Ezi-STEP® Ⅱ Plus-E

Micro Stepping System

User Manual

Text

(Rev.03)

FASTECH

- Table of Contents -

Table of Contents

Manual Version : [ver03]

Provided GUI version : 6.43.0.26~
First Edition: June. 30. 2016

---

1. Safety Pre-caution and Note on Installation

※ Before Operation

● Thank you for purchasing our Ezi-STEPⅡ Plus-E products.
● Ezi-STEPⅡ Plus-E is a high-performance 32bit ARM chip embedded Full Digital position control stepping driving unit.
● This manual describe the handling, maintenance, repair, diagnosis and troubleshooting of Ezi-STEPⅡ Plus-E.
● Before start operation of Ezi-STEPⅡ Plus-E, thoroughly read this manual.
● After reading this manual, keep the manual near Ezi-STEPⅡ Plus-E, so that any user can read this manual whenever needed.

1-1. Precautions

◆ General Precautions

● Contents of this manual are subject to change without prior notice for functional improvements, change of specifications or user's better understanding. Thoroughly read is the manual which is provided with purchased Ezi-STEPⅡ Plus-E
● In case of manual is damaged or lost, please contact with FASTECH's agent or our company at the address on the last page of this manual.
● FASTECH is not responsible for

◆ Safety Precaution

● Before installation, operation, repairing the products, thoroughly read the manual and fully understand the contents. Before operating the products, please understand the mechanical characteristics of this products and related safety information and precautions.
● This manual divides safety precautions into Attention and Warning.

⚠ **Attention**	If user does not properly handle the products, the user may seriously or slightly injured damages may occur in the machine.
⚠ **Warning**	If user does not properly handle the products, a dangerous situation (such as an electric shock) may occur resulting in deaths or serious injuries.

● Although precaution is only a Attention, a serious result could be caused depending on the situation. Follow safety precaution.

◆ Check the Product

⚠️ **Attention**	**Check the Product is damaged or parts are missing.** Otherwise, the machine may get damaged or the user may get injured.

◆ 설치

⚠️ **Attention**	**Please carry the Ezi-STEPⅡ Plus-E carefully.** Otherwise, the product may get damaged or user's foot may get injured by dropping the product. **Use non-flammable materials such as metal in the place where the Ezi-STEPⅡ Plus-E is to be installed.** Otherwise, a fire may occur. **When installing several Ezi-STEPⅡ Plus-E in a sealed place, install a cooling fan to keep the ambient temperature of the product as 50℃ or lower.** Otherwise, a fire or other kinds of accidents may occur due to overheating.
⚠️ **Warning**	**The process of installation, Connection, Operation, Checking and Repairing should be done by qualified person.** Otherwise, a fire or other kinds of accidents may occur.

◆ Connect Cables

⚠️ **Attention**	**Keep the rated range of input Voltage for drive.** Otherwise, a fire or other kinds of accidents may occur. **Cable connection should be following the wiring diagram.** Otherwise, a fire or malfunction of machine may occur.
⚠️ **Warning**	**Before connecting cables, check if input power is off..** Otherwise, an electric shock or a fire may occur. **The case of this Ezi-STEPⅡ Plus-E is installed from the ground of the internal circuit by the condenser, Please Ground the Ezi-STEPⅡ Plus-E.** Otherwise, an electric shock or a file may occur and a cause of malfunction of machine.

◆ Operation & Setting change

      ⚠ **Attention**	**If a protection function (Alarm) occurs, firstly remove its cause and then release (Alarm reset) the protection function.** If you operate continuously without removing its cause, the machine may get damaged or the user may get injured. **Make all input signals to OFF before supply input voltage to Ezi-STEPⅡ Plus-E drive.** The machine may get damaged or the user may get injured by motor operation. **All parameter values are set by default factory setting value. Change this value after reading this manual thoroughly.** Otherwise, the machine may get damaged or other kinds of accidents may occur.

◆ Check and Repair

    ⚠ **Warning**	**Stop to supply power to the main circuit and wait sufficient time before checking or repairing this Ezi-STEPⅡ Plus-E.** Electricity remaining in the condenser may cause of electric shock. **Do not change cabling while power is being supplied.** Otherwise, the user may get injured or the product and machine may get damaged. **Do not reconstruct the Ezi-STEPⅡ Plus-E.** Otherwise, an electric shock may occur or the product and machine get damaged. And the reconstructed product cannot get after service.

1‐2. Noes on Installation

1) This product has been designed for indoor uses. The ambient temperature of the room should be 0°~ 55℃ .

2) If the temperature of the case is 50℃ or higher, radiate heat outside for cooling down.

3) Do not install this product under direct rays or near magnetic or radioactive objects.

4) If more than 2 drives are installed in a line, keep the interval of 20mm or more vertically and 50mm or more horizontally at least.

2 . Specifications of the Drive

2 - 1 . Characteristic Table

Type of Drive		EzT2-PE series
Input Voltage		24VDC ± 10%
Control Method		ARM-based 32-bit MCU
Multi Axes Drive		Maximum 254 axes operating (Selectable IP:1~255)
Positon Table		256 of Motion command steps (Speed, External start, Jump, Loop, Wait and PT finish etc.)
Current Consumption		Max. 500mA (Except motor current)
Operating condition	Ambient Temperature	In Use : 0~50℃ In Storage: -20~70℃
	Humidity	In use : 35~85%RH (Non- condensing) In Storage : 10~90%RH (Non-condensing)
	Viv. Resist	0.5G
Function	Rotation Speed	0~3,000rpm*1
	Resolution [P/R]	500 1,000 1,600 2,000 3,200 ,3600 4,000 5,000 6,400 8,000 10,000 20,000 25,000 36,000 40,000 50,000 (Resolution can be selected by parameter)
	Protection Function	Over current, Over Speed, Over temperature, Over regenerated voltage, motor connect error, ROM error.
	LED Display	Power status, In-Position status, Enable status, Alarm status
	Rotational Direction	CW/CCW (Selectable by parameter)
	RUN Current	50%~150% (Selectable by parameter) RUN current is flowing current value in the motor when motor is operating (rotating), It is set based on constant current of motor * Default factory setting value : 100%
	STOP Current	20%~100% (Selectable by parameter) It is set as setting value of STOP current 0.1 sec after motor stop. STOP current value is at a ratio against RUN current value of motor * Default factory setting value is : 50%
I/O Signal	Input signal	3 dedicated input (LIMIT+, LIMIT-, ORIGIN), 9 programmable input (Photo coupler)
	Output signal	1 dedicated output (Compare Out), 9 programmable output (Photo coupler), Brake signal
Communication interface		Ethernet UDP communication with PC. Dual port Ethernet switch embedded, Communication Speed : 10/100base-T/TX Full duplex DHCP function embedded
Position Control		Incremental mode / Absolute mode Data range: -134,217,728 to +134,217,727 pulse, Operating: Max. 3,000rpm
Return to Origin		Origin Sensor, Z phase, ±Limit sensor, Torque
GUI		User interface Program for Windows
Software		Motion Library (DLL) for Windows 2000/XP/Vista/7/8

*1 Maximum Rotation speed can be changed by Resolution.

Up to Resolution 10,000, Max rotation speed is 3,000rpm.

More than 4,000, Max rotation speed will be decreased

2 - 2 . Dimensions
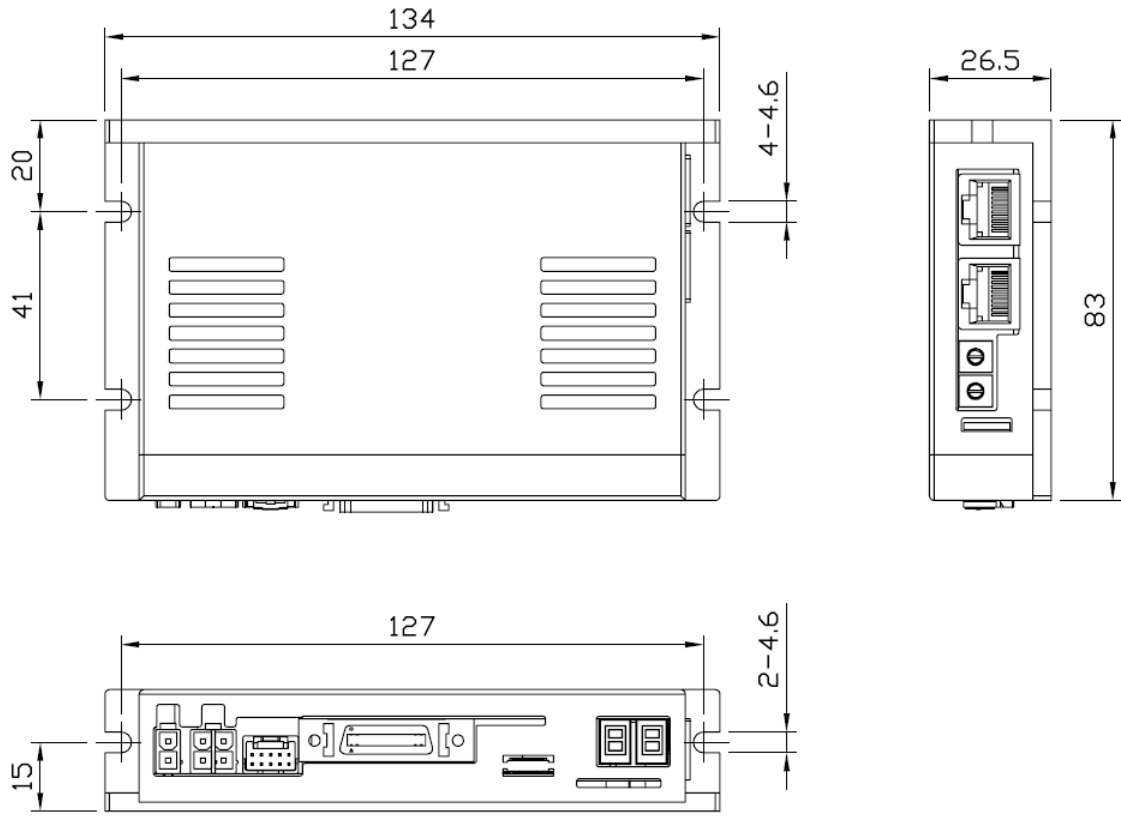
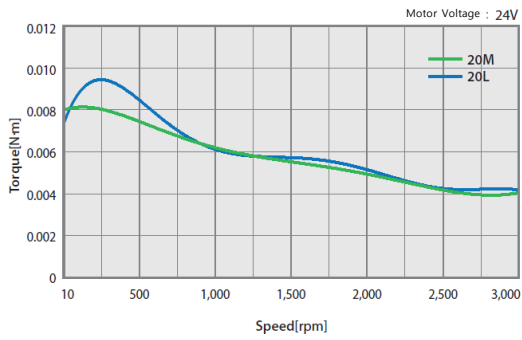# 3 . Specifications & size of the Motor
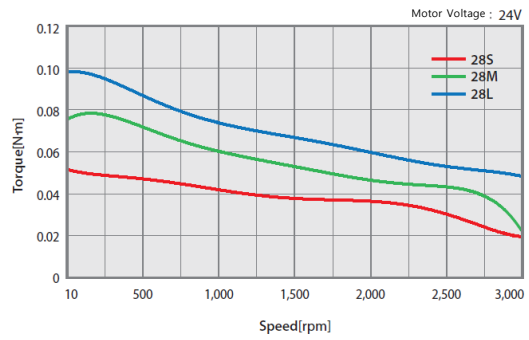
3 - 1 . Motor Specification and Torque Characteristic

MODEL		UNIT	BM-20 series		BM-28 series			BM-42 series			
			20M	20L	28S	28M	28L	42S	42M	42L	42XL
DRIVE METHOD		−	BI-POLAR								
NUMBER OF PHASES		−	2	2	2	2	2	2	2	2	2
CURRENT per PHASE		A	0.5	0.5	0.95	0.95	0.95	1.2	1.2	1.2	1.2
HOLDING TORQUE		N·m	0.016	0.025	0.069	0.098	0.118	0.32	0.44	0.5	0.65
ROTOR INERTIA		g·cm²	2.5	3.3	9.0	13	18	35	54	77	114
WEIGHTS		g	53	78	115	174	202	238	303	374	508
LENGTH(L)		mm	28	38	32	45	50	34	40	48	60
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	18	18	30	30	30	22	22	22	22
	8mm		30	30	38	38	38	26	26	26	26
	13mm		−	−	53	53	53	33	33	33	33
	18mm		−	−	−	−	−	46	46	46	46
PERMISSIBLE THRUST LOAD		N	Lower than motor weight								
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)								
INSULATION CLASS		−	CLASS B(130℃)								
OPERATING TEMPERATURE		℃	0 to 55								

MODEL		UNIT	BM-56 series			BM-60 series			BM-86 series		
			56S	56M	56L	60S	60M	60L	86M	86L	86XL
DRIVE METHOD		−	BI-POLAR								
NUMBER OF PHASES		−	2	2	2	2	2	2	2	2	2
CURRENT per PHASE		A	3.0	3.0	3.0	4.0	4.0	4.0	6.0	6.0	6.0
HOLDING TORQUE		N·m	0.64	1.0	1.5	0.88	1.28	2.4	4.5	8.5	12
ROTOR INERTIA		g·cm²	180	280	520	240	490	690	1800	3600	5400
WEIGHTS		g	548	726	1159	616	793	1349	2275	3808	5330
LENGTH(L)		mm	46	55	80	47	56	85	78	117	155
PERMISSIBLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	52	52	52	70	70	70	270	270	270
	8mm		65	65	65	87	87	87	300	300	300
	13mm		85	85	85	114	114	114	350	350	350
	18mm		123	123	123	165	165	165	400	400	400
PERMISSIBLE THRUST LOAD		N	Lower than motor weight								
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)								
INSULATION CLASS		−	CLASS B(130℃)								
OPERATING TEMPERATURE		℃	0 to 55								

Ezi-STEPⅡ-PE-20 series

Motor Voltage : 24V

Ezi-STEPⅡ-PE-28 series

Motor Voltage : 24V

Ezi-STEPⅡ-PE-42 series

Motor Voltage : 40V

Ezi-STEPⅡ-PE-56 series

Motor Voltage : 40V

Ezi-STEPⅡ-PE-60 series

Motor Voltage : 40V

Ezi-STEPⅡ-PE-86 series

Motor Voltage : 70V

3 - 2 . **Motor Size**

20mm

Model name	Length(L)
BM-20M	28
BM-20L	38
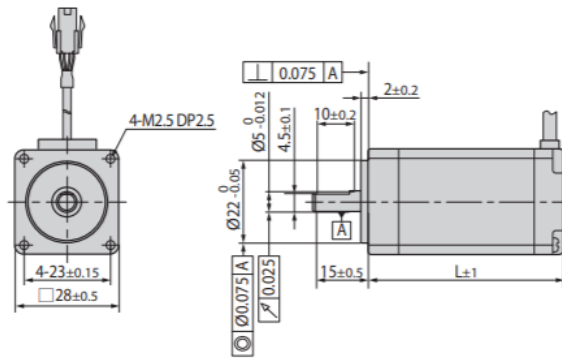
28mm

Model name	Length(L)
BM-28S	32
BM-28M	45
BM-28L	50
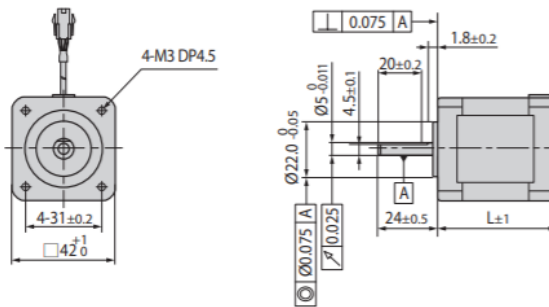
42mm

Model name	Length(L)
BM-42S	34
BM-42M	40
BM-42L	48
BM-42XL	60
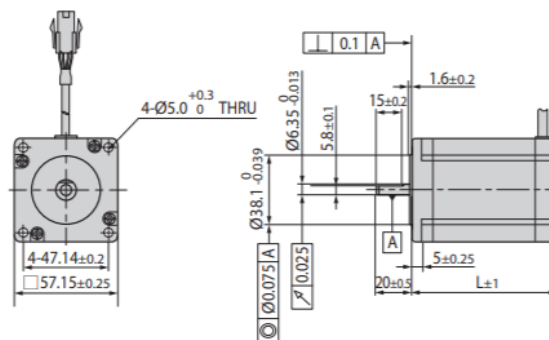
56mm

Model name	Length(L)
BM-56S	46
BM-56M	55
BM-56L	80
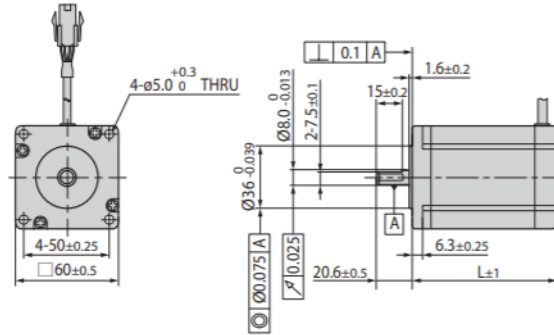
60mm

Model name	Length(L)
BM-60S	47
BM-60M	56
BM-60L	85
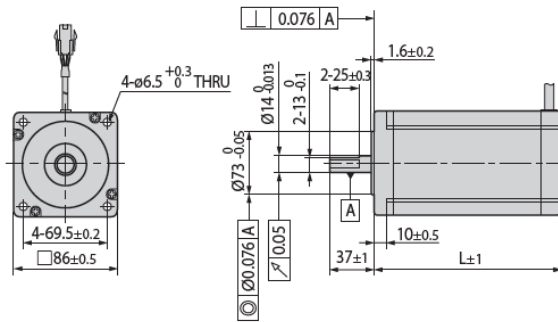
86mm

Model name	Length(L)
BM-86M	78
BM-86L	117
BM-86XL	155

4 . Configuration

4 － 1 . Motor and Drive Combination

1) Ezi-STEPⅡ Plus-E Part Numbering

Ezi-STEPⅡ-PE-42S-BK-□

Product Name	
Drive Series	
PE : Plus Ethernet	
Motor Flange Size	
20 : 20mm	
28 : 28mm	
42 : 42mm	
56 : 56mm	
60 : 60mm	
86 : 86mm	
Motor Length	
S : Small	
M : Medium	
L : Large	
XL : Extra Large	
Brake	
Blank : Without Brake	
BK : Brake	
User Code	
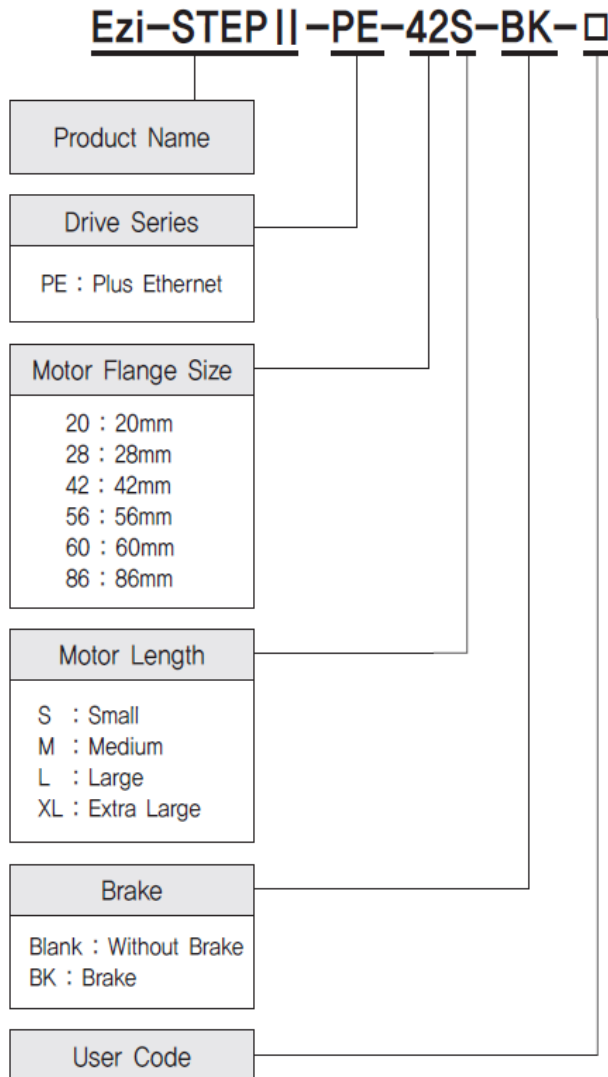
2) Ezi-STEPⅡ Plus-E Motor, Drive combination (Standard)

Unit Part Number	Motor Part Number	Drive Part Number
Ezi-STEPⅡ-PE-20M	BM-20M	EzT2-PE-20M
Ezi-STEPⅡ-PE-20L	BM-20L	EzT2-PE-20L
Ezi-STEPⅡ-PE-28S	BM-28S	EzT2-PE-28S
Ezi-STEPⅡ-PE-28M	BM-28M	EzT2-PE-28M
Ezi-STEPⅡ-PE-28L	BM-28L	EzT2-PE-28L
Ezi-STEPⅡ-PE-42S	BM-42S	EzT2-PE-42S
Ezi-STEPⅡ-PE-42M	BM-42M	EzT2-PE-42M
Ezi-STEPⅡ-PE-42L	BM-42L	EzT2-PE-42L
Ezi-STEPⅡ-PE-42XL	BM-42XL	EzT2-PE-42XL
Ezi-STEPⅡ-PE-56S	BM-56S	EzT2-PE-56S
Ezi-STEPⅡ-PE-56M	BM-56M	EzT2-PE-56M
Ezi-STEPⅡ-PE-56L	BM-56L	EzT2-PE-56L
Ezi-STEPⅡ-PE-60S	BM-60S	EzT2-PE-60S
Ezi-STEPⅡ-PE-60M	BM-60M	EzT2-PE-60M
Ezi-STEPⅡ-PE-60L	BM-60L	EzT2-PE-60L
Ezi-STEPⅡ-PE-86M	BM-86M	EzT2-PE-86M
Ezi-STEPⅡ-PE-86L	BM-86L	EzT2-PE-86L
Ezi-STEPⅡ-PE-86XL	BM-86XL	EzT2-PE-86XL

3) Ezi-STEPⅡ Plus-E Motor, Drive combination (Brake integration)

Unit Part Number	Motor Part Number	Drive Part Number
Ezi-STEPⅡ-PE-42S-BK	BM-42S-BK	EzT2-PE-42S
Ezi-STEPⅡ-PE-42M-BK	BM-42M-BK	EzT2-PE-42M
Ezi-STEPⅡ-PE-42L-BK	BM-42L-BK	EzT2-PE-42L
Ezi-STEPⅡ-PE-42XL-BK	BM-42XL-BK	EzT2-PE-42XL
Ezi-STEPⅡ-PE-56S-BK	BM-56S-BK	EzT2-PE-56S
Ezi-STEPⅡ-PE-56M-BK	BM-56M-BK	EzT2-PE-56M
Ezi-STEPⅡ-PE-56L-BK	BM-56L-BK	EzT2-PE-56L
Ezi-STEPⅡ-PE-60S-BK	BM-60S-BK	EzT2-PE-60S
Ezi-STEPⅡ-PE-60M-BK	BM-60M-BK	EzT2-PE-60M
Ezi-STEPⅡ-PE-60L-BK	BM-60L-BK	EzT2-PE-60L
Ezi-STEPⅡ-PE-86M-BK	BM-86M-BK	EzT2-PE-86M
Ezi-STEPⅡ-PE-86L-BK	BM-86L-BK	EzT2-PE-86L
Ezi-STEPⅡ-PE-86XL-BK	BM-86XL-BK	EzT2-PE-86XL

● **Brake Specification**

Motor	Electromagnetic Brake					Motor Unit Weight (g)	Permitted Overhung Load(N)				Permitted Thrust Load (N)
	Type	Voltage Input (V)	Rated Current (A)	Power Consumption (W)	Static Friction Torque (N·m)		Length from Motor Point (mm)				
							3	8	13	18	
BM-42S	Non-Excitation run Type	24VDC ±10%	0.2 ±10%	5	0.2	500	22	26	33	46	Must be Lower than Unit's Weight
BM-42M						560					
BM-42L						630					
BM-42XL						770					
BM-56S			0.27 ±10%	6.6	0.7	970	52	65	85	123	
BM-56M						1150					
BM-56L						1580					
BM-60S				6.6	0.7	1060	70	87	114	165	
BM-60M						1250					
BM-60L						1790					
BM-86M			0.54 ±10%	13	4	3580	270	300	350	400	
BM-86L						5110					
BM-86XL						6630					

Electric brake cannot be used for braking. It's for Position hold purpose only when power OFF
The weight means motor unit weight including motor and electric brake

● **Brake Operation Timing Chart**
The Brake is automatically controlled by Ezi-STEPⅡ Plus-E Drive.
Please refer to below Timing Chart when control brake from upper controller other than using Ezi-STEPⅡ Plus-E brake control. .
Otherwise, drive malfunction happen or loads can be fall down.
Also, please do not operate brake while motor operation to prevent damage.
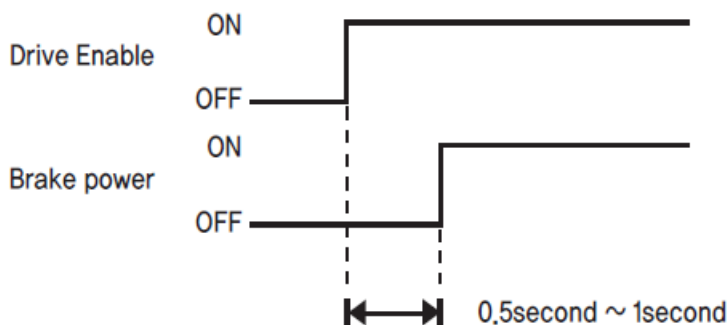
4 - 2 . **Controller configuration**

1) General Drive (For 20~60[mm] motor)

2) 86[mm] motor drive

⑤ Ethernet cable

PC / PLC

Input / Output

LIMIT- ORIGIN   LIMIT+

- 3 dedicated inputs and 9 programmable inputs
- 1 dedicated output and 9 programmable outputs, Brake

⑤ Ethernet cable

① Signal cable

② Encoder extension cable   External Encoder

③ Motor extension cable

Input DC Power
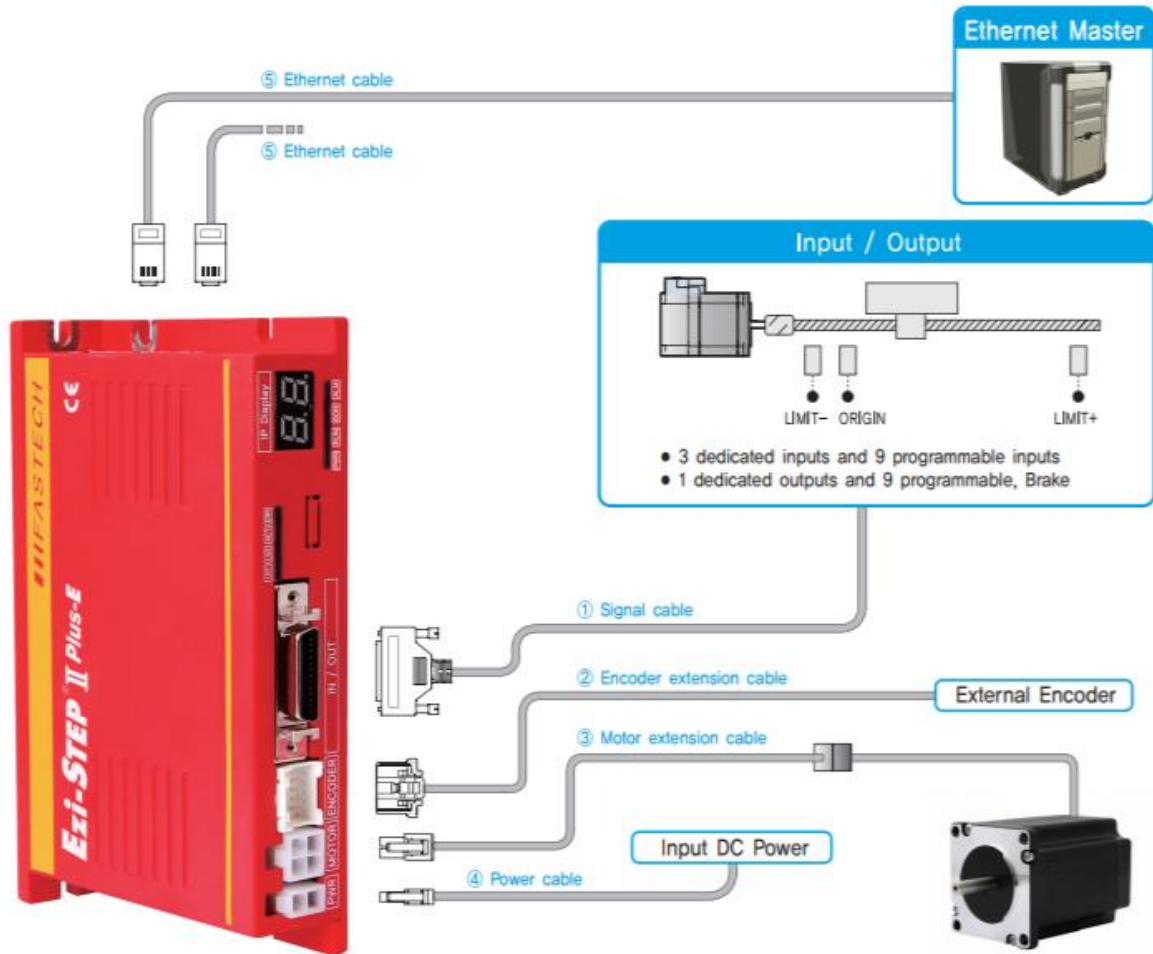
④ Power cable
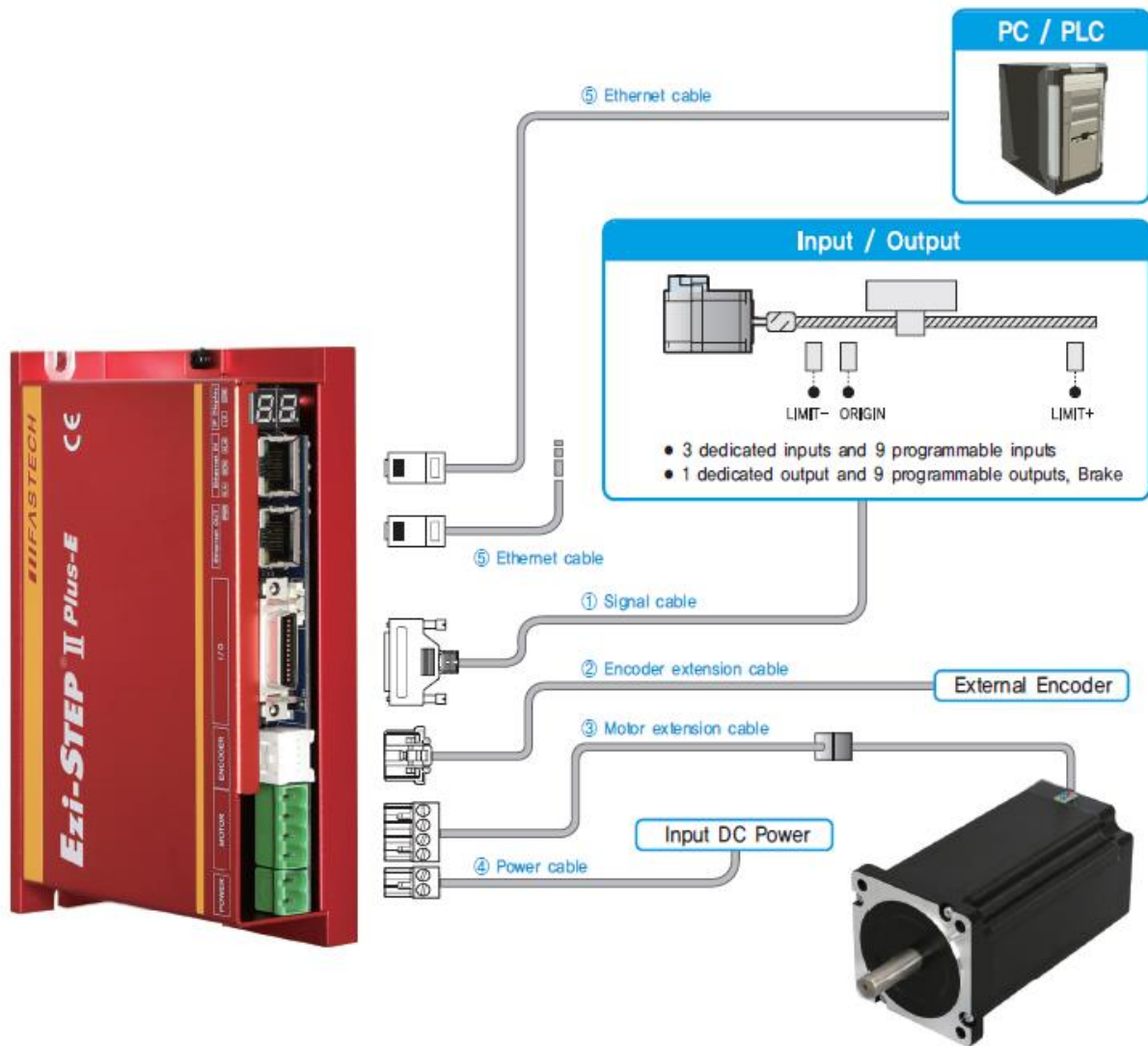
4-3. **External Wiring Diagram**
1) General Drive (For 20~60[mm] motor)

2) 86[mm] Motor Drive

Ezi-STEPII Plus-E

CN4
1 GND
2 40~70VDC

GND
40~70VDC

CN2   *1
A+   1
A−   2
B+   3
B−   4
Z+   5
Z−   6
5VDC 7
GND   8
F.GND 9,10

External Encoder

Encoder
E

External IN/OUT   *2   **CN1**

EXT_24VDC   26
LIMIT+   1
LIMIT−   2
ORIGIN   3
In1   4
In2   14
In3   15
In4   16
In5   17
In6   5
In7   6
In8   18
In9   19
Compare Out 7
EXT_GND   25
Out1   8
Out2   9
Out3   10
Out4   11
Out5   12
Out6   13
Out7   20
Out8   21
Out9   22
             23
BRAKE   24

F.GND   F.GND

CN3
A   4
/A   3
B   2
/B   1

Motor
Motor
M

* 1) Shielded Twisted Pair Cable

* 2) Shield Cable

5 . External Name and Function Setting of Ezi-STEPⅡ Plus-E

5 - 1 . Appearance and Part name

1) General Drive (For 20~60[mm] motor)
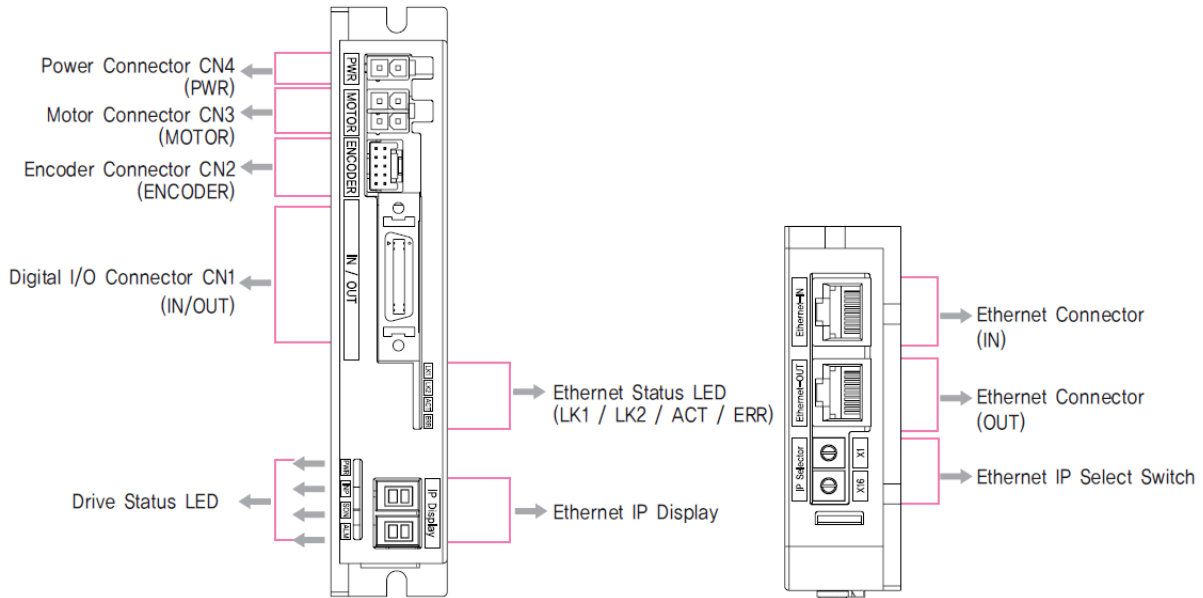
2) 86[mm] motor drive
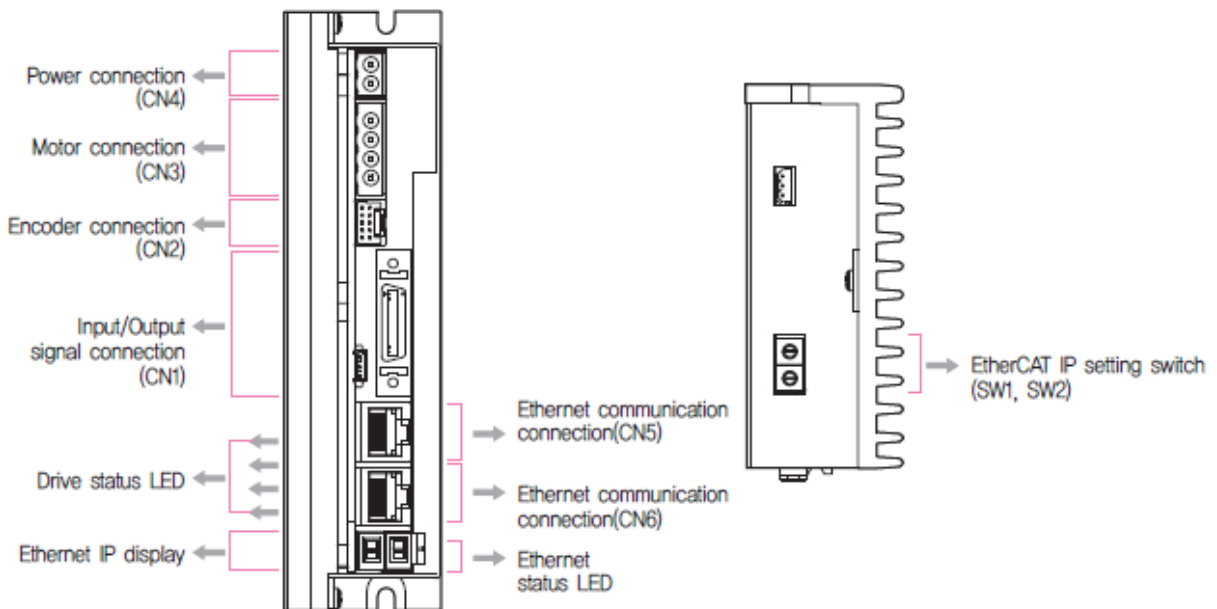
5 - 2 . **Drive Status LED**

Display	Color	Function	On / Off Condition
PWR	Green	Power Input Indication	Light on when power is applied.
RUN	Yellow	Driving Indication	Lights on when the motor is running
SON	Orange	Motor enable status indication	Enable : Light On, Disable: Light Off
ALM	Red	Alarm indication	Flash repeat when protection function is activated. (if count LED flash time, it is possible to check which protection function is activating)

5 - 3 . **Ethernet IP Display**

1) It displays the setting ID of SW1,2 (Drive ID Selection Switch)
2) In case of ID setting after power input status, 7-Segments are flushing and changed ID is not applied.
   ● The IP must be changed when power off status.
3) When Alarm generating from drive, Alarm value is displayed on 7-Segment, not ID value.
   Alarm value is displayed on 7-Segment as 'E-000' type with one each dial.
   This dial is changing every one second. (ex. Display of Alarm No. 15)
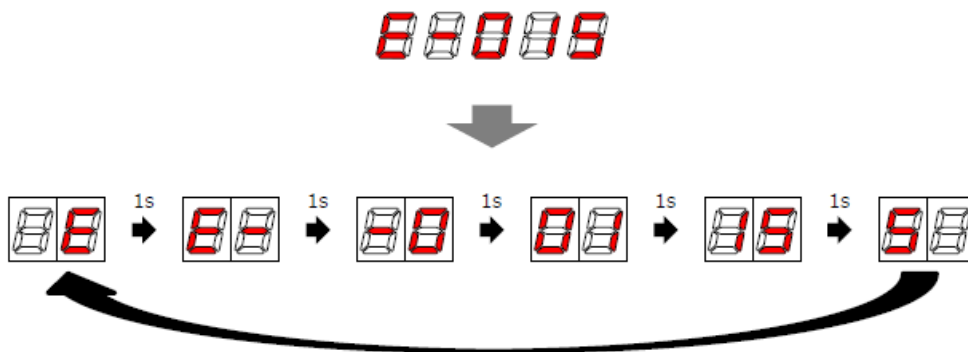
4) It displays the all of set ID on the drive after power input, it displays end number of IP address as hex code.
   Ex) IP Address: 192.168.0.10
       Firstly display 192.168.0.10 → only display 0A

5 - 4 . Ethernet status LED

1) This LED indicates the Ethernet communication status. The Link1 / Link2 LEDs are located on the top right of each Ethernet connector, and the Activity LED is on the top left.

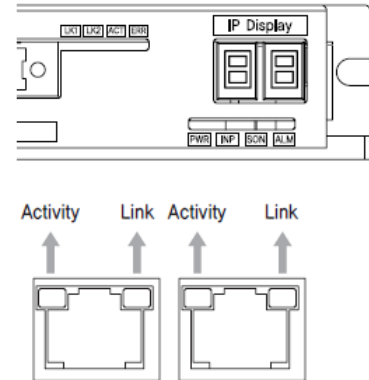| Name	Color	Status	Description
Error	Red	OFF	Normal status or Power OFF
		Single Flash	Local Error
LK1/ LK2	Green	OFF	Link deactivated
		ON	Link activated
Activity	Yellow	OFF	Non operation
		Flickering	In operation

5 - 5 . IP Address selection switch (SW1, SW2)

1) It can be set from "1 to 254". Please set IP not to overlap.
- "0" and "255" cannot be used for IP setting. Be sure to set it to "1 to 254"..
- The default gateway is 192.168.0.1. When the switch is set to "1"
  Change Gateway. Refer to the [Manual - User Program 2-4] section for the change method.
  If the IP address and gateway are the same, Alarm (201 or 202) occurs.
- It is recommended to use "2 ~ 254" for IP setting. (Default: SW1: 2, SW2: 0)

2) Basic set is "192.168.0.xxx", and xxx are set by switch.
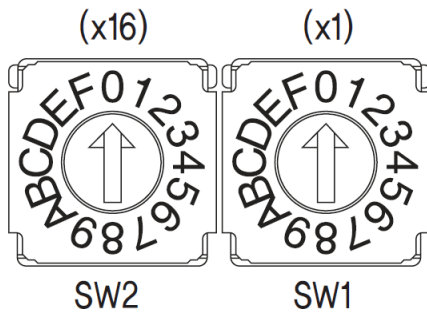
Ex.) In case of SW1 : 9, and SW2 : 6
　　9 * 1 + 6 * 16 = 105
　　IP address : 192.168.0.105 (7-Segment display : 69)
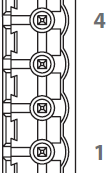
3) If set to switch as 255(FF), IP Address is setting automatically.
 Because it uses DHCP, IP address is set automatically only when using router.
　(Connect the Ethernet to Ethernet IN connector)
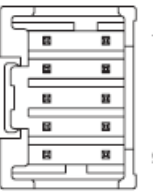
- When connecting directly to the controller (PC/PLC), it need to be sure to set the OP address with switch
- Set the IP address automatically only when you do not use the default IP address. If IP is set automatically, connect the user program (GUI) and save the IP address. And turn off the power and set the lasr number of IP with switch
- When the switch is set to 0, the IP setting becomes the initial (default) value.
  In the initial state, communication is not connected.
- Basic IP Address : 192.168.0.xxx, Subnet Mask : 255.255.255.0, Gateway : 192.168.0.1

5 - 6 . Motor Connection connector (CN3)
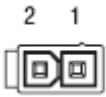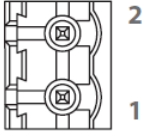
No.	Function
1	A
2	B
3	/A
4	/B

No.	Function
1	/B
2	B
3	/A
4	A

* For 86[mm] motor drive

5 - 7 . Encoder connection connector (CN2)

No.	Function
1	A+
2	A-
3	B+
4	B-
5	Z+
6	Z-
7	5VDC
8	5VDC GND
9	Frame GND
10	Frame GND
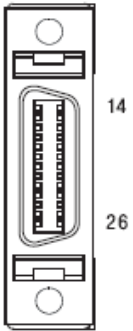
5 - 8 . Power connection connector (CN4)

No.	Function
1	24VDC ±10%
2	GND

No.	Function
1	GND
2	40~70VDC

* For 86[mm] motor drive

5 - 9 . I/O signal connector (CN1)

No.	Function	No.	Function
1	LIMIT+ (Dedicated input)	14	Digital In2 (Programmable input)
2	LIMIT- (Dedicated input)	15	Digital In3 (Programmable input)
3	ORIGIN (Dedicated input)	16	Digital In4 (Programmable input)
4	Digital In1 (Programmable input)	17	Digital In5 (Programmable input)
5	Digital In6 (Programmable input)	18	Digital In8 (Programmable input)
6	Digital In7 (Programmable input)	19	Digital In9 (Programmable input)
7	Compare Out (Dedicated Output)	20	Digital Out7 (Programmable output)
8	Digital Out1 (Programmable output)	21	Digital Out8 (Programmable output)
9	Digital Out2 (Programmable output)	22	Digital Out9 (Programmable output)
10	Digital Out3 (Programmable output)	23	Brake +24V (Output)
11	Digital Out4 (Programmable output)	24	Control signal for Brake(Output)
12	Digital Out5 (Programmable output)	25	GND external(Input)
13	Digital Out6 (Programmable output)	26	+24V external(Input)

* This connector's fixing pin is connected to frame GND through a mount hall

The programmable input/output pin is set by using the user program (GUI) or DLL library.

⚠ Caution	Connect the Brake (current consumption is under 300[mA]) for pin 24. Refer to 7.4 Output signal for the Brake that is over 300[mA].

5 - 1 0 . Ethernet connector

No	Function	No	Function
1	TD+	6	RD-
2	TD-	7	-
3	RD+	8	-
4	-	Connector Hood	F.G
5	-		
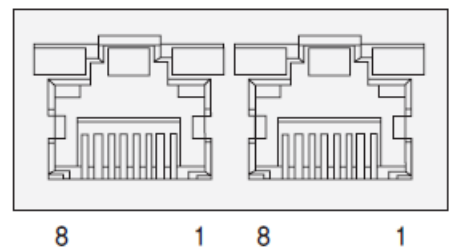
6 . Control I/O signal

6－1. Signal cabling

All control I/O signals use connector CN1 as specified below..

1) Input : 「Limit+」, 「Limit-」, 「Origin」signals are fixed to CN1 No. 1,2,3.

Other signals as like 'Reset' and others are assigned to IN1~IN9 terminal blocks.

3 dedicated input + 9 programmable input = total 12 input pins

CN1 No.	Signal Name	Function
1	Limit+	Positive Limit sensor signal
2	Limit-	Negative Limit sensor signal
3	Origin	Origin sensor signal
4	IN1	Clear Pos
14	IN2	Position Table A0 ~ Position Table A7 (PT A0~PT A7)
15	IN3	Position Table start execution (PT Start)
		Soft Stop(Stop)
16	IN4	Jog+, Jog-
17	IN5	Alarm Reset, STEP ON
		Pause, Origin Search, Teaching
5	IN6	Emergency Stop(E-Stop)
6	IN7	Jump Position Table input 0 ~ Jump Position Table input 2
		(JPT IN 0~ JPT IN 2)
18	IN8	Jump Position Table start (JPT Start)
19	IN9	User input 0 ~ User input 8 (User IN 0 ~ User IN 8)

* Jog0 ~ Jog2 functions are available from Firmware [ver.6.1.20.16].

2) Output : 「COMP」signal is fixed on each assigned No, Other signals like

In-position are assigned to OUT1~OUT9 terminal blocks.

1 dedicated Out + 9 programmable Out = 10 Outputs

CN1 No.	Signal Name	Function
7	COMP	Specific output signal (Compare Out)
8	OUT1	Alarm, Run/Stop
9	OUT2	Acc/Dec
10	OUT3	Moving
11	OUT4	ACK, END
12	OUT5	OriginSearchOK
13	OUT6	StepReady
		Brake
20	OUT7	Position Table output 0 ~ Position Table output 2
21	OUT8	(PT OUT 0 ~ PT OUT 2)
22	OUT9	User Output 0 ~ User Output 8

6 - 2 . **Connection Circuit**

All drive I/O signals are insulated by a photo coupler. The signals display the internal photo coupler status - [ON: Conduction] and [OFF: Non- Conduction], not the signal voltage level.

1)   Input Circuit

Input circuit power of DC24V±10% (consumed current : about 5mA/circuit) should be separately prepared.
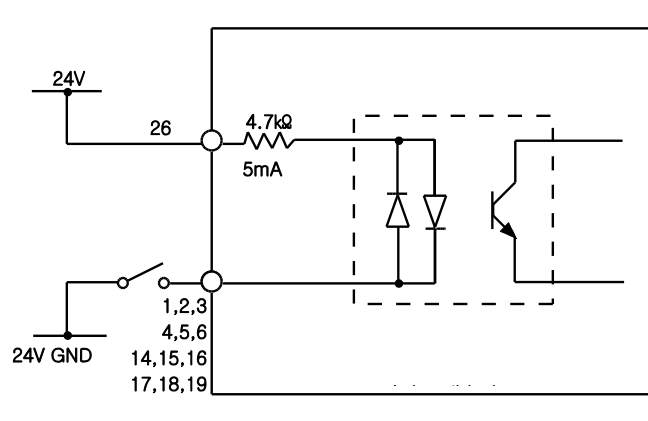
● **Connect NPN type Input signal**

Connect the '+24V external' signal of drive to '+24V' of Controller.
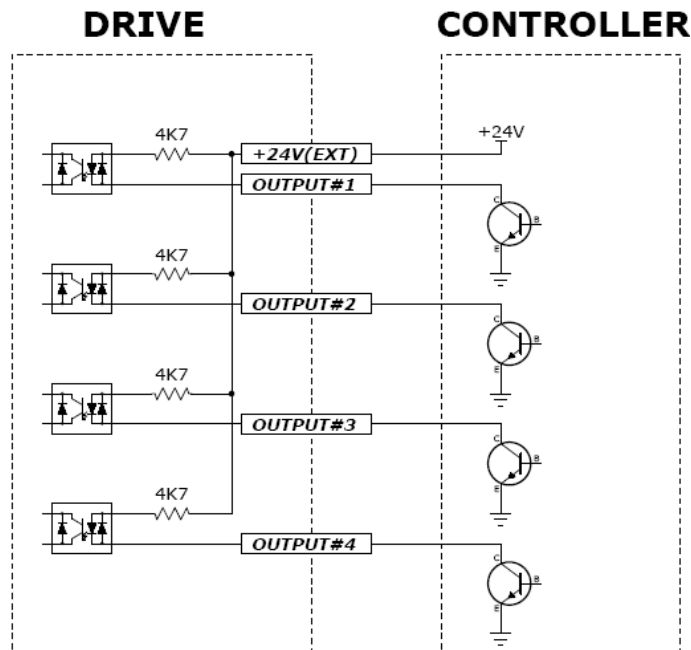
● **Connect PNP type Input signal**

Connect the '+24V external' signal of drive to 'GND' of Controller.
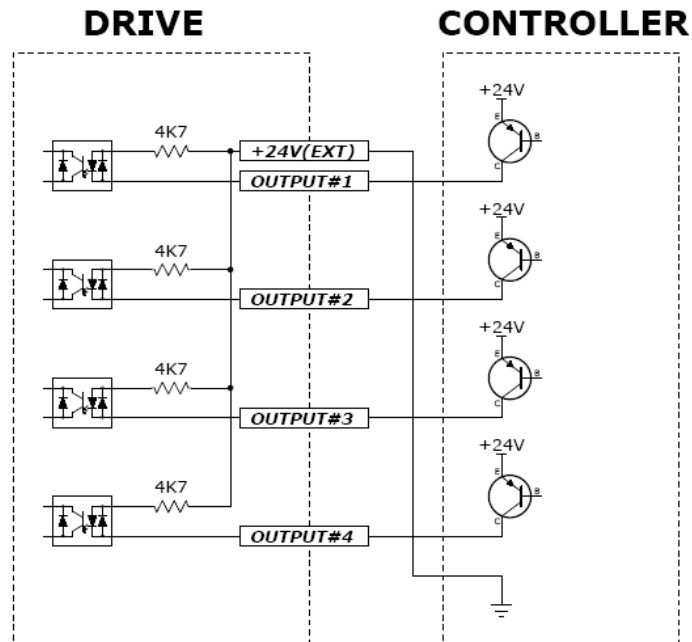
2) Output Circuit

Output circuit power should be separately prepared. This may share input circuit power. In this case, working power capacity should add output power capacity to input power capacity.
Applied voltage and power capacity in the control output port are as follows.
·Applied voltage ≤ 30V
·Electrified current ≤ 15mA
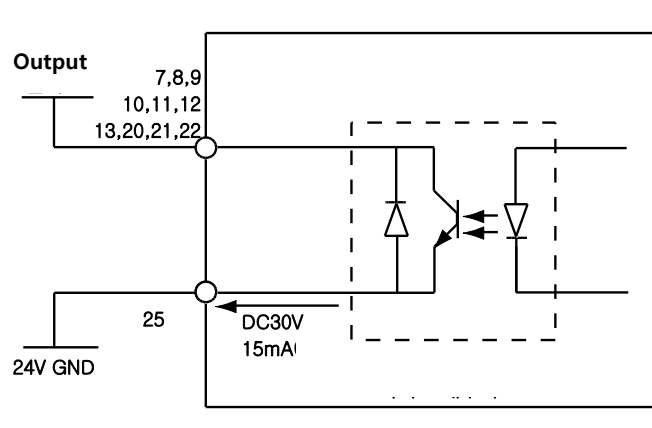
6 - 3 . **Input signal**

1) Limit Sensor and Origin Sensor

Limit sensor and origin sensor are assigned to LIMIT+, LIMIT- , and ORIGIN pin in the CN1 connector respectively. LIMIT+ and LIMIT- sensors are used to limit the motion of each axis to prevent mechanical collision. Origin sensor is to set the origin of equipment
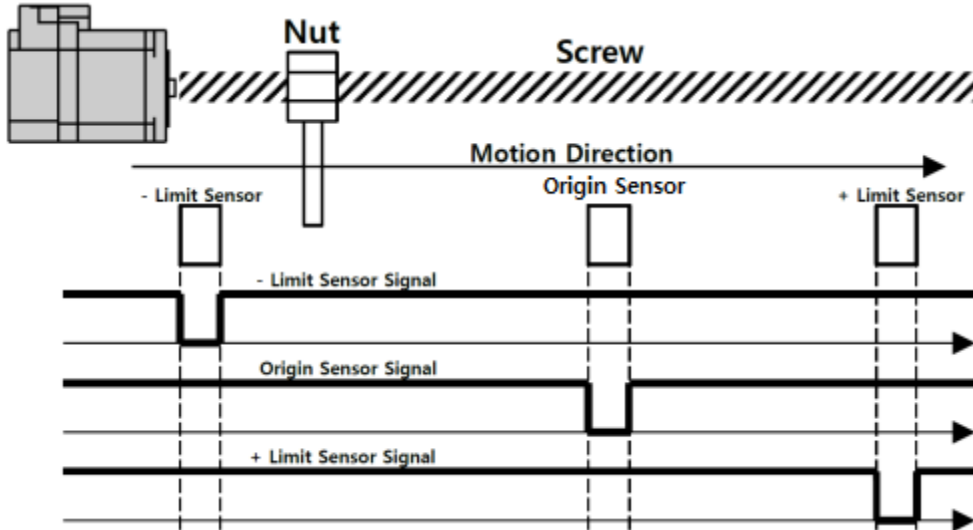
2) Clear Pos

This input signal sets the command position and the actual position to 0 in relation to motion position control. The reset signal pulse scale is 10ms or more.

Position value is to be "0" from the rising/falling edge of this signal

3) Position Table A0 –A7 (PT A0~A7) Input

The position table supports the machine so that its motion can be controlled by I/O signals of central controller. It can directly transmit commands such as position table number, start/stop and origin return to the machine through the PLC. Also, the user can check output signals such as in-position, completion of origin return and STEP ready through the PLC.

「Position Table A0~A7」 Inputs are total 8 bits of input signal. It is used to set 256 position table numbers. There are two application methods as follows

1) To set position table number (0~255) to be set by 'PT start' input signal.
2) To set position table number (0~255) to save current position values by 'Teaching' input signal.

By using PT A0~A7 signals, the position table address can be set from 0 to 255 with a binary number. A0 is least significant bit and A7 is most significant bit. The following table shows how to assign position table number.

*1. Save signal cabling: If 'PT A0~A7'signal is not connected when motioning by 'PT Start' signal, the position table number will be '0'.

A7	A6	A5 ~ A3	A2	A1	A0	PT No
0	0	0	0	0	0	0
0	0	0	0	0	1	1
0	0	0	0	1	0	2
0	0	0	0	1	1	3
0	0	0	1	0	0	4
… … … … … … … … … … … … … … … … … … …						
1	1	1	1	1	0	254
1	1	1	1	1	1	255

*2.**'PT A5/UserIN 6' 'PT A6/UserIN 7' 'PT A7/UserIN 8'** signal setting :
This signal can be used as 'PT A5~A7', and also can be used as
'User IN6~IN8'signal when the input signal 'User IN0~IN5'is not enough.

4) Position Table start (PT Start) Input

By using PT A0~A7 signals, set and input the running PT start number. Then the motion pattern corresponds to the PT No. will be executed.

Following example shows that total 6 motion patterns are in order to execute from No.0 to No.32 and then stopped.

1) All of PT A0~A7 is set to '0' and PT number is set to '0'.

2) Set PT Start signal to [ON], and PT No.0 motion pattern will be executed.

3) When the motion pattern is started by PT, ACK signal and END signal are displayed to [ON] at CN1 output port as illustrated below. The signal is kept until one motion pattern loop is stopped. After all motions are stopped, the output signal level is set to [OFF].

4) PT Start signal is edge trigger type and pulse scale is 10ms or more.

PT=0 PT=1 PT=2 PT=30 PT=31 PT=32 **Motion pattern**

Position table address input (PTA0 – A7)

0

ON

Position table start execution input signal (PT Start)

ACK output signal

END output signal
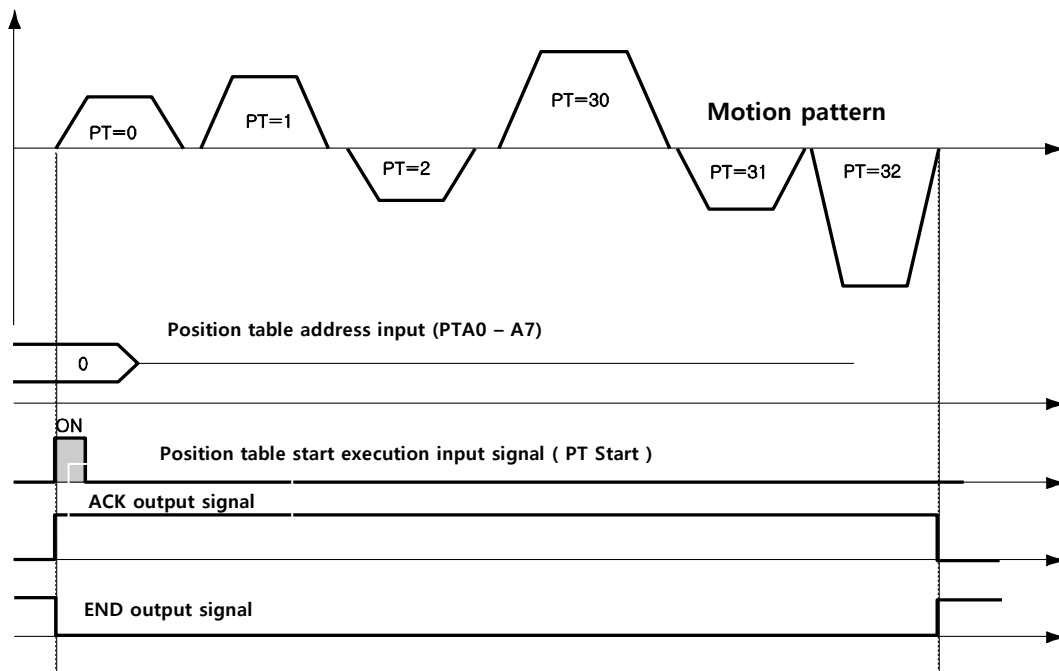
*1. Timing of signals : PT A0~A7 signals must be set before(50msec) PT Start signal set to [ON].

*2. If the PT A0~A7 signals are not used and the PT Start signal set to [ON] the PT No. 0 will be executed..

*3. Checking the 'Moving' and 'In-position' signals:

Between sequential 'PT Start' motion command signal, the checking step for motion status Moving, In-position) is needed before next motion command.
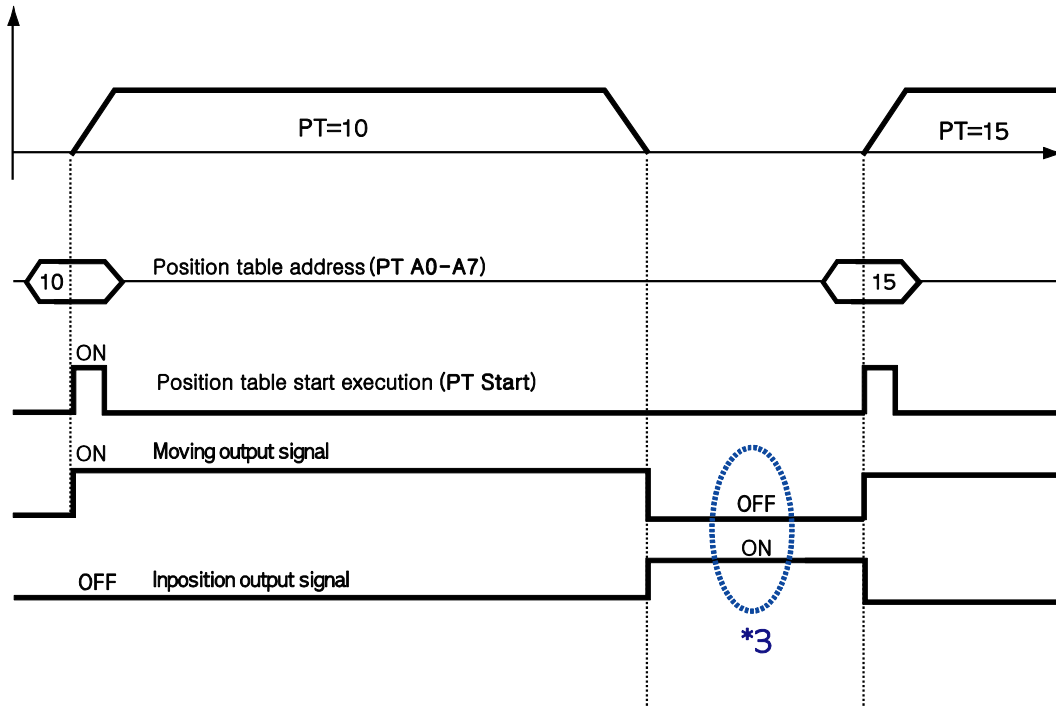
5) Stop Input

Soft stop input signal is to stop motion patterns under operation. The deceleration condition until they stop complies with the deceleration time value and the start speed value set previously. The soft stop signal is active in ON level and pulse scale is 10ms or more.
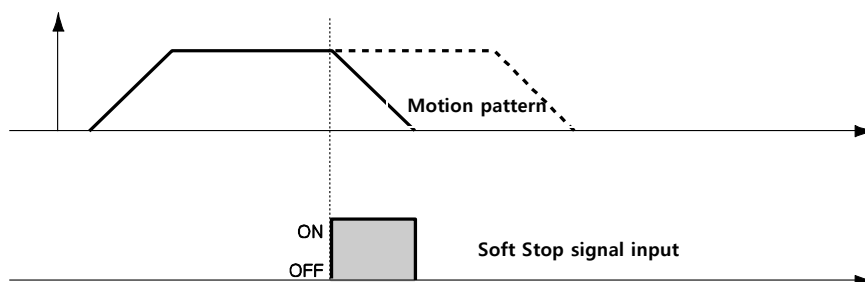
6) Jog+ and Jog- Input

When Jog+ or Jog- signal is ON, the motor rotates clockwise or counterclockwise until it reaches the hardware limit or the software limit. Jog motion pattern is subject to jog related parameters (No.7: start speed, No.6: speed, No.8: Acc Dec time).
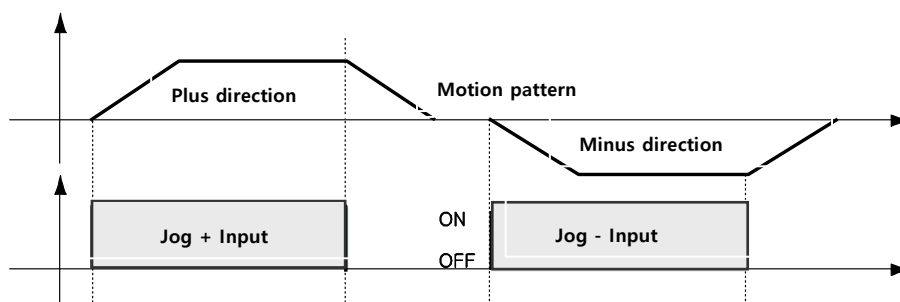
7) Step ON and Alarm Reset Input

When the protective function of drive executes, alarm output is released. When AlarmReset input is set to ON, alarm output and alarm blink output are released. Before releasing alarm output, the user must remove any cause of alarm operating.

When Step ON/OFF signal is set to OFF, the drive stops supplying the current to the motor and so the user can directly adjust the output position. When Step ON/OFF signal is set to ON, the drive restarts to supply the current to the motor and its torque is recovered. Before operating the motor, the user must set it to ON.

When the drive is set to Step ON, CN1 connector's <StepReady > output signal is set to ON. Step ON signal is edge trigger type and pulse scale is 10ms or more.

⚠ Caution	If the 'Step ON' signal is assigned to input pin, Step ON command from GUI or DLL library will not executed.

*1. In case of 'Step On' by input signal, No. 0: Pulse per Revolution of the parameter list cannot be changed.

*2. After 'StepON' signal is assigned to input pin, it is impossible to use 'STEP ON' button in User Program(GUI). Likewise, the 'FAS_STEPEnable' command in the DLL program will not run.

*3. After the Step ON command is executed, the command position value of the user program (GUI) is changed to be equal to the actual position value.

8) Pause Input

When Pause signal is set to ON, the motion in service is stopped

To start motion again, set the Pause signal to [OFF].

The pulse width of the pause signal is 10ms or more

9) Origin Search Input

When 'Origin Search' signal is set to ON (10ms or more), it starts to search the origin position according to selected conditions. The conditions are subject to parameters such as No.20:Org Method, No.17:Org Speed, No.18:Org Search Speed, No.19:Org AccDec Time, No.21:Org Dir. (For more information, refer to '1.2 Parameter'.) When the origin search command is completed, 'Origin Search OK' signal is set to ON to CN1 connector's output port.
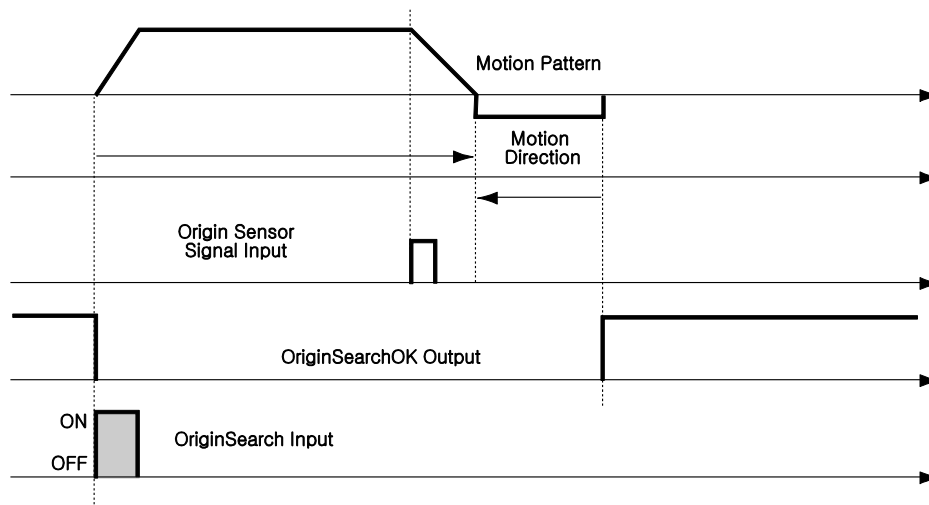
10) Teaching Input

[Teaching] signal functions that the position value [pulse] being working can be automatically inputted into a 'position' value of a specific position table. If it is hard to calculate the exact moving distance (position value) of specific motion mechanically, the user can measure and set the distance (position value) easily by using this signal.

1) By using User Program (GUI), set a command type of corresponding PT number among 4 kinds of absolute moving commands (Absolute Move).
2) By using input signal (PT A0~A7), select corresponding PT number.
3) When Teaching signal is set to ON, the position value [pulse] is saved to the position value of corresponding PT. At this time, it becomes the absolute position value.
4) Teaching signal pulse scale is 10ms or more.

*   1. After executing Teaching, click 'Refresh' icon, and the position value will be displayed to the position table.
*   2. Click 'Save to ROM' icon, and the position value will be saved to the ROM area.
*   3. Teaching signal can be used by two methods; the user assigns actual signal to the motor, or he clicks 'Teaching' icon at the 'I/O Monitoring' window of User Program(GUI).
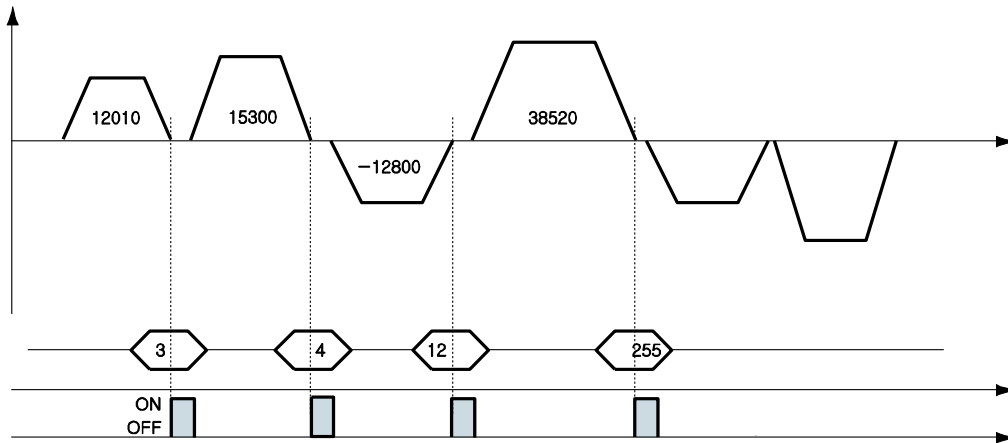
PT No.	Position Value [pulse] of Corresponding PT
3	12010
4	15300
12	-12800
255	38520

11) E-Stop Input

When [Emergency stop] signal is set to [ON] the current motion is stopped immediately without deceleration. E-Stop signal is active in ON level and pulse scale is 10ms or more.
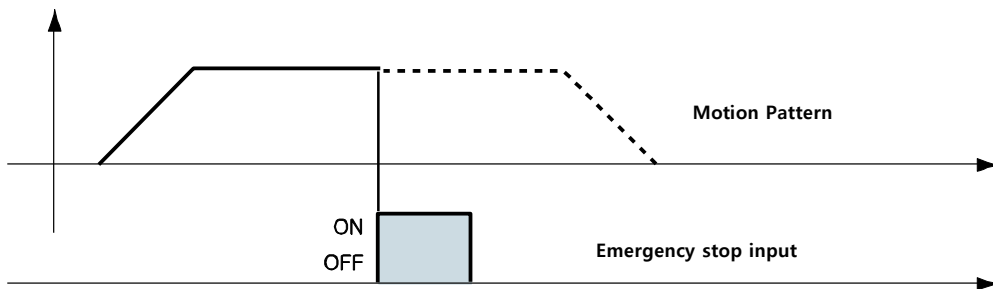
12) JPT Input0~Input2 (Jump Position Table Input) Input

Select motion pattern (position table number) to be subsequently executed according to input signal conditions.

【Example】 If PT 14 motion operates, when there is no other input signal, next motion becomes PT 15 as shown in Figure 1). However, if 'JPT Input0~Input2' input signal is set to ON while PT 14 is executing, each corresponding position number is executed as shown in Figure 2)~4).

PT 14 Data

PT No	...	JP Table No.	JPT 0	JPT 1	JPT 2
14	...	15	115	116	225
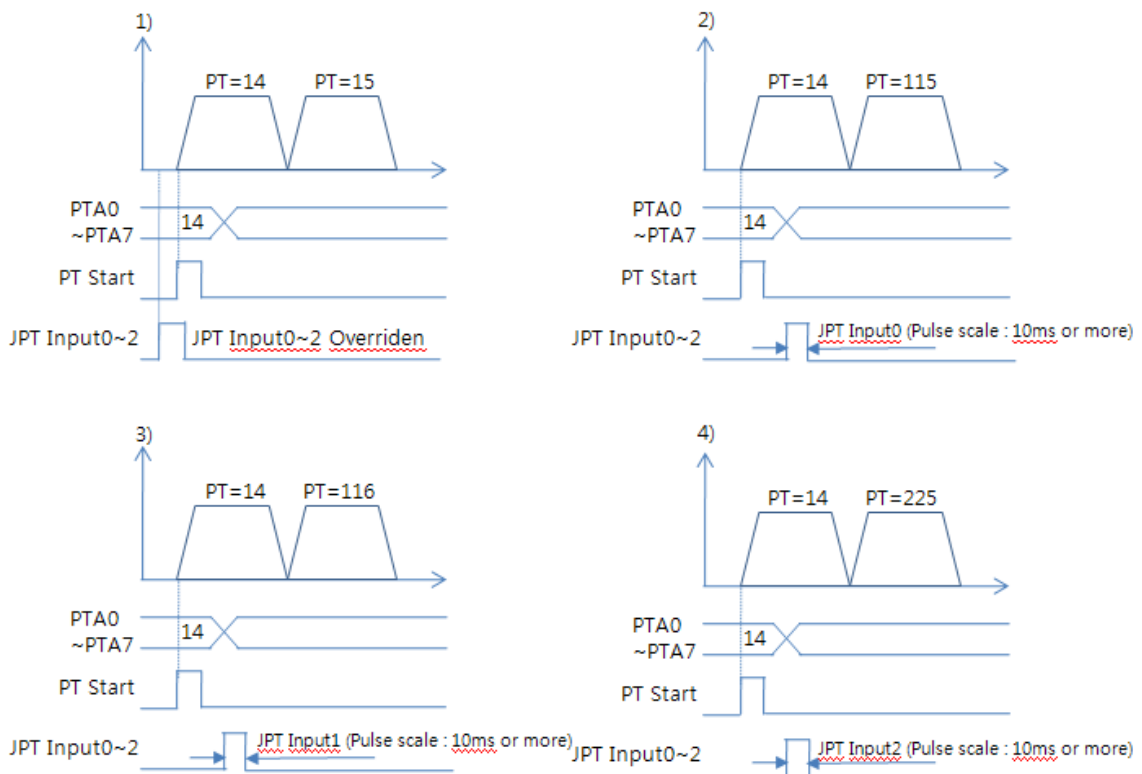
13) JPT(Jump Position Table) Start Input

To select motion pattern (position table number) to be subsequently executed according to input signal conditions. The difference from Paragraph 「12) 'JPT Input0~Input2 Input」 is:

1) PT number to be jumped must be composed to 10XXX;
2) Next motion is not executed until 'JPT Start' is set to ON. If 'Wait Time' value of PT data is more than '0', the time lapses additionally and then next motion is executed.

【Example】

PT 14 Data

PT Number	...	Wait Time	JP Table No	JPT 0	JPT 1	JPT 2
14	...	500	10015	10115	10116	10255
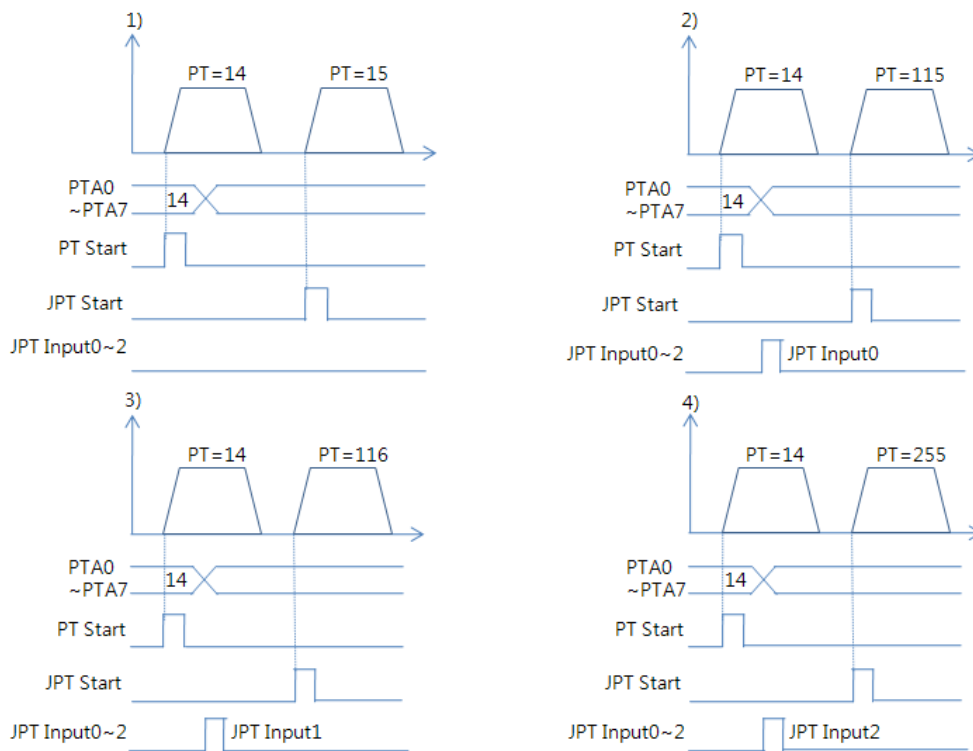
6－4. **Output Signal**

1) 'Compare Out/Trigger Pulse Output' output

'Trigger Pulse Output' signal is displayed when specific conditions are performed. It is fixed to CN1 connector's COMP (Compare Out) pin. And it is available when the motor needs to be synchronously controlled by an external controller. Refer to 「9.5 Trigger Pulse Output」.

2) Run / Stop Output

Outputs [ON] signal when the motor is running in Step ON.
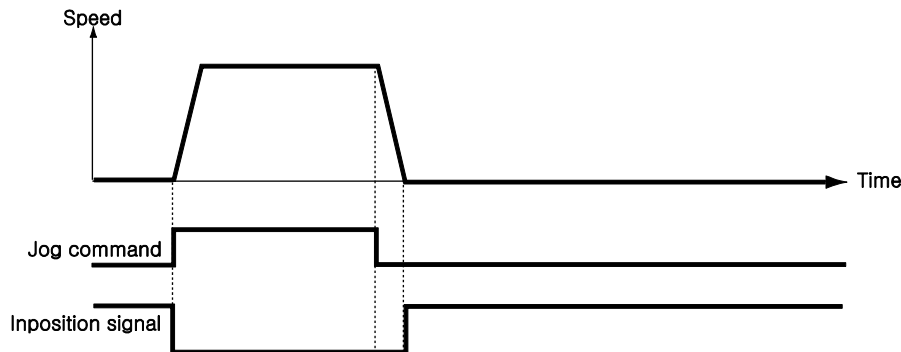
3) Alarm output

When the motor operates normally, alarm output becomes OFF. When the protective function operates, alarm output becomes ON. The upper controller being used by the user detects this alarm and then stops motor operation command. If overload or overcurrent occurs while the motor is operating, the drive detects it and cuts off the motor's current, In addition, alarm output is turned on and "Alarm LED" flashes to indicate the type of alarm occurrence.

4) PT ACK와 PT End output

'PT ACK' and 'PT End' signals are available only when the motion is executed by position table. When motion start, PT ACK signal is set to ON and PT End signal is set to OFF, if all of motion loops are finished. Then PT ACK signal becomes OFF and PT End signal becomes ON. If the 'Wait time' value in PT item is not 0, the defined time is needed to PT End signal becomes ON. Refer to 「Ezi- STEPⅡ Plus-E User Manual – 'Position Table Function'」.

5) Moving and Acc/Dec output

As shown below, the position starts to move by motion command, and Moving signal becomes ON and Acc/Dec signal becomes ON in the acceleration and deceleration section only.

Motion Pattern

Acc/Dcc Signal

ON
OFF

ON Moving signal
OFF
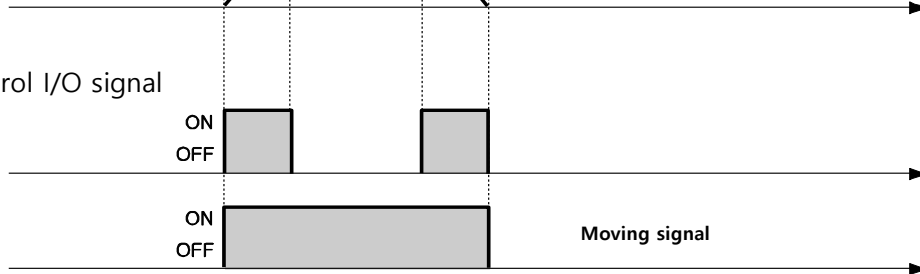
6) Org Search OK output

When the origin return motion is executed by origin search command, 'Origin Search OK' signal is set to OFF. When the origin return motion is normally finished by the origin sensor, 'Origin Search OK' is set to ON.
Refer to 「7.3 Input Signal - 8) Origin Search Input」.

7) Step Ready output

When the drive supplies power to the motor by STEP ON signal or command and is ready to perform motion command, 'STEP Ready' signal displays ON signal.

8) PT(Position Table) Output 0~2 output

Control output used for 'Start/Stop Message Function'. When these items are set, this signal enables the user to check if corresponding PT motion starts or stops through control output signal. If 'Start/Stop Message Function' is not used, this signal should be set to 0 or 8. At the position set with other values, the motion operates as follows.

·   If PT set items are set to '1~7', when the position starts to move, PT Output HEX value is displayed to 'PT Output O ~ PT Output 2'.
·   If PT set items are set to '9~15', the position motion is finished and then PT Output HEX value is displayed to 'PT Output O ~ PT Output 2'.

For more information, refer to 「Ezi-STEPⅡ Plus-E User Manual – Position Table Function」.

9) BRAKE+ and BRAKE-

This function is used to protect motor rotation in STEP ON status by pin23

And pin24 of CN1 connector. DC +24V is connect to 'BRAKE+'for brake logic

and brake control signal is connect to 'BRAKE

The control signal is automatically output according to the STEP ON / OFF status and alarm occurrence.

This output function must be used to the Brake that is under 200[mA]/DC24V

of current consumption.
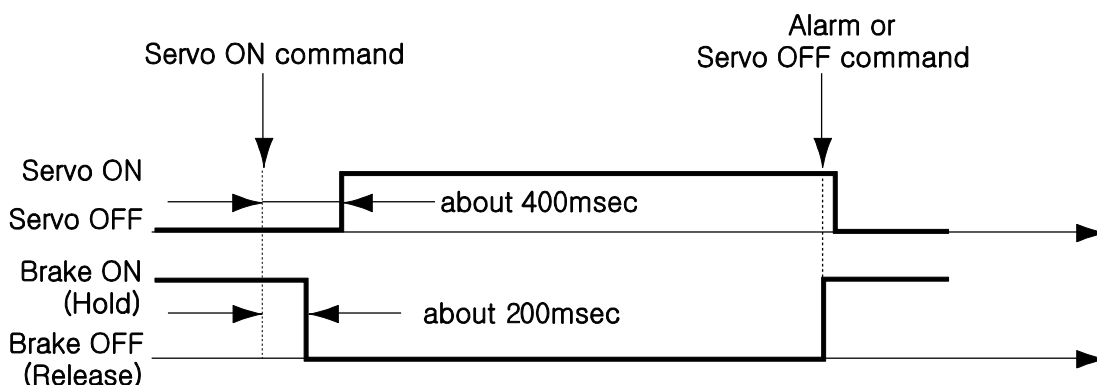
10) Brake for High current

This function can be used when the Brake signal is assigned to one of OUTPUT1~
OUTPUT9 of CN1 connector. This is used for protect motor rotation in
STEP ON status. The signal timing diagram between STEP ON command and
Brake signal is same as 9) 'BRAKE+' and 'BRAKE-' Output.
This signal used for the Brake that is over 300[mA]/DC24V of current
consumption. Brake, Relay and diode is needed for this function and the
signal connection diagram is as follows.
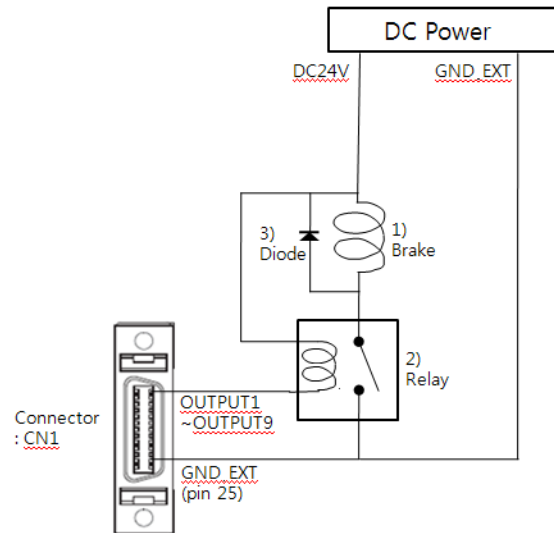
*1 Brake : User selected Brake
*2 Relay : under 15[mA] / DC24V
*3 Diode : 1N4004 or equivalent

7. **Operation**

7 - 1. **Power Supply Timing**

The power supply of Ezi-STEPⅡ Plus-E is supplied to the motor through the drive module. Therefore, before supplying power, connect the cable between the drive and the motor, and then supply power to the drive module.
The default setting of Ezi-STEPⅡ Plus-E after power supply is STEP OFF.

7 - 2. **STEP ON Operation**

After power is supplied, set the drive module to STEP ON as follows.

① Click 'STEP OFF' button at the User Program (GUI).

② Give the drive a command through DLL library.

③ Assign 'STEP ON' to control input pin, and supply the drive with signal through the p in.

⚠ Caution	**If the 'STEP ON' signal is assigned to input pin, STEP ON command from GUI or DLL library will not executed.**

7 - 3. **Operation Mode**

This controller can do three control operations such as I/O command, communication command (DLL program), and User Program (GUI)

(1) I/O Command Mode

This controller can execute control operation like in-position by I/O command transmitted from the upper controller. The in-position control operation is executed by operating position table with I/O command.

(2) Communication Command Mode

This controller can execute control operation like in-position by command transmitted from the upper controller. The in-position control operation is executed by operating position table with I/O command

Position Table Operation Sequence

It is can executed continuous operation by position table at the I/O command mode.

① By using PT A0 ~ PT A7 input signal or DLL program, set PT number to be operated.

② In case of STEP OFF, set the controller to STEP ON by communication program or STEP ON control input.

③ Start to operate by rising edge of PT Start input signal or communication program.

Stopping Continuous Operation of Position Table

When the motor is executing continuous operation of position table with Ezi-STEPⅡ Plus-E, stop executing position table by following methods.

① To use DLL program or control input signal corresponding to 'Stop' and 'E-Stop'. In this case, operation is completely finished and is not connected to next operation.

② The user can click 「Pause」 at User Program(GUI) to temporarily stop operating. In this case, click 「Pause」 again, and remaining operation will be executed again.

Position control Operation

To operate the motor by parameters set by User Program(GUI) or DLL program. (This is not connected with PT operation.)

Once position control operation is started, PT operation command is overridden. Likewise, while PT operation is executing, position control operation command is overridden.

The followings show parameters applied to position control operation. All position table item values are overridden.

Parameter Name	Setting Content	Range
Axis Max Speed	Operation speed after acceleration is finished	1~500,000[pps]
Axis Start Speed	Operation start speed before acceleration starts	1~35,000[pps]
Axis Acc Time	Required time until the motor reaches the axis max speed from stop status	1~9,999[ms]
Axis Dec Time	Required time until the motor reaches from the axis max speed to the stop status	1~9,999[ms]
Motion Dir	To select motion direction (CW or CCW)	0~1
Pulse per Revolution	Number of pulses per revolution. The range of 'Axis Max Speed'parameter is depend on this value.	0~15

Teaching Function

Teaching can be executed only by User Program(GUI). For more information, refer to 「User Manual – Position Table Function」.

8 . Other Operation Functions

8 – 1 . Position Table (PT) Operation Examples

Input 'PT A0~ PT A7' signals to set PT number.

Input 'PT Start' number to execute speed control operation. For more information, refer to 「User Manual – Position Table Function」.

【 Position Table Setting 】

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	-
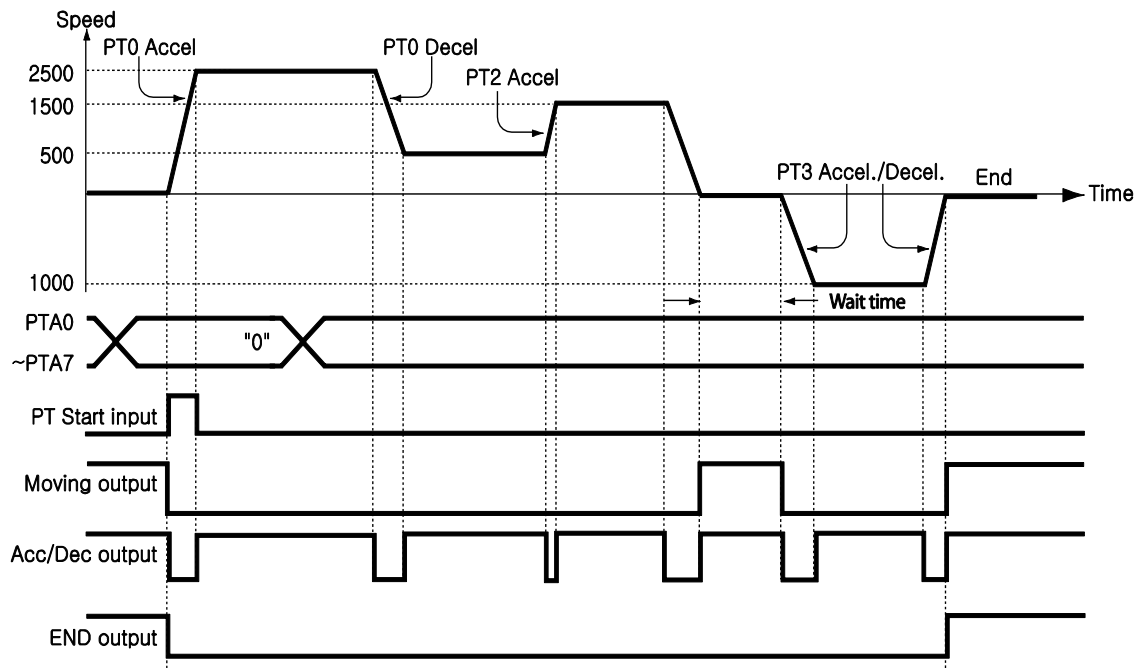
8 - 2 . **Jog Operation Examples**

The machine executes speed control operation at the speed set by parameters according to inputting 'Jog+' and 'Jog-' signals.

【 Parameter Setting 】

No.	Parameter Name	Setting Value	Unit
6	Jog Speed	1500	[pps]
7	Jog Start Speed	100	[pps]
8	Jog Acc Dec Time	200	[msec]
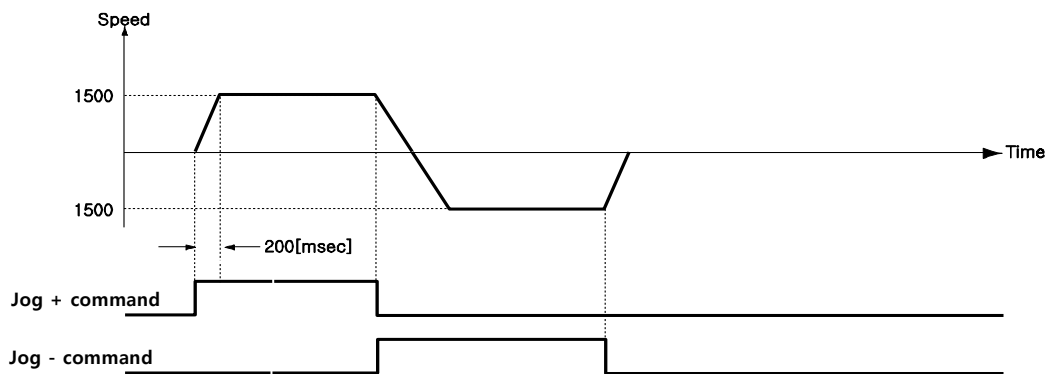
Also, when any value except 0 is set to the 'Jog Start Speed' parameter, the relation between jog command and in-position is indicating as below diagram.
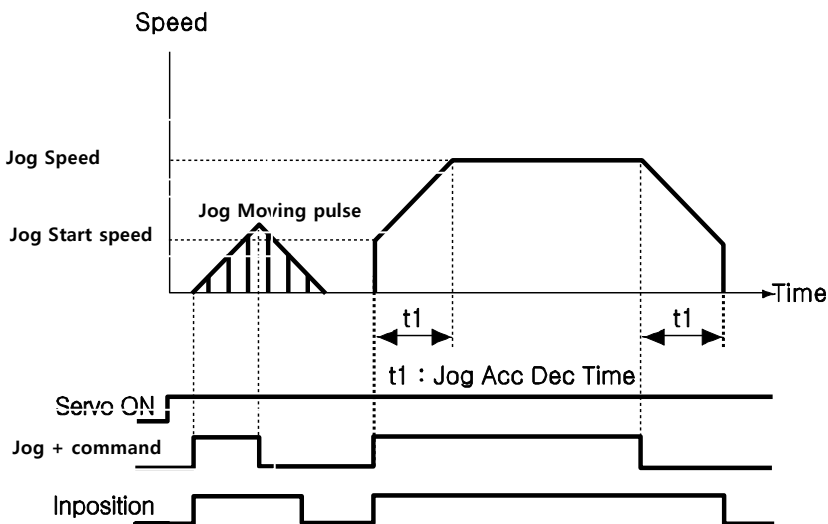
8 - 3 . **Origin Return**

If the machine is operated by I/O signals, the motor can execute origin return by inputting 'Origin Search' signal. Also, the motor can execute origin return with User Program(GUI) and DLL program.

The following table shows parameter types related to origin return.

Parameter Name	Description	Range
Org Speed	Operation speed when origin return starts	1~500,000[pps]
Org Search Speed	Low-speed operation speed after origin sensor is sensed and operation start speed when origin starts.	1~50,000[pps]
Org Acc Dec Time	The time assigned to the acceleration/deceleration section when origin return starts and stops.	1~9,999[ms]
Org Method	To select how to return the origin	0~5
Org Dir*1	To select operation direction(CW or CCW)	0~1
Org Offset*1	After origin return is finished, the motor moves additionally as this setting value and then stops.	-134,217,727 ~ 134,217,727
Org Position Set	After origin return is finished, 'Command Pos' value is set to this setting value.	-134,217,727 ~ 134,2177,27
Org Sensor Logic	To set the origin sensor signal level.	0~1

*1 The range differs from the product version, listed as below.
V06.01.**2**x.xx : -134,217,728 ~134,217,727
V06.01.**3**x.xx : - 2,147,483,648 ~ 2,147,483,647

(1) Origin Return method setting
To execute origin return, 'Org Method' parameter should be set as follows.
- Arrow mark is for moving direction in below picture.
- ○ is origin end position in below pic..

(Numbers in ○ mark is indication the sensor Dog position or following example of origin direction.)
- Index Pulse is Z Phase
- Origin return by Z Phase operates normally only when an external encoder is used.
- In the case of origin return by a Z-pulse , after the completion of low speed origin return in 'Org Search Speed' value, Z-pulse origin return (fixed rate) is done twice to complete the return to origin with 10[pps] speed. (Fixed speed)
  (It is method for precise return to Z-pulse origin.)
- When limit sensor is detected, stop by the stop method set in H / W Limit Stop Method (parameter No. 12, E-STOP / Stop) and then execute the remaining homing routine.

1) Origin (In case of Org Method = 0)
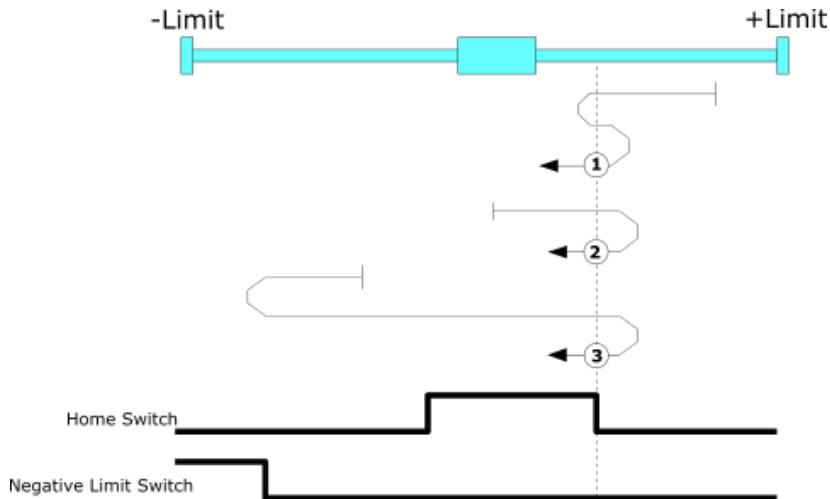
① : In case of position of sensor Dog is between the origin and +Limit Sensor
② : In case of position of sensor Dog is in the origin sensor
③ : In case of position of sensor Dog is between origin and -Limit Sensor

2) Z Origin (In case of Org Method = 1)
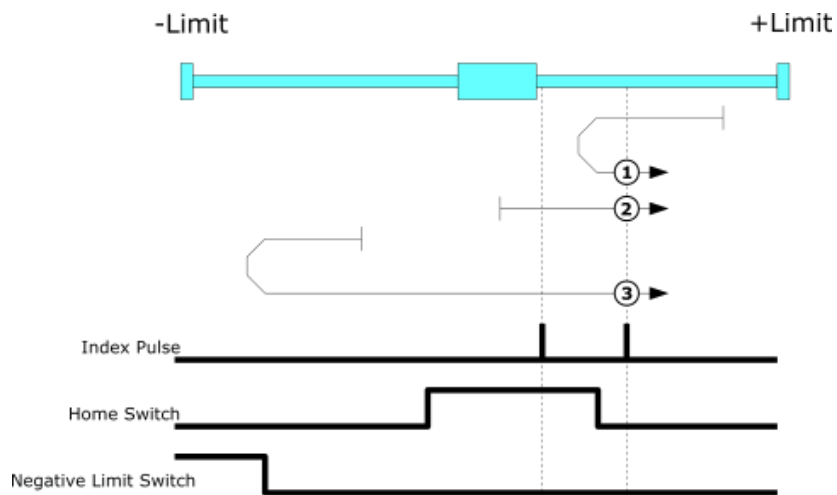
① : In case of position of sensor Dog is between the origin and +Limit Sensor
② : In case of position of sensor Dog is in the origin sensor
③ : In case of position of sensor Dog is between origin and -Limit Sensor

3) Limit Origin (In case of Org Method = 2)
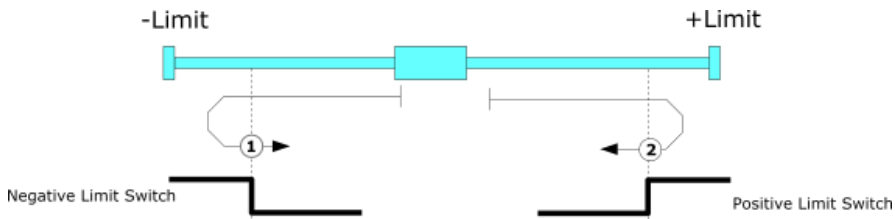
① : In case of Org Dir is 1 (CCW)

② : In case of Org Dir is 0 (CW)
- Home search is completed a the position when Limit Sensor is off

4) Z Limit Origin (In case of Org Method = 3)
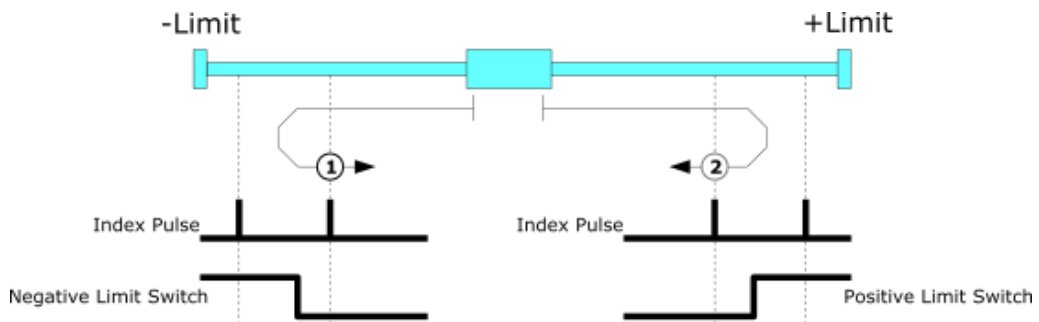
① : In case of Org Dir is 1 (CCW)

② : In case of Org Dir is 0 (CW)

5)Set Origin (In case of Org Method = 4)

It designates current mechanics position as origin irrespective sensor.

6) Z Phase (In case of Org Method = 5)
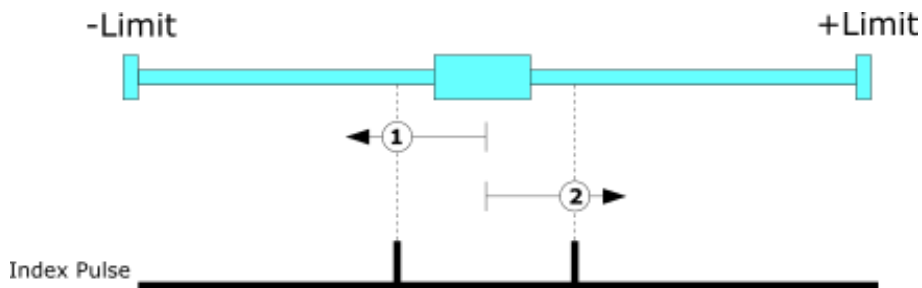
① : In case of Org Dir is 1 (CCW)

② : In case of Org Dir is 0 (CW)

(2) Origin return Procedure

Origin return is executed according to the following procedure.

① Set parameters required to origin return.

② If the STEP is OFF, (reset an alarm when it occurs) input a control input STEP ON command or send a communication program so that the STEP can be ON.

③ Start origin return operation to the rising edge of control input origin search or the communication program.

(3) Interruption of Origin Return

When the machine is under origin return, click 'Stop' or 'E-Stop' to stop the machine. In this case, the machine's origin is not edited and origin return is not completed either.

(4) 'Origin return finish' output

The completion of origin return operation can be decided with related bit values of either 'Origin Search OK' of control output or 'Axis Status' of communication program.

8 - 4 . Stop Operation

By using two methods of control input and communication program command, the user can input stop and emergency stop commands. Even though the emergency stop command is inputted, the STEP will be not OFF. In case emergency stop, the machine stops immediately without deceleration. So, a special caution for mechanical impact is required.

8 - 5 . Trigger Pulse Output

This function is used when the output signal becomes ON periodically in specific condition.

(1) Control Method

This function is working with communication (DLL library) method only.

This command can be executed during the positioning command or before the positioning command also. The following table shows the setting conditions and refers to

「User Manual – Communication Function」.

Setting Item	Description	Range
Start/Stop	Setting start/stop of pulse output.	0~1
Pulse Start Position*1	Setting the start position of first pulse output.	-134,217,728 ~ 134,217,727
Pulse Period*1	Setting the pulse period. (0 : pulse output only 1 time in Pulse start position. 1~ : pulse output repeatedly depends on setting.)	0~134,217,727 [pulse]
Pulse Width	Setting the pulse width.	1~1000[ms]

*1 The parameter range differs from the product version, listed as below.

V06.01.**2**x.xx : -134,217,728 ~134,217,727(Start Position),   0 ~ 134,217,727(Pulse Period)

V06.01.**3**x.xx : - 2,147,483,648 ~ 2,147,483,647(Start Position), 0 ~ 2,147,483,647(Pulse Period)

- Trigger output is output normally when the pulse period is over 2 [ms] (including pulse width)
    Pulse period [ms] = pulse period [pulse] / movement speed [pps] * 1000 (unit conversion constant [s]-> [ms]) + pulse width [ms]
    ex) Pulse period: 100 [pulse], moving speed: 10,000 [pps], pulse width: 1 [ms]
        Pulse period [ms] = 100/10000 * 1000 + 1= 11
- If the start / end is not set to '0' and the move command with the target position is sent, the trigger output will be activated.
- Start / end is automatically set to '0' if a command without a target position is delivered, such as Jog command, after trigger output execution.

(2) Output signal

This output pin of CN1 connector for Trigger Pulse is fixed to 「Compare Out」and the signal diagram is as follows.
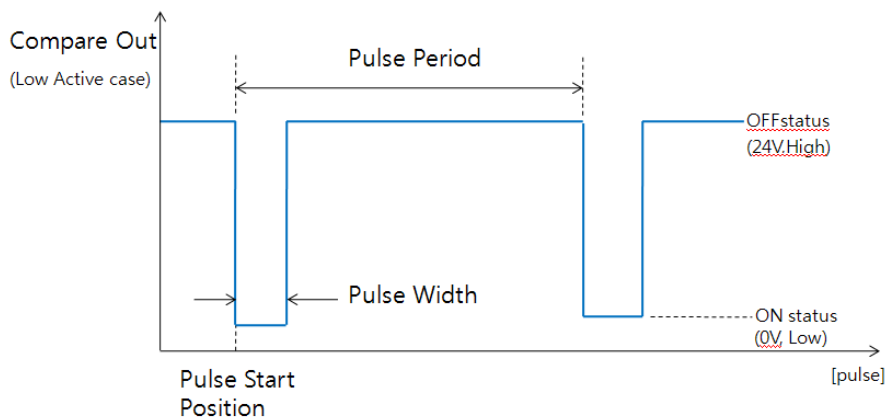
| ⚠ Caution | The pulse is output only in bigger position area than 'pulse starts position 'and is output in both motion directions. |

(3) Output Status Check

By using DLL program, the user can check the trigger pulse output status.
Refer to 「User Manual – Communication Function」.

9 . Communication function

1) It has embedded 2 Port Ethernet switching Hub for daisy-chain connection.
2) Use TCP and UDP protocol.
3) In case of using TCP, drive can be connected at the same time from GUI (Graphical User Interface) and application program (user program).
4) 4) In case of using UDP, you can connect and use the drive at the same time from GUI (Graphical User Interface) and one or more application programs (user programs). However, If you connect more than 2 applications, communication delay may occur.
5) Please refer to 「5.2 System Configuration」 for PC connection example
6) The signal contents of the RJ45 connector of the drive are as follows.
   (Same as general Ethernet 10/100 Base-T)

RJ45 Pin No.	Function
1	TD+
2	TD
3	-
4	-
5	RD+
6	RD-
7	-
8	-
case	Frame GND

7) Basic IP Address : 192.168.0.xxx
   Basic Gateway : 192.168.0.1
   Basic Subnet Mask : 255.255.255.0

１０．**Parameter**

１０‐１．**Parameter List**

No.	Name	Unit	Lower Limit	Upper Limit	Default
0	Pulse Per Revolution		0	15	10
1	Axis Max Speed	[pps]	1	500,000	500,000
2	Axis Start Speed	[pps]	1	35,000	1
3	Axis Acc Time	[msec]	1	9,999	100
4	Axis Dec Time	[msec]	1	9,999	100
5	Speed Override	[%]	1	500	100
6	Jog Speed	[pps]	1	500,000	5,000
7	Jog Start Speed	[pps]	1	35,000	1
8	Jog Acc Dec Time	[msec]	1	9,999	100
9[*2]	S/W Limit Plus Value	[pulse]	-134,217,728	134,217,727	134,217,727
10[*2]	S/W Limit Minus Value	[pulse]	-134,217,728	134,217,727	-134,217,728
11	S/W Limit Stop Method		0	2	2
12	H/W Limit Stop Method		0	1	0
13	Limit Sensor Logic		0	1	0
14	Org Speed	[pps]	1	500,000	5,000
15	Org Search Speed	[pps]	1	50,000	1,000
16	Org Acc Dec Time	[msec]	1	9,999	50
17	Org Method		0	5	0
18	Org Dir		0	1	1
19[*2]	Org OffSet	[pulse]	-134,217,728	134,217,727	0
20[*2]	Org Position Set	[pulse]	-134,217,728	134,217,727	0
21	Org Sensor Logic		0	1	0
22	Motion Dir		0	1	0
23	Limit Sensor Dir		0	1	0
24[*1]	Brake Delay Time	[msec]	10	5,000	200
25	Run Current	*10[%]	5	15	10
26	Boost Current	*50[%]	0	7	0
27	Stop Current	*10[%]	2	10	5
28	Encoder Multiply Value		0	3	0
29	Encoder Dir		0	1	0
30	Jog EXT FUNC USE		0	1	0
31	Jog Speed1	[pps]	1	500,000	5,000
32	Jog Speed2	[pps]	1	500,000	5,000
33	Jog Speed3	[pps]	1	500,000	5,000
34	Jog Speed4	[pps]	1	500,000	5,000

35	Jog Speed5	[pps]	1	500,000	5,000
36	Jog Speed6	[pps]	1	500,000	5,000
37	Jog Speed7	[pps]	1	500,000	5,000
38	Use Motion Queue		0	1	0
39	Disconnection Option		0	4	0
40	Communication Timeout	msec	100	60,000	100
41	Motion Profile		0	1	0
42	ORG RET OK OFF OPTION		0	3	0

*1 In the case of drive for 86[mm] motor, this parameter not be used.

*2 The range of parameter 9, 10, 19, 20 differs from the product version, listed as below.

V06.01.**2**x.xx : -134,217,728 ~134,217,727

V06.01.**3**x.xx : - 2,147,483,648 ~ 2,147,483,647

● Parameter No.30~40 are available from Firmware [ver.6.1.20.16].

● Parameter No.41 and 42 are available from Firmware [ver.6.1.xx.19].

10-2. Parameter Description

No.	Description	Unit	Lower Limit	Upper Limit	Default
0	**Pulse per Revolution :** It means number of pulses per revolution. If this value is changed, the motor is set to STEP OFF.. 	Value	Pulse/Revolution	Value	Pulse/Revolution
---	---	---	---
0	500	8	10,000
1	1,000	9	8,000
2	1,600	10	10,000
3	2,000	11	20,000
4	3,600	12	25,000
5	5,000	13	36,000
6	6,400	14	40,000
7	7,200	15	50,000 | ● Pulse per revolution is not changed when the input signal is 'Step On'.		0	15	10
1	**Axis Max Speed :** When position moving commands (absolute move, incremental move) are given, this mode sets the maximum speed which the motor can operate. So, the motor cannot be operated faster than this value in any case. This value is set to [pps] unit. Upper Limit value has limited by Pulse per resolution value *In case of 10000 : 500,000 In case of 20000 : 1,000,000	pps	1	500,000	500,000
2	**Axis Start Speed :** When position moving commands (absolute move, incremental move) are given, this mode sets the operation start speed to [pps] unit.	pps	1	35,000	1

3	**Axis Acc Time :** When position moving commands (absolute move, incremental move) are given, this mode sets the acceleration section of operation start segment to [msec] unit. Possible range is different from Axis Speed. (Ex.1) Axis Start Speed=1, Move Speed=400000 : 1~1430 [msec] (Ex.2) Axis Start Speed=1, Move Speed=10000 : 1~350 [msec]	msec	1	9,999	100
4	**Axis Dec Time :** When position moving commands (absolute move, incremental move) are given, this mode sets the deceleration section of operation stop segment to [msec] unit. Possible range is different from Axis Speed same as 'Axis Acc Time' parameter	msec	1	9,999	100
5	**Speed Override :** When position moving commands (absolute move, incremental move) are given, the operation speed is subject to the ratio set to 'Move Speed'. (Ex) If current move speed is 10,000 and speed override is 200, actual motion speed is set to 20,000.	%	1	500	100
6	**Jog Speed :** When jog position moving command is given, this mode sets the motor revolution value to [pps] unit.	pps	1	500,000	5,000
7	**Jog Start Speed :** When jog position moving command is given, this mode sets the operation start speed to [pps] unit.	pps	1	35,000	1
8	**Jog Acc Dec Time :** In case of jog operation, this mode sets the time of acceleration and deceleration sections to [msec] unit.	msec	1	9,999	100
9*²	**S/W Limit Plus Value :** When position moving commands (absolute move, incremental move, jog) are given, this move set the maximum input limit value that the motor can move to the plus (+) direction with 28 bits.	pulse	-134,217,728	+134,217,727	+134,217,727
10*²	**S/W Limit Minus Value :** When position moving commands (absolute move, incremental move, jog) are given, this move set the minimum input limit that the motor can move to the minus (-) direction with 28 bits.	pulse	-134,217,728	+134,217,727	-134,217.728
11	**S/W Limit Stop Method :** Sets how to stop the motor by SW Limit Plus/Minus Value', not stop motion by the limit sensor. ◆ 0 : stops the motor immediately by emergency stop mode. ◆ 1 : stops the motor gradually by soft stop mode. ◆ 2 : Do not use S/W Limit.		0	2	0

12	**H/W Limit Stop Method:** In case of stop motion by the limit sensor, this mode sets how to stop the motor. ◆ 0 : stops the motor immediately by emergency stop mode. ◆ 1 : stops the motor gradually by soft stop mode. ● The above stop method is applied even when the limit sensor is detected during Home Search motion		0	1	0
13	**Limit Sensor Logic :** Sets the signal level so that the motor can recognize limit sensor's input to ON. ◆ 0 : 0 V (Active low level) ◆ 1 : 24V(Active high level)		0	1	0
14	**Org Speed :** In case of origin return command, this modes sets the operation speed until the motor senses the origin sensor to [pps] unit	pps	1	500,000	5,000
15	**Org Search Speed :** In case of origin return command, The low operation speed for precise origin return after the motor senses the origin sensor is set to [pps] unit by this mode	pps	1	500,000	1,000
16	**Org Acc Dec Time :** In case of origin return command, the acceleration/deceleration section time of the operation start/stop segment is set to [msec] unit by this mode	msec	1	9,999	50

17	**Org Method :** The user can select origin return command types. ◆ 0 : The motor moves up to the origin sensor spot by 'Org Speed' and then executes precise origin return at the low value of 'Org Search Speed'. ◆ 1 : The motor moves up to the origin sensor spot by 'Org Speed' and then executes Z-pulse origin return at the low value of 'Org Search Speed'. ◆ 2 : The motor moves up to the limit sensor spot by 'Org Speed' and then immediately stops. ◆ 3 : The motor moves up to the limit sensor spot by 'Org Speed' and then executes Z-pulse origin return at the low value of 'Org Search Speed'. ◆ 4 : To set origin in current mechanical position. ◆ 5 : To execute the Z-pulse origin return at the low value of 'Org Search Speed'. 　For more information, refer to '9.3 Origin Return'. 　. ※ In the case of origin return by a Z-pulse , after the completion of low speed origin return in 'Org Search Speed' value, Z-pulse origin return (fixed rate) is done twice to complete the return to origin with 10[pps] speed. (Fixed speed) 　(It is method for precise return to Z-pulse origin.) ※ In case of using Home Return by Z-pulse, be sure to connect external encoder.		0	5	0
18	**Org Dir :** In case of origin return, this mode sets the revolution direction of the motor. ◆ 0 : moves the motor clockwise. ◆ 1 : moves the motor counterclockwise.		0	1	0
9*2	**Org Offset :** After origin return is completed, the motor moves additionally as this setting value and then stops.　'Command Pos/Actual Pos' is set to '0'.	pulse	-134,217,728	+134,217,727	0
10*2	**Org Position Set :** After origin return is completed, 'Command Pos/Actual Pos' value is set to this setting value.	pulse	-134,217,728	+134,217,727	0
21	**Org Sensor Logic :** Sets the origin sensor signal level so that the motor can recognize origin sensor's input to ON. 　◆ 0 : 0 V (low level) ◆ 1 : 24V(high level)		0	1	0

No	Description	Unit	Min	Max	Default
22	**Motion Dir :** When the motor operates by position command, this mode sets the revolution direction of the motor. ◆ 0 : moves the motor clockwise. ◆ 1 : moves the motor counterclockwise.		0	1	0
23	**Limit Sensor Dir :** This is a function to set the direction of the limit sensor to stop during operation to the limit point. In a typical system, set it equal to parameter '28'. ◆ 0 : When operation direction is 'CW', input the sensor signal to the Limit＋ direction, and the motor will stop. ◆ 1 : When operation direction is 'CW', input the sensor signal to the Limit‐ direction, and the motor will stop.		0	1	0
24*1	**Brake Delay Time :** According to the STEP ON command, It can be set the brake operation time.	msec	10	5,000	200

25	**Run Current:**
	Run Current is value of running current during the operating of motor, it is set based on rated current of motor. This value is related with torque in operating of motor, if this value is big, motor torque getting high in operation. So, in case of lack of torque, it can be raising the torque by increasing the run current value.
	
	Precaution)
	  1) To be notified If Run Current value is high, heat temperature can be increasing.
	  2) Maximum set value of Run Current (150%) is limited by 4[A]. So, in case of motor (56,60mm) of rated current value is exceed 2.7[A], set value is not increased as much as set-up, even increasing the set value.
	  3) Run Current is automatically controlled according to load, so please use in case of lacking torque in operation.
		*10[%]	5	15	10

26	**Boost Current :**
	It is the parameter of supplied current to motor to improve for character of acceleration in case of cannot set the acceleration time sufficiently. .
	(it is applied to acceleration .)
	Example of use)
	  1) BM -42XL (Current : 1.2[A])
	  2) Run Current : 10(100[%])
	  3) Boost Current : 1(50[%])
	  4) Control current in case of acceleration :
	      1.2[A]+1.2[A]*50[%] = 1.8[A]
	
	  * The control current is limited by 4[A] same as Run Current case.
	  * In case of motor (56,60mm) of rated current value is exceed
		*50[%]	0	7	0

	2.7[A], set value is not increased as much as set-up, even increasing the set value.					
27	**Stop Current:** Stop Current is meaning of motor current which is automatically set after 0.1 second since motor stop. This parameter is using to decrease the temperature when motor stopped long- time. It also can be increased the motor temperature in case set-up more than 60%.	*10[%]	20	10	5	
28	**Encoder Multiply:** Sets the multiplication for the input of the external encoder. | value	Pulse / rotation | |---|---| | 0 | Do not use | | 1 | *1 | | 2 | *2 | | 3 | *4 |		0	3	3	
29	**Encoder Direction:** Set count direction of encoder. ◆ 0 : CW (Count increases when CW is driven) ◆ 1 : CCW (Count increases when CCW is driven)		0	1	0	
30	**Jog EXT FUNC USE:** It is used to change Jog movement command by input signal to other speed than setting speed in parameter 6. ◆ 0 : Jog Disable speed expansion ◆ 1 : Jog Enable speed expansion In addition, seven speeds can be selected, and the speed selection is determined by the input signals Jog0, Jog1, and Jog2.		0	1	0	

Encoder Multiply table (parameter 28):

value	Pulse / rotation
0	Do not use
1	*1
2	*2
3	*4

Jog speed selection table (parameter 30):

Jog2	Jog1	Jog0	Set speed
OFF	OFF	OFF	6th parameter
OFF	OFF	ON	34th parameter
OFF	ON	OFF	35th parameter
OFF	ON	ON	36th parameter
ON	OFF	OFF	37th parameter

	ON	OFF	ON	38th parameter				
	ON	ON	OFF	39th parameter				
	ON	ON	ON	40th parameter				

※ 1) Only jog speed by input is applied..

2) Since JOG0 ~ JOG2 are used in common with PT5 ~ 7, the number of Position Table can be limited when using the above function..

3) After Jog0 ~ Jog2 is input, it operates normally when Jog move command by signal is input.

31 ~37	**Jog Speed1~Jog Speed7:** Set Jog speed which is extended according to input signal Jog0, Jog1, Jog2.	pps	1	500,000	5000
38	**Use Motion Queue:** If another move command is received before the move command is completed, the current move command is executed and the next move command is executed. ◆ 0 : Motion Queue Use feature ◆ 1 : Motion Queue Feature off (Return error (0x85) if another move is received during the move) ※ Move commands are only available for Incremental / Absolute commands. If more than one command is received, only one is executed and other commands return error.		0	1	0
39	**Disconnection Option Code:** This function is used to stop the movement command when the communication end or communication cable disconnection is issued while the movement command is being executed.. ◆ 0 (None) : Perform move command ◆ 1 (Stop) : Deceleration stop ◆ 2 (E-Stop) : Quick stop ◆ 3 (Stop&STEP Off) : After deceleration stop STEP Off ◆ 4 (E-Stop&STEP Off) : After a quick stop STEP Off ※ Only available when communication is connected via TCP. GUI program connection termination does not apply to the above function.		0	4	0
40	**Communication Timeout:** This parameter sets the timeout time for communication.. ※ If timeout occurs, it executes the function set in parameter 42.	msec	100	60,000	100

41	**Motion Profile:** This parameter sets Motion Acceleration/Deceleration Profile. ◆ 0 : Trapezoid ◆ 1 : S-curve ※ If the acceleration time and deceleration time are different when it is set to S-curve, the deceleration time is considered the same as the acceleration time.		0	1	0

42	**Org Ret OK Flag Off Option**
	Set the condition that the [Org Ret OK] flag of Axis Status becomes off.
	
	◆ 0 : When the [Org Ret OK] flag of Axis Status is On
	      and Origin search is interrupted while searching
	◆ 1 : Same as No. 0
	◆ 2 : When Drive Alarm (Axis Status Err Servo Alarm flag On)
	      occurs (including No. 0)
	◆ 3 : Drive Alarm (Axis Status Err Servo Alarm flag On) occurs
	or Servo off command executed (including No. 0)
			0	3	0

*1 In the case of drive for 86[mm] motor, this parameter not be used.
*2 The range of parameter 9, 10, 19, 20 differs from the product version, listed as below.
   V06.01.**2**x.xx : -134,217,728 ~134,217,727
   V06.01.**3**x.xx : - 2,147,483,648 ~ 2,147,483,647
● Parameter No.30~40 are available from Firmware [ver.6.1.20.16].
● Parameter No.41 and 42 are available from Firmware [ver.6.1.xx.19].

1 1 . Protection Function
1 1 - 1 . Type of Alarm

1) If an alarm occurs during drive operation, the red LED of the status display LED flashes and the LED flashes like the alarm number and the protection function as shown in the following table is activated.

2) After alarm number 15, alarm LED does not flash and alarm number is displayed in 7-segment.

Flash Count	Alarm Name	Description
1	Overcurrent	The current through power devices in inverter exceeds the limit value *1
2	Overspeed	Command speed for motor exceeds 3,300[rpm].
5	Overheat	The internal temperature of the drive exceeds 85℃.
6	Over regenerative voltage	Back-EMF more than limit value. *3
7	Motor connection	The connection of drive and motor is defective.
12	ROM error	Read/Write error on ROM device in drive system.
50	Internal communication	A communication error has occurred between parts in the drive.
51	STEP ON failure	If the STEP ON command fails
60		
201	IP setting error	In case of IP and Gateway set value is same
202	IP conflict	If there are any product that has the same IP address existing on the connected network. (Including other products)

*1 Detection current: 4.5A

1 1 - 2 . Acquiring the alarm information

If an alarm occurs, the motor will go into STEP OFF state and will stop if it is running. At the same time, the control output "Alarm" is output and the alarm number is displayed in the 7-segment for ID Display.

The "Alarm Blink" signal repeats ON / OFF at the timing shown in the figure below. Depending on the type of alarm that is currently occurring, it blinks at the rate of flickering every 0.5 seconds, waits for 2 seconds, and then it outputs repeatedly until the alarm is released by "Alarm Reset" command or signal.

Ex1) Alarm 3 : 'AlarmBlink' display signal occurred when the step-out is occurred

Ex2) Alarm 15 : 7-Segment displays when position error overflow is occurred.
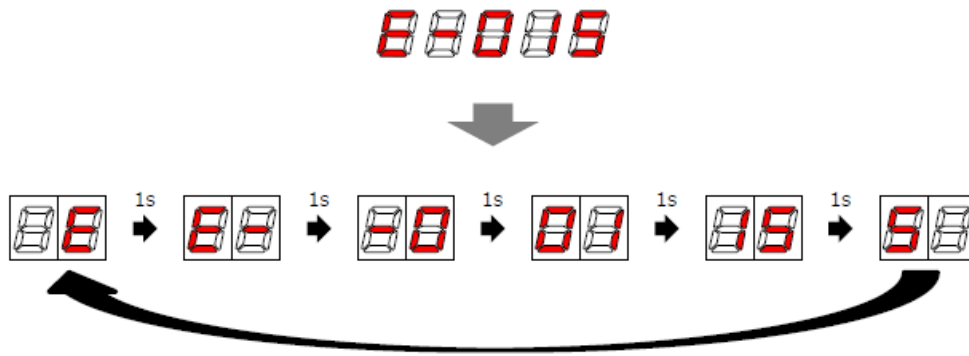
11-3. **Alarm check and Release**

If an alarm occurs, remove its cause and then release it. The alarm can be released as follows.
In case of alarms of which 'Reset 'column is indicated to 'Invalid', power must get down prior
to releasing the alarms

Flash Count	Alarm Name	Description	Reset
1	Overcurrent	1)Check the motor's short-circuit (A, /A, B, /B) 2)Check the mechanical status such as parameter setting.	Valid
2	Overspeed	1)Check parameter setting, and abnormal operation of the motor. 2)Check the speed command of upper controller(ex:PLC).	Valid
5	Overheat	1)Get down the ambient temperature or install a cooling fan. 2)Check the distance is over 50mm between drivers.	Valid
6	Over regeneratived voltage	1)In case of high-speed operation, check if the acceleration or deceleration speed is low.	Valid
7	Motor connection	1)Check the connection status of drive and motor.	Invalid
12	ROM error	1)Contact to distributor.	Invalid
14	Drive voltage error	1)Check if power is supplied to the drive.	Invalid
50	Internal communication	1) Power on the drive again.	Invalid
51,60	STEP ON failure	1) Pass the STEP ON command again. 2) Power on the drive again.	Valid
201	IP setting error	1) Set the last number of IP and Gateway differently. 2) If using the basic IP address, set the IP setting from 2 to 254	Invalid
202	IP conflict	1) IP conflict with other drives (including other products), so check the settings of each drive (including other products).	Invalid

12. **Appendix**

12-1. **Option for Interface Board: Ezi-STEPⅡ Plus-E**

■ Interface Board

All Input & Output signals are connected through the connector CN1.

Type	Item	
Interface Board (Terminal Block)	TB-Plus	

No. of CN1	Signal name	Signal name of TB-Plus	No. of CN1	Signal name	Signal name of TB- Plus
1	Limit+	L+	7	COMP	CO
2	Limit-	L-	8	OUT1	O1
3	Origin	ORG	9	OUT2	O2
4	IN1	I1	10	OUT3	O3
5	IN6	I6	11	OUT4	O4
6	IN7	I7	12	OUT5	O5
14	IN2	I2	13	OUT6	O6
15	IN3	I3	20	OUT7	O7
16	IN4	I4	21	OUT8	O8
17	IN5	I5	22	OUT9	O9
18	IN8	I8	23	Brake+	B+
19	IN9	I9	24	Brake-	B-

■ **Extension cable for Interface Board**

It is used to connect the CN1 terminal block of the drive to the interface board.

Item	Length[m]	Remark
CIFD-S-□□□F	□□□	Normal cable
CIFD-S-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m] , maximum length is 20[m].

The cable connection is 1:1 straight type.

Use	Item	Specification	Maker
Terminal Block connector	Connector	DB-26 male type	
Drive connector(CN1)	Connector Housing	10126-30000VE	3M
	Backshell	10320-52AO-008	3M

12-2. **Option for Motor Drive**

■ I/O connection cable

Available to connect between drive and I/O

Item	Length[m]	Remark
CSVR-S-□□□F	□□□	Normal cable
CSVR-S-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m] , maximum length is 20[m].

Refer to ① of 「5.2 Controller Configuration (1)」

■ Drive power cable

Available to connect between Power and Drive

Item	Length[m]	Remark
CSVO-P-□□□F	□□□	Normal cable
CSVO-P-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m] , maximum length is 2 [m].

Refer to ④ of 「5.2 Controller Configuration (1) (2)」

■ Extension cable for motor
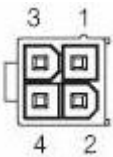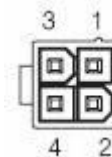
Available to extended connection between motor & Drive

Item	Length[m]	Remark
CSVO-M-□□□F	□□□	Normal cable
CSVO-M-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m] , maximum length is 20[m].

Refer to ③ of 「5.2 Controller Configuration (1)」

※ Wiring Diagram

Drive Connector(CN3)		Cable Connection	Motor Connector	
Pin Layout	Pin No.		Pin No.	Pin Layout
	1		1	
	2		2	
	3		3	
	4		4	

Connector Specification

Item	Specification	Maker
Housing	5557-04R	MOLEX
Terminal	5556T	MOLEX

It is an extension cable to connect between drive for 86[mm] motor and motor.
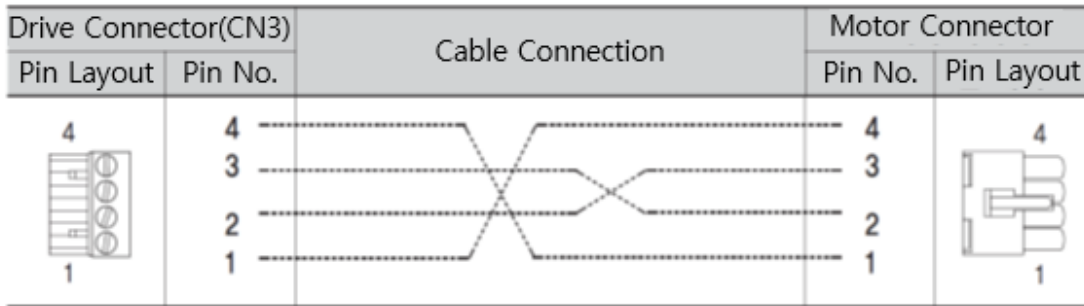
Part Name	Length[m]	Remark
CSVO-M-□□□F	□□□	Normal cable
CSVO-M-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m], maximum length is 20[m].

Refer to ③ of 「4-2 Controller configuration」.

※Wiring Diagram

Connector Specification (Drive for 86mm motor)

Use	ITEM	Specification	Manufacturer
Drive Connector(CN3)	Terminal Block	AK950-4	PTR
Motor Connector	Housing Terminal	3191-4RI 1381T	MOLEX MOLEX

■ Extension cable for Encoder

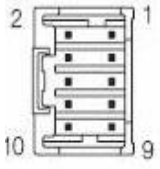Available to extend the distance between the encoder and drive

Item	Length[m]	Remark
CTPR-E-□□□F	□□□	Normal cable
CTPR-E-□□□M	□□□	Robot cable

□ is cable length.

The unit is 1[m] , maximum length is 20[m].

Refer to ② of 「5.2 Controller Configuration (1)」

※ Wiring Diagram

Drive Connector(CN2)		Cable Connection	Motor shaft open
Pin Layout	Pin No.		
	1	----------------------------	
	2	----------------------------	
	3	----------------------------	
	4	----------------------------	
	5	----------------------------	
	6	----------------------------	
	7	----------------------------	
	8	----------------------------	
	9	----------------------------	

Connector Specification

Type	Item	Specification	Maker
Drive Connector (CN2)	Housing	51353-1000	MOLEX
	Terminal	56134-9000	MOLEX

■ Ethernet Cable for : Ezi-STEPⅡ Plus-E

Use STP (Shielded Twisted Pair) cable (CAT5E)

Item	Length[m]	Remark
CGNR-EC-□□□F	□□□	Normal cable

□ is cable length.

The unit is 1[m] , maximum length is 100[m].

Refer to ⑤ of 「5.2 Controller Configuration (1)」

■ Connector for cabling

Connector specification to connect the drive.

| Use		ITEM	Specification	Manufacturer
Power connection(CN4)		Housing	5557-02R	MOLEX
		Terminal	5556T	MOLEX
		Terminal Block[*1]	AK950-2	PTR
Motor Connection	Drive (CN3)	Housing	5557-04R	MOLEX
		Terminal	5556T	MOLEX
		Terminal Block[*1]	AK950-4	PTR
	Motor	Housing	5557-04R	MOLEX
		Terminal	5556T	MOLEX
		Housing[*1]	3191-4RI	MOLEX
		Terminal[*1]	1381T	MOLEX
Encoder Connection	Drive (CN2)	Housing	51353-1000	MOLEX
		Terminal	56134-9000	MOLEX
I/O connection (CN1)		Connector	10126-3000VE	3M
		Backshell	10326-52AO-008	3M

*1 Drive for 86[mm] motor.

※ The above connectors are suitable to Ezi-STEPⅡ Plus-E. Equivalent or alternative items can be used.
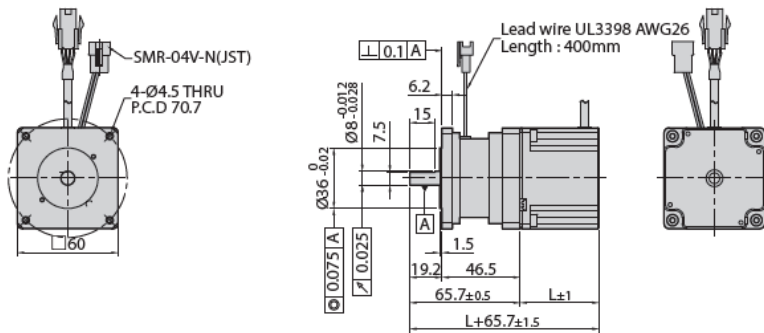
1 2 - 3 . Brake Installed Motor Specification and Size
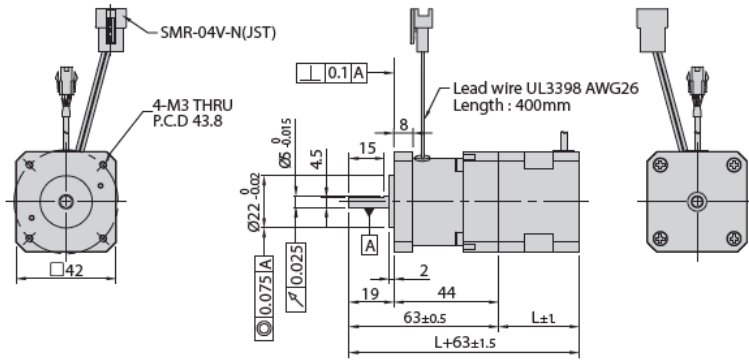
42mm

Model Name	Length(L)	Weight(kg)
BM-42S	34	0.50
BM-42M	40	0.56
BM-42L	48	0.63
BM-42XL	60	0.77
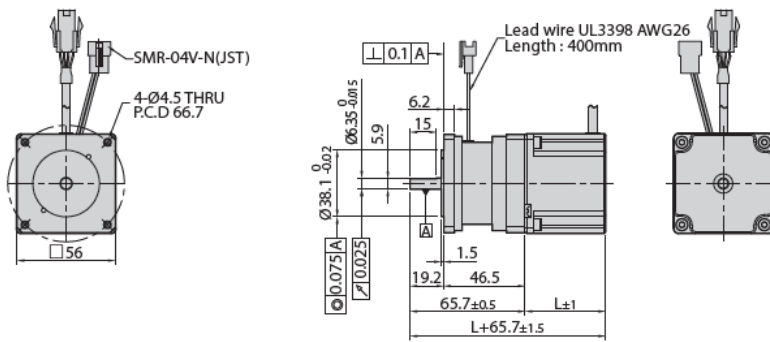
56mm

Model Name	Length(L)	Weight(kg)
BM-56S	46	0.97
BM-56M	55	1.15
BM-56L	80	1.58

60mm

Model Name	Length(L)	Weight(kg)
BM-60S	47	1.06
BM-60M	56	1.23
BM-60L	85	1.79
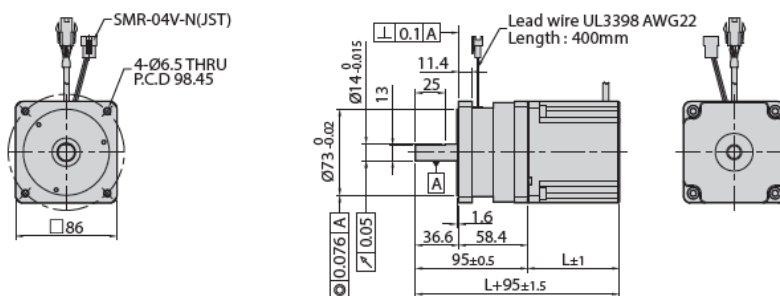
86mm

Model Name	Length(L)	Weight(kg)
BM-86M	78	3.58
BM-86L	117	5.11
BM-86XL	155	6.63

FASTECH Co., Ltd.

Rm#1202, 401-dong, Bucheon Techno-Park,
655, Pyeongcheon-ro, Bucheon-si Gyeonggi-do,
Republic of Korea (Zip:14502)
TEL : +82-32-234-6300 FAX : +82-32-234-6302
E-mail : fastech@fastech.co.kr
Homepage : www.fastech.co.kr

- It is prohibited to unauthorized or reproduced in whole or in part described in the User's Guide
- If you need a user manual to the loss or damage, etc., please contact us or your nearest distributor.
- User manual are subject to change without notice to improve the product or quantitative changes in specifications and user's manual.
- Ezi-STEPⅡ Plus-E is registered trademark of FASTECH Co., Ltd in the national registration

ⓒ Copyright 2016 FASTECH Co.,Ltd. Mar 25, 2021 Rev.03