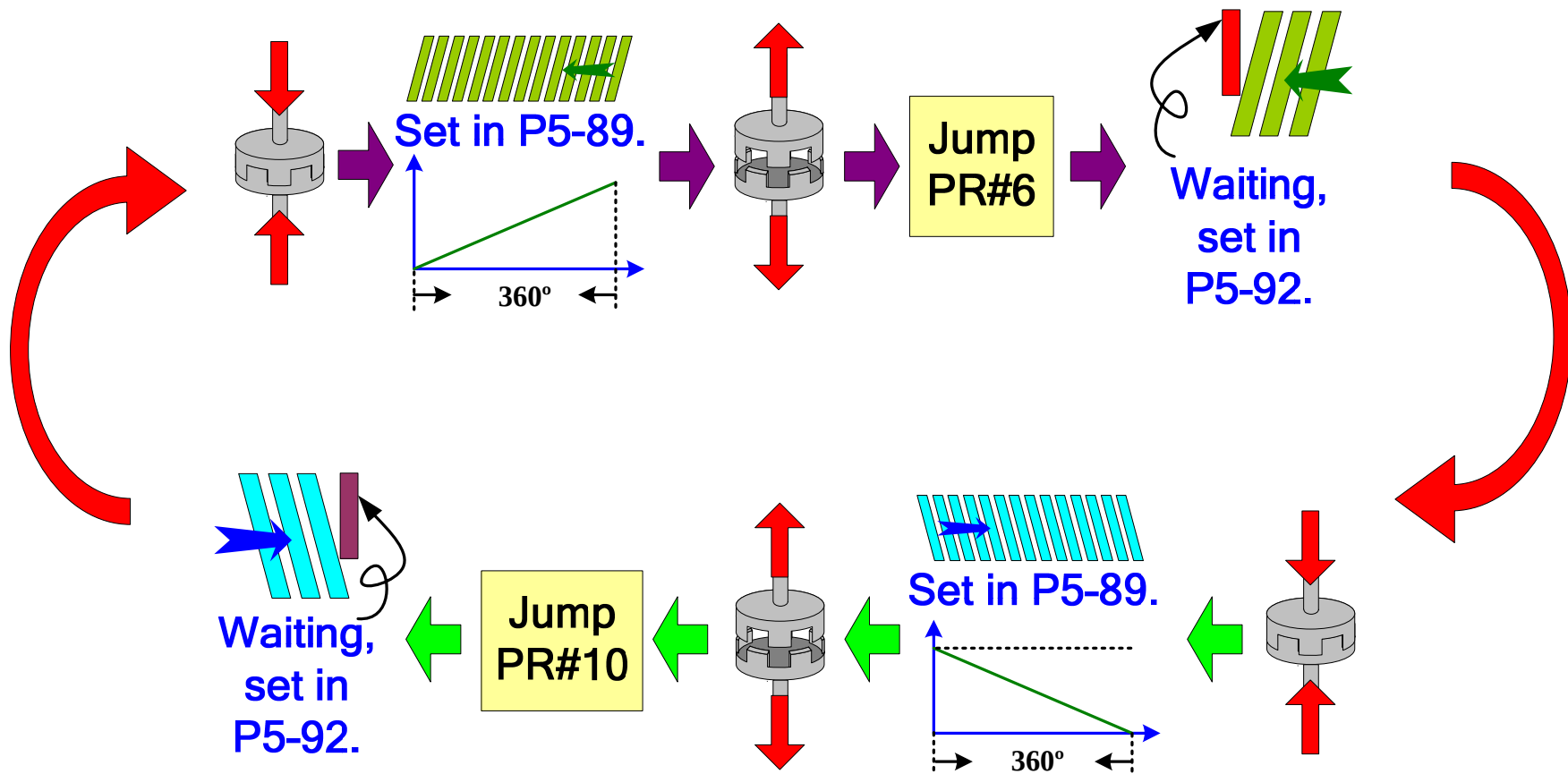
A PR Example (6)



A PR Example (7)

The Whole Cycle

E-Cam disengaging condition set to **P5-88.U=4.**



Thank You

