UNIMOTION

Manual

Closed Loop Stepping System Manual

STDF EN - Ethernet

TABLE OF CONTENTS

1 BEFORE OPERATION

Thank you for purchasing our STDF EN products.

STDF EN is a high-performance 32-bit ARM chip embedded Full Digital position control stepping driving unit.

This manual describes the handling, maintenance, repair diagnosis and troubleshooting of STDF EN.

Before starting to operate with STDF EN, thoroughly read this manual.

After reading this manual, keep the manual near the STDF EN, so that any user can read this manual whenever needed.

1.1 Precautions

1.1.1 Safety Precaution

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

Attention	If user does not properly handle the products, the user may get seriously or slightly injured, and 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 an Attention, a serious result could be caused depending on the situation. Follow safety precaution.

1.1.2 Check the Product

Attention	**Check if the product is damaged or that the parts are missing.** Otherwise, the machine may get damaged or the user may get injured.

1.1.3 Installation

Attention	**Please carry the STDF EN 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 STDF EN is to be installed,** Otherwise, a fire may occur. **When installing several STDF EN 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.

1.1.4 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 STDF EN is installed from the ground of the internal circuit by the condenser, please Ground the STDF EN,** Otherwise, an electric shock or a file may occur and a cause of malfunction of machine.

1.1.5 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 OFF before supply input voltage to STDF EN 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.

1.1.6 Check and Repair

Warning	**Stop to supply power to the main circuit and wait a sufficient time before checking or repairing this STDF EN.** Electricity remaining in the condenser may cause 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 STDF EN.** Otherwise, an electric shock may occur or the product and machine get damaged. And the reconstructed product cannot get after service.

1.2 Note on Installation

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

2) If the temperature of the case is 50 °C 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 20 mm or more vertically and 50 mm or more horizontally at least.

2 SPECIFICATIONS OF THE DRIVE

2.1 Characteristic Table

Table 2-1: Characteristics table of the STDF-EN

Input Voltage	24 V DC +/- 10 %	
Control Method	Closed-loop control with ARM based 32 bit MCU	
Multi Axes Drive	Max. 254 axes operating (Selectable IP: 1-255)	
Position Table	It is possible to design 256 of Motion Step. (Speed, External Start, Jump, Loop, Wait and PT finish etc.)	
Current consumption	Max 500 mA (Except the motor current)	
Operating condition	Ambient Temperature	In Use: 0 ~ 50 °C In Storage: -20 ~ 70 °C
	Humidity	In Use: 35 ~ 85 % RH (Non-condensing) In Storage: 10 ~ 90 % RH (Non-condensing)
	Vib. Resist	0.5 G
Function	Resolution [ppr]	500, 1000, 1600, 2000, 3600, 5000, 6400, 7200, 10000 (Resolution can be selected by parameter)
	Protection functions	Over Current, Over Speed, Position tracking error, Overload, Over temperature, Regenerative voltage error, Motor connect error, Encoder connect error, Encoder connect error, Motor voltage error, Imposition error, ROM error, Position overflow error
	LED Display	Power status, In-Position status, Servo On status, Alarm status
	In-position selection	0-63 (Selectable by parameter)
	Position Gain selection	0-63 (Selectable by parameter)
	Rotational Direction	CW/CCW (Selectable by parameter)
	RUN current[1]	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
	STOP current[1]	20 % - 100 % (Selectable by parameter)
I/O Signal	Input signal	3 dedicated input (LIMIT+, LIMIT-, ORIGIN),

	Output signal	1 dedicated output (Compare Out), 9 programmable output (Photocoupler), Brake signal
Communication function	Ethernet TCP, UDP communication with PC Dual port Ethernet switch embedded Communication Speed: 10/100 base – T/TX Full duplex DHCP function embedded	
Return to Origin	Origin Sensor, Z phase +/- Limit sensor, Torque	
GUI	User Interface Program for Windows	
Library	Motion Library (DLL) for Windows XP/Vista/7/8/10	

[1]Default factory setting value is 50 %.

2.2 Dimensions

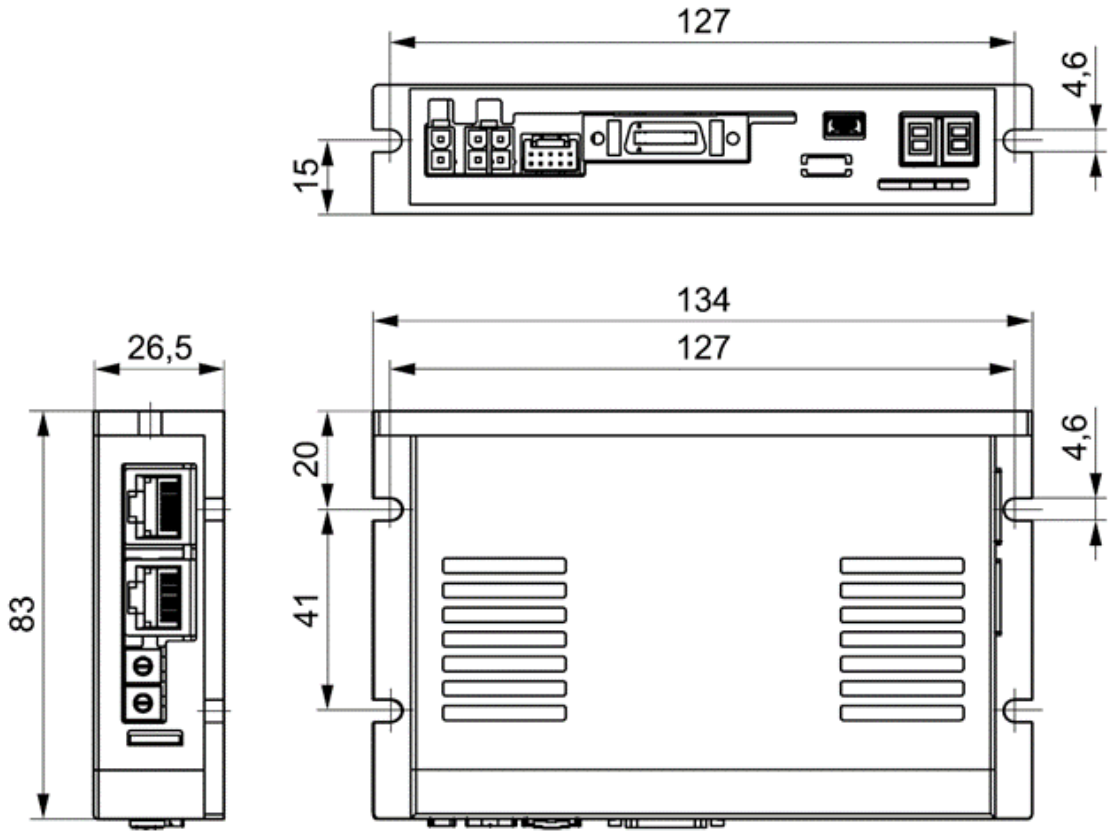


Figure 2-1: Dimensions of the Drive

3 CONFIGURATION

3.1 Motor and Drive Combination

3.1.1 STDF EN part numbering

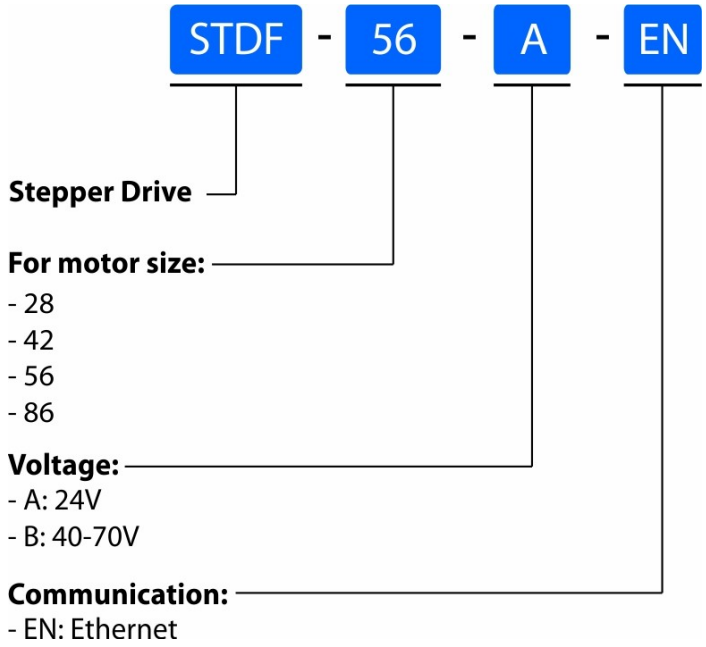


Figure 3-1: Model Naming

3.2 Brake Operation Timing Chart

The Brake is automatically controlled by STDF EN Drive.

Please refer to below Timing Chart when control brake from upper controller other than using STDF EN brake control.

Otherwise, drive malfunction to happen or loads can fall down.

Also, please do not operate brake while the motor operation to prevent damage.

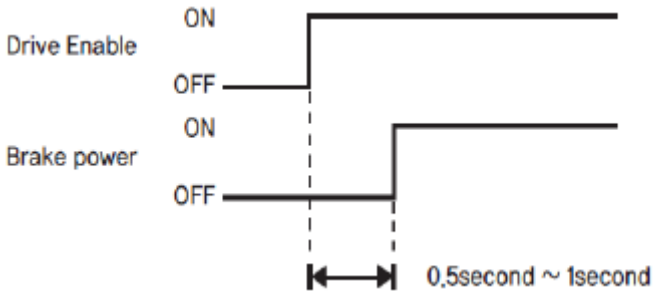


Figure 3-2: Brake response

3.3 Controller configuration (only for motor sizes 42 and 56)

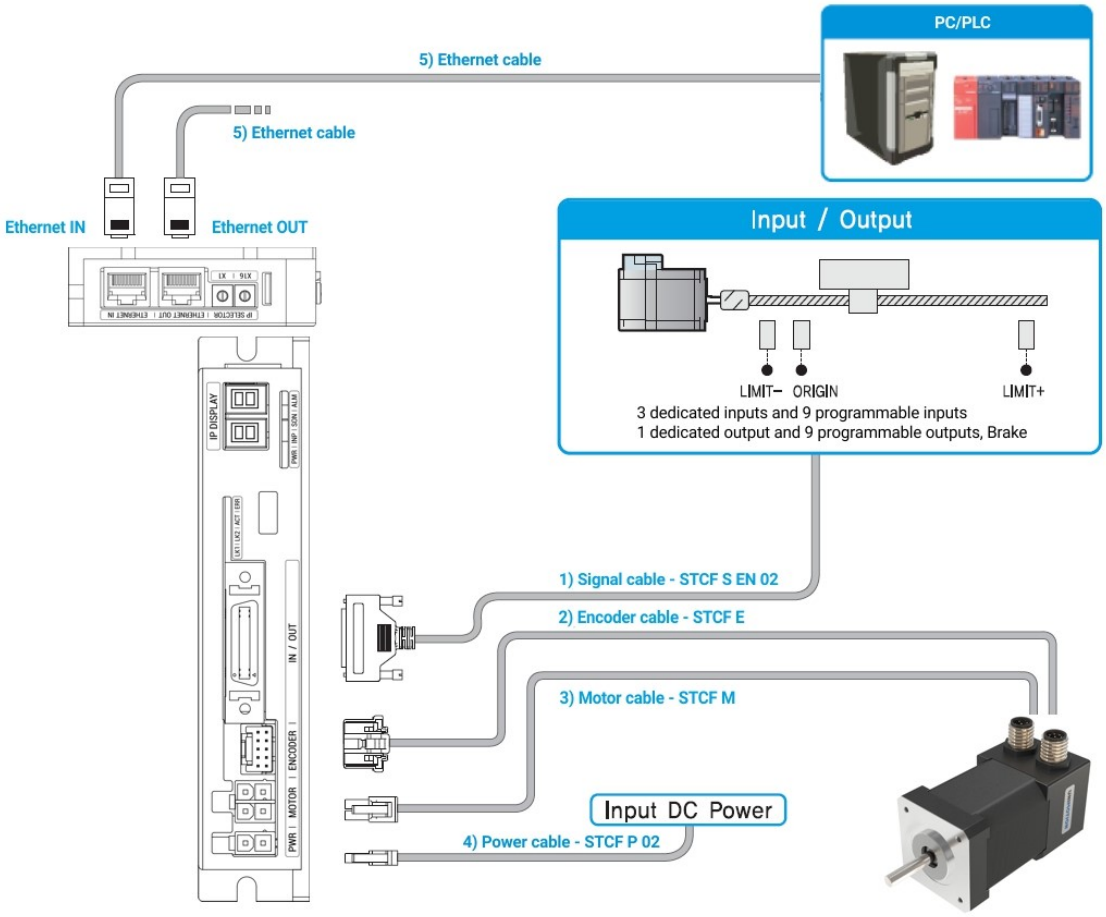


Figure 3-3: System Configuration Diagram of the STDF EN

3.4 External Wiring Diagram

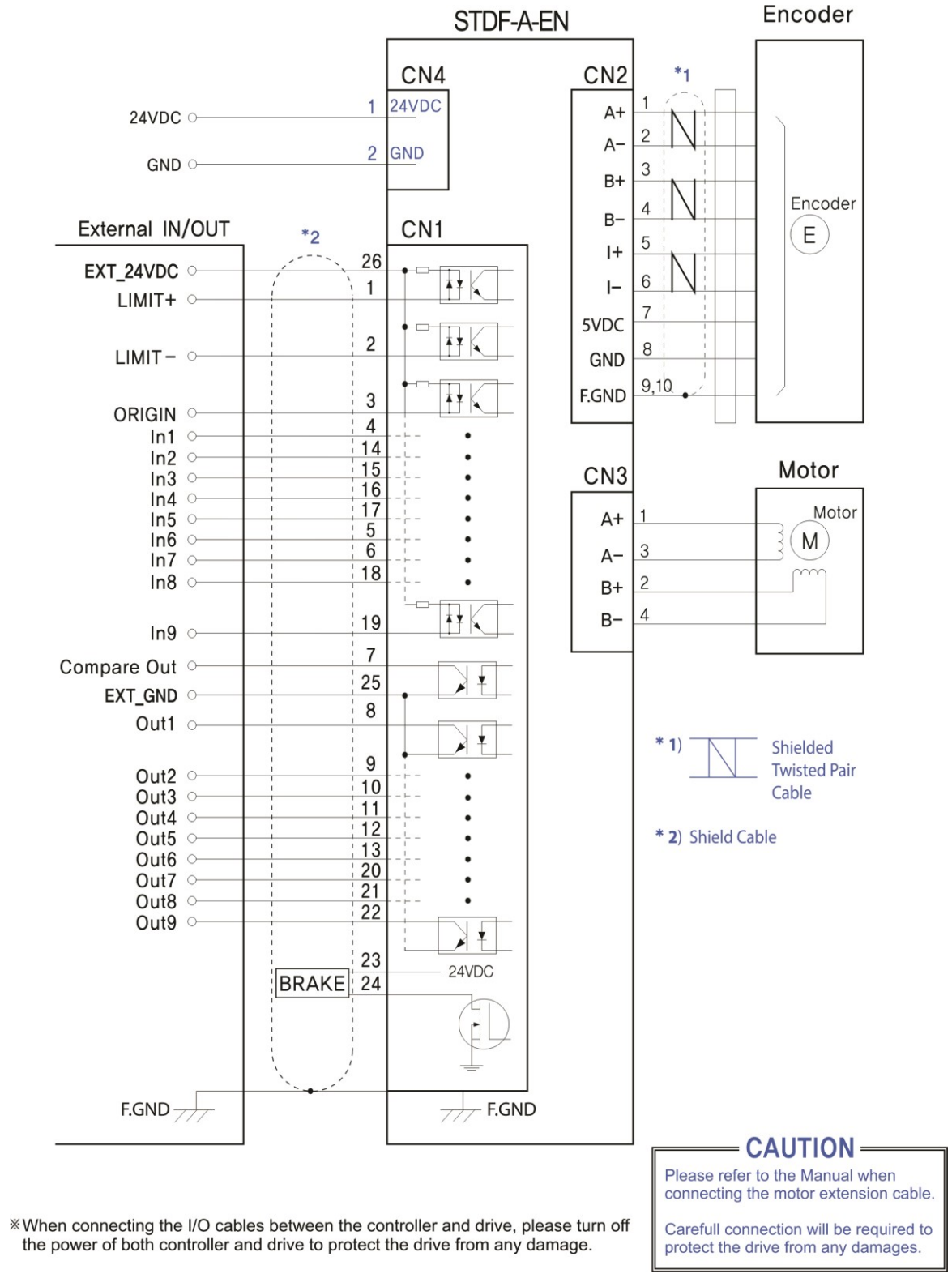


Figure 3-4: External Wiring Diagram of STDF A EN

4 EXTERNAL NAME AND FUNCTION SETTING OF THE STDF EN

4.1 Appearance and Part name

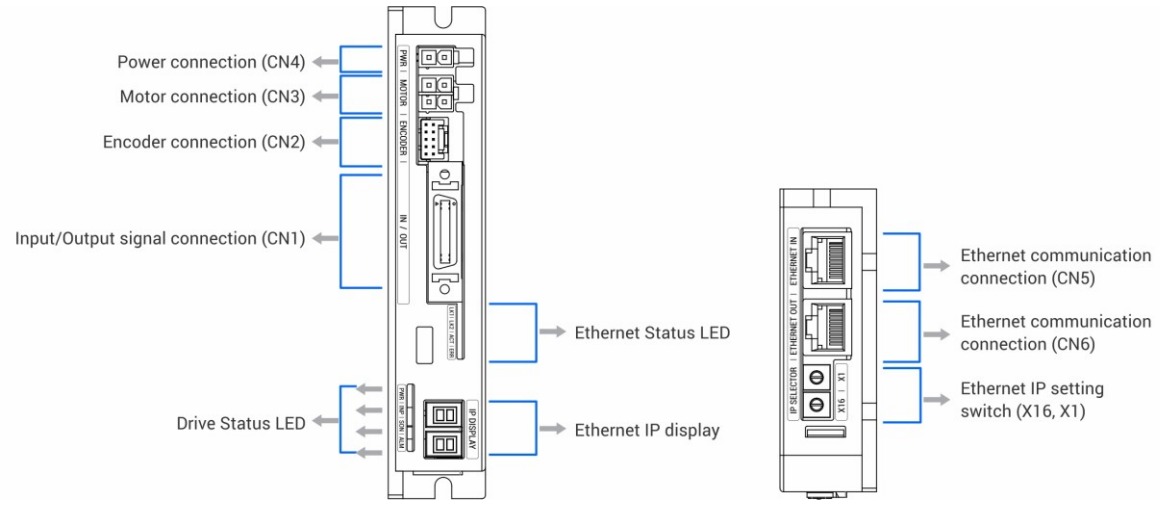


Figure 4-1: Appearance of STDF A EN

4.2 Drive Status LED

Table 4-1: LED indication meaning

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power Input indication	Light on when power is applied.
INP	Yellow	In – position signal indication	Light on when position command pulse input and then position deviation is within the parameter setting value.
SON	Orange	Servo On Indication	Servo On : Light On, Servo Off: 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.)

4.3 Ethernet IP Display

1) It displays the setting IO of X1, X16 (Drive ID Selection Switch).

2) If change 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 the Alarm is generated 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)

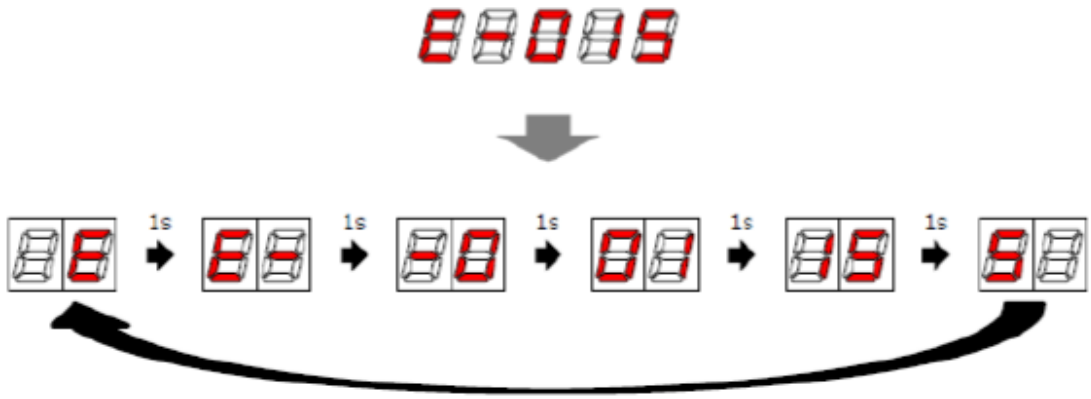


Figure 4-2: Error value indication (ex: E015)

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.

4.4 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.

Table 4-2: Ethernet LED status.

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

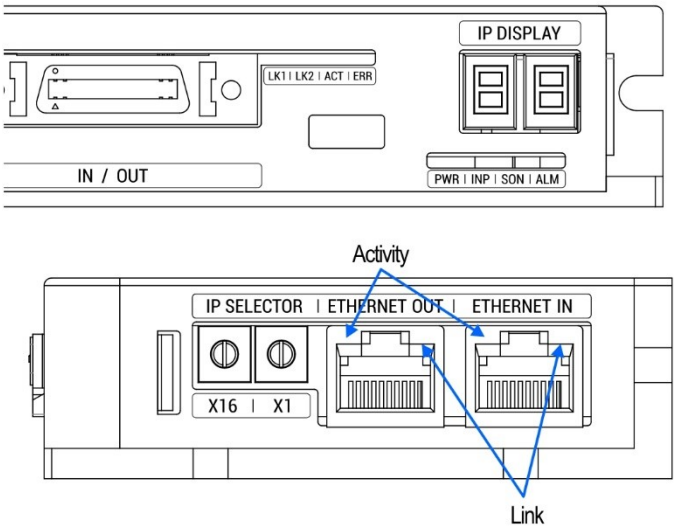


Figure 4-3: Ethernet status LED.

4.5 IP Address selection switch (X1, X16)

1) It can be set from 1 to 254. Please set IP without overlapping.

- "0", "255" cannot be used for IP setting. Be sure to set it to "1~254".
- The default Gateway is 192.168.0.1. When the switch is set to "1", change Gateway. Refer to the *STDF EN Workspace Manual, 2.4. Board List* 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: X1: 2, X16: 0)

2) Basic set is “192.168.0.xxx”, and xxx are set by switch.

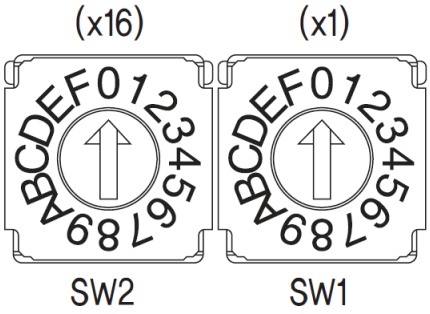


Figure 4-4: IP setting switch.

Ex.) In case of X1: 9, X16: 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 set automatically.

Because it uses DHCP, IP address is set automatically only when using a router.

(Connect the Ethernet to Ethernet IN connector)

- When connecting directly to the controller (PC/PLC), it needs 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 STDF EN Workspace, save the IP address and turn off the power and set the last 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

4.6 Motor Connector (CN3)

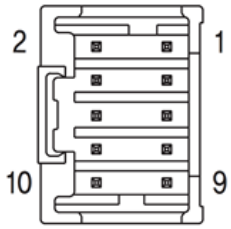
Table 4-3: Motor connector signals.

No.	Function
1	A+
2	B+
3	A-
4	B-

4.7 Encoder Connector (CN2)

Table 4-4: Encoder connector signals.

No.	Function
1	A+
2	A-
3	B+
4	B-
5	Z+
6	Z-
7	5 VDC
8	5 VDC GND
9	Frame GND
10	Frame GND



4.8 Power Connector (CN4)

Table 4-5: Power connector signals.

No.	Function
1	24 VDC ±10%
2	GND

4.9 I/O Signal Connector (CN1)

Table 4-6: Signal connector signals.

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)

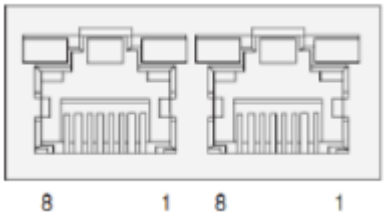
9	Digital Out2 (Programmable output)	22	Digital Out9 (Programmable output)
10	Digital Out3 (Programmable output)	23	Brake +24 V (Output)
11	Digital Out4 (Programmable output)	24	Control signal for Brake (Output)
12	Digital Out5 (Programmable output)	25	GND external (Input)
13	Digital Out6 (Programmable output)	26	+24 V external (Input)
This connector's fixing pin is connected to the frame GND through a mount hole.			

The programmable input/output pin is set by using the STDF EN Workspace program or DLL library.

4.10 **Ethernet connector**

Table 4-7: Ethernet connector signals.

No.	**Function**
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-
Connector hood	F. G.



5 CONTROL I/O SIGNAL

5.1 Signal cabling

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

Input: Limit+, Limit-, Origin signals are fixed to each assigned No.

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

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

Table 5-1: Signal cabling input signals.

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 Position Table A0 ~ Position Table A7 (PT A0 ~ PT A7) Position Table start execution (PT Start) Soft Stop (Stop) Jog+, Jog- Alarm Reset, Servo ON Pause, Origin Search, Teaching Emergency Stop (E-Stop) Jump Position Table input 0 ~ Jump Position Table input 2 (JPT IN 0 ~ JPT IN 2) Jump Position Table start (JPT Start) User input 0 ~ User input 8 (User IN 0 ~ User IN 8) Jog0 ~ Jog2
14	IN2	
15	IN3	
16	IN4	
17	IN5	
5	IN6	
6	IN7	
18	IN8	
19	IN9	

Output: COMP signal is fixed on each assigned No. Other signals like In-position

use OUT1 ~ OUT9.

1 dedicated Output + 9 programmable Output = total 10 Output pins

Table 5-2: Signal cabling output signals.

No.	Function	No.
7	COMP	Specific output signal (Compare Out)
8	OUT1	InPosition, Alarm, Moving Acc/Dec ACK, END OriginSearchOK ServoReady Brake Position Table output 0 ~ Position Table output 2
9	OUT2	
10	OUT3	
11	OUT4	
12	OUT5	
13	OUT6	
20	OUT7	

21	OUT8	(PT OUT 0 ~ PT OUT 2) User Output 0 ~ User Output 8
22	OUT9	

5.2 Connection circuit

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

5.2.1 Input Circuit

Input circuit power of 24 VDC ± 10% (consumed current: about 5 mA/circuit) should be separately prepared.

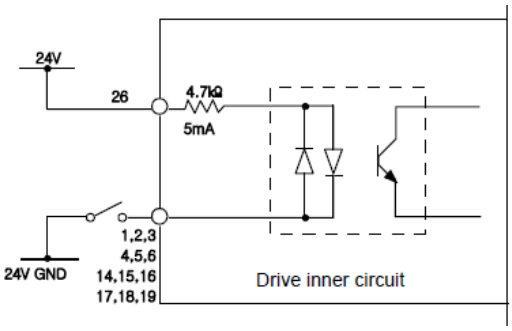


Figure 5-1: Input circuit.

Connect NPN type Input signal

Connect the '+24V external' pin of drive to '+24 V' of Controller.

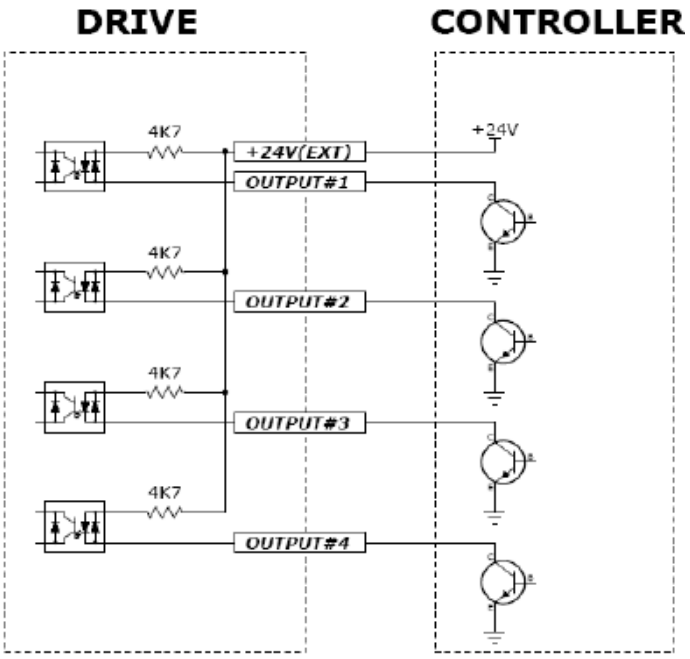


Figure 5-2: Connecting diagram for NPN type input signal.

Connect PNP type Input signal

Connect the '+24 V external' pin of drive to 'GND' of Controller.

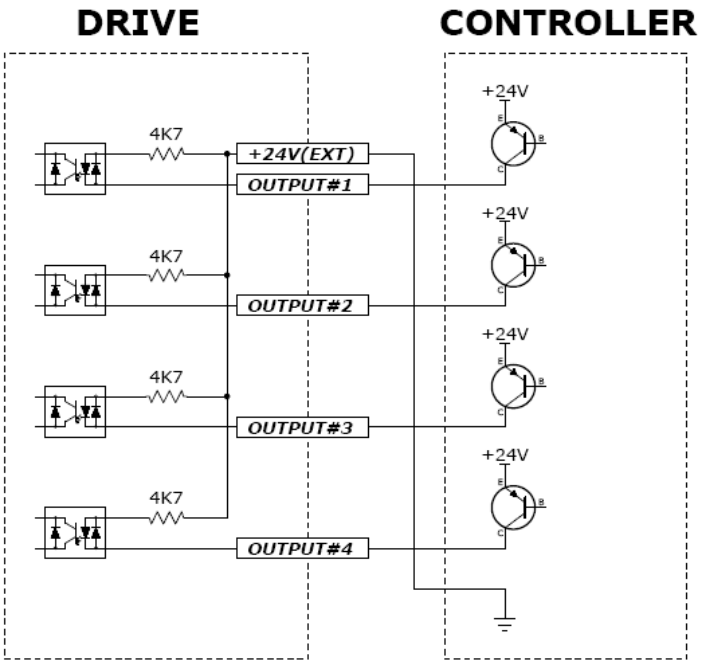


Figure 5-3: Connecting diagram for PNP type input signal.

5.2.2 Output Circuit

Output circuit power should be separately prepared. This may share input circuit power. In this case, power capacity should add output power capacity to input power capacity. Applied voltage and power capacity in the control output port are as fol lows.

Applied voltage ≤ 30 V

Electrified current ≤ 15 mA

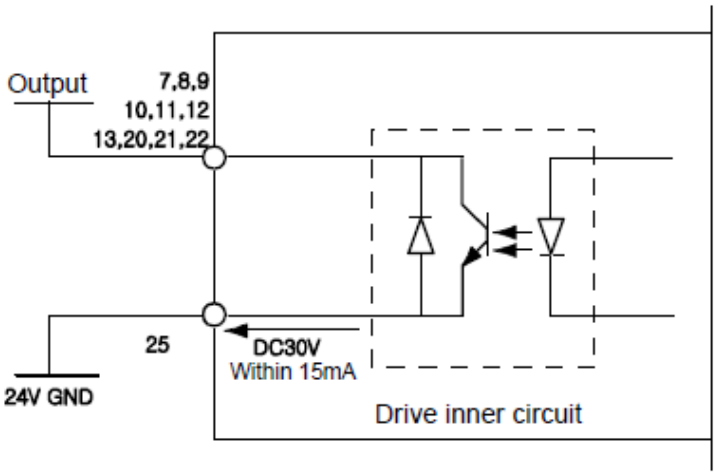


Figure 5-4: Output circuit.

5.3 Input signal

5.3.1 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.

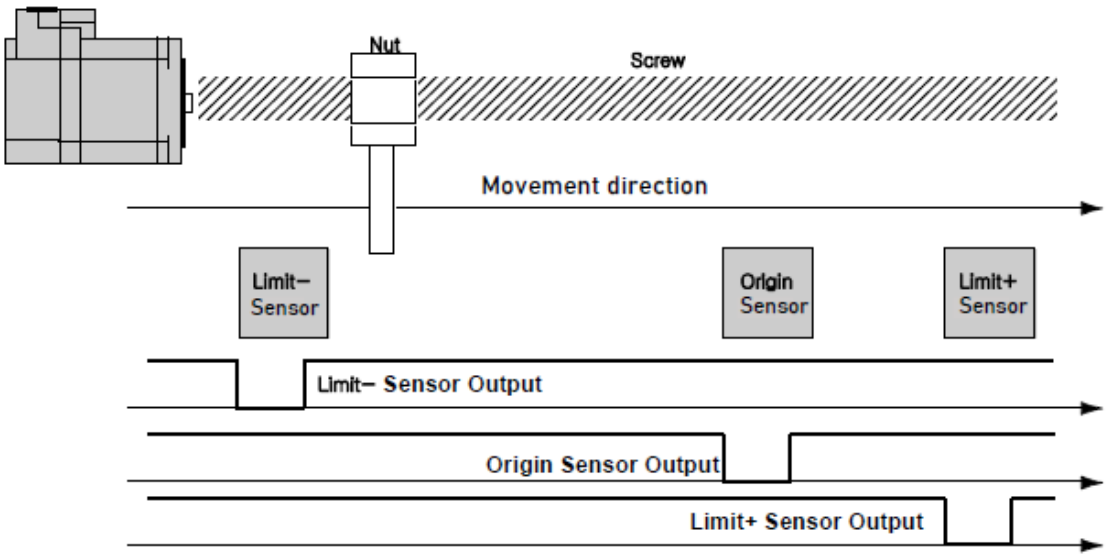


Figure 5-5: Limit and Origin sensor signals.

5.3.2 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 10 ms or more.

Figure 5-6: Position signal from the rising/falling edge.

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

5.3.3 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 the 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 Servo ready through the PLC.

Position Table A0 ~ A7 Inputs are total of 8 bits of input signal. It is used to set 256 position table numbers (Command step). 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 LSB (least significant bit) and A7 is MSB (most significant bit). The following table shows how to assign position table number.

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

Table 5-3: Position table values.

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

*1. PT A5/UserIN 6' 'PT A6/UserIN 7' 'PT A7/UserIN 8' signal setting:

This signal can be used as 'PT A5 ~ A7' when PT function is used, and also can be used as 'User IN6 ~ IN8' signal when the input signal 'User IN0 ~ IN5' is not enough.

5.4 Position Table start (PT Start) Input

If set and input the running start number at the same time by using PT A0 ~ A7 signals, 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.

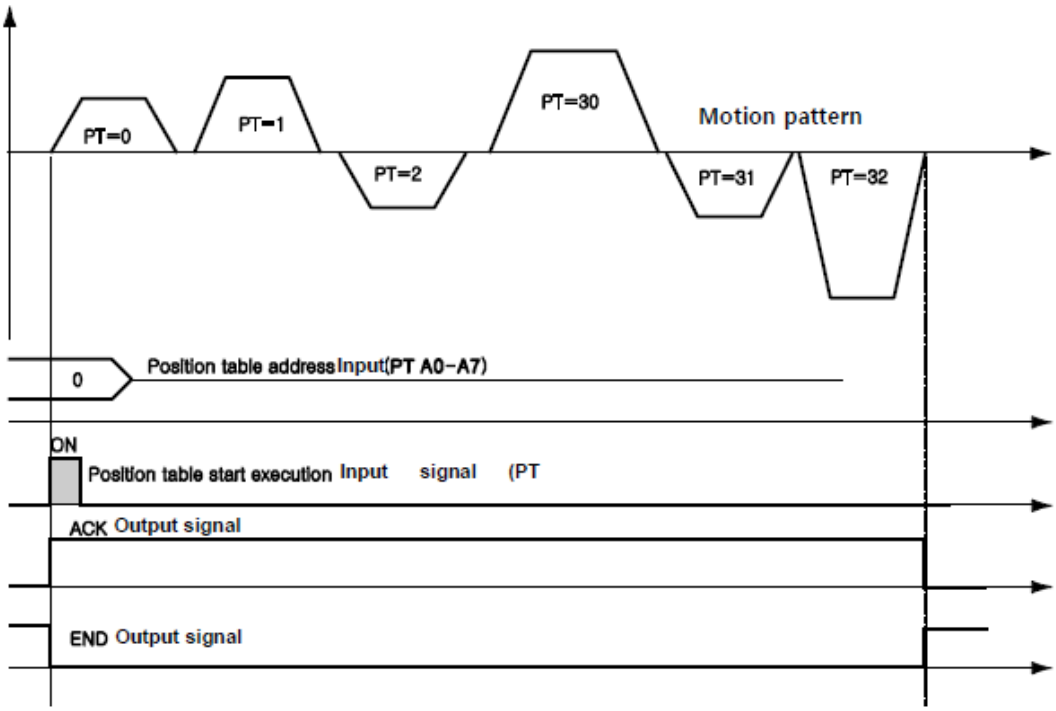


Figure 5-7: Position table input signals 1.

*1. Order of signal: 'PT A0 ~ A7' signals must be set over 50 ms before 'PT Start' signal to be [ON].
*2. Save signal cabling : If it starts 'PT Start without designating 'PT A0~A7' signals, Start PT number set to be '0'.
*3. In case of using 'PT Start' command sequentially, Before executing the next 'PT Start' command check motion status ('Moving' signal and 'In-position' signal).

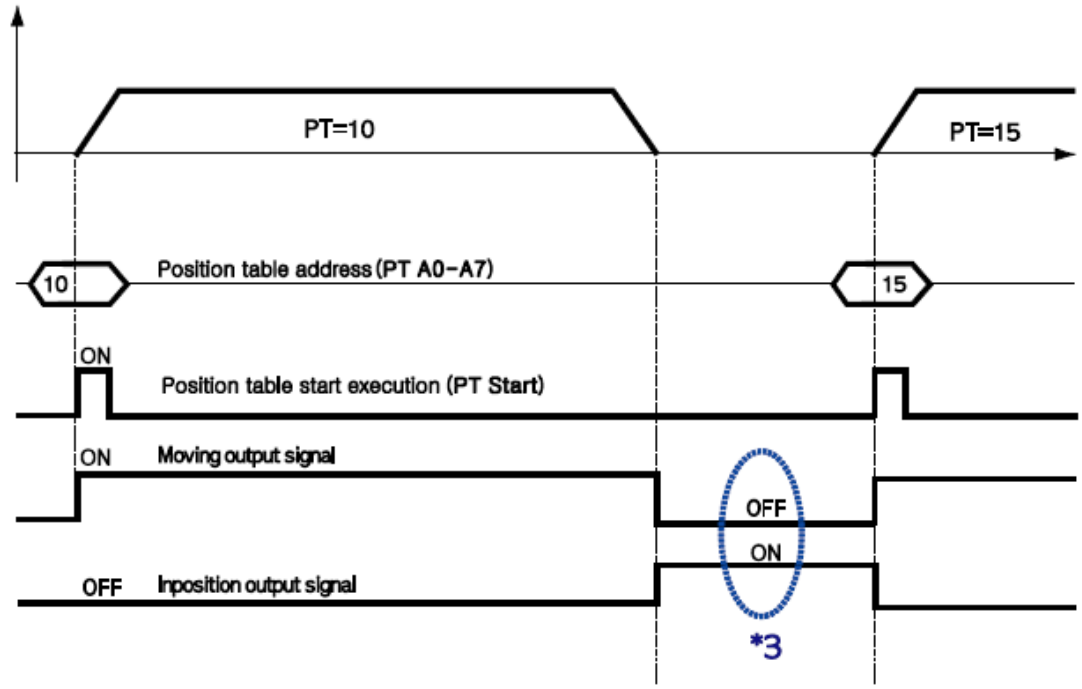


Figure 5-8: Position table input signals 2.

5.5 Stop Input

Stop (Soft) input signal is to stop motion patterns under operation. The deceleration condition until stop follows deceleration time value and start speed value which is set existing. Stop signal is recognized as ON status level, pulse width must be over 10ms.

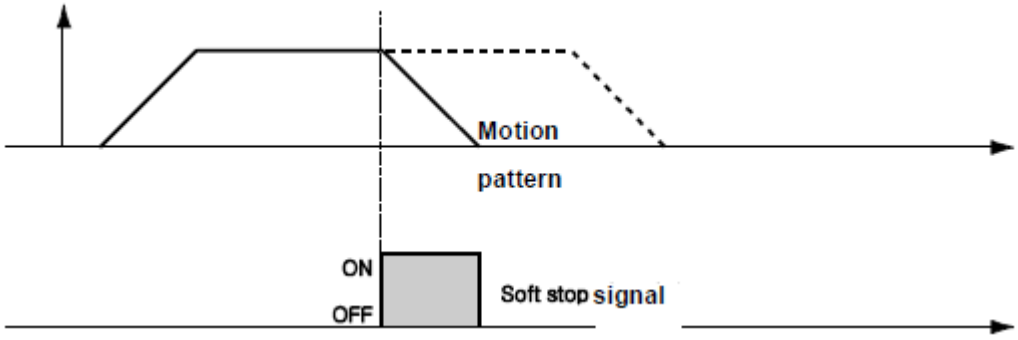


Figure 5-9: Stop input signal.

5.6 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).

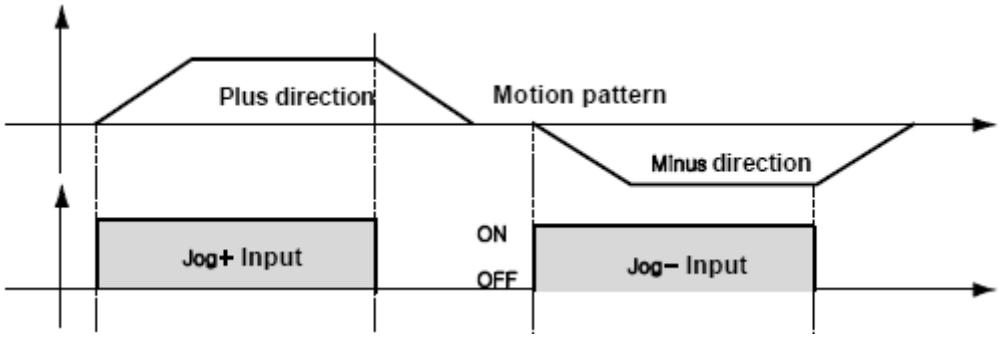


Figure 5-10: Jog+ and Jog- input signals.

5.7 Servo ON and Alarm Reset Input

When the protective function of drive executes, alarm output is released. When Alarm Reset 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 Servo 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 Servo 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 to be Servo ON status, CN1 connector's Servo Ready output signal is set to [ON].

If the Servo ON command is assigned to control input, Servo ON command from STDF EN Workspace program or DLL library will not executed.

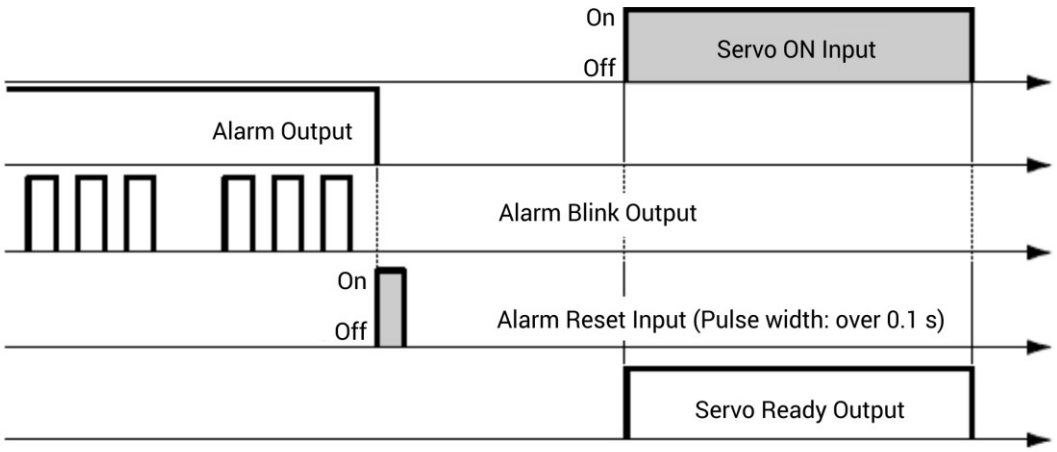


Figure 5-11: Servo ON and alarm reset input signals.

*1. In Step On status by an input signal, No.0 : Pulse per Revolution among the Parameter List is not changed.

*2. At the status which set 'Servo On' at input signal, Servo On command is not executed at the STDF EN Workspace program. Also, 'FAS_ServoEnable' command of DLL program does not execute.

*3. After 'ServoON' is executed, the Command Position value of user program (STDF EN Workspace program) will be changed as same as Actual Position value.

5.8 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 10 ms or more.

5.9 Origin Search Input

When Origin Search signal is set to [ON] (10 ms 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 Acc/Dec Time, No. 21: Org Dir. (For more information, refer to '9 - Parameter').

When the origin search command is completed, Origin Search OK signal is set to [ON] to CN1 connector's output port.

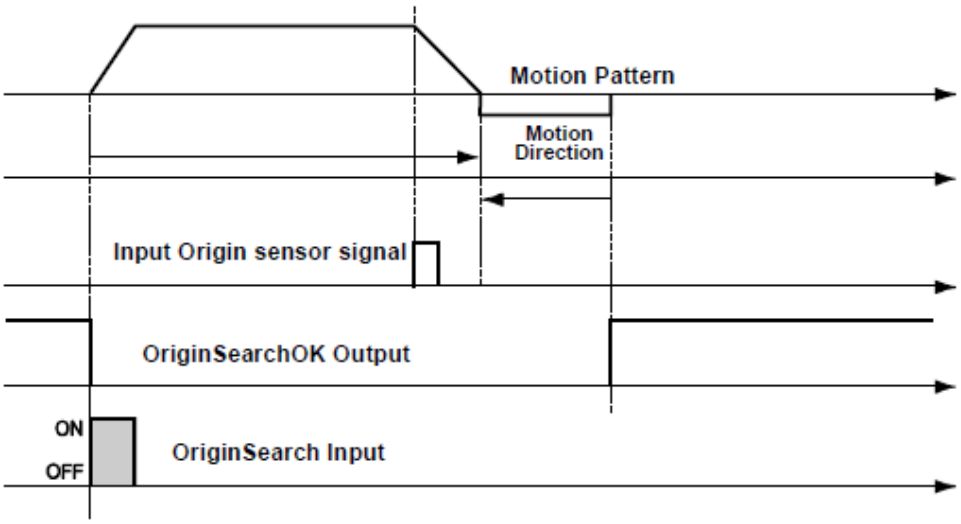


Figure 5-12: Origin search input signals.

5.10 **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. This is a function to easily measure and specify the position when it is difficult to mechanically obtain the exact actual moving position (position value) of a specific motion.

1) By using User Program (STDF EN Workspace program), set a 'Command' type of corresponding PT number among absolute position value moving command (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) Pulse width of Teaching signal is over 10 ms.

*1. After executing Teaching, click 'Refresh' icon on Teaching Dialog window to display written position value on position table.

*2. Click 'Save to ROM' icon to save written position value in the ROM area.

*3. Teaching signal can be used by two methods; the user assigns actual signal to the motor, or the user clicks 'Teaching' icon at the 'I/O Monitoring' window of User Program (STDF EN Workspace program).

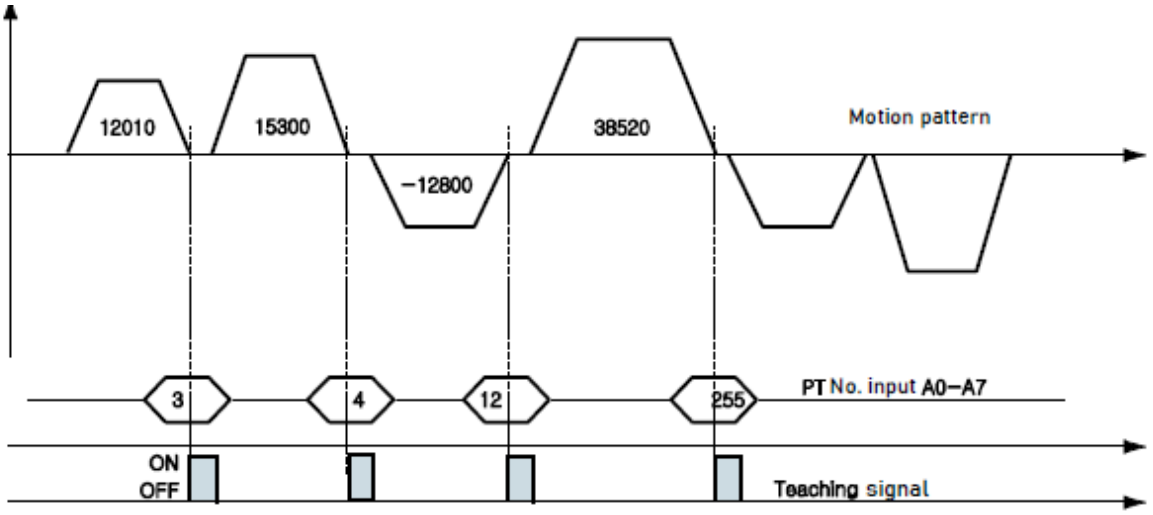


Figure 5-13: Teaching input signals.

Table 5-4: Position values of specific motions.

PT No.	Position Value of Corresponding PT [pulse]
3	12010
4	15300
12	-12800
255	38520

5.11 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 width is 10 ms or more.

5.12 JPT Input0 ~ Input2 (Jump Position Table Input) Input

This function selects the motion pattern (position table number) to be executed next according to the condition of the input signal.

(Example) If there is no other input signal when PT 14 motion is running, the next motion PT15 like 1) will be executed. However, if the input signal of JPT Input 0 to Input 2 becomes [ON] while PT No. 14 is in operation, the designated position numbers are executed as shown in 2) to 4).

Table 5-5: Jump position table values.

PT No.	...	JP Table No.	JPT 0	JPT 1	JPT 2
14	...	15	115	116	225

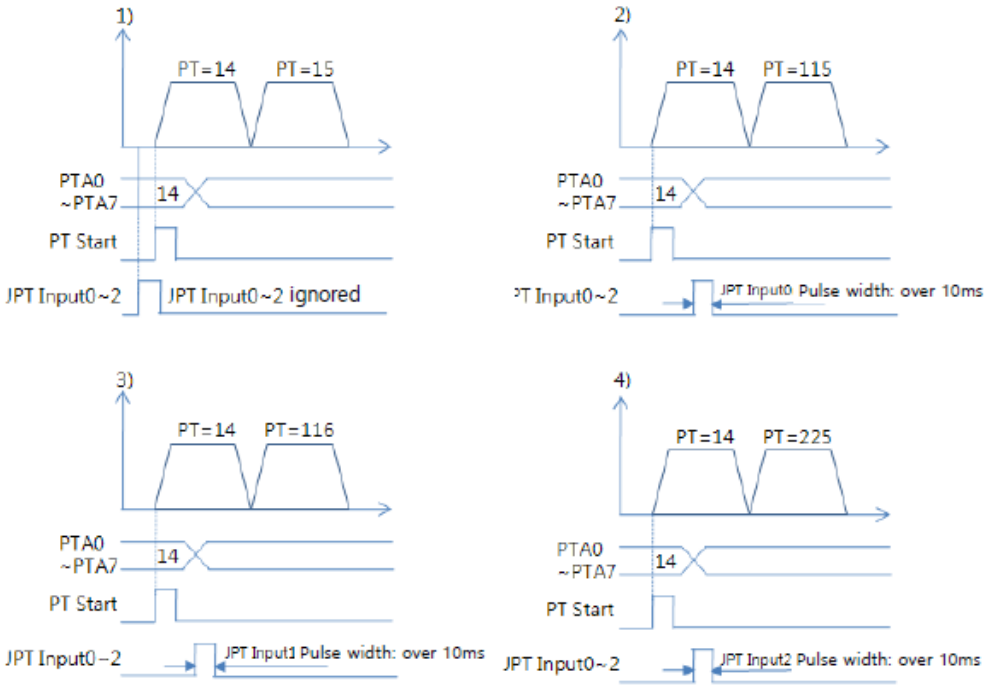


Figure 5-14: Jump position table signals.

5.13 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 'Figure 5-14' JPT Input0 ~ Input2 Input is:

1) PT number to be jumped must be composed to 1 0 XXX

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)

Table 5-6: Jump position table values.

PT No.	…	Wait Time	JP Table No	JPT 0	JPT 1	JPT 2
14	…	500	10015	10115	10116	10255

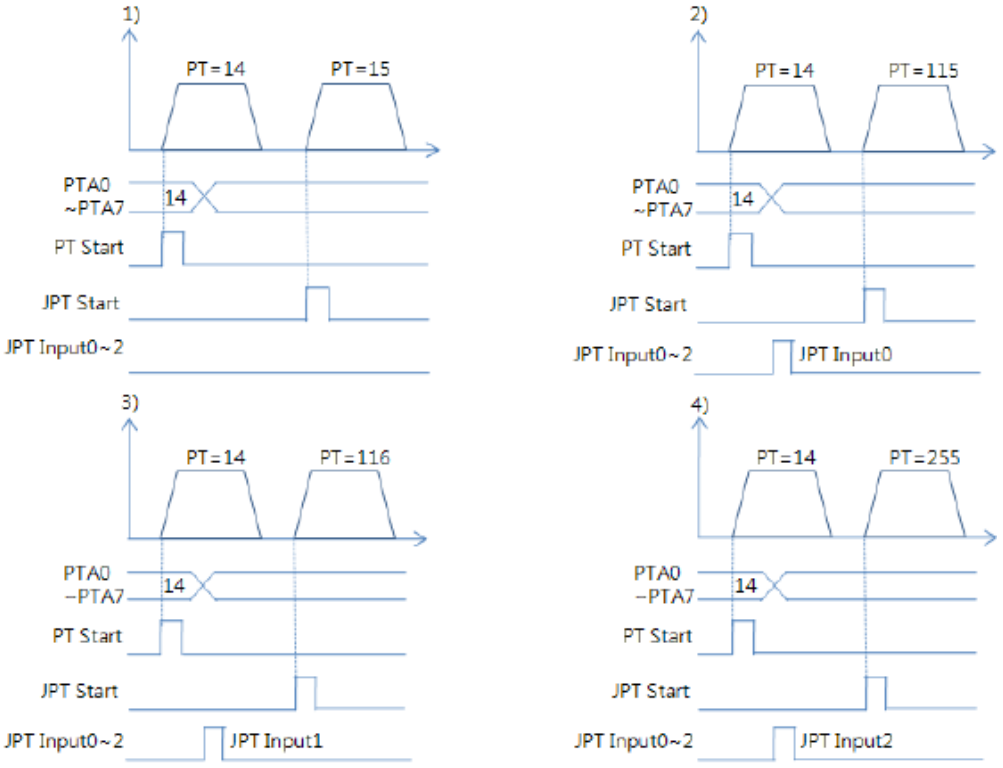


Figure 5-15: Jump position table signals.

5.14 Output signal

5.14.1 Compare Out/Trigger Pulse 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.

(For more information, refer to '7-5. Trigger Pulse Output')

5.14.2 In-position Output

After the motor stop in target position exactly on Servo ON status, the signal becomes [ON]. The condition of this signal depends on parameter 'Position Loop Gain' and 'In-pos Value'.

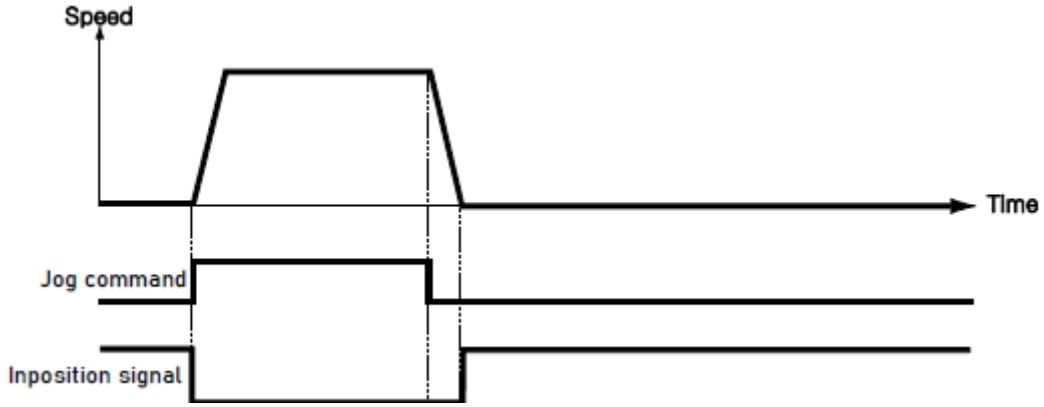


Figure 5-16: In-position output signal.

* Time delay of Output signal depends on the parameter 'Inpos' Value:

Value	Mode	Description
0 ~ 63	Fast mode	Output the signal within 1 ms after the motor stop in target position.
64 ~ 127	Accurate mode	Output the signal within 100 ms after the motor stop in target position. (The step is needed to check find exact positioning)

5.14.3 Alarm

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.

5.14.4 PT ACK and 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] and if all of motion loops are finished, 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 STDF EN Workspace Manual – 6. Position Table Function

5.14.5 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.

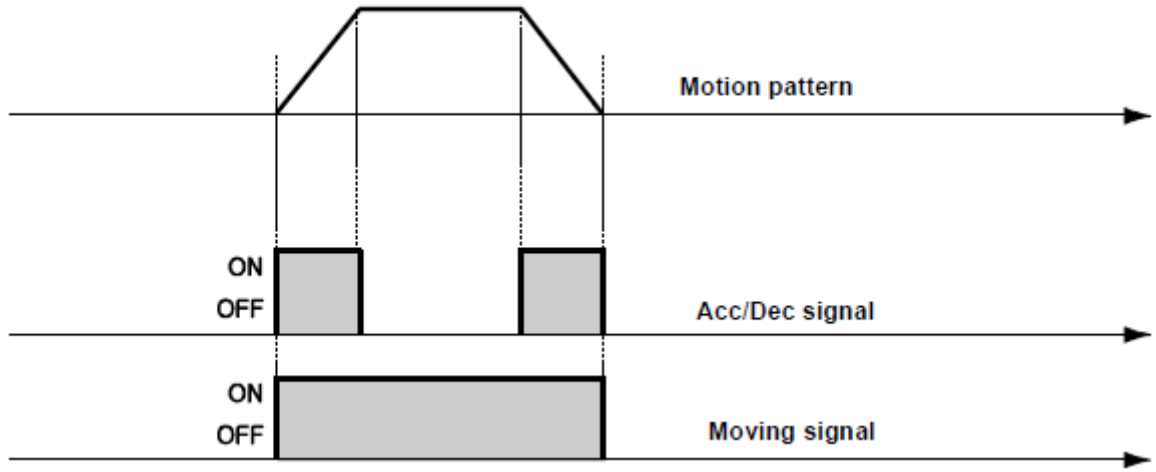


Figure 5-17: Movement and Acc/Dec signals.

* Moving signal is not related to actual position. The signal becomes to [OFF] just after the 'position command' is finished.

5.14.6 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 5.3 - Input signal and 5.9 - Origin Search Input.

5.14.7 Servo Ready Output

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

Refer to 5.3 - Input signal and 5.7 - Servo ON and Alarm Reset Input.

5.14.8 PT (Position Table) Output 0~2 Output

It is 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 (PT Output 0 ~ 2). If Start/Stop Message Function is not used, 'PT Set' item of position table should be set to 0 ~ 8. At the position set with other values, the motion operates as follows.

- In case that PT Set items are set to '1 ~ 7', if the position starts to move, 'PT set' setting value is outputted as [PT Output 0 ~ PT Output 2], the value of PT Output Hex is outputted.
- In case that PT Set items are set to '9 ~ 15', after completed the position movement, 'PT set' setting value is outputted as [PT Output 0 ~ PT Output 2], the value of PT Output Hex is outputted.

For more information, refer to STDF Table Function EN Workspace Manual – 6.3 - Position.

5.14.9 BRAKE+ and BRAKE-

This brake function is used to protect a motor rotation in Servo OFF status by using pin 23 and pin 24 of CN1. 'BRAKE+' is +24 V which supplied to the brake, 'BRAKE-' is an output signal for real brake control.

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

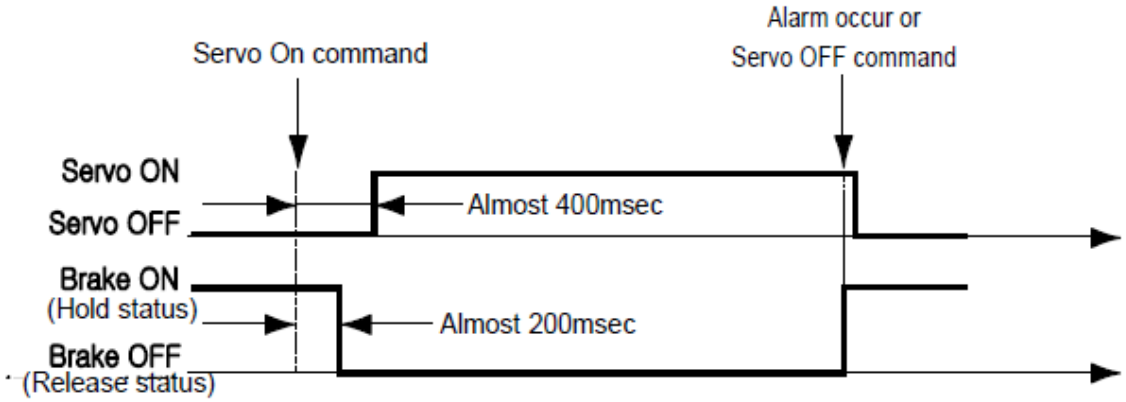


Figure 5-18: Brake +/- signaling.

6 OPERATION

6.1 Power Supply Timing

The power supply of STDF EN 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 STDF EN after power supply is Servo OFF.

6.2 Servo ON Operation

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

- Click SERVO ON button at the STDF Workspace program.
- Give a command through communication by using DLL library.
- Assign Servo ON to control input pin, and supply signal through the pin.

After Servo ON command is given, In-position is finished to the time as shown below.

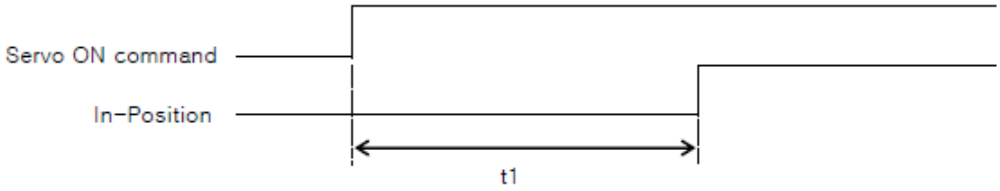


Figure 6-1: Servo ON signal.

t1 can be different subject to the rising time of supplying power and motor status.

If the Servo ON signal is assigned to control input, Servo ON command from STDF EN Workspace program or DLL Library will not be executed.

6.3 Operation Mode

This drive can do three control operations such as I/O command, communication command (DLL program), and STDF EN Workspace program.

6.3.1 I/O Command Mode

This drive can execute control operations 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.

6.3.2 Communication Command Mode

This drive can execute control operations like in position by communication command from the upper controller. Also, it can operate using a position table among communication commands.

6.3.2.1 Position Table Operation Sequence

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

- By using PT A0 ~ PT A7 input signal or DLL program, set PT number to be operated.
- In case of Servo OFF, set the drive to Servo ON by communication program or Servo ON control input.
- Start to operate by rising edge of PT Start input signal or communication program.

6.3.2.2 Stopping Continuous Operation of Position Table

When the motor is executing continuous operation of position table with STDF EN, it can stop executing position table by following methods.

- To use DLL program or control input signal corresponding to Stop and E-Stop. In this case, operation is finished and is not connected to next operation.
- The user can click Pause at STDF EN Workspace program to temporarily stop operating. In this case, click Pause again, and remaining operation will be executed again.

6.3.2.3 Position control operation

To operate the motor by parameters set by STDF EN Workspace program 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	Description	Range
Axis Max Speed	Constant operation speed after acceleration is finished.	1 ~ 2.500.000 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 ~ 9999 ms
Axis Dec Time	Required time until the motor reaches from the axis max speed to the stop status.	1 ~ 9999 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 depends on this value.	0 ~ 15

6.3.2.4 Teaching Function

Teaching can be executed by STDF EN Workspace program and control input signal.

For more information, refer to STDF EN Workspace Manual - 6. Position Table Function.

7 OTHER OPERATION FUNCTIONS

7.1 Position Table (PT) operation Example

Set PT number by 'PT A0 ~ PT A7' input and start speed control operation inputting 'PT Start' signal. For more information, refer to STDF EN Workspace Manual - 6. Position Table Function.

Table 7-1: Position table settings.

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	-

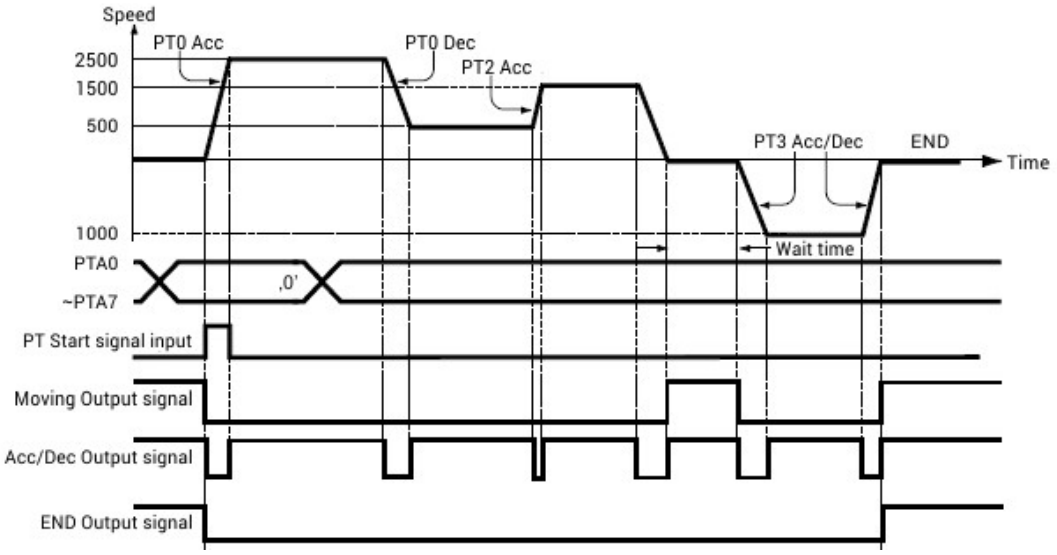


Figure 7-1: Position Table operation example signals.

7.2 Jog operation Example

It starts speed control operation using a parameter condition by Jog+, Jog- signal input.

Table 7-2: Jog operation parameter settings.

No.	Parameter Name	Setting Value	Unit
6	Jog Speed	1500	[pps]
7	Jog Start Speed	100	[pps]
8	Jog Acc Dec Time	200	[ms]

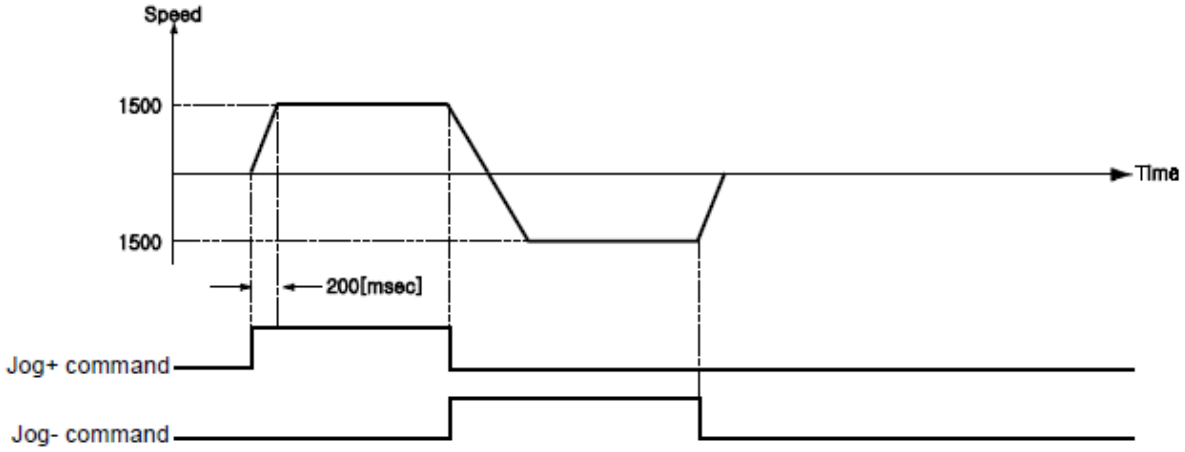


Figure 7-2: Jog operation signals 1.

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.

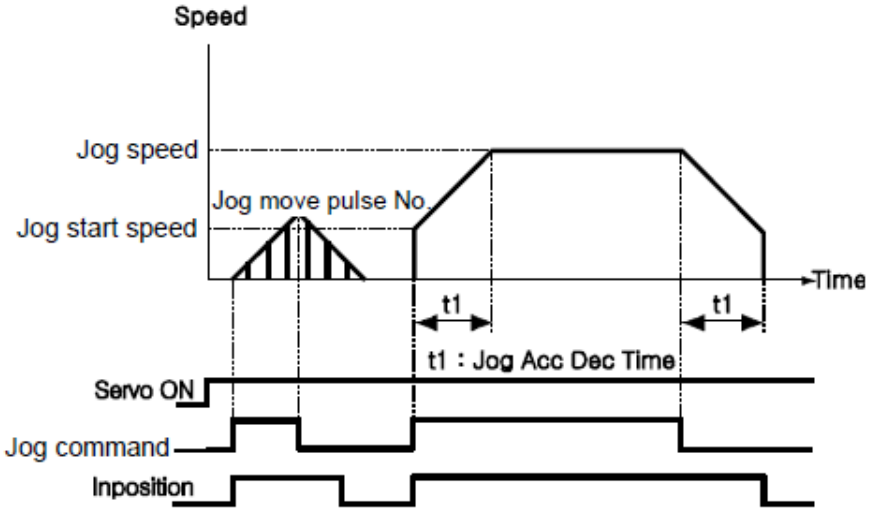


Figure 7-3: Jog operation signals 2.

7.3 Origin Return

If a machine operates as I/O command mode, it can execute origin return by inputting Origin Search signal. Also, it can execute origin return by a command from STDF EN Workspace program or DLL program.

The following table shows parameter types related to origin return.

Table 7-3: Origin return parameters.

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 ~ 9999 ms
Org Method	To select how to return the origin (8 types).	0 ~ 7
Org Dir	To select operation direction (CW or CCW).	0 ~ 1
Org Offset	After origin return is finished, the motor moves additionally as this setting value and then stops.	-134.217.728 ~ 134.217.727
Org Position Set	After origin return is finished, 'Command Pos' value is set to this setting value.	-134,217,728~ 134,217,727
Org Sensor Logic	To set the origin sensor signal level.	0 ~ 1
Org Torque Ratio	To set the torque ratio during Torque origin method.	10 ~ 100 %

7.3.1 (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 picture (Numbers in ○ mark is indication the sensor Dog position or following example of origin direction).
- Index Pulse is Z Phase
- 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 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.

7.3.1.1 Origin (In case of Org Method = 0)

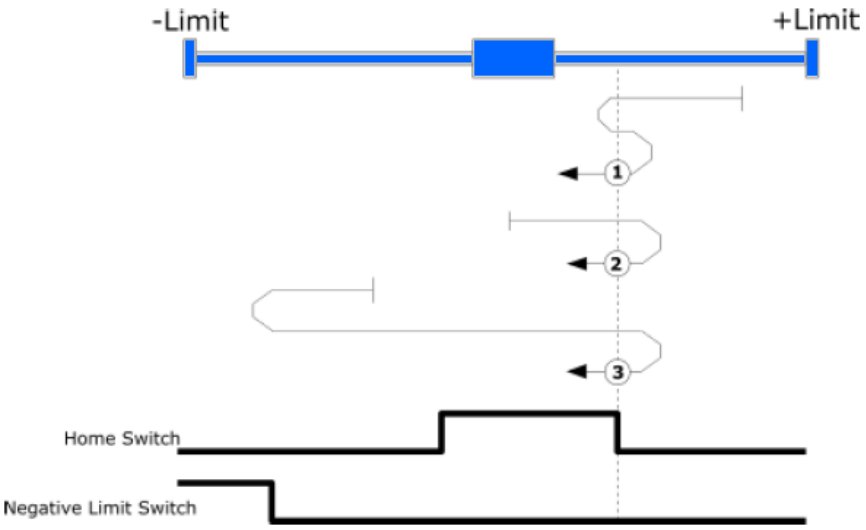


Figure 7-4: Origin method 0 signals.

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 the origin and -Limit Sensor.

7.3.1.2 Z Origin (In case of Org Method = 1)

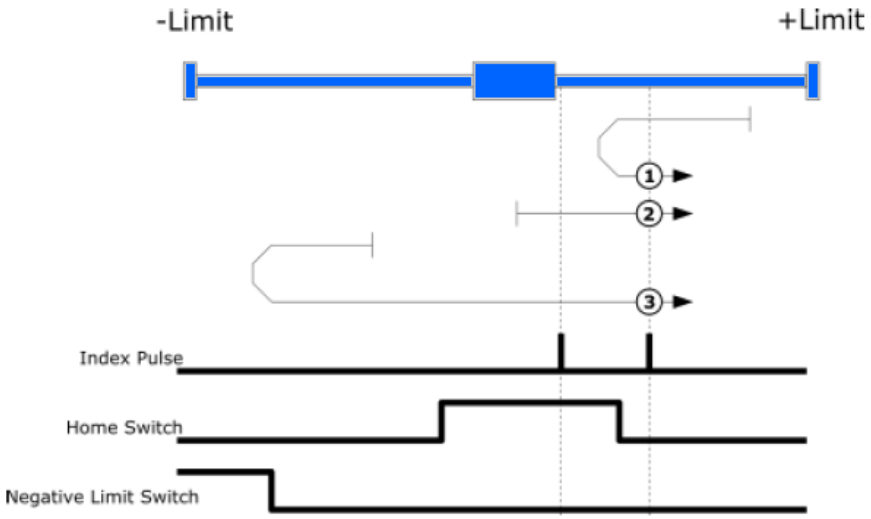


Figure 7-5: Origin method 1 signals.

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 the origin and -Limit Sensor.

7.3.1.3 Limit Origin (In case of Org Method = 2)

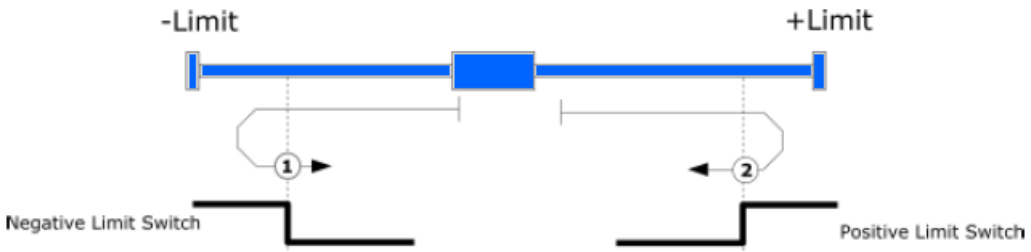


Figure 7-6: Origin method 2 signals.

1. In case of Org Dir is 1 (CCW).
2. In case of Org Dir is 0 (CW).

Home search is completed at the position that Limit Sensor is OFF.

7.3.1.4 Z Limit Origin (In case of Org Method = 3)

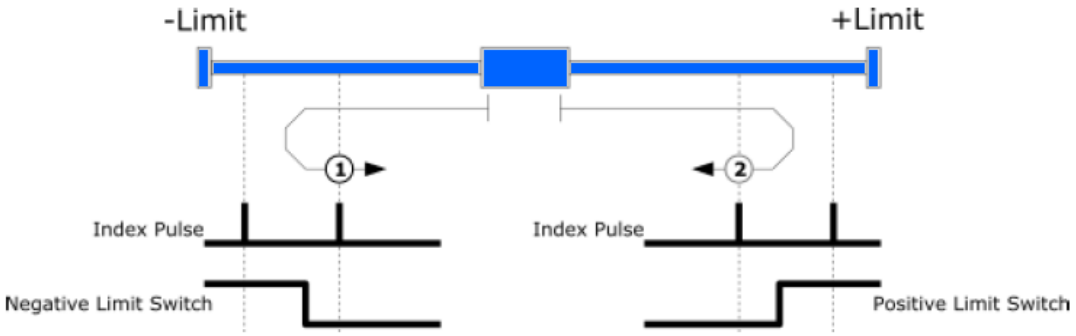


Figure 7-7: Origin method 3 signals.

1. In case of Org Dir is 1 (CCW).
2. In case of Org Dir is 0 (CW).

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

Regardless of sensor, it designates current apparatus position as origin.

7.3.1.6 Z Phase (In case of Org Method = 5)

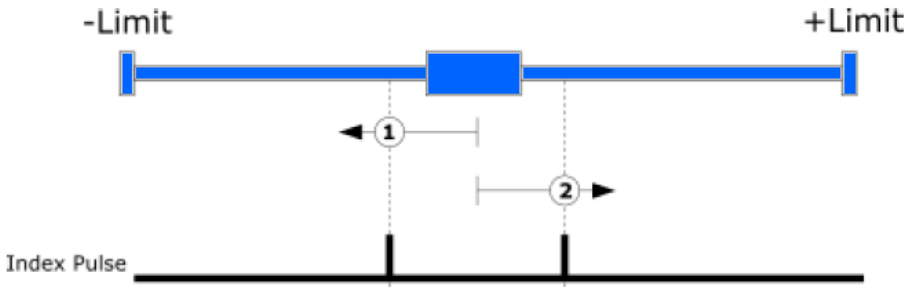


Figure 7-8: Origin method 5 signals.

1. In case of Org Dir is 1 (CCW).
2. In case of Org Dir is 0 (CW).

7.3.1.7 Torque Origin (In case of Org Method=6)

During movement motion by 'Org Speed' value, motion stop when detecting the force as much as Org Torque Ratio by contact with a particular object, and finished origin return after moving to opposite origin return direction of a certain position.

This method can be used in a system that origin sensor or Limit sensor is not supported.

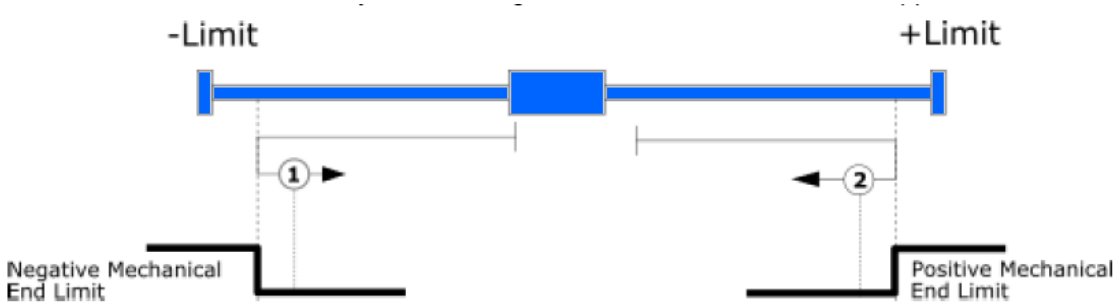


Figure 7-9: Origin method 6 signals.

1. In case of Org Dir is 1 (CCW).
2. In case of Org Dir is 0 (CW).

7.3.1.8 Torque Origin + Z Phase (In case of Org Method=7)

During movement motion by 'Org Speed' value, motion stop when detecting the force as much as Org Torque Ratio by contact with a particular object, finished origin return when detecting the Z-phase during the moving to opposite origin return direction.

This method can be used in a system that origin sensor or Limit sensor is not supported.

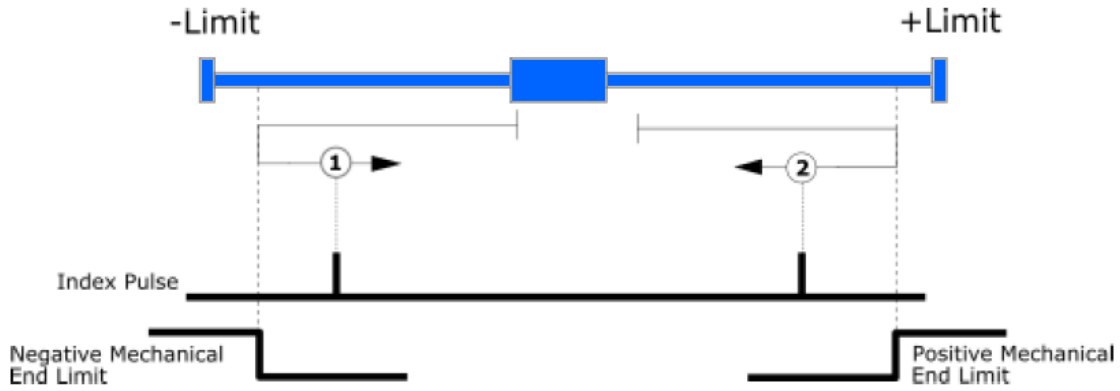


Figure 7-10: Origin method 7 signals.

1. In case of Org Dir is 1 (CCW).
2. In case of Org Dir is 0 (CW).

7.3.2 Origin return Procedure

Origin return is executed according to the following procedure.

1. Set parameters required to origin return.
2. If the Servo is OFF, (reset an alarm when it occurs) input Servo ON on the controller send a communication program so that the Servo can be ON.
3. Start origin return operation by inputting ON signal of Origin Search on control or inputting the command of the communication program.

7.3.3 Interruption of Origin Return

When the machine is under origin return, it stops according to 'Stop' or 'E-stop' command. the machine's origin is not edited and the origin return is canceled.

7.3.4 Origin return finish output

The completion of origin return operation can check by using control output Origin Search OK or using bit value Origin Search OK of Axis status of communication program.

7.4 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 motor will be not Servo OFF. In case of emergency stop, the machine stops immediately without deceleration. So, a special caution for mechanical impact is required.

7.5 Trigger Pulse Output

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

7.5.1 Control Method

This function is only available control by DLL program method by communication.

This method can be set during the positioning command having target position or before the positioning command also. The following table shows the control command and for more information, refer to STDF EN Communication manual.

Control Condition	Description	Range
Start/Stop	Setting start/stop of output	0 ~ 1
Start Position	The first start position to output a signal.	-134.217.728~ 134.217.727
Pulse Period	Setting the period of the output signal (0: Pulse output in start position only 1 time).	0 ~ 134.217.727 pulse
Pulse Width	Setting width(time) of output signal.	1 ~ 1000 ms

- Trigger output can be output normally when the pulse period is 2 ms or more (include pulse width).

Pulse period [ms] = Pulse period [pulse] / moving velocity [pps] * 1000 (unit converter constant [s] → [ms]) + Pulse width [ms]

ex) Pulse period: 100 pulses, Moving velocity: 10.000 pps, Pulse width: 1 ms

Pulse period [ms] = 100 / 10000 * 1000 + 1 = 11

- In case that Start/End is not set as '0', if moving command having target position be transferred, trigger output is operated.
- After trigger output, if command having no target position as like Jog command, Start/End set as '0' automatically.

7.5.2 Output signal

If the output signal pin is fixed on the Compare Out of CN1 connector, the signal shape is as shown below.

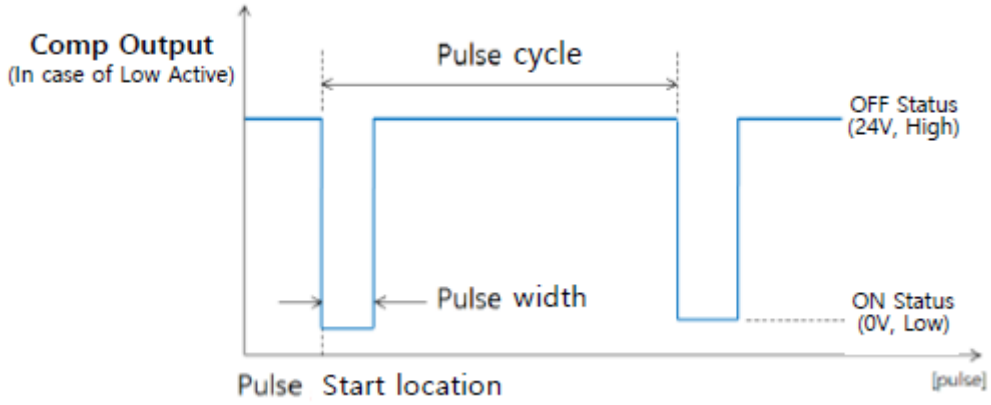


Figure 7-11: Output signal shape.

7.5.3 Output check

By using DLL program, the user can check the trigger pulse output status.

For more information, refer to STDF EN Communication Manual

7.6 **Push Motion Function**

While moving by position command, it moves while maintaining a fixed force from a certain position. When it comes into contact with work during movement, it stops movement (Stop mode method), but it keeps the force.

7.6.1 Function Description

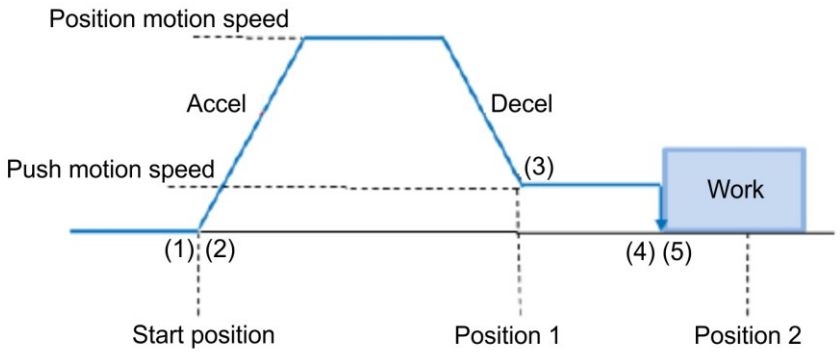


Figure 7-12: Function description signal.

1. Send Push Motion command
2. Normal position motion command is executed (position mode status).
3. Decelerate the speed from normal position motion and reach to push motion velocity (At this time, the speed must be lower than 200 rpm).

4. Push motioning until the work detected with specified motor torque (push mode status).
5. When push mode is set as Stop mode method:

After the work detected, the motor will stop but the motor torque will be maintained and the 'In-position/PT Stopped/END' signals are effective.
The held force is automatically changed to Servo ON (push mode release and switch to position mode) during stop command or normal position motion command.

When push mode is set as Non-stop mode method:
After the work detected, the motor will not stop. It keeps pushing and the motor torque will be maintained. The complete signal of 'In-position/PT Stopped/END' will occur.
Additional next step is needed as below diagram.

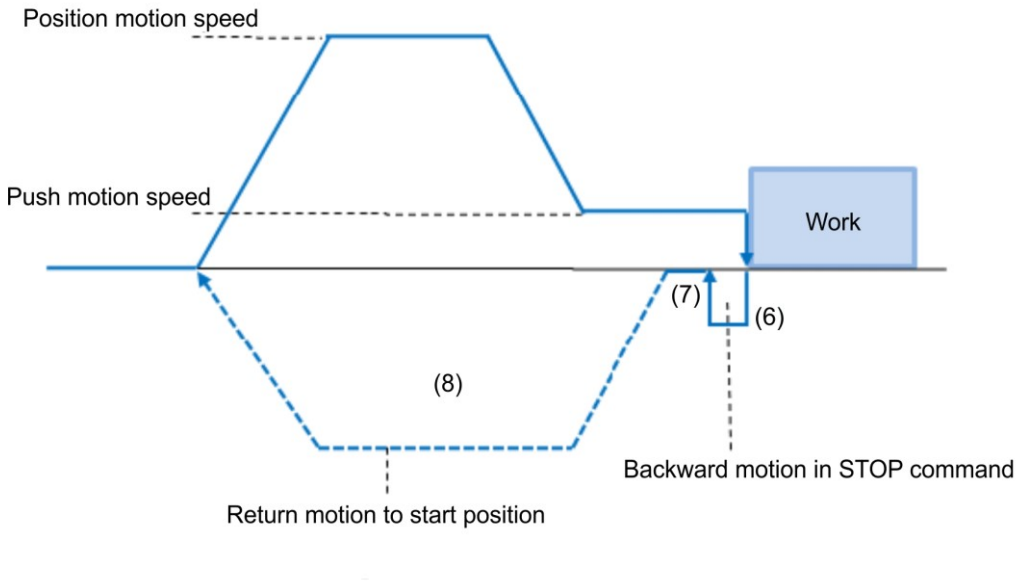


Figure 7-13: Push motion signals.

The 'Stop' command must be executed before next motion command (In Stop mode, it does not need to stop when there is no shock in mechanism).
At this 'stop' procedure, the motor move to backward as much as the 'Push mode' parameter values. This motion will reduce the shock in mechanism. So, if the Stop command is not used, 'Backward motion' is also not executed. 'Backward motion' speed is set to 5000[pps] at this moment.

1. Time delay can be needed for shock ease till position return after stop. It depends on mechanical conditions.
2. Return to start position.

Non-stop mode: It must be executed with the 'Stop' command before next motion command in the work detect situation.

If a shock occurs to the structure when returning to the position, it takes a certain delay time to relieve the impact.

7.6.2 Control Method

This function is working only in absolute position value. The position error can be happened due to the work status in push mode. Push motion command can be executed by 2 methods. One is communication (DLL library) method and the other is external digital signal (PT Start command) method.

7.6.2.1 DLL library command

The following table shows the control conditions and for more information, refer to STDF EN Communication Manual.

Also, we provide a control command that can check the status of push motion command. The position values of using for Push Motion **are all absolute coordinate values.**

Control Condition	Description	Range[1]
Position command Start speed	Start speed value of position motion.	1 ~ 35.000 pps
Position command Moving speed	Moving speed of position motion.	1 ~ 500.000 pps
Position command Target position	Absolute target position value of position command.	-134.217.728 ~ 134.217.727
Acceleration time	Accel time of position motion.	1 ~ 9999 ms
Deceleration time	Decelerate time of position motion.	1 ~ 9999 ms
Push ratio	Motor torque ratio in push mode.	20 ~ 90 %
Push command Moving speed	Moving speed of Push motion (max. 200 rpm).	1 ~ 33.333 pps
Push command Target position	Absolute target position value of push command. *Non-stop mode: The value must be set more than 'Position command Target Position' value.	-134.217.728 ~ 134.217.727
Push mode setting	Set Stop mode (0) or Non-stop mode (1 ~ 10000) after the work detect. In case of Non-stop mode, the motor moves backward as much as this value[pulse] distances. This function is for relaxing shock that possible to occur according to a mechanism condition when changing the direction.	0 ~ 10.000

[1] The unit of [pps] in this item is referenced to 10.000 ppr encoder.

7.6.2.2 Input signal (PT Start) command

It is a method that Input push motion command on the position table and then execute by an external signal. For more information, refer to STDF EN Workspace Manual - 6. Position Table Function

7.6.3 Output check

It can check the progress status of current push motion command through DLL library. At the same time, it can check Flag (In-position and PT Stopped signal) and output (END signal) as below.

7.6.3.1 When Work is detected

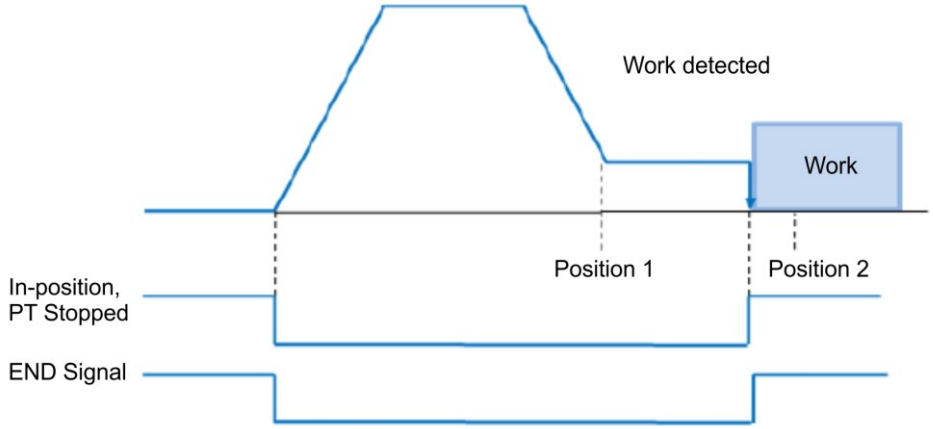


Figure 7-14: Work detected signal.

7.6.3.2 When Work is not detected (Stop mode)

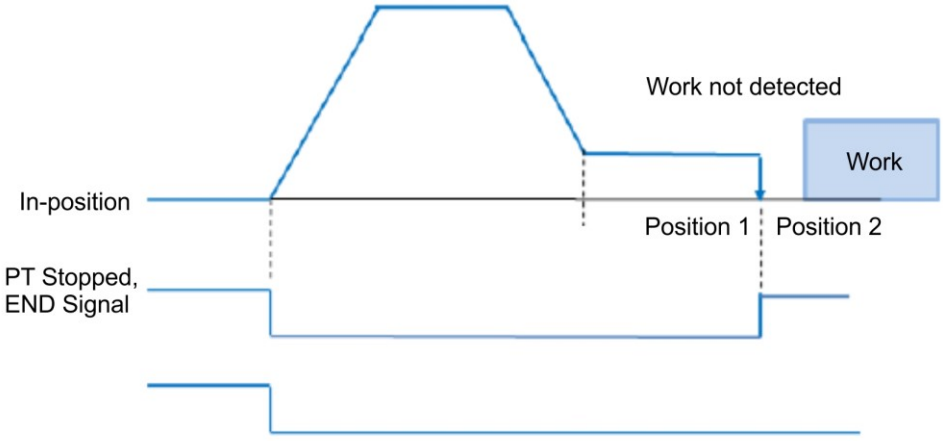


Figure 7-15: Work not detected signal.

The 'In-position' signal is still OFF when the work is not detected in **Non-stop mode**. The push command is stopped at 'position 2' (absolute position value in push command).

8 COMMUNICATION FUNCTION

1) It has embedded 2 Port Ethernet switching Hub for daisy-chain connection.

2) It uses TCP and UDP Protocol.

3) By using TCP, it can connect and use drive at the same time at STDF EN Workspace program and user program.

4) By using UDP, it can connect and use drive at the same time at STDF EN Workspace program and one more user program. But if a user connects application programs over 2, it can generate communication delay.

5) Refer to 4.2 Controller 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)

Table 8-1: RJ45 connector signals.

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

7) Default IP Address: 192.168.0.xxx

Default Gateway: 192.168.0.1

Default Subnet Mask: 255.255.255.0

9 PARAMETER

9.1 Parameter List

Table 9-1: Parameter list.

No.	Name	Unit	Lower Limit	Upper Limit	Default
0	Pulse Per Revolution		0	8	8
1	Axis Max Speed	[pps]	1	2.500.000	500.000
2	Axis Start Speed	[pps]	1	35.000	1
3	Axis Acc Time	[ms]	1	9999	100
4	Axis Dec Time	[ms]	1	9999	100
5	Speed Override	[%]	1	500	100
6	Jog Speed	[pps]	1	2.500.000	5000
7	Jog Start Speed	[pps]	1	35.000	1
8	Jog Acc Dec Time	[ms]	1	9999	100
9	S/W Limit Plus value	[pulse]	-34.217.728	134.217.727	134.217.727
10	S/W Limit Minus Value	[pulse]	-34.217.728	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	5000
15	Org Search Speed	[pps]	1	50.000	1000
16	Org Acc Dec Time	[ms]	1	9999	50
17	Org Method		0	7	0
18	Org Dir		0	1	1
19	Org OffSet	[pulse]	-34.217,728	134.217,727	0
20	Org Position Set	[pulse]	-34.217.728	134.217.727	0
21	Org Sensor logic		0	1	0
22	Position Loop Gain		0	63	4
23	Inpos Value		0	63	0
24	Pos Tracking Limit	[pulse]	1	134.217.727	2500
25	Motion Dir		0	1	0
26	Limit Sensor Dir		0	1	0
27	Org Torque Ratio	[%]	20	90	50
28	Pos. Error Overflow Limit	[pulse]	1	134.217.727	2500
29	Brake Delay Time	[ms]	10	5000	200
30	Run Current	10 %	5	15	10
31	Boost Current	50 %	0	7	0
32	Stop Current	10 %	2	10	5
33	Jog EXT FUNC USE		0	1	0
34	Jog Speed1	[pps]	1	500.000	5000
35	Jog Speed2	[pps]	1	500.000	5000
36	Jog Speed3	[pps]	1	500.000	5000
37	Jog Speed4	[pps]	1	500.000	5000

38	Jog Speed5	[pps]	1	500.000	5000
39	Jog Speed6	[pps]	1	500.000	5000
40	Jog Speed7	[pps]	1	500.000	5000
41	Use Motion Queue		0	1	0
42	Disconnection Option		0	4	0
43	Communication Timeout	[ms]	100	60.000	100

9.2 Parameter Description

Table 9-2: Parameter description.

<table>
<tr><th>No.</th><th>Description</th><th>Unit</th><th>Lower Limit</th><th>Upper Limit</th><th>Default</th></tr>
<tr><td>0</td><td>Pulse per Revolution:
It means number of pulses per revolution.
If this value is changed, the motor is set to Servo OFF.
<table>
<tr><th>Value</th><th>Pulse/Revolution</th><th>Value</th><th>Pulse/Revolution</th></tr>
<tr><td>0</td><td>500</td><td>8</td><td>10,000</td></tr>
<tr><td>1</td><td>1,000</td><td></td><td></td></tr>
<tr><td>2</td><td>1,600</td><td></td><td></td></tr>
<tr><td>3</td><td>2,000</td><td></td><td></td></tr>
<tr><td>4</td><td>3,600</td><td></td><td></td></tr>
<tr><td>5</td><td>5,000</td><td></td><td></td></tr>
<tr><td>6</td><td>6,400</td><td></td><td></td></tr>
<tr><td>7</td><td>7,200</td><td></td><td></td></tr>
</table>
When ‘Servo On’ status by an input signal,
Pulse per Revolution is not changed.</td><td></td><td>0</td><td></td><td>3</td></tr>
<tr><td>1</td><td>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.</td><td>[pps]</td><td>1</td><td>2.500.000</td><td>500.000</td></tr>
<tr><td>2</td><td>Axis Start Speed:
When position moving commands (absolute move, incremental move) are given, this mode sets the operation start speed to [pps] unit.</td><td>[pps]</td><td>1</td><td>35.000</td><td>1</td></tr>
</table>

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 [ms] unit. Possible range is different from Axis Speed. (Ex.1) Axis Start Speed=1, Move Speed=400000: 1 ~ 1430 [ms] (Ex.2) Axis Start Speed=1, Move Speed=10000: 1 ~ 350 [ms]	[ms]	1	9999	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 limited according to Axis Speed as like as 'Axis Acc Time'.	[ms]	1	9999	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	2.500.000	5000
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 [ms] unit.	[ms]	1	9999	100

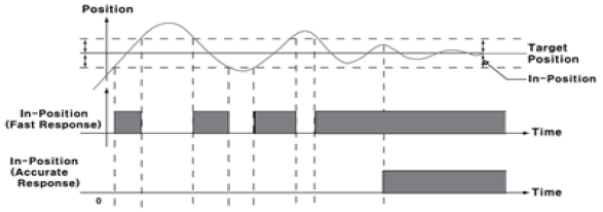
9	**S/W Limit Plus Value:** When position moving commands (absolute move, incremental move, jog) is given, this move set the maximum input limit value that the motor can move to the plus (+) direction with 28 bits.	[pulse]	-134.217.728	+134.217.727	+134.217.727
10	**S/W Limit Minus Value:** When position moving commands (absolute move, incremental move, jog) is 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 sensors input to ON. 0: 0 V (Active low level) 1: 24 V (Active high level)		0	1	0
14	**Org Speed:** In case of origin return command, this mode sets the operation speed until the motor senses the origin sensor to [pps] unit.	[pps]	1	500.000	5000

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	1000
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 [ms] unit by this mode.	[ms]	1	9999	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 6: The motor moves up to the wall by Org Torque Ratio and then immediately stops. 7: The motor moves up to the wall by 'Org Torque Ratio' and then executes Z-pulse origin return at the low value of 'Org Search Speed'. For more information, refer to **8.3 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.)		0	7	0

18	**Org Dir:** In case of origin return, this mode sets the revolution direction of the motor. 0: moves to CW direction. 1: moves to CCW direction.		0	1	0
19	**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
20	**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 sensors input to ON. 0: 0 V (Active low level). 1: 24 V (Active high level).		0	1	0

<table>
<tr>
<td>22</td>
<td>Position Loop Gain:
After the motor stops, this mode controls the motor’s response by a load attached to the motor. This value is a relative value, not a real value In use of internal drive. For example, if this value is changed 3 to 6, not increased the response time two times.
If this parameter value is small, motor stop motion become sensitive, motor stop time is getting shorter and if value is big stop motion becomes insensitive, motor stop time is getting longer relatively.
Set this mode as follows.
1) Set the value to ‘0’
2) Increase the value until the motor s response is stabilized
3) Previously adjust the setting status by increasing/decreasing one
or two steps of the current setting value.
<table>
<tr><th>Value</th><th>Integral part's Time Constant</th><th>Proportional Gain</th><th>Value</th><th>Integral part's Time Constant</th><th>Proportional Gain</th></tr>
<tr><td>0</td><td>1</td><td>1</td><td>32</td><td>5</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>2</td><td>33</td><td>5</td><td>2</td></tr>
<tr><td>2</td><td>1</td><td>3</td><td>34</td><td>5</td><td>3</td></tr>
<tr><td>3</td><td>1</td><td>4</td><td>35</td><td>5</td><td>4</td></tr>
<tr><td>4</td><td>1</td><td>5</td><td>36</td><td>5</td><td>5</td></tr>
<tr><td>5</td><td>1</td><td>6</td><td>37</td><td>5</td><td>6</td></tr>
<tr><td>6</td><td>1</td><td>7</td><td>38</td><td>5</td><td>7</td></tr>
<tr><td>7</td><td>1</td><td>2</td><td>39</td><td>5</td><td>2</td></tr>
<tr><td>8</td><td>2</td><td>1</td><td>40</td><td>6</td><td>1</td></tr>
<tr><td>9</td><td>2</td><td>2</td><td>41</td><td>6</td><td>2</td></tr>
<tr><td>10</td><td>2</td><td>3</td><td>42</td><td>6</td><td>3</td></tr>
<tr><td>11</td><td>2</td><td>4</td><td>43</td><td>6</td><td>4</td></tr>
<tr><td>12</td><td>2</td><td>5</td><td>44</td><td>6</td><td>5</td></tr>
<tr><td>13</td><td>2</td><td>6</td><td>45</td><td>6</td><td>6</td></tr>
<tr><td>14</td><td>2</td><td>7</td><td>46</td><td>6</td><td>7</td></tr>
<tr><td>15</td><td>2</td><td>8</td><td>47</td><td>6</td><td>8</td></tr>
<tr><td>16</td><td>3</td><td>1</td><td>48</td><td>7</td><td>1</td></tr>
<tr><td>17</td><td>3</td><td>2</td><td>49</td><td>7</td><td>2</td></tr>
<tr><td>18</td><td>3</td><td>3</td><td>50</td><td>7</td><td>3</td></tr>
<tr><td>19</td><td>3</td><td>4</td><td>51</td><td>7</td><td>4</td></tr>
<tr><td>20</td><td>3</td><td>5</td><td>52</td><td>7</td><td>5</td></tr>
<tr><td>21</td><td>3</td><td>6</td><td>53</td><td>7</td><td>6</td></tr>
<tr><td>22</td><td>3</td><td>7</td><td>54</td><td>7</td><td>7</td></tr>
<tr><td>23</td><td>3</td><td>2</td><td>55</td><td>7</td><td>2</td></tr>
<tr><td>24</td><td>4</td><td>1</td><td>56</td><td>8</td><td>1</td></tr>
<tr><td>25</td><td>4</td><td>2</td><td>57</td><td>8</td><td>2</td></tr>
<tr><td>26</td><td>4</td><td>3</td><td>58</td><td>8</td><td>3</td></tr>
<tr><td>27</td><td>4</td><td>4</td><td>59</td><td>8</td><td>4</td></tr>
<tr><td>28</td><td>4</td><td>5</td><td>60</td><td>8</td><td>5</td></tr>
<tr><td>29</td><td>4</td><td>6</td><td>61</td><td>8</td><td>6</td></tr>
<tr><td>30</td><td>4</td><td>7</td><td>62</td><td>8</td><td>7</td></tr>
<tr><td>31</td><td>4</td><td>8</td><td>63</td><td>8</td><td>8</td></tr>
</table>
</td>
<td></td>
<td>0</td>
<td>63</td>
<td>4</td>
</tr>
</table>

<table>
<tr><td rowspan="2">23</td><td rowspan="2">In-pos Value:
Sets the output condition of the in-position finish signal. After position command pulse is finished, when the position deviation from target position is within ‘In-pos Value’, this mode displays in-position finish signal
The position deviation to output the In-position is 0~63.
According to control mode set value is as follows:
1) Fast Response Mode: 0~63
2) Accurate Response Mode: 64~127
According to each mode, the position deviation range is 0~63.</td><td></td><td>0</td><td>127</td><td>3</td></tr>
<tr><td colspan="4">Fast Response and Accurate Response control method is as below.
 
</td></tr>
<tr><td>24</td><td>Pos Tracking Limit:
Acts to protect the motor and the drive. While the motor is run, when Position Error is greater than this setting value, this mode generates an alarm to stop a flow of electricity to the motor and then set it to Servo OFF.</td><td>[pulse]</td><td>1</td><td>+134.217.727</td><td>2500</td></tr>
<tr><td>25</td><td>Motion Dir:
When the motor operates by position command, this mode sets the revolution direction of the motor.
0: moves to CW direction.
1: moves to CCW direction.</td><td></td><td>0</td><td>1</td><td>0</td></tr>
</table>

26	**Limit Sensor Dir :** Sets the limit sensor direction to stop the motor to the limit spot under operation. In the general system set the same as 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
27	**Org Torque Ratio:** In case of 'Origin Method' parameter is set to '5' or '6' to set the maximum torque value to stop the motor.	[%]	20	90	50
28	**Pos. Error Overflow Limit:** Acts to protect the motor and the drive. While the motor stops and is set to Servo ON, when 'Position Error' is greater than this setting value, this mode generates an alarm to stop a flow of electricity to the motor and then set it to Servo OFF.	[pulse]	1	+134.217.727	2500
29	**Brake Delay Time:** According to the SERVO ON command, it can be set the brake operation time.	[ms]	10	5000	200

30	**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 4,4 A. So, in case of motor (56 mm) 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
31	**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.) *The control current is limited by 4,4 A same as Run Current case. *In case of motor (56 mm) of rated current value is exceed 2,7 A, set value is not increased as much as set-up, even increasing the set value.	*50 [%]	0	7	0

<table>
<tr><td>32</td><td>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 %.</td><td>*10 [%]</td><td>20</td><td>10</td><td>5</td></tr>
<tr><td>33</td><td>Jog EXT FUNC USE:
It is used to change Jog movement command by input signal to other speed than setting speed in parameter No. 6.
0: No using Jog speed expand function
1: Using Jog speed expand function
There are seven additional speeds to choose from.
Speed selection is determined by the input signals Jog0, Jog1, and Jog2.
<table>
<tr><th>Jog 2</th><th>Jog 1</th><th>Jog 0</th><th>Setting Speed</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Parameter No.6</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>Parameter No.34</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>Parameter No.35</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>Parameter No.36</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>Parameter No.37</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>Parameter No.38</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>Parameter No.39</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>Parameter No.40</td></tr>
</table>
1) Only jog speed by input is applied.
2) Since Jog0 ~ Jog2 are used in common with PT5 ~ 7, the number of position table may be limited when using the above function.
3) After Jog0 ~ Jog2 is input, it to be normal operate becoming Jog movement command by a signal is inputted.</td><td></td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>34
-
40</td><td>Jog Speed1 ~ Jog Speed7:
Set Jog speed which is extended according to input signal Jog0, Jog1, Jog2.</td><td>[pps]</td><td>1</td><td>500.000</td><td>5000</td></tr>
</table>

41	**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: Using Motion Queue function 1: No using Motion Queue function (Return error (0x85) if another move is made during the move) Move commands are only available for Incremental/Absolute commands. If more than one command is received, only one is executed and the other commands return an error.		0	1	0
42	**Disconnection Option Code:** This function is used to stop the move command when communication end or communication cable disconnection is issued while moving command is being executed. 0 (None): Executing moving command 1 (Stop): Deceleration stop 2 (E-Stop): Emergency stop 3 (Stop & Servo Off): Servo Off after deceleration stop 4 (E-Stop & Servo Off): Servo Off after emergency stop Only available when connecting communication by TCP. The above function does not apply to STDF EN Workspace program connection termination.		0	4	0
43	**Communication Timeout:** This parameter sets the timeout time for communication. Timeout occurs only when communication is connected via TCP. If timeout occurs, it executes the function set in parameter 42.	[ms]	100	60.000	100

10 PROTECTION FUNCTION

10.1 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.

Table 10-1: Alarm description.

Alarm No.	Alarm Name	Description
1	Overcurrent	The current through power devices in inverter exceeds the limit value[1]
2	Overspeed	Command speed for motor exceeds 3300 rpm
3	Position Tracking	Position error value is higher than specified value[2] in-position command status.
4	Overload	The motor is continuously operated more than 5 seconds under a load exceeding the max. torque.
5	Overheat	The internal temperature of the drive exceeds 85 °C.
6	Over regenerative voltage	Back-EMF is more than limit value[3].
7	Motor connection	The connection of drive and motor is defective.
8	Encoder connection	The connection of drive and encoder is defective.
9	Motor voltage error	The power supplied to the motor is less than low limit value[4].
10	In-position error	After operation is finished, a position error (over 1) occurs for over 3 seconds.
11	System error	Drive system is halted (Watch Dog Timer).
12	ROM error	Error is occurred in parameter saving device (ROM).
15	Pos. Error Overflow	Position error value is higher than specified value[5] in motor stop status.
50	Internal communication	A communication error has occurred between parts in the drive.
51	SERVO ON failure	If the SERVO 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: 4.5 A.
[2] Set value [pulse] in 'Pos Tracking Limit [No.24]' parameter.
[3] Limiting value: 70 V.
[4] Lower bound: 20 V.
[5] Set value [pulse] in 'Pos Error Overflow Limit [No.28]' parameter.

10.2 Acquiring the alarm information

If an alarm occurs, the motor will go into Servo OFF state and will stop if it is running. At the same time, the control output Alarm is outputted 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: Alarm Blink display signal occurred when the step-out is occurred.

Figure 10-1: Alarm blink signal.

Ex2) Alarm 15: 7-Segment displays when position error overflow has occurred.

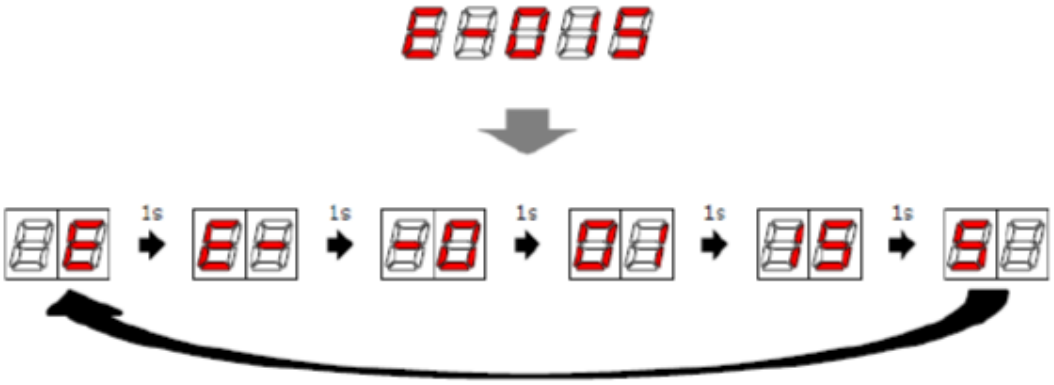


Figure 10-2: 7-segment display during error.

10.3 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 before releasing the alarms..

Table 10-2: Alarms description.

Alarm No.	Alarm Name	Description	Reset
1	Overcurrent	1) Check the motors 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
3	Position Tracking	1) Get down the load or increase the acceleration or deceleration speed. 2) Check assemble status of mechanism. 3) Check the brake signal cable. 4) Check the motors short-circuit (A+, A-, B+, B-) 5) Check the encoder cable connection status. 6) Check the parameter setting value.	Valid
4	Overload	1) Compare the motor's rating with load scale. 2) Check assemble status of mechanism. 3) Check 'SW limit' value of parameter. 4) Check the status of sensors. 5) Check the motorDB for driver and motor. 6) Check the motors short-circuit (A+, A-, B+, B-).	Valid
5	Overheat	1)Get down the ambient temperature or install a cooling fan. 2)Check the distance is over 50 mm between drivers.	Valid
6	Over regenerative 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
8	Encoder connection	1) Check the connection status of drive and encoder. 2) Check the screw condition, cabling short-circuit of encoder.	Invalid
9	Motor voltage error	1) Check if power is supplied to the drive. 2) Check the diameter and length of power cable to driver.	Invalid
10	Inposition error	1) Check if parameters are set correctly or the machine is over-loaded. 2) Check the vibration of mechanism and belt tension. 3) Check the cabling status of motor and encoder.	Valid
11	System error	1) Check if current of power supply is supplied to the drive.	Invalid
12	ROM error	1) Contact to distributor.	Invalid
14	Drive voltage error	1) Check if power is supplied to the drive.	Invalid

15	Pos. Error Overflow	1) Get down the load or increase the acceleration or deceleration speed. 2) Check the brake and encoder is working correctly or not.	Valid
50	Internal communicati on	1) Power on the drive again.	Invalid
51, 60	SERVO ON failure	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
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

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