

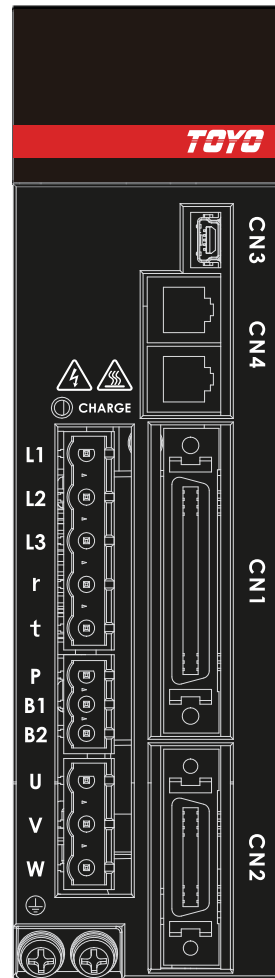


TOYO Linear Motor Controller
English Operation Manual

V.2501

LC100 Series

User's Manual



About Product

About Product

- We are not be liable for any claims for damages arising from infringement with any third-party patent, intellectual property right or other right in respect of any product manufactured with this product.
- This product is designed for use in general industrial equipment. This product is not intended for any equipment which is highly demanding for quality, reliability and especially whose failure or malfunction may have direct threat to personal or property safety or do harm to human body (i.e., atomic energy control equipment, aerospace equipment, transmission equipment, traffic signal equipment, combustion control, medical equipment used to sustain human life, and various types of safety device) (hereinafter referred to as "special purpose"), and is not covered by the warranty. If this product is used for any special purpose, the user shall be solely responsible for its use.

This manual is not a guarantee or a commitment to perform any other rights such as industrial ownership.

In addition, we are not responsible for any industrial ownership issues arising from use of the information contained in this manual.

Introduction

Thank you for using our product. This operation manual provides relevant information on LC100 controllers, including:

- installation and inspection of linear motor controller
- linear motor controller composition description
- trial operation procedure
- description of control function and adjustment method of linear motor controller
- description of all parameters
- communication protocol description
- testing and maintenance
- trouble shooting

This operation manual is applicable to the following users for reference:

- mechanism system designer
- installation or wiring worker
- trial operation & commissioning staff
- maintenance or inspection staff

Before use the product, please read this manual carefully to make sure correct use. In addition, please keep it in a safe place for easy access. The following shall be observed till you have finished reading this manual:





- The installation environment must be free of water vapor, any corrosive gas and flammable gas.
- Grounding works must be carried out properly.
- When the power supply is switched on, do not disassemble the controller, motor or change any wiring.
- Before the power supply is switched on, please make sure that the emergency stop device will be activated at any time.

For any question on use of it, please contact your dealer or our customer service center.

Safety Considerations

Before installation, operation, maintenance and inspection of this product, please carefully read the operation manual and relevant manual and documents for all equipment and auxiliary devices connected to the product to ensure proper use. Such operations shall be performed by professional staff with equipment and safety knowledge. The following precautions are provided to ensure safe and correct use of this product, avoid personal injury and property damage, and to prevent any potential hazard.

During installation, wiring, operation, maintenance and inspection, the following safety precautions shall be paid attention to at all times. In this manual, safety precautions are classified into four types: Danger, Warning, Caution and Note.

 Danger	Any improper operation may endanger personal life or cause serious injury.
 Warning	Any improper operation may result in death or serious injury.
 Caution	Any improper operation may cause personal injury or property damage.
 Note	Relevant instructions shall be observed for proper use of the product even though there is no possibility of injury.

Failure to observe relevant instructions under Caution or Note may, depending on specific circumstance, may still cause any serious consequence. Any information contained herein is important, so please read it carefully before use. This manual shall be kept in a place where it can be accessed at any time when necessary, and must be delivered to the end user.

Danger

[General]

- Do not use this product for the following purposes.
 1. Medical devices concerned with maintenance and management of human life and health
 2. Equipment and mechanical appliance for the purpose of moving or transporting persons
 3. Important safety parts of mechanical devices

This product is not intended and designed for any application that requires a high degree of safety. We will not make any warranty with respect to any unauthorized use of this product for any life-related application. The warranty covers only this product as delivered.

[Settings]

- Do not use this product in places with inflammable and explosive materials, which may cause fire or explosion.
- The framework and controller shall not be used in places with water or oil drops.
- Do not cut and reconnect the cable to lengthen or shorten its length, which may cause fire hazard.

[Operation]

- Do not expose this product to water. Exposing it to or cleaning it with water may result in injury, electric shock or fire.

[Maintenance, check and repair]

- Do not refit this product, or otherwise, it may cause injury, electric shock or fire due to malfunction.
- Do not disassemble the product, or otherwise it may result in injury, electrocution or fire.

Safety Considerations

Warning

[General]

- Do not use it outside the range of product specifications. Use outside the range of specifications may result in product failure, malfunction or damage, or even impair its service life. In particular, the maximum load and speed limits shall be observed.

[Settings]

- Proper safety circuit or devices shall be designed to ensure emergency stop in case of power failure and other system error and thereby to avoid device damage and personal accident.
- Drive shaft and controller must be grounded by Class-D means (the original Class-3 grounding means with grounding resistance below 100Ω), since electric leakage may result in electric shock or malfunction.
- Before powering on or starting the product, be sure to verify the safety within the operating range of relevant equipment. Improper power supply may result in injury due to electric shock or contact with moving parts.
- Cable and connector shall be such connected to avoid falling off or loosening, or otherwise it may lead to malfunction or fire.

[Operation]

- When the power is on, do not touch the terminal board or all types of switches. Failure to do so may result in electric shock or malfunction.
- Do not damage the cable. Damaging, forcibly bending, pulling, winding, squeezing or carrying heavy objects on the cable may result in fire, electric shock or malfunction due to electric leakage or poor conduction.
- In case of over-heating, smoke or odor, switch off the power supply immediately, or otherwise it may cause product damage or fire.
- When any product protection device (alarm) starts, please switch off the power supply immediately, or otherwise, it may cause injury or product breakage and damage due to malfunction. After switching off the power supply, locate and eliminate the cause of alarm, and then switch the power supply on again.
- If the LED on the product fails to light up after the power supply is switched on, switch off it immediately. Related protective device at operating terminal (e.g., fuse) may not activated to cut off the circuit. For any repair service, please contact your dealer from which this product was purchased.

[Maintenance, check and repair]

- Before product-related maintenance, inspection, repair and replacement operation, the power supply must be completely disconnected, and the following instructions shall be observed.
 1. Signs such as "Do not switch on the power supply during operations" shall be posted in a conspicuous place to avoid any other person from switching on the power supply due to negligence during operations.
 2. When a number of workers perform maintenance and inspection task, all of them shall be communicated properly when the power supply is switched on/off and the drive shaft is moved to ensure safety.

[Disposal]

- Do not throw the product into fire, or otherwise it may result in product breakdown or generation of toxic gas.

Safety Considerations

Caution

[Settings]

- Do not use in the environment under direct sunlight (ultraviolet), or with dust, salt, iron powder, high humidity, organic solvents, or phosphoric ester oil.
- Do not set it in any place subjected to large vibration or impact (above 4.9m/s²), which may cause malfunction.
- Emergency stop device shall be set at proper position to ensure that relevant equipment will stop can be immediately in case of emergency to ensure personal injury.
- This product shall be such installed to make sure there is sufficient space for maintenance work, or otherwise, it may be difficult to carry out routine inspection and maintenance, which may cause equipment failure or product damage.
- The cable between the drive shaft and controller must be the genuine part supplied by us. Drive shaft, controller and teaching device as well as any other components and accessories must be the with the genuine parts supplied by us.
- During installation and adjustment, please set a sign "Do not switch on the power supply during operations" to avoid any accident, or otherwise, personal injury may be caused by electric shock or sudden start of drive shaft.

If the power is turned on negligently, it may cause the operator' s injury due to electric shock or sudden start of the drive shaft.

[Operation]

- When connecting the power supply, please start from the upstream equipment in turn. Sudden start of the product may result in personal injury or product damage.
- Do not put your fingers or other objects into any opening of the product, or otherwise it may result in fire, electric shock or injury.

[Maintenance, check and repair]

- Do not touch terminal while conducting insulation resistance test, or otherwise it may cause an electric shock.

Safety Considerations

Note

[Settings]

- Do not place any obstacle that may impair ventilation around the controller, or otherwise it may lead to poor heat dissipation of the controller.
- When configuring the controller, do not set it as the control of falling workpiece when power failure occurs. Please set any mechanical equipment as control to prevent fall of work table or work piece in case of power failure or emergency stop.

[Settings, operation, and maintenance]

- When using the product, please wear proper protective gloves, protective glasses and safety boots as required to ensure safety.

[Disposal]

- When the product cannot be used or is not needed, it shall be properly disposed of as industrial waste.

Other

- We will not be held liable for any consequence resulting from failure to comply with all of the Safety Considerations.

We have done our best to try to avoid any error or omission in this manual, but in case of any mistake or omission, please contact us immediately.

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1. Overview

1.1 Introduction

This product is an LGF/LGW/LTF2/LNF2/LCF2/LAF/LSF/LAU/LMR linear motor controller, and intended for control via IO control of main controller (PLC), communication control and pulse control. In addition, this product presents improved energy saving performance.

It features and functions mainly as follows.

- Special signal for origin return

This signal is used for the original push and press to the travel terminal and then turn to complete the origin recovery.

With this function, you will achieve automatic origin return without need of complex PLC program controller and external sensors and other devices.

- Torque limit function

The torque can be limited by an external signal. When the set torque is reached, a signal will be output. With this function, you can perform such actions as press or push-in.

In case of actual debugging or malfunction, in addition to this manual, please refer to related instruction of linear motor and on-line software.

It does not fully cover unexpected situations such as improper operation and complex signal changes at critical points. Therefore, matters not indicated in this manual shall in principle be understood as "impossible".

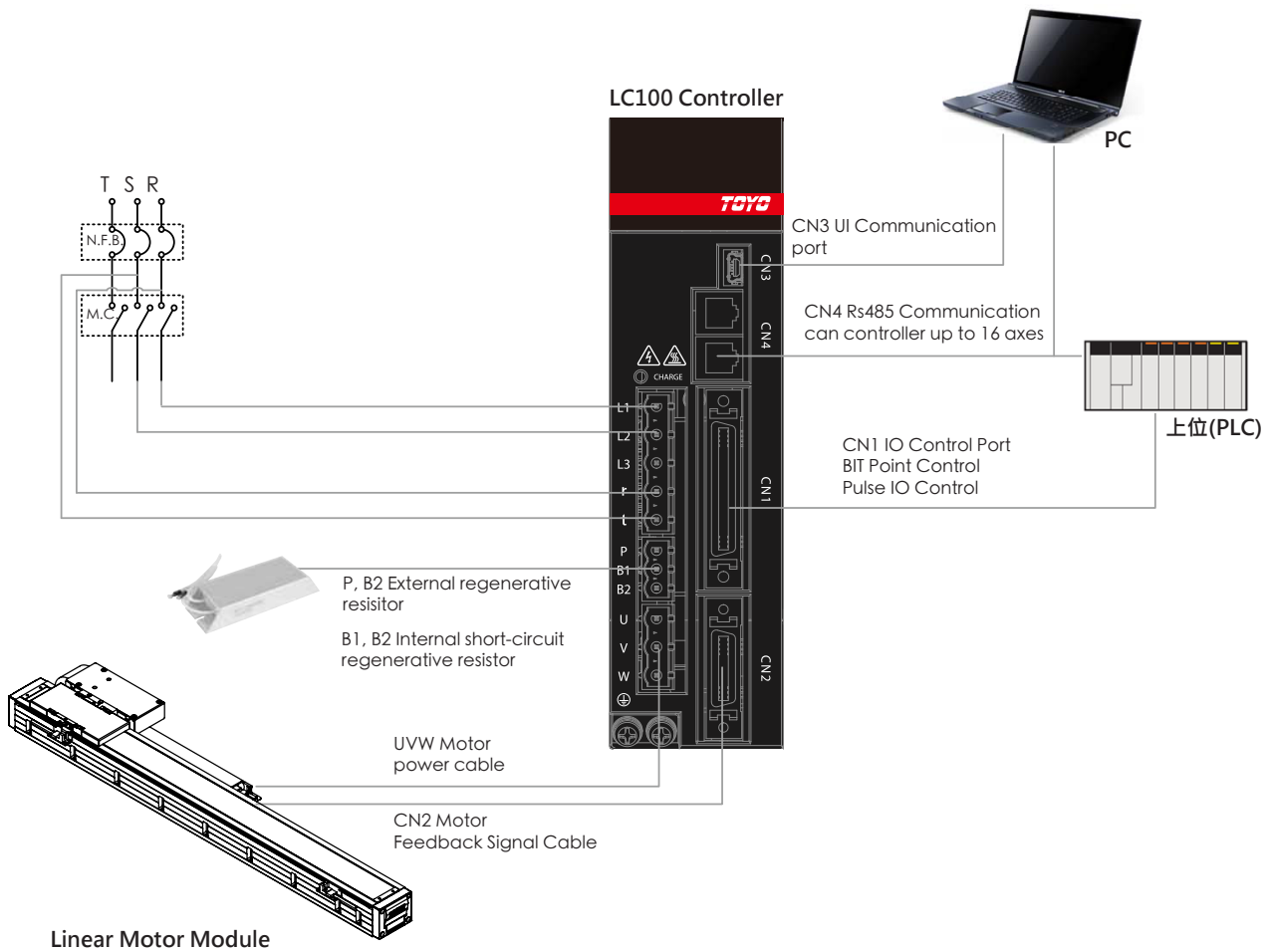
* For any mistake or error, please contact us immediately. Please keep this book in a place where it can be accessed immediately when needed.

1.2 Specification description

LC100

Spec of Controller	
Capacity	
LC100-4	400W
LC100-5	750W

1.3 Controller system composition



1.4 Procedure from unpacking to commissioning

When using this product for the first time, please refer to the following steps to carefully confirm that there are no omissions and wiring errors before operation.

1. Confirmation of unpacked goods

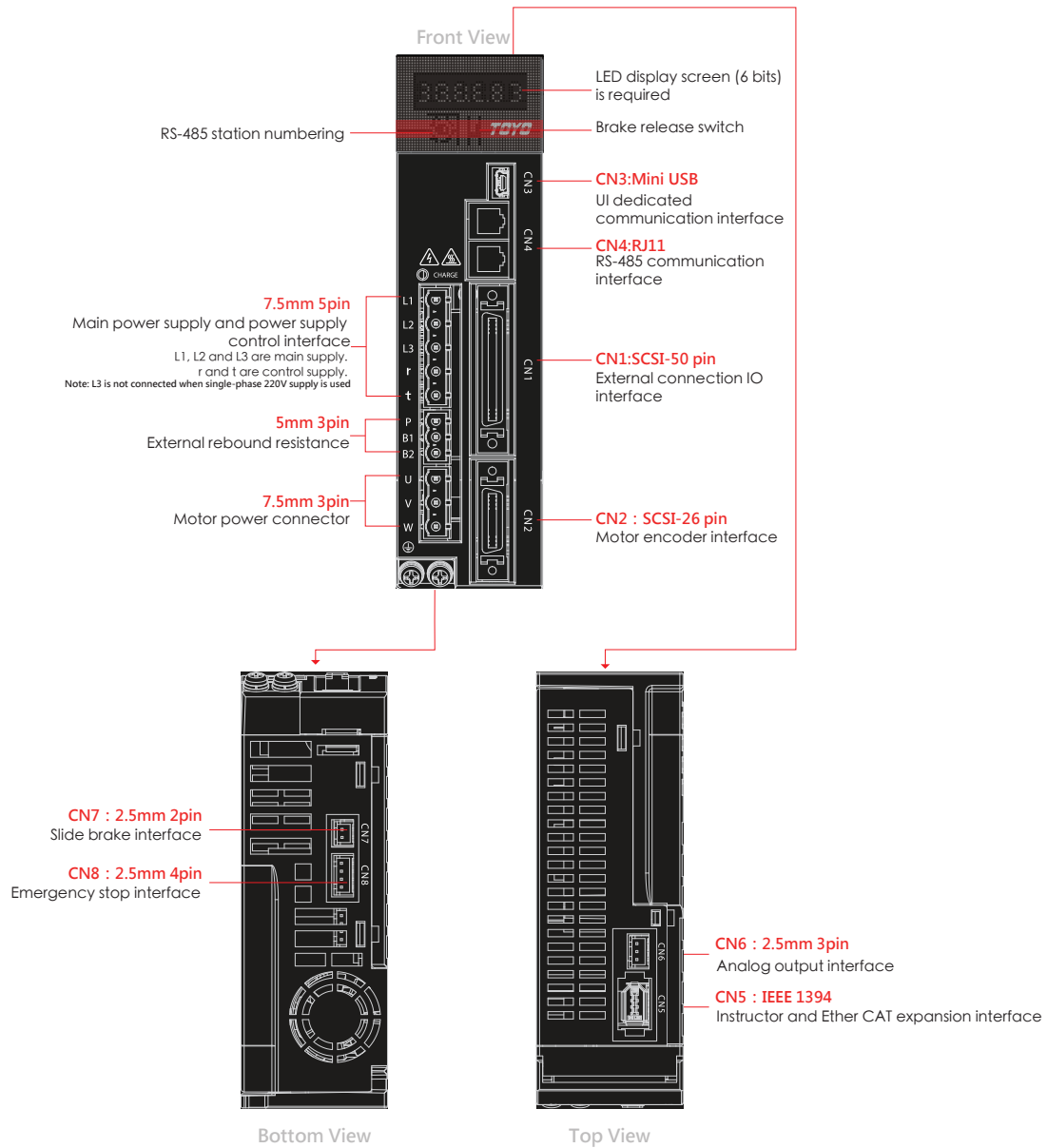
In case of wrong model or missing parts, please contact your dealer.

Name of Articles Packed	Qty.	Picture	Model
Controller	1		LC100
Matched linear motor drive shaft	1		In accordance with customer requirements LGF/LGW/LTF2/LNF2/LCF2/LAF/LSF/LAU/LMR
Controller power connector	1		PCN-00000014-OP
Motor power connector	1		PCN-00000015-OP
Recovery resistor connector	1		PCN-00000016-OP
Motor power cable	1		LC100-CP-05 (Standard 5 meters)
Motor encoder cable	1		LC100-CS-05 (Standard 5 meters)
I/O connector (SCSI 50 PIN)	1		SAN-M-SCSI-50PIN

⚠ Note: The articles packed in the box will vary depending on the configuration model as ordered.

2. Interface specification

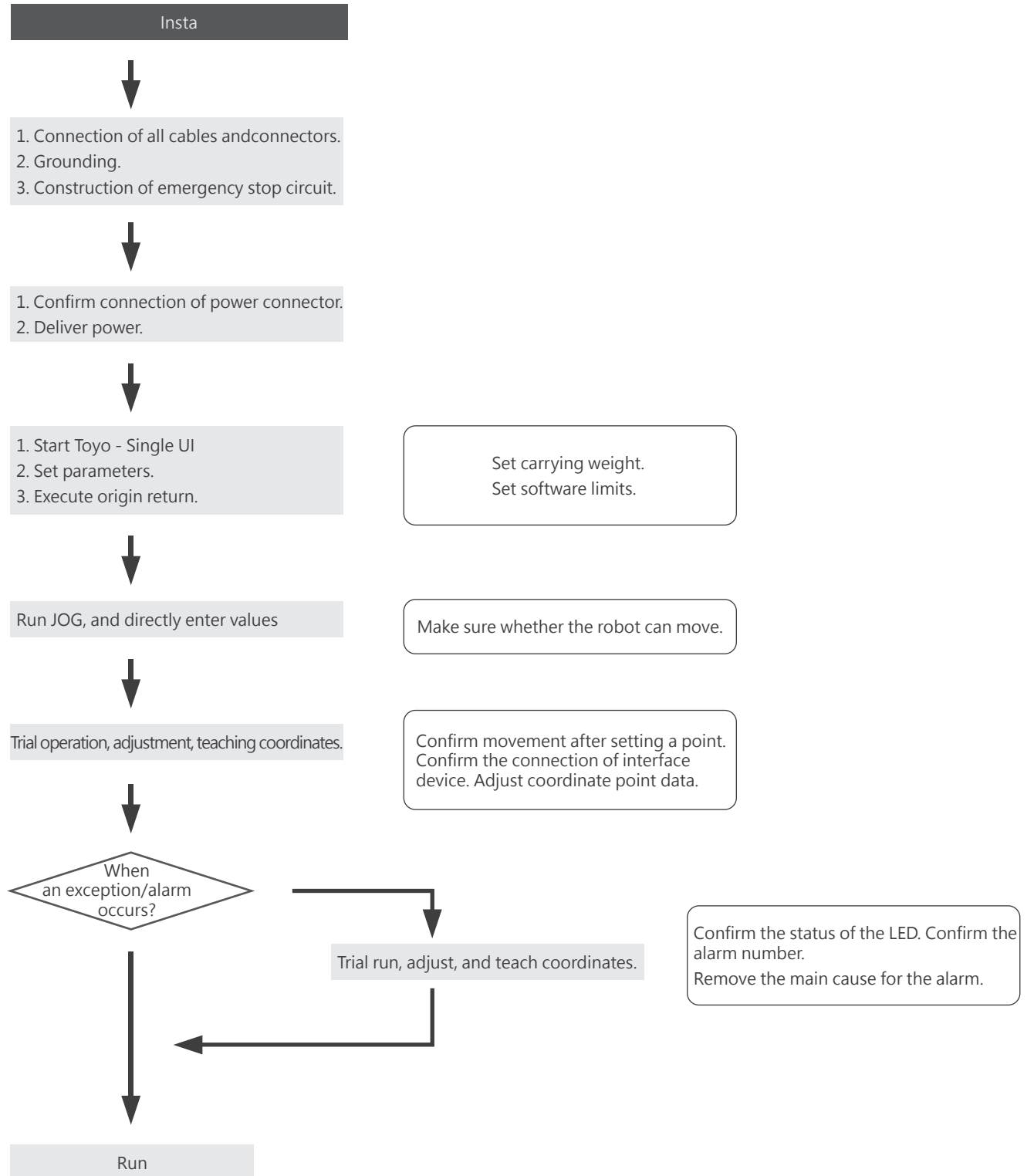
LC100 Controller



3. Operation Procedure

The basic steps from installation of the controller to actual operation are shown below.

1
Overview



1.5 Validity and scope of warranty

The controller you purchased has passed our strict factory test. The product is covered by the following warranty.

1. Validity of warranty

The warranty shall be valid till end of the following periods, whichever is the shorter.

- 18 months following our shipment
- 12 months following delivery to specified location

2. Scope of warranty

In case of failure under normal operation and obviously caused by the fault of the manufacturer, repair service will be provided free of charge. However, the following cases are not within the scope of warranty.

- Natural fading of color and other changes over time.
- Circumstances caused by consumption of consumable materials.
- Sensory phenomena such as sound that have no mechanical effect.
- Consequence caused by improper and incorrect use.
- Circumstance caused by negligence or error in maintenance inspection.
- Use of parts other than supplied by us.
- Any unauthorized refitting without prior approval of us or the dealer.
- Condition caused by natural disasters, accident or fire.

The warranty is only valid for the delivered product, but not for any damage caused by malfunction of this product. For repair service, please send the product to the dealer.

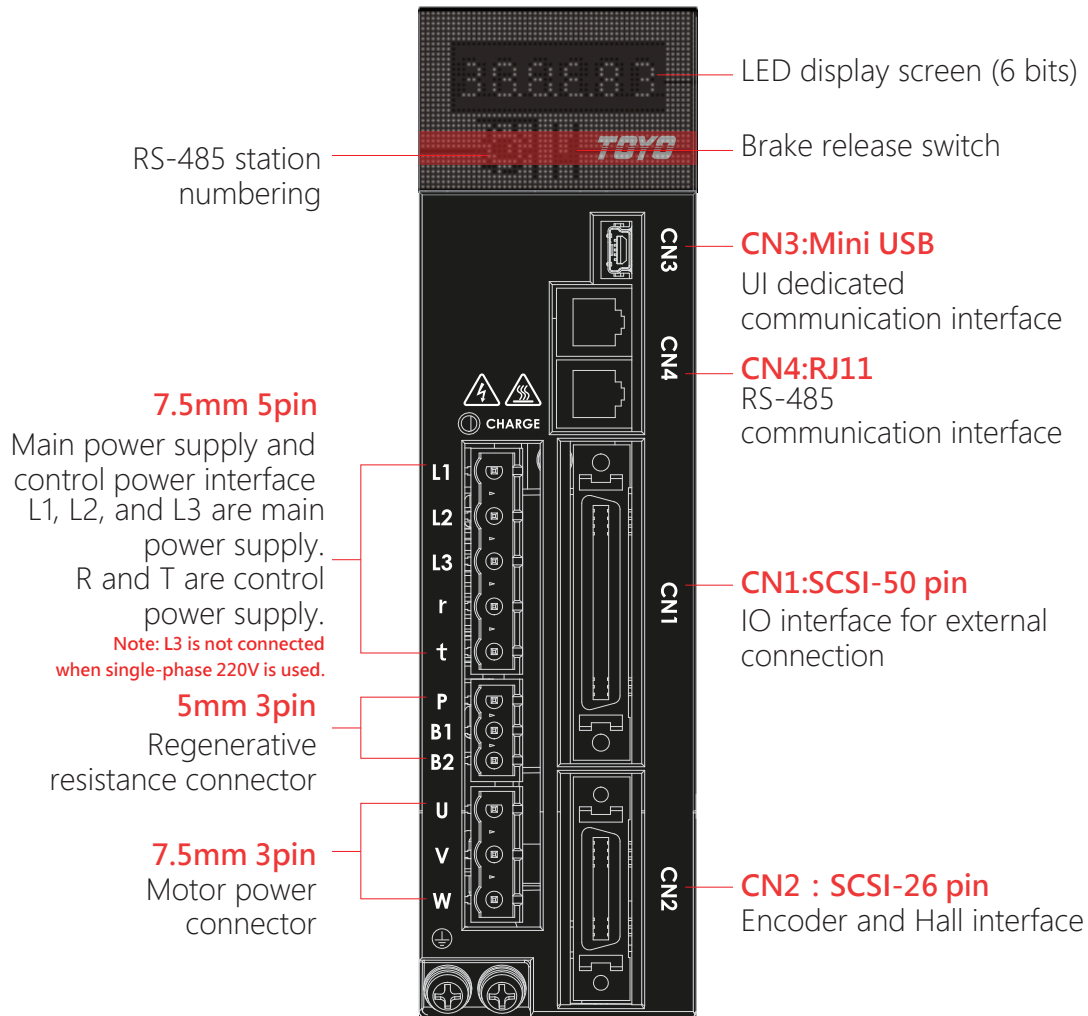
Warranty is provided as above.

2. Specifications

2.1 Basic specifications

Item		Description
Input power	Control power	Single-phase AC200 ~ 230V
	Power supply	Single-phase AC200 ~ 230V
Number of control shaft		1
Motor	Applicable motor	Linear motor
	Rated output	400W for 2.8A/750W for 5.6A
	Instantaneous maximum output	400W for 14.2A/750W for 25A
Movement control mode		ABS absolute position operation, INC relative position operation, INC-R relative position continuous operation, ABS-R absolute position continuous operation, ABS-T operation, INC-T operation, TSL torque monitoring
Pulse control mode		Input control: Differential (4Mpps)/ open collector (200Kpps) signal (CW/CCW; PULSE/DIR;A/B phase) Output signal: A, /A, B, /B, Z, /Z
Position	The total number of points	1~255 points (individual actions)
	Point setting side	Communication setting point location IO point location teaching
Encoder	Location management	Incremental type
	Position detection	AB phase PULSE maximum 10Mpps (4 times after transmission)
	Resolution	The resolution is determined by the reading head. The standard configuration is magnetic ruler reading head (1μm), while optional configuration is optical ruler reading head (0.5μm).
General-purpose DI/DO signals		DI (15 points)/DO (15 points)NPN can be modified by parameters
Error history		Up to 50 error codes can be stored
Safety circuit		After emergency stop and press-in (servo OFF)
Communication	USB(virtual COM port):Mini USB/RS485(half duplex):RJ11	
	RS-485 Modbus, can control the combined operation and direct movement of points (16 stations)	
	Extensible EtherCAT module (255 stations)	
Station numbering		Rotate the DIP switch (0~F), 16 stations
Safety certification		CE, EN61800-3/EN61800-5-1
Station numbering		Rotate the DIP switch (0~F), 16 stations

2.2 Name and description of components of controller



3. Installation & Wiring

Please pay attention to the controller installation environment.

3.1 Installation environment

- When installing and wiring the controller, please avoid blocking the ventilation hole used for cooling. If it is not well ventilated, it will not only fail to present full performance, but also may lead to failure.
- Avoid entry of foreign matter from the vent hole into controller. In addition, the controller is not dust-proof and water-/oil-proof, so please avoid using it in environment with much dust, oil fog, or flying cutting fluid.
- Please protect the controller from direct sunlight, heat treatment furnace and other large heat sources generated thermal radiation.
- The controller shall be used within the temperature of 0 ~ 50 °C , humidity below 85% (no condensation), and in environment without corrosive and combustible gas.
- The controller itself shall be used in an environment that is not subject to external vibration or impact.
- Electrical interference to the controller body and cables should be avoided.

3.2 Power supply

Main power supply L1, L2, L3: AC 220V \pm 10%

(Single-phase power supply shall be used for power below 750W, and L3 is not used when single-phase power supply is used.) Control power supply R, T: AC 220V \pm 10%

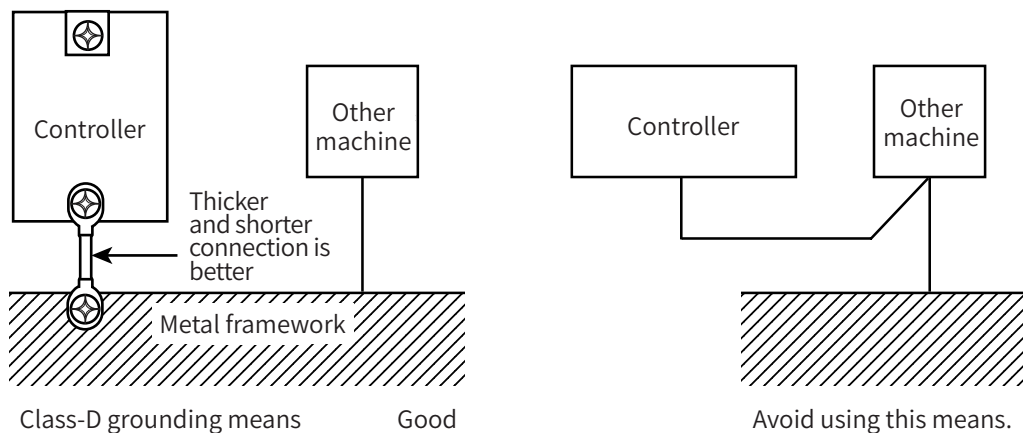
IO power supply: DC 24V \pm 10%

3.3 Interference protections and grounding

Interference protections in use of controller are described below.

1. Wiring and related power supply

- (1) When earthing, please use special Class-D earthing means.
Cables above 2.0 ~ 5.5mm² shall be used for wiring.



(2) Considerations for Wiring

DC24V external power supply shall be connected with stranded wire for wiring.

The controller shall be connected separately and independently from the power circuit and other strong electrical circuit.

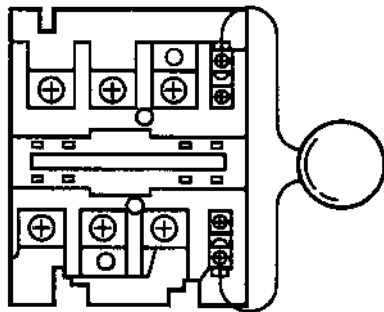
(Not tied together, nor put in one cable tray.)

For attached extensive motor cable or encoder cable, please consult us.

2. Interference source and interference protection

There are many interference sources in the system composition, including solenoid valves, magnetic switches and relays, which can be prevented separately by the following treatment.

Treatment of AC solenoid valve, magnetic switch, relay Install current absorber in parallel with coil.



← Key point

Install to each coil with the shortest connection.

When mounted to the terminal board, its performance will be impaired if there is a distance to the coil.

3.4 Ventilation and installation

When designing sizes of the distribution box, configuration of the controller and the cooling method, attention shall be paid to the installation conditions to ensure that the controller operates under normal conditions, as shown below.

■ ■ Mounting position

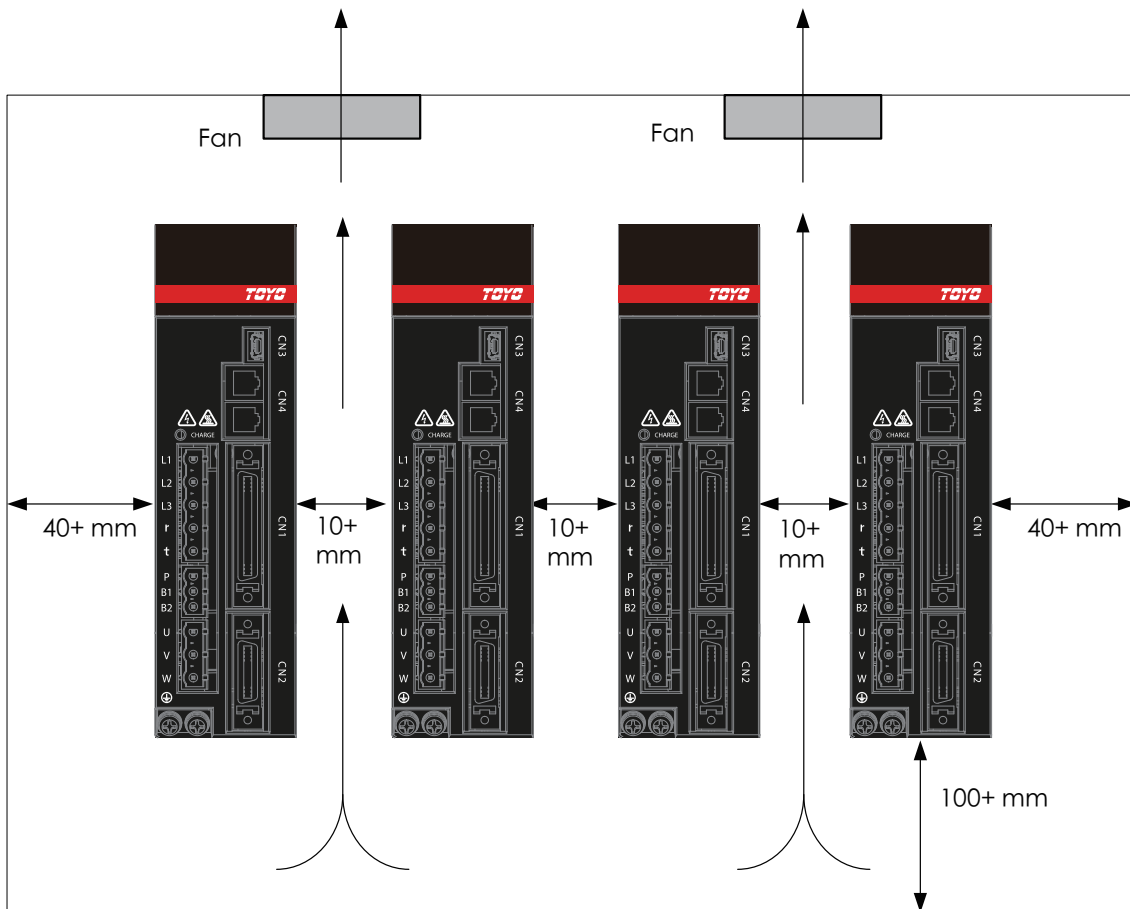
Please install the controller in the control panel.

■ ■ Installation direction

Please install the controller vertically on the wall surface.

■ ■ Surrounding space

Please install the controller in a well-ventilated place and leave enough space around it. (Refer to the figure below)



For the clearance between the controller, no matter 1 or more sets, a proper distance shall be set aside to facilitate the installation and removal of controller.

■ Operating temperature and humidity

The ambient temperature and humidity for the controller must meet the following conditions.

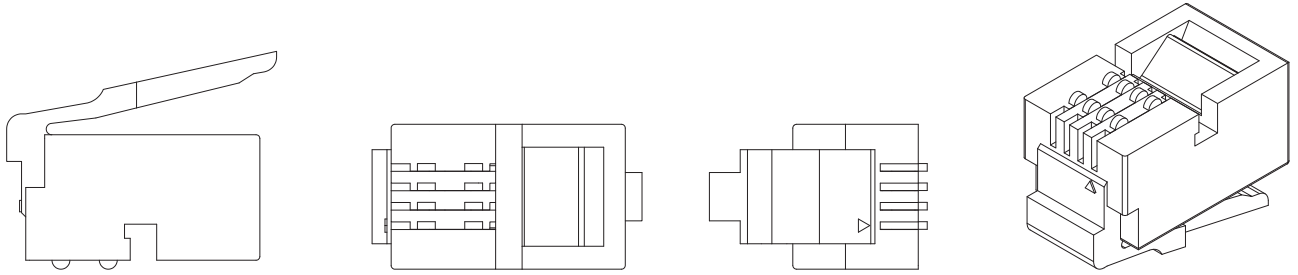
- Ambient temperature: 0 ~ 50°C (no condensation)
- Ambient humidity: 35 ~ 85%RH (no condensation)

■ Unfavorable operating environment

In order to enable the controller to operate under normal conditions, please avoid using it in the following environments.

- Environment containing sulfuric acid, hydrochloric acid and other corrosive gases, flammable gases or flammable liquids
- Place with heavy dust
- Areas that are likely to be exposed to chips, oil, water from other equipment
- Location affected by strong vibration
- Place that can produce electromagnetic or static noise
- Environment under direct sunlight

3.5 RS485 connection



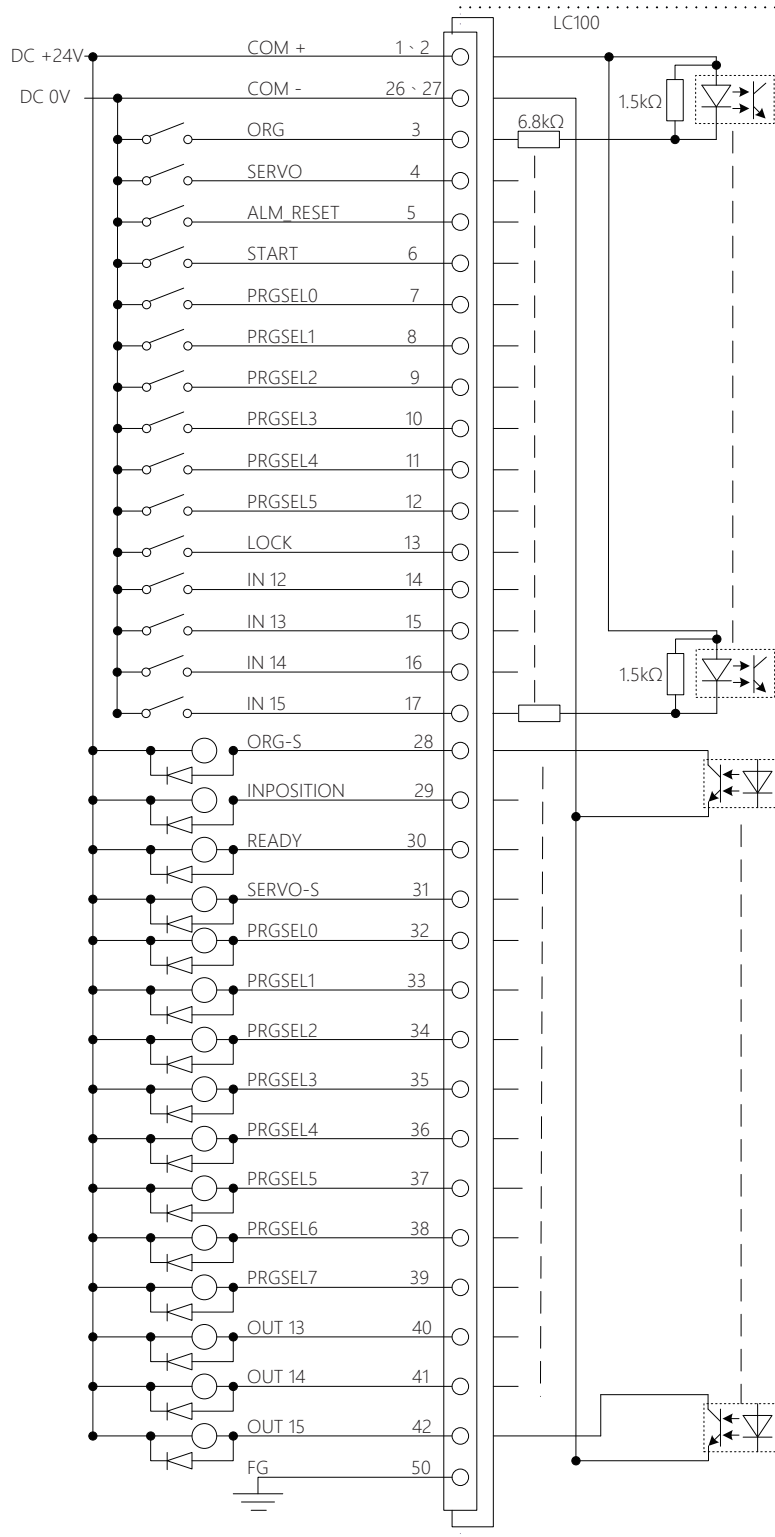
■■ Name and function of the terminal RJ11_4P4C

Diagram	Number	Singnal name	Description
	1	GND	Inner of controller 0V
	2	D+	RS-485 DATA+
	3	D-	RS-485 DATA-
	4	GND	Inner of controller 0V

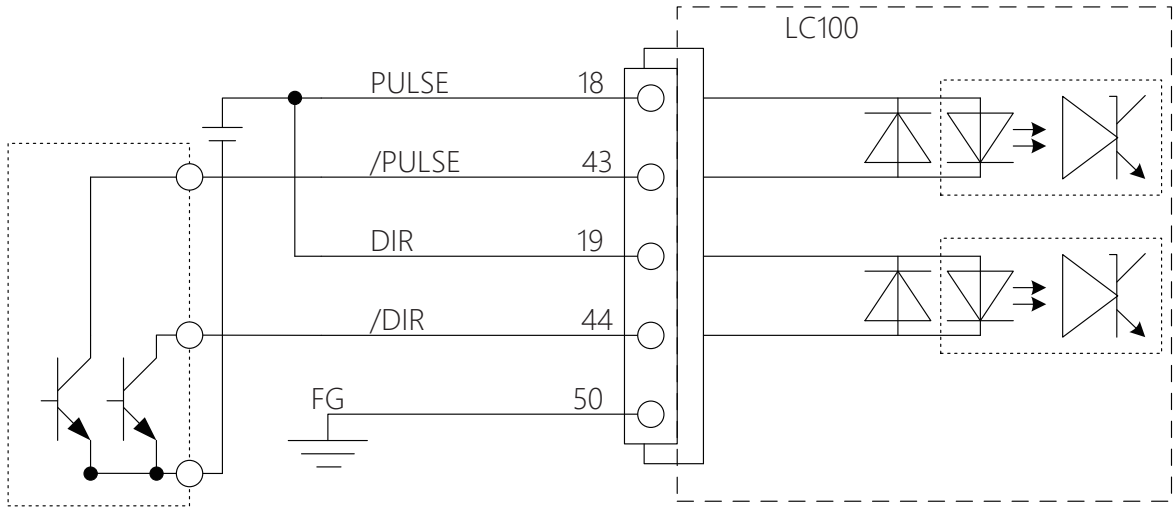
3.6 IN/OUT SIGNAL CONNECTION

Connect the robot cable to the connector interface on the front side.

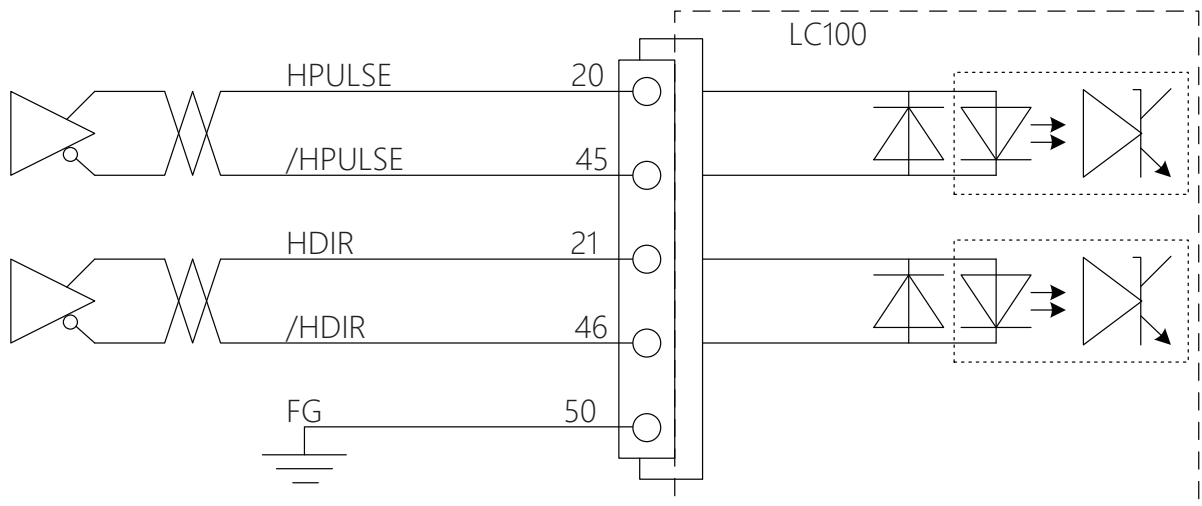
1. Connection method (NPN)



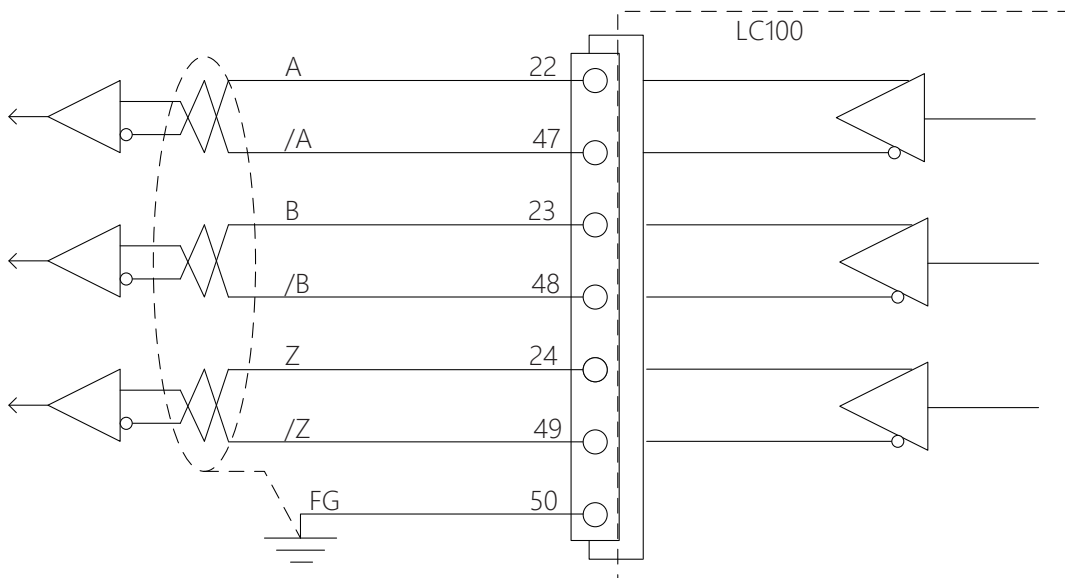
2. Open collector circuit



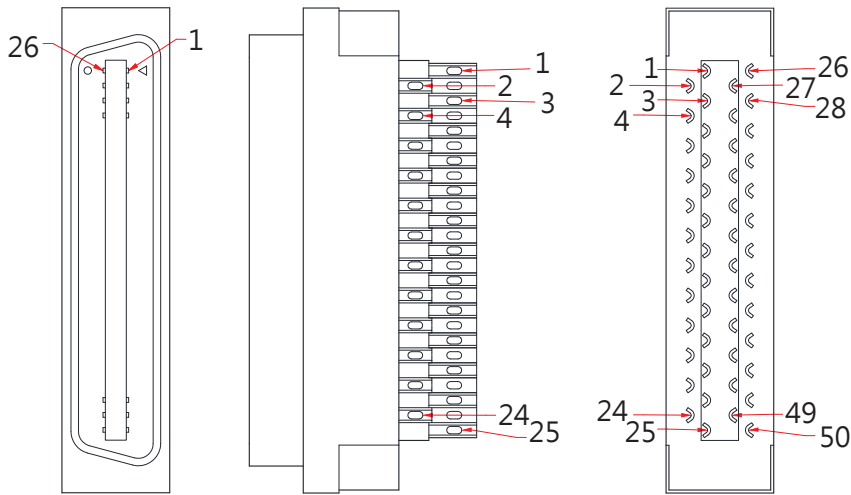
3. Line drive circuit



4. Pulse signal output



5.Name and function of CN1 IO 50 PIN terminal



6.IO Pin Definitions

NO		Signal name	Description	NO		Signal name	Description
1	Dedicated	IN-COM	Input signals sharing COM connection (NPN: +)(PNP:-)	26	Dedicated	OUT-COM	Output signals sharing COM connection (NPN: -)(PNP: +)
2		IN-COM		27		OUT-COM	
3		ORG	Origin return signal	28		ORG-S	Origin return completed
4		/SERVO	Servo signal	29		INP-S	In-place signal
5		ALM_RESET	Error reset	30		READY	Ready to complete
6		START	Start point selection	31		SERVO-S	Servo excitation signal
7		PRGSEL0	Point selection 0	32		PRGSEL0	Point selection 0
8	Digit	PRGSEL1	Point selection 1	33	Digit	PRGSEL1	Point selection 1
9		PRGSEL2	Point selection 2	34		PRGSEL2	Point selection 2
10		PRGSEL3	Point selection 3	35		PRGSEL3	Point selection 3
11		PRGSEL4	Point selection 4	36		PRGSEL4	Point selection 4
12		PRGSEL5	Point selection 5	37		PRGSEL5	Point selection 5
13		LOCK	Pause	38		OUT 11	Retained
14		IN 12	Retained	39		OUT 12	Retained
15		IN 13	Retained	40		OUT 13	Retained
16		IN 14	Retained	41		OUT 14	Retained
17		IN 15	Retained	42		OUT 15	Retained
18	Dedicated	PULSE	Pulse - open collector circuit	43	Dedicated	/PULSE	Pulse - open collector circuit
19		DIR	Pulse - open collector circuit	44		/DIR	Pulse - open collector circuit
20		HPULSE	Pulse-line drive circuit	45		/HPULSE	Pulse-line drive circuit
21		HDIR	Pulse-line drive circuit	46		/HDIR	Pulse-line drive circuit
22		A	Pulse output A	47		/A	Pulse output /A
23		B	Pulse output B	48		/B	Pulse output /B
24		Z	Pulse output Z	49		/Z	Pulse output /C
25		GND	Inner of controller 0V	50		FG	Isolation net grounding

7.IO function description

① DI definition

If you use the controller function, please use the default IO definition, and do not arbitrarily change it to avoid UI from failing to operate.

Input digital INPUT signal 14 points/IO function can be freely configured/NPN		
NO.	IO signal	Functional description
1	ORG	origin return starts
2	/SERVO	Servo ON
3	ALM RESET	Error cleared
4	START	Program started
5	JOG+	Inch moving forward
6	JOG-	Inch moving backward
7	MANUAL	Manual mode
8	TEACH	Point teaching
9	LOCK	Interlocking/Pause
10	ORG_SIG	Origin return SENSOR signal
11	BK_OFF	Brake control (when SERVO_OFF)
12	PRGSEL 0	Procedure selection No.0~No.255 bit 0
13	PRGSEL 1	Procedure selection No.0~No.255 bit 1
14	PRGSEL 2	Procedure selection No.0~No.255 bit 2
15	PRGSEL 3	Procedure selection No.0~No.255 bit 3
16	PRGSEL 4	Procedure selection No.0~No.255 bit 4
17	PRGSEL 5	Procedure selection No.0~No.255 bit 5
18	PRGSEL 6	Procedure selection No.0~No.255 bit 6
19	FULL_COUNT	Toggle the full-count judgment

② DO definition

If you use the controller function, please use the default IO definition, and do not arbitrarily change it to avoid UI from failing to operate.

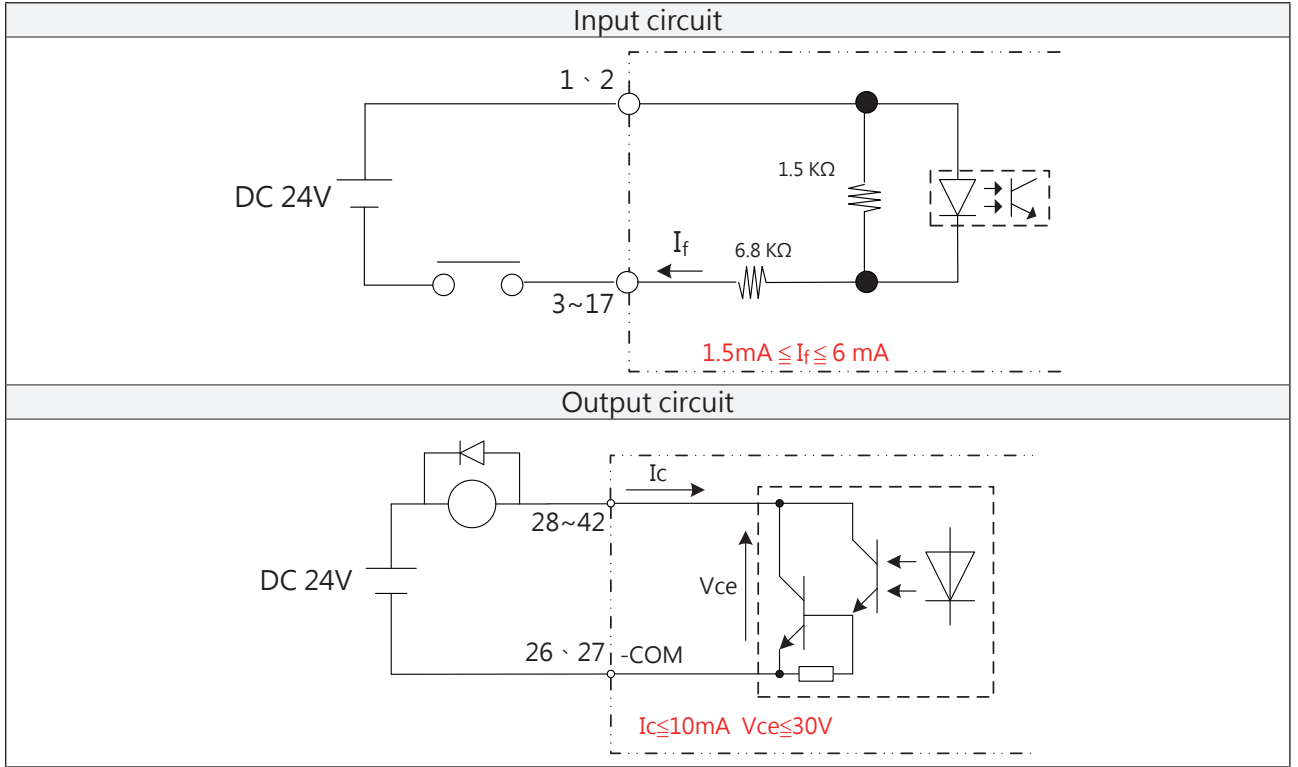
Digital output signal OUT PUT 10 points/IO function can be freely configured/NPN		
NO.	IO signal	Functional description
1	INP	In-place signal
2	ALARM	Error output
3	READY	Ready to complete
4	MOVE	In movement
5	ORG-S	Origin return completed
6	SERVO-S	Servo state
7	PRGSEL 0-S	Procedure selection No.0~No.255 bit 0
8	PRGSEL 1-S	Procedure selection No.0~No.255 bit 1
9	PRGSEL 2-S	Procedure selection No.0~No.255 bit 2
10	PRGSEL 3-S	Procedure selection No.0~No.255 bit 3
11	PRGSEL 4-S	Procedure selection No.0~No.255 bit 4
12	PRGSEL 5-S	Procedure selection No.0~No.255 bit 5
13	PRGSEL 6-S	Procedure selection No.0~No.255 bit 6
14	INRANGE	Output signal within the area
15	TRQ_LMT	Set current reaches the output signal
16	ERR 0	Error code output and displayed bit0
17	ERR 1	Error code output and displayed bit1
18	ERR 2	Error code output and displayed bit2
19	ERR 3	Error code output and displayed bit3
20	NEAR	When moving within the range of target position, output target position from point position operation mode ABS, INC setting
21	SOFLMT	Software limit output lamp No.

▲ Note:

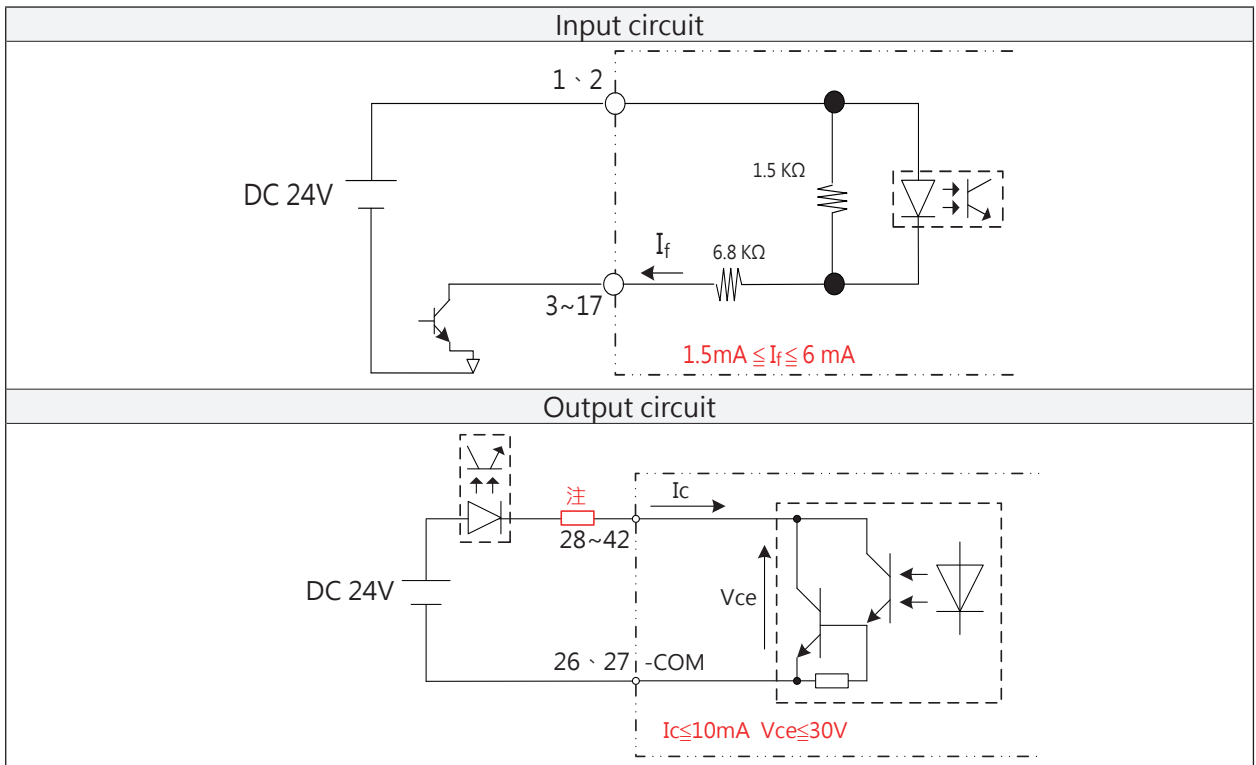
When wiring, take care not to connect wrong terminal number or cause short circuiting between terminals. Improper connection may cause damage to the controller. Please make sure the arrangement of terminals carefully when connecting. Be careful not to cause short circuiting between terminals.

3.7 Connector wiring diagram

1. Relay contact wiring

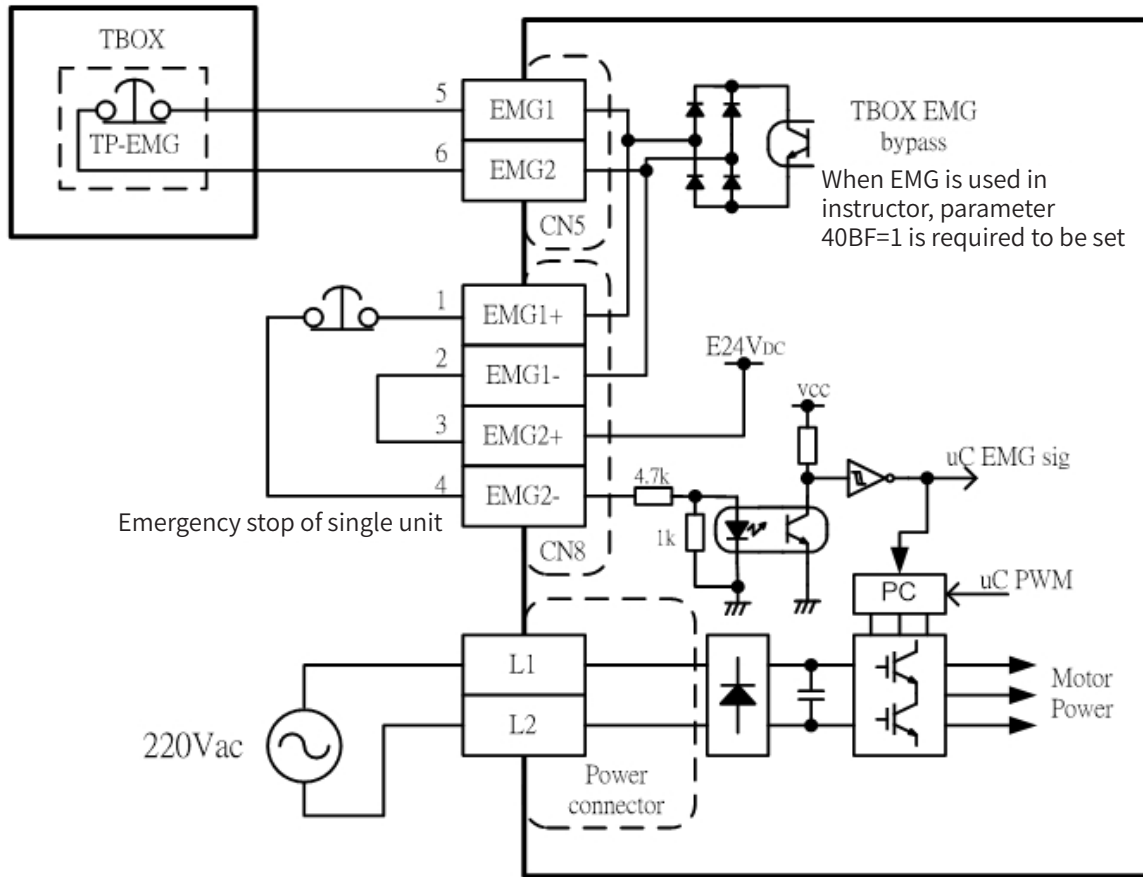


2. Transistor connector wiring



Note) Please consider that the saturation voltage of the output opto-coupler 1VTYP (when the output current is 10mA) will determine the limit value.

3.8 Emergency stop circuit diagram



4. Data setting

In order to use LC100 to operate a robot, both coordinate point data and parameter data must be set.

4.1 Overview

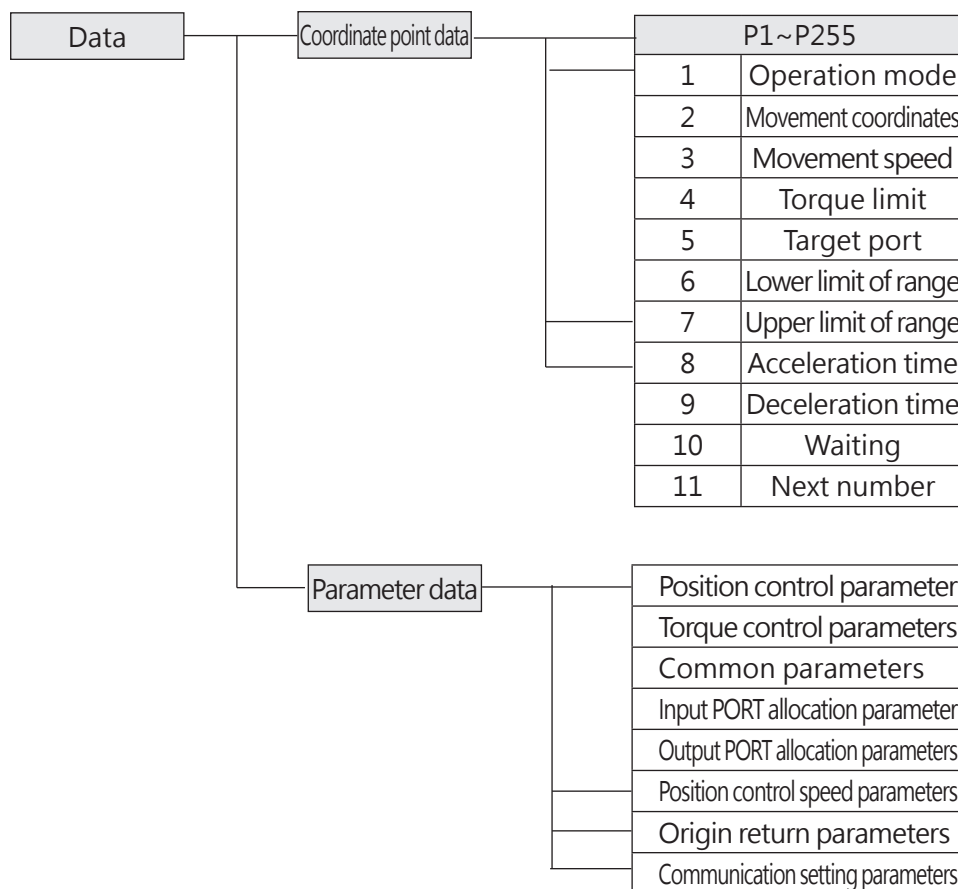
1.Coordinate point data setting:

Coordinate point data provides "standard Settings" for optimal positioning and "custom Settings" for setting speed and acceleration through SI unit position by specifying only the weight to be carried, which can be selected based on the purpose. The coordinate point data used for positioning contains items such as Operation Type, Position, and Speed. Data on 255 points are available in P1~P255.

2.Parameter data setting:

Parameter data can be classified into "motor parameters", "thrust parameters", "common parameters", "input setting", "output setting", "speed parameters" and "origin parameters", and "communication parameters".

3.Data composition:



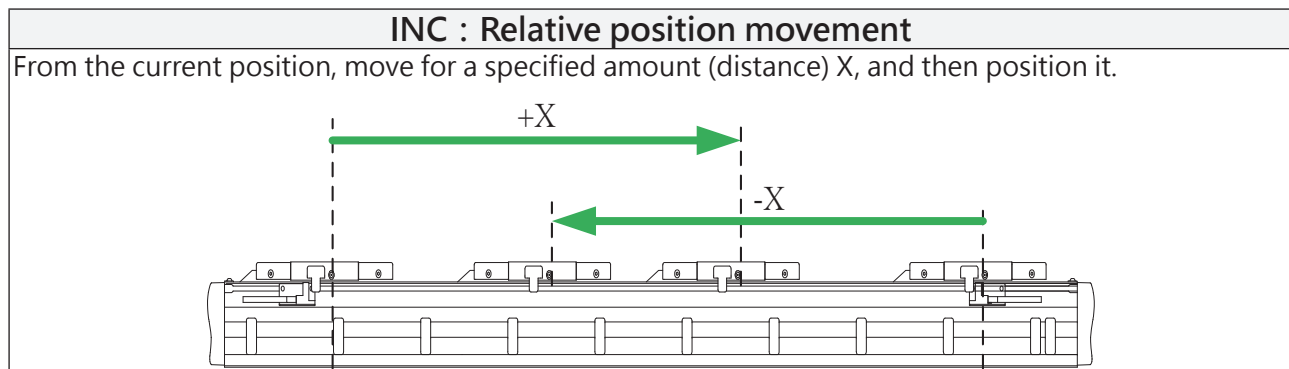
4.Coordinate point data item:

P1~P255					
Item	Content		Range	Unit	Initial value
1	Operation mode	Set the type of location during operation.	9 modes	-	0
2	Movement coordinates	Set the target position or movement amount during operation.	-9999.99~9999.99	mm	0.00
3	Movement speed	Set the speed (%) during operation	1~100	%	100
4	Torque limit	Set the current limit value during operation.	1~1000	0.1%	1000
5	Target port	When the operation mode is set to "+SIG, -sig, OUT1, OUTB, OUTS", specify the output/input IO code.	INPUT : $\pm 9 \sim \pm 15$ OUTPUT : $\pm 2 \sim \pm 15$	-	0
6	Lower limit of range	Set the scope of "single area output".	-9999.99~9999.99	mm	0.00
7	Upper limit of range				
8	Acceleration time	Time taken to accelerate to a set speed	1-30000	msec	300
9	Deceleration time	Time taken to stop still from a set speed	1-30000	msec	300
10	Waiting	Waiting delay time after movement has ended.	0~30000	ms	0
11	Next number	The next execution number after movement has ended.	1~255	-	-1

4.2 Coordinate point data details

Each item of the coordinate point data is detailed below.

1.Description of each operation mode:



UI application instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	INC	250.000	100	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

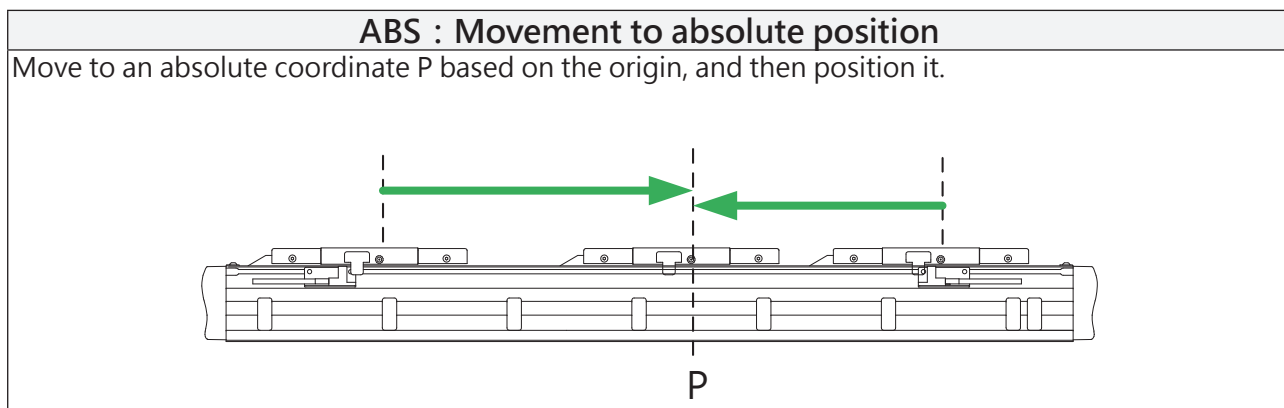
1 · Move for 250mm from the current position opposite to the origin, at a speed 100%. When using INC, the torque limit is subject to the parameters (0400H, 0401H). (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Torque limit and target port are disabled)

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	INC	-28.550	75	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move for 28.55mm from the current position opposite to the origin, at a speed 75%. When using INC, the torque limit is subject to the parameters (0400H, 0401H). (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Torque limit and target port are disabled)



UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	ABS	250.000	100	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move for 250mm from the current position opposite to the origin, at a speed 100%. When using ABS, the torque limit is subject to the parameters (0400H, 0401H). Torque limit and target port are disabled.

UI application Instructions:

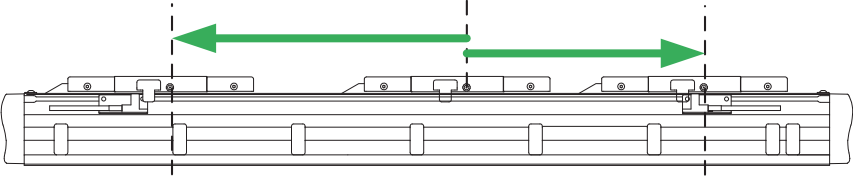
Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	ABS	128.55	50	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move for 128.55mm from the current position opposite to the origin, at a speed 50%. When using ABS, the torque limit is subject to the parameters (0400H, 0401H). Torque limit and target port are disabled.

ORG : Origin return movement

Now move the position to the origin.



ORG: The origin position mainly depends on the parameter setting. Sub-motor side and reverse-motor side.

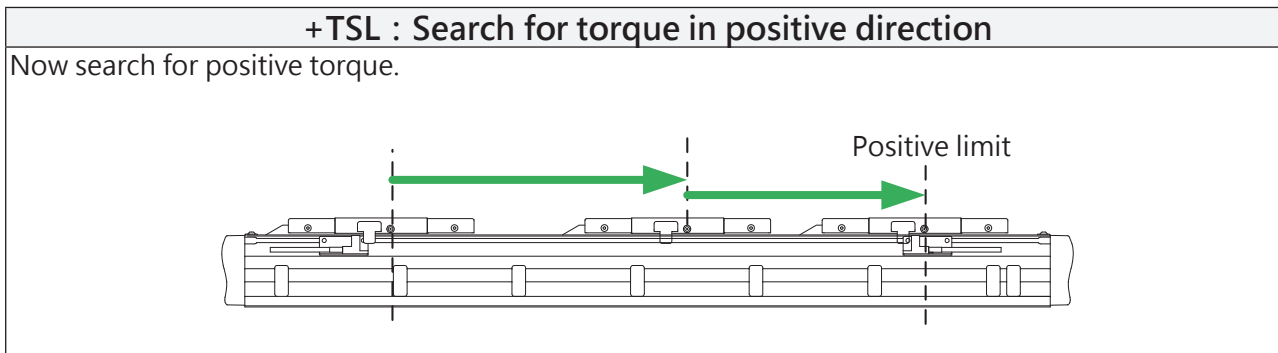
UI application instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC-R	100.000	30	1000	0	0.00	0.00	300	300	0	2
002	ORG	250.000	100	1000	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move to the origin from the current position to the origin based on the origin parameter setting. When moving, "ORG-S" is OFF. When the movement is completed, "Org-s" is ON.

Note: ORG only accepts the setting of origin parameters, and point position setting is only valid for the waiting time after end of the movement and for the number of the next step.



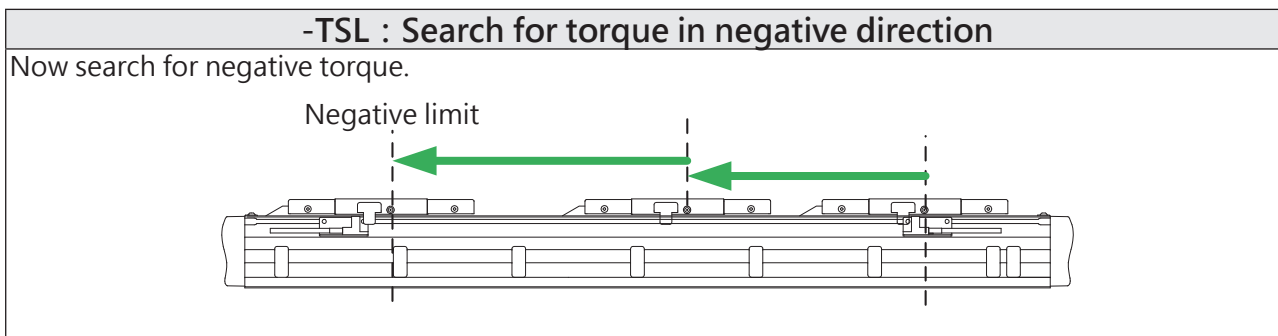
UI application instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	+TSL	250.000	100	335	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move from the current position to the limit position of the software with 33.5% torque in the direction opposite to the origin or till the torque reaches 33.5%.

Note: Movement coordinates, target port, and acceleration and deceleration time are disabled.



UI application instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	-TSL	250.000	100	516	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

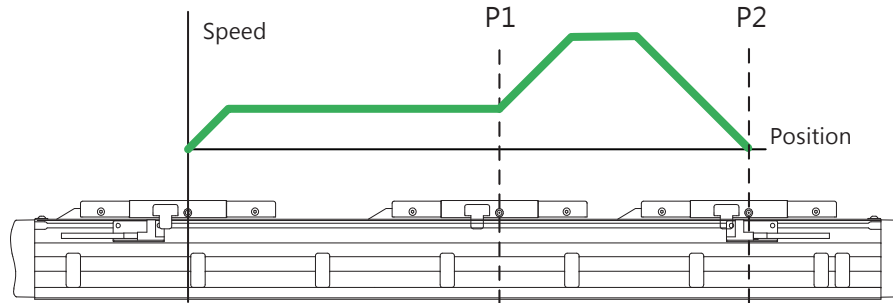
Action description:

1 · Move from the current position to the limit position of the software with 51.6% torque toward the origin or till the torque reaches 51.6%.

Note: Movement coordinates, target port, and acceleration and deceleration time are disabled.

ABS-R : Continuous operation to absolute position

Change the speed without stopping, and run multiple coordinate points continuously.



Points P1 and P2 are of absolute coordinates based on the origin.

(1) Accelerate to the speed specified at coordinate point 2 (2) After reaching P1, continue to move toward P2 without stopping.

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	ABS-R	100.000	30	1000	0	0.00	0.00	300	300	0	2
002	ABS-R	250.000	100	1000	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move from the current position at 30% speed and 100% torque to the absolute position at 100mm, and then accelerate to 100% speed and 100% torque and move to absolute position at 250mm. (Target port is disabled)

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	ABS-R	210.000	100	800	0	0.00	0.00	300	300	0	2
002	ABS-R	250.000	20	300	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move from the current position at 100% speed and 80% torque to the absolute position at 210mm, and then accelerate to 20% speed and 30% torque and move to absolute position at 250mm. (Target port is disabled)

INC-R : Continuous operation based on relative position movement

Change the speed without stopping, and run multiple coordinate points continuously.

Amount of multiple movements (distance) specified in movement from current position movement.
 (1) Move for specified amount of movement (X1)
 (2) After reaching the specified amount X1, accelerate (decelerate) to the specified speed P2, and then move to P2 by the specified amount X2.

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC-R	100.000	30	1000	0	0.00	0.00	300	300	0	2
002	INC-R	250.000	100	1000	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

Move from the current position at 30% speed and 100% torque opposite to the origin for 100mm, and then accelerate to 100% speed and 100% torque and move opposite to the origin for 250mm. (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Target port is disabled)

UI application Instructions:

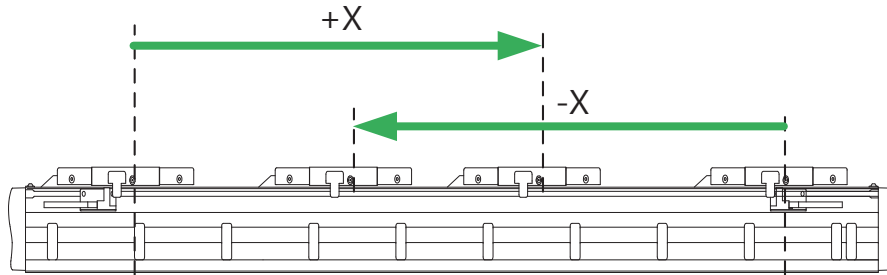
Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC-R	210.000	100	500	0	0.00	0.00	300	300	0	2
002	INC-R	-50.000	20	200	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move from the current position at 100% speed and 50% torque opposite to the origin by 210mm, and then decelerate to 20% speed and 20% torque and move toward the origin for 50mm. (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Target port is disabled)

INC-T : Relative position movement

After moving a specified amount (distance) X from the current position, locate it and detect the torque during the movement.

**UI application Instructions:**

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	INC-T	250.000	100	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

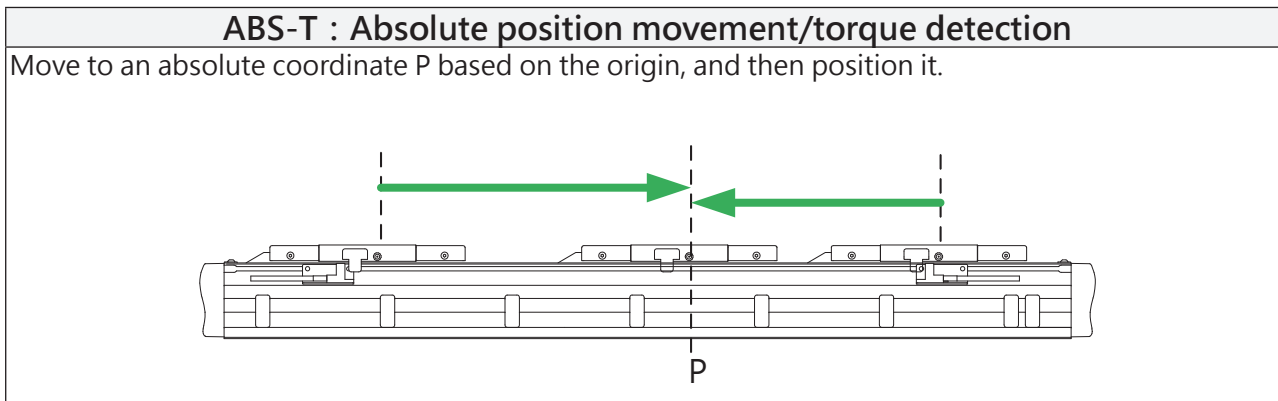
1 · Move 250mm from the current position opposite to the origin by 250mm at 100% speed and 50% torque. When torque reaches 50% of the set value during the movement, motor will maintain a 50% torque output till it moves to the position at 250mm or is stopped by LOCK. (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Target port is disabled)

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	INC-T	-28.550	75	650	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move 28.55mm from the current position toward the origin by 28.55mm at 75% speed and 65% torque. When torque reaches 65% of the set value during the movement, motor will maintain a 65% torque output till it moves to the position at 250mm or is stopped by LOCK. (When the movement coordinate value is positive, it moves in the direction opposite to the origin. When the movement coordinate is negative, it moves toward the origin. Target port is disabled)



UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	ABS-T	250.000	100	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

1 · Move from the current position at 100% speed and 50% torque to an absolute position at 250mm, and stop when torque reaches 50% during the movement and finish movement to the target position. The target port is disabled.

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
002	ABS-T	128.55	50	500	0	0.00	0.00	300	300	0	-1
003	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1

Action description:

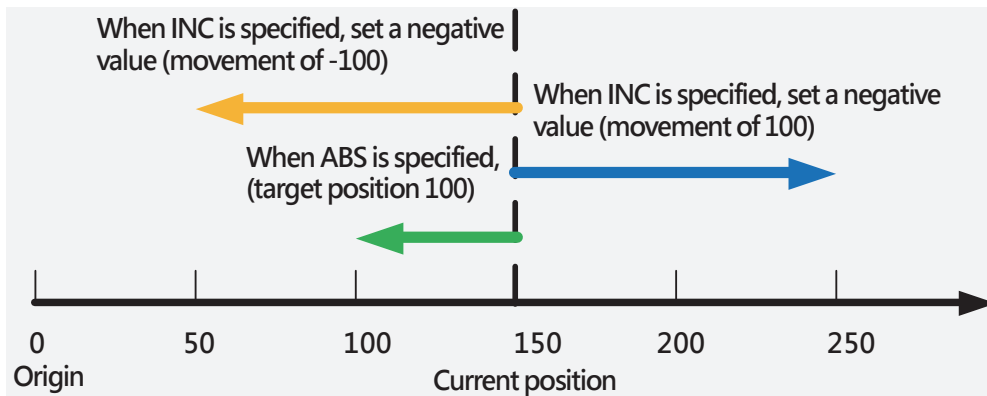
1 · Move from the current position at 50% speed and 50% torque to an absolute position at 128.55mm, and stop when torque reaches 50% during the movement and finish movement to the target position. The target port is disabled.

4.3 Movement coordinates

It will vary according to the operation mode.

- ■ ABS: Absolute position, with set value as the target position.
- ■ INC: Relative position, with set value as the amount of movement, either in positive or negative direction.

The following figure displays the movement coordinates, and the movement difference when 100 is set:



4.4 Movement speed

Used to set the speed during movement; and set as a percentage (%) of the maximum speed of robot.

⚠ Note:

When using torque search mode, reduce the speed to less than 30% to improve the accuracy of torque force feedback

4.5 Torque limit

Set the current limit value during movement. and set as a percentage (%) of the rated current of robot.

⚠ Note:

The torque limit value is set at an increment of 0.1%, so 1000 is 100%, which represents the rated current of robot. The current value of each robot varies depending on hardware friction force.

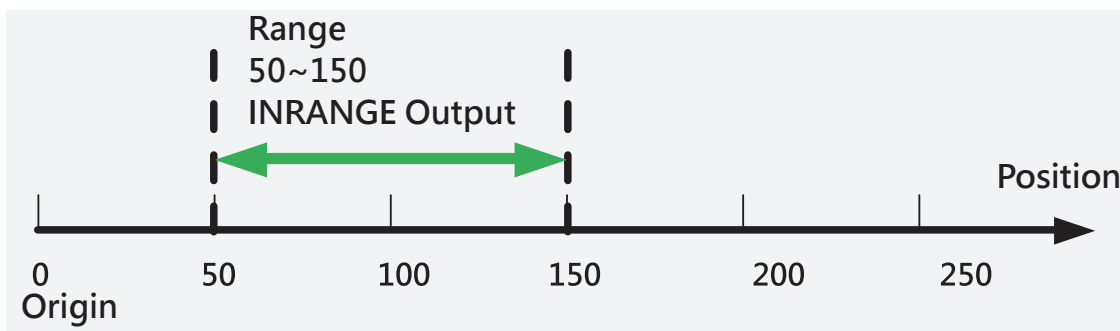
4.6 Target port

It is available only when operation mode is \pm SIG, OUTI, OUTB, or OUTS, and its port value is mainly set as the input/output IO number. It will be unavailable in any other modes.

4.7 Range setting (upper/lower limit)

Set the upper and lower limits of the range, within which special signal "INRANGE" will be output. For output of special signal, it is necessary to set the output IO parameters first.

The following figure gives an example of range set between absolute positions 50 and 150 from the origin:



4.8 Acceleration / deceleration time

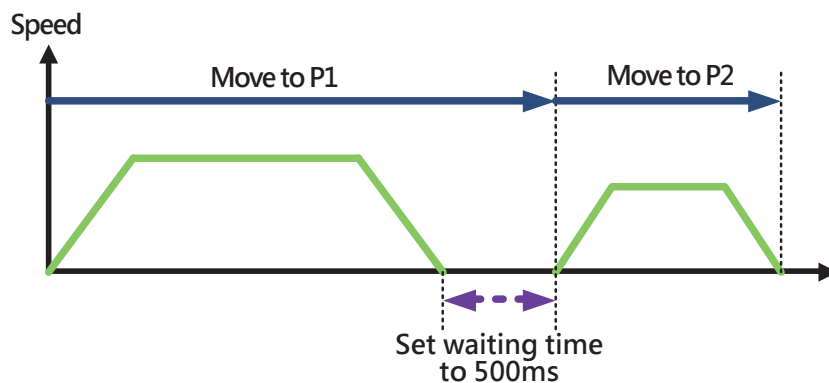
Set different acceleration and deceleration time of each point, to facilitate users to set more different actions.

4.9 Waiting

Set the waiting time finish moving to for a point position. A full movement contains waiting time, upon end of which "READY" and "MOVE" will occur.

UI application Instructions:

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Target port	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
001	INC-R	210.000	100	500	0	0.00	0.00	300	300	500	2
002	INC-R	50.000	20	200	0	0.00	0.00	300	300	0	-1
003	ABS	200.000	50	823	0	0.00	0.00	300	300	0	-1
004	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
005	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1
006	INC	0.000	100	500	0	0.00	0.00	300	300	0	-1



Action description: Move to point P1, and wait for 500ms, and then move to point P2.

5. Parameter information

5.1 Motor parameters

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Unit	Power on again
0108 h	2	FullCountValue	Counter Overflow Alarm Value (PULSE)	Alarm will be activated when the differential PULSE value between current position and instruction position is greater than this value.	30000	1 ~ 2147483647	Pulse	×
010A h	1	InPositionZone	INPOSITION Signal in-position range setting (Pulse)	A too large set value is set or too low movement speed may cause the INPOSITION signal to be constantly ON. When the difference between instruction position and current position is less than the set value, the signal is ON."	4	0~1000	Pulse	×
0114 h	1	PosDir	External pulse instruction, with rotation direction specified	"0: Motor running direction, CW 1:Motor running direction, CCW	0	0~1	-	
0115 h	1	SelComPulse	External pulse instruction form	"0: CW/CCW(initial value) 1: PULSE/DIR 2: Phase A /Phase B	0	0~2	-	○
011D h	1	NearZone	Near Signal Output Range Setting (Pulse)	Signal is ON when approaching target is less than set value (initial value 4)	4	0~10000	Pulse	×

5.2 Push parameters

Parameter	word	Abbreviation	Description	Remark	Default value	Value range	Unit	Power on again
0400 h	1	DigPushTrqRateCw	Push in + direction, with torque value (× 0.1%)	Maximum torque value in positive direction	1000	0~1000	0.10%	×
0401 h	1	DigPushTrqRateCcw	Push in - direction, with torque value (× 0.1%)	Maximum torque value in negative direction	1000	0~1000	0.10%	×
0402 h	1	TrqLmtTime	Torque Limit Detection Time (msec)	Maximum torque value detection time	0	0~10000	msec	×
0406 h	1	RtnSpdLmtEnable	Select whether there is a position to correct the speed limit	"0:Invalid 1:Valid (initial value)"	1	0~1	-	×
0407 h	1	RtnMaxSpd	"There is a position to correct the speed limit RPM linear motor(mm/sec)"	(Initial value 10)	10	0~500	"rpm mm/sec"	×

5.3 Common parameters

Parameter	word	Abbreviation	Description	Remark	Default value	Value range	Unit	Power on again
0500 h	1	MaxTrqRate	Set the maximum output torque in position mode (× 0.1%)	100% is the peak torque (Initial value 1000)	1000	0~1000	0.1%	×
0501 h	1	FullTrqTime	Full Torque Error Detection Time (msec) in Position Mode	(Initial value 1000)	1000	500~10000	msec	×
0503 h	1	ModeSwitch	Mode switch under PULSE control	"0:Torque mode (initial value) 1: Position mode"	1	0~1	-	×
0515 h	1	ServoState	Servo state set upon power input	"0: Servo ON (initial value) 1: Servo OFF"	0	0~1	-	×
051B h	1	OrgRetRestrict	Action limit with origin return uncompleted	"When origin return is uncompleted, any movement will be restricted. 0:Not restricted (action is allowed when origin return is uncompleted) 1: Restricted (action is allowed only when origin return is completed) (initial value)"	1	0~1	-	×
051E h	1	UseTotalRev	Switch of the function that specifies the number of turns the motor accumulates.	"0:Invalid (initial value) 1:Valid"	0	0~1	-	×
40A2 h	1	SelPulseIo	Switch pulse input interface	"0: Open collector control.(18 : PULSE, 43: / PULSE, 19 :DIR, 44:/DIR) 1: Linear motor motion control. (20 : HPULSE 、 45 : /HPULSE 、 21 : HDIR 、 46 : /HDIR) The software is displayed on the common parameters page."	0	0~1	-	○

5.4 Input settings

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Remark	Power on again
0601 h	1	JOG+	JOG + : + Jog movement (applied when MANUAL is ON)	Execute inch in positive direction. (Manual mode is valid)	0	0 · 9~15		○
0602 h	1	JOG-	JOG - : - Jog movement (applied when MANUAL is ON)	Execute inch in negative direction. (Manual mode is valid)	0	0 · 9~15		○
0603 h	1	MANUAL	MANUAL: Manual mode	Manual/automatic mode switch.	0	0 · ±9~15		○
0604 h	1	TEACH	TEACH: Point position is stored (applied when MANUAL is ON)	Sets the current position to the specified point position. (Manual mode is valid)	0	0 · 9~15		○
0605 h	1	ALM_RESET	ALM_RESET: Alarm Reset (Enable only when Servo is OFF)	When an alarm occurs, the alarm resets. (Valid when servo is OFF)	3	3		○
0606 h	1	SERVO ON/OFF	SERVO ON/OFF: Servo ON/OFF	Motor excitation ON/OFF switch	-2	2		○
0607 h	1	LOCK	LOCK: Pause/interlock	The motor is suspended during operation.	13	0 · ±9~±15		○
060A h	1	ORG_SIG	ORG_SIG: Origin return detection signal	External origin sensor, input contact.	0	0 · ±9~±15		○
060B h	1	BK_OFF	BK_OFF: Brake ON/ OFF signal (applies when SERVO is OFF)	Brake release signal. (Valid when SERVO is OFF)	0	0 · ±9~±15		○
060C h	1	FULL_COUNT	FULL-COUNT: FULL-COUNT switch determination	Uncheck FULL-COUNT set value.	0	0 · ±9~±15		○
060D h	1	LS +	LS + : + limit signal	External positive direction sensor, input contact.	0	0 · ±9~±15		○
060E h	1	LS -	LS - : - limit signal	External positive direction sensor, input contact.	0	0 · ±9~±15		○
0613 h	1	PRGSEL4	PRGSEL4: Program selection No.0 ~ 255 Bit4	Point program switch code Bit 4	9	0 · 9~15		○
0614 h	1	PRGSEL5	PRGSEL5: Program selection No.0 ~ 255 Bit5	Point program switch code Bit 5	10	0 · 9~15		○
0615 h	1	PRGSEL6	PRGSEL6: Program selection No.0 ~ 255 Bit6	Point program switch code Bit 6	11	0 · 9~15		○
0616 h	1	PRGSEL7	PRGSEL7: Program selection No.0 ~ 255 Bit7	Point program switch code Bit 7	12	0 · 9~15		○
0617 h	1	CLR	Clear deviation counter	When instruction position is out of sync with current position, the instruction position will be synchronized to the current position value.	0	0 · 9~15		○
0618 h	1	PULS-INH	Command pulse suppression	In pulse mode, the interrupt external pulse signal is transmitted to the controller.	0	0 · 9~15		○
0619 h	1	GAIN	Gain switching input	It should be set using the UI Viewer mode.	0	0 · 9~15		○
061F h	1	Vs-SEL1	Vibration control switches input 1	It should be set using the UI Viewer mode.	0	0 · 9~15		○
0620 h	1	Vs-SEL2	Vibration control switches input 2	It should be set using the UI Viewer mode.	0	0 · 9~15		○

5.5 Output settings

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Remark	Power on again
0700 h	1	INPOSITION	INP: Inposition signal	When instruction position and current position reach the set value, signal is output. (If the movement speed is too slow, this signal will become "ON" during the movement.)	2	0、±2~±15	"CN1 Interface OUTPUT Numbering Not used when set value is 0."	○
0701 h	1	ALARM	ALARM: Error signal	Signal is output when an error occurs.	0	0、±2~±15		○
0702 h	1	READY	READY : SERVO READY	Signal is output when the controller is ready.	3	0、±2~±15		○
0703 h	1	MOVE	MOVE: In movement	Signal output when motor is running.	0	0、±2~±15		○
0705 h	1	SERVO-S	SERVO-S: SERVOON Status state	Signal is output when motor excites.	4	0、±2~±15		○
0706 h	1	MANUA-SL	MANUA-SL: Manual output	Signal is output when manual mode is activated.	0	0、±2~±15		○
0707 h	1	PULSEIN-S	PULSEIN-S: Pulse action	The signal is output when the upper pulse wave is input.	0	0、±2~±15		○
0708 h	1	INRANGE-S	INRANGE: Range setting Internal output	When the motor moves to the set value in point program signal is output.	0	0、±2~±15		○
0709 h	1	FULLTRQ-S	FULLTRQ-S: Full torque	When motor current value reaches the value set in parameter "0501 H" the torque is output.	0	0、±2~±15		○
070A h	1	TRQLMT-S	TRQLIM: Torque limit	When motor current value reaches the value set in point program the torque is output.	0	0、±2~±15		○
070B h	1	REVLIM-S	REVLIM-S: Limit of turns	"CN4 interface OUTPUT numbering. Not used when set value is 0."	0	0、±2~±15		○
070C h	1	SPEEDLIM-S	SPEEDLIM-S: Speed limit	"CN4 interface OUTPUT numbering. Not used when set value is 0."	0	0、±2~±15		○
070D h	1	CURLIM-S	CURLIM-S: Current value limit	"CN4 interface OUTPUT numbering. Not used when set value is 0."	0	0、±2~±15		○
070E h	1	TEMPLIM-S	TEMPLIM-S: Temperature limit	"CN4 interface OUTPUT numbering. Not used when set value is 0."	0	0、±2~±15		○
070F h	1	SOFTLMT-S	SOFTLMT: Software limit output lamp No.	"CN4 interface OUTPUT numbering. Not used when set value is 0."	0	0、±2~±15		○
0710 h	1	+ SOFTLIM-S	+ SOFTLIM-S: + software Limit output lamp No.	Output when motor moves to the positive software limit.	0	0、±2~±15		○
0711 h	1	- SOFTLIM-S	- SOFTLIM-S: - software Limit output lamp No.	Output when motor moves to the negative software limit.	0	0、±2~±15		○
0712 h	1	PRGSEL0-S	PRGSEL0-S: Program selection No.0 ~ 255 Bit0	Point program switch code Bit 0	5	0、±2~±15		○
0713 h	1	PRGSEL1-S	PRGSEL1-S: Program selection No.0 ~ 255 Bit1	Point program switch code Bit 1	6	0、±2~±15		○
0714 h	1	PRGSEL2-S	PRGSEL2-S: Program selection No.0 ~ 255 Bit2	Point program switch code Bit 2	7	0、±2~±15		○
0715 h	1	PRGSEL3-S	PRGSEL3-S: Program selection No.0 ~ 255 Bit3	Point program switch code Bit 3	8	0、±2~±15	○	
0716 h	1	PRGSEL4-S	PRGSEL4-S: Program selection No.0 ~ 255 Bit4	Point program switch code Bit 4	9	0、±2~±15	○	
0717 h	1	PRGSEL5-S	PRGSEL5-S: Program selection No.0 ~ 255 Bit5	Point program switch code Bit 5	10	0、±2~±15	○	
0718 h	1	PRGSEL6-S	PRGSEL6-S: Program selection No.0 ~ 255 Bit6	Point program switch code Bit 6	11	0、±2~±15	○	
0719 h	1	PRGSEL7-S	PRGSEL7-S: Program selection No.0 ~ 255 Bit7	Point program switch code Bit 7	12	0、±2~±15	○	

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Remark	Power on again
071A h	1	BK-OFF-S	Brake release signal output	Signal is output when motor brake is released.	0	0、±2~±15	"CN1 Interface OUTPUT Numbering Not used when set value is 0."	○
071B h	1	NEAR	NEAR: Near target value	Output when the motor moves to near target value. (Target error reference parameter "011D H")	0	0、±2~±15		○
071C h	1	ALM0-S	ALM0-S: Error code Bit0	Error code Bit0	0	0、±2~±15		○
071D h	1	ALM1-S	ALM1-S: Error code Bit1	Error code Bit1	0	0、±2~±15		○
071E h	1	ALM2-S	ALM2-S: Error code Bit2	Error code Bit2	0	0、±2~±15		○
071F h	1	ALM3-S	ALM3-S: Error code Bit3	Error code Bit3	0	0、±2~±15		○
0720 h	1	ALM4-S	ALM4-S: Error code Bit4	Error code Bit4	0	0、±2~±15		○
0721 h	1	ALM5-S	ALM5-S: Error code Bit5	Error code Bit5	0	0、±2~±15		○

5.6 Speed parameters

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Unit	Power on again
0802 h	2	HighSpeed	"Maximum speed setting when running RPM linear motor (mm/Sec)"	Maximum speed setting during motor operation.	1000	1~30000	"rpm mm/sec"	×
0804 h	1	AccelTime	Acceleration time setting (msec)	Motor acceleration time setting. (Initial value 300)	300	1~30000	msec	×
0805 h	1	DecelTime	Deceleration time setting (msec)	Motor deceleration time setting. (Initial value 300)	300	1~30000	msec	×
0807 h	2	TrqLimitPress	Torque tolerance setting (PULSE)	The number of pulses that will move back to the set value after reaching the torque limit in TSL mode.	0	"-2147483648~2147483647"	Pulse	×
080A h	1	MoveSttSet	Status setting during movement	"Action state setting. 0: After the PULSE output is specified, the state is OFF during movement. 1: After the PULSE output is specified, Inposition is ON, and the state is OFF during movement."	0	0~1	-	×
080F h	1	JogInchingSpd	Speed setting when JOG is moving (× 0.1%)	Manual mode is valid when IO is used to control JOG.	200	1~1000	0.1%	×
0810 h	2	JogInchingData	Movement amount setting when JOG is moving (PULSE)	Manual mode is valid when IO is used to control JOG.	0	0~2147483647	Pulse	×
0812 h	1	JogInchingWait	Waiting time setting after JOG moves (MSEC)	Manual mode is valid when IO is used to control JOG.	0	0~1000	msec	×
0813 h	2	PlusSoftLimit	Software limit in + direction (mm)	"Software limit setting in + direction. Invalid when software limit is 0."	0	"-2147483648~2147483647"	mm	×
0815 h	2	MinusSoftLimit	Software limit in - direction (mm)	"Software limit setting in - direction. Invalid when software limit is 0."	0	"-2147483648~2147483647"	mm	×

5.7 Origin parameters

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Unit	Power on again
0900 h	1	OrgMode	Origin return direction	<p>"Set origin return movement direction.</p> <p>0: Torque return in + direction 1: Torque return in - direction 2: After torque returns in + direction, search for Z-phase in the opposite direction 3: After torque returns in + direction, search for Z-phase in the opposite direction 4: Search for ORG_SIG signal in + direction 5: Search for ORG_SIG signal in - direction 6: After searching for ORG_SIG signal in + direction, search for Z-phase in the opposite direction 7: - After searching for ORG_SIG signal in + direction, search for Z-phase in the opposite direction 8: After moving in + direction for Org_Sig signal output, move to Z-phase for output at OrgSpeedZ1 speed 9: After moving in - direction for Org_Sig signal output, move to Z-phase for output at OrgSpeedZ1 speed 10: After searching for Z-phase in + direction, move Orgoffset_z at the speed OrgSpeed_Z1, and then move back to A-phase at the speed OrgSpeed_Z2, and stops at Z-phase if the value is set to 0. 11: After searching for Z-phase in - direction, move Orgoffset_z at the speed OrgSpeed_Z1, and then move back to A-phase at the speed OrgSpeed_Z2, and stops at Z-phase if the value is set to 0.</p>	0	0~11	-	×
0901 h	1	OrgSpeed	Origin return speed (0.1%)	<p>"For the setting of origin return speed, if torque return pattern is used, it is recommended to set the speed below 20%. When the value is 1%~100%, the speed is a percentage of the maximum speed 0802 H."</p>	100	1~1000	0.1%	×
0902 h	2	OrgOffset	Origin return offset setting (PLUSE)	<p>"When origin return is completed, execute the movement offset. This movement should be in reference to the torque values 0400h and 0401h."</p>	0	"-2147483648~2147483647"	Pulse	×

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Unit	Power on again
0904 h	1	OrgOffsetSpeed	Origin return offset moving speed (0.1%)	"The velocity at which the torque returns to its original point and then moves one offset in the opposite direction after the torque is detected. When the value is 1%~100%, the speed is a percentage of the maximum speed 0802 H." "	100	1~1000	0.1%	×
0905 h	2	OrgData	Data on origin return (mm)	Data on the set position after origin return is completed.	0	"-2147483648~2147483647"	Pulse	×
0907 h	1	OrgTrqLimit	Torque setting upon origin return (× 0.1%)	The torque required to hit the hardware limit upon origin return.	500	0~1000	0.1%	×
0908 h	2	OrgOffset_Z	Offset (Pulse) before Z-phase is detected	"When origin return hits the hardware limit, first offset this value, and then search for Z-phase. This movement should be in reference to the torque values 0400h and 0401h."	0	"-2147483648~2147483647"	Pulse	×
090A h	1	OrgTrqLmtTime	Torque Detection Time (MSEC) for origin return	Torque detection time setting when origin return is executed. (Initial value 100)	100	1~10000	msec	×
090B h	1	OrgSpeed_Z1	Z-phase detection speed _1(0.1%)	Z-phase search speed adjustment during the origin return action. (Based on 100 of the set value 0802H)	100	1~1000	0.1%	×
090C h	1	OrgSpeed_Z2	Z-phase detection speed _2(0.1%)	After finding the Z-phase at the speed of 090BH, reverse and search for Z-phase again at the speed of 090CH.	100	1~1000	0.1%	×

5.8 Communication parameters

Parameter	word	Abbreviation	Description	Remark	Preset value	Value range	Unit	Power on again
0A00 h	1	BaudRate	Communication rate	"Communication rate setting.0:19200bps 1: 38400bps 2: 57600bps 3: 115200bps (initial value)"	3	0~3	-	○
0A01 h	1	DataSize	Character string data Bit setting	"Set the number of data bits in one string. 0:8bit (initial value) 1: 7bit"	0	0~1	-	○
0A02 h	1	Parity	Parity checking	"Parity settings. 0:None (initial value) 1: Even 2: Odd"	0	0~2	-	○
0A03 h	1	Broadcast	Broadcast setting	"Setting of broadcast. Message from broadcast station 0 will be ignored when it is invalid. 0: Invalid (initial value) 1:Valid"	0	0~1	-	○
0A04 h	1	Protocol	Communication protocol	"Modbus protocol settings for RS485. 0:Modbus-ASCII (Initial Value) 1: MODBUS-RTU"	0	0~1	-	○
0A05 h	1	RS485BaudRate	RS485 communication rate (CN4: RJ11 connector)	"RS485 communication rate setting. 0:19200bps 1:38400bps 2:57600bps 3: 115200bps (initial value)"	3	0~3	-	○
0A06 h	1	RS485DataSize	RS485 string data Bit setting (CN4: RJ11 connector)	"Set the number of data bits in one string of RS485. 0: 8bit (initial value) 1:7bit"	0	0~1	-	○
0A07 h	1	RS485Parity	RS485 parity check (CN4: RJ11 connector)	"RS485 parity setting. 0:None (initial value) 1:Even 2: Odd"	0	0~2	-	○

6. Input/output function description

6.1 Input/output specifications

LC100 can communicate with the peripheral through IO interface.

Current IO standard configuration is 50PIN connector, and an option is weld-free wire terminal board, which can be purchased additionally.

IO specifications: Crystal (NPN).

50 PIN isolation line {
 15 IN DC24V, ±10%, 1.5~6mA/ point
 15 OUT DC24V, ±10%, less than 10mA/ point
 PULSE +/-, HPULSE +/-
 DIR +/-, HDIR +/-

6.2 IO Signal Table

NO		Signal name	Description	NO		Signal name	Description
1	Dedicated	IN-COM	Input signals sharing COM connection (NPN: +)(PNP:-)	26	Dedicated	OUT-COM	Output signals sharing COM connection (NPN: -)(PNP: +)
2		IN-COM		27		OUT-COM	
3		ORG	Origin return signal	28		ORG-S	Origin return completed
4		/SERVO	Servo signal	29		INP-S	In-place signal
5		ALM_RESET	Error reset	30		READY	Ready to complete
6		START	Start point selection	31		SERVO-S	Servo excitation signal
7		PRGSEL0	Point selection 0	32		PRGSEL0	Point selection 0
8	Digit	PRGSEL1	Point selection 1	33	Digit	PRGSEL1	Point selection 1
9		PRGSEL2	Point selection 2	34		PRGSEL2	Point selection 2
10		PRGSEL3	Point selection 3	35		PRGSEL3	Point selection 3
11		PRGSEL4	Point selection 4	36		PRGSEL4	Point selection 4
12		PRGSEL5	Point selection 5	37		PRGSEL5	Point selection 5
13		LOCK	Pause	38		OUT 11	Retained
14		IN 12	Retained	39		OUT 12	Retained
15		IN 13	Retained	40		OUT 13	Retained
16	IN 14	Retained	41	OUT 14	Retained		
17	IN 15	Retained	42	OUT 15	Retained		
18	Dedicated	PULSE	Pulse - open collector circuit	43	Dedicated	/PULSE	Pulse - open collector circuit
19		DIR	Pulse - open collector circuit	44		/DIR	Pulse - open collector circuit
20		HPULSE	Pulse-line drive circuit	45		/HPULSE	Pulse-line drive circuit
21		HDIR	Pulse-line drive circuit	46		/HDIR	Pulse-line drive circuit
22		A	Pulse output A	47		/A	Pulse output /A
23		B	Pulse output B	48		/B	Pulse output /B
24		Z	Pulse output Z	49		/Z	Pulse output /C
25		GND	Inner of controller 0V	50		FG	Isolation net grounding

6.3 Input signal details

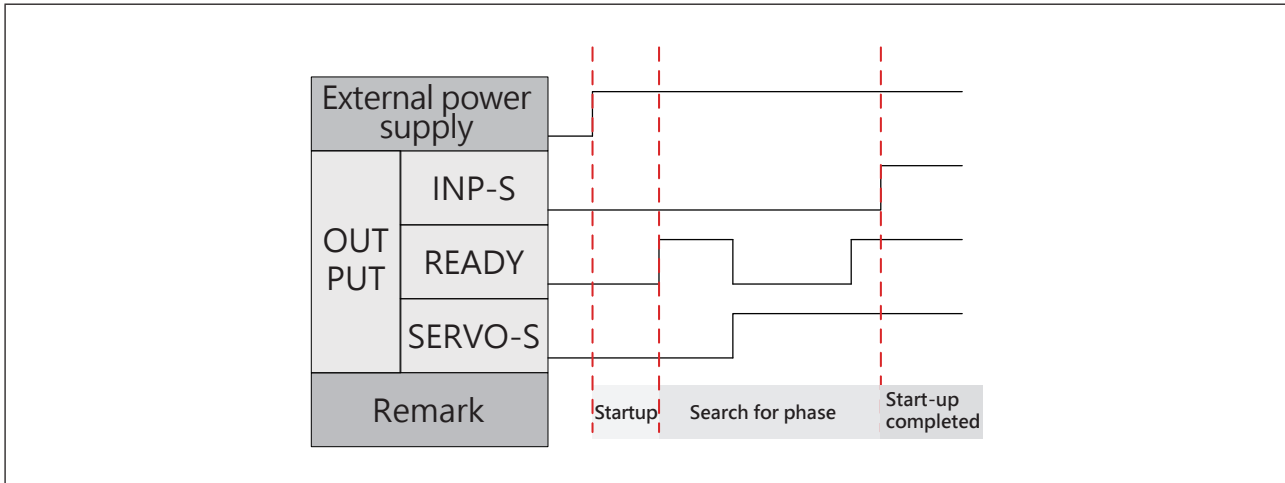
NO	Signal name	Description																							
1	ORG	Origin return shall be executed upon start-up to validate point coordinates.																							
2	ALM_RESET	When the signal is ON, the following action will be executed: When an alarm occurs, the alarm resets. After related actions have been taken, the alarm can be dismissed by this signal.																							
3	/SERVO	This signal is Contact B. When its OFF, it is in servo ON state; when it is ON, it is in servo OFF state. Note: In case of alarm or emergency stop, the servo is out of control and it is in servo OFF state.																							
4	/LOCK	This signal is Contact B. If this signal is ON during operation, the robot will decelerate and stop. To start it again, this signal must be OFF. Note: Interlocking is not a safety switch. It shall not be used for safety purpose. Servo will not be OFF during interlocking, but will remain as what it is.																							
5	START	Perform the positioning operation of the coordinate data specified in the point position number selection (PRGSEL0~PRGSEL6). Note: It is valid only when Manual mode is OFF.																							
6	PRGSEL0 ~ PRGSEL6	<p>The 7-bit binary code point number is read before the START or TEACH signal is used.</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;"> <p>PIN6</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> </table> </div> <div style="margin-right: 20px;"> <p>PIN0</p> </div> <div style="border: 1px solid black; padding: 5px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #cccccc;"> <th>summation values for ON</th> <th>Examples</th> </tr> </thead> <tbody> <tr><td>2⁰</td><td>1</td></tr> <tr><td>2¹</td><td>0</td></tr> <tr><td>2²</td><td>0</td></tr> <tr><td>2³</td><td>8</td></tr> <tr><td>2⁴</td><td>0</td></tr> <tr><td>2⁵</td><td>32</td></tr> <tr><td>2⁶</td><td>0</td></tr> </tbody> </table> <p style="text-align: right; margin-top: 5px;">total =41 (coordinate point 41)</p> </div> </div>	0	1	0	1	0	0	1	summation values for ON	Examples	2 ⁰	1	2 ¹	0	2 ²	0	2 ³	8	2 ⁴	0	2 ⁵	32	2 ⁶	0
0	1	0	1	0	0	1																			
summation values for ON	Examples																								
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2 ³	8																								
2 ⁴	0																								
2 ⁵	32																								
2 ⁶	0																								
7	JOG+ / JOG-	In manual mode, as long as JOG(+/-) is ON, the motor moves in the specified direction (+/-) until the signal is OFF or software limit is reached.																							
8	MANUAL	When this signal is ON, manual mode is activated. Actions performed in manual mode: JOG(+/-), TEACH, PRGSEL 0~PRGSEL 6.																							
9	TEACH	When the signal is ON, current position value is stored in the specified point position.																							
10	BK_OFF	Brake ON/OFF signal (applies when SERVO is OFF)																							
11	FULL-COUNT	Toggle the FULL-COUNT judgment (initial is application)																							

6.4 Output signal details

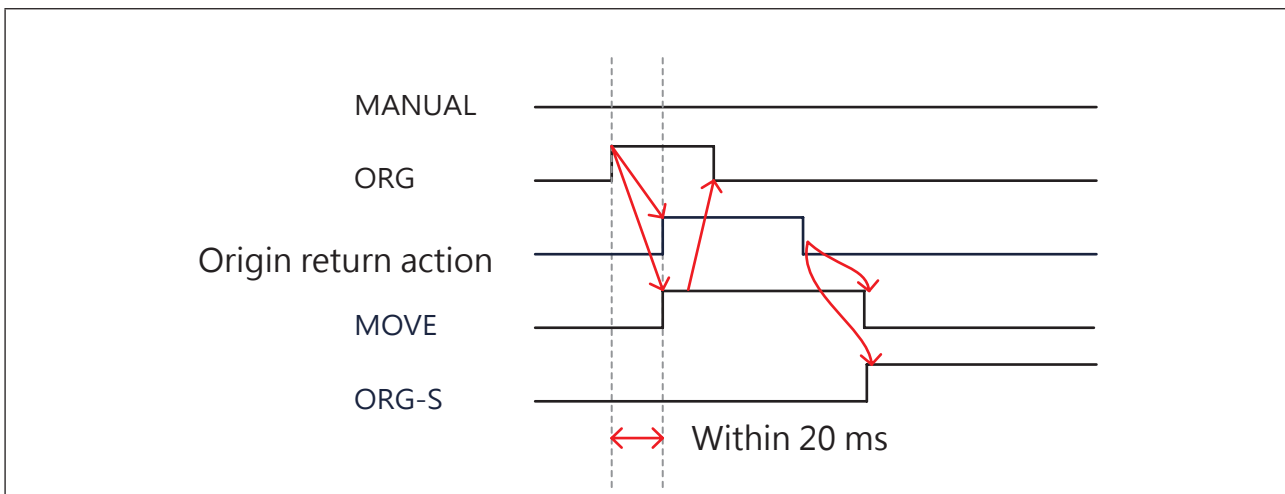
NO	Signal name	Description																														
1	IN-POSITION	In-position signal, the signal is ON when instruction position is the same as current position. A too large set value of parameter InPositionZone or too slow movement may cause the INPOSITION signal to remain ON.																														
2	ALARM	When error occurs in the controller, the signal is ON.																														
3	READY	When the controller is in standby state and can receive external signals or communication instructions, the signal is ON.																														
4	MOVE	During movement, the signal is ON.																														
5	ORG-S	Upon completion of origin return, the signal is ON, and during the origin return, it is OFF.																														
6	SERVO-S	Upon servo excitation, the signal is ON. in case of emergency stop or error, it is OFF.																														
7	PRGSEL0-S ~ PRGSEL6-S	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>PIN6</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> </table> </div> <div> <p>PIN0</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> </table> </div> </div> <table border="1" style="border-collapse: collapse; width: 100%;"> <thead> <tr> <th style="width: 50%;">summation values for ON</th> <th style="width: 50%;">Examples</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2^0</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">2^1</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">2^2</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">2^3</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">2^4</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">2^5</td> <td style="text-align: center;">32</td> </tr> <tr> <td style="text-align: center;">2^6</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <div style="margin-left: 20px; text-align: center;"> <p>total =45 (coordinate point 45)</p> </div>	0	1	0	1	0	0	1	0	1	0	1	0	0	1	summation values for ON	Examples	2^0	1	2^1	0	2^2	4	2^3	8	2^4	0	2^5	32	2^6	0
0	1	0	1	0	0	1																										
0	1	0	1	0	0	1																										
summation values for ON	Examples																															
2^0	1																															
2^1	0																															
2^2	4																															
2^3	8																															
2^4	0																															
2^5	32																															
2^6	0																															
8	TRQ_LMT	When the motor is moving, the signal is ON once the current value reaches the set value.																														
9	ERR0~ERR3	When error occurs in the controller, the output error code is expressed as binary value. Displays the error status of 16 groups.																														
10	INRANGE	When the motor operates within the set range, the signal is ON.																														
11	NEAR	When moving to the range of the target position, the output target position is set by the point position operation mode ABS, INC.																														
12	SOFTLMT	When the current position moves to the software limit, the signal is ON.																														

7.Action timing

7.1 Startup timing



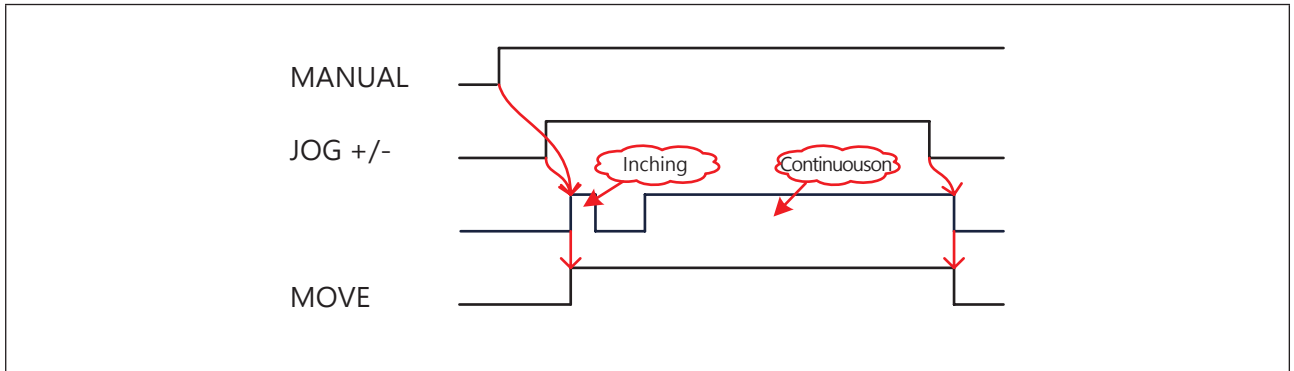
7.2 Start-up completed



Description:

- 1.After normal startup, servo signal is normally ON.
- 2.Make input signal "ORG" on, and the signal is ON.
- 3.Start to execute origin return action, "MOVE" signal is ON, input "ORG" to make it OFF.
- 4.Upon completion of origin return action, "MOVE" signal is OFF, and "ORG-S" signal is ON; origin return action is completed.

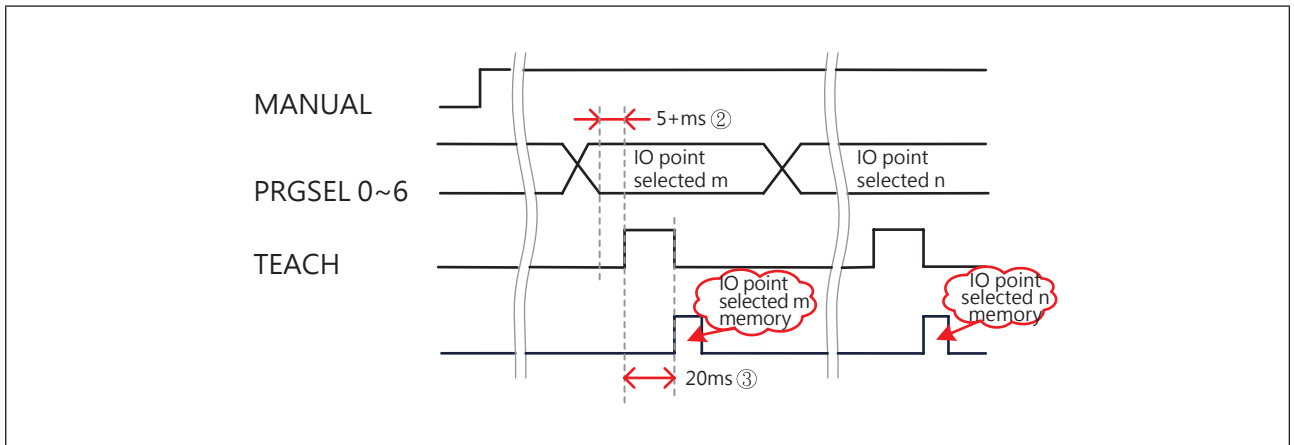
7.3 IO Controlled JOG Action



Description:

1. Valid only when "MANUAL" signal is ON.
2. Make signal "Manual" ON.
3. "Jog +/-" signal is ON, motor starts action, and "MOVE" is ON.
4. "JOG +/-" signal is OFF, motor stops action, and "MOVE" is OFF.

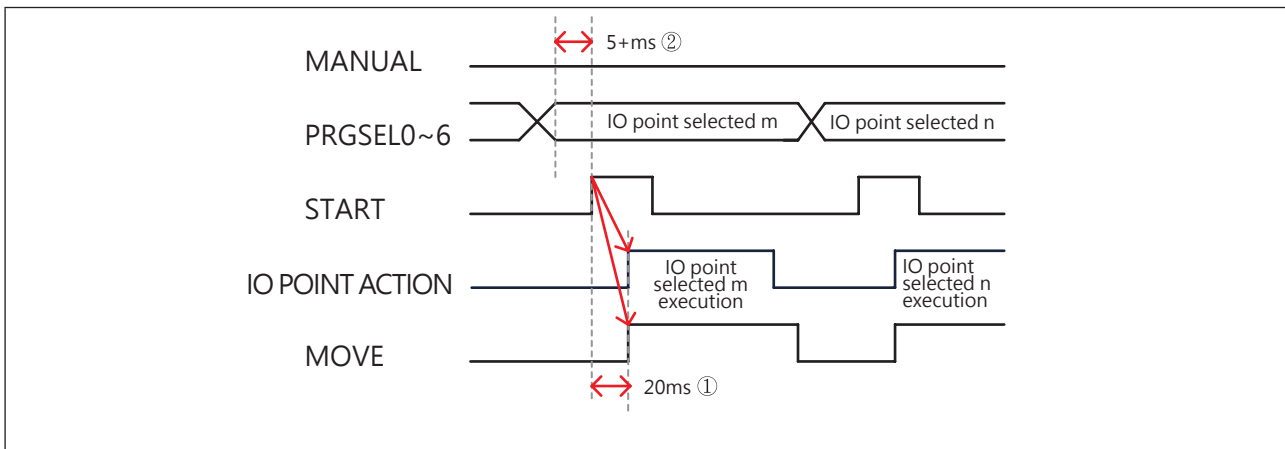
7.4 IO Point Teaching



Description:

1. Valid only when "MANUAL" is on.
2. Make signal "MANUAL" on.
3. The point position to be moved is determined by the signal "PRGSEL0~6" (by binary number)
4. Keep "TEACH" signal ON for at least 20ms to complete current position storage.

7.5 IO Point Action



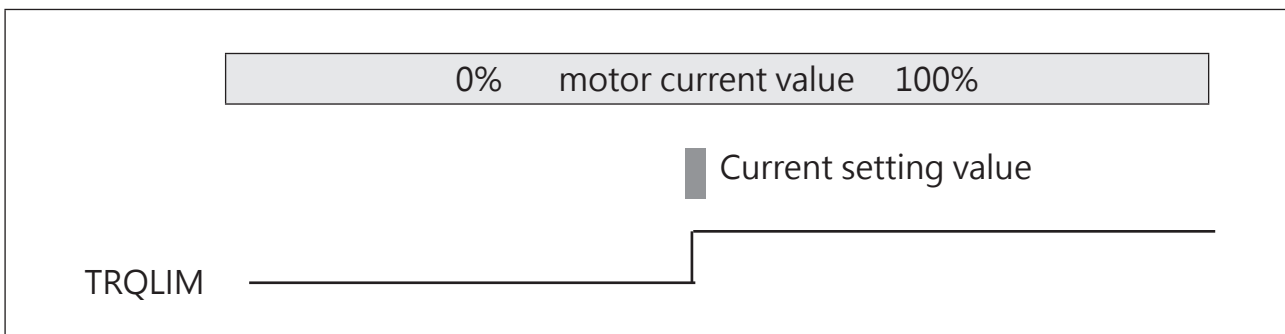
Description:

1. Valid only when "MANUAL" is OFF.
2. Make signal "MANUAL" OFF.
3. The point position to be moved is determined by the signal "PRGSEL0~6" (by the binary code number).
4. Make "START" signal ON, IO selection is completed, motor starts action and "MOVE" signal is ON.

Remark:

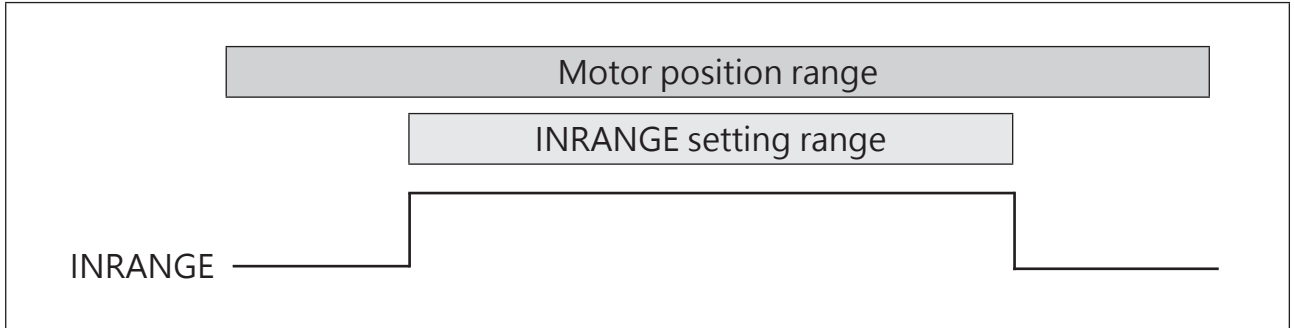
- ① Org, START signals can accept the shortest time.
- ② Stability time of PRGSEL N signal.
- ③ The shortest time that the point memory signal can accept.
- ④ In JOG operation, fine tuning distance, waiting time and working time can be set in parameters.

7.6 TRQLIM Signal Output



7.7 INRANGE Signal Output

In point position setting, the upper and lower limits of INRANGE are set, and as soon as the motor moves within the range, the signal will be output.



7.8 On-controller LED display

<p>LED status representation</p>	<p>PWRS: Power supply (green): Lit up when Drive + control power is input; flashing in yellow color when drive power is switched off. SON: Servo (green): Lit up when Serve is on; Go out when an error occurs. ERR: Error (red): The error code is determined by number of flashes.</p>
----------------------------------	--

8. Communication RS485

8.1 Communication specification

This unit communicates through Modbus protocol.

Signal are transmitted in either of two modes: ASCII or RTU (binary) mode.

Item	ASCII mode	RTU mode
Communication protocol	MODBUS ASCII	MODBUS RTU
Communication methods	RS-485 2 wired type (half duplex)	
	USB2.0	-
Communication distance	RS-485: The maximum wire length in total is 500 meters	
	USB 2.0 : 5 meters	-
Online pattern	RS-485: 1 to many (Max. 16 sets)	
	USB 2.0 : 1 to 1	-
Communication rate	9600 · 19200 · 38400 · 57600 · 115200 bps	
Start bit	1 BIT	
Data length	7 · 8 BIT	8 BIT
Parity check	None, even parity, odd parity	
Stop bit	1 BIT	
Communication code	ASCII	Binary
Start code	" : " (3A H)	None
End code	CR+LF (0D H+0A H)	None
Check code	LRC	CRC-16
Maximum number of connections	16 sets	

Note) If you need to use UI to connect LC100 controller, it should be set in ASCII mode.

■ CN4(RJ11 4P4C) connector pin position is defined as follows:

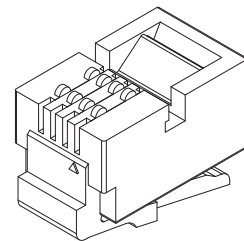
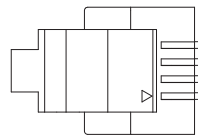
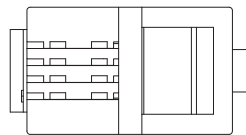
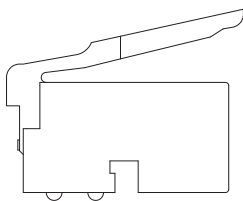


Diagram	Number	Signal name	Description
	1	GND	Inner of controller 0V
	2	D+	RS-485 DATA+
	3	D-	RS-485 DATA-
	4	GND	Inner of controller 0V

8.2 Data structure

■ ■ Read state

Position	Number of Word	Abbreviation	Description	Remark	Range/Unit
1000 H	1	ActionStatus	Action state	0:Stop 1:In action 2:Emergency stop	0~2
1001 H	1	InpStatus	Current in-position signal state	0:The current position has not reached the set range 1:The current position is within the target set range	0~1
1004 H	1	TrqLmtStatus	Torque limit state	0:Has not reached the set range 1:Already within the target set range	
1005 H	1	AlarmStatus	Alarm state	0:No alarm 1:Loop error 2: Full Count 3: Over-speed 4:Gain value is not adjusted properly 5:Over-voltage 6:Incipient error 7: EEPROM error 8:Main circuit power supply voltage is insufficient 9:Over-current 10:Regeneration error 11:Emergency stop 12:Motor is disconnected 13:Encoder is disconnected 14:Protection current value 15:Power is input again 17:Action timeout	
1006 H	1	MonSpeed	Motor speed		rpm
1007 H	1	MonCurrent	Motor current value		*0.1%
1008 H	2	CmdNowPos	Current instruction position		
100A H	2	EcdPos	Encoder position		
100C H	1	ServoStatus	Servo state	0:Servo OFF 1:Servo ON	0~1
100D H	1	ErrorStatus	Failure state	0:No error 1:Receive action commands in action 2:Upper and lower limits error 3:Position error 4:Format error 5:Control mode error 6:Power failure and restart 7:Initialization not completed 8: Servo ON/OFF error 9: LOCK 10: Software limit 11:Insufficient parameter write permission 12:Origin return uncompleted 13:Brake released	
100E H	1	StepNo	Program selection number	Display number of the last program executed. Never execute program STEP is "-1"	-1~255
1020 H	1	PORT (OUT1~10)	Overall output state	Output bit 0 (OUT 1)~bit 9 (OUT 10) 0: OFF 1: ON	0~1023
1021 H	1	PORT (OUT 1)	Separate output state	Output state of OUT 1; 0:OFF 1:ON	0~1
1022 H	1	PORT (OUT 2)	Separate output state	Output state of OUT 2; 0:OFF 1:ON	0~1
1023 H	1	PORT (OUT 3)	Separate output state	Output state of OUT 3; 0:OFF 1:ON	0~1
1024 H	1	PORT (OUT 4)	Separate output state	Output state of OUT 4; 0:OFF 1:ON	0~1
1025 H	1	PORT (OUT 5)	Separate output state	Output state of OUT 5; 0:OFF 1:ON	0~1
1026 H	1	PORT (OUT 6)	Separate output state	Output state of OUT 6; 0:OFF 1:ON	0~1

Position	Number of Word	Abbreviation	Description	Remark	Range/Unit
1027 H	1	PORT (OUT 7)	Separate output state	Output state of OUT 7; 0:OFF 1:ON	0~1
1028 H	1	PORT (OUT 8)	Separate output state	Output state of OUT 8; 0:OFF 1:ON	0~1
1029 H	1	PORT (OUT 9)	Separate output state	Output state of OUT 9; 0:OFF 1:ON	0~1
102A H	1	PORT (OUT 10)	Separate output state	Output state of OUT 10; 0:OFF 1:ON	0~1
1040 H	1	PORT (IN1~IN14、Z相)	Overall input state	Input bit 0 (IN 1)~bit 13 (IN 14), Bit14 (Z-phase) 0: OFF 1:ON	0~32767
1041 H	1	PORT (IN 1)	Separate output state	Input state of IN 1;0:OFF 1:ON	0~1
1042 H	1	PORT (IN 2)	Separate output state	Input state of IN 2;0:OFF 1:ON	0~1
1043 H	1	PORT (IN 3)	Separate output state	Input state of IN 3;0:OFF 1:ON	0~1
1044 H	1	PORT (IN 4)	Separate output state	Input state of IN 4;0:OFF 1:ON	0~1
1045 H	1	PORT (IN 5)	Separate output state	Input state of IN 5;0:OFF 1:ON	0~1
1046 H	1	PORT (IN 6)	Separate output state	Input state of IN 6;0:OFF 1:ON	0~1
1047 H	1	PORT (IN 7)	Separate output state	Input state of IN 7;0:OFF 1:ON	0~1
1048 H	1	PORT (IN 8)	Separate output state	Input state of IN 8;0:OFF 1:ON	0~1
1049 H	1	PORT (IN 9)	Separate output state	Input state of IN 9;0:OFF 1:ON	0~1
104A H	1	PORT (IN 10)	Separate output state	Input state of IN 10;0:OFF 1:ON	0~1
104B H	1	PORT (IN 11)	Separate output state	Input state of IN 11;0:OFF 1:ON	0~1
104C H	1	PORT (IN 12)	Separate output state	Input state of IN 12;0:OFF 1:ON	0~1
104D H	1	PORT (IN 13)	Separate output state	Input state of IN 13;0:OFF 1:ON	0~1
104E H	1	PORT (IN 14)	Separate output state	Input state of IN 14;0:OFF 1:ON	0~1
104F H	1	Z-phase input state	Z-phase input state	Input state of Z-phase; 0:OFF 1:ON	0~1

■ Read history of 50 errors

Position	Number of Word	Abbreviation	Description
1060 H	1	AlarmList 01	History of 50 errors -01
1061 H	1	AlarmList 02	History of 50 errors -02
1062 H	1	AlarmList 03	History of 50 errors -03
1063 H	1	AlarmList 04	History of 50 errors -04
1064 H	1	AlarmList 05	History of 50 errors -05
1065 H	1	AlarmList 06	History of 50 errors -06
1066 H	1	AlarmList 07	History of 50 errors -07
1067 H	1	AlarmList 08	History of 50 errors -08
1068 H	1	AlarmList 09	History of 50 errors -09
1069 H	1	AlarmList 10	History of 50 errors -10
106A H	1	AlarmList 11	History of 50 errors -11
106B H	1	AlarmList 12	History of 50 errors -12
106C H	1	AlarmList 13	History of 50 errors -13
106D H	1	AlarmList 14	History of 50 errors -14
106E H	1	AlarmList 15	History of 50 errors -15
106F H	1	AlarmList 16	History of 50 errors -16

Position	Number of Word	Abbreviation	Description
1070 H	1	AlarmList 17	History of 50 errors -17
1071 H	1	AlarmList 18	History of 50 errors -18
1072 H	1	AlarmList 19	History of 50 errors -19
1073 H	1	AlarmList 20	History of 50 errors -20
1074 H	1	AlarmList 21	History of 50 errors -21
1075 H	1	AlarmList 22	History of 50 errors -22
1076 H	1	AlarmList 23	History of 50 errors -23
1077 H	1	AlarmList 24	History of 50 errors-24
1078 H	1	AlarmList 25	History of 50 errors-25
1079 H	1	AlarmList 26	History of 50 errors-26
107A H	1	AlarmList 27	History of 50 errors-27
107B H	1	AlarmList 28	History of 50 errors-28
107C H	1	AlarmList 29	History of 50 errors-29
107D H	1	AlarmList 30	History of 50 errors-30
107E H	1	AlarmList 31	History of 50 errors-31
107F H	1	AlarmList 32	History of 50 errors-32
1080 H	1	AlarmList 33	History of 50 errors-33
1081 H	1	AlarmList 34	History of 50 errors-34
1082 H	1	AlarmList 35	History of 50 errors-35
1083 H	1	AlarmList 36	History of 50 errors-36
1084 H	1	AlarmList 37	History of 50 errors-37
1085 H	1	AlarmList 38	History of 50 errors-38
1086 H	1	AlarmList 39	History of 50 errors-39
1087 H	1	AlarmList 40	History of 50 errors-40
1088 H	1	AlarmList 41	History of 50 errors-41
1089 H	1	AlarmList 42	History of 50 errors-42
108A H	1	AlarmList 43	History of 50 errors-43
108B H	1	AlarmList 44	History of 50 errors-44
108C H	1	AlarmList 45	History of 50 errors-45
108D H	1	AlarmList 46	History of 50 errors-46
108E H	1	AlarmList 47	History of 50 errors-47
108F H	1	AlarmList 48	History of 50 errors-48
1090 H	1	AlarmList 49	History of 50 errors-49
1091 H	1	AlarmList 50	History of 50 errors-50

■■ Controller information

Position	Number of Word	Abbreviation	Description	Remark
10D0 H	16	MotorType	Motor model number	Max. 31 characters (half-angle English letters)
10E0 H	16	Controller	Controller model number	LC-100_01.03

■ Action

Position	Number of Word	Abbreviation	Description	Remark	Range/ Unit
2000 H	2	INCamount	Relative movement amount	Set the relative movement distance (valid in position control and torque control) (initial value 0)	0.01mm/1pulse
2002 H	2	ABSamount	Absolute movement amount	Set the absolute movement distance (valid for position control and torque control) (initial value 0)	0.01mm/1pulse
2005 H	1	TrqStopDir	Stop search for torque Direction	0: + direction;1:- direction. Valid for torque control.	0~1
2006 H	2	PosAmount	Position specified data	Set instruction and current position data values (initial value 0)	0.01mm/1pulse
2011 H	1	Servo ON/OFF	Servo ON/OFF	0:Servo ON;1: Servo OFF.	0~1
2014 H	1	MovSpeedSet	Position/ torque control action speed setting (relative position movement, absolute position movement, JOG)	When the value is 1%~100%, the speed is a percentage of the maximum speed 0802 H. When the value is 0%, the speed is the set value of 0800 H initial speed.	0~100%
201E H	1	MovType	Movement type	0: INC relative position movement 1: ABS absolute position movement 2: TSL Torque Search Movement (Direction set by 2005H) 3: Org Origin return 4:Set data values for instruction and current positions 5:Unavailable 6:Alarm reset 7:Deviation clearance (to make instruction position equal to current position) 8:Decelerate to stop 9:Emergency stop 10:Unavailable 11:+JOG 12:-JOG	0~12
2040 H	1		Analog input settings (binary)	Input state change (IN1~IN15) Bit0:IN1 ~ Bit14: IN15 0: OFF 1:ON After setting, the current value is the input value of the controller IO simulation, with accumulation of binary values (bit 0~bit14)	0~1
2041 H	1		IN1 analog input setting	IN1 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2042 H	1		IN2 analog input setting	IN2 Analog input setting0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2043 H	1		IN3 analog input setting	IN3 analog input setting0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2044 H	1		IN4 analog input Settings	IN4 analog input setting 0:OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2045 H	1		IN5 analog input setting	IN5 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2046 H	1		IN6 analog input setting	IN6 Analog input setting0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2047 H	1		IN7 analog input setting	IN7 analog input setting0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1



Position	Number of Word	Abbreviation	Description	Remark	Range/ Unit
2048 H	1		IN8 analog input setting	IN8 analog input setting 0:OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
2049 H	1		IN9 analog input setting	IN9 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204A H	1		IN10 analog input setting	IN10 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204B H	1		IN11 analog input setting	IN11 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204C H	1		IN12 analog input setting	IN12 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204D H	1		IN13 analog input setting	IN13 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204E H	1		IN14 analog input setting	IN14 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1
204F	1		IN15 analog input setting	IN15 analog input setting 0: OFF; 1:ON After setting, the current value is the signal received by the controller or physical signal.	0~1



■■ Step sequence instruction description

Position	Number of Word	Step sequence	Brief	Description	Range/ Unit
9010 H	1	The first step sequence	Movement mode	Used to set movement mode: 0: INC Relative Position Movements [Position Mode] (Initial Value) 1: ABS Absolute Position Movement [Position Mode] 2: Org Origin return 3:+ TSL torque search movement in positive direction 4: - TSL Torque search movement in negative direction 5:Unavailable 6:Unavailable 7:Unavailable 8:Unavailable 9:Unavailable 10:Unavailable 11:Unavailable 12: INC-R Relative Position Movement (Continuous Movement) 13: ABS-R Absolute Position Movement (Continuous Movement) 14:Unavailable 15: INC-T Relative Position Movement [Torque Mode] 16: ABS-T Absolute Position Movement [Torque Mode]	0~13
9011 H	2		Movement amount/ movement position	Set the amount of movement or target position. Mode definition: ABS= Target Position (Moving Position) INC= Relative Position (Movement amount) ABS-R= Target position (moving position) INC-R= Relative position (movement amount) Except the foregoing, any other modes are invalid (initial value 0)	- 2147483648~ 214748648 pulse
9013 H	1		Movement speed	Set movement speed. When the value is 1%~100%, the speed is a percentage of the maximum speed 0802 H. When the value is 0%, the speed is the set value of 0800 H initial speed. This function is invalid when in movement mode 9000 H is ORG.	0~100%
9014 H	1		Torque limit	Except the signal search mode, all other movement modes are affected by it	0~1000 x0.1%
9015 H	1		Target port	When the operation mode is set to "+SIG, -sig, OUTI, OUTB, OUTS", specify the output/input IO code.	INPUT : ±9~±15 OUTPUT : ±2~±15
9016 H	2		Range L	Lower limit of range. When the current position is less than the set value, the specified IO of the INRANGE will be output. (Initial value 0)	
9018 H	2		Range H	Upper limit of range. When the current position is larger than the set value, the specified IO of the INRANGE will be output. (Initial value 0)	
901A H	1		Acceleration time	Motor acceleration time setting.(Initial value 300)	1~30000msec
901B H	1		Deceleration time	Motor deceleration time setting.(Initial value 300)	1~30000msec
901C H	1		Waiting time	Waiting time after movement has ended. (Initial value 0)	0~30000msec
901D H	1		Next step sequence	Upon end, skip to the specified program. (Initial value -1)	-1~255 -1 is the end step
9020 H ~ 902D H	12		The second step sequence		

}}

Parameter notes and storage

Position	Number of Word	Brief	Description	Range/ Unit
9999 H	1	Parameters storage	0:Current parameter; 1: Default data	0~1

Open write instructions

Character Hex	:	0	1	1	0	9	9	9	B	0	0	0	4	0	8	4	C	7	6	3	0	3	1	5	4	7	9	5	6	6	7	0	2	CR	LF
	3A	30	31	31	30	39	39	39	42	30	30	30	34	30	38	34	43	37	36	33	30	33	31	35	34	37	39	35	36	36	37	30	32	0D	0A
Start code	Station number controller knob plus 1	Function code	Write start position	Write number of WORD	Write number of Bytes	The 1st WORD data	The 2nd WORD data	The 3rd WORD data	The 4th WORD data	Data string										Authentication code (LRC)	End code (CR/ LF)														

Parameter writing process



RTU mode structure

01	06	20	1E	00	03	A2	0D
Station number 1 Byte	Function code 1 Byte	Data 2~120 Byte				CRC-16 2 Byte	

ASCII mode structure

.	0	1	0	6	2	0	1	E	0	0	0	3	B	8	0D	0A
(3A H) Start code 1 Byte	Station number 2 Byte	Function code 2 Byte	Data string 4~240 Byte										LRC 2 Byte	CR 1 Byte	LF 1 Byte	

■ Structure composition description

1 · Station number

If a specified station number is used for data transmission, only the station with the same station number will receive data, while any other stations with different station numbers will ignore the data.

▲ Note:

The designated station number for communication is the CH torque set value +1 on the controller. For example, If the external CH value is "1", the specified station number value is "2".

2 · Function Code

Specify function number.

Function code	Functional description
03 H	Read data
06 H	Write data (1 Word)
10 H	Continuous data writing (more than 1 Word)

3 · Data

Structure of the data necessary to execute a specified function code may differ depending on the specified function code.

Function code	Data structure
03 H	Data location, number to read
06 H	Data location, number to write
10 H	Data location, number to write, and content to write

4 · Check code

In order to confirm whether there is any missing data in the process of data transmission, a confirmation is added at the end of the data.

RTU: Use CRC-16 format.

ASCII: Use the LRC format.

8.3 Detailed error message

When an error outside the response condition is detected, the error code corresponding to the type of the error is sent back.

1 · Function code error

① If the input function code is wrong, the received function code will respond with "function code" + "80 H".

Example:

Character	:	0	1	0	4	2	0	1	E	0	0	0	3	B	A	CR	LF
Hex	3A	30	31	30	34	32	30	31	45	30	30	30	33	42	41	0D	0A
Start code	Station number Controller knob plus 1		Function code		Data position				Data action code				Verification code (LRC)		End code (CR/LF)		
	Data string																

Character	:	0	1	8	4	0	1	7	A	CR	LF
Hex	3A	30	31	38	34	30	31	37	41	0D	0A
Start code	Station number Controller knob plus 1		Function code		Error code			Verification code (LRC)		End code (CR/LF)	

② If the input function code error is above "80 H", the received "function code" will respond with the original function code. Example:

Character Hex	:	0	1	9	0	2	0	1	E	0	0	0	3	2	E	CR	LF
	3A	30	31	39	30	32	30	31	45	30	30	30	33	32	45	0D	0A
Start code	Station number Controller knob plus 1		Function code		Data position				Data action code				Verification code (LRC)		End code (CR/LF)		
	Data string																

Character Hex	:	0	1	9	0	0	1	6	E	CR	LF
	3A	30	31	39	30	30	31	36	45	0D	0A
Start code	Station number Controller knob plus 1		Function code		Error code			Verification code (LRC)		End code (CR/LF)	

2 · Error code

Error code	Description
01 H	Function code error. When a function code outside the specified condition is received.
02 H	Station number error. When a dedicated write location is read. When a dedicated read location is written. When data is read from/written to a location that does not exist.
03 H	Data error. When the value of the written data has exceeded the valid range. When the number of data read exceeds the range. Writes to an unmodifiable parameter location. When written data mismatches the specified amount.

⚠ Note:

For priority of error codes, the lower the value of the error code, the higher the order. When there is more than one error, the error code with higher priority will be returned first. Example: When the function code detects an error, even if there is a data error or a station number error, it will only reply "01" first.

8.4 RTU request message structure

1 · Word data reading

Read the WORD number from the start of the reading position and read the WORD data continuously. After reading the WORD data, it will be sent from the upper Bytes to the lower Bytes.

■ Request message structure

Station number		01 H~10 H
Function code		03 H
Read start position	Upper	0000 H~FFFF H
	Lower	
Read number of WORD	Upper	0001 H~0003 H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

■ Response message structure

Station number		01 H~10 H
Function code		03 H
Read number of Bytes		02 H~7F H
Data on the first WORD	Upper	0000 H~FFFF H
	Lower	
Second WORD data	Upper	0000 H~FFFF H
	Lower	
⋮	⋮	⋮
Last WORD data	Upper	0000 H~FFFF H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

■ Error response message structure

Station number		01 H~10 H
Function code		83 H
Error code		01 H~03 H
CRC-16	Upper	0000 H~FFFF H
	Lower	

RTU read sample state: Read
 Data position:1000 H (action status data)
 Word number: One word

Character	01	03	10	00	00	01	80	CA
	Station number Controller knob plus 1	Function code	Read start position		Read number of WORD		CRC-16	
	Data string							

2 · Word data writing

Specifies the position to start writing WORD data.

Data is sent in the order from the upper Bytes to the lower Bytes of the WORD data.

■ Request message structure

Station number		01 H~10 H
Function code		06 H
Write start position	Upper	0000 H~FFFF H
	Lower	
Write number of WORD	Upper	0000 H~FFFF H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

■ Response message structure

Station number		01 H~10 H
Function code		06 H
Write start position	Upper	0000 H~FFFF H
	Lower	
Write number of WORD	Upper	0000 H~FFFF H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

■ Error response message structure

Station number		01 H~10 H
Function code		86 H
Error code		01 H~03 H
CRC-16	Upper	0000 H~FFFF H
	Lower	

Example of writing RTU: Return to origin

Data position :201E H

Data action code: 0003 H (origin return)

Character	01	06	20	1E	00	03	A2	0D
	Station number Controller knob plus 1	Function code	Read start position		Read number of WORD		CRC-16	
	Data string							

3 · Continuous WORD data writing

Write WORD number to the start position, and continuously write WORD data.
It is sent in the order from the top Bytes to the bottom Bytes of WORD data.

Request message structure

Station number		01 H~10 H
Function code		10 H
Write start position	Upper	0000 H~FFFF H
	Lower	
Write number of WORD	Upper	0001 H~003F H
	Lower	
Write number of Bytes		02 H~7F H
Data on the first WORD	Upper	0000 H~FFFF H
	Lower	
Second WORD data	Upper	0000 H~FFFF H
	Lower	
⋮	⋮	⋮
Last WORD data	Upper	0000 H~FFFF H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

Response message structure

Station number		01 H~10 H
Function code		10 H
Write start position	Upper	0000 H~FFFF H
	Lower	
Write number of WORD	Upper	0001 H~003F H
	Lower	
CRC-16	Upper	0000 H~FFFF H
	Lower	

Error response message structure

Station number		01 H~10 H
Function code		86 H
Error code		01 H~03 H
CRC-16	Upper	0000 H~FFFF H
	Lower	

Example of continuous RTU writing

Example: Write relative movement data

Data position: 2000 H (set relative movement distance)

Number of Word: One word

Character	01	10	20	00	00	02	04	00	00	00	64	6B	85
	Station number Controller knob plus 1	Function code	Write start position	Write number of WORD		Read Number of Byte	1st Data on WORD		2nd Data on WORD		CRC-16		
	Data string												

4 · Examples of CRC-16 calculation

CRC-16 is a 2-Bytes (16Bit) error confirmation.

CRC-16 is calculated sequentially from the station number position to the end of the data.

1. Declare CRC as the initial value of FFFF H.
2. Execute XOR operation on 1 Byte in CRC and the first message. The calculated value is then substituted into the CRC.
3. The CRC variable is offset to the right by 1 Bit (next Bit).
4. If the carry flag "c_carry" is 1, then execute XOR operation on the CRC and A001 H.
5. Repeat the results for 3, 4, and 8 cycles.
6. Execute XOR operation on 1 Byte in CRC and the next message. The calculated value is then substituted into the CRC.
7. For values other than CRC, repeat the executions under 3~6,
8. until the last Byte is calculated, and then it is sent in the order of lower and upper CRC variables.

■ Taking VB 6.0 as an example, calculate CRC-16:

Variables are declared below:

Dim CRC As Long

Dim i, j, array_count As Integer

Dim c_next, c_carry As Long

Dim crc_array(64) As Integer

```

i = 0
CRC = 65535
For i = 0 To array_count
  c_next = crc_array(i)
  CRC = (CRC Xor c_next) And 65535
  For j = 0 To 7
    c_carry = CRC And 1
    CRC = CRC \ 2
    If c_carry = 1 Then
      CRC = (CRC Xor &HA001) And 65535
    End If
  Next j
Next i
End

```

Add to the end of the error code and message, and pay attention to the order of lower Bit and upper Bit of CRC.

8.5 ASCII Request Message Structure

1 · Word data reading

Read the WORD number from the start of the reading position and read the WORD data continuously. After reading the WORD data, it will be sent from the upper Bytes to the lower Bytes.

Request message structure

Start code		": "
Station number		"0" · "1"~"1" · "0"
Function code		"0" · "3"
Read start position	Upper	"0" · "0"~"F" · "F"
	Lower	"0" · "0"~"F" · "F"
Read number of WORD	Upper	"0" · "0"~"0" · "0"
	Lower	"0" · "0"~"3" · "C"
Check code LRC		"0" · "0"~"F" · "F"
End code		CR · LF

Response message structure

Start code		": "
Station number		"0" · "1"~"1" · "0"
Function code		"0" · "3"
Read number of Bytes		"0" · "2"~"7" · "F"
Data on the first WORD	Upper	"0" · "0"~"F" · "F"
	Lower	"0" · "0"~"F" · "F"
Second WORD data	Upper	"0" · "0"~"F" · "F"
	Lower	"0" · "0"~"F" · "F"
⋮	⋮	⋮
Last WORD data	Upper	"0" · "0"~"F" · "F"
	Lower	"0" · "0"~"F" · "F"
Check code LRC	Upper	"0" · "0"~"F" · "F"
End code	Lower	CR · LF

Error response message structure

Start code		": "
Station number		"0" · "1"~"1" · "0"
Function code		"8" · "3"
Error code		"0" · "1"~"0" · "3"
Check code LRC	Upper	"0" · "0"~"F" · "F"
End code	Lower	CR · LF

Example of reading ASCII state: Read
 Data position: 1000H (action status data)
 Number of Word: One word

Character	:	0	1	0	3	1	0	0	0	0	0	0	1	E	B	CR	LF
	3A	30	31	30	33	31	30	30	30	30	30	30	31	45	42	0D	0A
Start code	Station number Controller knob plus 1	Function code		Read start position				Read number of WORD				Verification code (LRC)		End code (CR/LF)			
Data string																	

2 · Word data writing

Specifies the position to start writing WORD data.

Data is sent in the order from the upper Bytes to the lower Bytes of the WORD data.

Request message structure

Start code			": "
Station number			"0" · "1"~"1" · "0"
Function code			"0" · "6"
Read start position in	Upper		"0" · "0"~"F" · "F"
	Lower		"0" · "0"~"F" · "F"
Read number of Word in	Upper		"0" · "0"~"F" · "F"
	Lower		"0" · "0"~"F" · "F"
Check code LRC			"0" · "0"~"F" · "F"
End code			CR · LF

Response message structure

Start code			": "
Station number			"0" · "1"~"1" · "0"
Function code			"0" · "6"
Read start position in	Upper		"0" · "0"~"F" · "F"
	Lower		"0" · "0"~"F" · "F"
Read number of Word in	Upper		"0" · "0"~"F" · "F"
	Lower		"0" · "0"~"F" · "F"
Check code LRC			"0" · "0"~"F" · "F"
End code			CR · LF

Error response message structure

Start code			": "
Station number			"0" · "1"~"1" · "0"
Function code			"8" · "6"
Error code			"0" · "1"~"0" · "3"
Check code LRC			"0" · "0"~"F" · "F"
End code			CR · LF

Example of writing ASCII: Return to origin

Data position :201E H

Data action code: 0003H (origin return)

Character	:	0	1	0	6	2	0	1	E	0	0	0	3	B	8	CR	LF
	3A	30	31	30	36	32	30	31	45	30	30	30	31	42	38	0D	0A
Start code	Station number Controller knob plus 1		Function code		Data position				Data action code				Verification code (LRC)		End code (CR/LF)		
	Data string																

3 · Continuous WORD data writing

Write WORD number to the start position, and continuously write WORD data.
It is sent in the order from the top Bytes to the bottom Bytes of WORD data.

■■ Request message structure

Start code		" :
Station number		"0" , "1" ~ "1" , "0"
Function code		"1" , "0"
Read start position in	Upper	"0" , "0" ~ "F" , "F"
	Lower	"0" , "0" ~ "F" , "F"
Read number of Word in	Upper	"0" , "0" ~ "0" , "0"
	Lower	"0" , "0" ~ "3" , "C"
Write number of Bytes		"0" , "2" ~ "7" , "6"
Data on the first WORD	Upper	"0" , "0" ~ "F" , "F"
	Lower	"0" , "0" ~ "F" , "F"
Second WORD data	Upper	"0" , "0" ~ "F" , "F"
	Lower	"0" , "0" ~ "F" , "F"
⋮	⋮	⋮
Last WORD data	Upper	"0" , "0" ~ "F" , "F"
	Lower	"0" , "0" ~ "F" , "F"
Check code LRC		"0" , "0" ~ "F" , "F"
End code		CR · LF

■■ Response message structure

Start code		" :
Station number		"0" , "1" ~ "1" , "0"
Function code		"1" , "0"
Read start position in	Upper	"0" , "0" ~ "F" , "F"
	Lower	"0" , "0" ~ "F" , "F"
Read number of Word in	Upper	"0" , "0" ~ "0" , "0"
	Lower	"0" , "1" ~ "3" , "B"
Check code LRC		"0" , "0" ~ "F" , "F"
End code		CR · LF

■■ Error response message structure

Start code		" :
Station number		"0" , "1" ~ "1" , "0"
Function code		"9" , "0"
Error code		"0" , "1" ~ "0" , "3"
Check code LRC		"0" , "0" ~ "F" , "F"
End code		CR · LF

Example of continuous ASCII writing: Write relative movement data
 Data position: 2000 H (set relative movement distance)
 Number of Word: One word

Character	:	0	1	1	0	2	0	0	0	0	0	0	2	0	4	0	0	0	0	0	0	6	4	6	5	CR	LF
	3A	30	31	31	30	32	30	30	30	30	30	30	32	30	34	30	30	30	30	30	30	36	34	36	35	0D	0A
Start code	Station number Controller knob plus 1		Function code		Write start position				Write number of WORD				Read Number of Bytes		1st Data on WORD				2nd Data on WORD				Verification code (LRC)		End code (CR/ LF)		
Data string																											

4 · Examples of LRC calculation:

LRC is calculated sequentially from the station number to the end of the data.

1. Execute sum calculation from the beginning of the data (station number) to the end of the data.
2. When the result exceeds FF H, such as 100 H or above, drop the "1". (Example: 153 H => 53 H)
3. The complement of the result (BIT inversion) takes the result plus 1.
4. LRC_ARRAY array is a group of 2 characters to do the combination, its value needs to be converted to base 10 calculation. (Example: 0106201E0003 => 01 06 20 1E 00 03)

● Taking VB 6.0 as an example, calculate LRC:

```
Dim LRC As Integer
Dim i As Integer
Dim array_count As Integer
Dim lrc_array(128) As Integer
```

```
For i = 0 To array_count
    LRC = (LRC + lrc_array(i)) And &HFF
Next i
LRC = ((Not LRC) + 1) And &HFF
```

8.6 EtherCAT network setting:

1. When Omron PLC is used, the ESI file is stored in the following path:

名稱	修改日期	類型	大小
AMP Stepper EtherCAT v2.1	2020/6/4 上午 10:15	XML Document	152 KB
Delta_ASDA2-E_rev4-00_XML_TSE_20160620	2018/11/28 下午 12:43	XML Document	189 KB
Elmo ECAT 00010420 V10	2018/9/25 下午 05:34	XML Document	393 KB
ORIENTALMOTOR_AZDxA-KED_rev0301	2020/6/4 上午 10:15	XML Document	2,535 KB
Panasonic_MINAS-A6BM_V1_3	2018/12/12 下午 03:09	XML Document	679 KB
Servotronics_CDHD_PC0_RV0_1_41_13	2020/6/8 上午 11:48	XML Document	392 KB
TOYO-Device-1Axis	2020/5/8 下午 03:15	XML Document	64 KB
YAMAHA_RCX3_EtherCAT_V1.1	2019/12/16 下午 07:02	XML Document	329 KB
Yaskawa_SGD7S-xxxxA0x	2018/11/28 下午 12:43	XML Document	797 KB

2. When Backoff PLC is used, the ESI file is stored in the following path:

1. Copy TOYO-Device-1Axis. The XML file is sent to the EtherCat Master tool folder

2. Software name

3. Default path

4. Beckhoff EtherCAT Configuration

5. C:\EtherCAT Configurator\EtherCAT

6. Beckhoff TwinCAT 3.X

7. C:\TwinCAT\3.x\Config\Io\EtherCAT

8. Beckhoff TwinCAT 2.X

9. C:\TwinCAT\Io\EtherCAT

1. WRITE TAG

EtherCAT Network Configuration				
Node1	TOYO			
	Output mapping 0_Toyo_CTL0_7000_01	W	UINT	A1_WS0
	Output mapping 0_Toyo_CTL1_7000_02	W	UINT	A1_WS1
	Output mapping 0_Toyo_ORG_7000_03	W	BOOL	A1_ORG
	Output mapping 0_Toyo_SERVO_ON_7000_04	W	BOOL	A1_SERVON
	Output mapping 0_Toyo_ALARM_RESET_7000_05	W	BOOL	A1_ALALRM
	Output mapping 0_Toyo_START_7000_06	W	BOOL	A1_Start
	Output mapping 0_Toyo_PRG0_7000_07	W	BOOL	A1_PG0
	Output mapping 0_Toyo_PRG1_7000_08	W	BOOL	A1_PG1
	Output mapping 0_Toyo_PRG2_7000_09	W	BOOL	A1_PG2
	Output mapping 0_Toyo_PRG3_7000_0A	W	BOOL	A1_PG3
	Output mapping 0_Toyo_PRG4_7000_0B	W	BOOL	A1_PG4
	Output mapping 0_Toyo_PRG5_7000_0C	W	BOOL	A1_PG5
	Output mapping 0_Toyo_PRG6_7000_0D	W	BOOL	A1_PG6
	Output mapping 0_Toyo_ORGSIG_7000_0E	W	BOOL	
	Output mapping 0_Toyo_Revers1_7000_0F	W	BOOL	
	Output mapping 0_Toyo_Revers2_7000_10	W	BOOL	
	Output mapping 0_Toyo_Revers3_7000_11	W	BOOL	
	Output mapping 0_Toyo_Revers4_7000_12	W	BOOL	
	Output mapping 0_Toyo_MovSpeedSet_7000_13	W	UINT	A1_Speed
	Output mapping 0_Toyo_MovType_7000_14	W	UINT	A1_Command
	Output mapping 0_Toyo_ABSamount_7000_15	W	DINT	A1_ABSamount

2. READ TAG

Input mapping 0_Toyo_SYS0_6000_01	R	UINT	A1_RS0
Input mapping 0_Toyo_SYS1_6000_02	R	UINT	A1_RS1
Input mapping 0_Toyo_ORG_S_6000_03	R	BOOL	A1_ORG_S
Input mapping 0_Toyo_INP_6000_04	R	BOOL	A1_INP
Input mapping 0_Toyo_READY_6000_05	R	BOOL	A1_Ready
Input mapping 0_Toyo_SERVO_S_6000_06	R	BOOL	A1_Serovon_S
Input mapping 0_Toyo_PRG_0S_6000_07	R	BOOL	A1_PG0_S
Input mapping 0_Toyo_PRG_1S_6000_08	R	BOOL	A1_PG1_S
Input mapping 0_Toyo_PRG_2S_6000_09	R	BOOL	A1_PG2_S
Input mapping 0_Toyo_PRG_3S_6000_0A	R	BOOL	A1_PG3_S
Input mapping 0_Toyo_PRG_4S_6000_0B	R	BOOL	A1_PG4_S
Input mapping 0_Toyo_PRG_5S_6000_0C	R	BOOL	A1_PG5_S
Input mapping 0_Toyo_Rever1_6000_0D	R	BOOL	
Input mapping 0_Toyo_Rever2_6000_0E	R	BOOL	
Input mapping 0_Toyo_Rever3_6000_0F	R	BOOL	
Input mapping 0_Toyo_Rever4_6000_10	R	BOOL	
Input mapping 0_Toyo_Rever5_6000_11	R	BOOL	
Input mapping 0_Toyo_Rever6_6000_12	R	BOOL	
Input mapping 0_Toyo_AlarmStatus_6000_13	R	UINT	A1_Alarm
Input mapping 0_Toyo_EcdPos_6000_14	R	UDINT	A1_Encoder



READ/ WRITE	Data format	TAG	Brief	Content description	Range
READ	BOOL	The same as defined name 1~10	Overall output state	Output Bit 0 (OUT 1)~ Bit 9 (OUT 10) 0:Set H1020 as master: 1002N0 (pre-set) IO defined as follows) OUT2: INRPG-S OUT4:SERAVDOY -S OUT6:PRGSEL1-S OUT8:PRGSEL34-S OUT10:PRGSEL5-S	-
READ	UINT	AlarmStatus	Alarm status	012:Alarm Over-torque Excessive deviation 34:Over-speed Improper gain adjustment 56:Over-voltage Incipient error 78: EEPROM error Insufficient circuit supply voltage 9:Over-current Regeneration error 11: : In emergency stop Motor is disconnected 13: : Encoder is disconnected Current value protection 15:Switch power supply off and restart	-
READ	DINT	EcdPos	Encoder position	Current position value	-
WRITE	BOOL	As IN1 ~ 14	Input state change	Input bit 0 (IN 1)~bit 13(IN 14) Set H2040 as mater IN: 120: FOFR1G: ON (preset is defined as follows IN34: AELMRV-ROESET IN56: PTRAGRSTEL0 IN78: PRGSEL2 IN9: PRGSEL4 IN121: OP RGSEIGL6	-

READ/ WRITE	Data format	TAG	Brief	Content description	Range
WRITE	UINT	MovType	Movement type	136:To-position movement Origin Return to origin: Decelerate to stop Clear command	0~f
WRITE	DINT	ABSamount	Absolute movement amount	Set absolute movement distance (Valid for position control and torque control) (Initial value 0)	2~2000
WRITE	UINT	MovSpeedSet	Action speed setting/absolute position movement for position /torque control	Set based on 100% maximum speed (based on the set value of 0802H) (initial value 100) If set value is 0%, move at the start speed (0800H)	0~100%
WRITE	UINT	Toyo_CTL0	System control	It must be set to 1	-

Note:

1. ID knob on TC100/XC100 must be set to 0.
2. Station number of ECAT-TC100 is set by the upper Master. °
3. EtherCAT IN PORT is CN6
4. EtherCAT OUT PORT is CN7

9.TOYO-Single software operations

9.1 TOYO-Single introduction

1 ∙ Introduction

To facilitate customers to use our serial products, we have specially designed a professional control software TOYO-Single so as to provide customers with better user experience.

2 ∙ Installation and software requirements

Minimum Software Requirements	
Operating System	Microsoft Windows 2000/XP/Vista/7/8.1/10
CPU	As recommended by the OS or above
Memory	As recommended by the OS or above
Hard disk space	More than 20MB of available space
Communication port	RS-485 ∙ USB
Controller	LC100

9.2 TOYO-Single software installation and removal

1 ∙ Installation

This section will show you how to install TOYO-Single, starting with [Toyo-Single-Setup.exe] file, as shown in Figure 1. It is recommended to execute the installer as administrator to avoid installation exceptions caused by insufficient permissions.

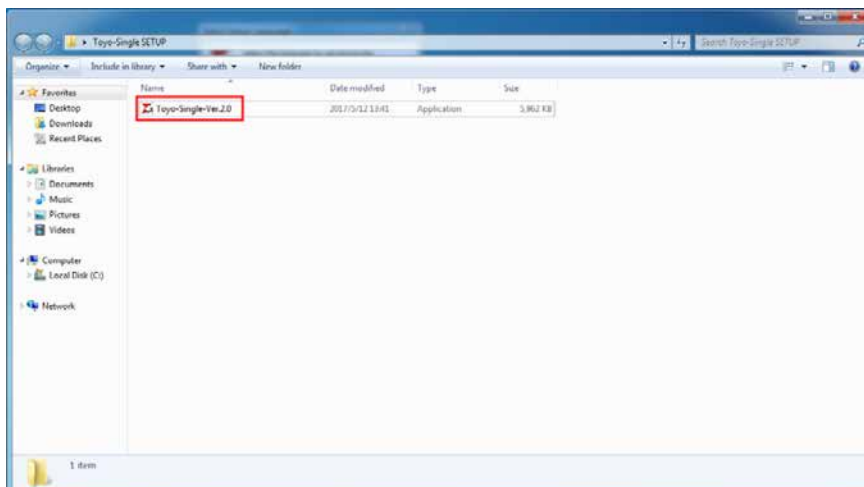


Figure 1 - Toyo-Single.Exe

① Framework detection

If, after being run, the software detects that your computer does not have Microsoft.NET Framework 4 installed, it will ask you if you want to download and install it, as shown in Figure 2. If this screen is not displayed, please skip to Section 1.2 to continue the installation process. Please press "Yes" to download or "No" to exit from the installer. Or alternatively, you can go to the Microsoft website to download Microsoft.NET Framework 4 for installation.

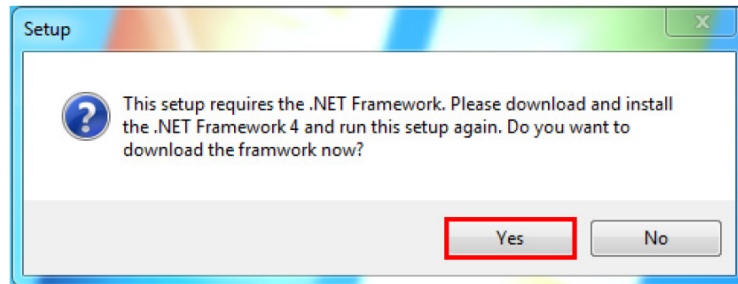


Figure 2 - Ask about Installation of Microsoft.NET Framework 4

Please read the license terms in installation document, and then check "Agree" and click on "Install", as shown in Figure 3.

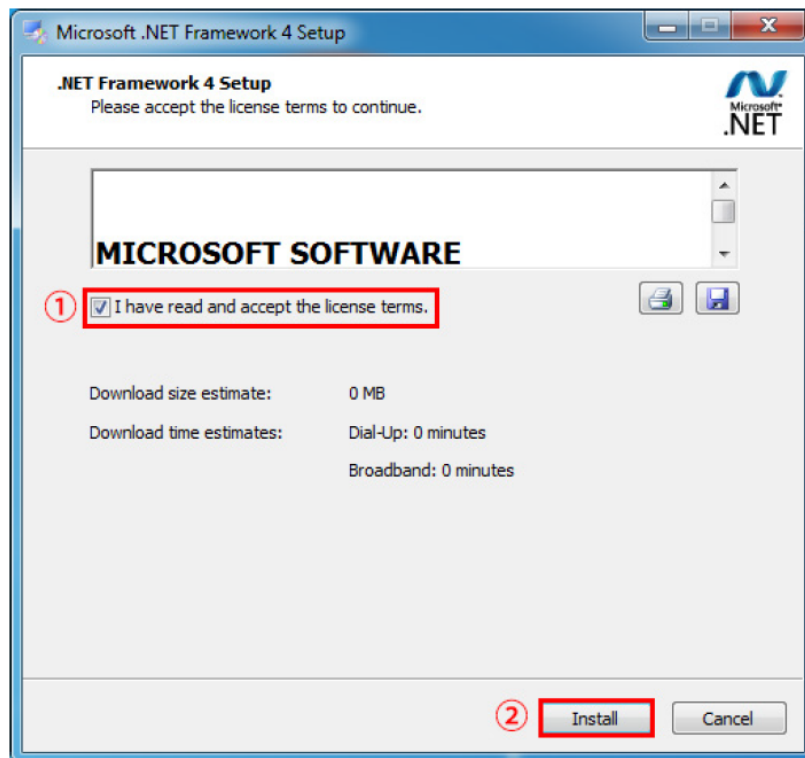


Figure 3 - Installation of Microsoft.NET Framework 4

Please wait while the installer is running, as shown in Figure 4.

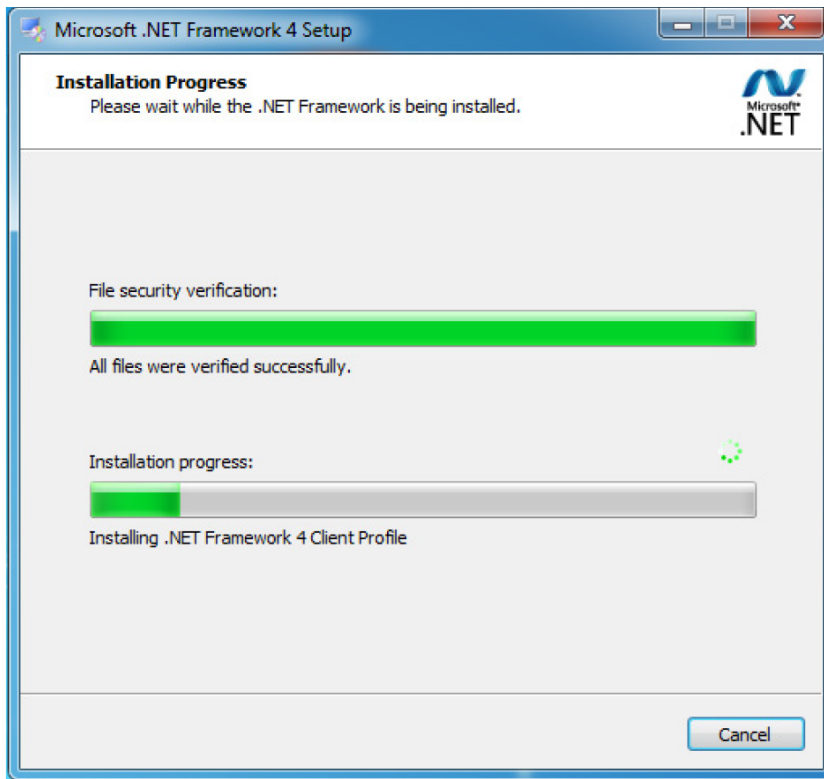


Figure 4 - Installer

Click Finish to complete installation, as shown in Figure 5.

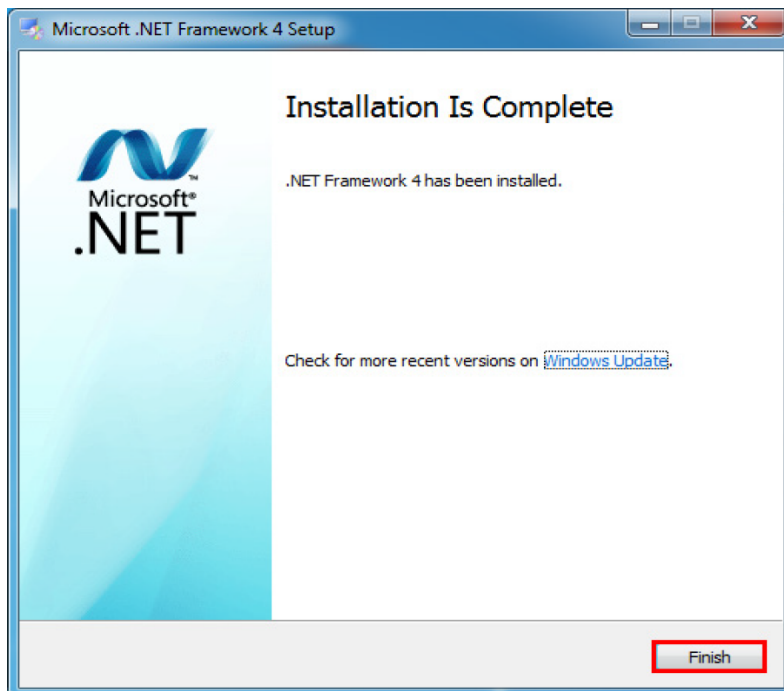


Figure 5 - Completing Installation of Framework 4

② Toyo-Single installer

The installer will ask the language used during the installation. User can choose one and then click on "OK", as shown in Figure 6.

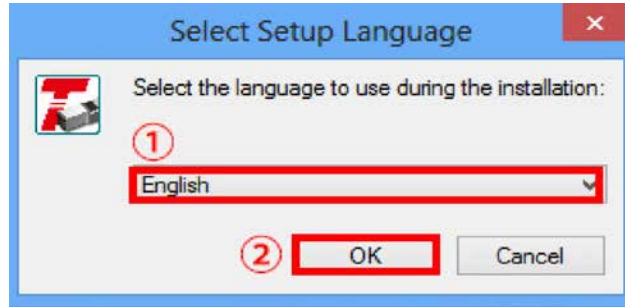


Figure 6 - Choosing Installation Language

After reading Toyo-Single copyright statement, click on "Next" to continue the installation process, as shown in Figure 7.

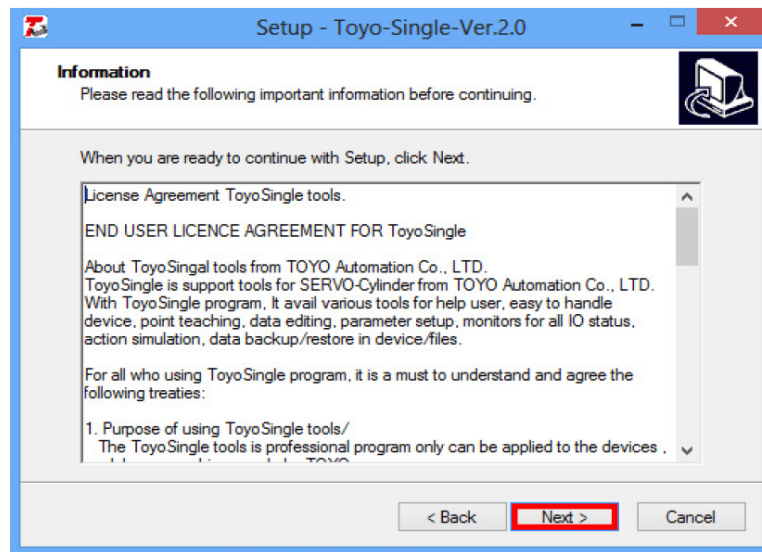


Figure 7 - Copyright Statement Page



On installation path selection page, you can press [Browse] to choose another location where you want to install the program. It is recommended to use the default installation path. After selection, click on [Next] to continue the installation process, as shown in Figure 8.

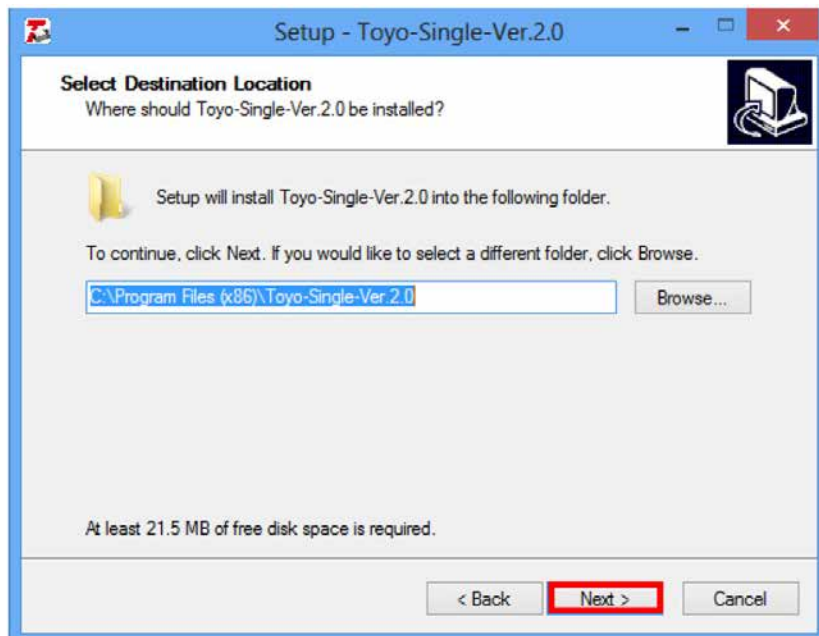


Figure 8 - Installation Path Selection

On additional task selection page, check USB Driver (recommended) and Create desktop shortcut as you like, and then click on "Next" to continue the installation process, as shown in Figure 9.

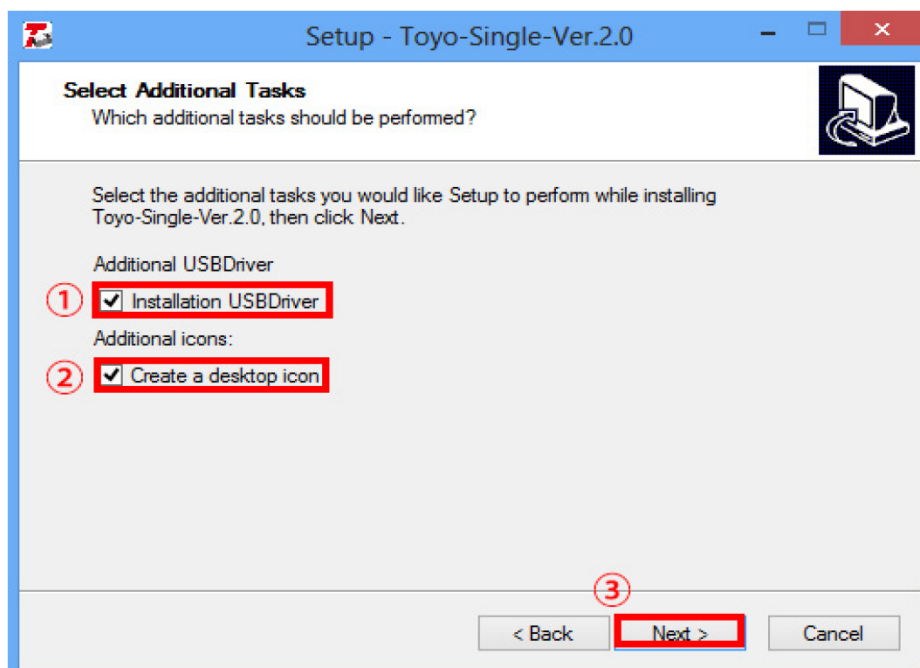


Figure 9 - Create Desktop Shortcut

On installation confirmation page, click on "Install" to execute installation, as shown in Figure 10.

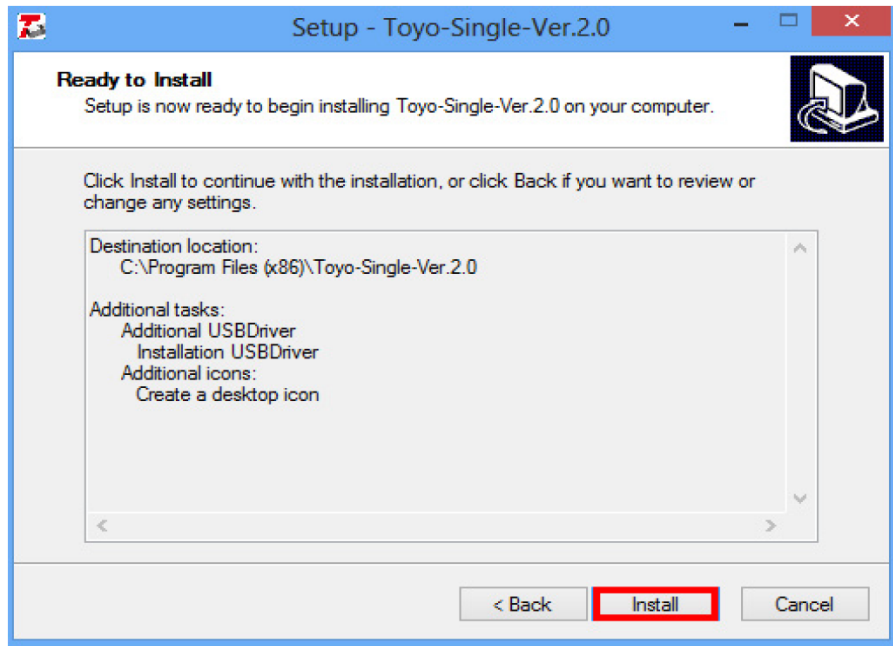


Figure 10 - Installation Confirmation

On Complete Installation page, check "Run Toyo-single" if you want it run upon end of installation, and finally click on "Finish" to complete the installation process, as shown in Figure 11.

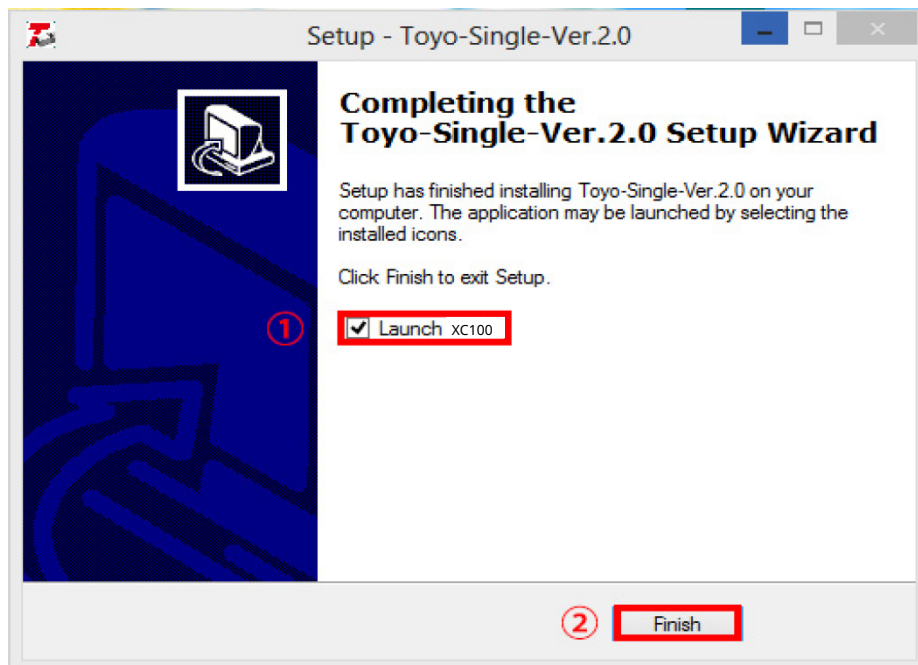


Figure 11 - Complete Installation

③ USBDriver - FTDI

This section describes how to install FTDI driver. On the installation page, click on [Extract] button, as shown in Figure 12.



Figure 12 - Installation of FTDI Driver

On driver installation wizard page, click on Next to proceed, as shown in Figure 13.

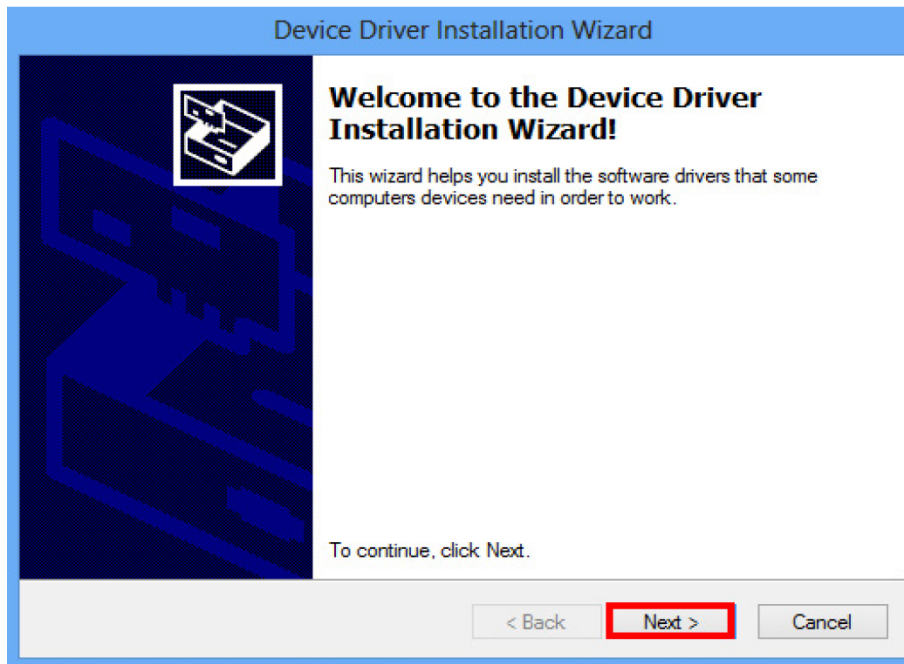


Figure 13 - Installation Wizard

On license agreement page, check "I accept this agreement" and click on "Next", as shown in Figure 14.

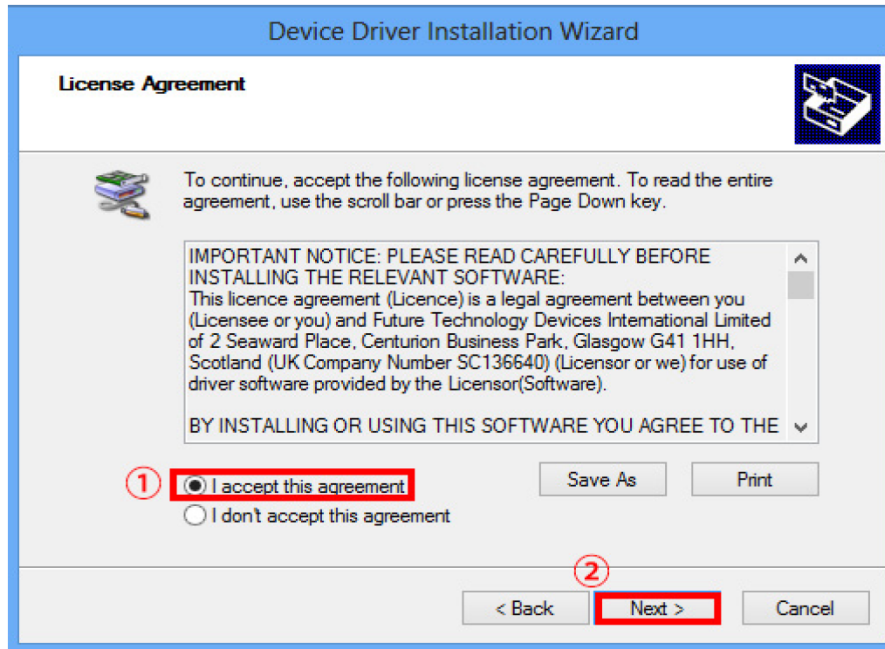


Figure 14 - License Agreement Page

Finally, on the completion page, click on "Finish" to finish the installer, as shown in Figure 15.

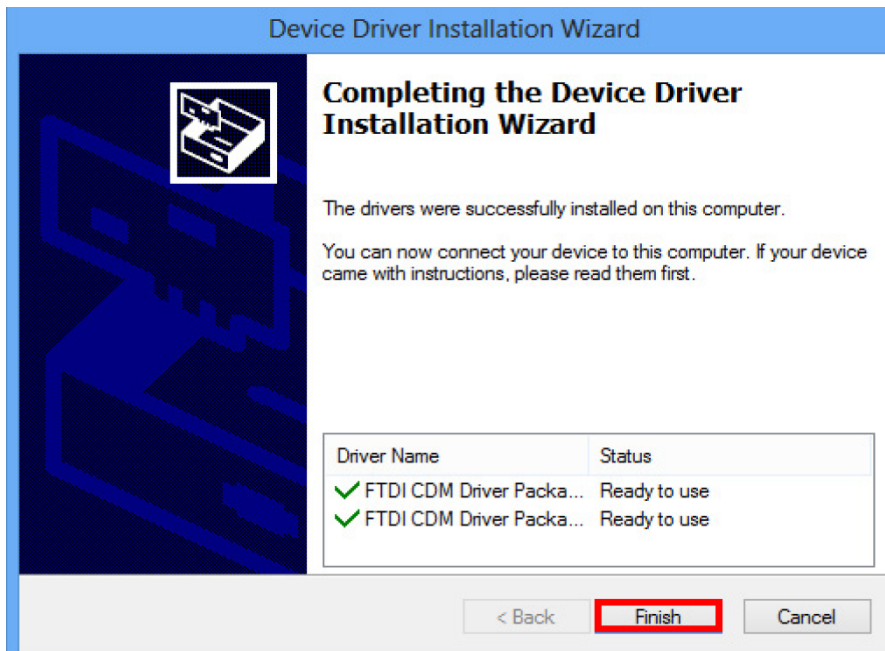


Figure 15 - Complete Installation

2 · Removal

This section describes how to remove Toyo-single software by navigating to Uninstall or Change Program Screen from [Console]->[Assembly]->[Uninstall Program] and then selecting [Toyo-single] to remove the software, as shown in Figure 16.

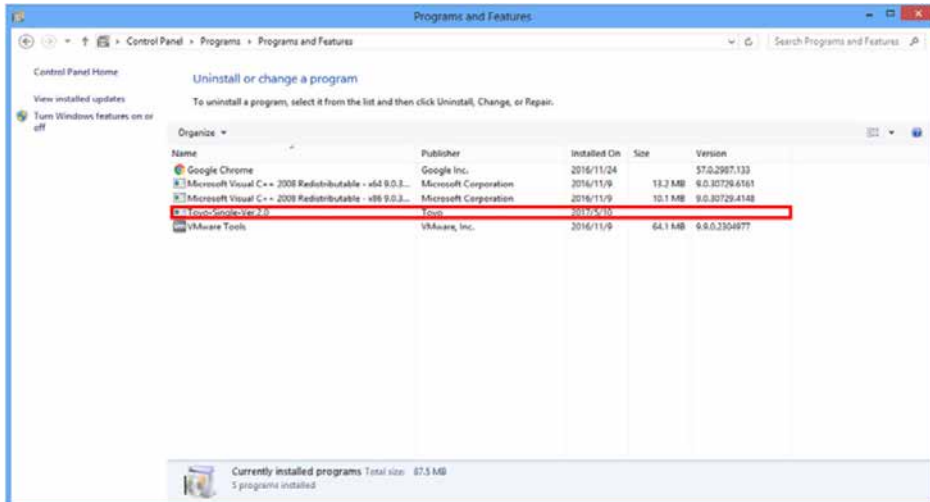


Figure 16 - Uninstall or Change Program

On the uninstallation page, click on [Yes] to confirm the uninstallation or [No] to cancel uninstallation, as shown in Figure 17.

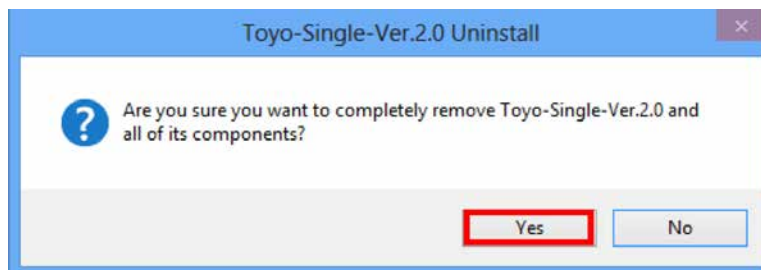


Figure 17 - Uninstallation Confirmation

After the software is uninstalled, click on "OK" to confirm the uninstallation, as shown in Figure 18.

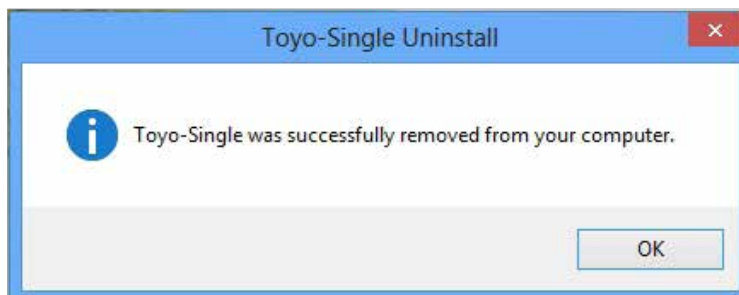


Figure 18 - Successful Uninstallation

9.3 TOYO-Single software interface description

1 · Initial screen

This section will introduce the basic main online screen by different functions, as shown in Figure 1.

▼ Basic main online screen

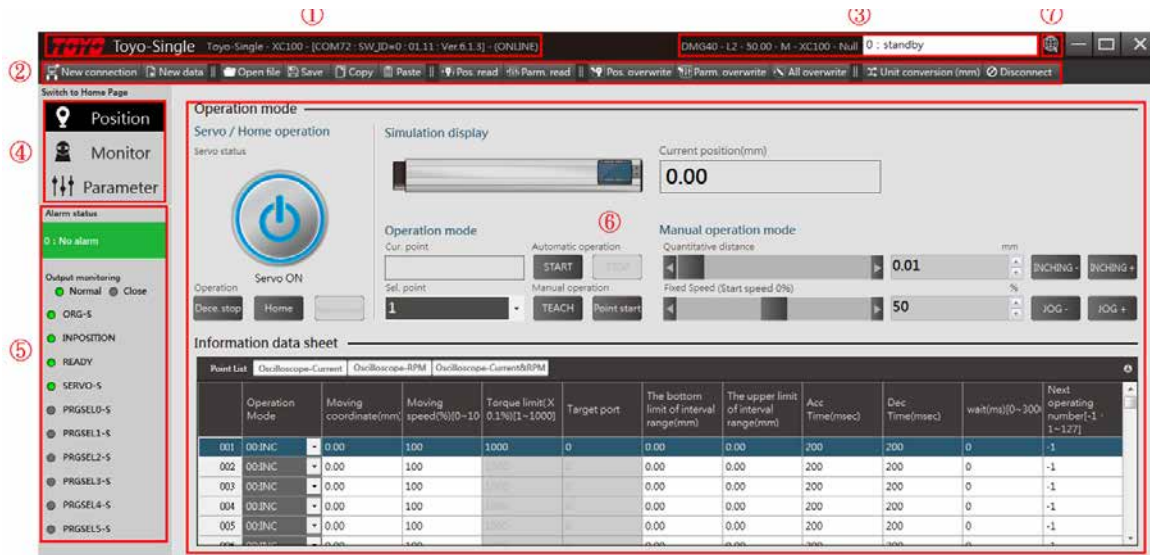


Figure 1 - Initial Screen

① Basic status bar

Display the current system information from left to right, including, [software name], [driver name], [COM], [SW_ID], [Firmware version], [software version], [online state], as shown in Figure 2.

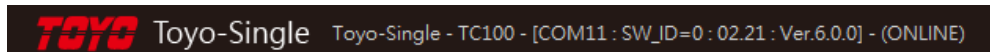


Figure 2 - Basic Status Bar

② Toolbar

This area provides basic system functions, as shown in Figure 3. Individual functions are described as follows:

1. **New connection:** When system is connected, point position value and parameter value in current controller will be loaded. Upon completion of connection, the main screen will be available for operations.
2. **New data:** This function can be used to add data on a single machine, after the addition of the file can be output, to provide subsequent writing use.
3. **Open file:** This function can be used to load any file previously stored for edition.
4. **Storage:** It is used to store relevant files on current page, including point location file (.PRG) and parameter file (.PAR). Point location file can be used from the [Point location page] by clicking [Store], and parameter file can be used from the [Parameter page] by clicking [Store].
5. **Copy:** You can copy the data contents of the currently selected column or columns in the point location data column, or you can use shortcut key (Ctrl+C).
6. **Paste:** You can paste the data from the copied column to a data column, or use shortcut key (Ctrl+V).
7. **Read point:** This function can be executed to read the point position value in the current controller into the data column.
8. **Read parameter:** This function can be executed to read the parameter value in the current controller into the data column.
9. **Write point:** The modified point position value or all the point position values on the current point position data column can be written to the controller.
10. **Write parameter:** The modified parameter value or all parameter values on the current page can be written to the controller.
11. **Write all:** The modified parameter values and all point position values can be written to the controller.
12. **Unit conversion:** With this function, the system can display mm, Pulse and mil as units.
13. **Disconnection:** This function can be used to disconnect the current system.



Figure 3 - Toolbar

③ Other status bar

This area displays other status of the current system. At the right side displayed is the current operation mode while at the left side displayed is the current mode name and specification. From left to right, displayed are [Mechanism Model], [Lead], [Stroke], [Motor Direction], [Name of Controller] and [Special Note Code], as shown in Figure 4.

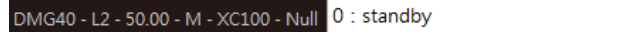


Figure 4 - Other Status Bar

④ Function page

Three system functions are provided in this area for page switching, as shown in Figure 5. Individual functions are described as follows:

1. **Point position:** In this function page, software can be used to control and edit the point position content, which will be described in detail in the following sections.
2. **Monitor:** In this function page, the values of the controller can be read and the current values can be monitored, which will be introduced in detail in the following sections.
3. **Parameters:** In this function page, you can browse the current controller parameters and edit parameters, which will be introduced in detail in the following sections.

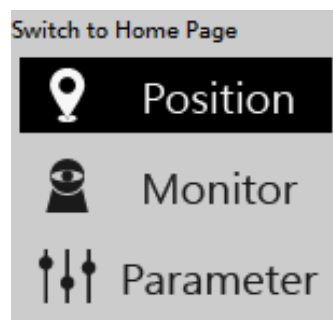


Figure 5 - Function Page

⑤ Output monitoring

This area displays feedback information from the controller, as shown in Figure 6.

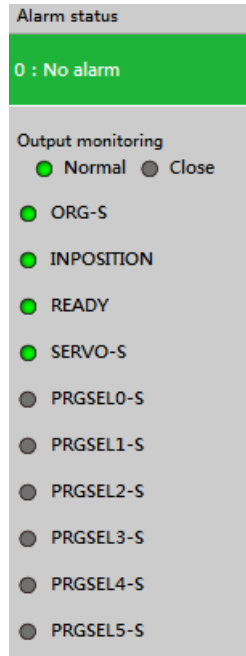


Figure 6 - Output Monitoring

⑥ Main operation area

Users can conduct real-time operation in this area, edit point position value and parameter value, monitor feedback information from the controller and other functions, as shown in Figure 7.

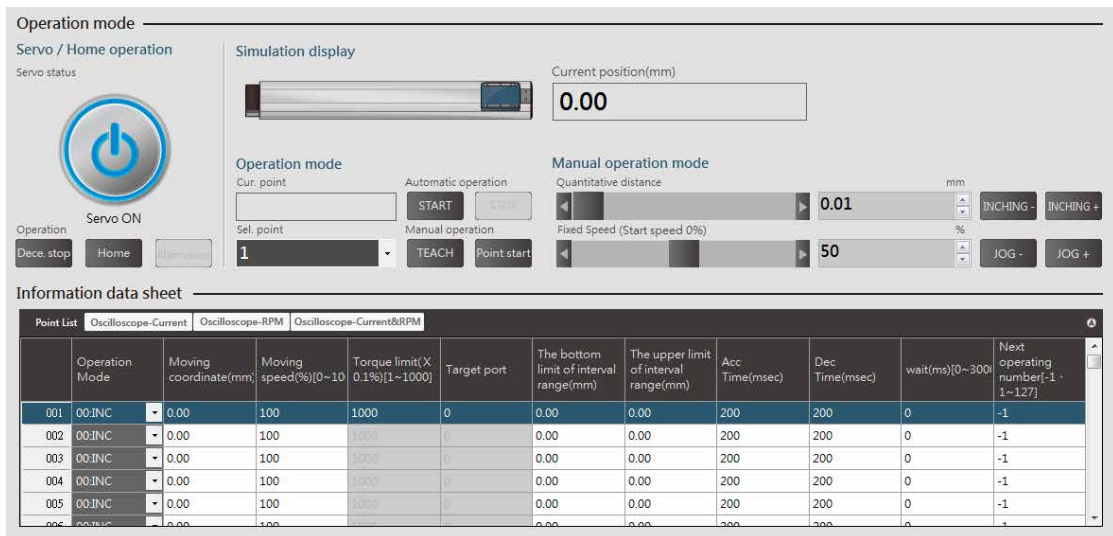


Figure 7 - Main Operation Area

⑦ URL to official website

It provides users with access to the official TOYO website to obtain our latest product news.



Figure 8 - URL Button

2 · Point position page description

The point position page is mainly used for teaching points of the point position in the mechanism, as shown in Figure 9.

In order to facilitate users to quickly complete tasks during operation, the system has set up different operation modes for users' choice, including, [Servo/Origin operation], [Operation mode], [Manual operation mode], and the point position edition and oscilloscope switch functions as shown below. In stand-alone mode this page will only display the point position form for user's edition.

▼ Slide table point teaching screen

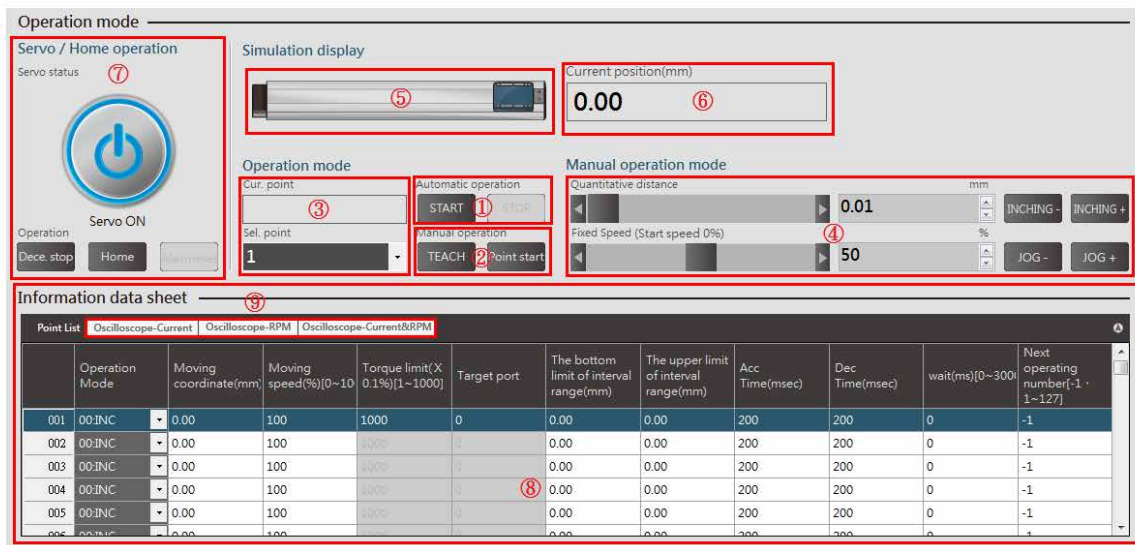


Figure 9 - Point Position Page

① Automatic operation

This function can be automatically run based on the current operation mode of the point position in the selection window, as shown in Figure 10.

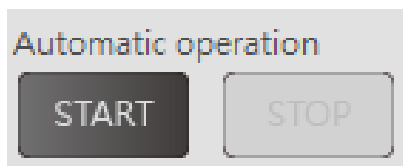


Figure 10 - Automatic Operation

② Manual operation

This area can carry out the [Teach] function and [Point Start] function based on the currently selected point position, while the Point Start function only carries out the single-point operation mode for [Movement coordinates] and [Movement speed], as shown in Figure 11.



Figure 11 - Manual Operation

③ Execution point position

This function can display and select the current execution point position, as shown in Figure 12.

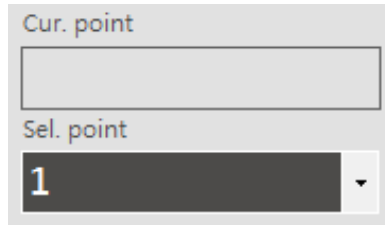


Figure 12 - Execution Point Position

④ Manual operation

This function provides the user with general manual operations, as shown in Figure 13.

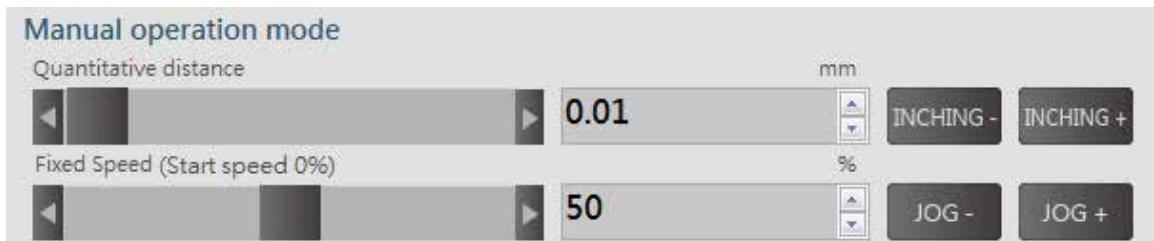


Figure 13 - Manual Operation

⑤ Simulation display

This function can simulate and display the current position of the physical slide table, and can directly manually move the slide seat for operation, as shown in Figure 14.



Figure 14 - Simulation Display

⑥ Current position

This function can display the current position information on slide table from the controller, as shown in Figure 15.

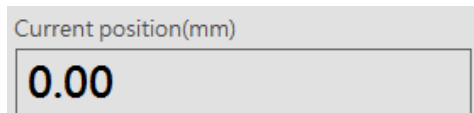


Figure 15 - Current Position

⑦ Servo/origin operation

This function can carry out SERVO ON/OFF, deceleration to stop, origin return, alarm reset and other functions, as shown in Figure 16.

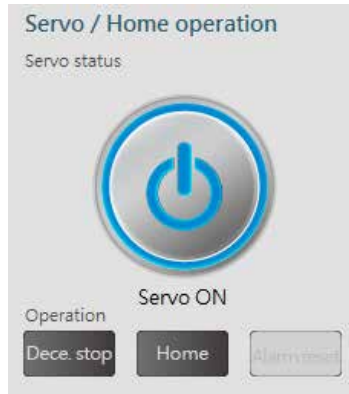


Figure 16 - Servo/Origin Operation

⑧ Point position window

Relevant data on the current 255 points in TOYO-Single are displayed, as shown in Figure 17. The operation modes of single-axis system include INC, ABS, ORGS, +TSL, -TSL, INC-R and ABS-R. The operation modes of clamping claw system include INC-T, ABS-T, CLOSE, CLOSS-R, OPEN and OPEN-R. The operating conditions of ORG, +TSL, -TSL, CLOSE, CLOSE-R, OPEN and OPEN-R do not refer to the items marked in gray, while INC, ABS, INC-R, ABS-R, INC-T and ABS-T refer to all conditions. Please pay more attention to them in setting.

Point List	Oscilloscope-Current	Oscilloscope-RPM	Oscilloscope-Current&RPM								
	Operation Mode	Moving coordinate(mm)	Moving speed(%) [0~10]	Torque limit(X 0.1%) [1~1000]	Target port	The bottom limit of interval range(mm)	The upper limit of interval range(mm)	Acc Time(msec)	Dec Time(msec)	wait(ms) [0~300]	Next operating number [-1, 1~127]
001	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1
002	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1
003	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1
004	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1
005	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1
006	00:INC	0.00	100	1000	0	0.00	0.00	200	200	0	-1

Figure 17 - Point Position Window

⑨ Oscilloscope

The main function of this system is to observe the current use condition of the mechanism through the oscilloscope based on customer's different application conditions. When the customer changes load of the mechanism, the system can be adjusted to meet customer's expected needs, as shown in Figure 18 below.

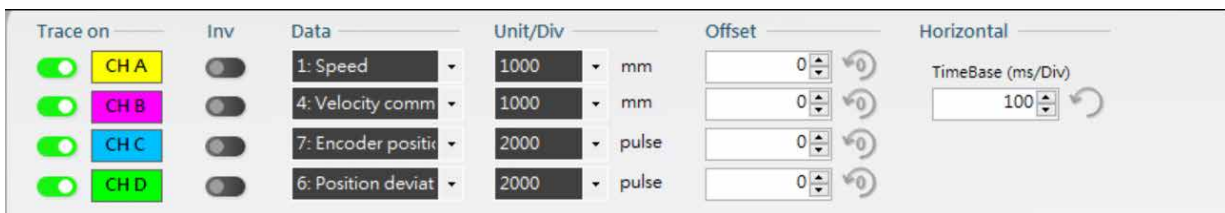


Figure 18 - Oscilloscope Panel Control

[Data]

The display section is currently divided into 21 items for users to monitor, which can be monitored by the items users need to observe in different applications.

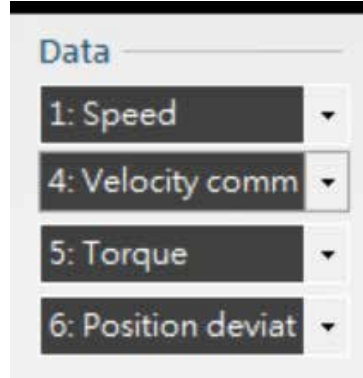


Figure 19 - Data Display Adjustment

[Unit/Grid]

The spacing of each Channel on the Y axis can be adjusted.

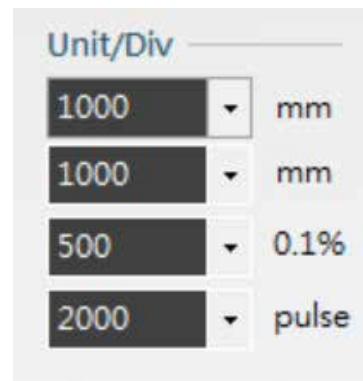


Figure 20 - Adjustment of Unit/Grid

[Vertical Offset]

This function can be used to offset and adjust the vertical position when monitoring the overlap of Y-axis diagram in each Channel.



Figure 21 - Vertical Offset Adjustment

[Horizontal]

The spacing between grids on X axis (time axis) can be adjusted.

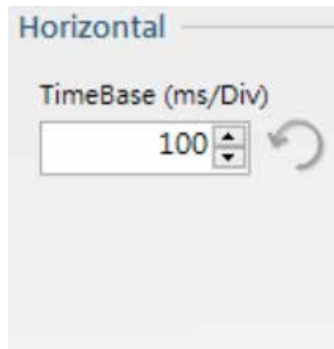


Figure 22 - Horizontal Spacing Adjustment

[Waveform rendering]

Waveform drawing can be switched with this function.

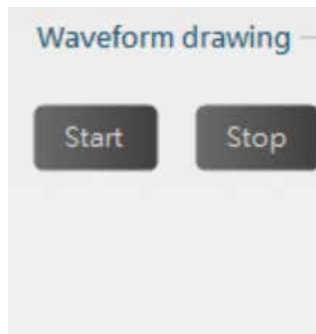


Figure 23 - Waveform Drawing

[ZOOM]

The frame size of the monitoring area can be adjusted, including, from top to bottom, horizontal zoom-in, vertical zoom-in, local zoom-in, and zoom restoration.



Figure 24 - Zoom



Figure 25 - Horizontal X-Axis Adjustment



Figure 26 - Vertical Y-Axis Adjustment

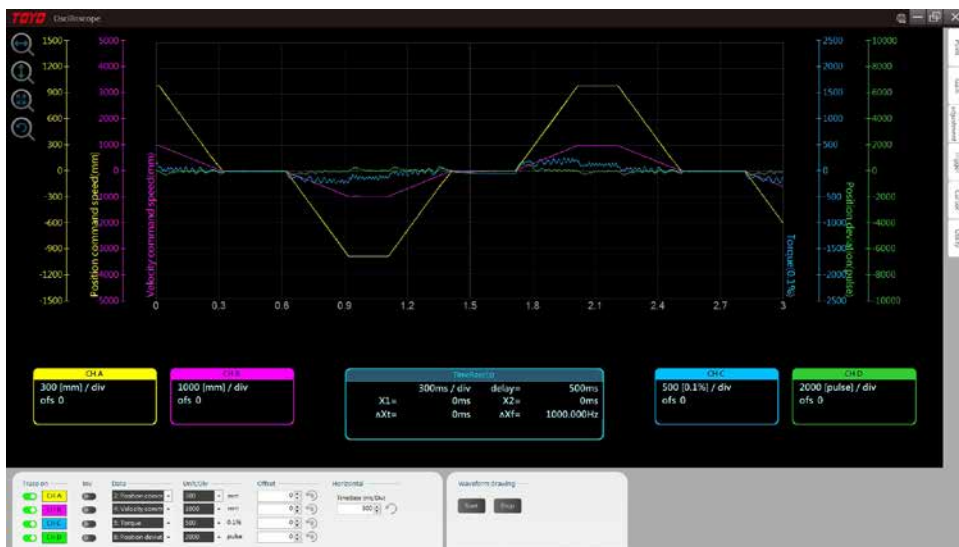


Figure 27 - Local Zoom-In

[Point Position]

The page is mainly used to easily set the controller point, facilitating users to monitor the operation of the mechanism.

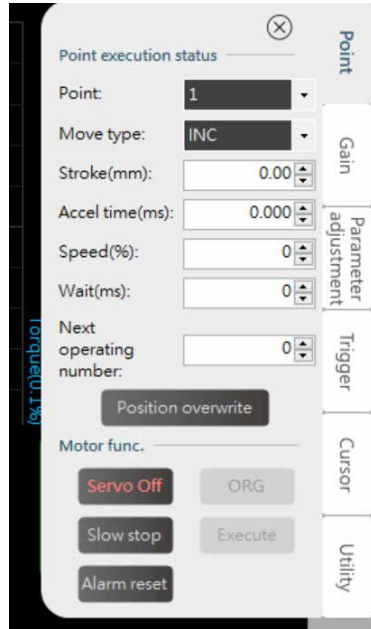


Figure 28 - Point Position Setting Page

[Gain Value]

The page is mainly used by advanced user when user is not satisfied with the results of the automatic gain adjustment (e.g.noise, jitter, rigidity), using this function for real-time gain adjustment, so that the mechanism achieves efficiency optimization of the operation results. It is normal that the waveform is stuck in gain value adjustment during waveform drawing.

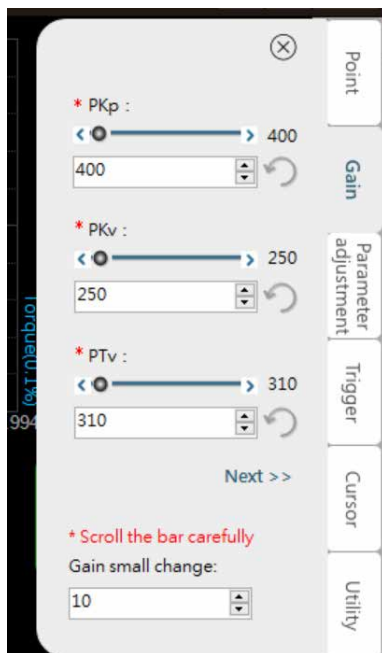


Figure 29 - Gain Value Adjustment Page

[Parameter Adjustment]

The menu on the page contains vibration filter, sag filter and gain adjustment. The vibration filter is mainly used to suppress the vibration, which is generated when the load on the mechanism is extended or at a height, and in this case the user can adjust the parameters to reduce the vibration during movement. The sag filter is used mainly to suppress the frequency sound caused by the resonance during movement of the mechanism. User can capture frequency by using the spectrum analyzer, and then input the value to relevant parameters. The Gain Adjustment menu item is mainly to set the second group of gain value function and switch the second group of gain value based on the conditions set by the parameters.

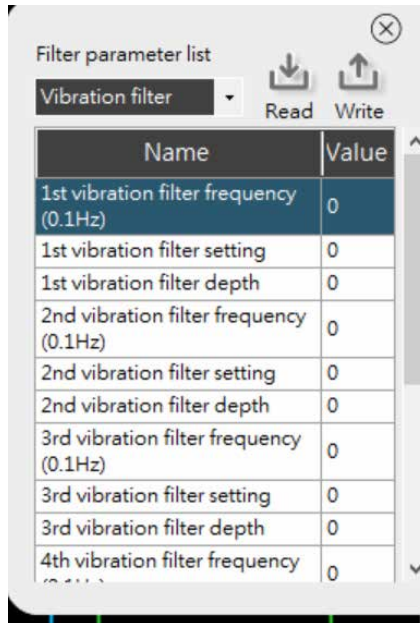


Figure 30 - Parameter Adjustment Page

[Trigger]

This page is mainly used to set, when users want to observe a phenomenon on the oscilloscope, the trigger function to conduct monitoring, in the same method and function as general oscilloscope, but only to capture data under the condition as set. When the mechanism keeps continuous operation, this function can be used to avoid difficult in judgment caused by continuous waveform output.

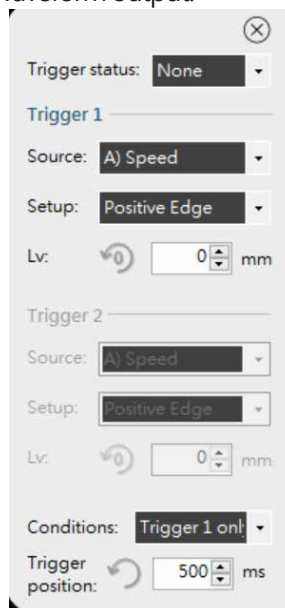


Figure 31 - Trigger Page

[Cursor]

This page is mainly used to assist the user to more accurately observe the current curve information on the oscilloscope. On the oscillogram, the red line can be adjusted with the left mouse button and the blue line can be adjusted with the right mouse button.

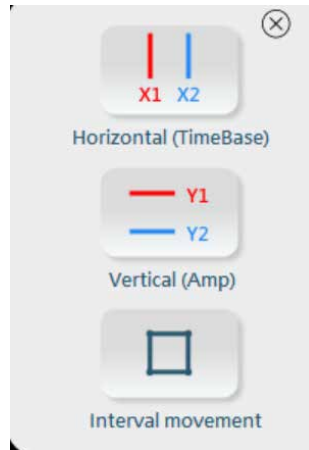


Figure 32 - Cursor Page

[Tools]

The main function of the page includes: waveform data access and automatic gain adjustment.

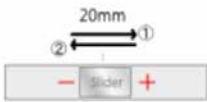


Figure 33 - Cursor Page

The waveform data access is used to access the waveform data, while opening waveform function is mainly used to reproduce the previously tested waveform data, and the storing waveform function can be used to store the curve test data on the screen.

Automatic gain adjustment function is used to assist customers in changing the mechanism load, so that through simple setting steps, user can achieve the purpose of automatic gain estimation, even if the user does not adjust the air lue, facilitating user's easy use of the mechanism.

Params	Previous	Current
Tune status	-	
Alarm status	0	
Inertia ratio	700	
First position loop gain (PKp)	750	
First speed loop gain (PKv)	650	
Time constant of first speed loop integral (PTv)	210	
Second speed detection filter (LpfSpeed)	0	
Time constant of first torque filter (LpTTorqueTime)	250	
Second position loop gain (PKp)	870	
Second speed loop gain (PKv)	650	
Time constant of second speed loop integral (PTv)	130	
Second speed detection filter (LpfSpeed)	0	
Time constant of second torque filter (LpTTorqueTime)	250	
feedforward(%) (Ff)	30	
Time constant of speed feed-forward filter	50	
Position control shift mode	7	
Position control shift delay time	5	
Position control shift level	100	
Position control shift width	30	
Position gain shift time	4	



After performing Servo off, move the slide to the middle position.

Input stiffness Alarm reset

Servo Off

Auto gain starts


Exit
Save and Exit

Inertia gain estimate value


Figure 34 - Automatic Gain Adjustment Page

The user must first push the slide seat with load to the middle of the slide table, and then choose one form the eight modes of rotation, based on the environmental conditions for setup of equipment.


旋轉方式




20mm
② ← ①



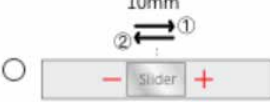
20mm
① ← ②




20mm
←




20mm
→




10mm
② ← ①



10mm
① ← ②



10mm
←



10mm
→

Figure 35 - Rotation Modes



Input desired mechanism rigidity value; less value means that the mechanism gets softer upon stop after movement, vice versa. However, it is also possible that noise may be generated, so user can do adjustment based on the load. If user does not know how to set, it is recommended to use the default value.

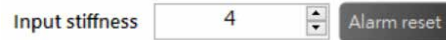


Figure 36 - Rigid Adjustment

In this execution step, user shall execute the Servo On button to power on.



Figure 37 - Servo on Button

Click on the auto gain estimation button to enable LC100 to automatically start gain estimation. The mechanism will run back and forth until the execution status is SUCCESS.



Figure 38 - Automatic Gain Estimation Button

Finally, if user is satisfied with the estimated results, click on Store EEPROM and exit, or exit without storage. To estimate other loads, user can directly execute the automatic gain estimation button after changing load for re-estimation.



Figure 39 - Finish Estimation Button

3. Monitoring page description

The monitoring page is mainly used to monitor relevant information on slide table from the current controller, and to use input monitoring to perform point operation and read error information, as shown in Figure 40.

▼ Monitoring Page

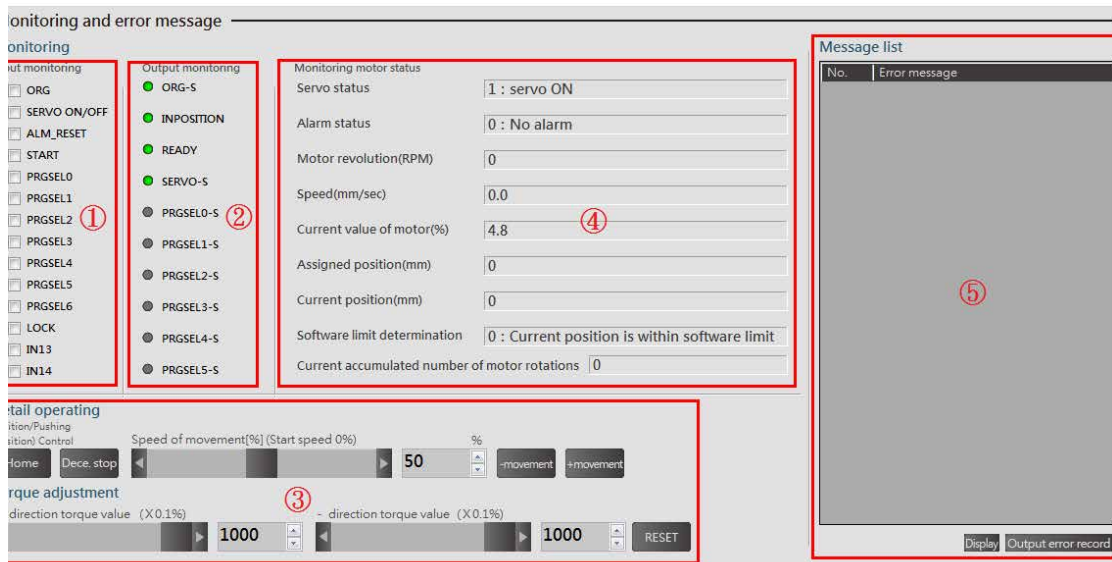


Figure 40 - Monitoring Page

① Input monitoring

This area can monitor relevant display of input signal to the controller. When different communication modes are used, the signal light will be displayed. In addition, relevant functions can be triggered by checking them for related operation, as shown in Figure 41.

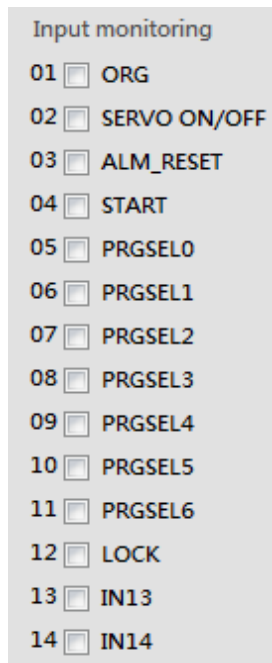


Figure 41 - Input Monitoring

② Output monitoring

This area can monitor relevant display of output signal from the controller. When different communication modes are used, the signal light will be displayed, as shown in Figure 42.

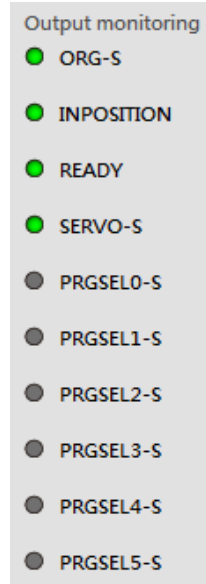


Figure 42 - Output Monitoring

③ Detailed operation/torque value adjustment

Position/push (position) control, torque value adjustment and other functions can be carried out in this area, as shown in Figure 43.

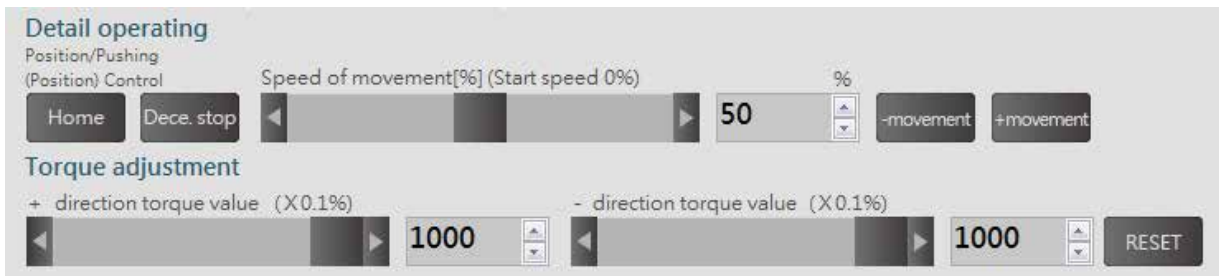


Figure 43 - Detail Operation/Torque Value Adjustment

④ Motor state monitoring

This area can display the relevant information on slide table from the controller, as shown in Figure 44.

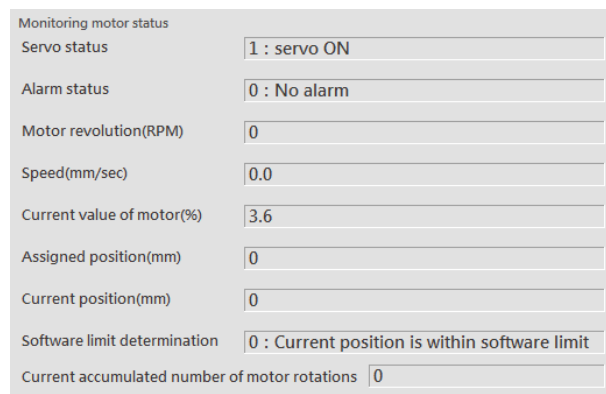


Figure 44 - Motor State Monitoring

⑤ Error message list

This area can be used to search for error message recorded by the controller in case of operation error, as shown in Figure 45.

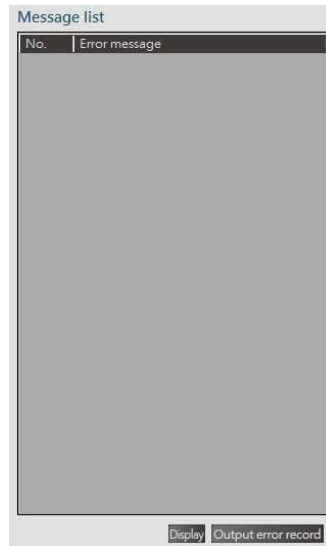


Figure 45 - Error Message List

4. Parameter page description

The parameter page is mainly used to display and set the parameters related to the controller, as shown in Figure 46. This page further contains eight parameter items, including, [Motor parameters], [Thrust parameters], [Common parameters], [Input settings], [Output Settings], [Speed parameters], [Origin parameters], and [Communication parameters], so as to facilitate users to make relevant settings.

▼ Parameter page

Parameter list					
	Parameters position	Title	Content	Range	Value
Parm. of Motor	0108h	FullCountValue	Counter overflow alarm value(Pulse)	1~100000	200
	010Ah	InPositionZone	Setting the range of INPOSITION signal (Pulse)	0~1000	1
Parm. of Thrust	0114h	PosDir	External pulse command, which specify the rotating direction	0~1	0
	0115h	SelComPulse	External pulse command mode	0~2	0
Common Parameters	011Dh	NearZone	Setting the signal interval range of NEAR (Pulse)	0~10000	4
Parm. of Input					
Parm. of Output					
Parm. of Speed					
Parm. of Homing					
Parm. of Comm.					

Figure 46 - Parameter Page

9.4 Single-axle software operation instructions

1 · Connection of controller

This section describes how to connect the software to the controller. First start TOYO-Single, as shown in Figure 31.



Figure 31 - TOYO-Single

After entering the welcome page, you can set up the system, as shown in Figure 32. Its individual functions are described as follows. After confirming completion of setting, please select a proper system.

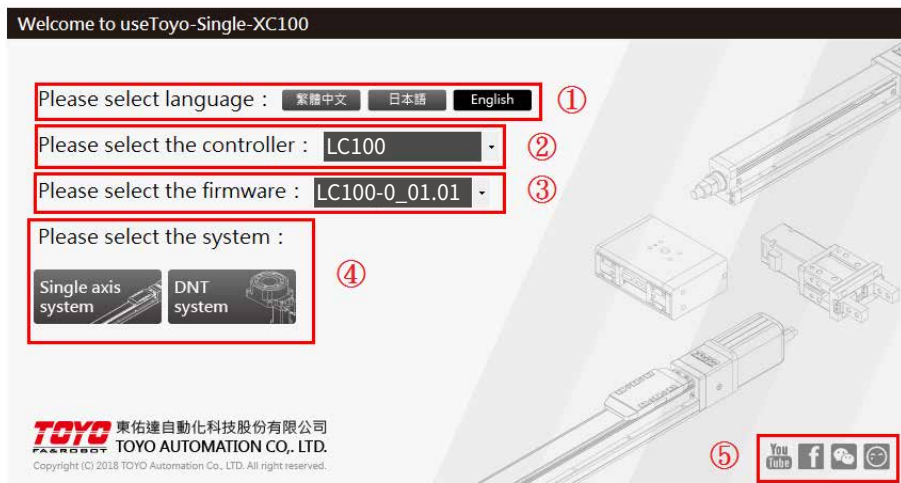


Figure 32 - Welcome Page

① Choose a language

User can change language.

② Choose a controller

User can choose a proper controller.

③ Choose how to start the system

Users can choose New axis connection or New data to enter the main system.

④ Choose a version

User can choose a firmware version for the controller.

⑤ Choose a system

User can choose a proper system.

⑥ Company Information

Link to relevant information about us is provided.

Click on "New connection" button, as shown in Figure 33, and then select a system to be used for the mechanism to enter the main screen.



Figure 33 - New Connection

Set relevant station number, COM port, connection baud rate and other information, as shown in Figure 50. In addition, user can use the [RES] button to rearrange COM PORT currently connected to computer, or use the [Search] button below to automatically detect whether there is any connection available. After confirming connection, click on [Execution Connection] button.

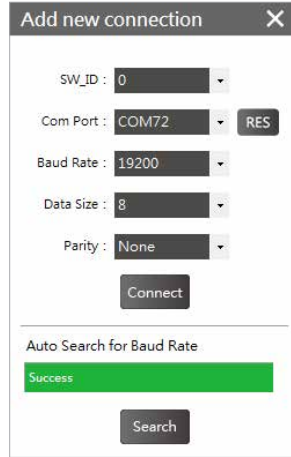


Figure 50 - New Connection Settings

Confirm the information on connection to the controller, as shown in Figure 35. Click on "OK" to read point position value and parameter value.

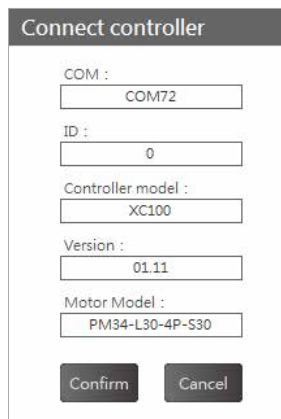


Figure 51 - Information on Connection to Controller

After reading point position value and parameter value, the system will display an initial screen, as shown in Figure 52.

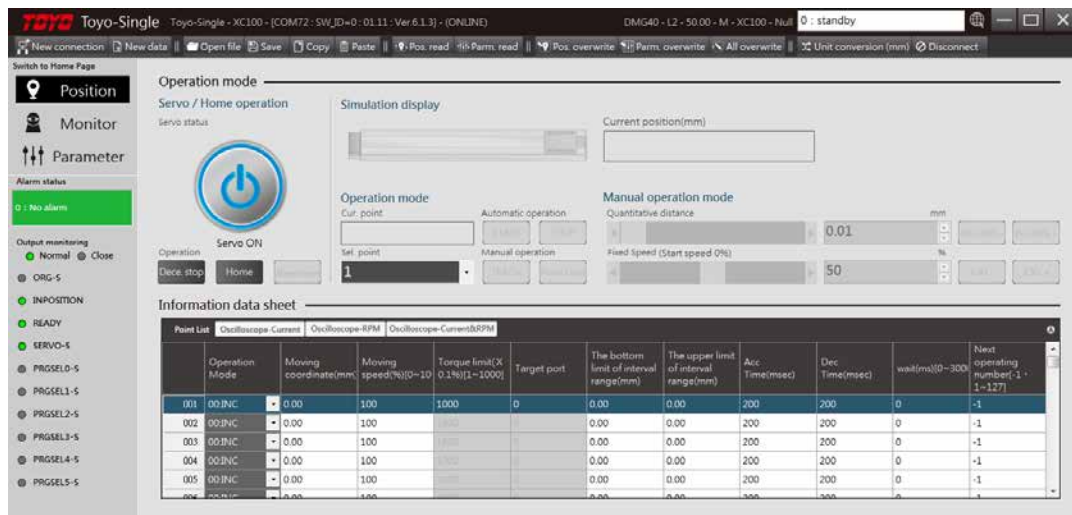


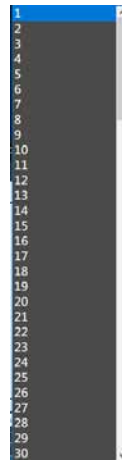
Figure 52 - Initial Screen

3 · Point position movement

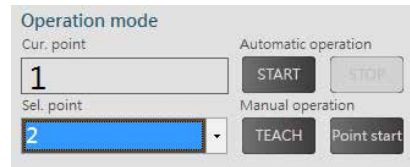
Point position movement includes Automatic operation and Manual operation. Automatic operation can execute multi-point movement based on selected point position, while manual operation can execute single point movement based on selected point position, as stated below.

Point position can be selected in either of two ways:

- by dragging the scroll bar, as shown in Figure 56; or
- by clicking on the point position window, as shown in Figure 57.



(a) Before selecting



(b) Selection Completed

Figure 56 Select by Dragging Scroll Bar

Point List	Oscilloscope-Current	Oscilloscope-RPM	Oscilloscope-Current&RPM	
	Operation Mode	Moving coordinate(mm)	Moving speed(%) [0~10]	Torque limit(X 0.1%) [1~1000]
001	00:INC	0.00	100	1000
▶ 002	00:INC	0.00	100	1000
003	00:INC	0.00	100	1000
004	00:INC	0.00	100	1000
005	00:INC	0.00	100	1000
006	00:INC	0.00	100	1000

Figure 57 - Select on Window

To execute Automatic operation, click on [Start] button, as shown in Figure 58.



Figure 58 - Start Button

To finish the operation, click on [Stop] button, as shown in Figure 59.



Figure 59 - Stop Button

To execute Manual operation, click on [Start] button after selecting a point position, as shown in Figure 60.

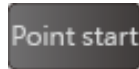


Figure 60 - Click on Start Button

4 · Manual operation movement

Manual operation movement includes inch movement, micro movement, manual movement, as described below.

① Inch movement

Before executing inch movement, first set a movement distance, as shown in Figure 61.



Figure 61 - Quantitative Distance

Then execute an inch movement, as shown in Figure 62, by clicking the button to move for the distance as set under "Quantity Distance".



Figure 62 - Inch Movement Button

② Micro movement

Before executing micro movement, first set a movement speed, as shown in Figure 63.

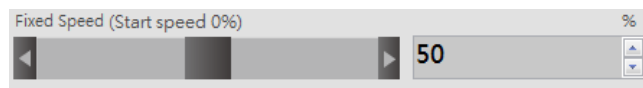


Figure 63 - Constant Speed

Then execute a micro movement, as shown in Figure 64, by clicking the button to move at the speed as set under "Constant Speed".



Figure 64 - Micro Movement Button

③ Manual movement

Before executing manual movement, first set a movement speed, as shown in Figure 65.

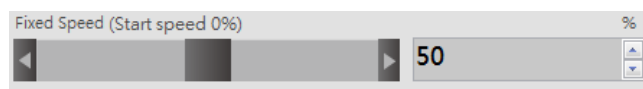


Figure 65 - Constant Speed

Then execute a manual movement, as shown in Figure 66, by dragging the slider to move at the speed as set under "Constant Speed".



Figure 66 - Manual Movement

5 · Teaching point

After executing a manual movement, you can use the TEACH button to teach a point, as shown below. First, select the point position to teach, as shown in Figure 67.

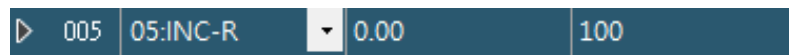


Figure 67 - Select Point Position

Then click on [Teach] button to teach the point, as shown in Figure 68.



Figure 68 - Teach Button

The system will fill in the movement coordinate of the selected point based on the value of the current position as shown in Figure 69, and the operation mode will be changed to [ABS], as shown in Figure 70.

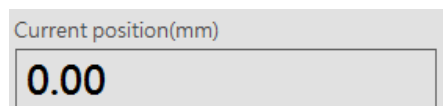


Figure 69 - Current Position

	Operation Mode	Moving coordinate(mm)
▶ 001	01:ABS	2.15

Figure 70 - Completion of Teaching Point

6 · New data

New data can be added based on the user's product line, slide table model, and motor direction to automatically set the initial parameter value, so as to facilitate user's parameter setting, as described below.

First, click on New Data button on the Toolbar, as shown in Figure 71.



Figure 71 - New Data Button

After execution, a "New Data" setting window will appear, as shown in Figure 72.

Item	Setting value
Spec of controller	LC100
Model of actuator	LGW17
Motor direction	M
Load of actuator	0
Control mode	I/O control
Stroke	2500.000
Lead	1
Homing mode	torque
Direction of CW	- Direction
Search Z face for returning ORG	Yes
Customization no.	

Figure 72 - New Data Setting Window

If user needs PULSE control, check relevant option, as shown in Figure 73.

Item	Setting value
Spec of controller	LC100
Model of actuator	LGW17
Motor direction	M
Load of actuator	0
Control mode	I/O control
Stroke	2500.000
Lead	1
Homing mode	torque
Direction of CW	- Direction
Search Z face for returning ORG	Yes
Customization no.	

Figure 73 - Pulse Control Selection

User need to set relevant initial data in this window to facilitate the automatic generation of initialization parameter values. After setting, click on "OK" button. If parameter writing is to be executed after parameter setting, information on another motor model may appear, as shown in Figure 59.

This is because the system detects that the motor model for the newly added slide table is different from the motor model in the current controller. If you write back the parameters, it may cause incorrect operation. Therefore, if you confirm that the slide table model needs to be changed, click on "OK" button to write the motor data, or click on "Cancel" button.

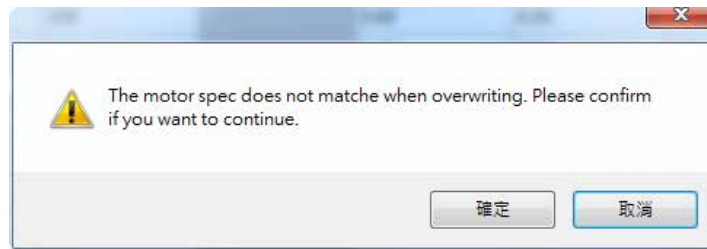


Figure 59 - Motor Model Information Discrepancy

Click on "OK" and then power off and restart the equipment in accordance with the information displayed on the screen, as shown in Figure 60. After completion, the system will continue to write.

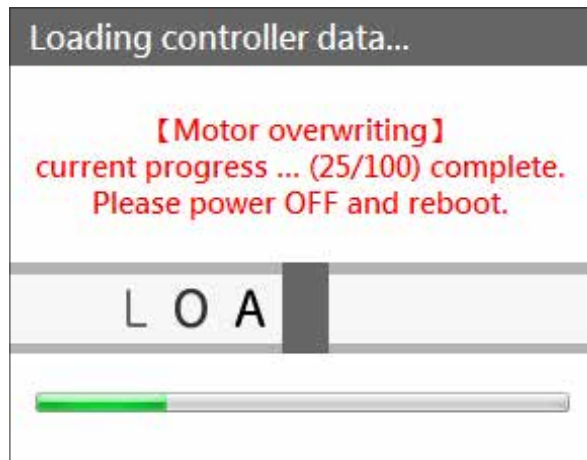


Figure 60 - Power Off and Restart

Then power off and restart the equipment in accordance with the information displayed on the screen, as shown in Figure 61. After completion, the system will continue to write.

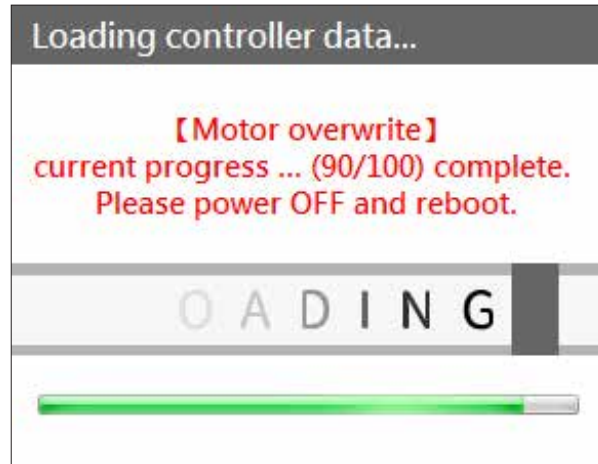


Figure 61 - Power Off and Restart

Then the system will display whether to write the parameters, as shown in Figure 62. If choose "Yes", the system will write all parameters; or choose "No" not to write parameters.

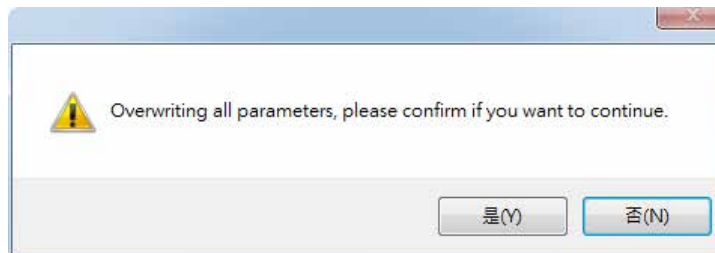


Figure 62 - Confirmation of Parameter Writing



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