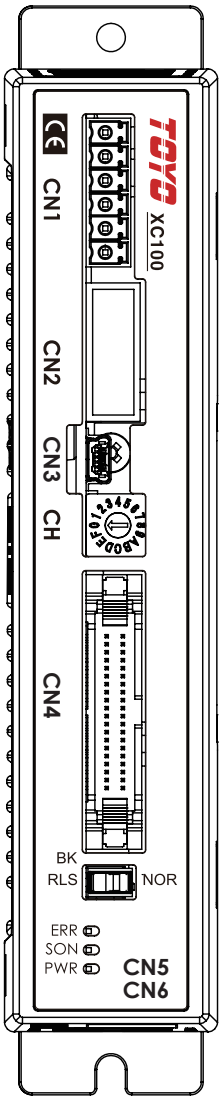
User's Manual

TOYO Servo Electric Cylinder Controller

English User Manual

V.2501

XC100 Series



About the Product

About the Product

- Our company will not be liable for any indemnity claimed by any third party in case any patent, intelligent property or any other rights and interests of the third party mentioned afore is infringed by any product manufactured with this product herein.

- This product is designed for the purpose of being used in general industrial equipments. This product is not designed for equipments (atomic energy control equipment, aerospace equipment, transmission equipment, traffic signal equipment, combustion control, medical equipment for life support and various safety devices etc.) (hereinafter referred to as "Specific Purpose") which have particularly high requirements on quality and reliability and may cause direct threats to personal and property safety or harms to human health in case of fault or misoperation;

- so the utilizations stated above will not be included in the warranty range. And the customer will be solely liable for using this product for the Specific Purpose.

- This manual is not a guarantee or commitment to the enforcement of other rights such as industrial ownership. In addition, our company will not be liable for any and all issues relevant to industrial ownership caused by using any content published in this User Manual.

Introduction

Thank you for using this product and this User Manual provides you the information associated with XC100 Controller Series.

Main contents are stated as following:

- Installation & Inspection of servo Controller & servo Motor
- Structure Description of servo Controller
- Commissioning Steps
- Introduction & Adjustment of Control Function of servo Controller
- Description of All Parameters
- Description of Communication Protocol
- Inspection & Maintenance
- Troubleshooting

This User Manual is suitable for reference by the users stated below

- Mechanical System Designers
- Installation or Wiring Personnel
- Commissioning Personnel
- Maintenance or Inspection Personnel

Please read the User Manual carefully to ensure to use this product correctly prior to its use. Additionally please put it in a safe and accessible place for reference at any time. Please comply with the following requirements before you read the User Manual fully:

The installation environment must be free of moisture, corrosive gas and combustible gas

- The earthing engineering must be implemented actually
- Do not disassemble the drive, motor or change the wiring when power is on
- Before operation, please make sure that the emergency shutdown device can be started at any time

If you still have problems in use, please contact the dealer or customer service center of our company.

Safety Attentions

Before installation, operation, maintenance and inspection of this product, please carefully read this User Manual and the user manuals and relevant documents of all devices and auxiliary devices to be connected with this product to ensure correct use. Such operations shall be carried out by professionals who have grasped relevant equipment and safety knowledge. The purpose of the following safety precautions is to ensure the safe and correct use of this product and avoid personal injury and property damage.

The following safety precautions should be noticed at any time during installation, wiring, operation, maintenance and inspection. In this manual, safety precautions are divided into four levels: "Danger", "Warning", "Caution" and "Attention".

⚠ Danger	The misoperation may threaten life or lead to a serious injury.
⚠ Warning	The misoperation may cause death or serious injury.
⚠ Caution	The misoperation may cause injury or property damage.
⚠ Attention	The content should be observed for using the product reasonably though there will be no possibility of injury due to the misoperation

A serious consequence is still possible depending on the specific situation even for cautions or attentions. Every part herein is important content. Please use them after careful reading. The User Manual should be kept well in an accessible place for reference at any time and received by the end user definitely.

⚠ Danger

[General]

- Please do not use this product for the following purposes.
  1. Medical devices for life support and health maintenance and management
  2. Equipment and machinery for moving or transporting persons
  3. Important safety components and parts of a mechanical device

This product is not planned and designed for any purpose that require a high degree of safety. Our company will not provide any guarantee for any unauthorized use of the product for any purpose involving life safety. The guaranteed scope is only limited to this product delivered.

[Setting]

- Do not use this product in a place where there are inflammable, explosive or other dangerous goods. Otherwise a fire or explosion may be caused.
- The body and controller of this product should be used away from a place with water droplets or oil droplets.

Safety Attentions

• Never extend or shorten a cable of the product by cutting and reconnecting it, which may result in a risk of fire.

[Operation]

• Keep this product away from water. Water may cause an abnormal operation, which may lead to injury, electric shock or fire.

[Maintenance, Inspection & Repair]

• Never attempt to modify this product. Otherwise, it may cause injury, electric shock or fire due to abnormal operation.

• Do not disassemble this product. Otherwise injury, electric shock or fire may be caused.

⚠ Warning

[General]

• Please do not use this product for the purpose out of its specification range. If used outside the range of specifications, it may result in product failure, invalid functions or damage. Furthermore service life of the product may be shortened signicantly. Especially the limitations on max load and speed should be observed.

[Setting]

• A safety circuit or device should be designed to prevent device damage or personal accident etc. in case of emergency stop, power failure and other system abnormalities.

• Grounding type D (original grounding Type 3 with Grounding resistance under 100 Ω) must be adopted for drive shaft and controller. Electric shock or misoperation may be caused in case of electric leakage.

• Please confirm safety of the working area of the equipment before supplying power to the product or starting the product. If the power supply is not proper, injuries may be caused by electric shock and contact with movable parts.

• Wiring of the product should be confirmed by reference to the User Manual to avoid any wrong wiring. Avoid falling or loosening connection of cable and joint. Otherwise abnormal operation of the product or fire may be caused.

Safety Attentions

⚠ Attention

[Operation]

- When the power is on, do not touch the terminal and all kinds of switches. Otherwise electric shock or abnormal operation may be caused.
- Do not damage the cable. Damage, forced bending, stretching, winding, squeezing or carrying heavy loads on the cable may lead to fire, electric shock or abnormal operation due to electric leakage or poor conduction.
- Cut off the power immediately in case of abnormal heat, smoke or odor. Continuous use may result in product damage or fire.
- When the product protection device (alarm) is triggered, please immediately cut off the power. Otherwise, the product may be damaged due to abnormal operation. After cutting off the power, please check the cause of alarm, solve any problem and then switch on the power.
- Please cut off the power immediately if LED of this product does not light up after the power is on. A protection device (fuse etc.) for operation may not be cut off and continue to work. Please contact our company's sales department responsible for selling this product for troubleshooting.

[Maintenance, Inspection & Repair]

- Product related maintenance, inspection, repair, replacement and other operations must be conducted after the power supply is cut off completely. The following requirements should be observed:

1. A sign such as "Do not switch on the power as a special operation is conducted" and so on should be posted in a prominent place to avoid accidental switching on of the power due to negligence during the operation.

2. When several persons are carrying out the maintenance or inspection work, they must inform one another to ensure the safety before switching on the power or moving the shaft.

[Disposal]

- Do not put the product into the fire. Otherwise, the product may break or produce toxic gas.

Safety Attentions

Attention

[Setting]

• Do not place any obstacle around the controller, which may affect the ventilation, or else a poor heat dissipation of the controller may be caused.• Please do not set the product in a place with strong vibration or impact (4.9m/s2 or above). Strong vibration or impact may cause misoperation.

• Make sure there is room for maintenance when installing the product. It will be difficult to conduct daily inspection and maintenance without enough room for maintenance; thus shutdown

[Setting, Operation & Maintenance]

• Please use protective gloves, protective glasses and safety boots as required to ensure safety when using the product.• Do not place fingers or other objects into the opening of the product. Failure to do so could result in fire, electric shock or injury.

[Disposal]

• If the product cannot be used or is not needed any more, please dispose it as an industrial waste.

Others

• Our company will not be liable for failure to comply with the "Safety Precautions" mentioned above.

We have tried to provide you a perfect and correct user manual; but mistakes and omissions are inevitable; so if you find any incorrect content herein, please don't hesitate to contact our company.

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1. Summary

1.1 Introduction

This product is the controller for electric cylinder series DGTH/DGTY/DM/DNT. It can be controlled through IO, communication and pulse of the PLC. Besides energy-saving concept is enhanced for this product; so relevant electricy saving function is adopted.

Main characteristics and functions of the product are stated as below:

■ Special signal for Origin Reset (OR)

This signal is used for ZRN by pushing to the travel terminal created by our company.

With this function, ZRN can be automatically performed without using complicated PLC and external sensor.

■ Brake Control

Power for the electromagnetic brake is supplied by the system power supply; so a special external power supply from IO is unnecessary.

■ Torque Limiting

The torque can be limited through an external signal. When the required torque is achieved, the signal will be send out. Action such as pushing or pressing can be executed with this function.

Please refer to the instructions of electric cylinder and on-line software etc. in case of equipment commissioning or failure besides this User Manual.

An unpredictable situation such as abnormal operation and complicated signal change at some critical point are not covered in this User Manual.
Therefore, what is not stated in this User Manual should in principle be taken as "Not Allowed".

* We have tried to provide accurate and correct contents to you in this User Manual; but it is inevitable to make some errors; therefore please contact our company if you find any content improper or incorrect herein.
Please keep this User Manual well in an accessible place for your instant reference when necessary.

1.2 Model

XC100 - 01 - N1

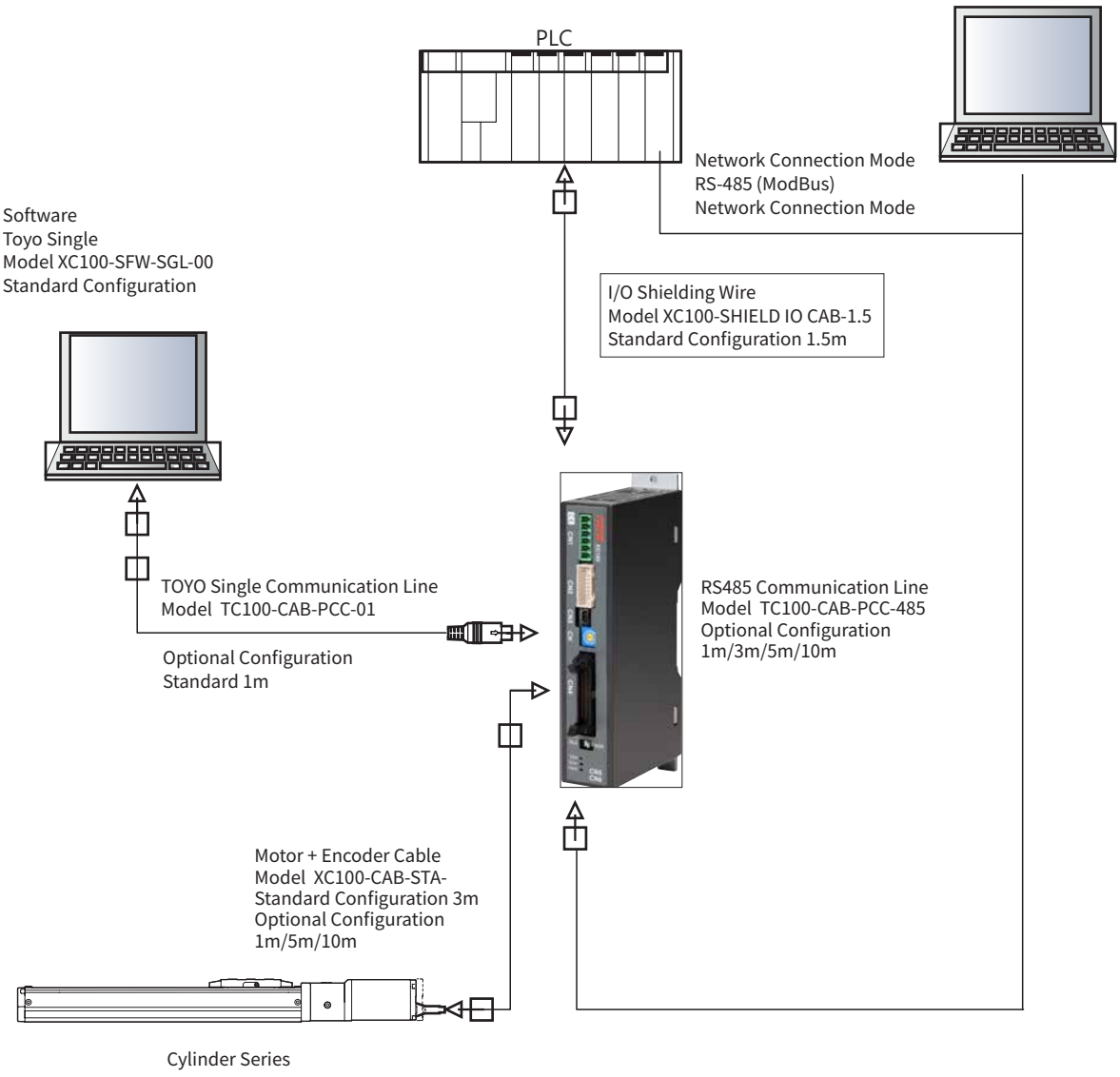
Model of the Controller

Length of the cables

01 : 1m
03 : 3m
05 : 5m
10 : 10m

Model of the Shielding Wire

1.3 Composition of the Control System

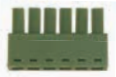


1.4 Steps from Unpacking to Commissioning

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. Check on Unpacked Product

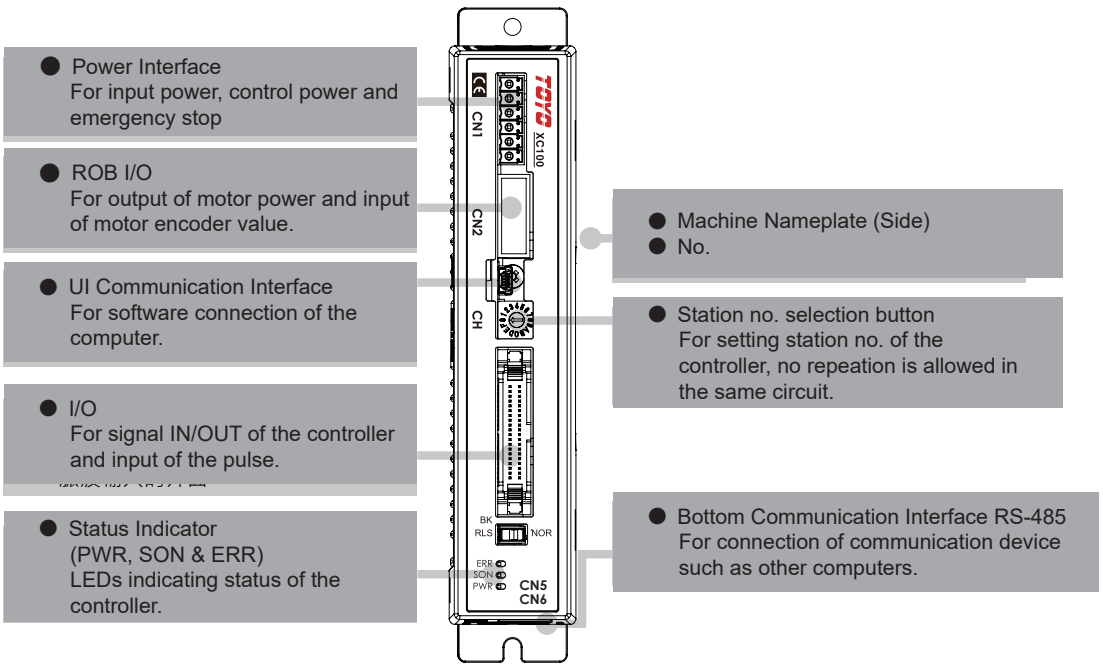
Please contact the dealer if you find any wrong model or missing part.

Packed Articles	Quantity	Picture	Model
Controller	1		XC100
Drive Shaft	1		as per customer demands DGTH/DGTY/DMG/DMH/DNT
Shielded I/O Cable	1		XC100-CAB-IOL-1.5
Motor Power Cord & Motor Encoder Cable	1		XC100-CAB-STA- □
Power Connector	1		EC381V-S2236106P

⚠ Note：

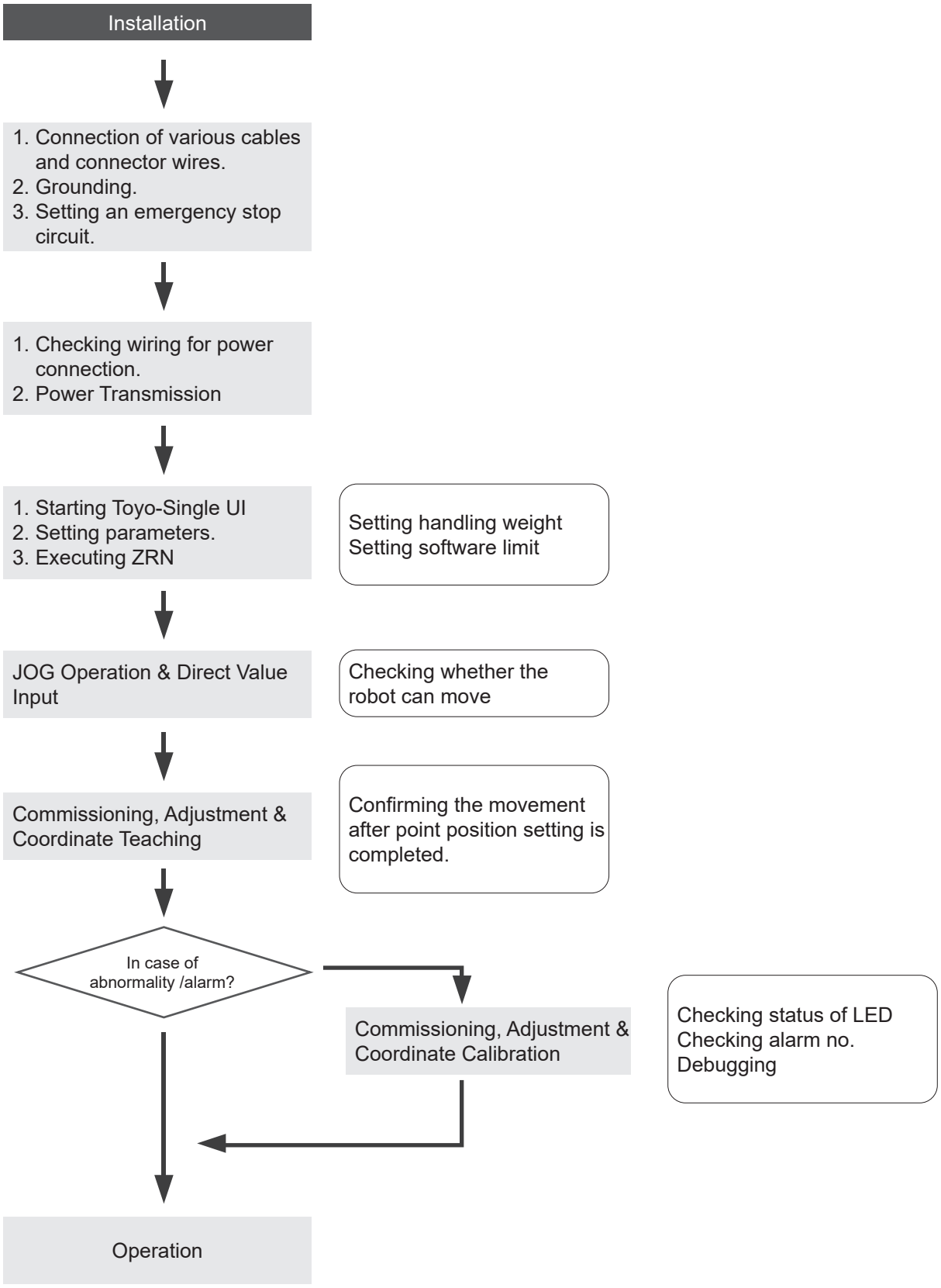
The articles packed may vary according to the model ordered.

2. Interface Description



3. Steps

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



1.5 Warranty Period and Scope

The controller bought has passed the strict predelivery test in our company.

And the following warranties will be provided to you:

1. Warranty Period

The warranty period refers to the periods stated below, whichever is earlier shall prevail.

- 18 months after delivery by our company
- 12 months after the product is delivered to the specified destination

2. Warranty Scope

Any failure occurs in the normal operation during the periods stated above and is caused by the manufacturer obviously will be repaired freely.

However the following situations will not be covered by the warranty.

- The natural fading of color and other changes along with elapse of the time;
- A situation caused by the use of consumables;
- A sensory phenomenon such as sound change, which has no effect on mechanical operation;
- A situation resulted from improper or wrong use of the user;
- A situation caused by negligent or mistaken maintenance or inspection;
- A situation caused by not using original part or component of our company;
- Any discretional modification without prior consent of our company or the dealer of our company;
- A situation caused by a natural disaster, accident and fire etc..

The above warranty is only for the single product delivered by us and we will feel sincerely sorry for any possible damage as a consequence of a failure of this product.

Please send the product to the dealer for repair.

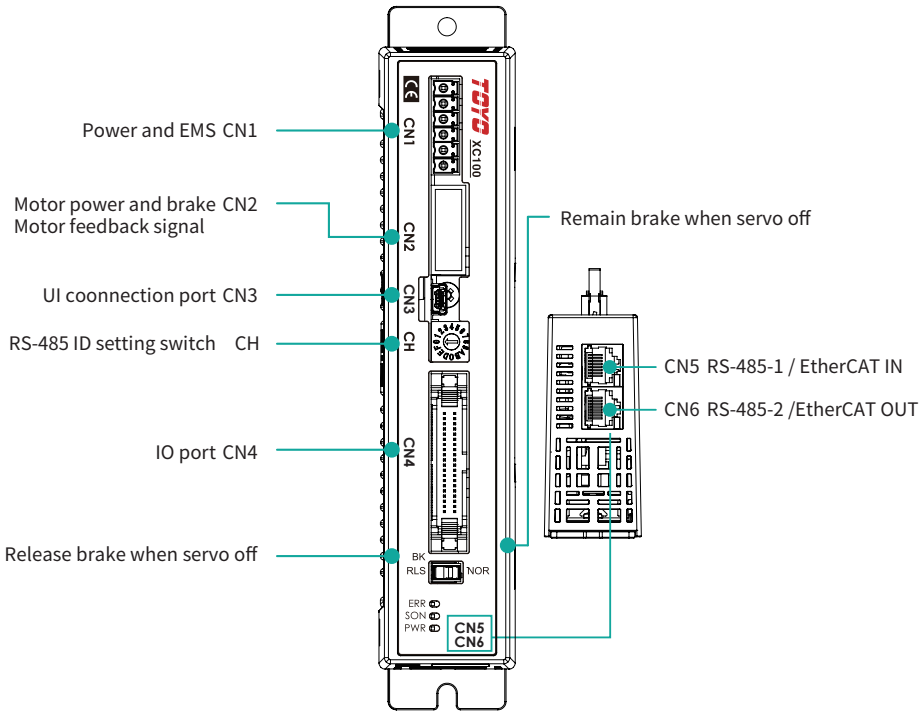
The content regarding warranty is stated above.

2. Specification

2.1 Basic Specifications

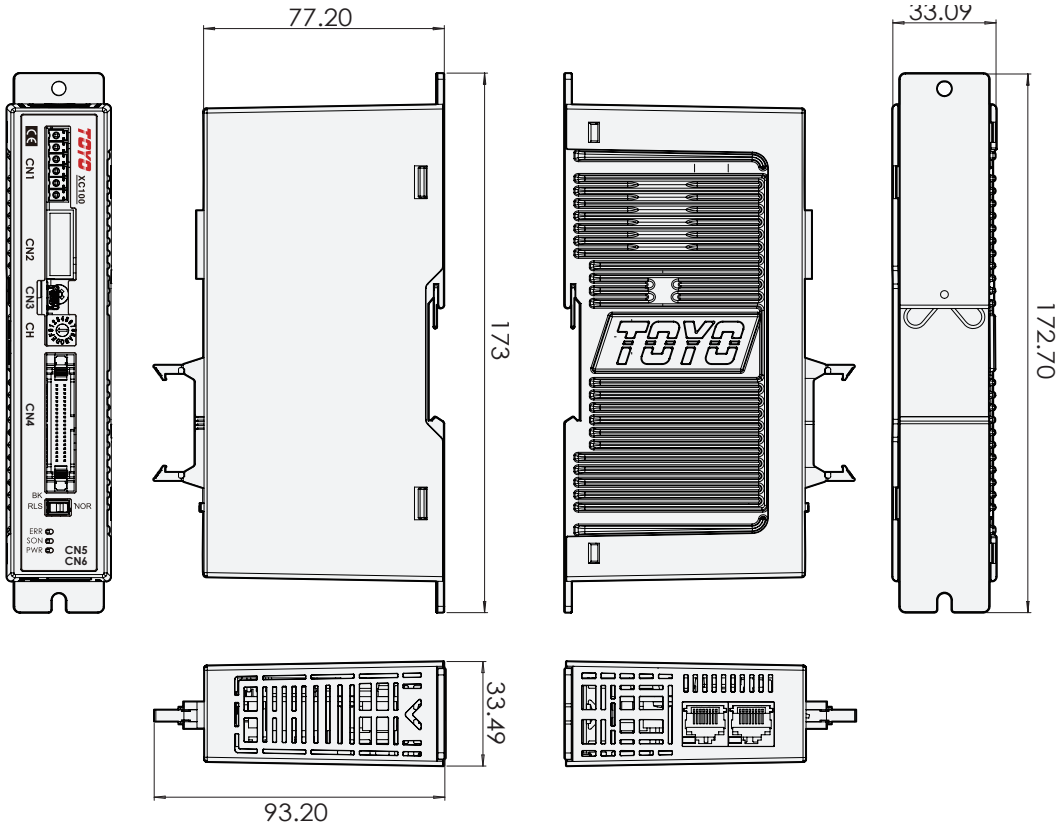
Item		XC100
Input Power	Control Power	DC 24V (±10%)
	Utility Power	DC 24V (±10%)
Number of Control Shaft		1
Motor	Applicable Motor	DC Servo Motor
	Capacity	25W、40W
	Rated Output	25W 2.7Arms; 40W 3Arms
	Instant Max Output	25W 7.3Arms; 40W 8Arms
Movement Control Mode		ABS Operation
		INC Operation
		INC-R Continuous Operation ABS-R Continuous Operation
		Operation with Thrust
Position	Total No. of Point Position	1 ~ 127 points (Individual Movement)
	Point Position Setting Method	Point Position of Communication Setting IO Point Position Teaching
Encoder	Position Management	Incremental
	Position Detection	Optical Rotary Encoder
	Resolution	10000 ppr
General DI/DO Signal		DI (14 points) / DO (10 points) NPN The definitions can be changed with parameters
Brake		Optional Configuration (Please inform us of your desired configuration before purchase)
Error Record		Max 50 sets of error codes can be stored
Safety Circuit		After emergent stop and press-in (Servo OFF)
Communication		USB (Virtual COM Port): mini USB / RS485 (half-duplex): RJ-45
LED Status		PWR: Power (Green): Constant on when Drive + Control Power are on active service; the green dot flashes when the drive power is off. SON: Servo (Green): Constant on when servo is on; off when an error occurs. ERR: Abnormal (Red): the error message can be determined by the number of flashes.
Setting of Station No.		Rotary DIP Switch (0~F), 16 stations

2.2 Name & Description of Each Part of the Controller



2.3 External Dimension of the Controller

he appearance drawing and dimension of this product are shown below.



3. Installation & Wiring

Please pay attention to the installation environment of the controller.

3.1 Installation Environment

- Avoid blocking the ventilation holes used for cooling when installing and wiring the controller. (The performance may not be optimal and a failure may occur without full ventilation.)
- Prevent foreign matter from entering the controller through the ventilation holes. In addition, structure of the controller is not dust-proof, water-proof and oil-proof; so please do not use it in a place with much dust, oil mist and cutting fluid.
- Keep the controller away from direct sunlight and heat radiation produced by large heat sources including heat treatment furnace.
- The controller should be used in the environment where the ambient temperature is 0~50 ℃ , humidity is below 85% (no condensation) and there is no corrosive or combustible gas.
- Main body of the controller should be used in an environment without external vibration or impact.
- Any electrical interference in the controller body and wiring cable should be avoided.

3.2 Power Supply

The power supply should be DC 24V±10%.

▲ Only DC 24V±10% is available for control power supply.

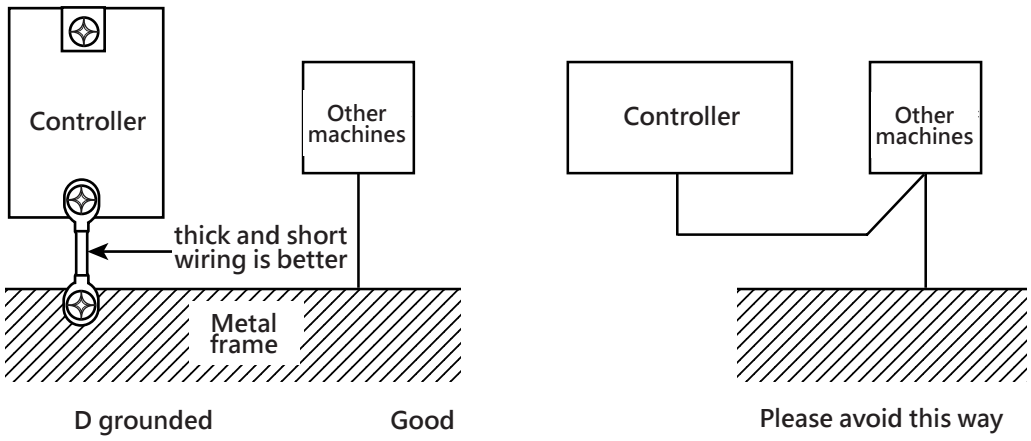
3.3 Anti-interference Measures & Grounding

The anti-interference measures when using the controller are described below.

1. Wiring & Relevant Power

(1) Please take the special grounding engineering type D for grounding.

The cables 2.0 ~ 5.5 mm2 should be selected for wiring.



(2) Attentions Relevant to Wiring Method

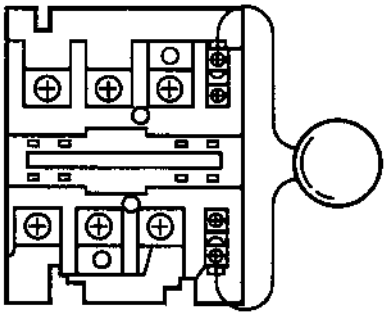
The external power supply of DC24V shall be twisted for wiring. Wiring of the controller should be separated and independent from the power circuit and other circuits with strong electricity.

(Not being bound together. Not being put into the same wire way.) Please contact our company if you need to extend the attached motor wiring or encoder wiring.

2. Interference Source & Interference Prevention

There are many interference sources. As a part of the system, the most common interference sources include solenoid valve, magnetic switch and relay etc.. These sources of interference can be avoided respectively with the following measures.

AC solenoid valve, magnetic switch and relay.... should be paralleled with the coils to install a current absorber.



← Key Points

Each coil to be mounted with the shortest wiring.

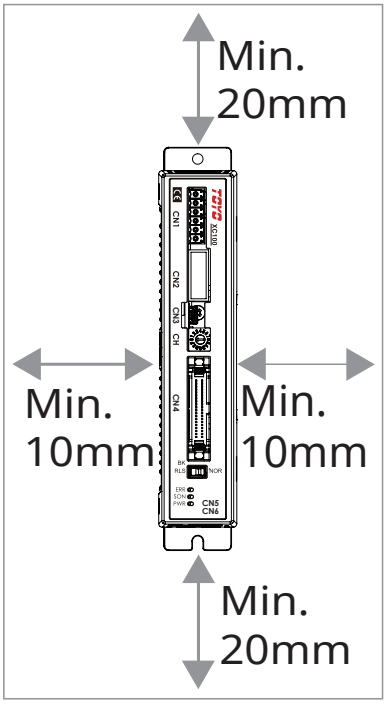
The effect will be diminished if there is a distance from the coil when mounting the coils to the terminal.

3.4 Heat Dissipation and Installation

Attentions should be taken to ensure that the controller operates under normal installation conditions when designing size of the distribution box, configuration of the controller and the cooling method, as shown below.

■■ Mounting Position Please mount the controller on the control panel.

■■ Mounting Direction Please mount the controller vertically on the wall.



With respect to the clearance between the controllers, a proper clearance shall be set for installation and removal of the controller, regardless of 1 or more controllers.

■■ Temperature & Humidity The ambient temperature and humidity of the controller must comply with the following conditions.

- Ambient Temperature: 0 ~ 50℃ (No condensation)
- Ambient Humidity: 35 ~ 85% RH (No condensation)

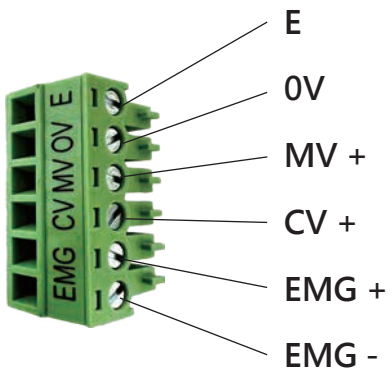
■■ Service Environment to be Avoided The environments stated below should be avoided in order to enable the controller to run in a normal state.

- An environment with corrosive gases containing sulfuric acid and hydrochloric acid etc., flammable gases or flammable liquids.
- A dusty place
- A place may be splashed by chips, oil, water etc from other equipment
- A place affected by a strong vibration
- A place that may generate electromagnetic or static noise
- A place with direct sunlight

3.5 Power Wiring Diagram

Connect to the power supply with supplied power connector.

1.Name & Function of Power Connector Terminal

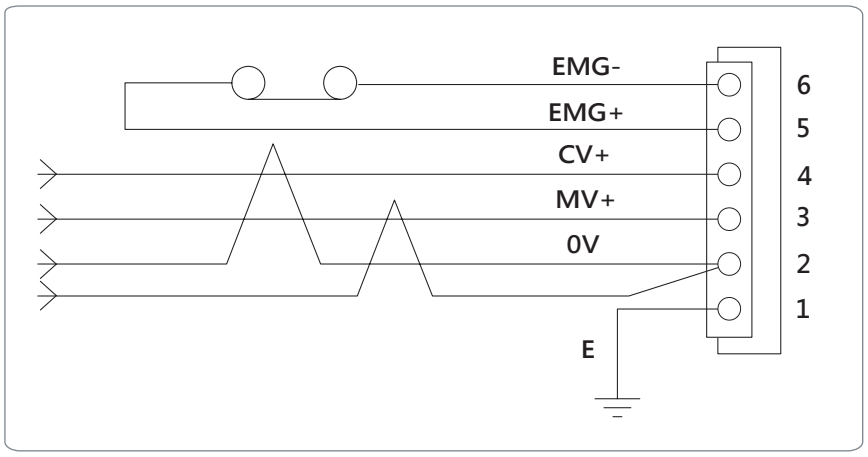


No.	Signal Name	Description
1	E	Earthing (Earthing should be executed actually to prevent possible misoperation due to noise interference).
2	0 V	GND
3	MV+	Main Power Supply: DC 24V ±10%
4	CV+	Control Power Supply: 24V(±10%)4V ±10%
5	EMG+	Emergency Stop: please use normally closed contact (RELAY contact)
6	EMG-	

⚠ Attention :

Rated current of the controller is 3A and the maximum current is 8A. Please select an appropriate power supply according to the specifications. In order to prevent misoperation of the equipment due to noise, please make sure to earth the grounding terminal.

2. Emergency Stop And Power Wiring Diagram



⚠ Attention

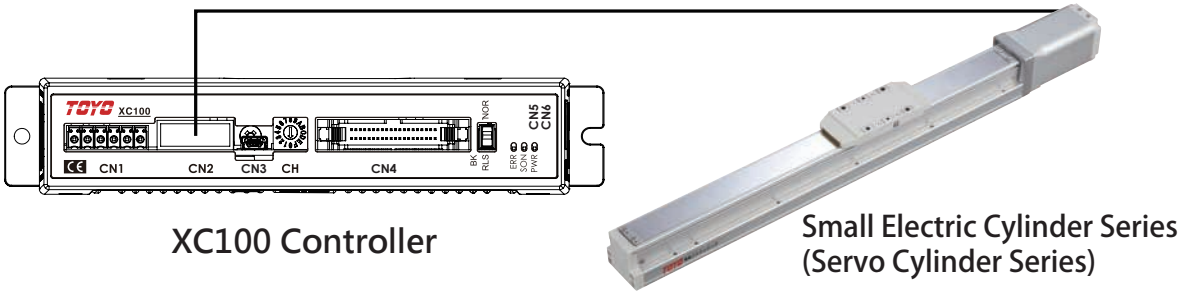
Do not connect the wrong power supply voltage and terminals. Otherwise a failure may be caused.

- PIN (E) on the power connector is the grounding terminal and must be grounded.
- Please use AWG #18 (0.75mm2) for cable.
- In order to prevent the misoperation caused by interference, please install a filter at the input end of the cable.
- Twisted-pair of AWG #18 (0.75mm2) and above used be used and a surge absorber should be equipped on the relay or brake circuit.
- Please note that only DC 24V can be used when CV is used as the cable connected to the control power supply.

3.6 Connection with Robot

Connect the robot cable to the connector interface on the front of the controller.

1.Connection Method



XC100 Controller

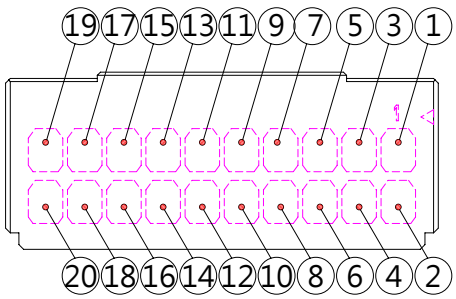
Small Electric Cylinder Series
(Servo Cylinder Series)

⚠ Attention :

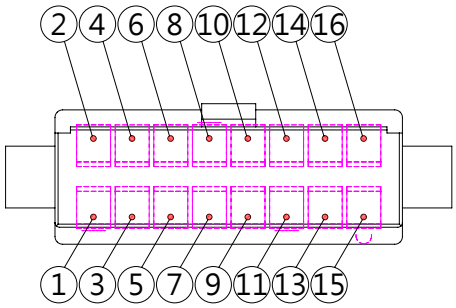
- Please use the cable special for XC100 to connect the robot.
- Please connect when the power is off.
- Please insert the cable into the interface and confirm it is plugged to the very bottom.
- Do not connect to an unspecified robot.
- Please hold the connector body and do not pull the cable directly when you plug and pull the connector.

2. Robot Connector (feedback signal of motor power and brake motor)

Controller Side



Motor Side



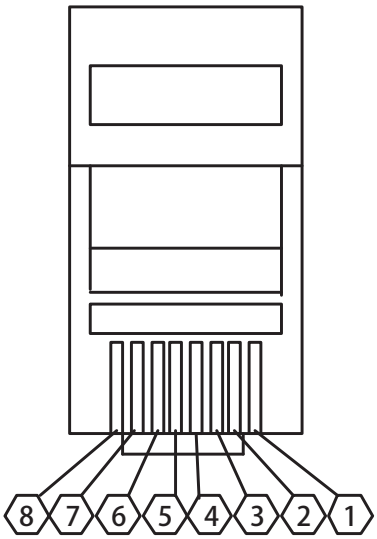
Controller Side: PUDP-20V-S	Pin Assignment Description		Motor Side: Connector
1	W	Phase W of Motor	13
2	E	Motor Ground Wire	
3	V	Phase V of Motor	12
4	-	-	
5	U	Phase U of Motor	11
6	-	-	
7	SERVO	Excitation State of Servo	8
8	ERROR	Error state	9
9	-	-	
10	DC 24V	Power Supply 24V	
11	BK+	Brake Power +	14
12	BK-	Brake Power -	15
13	A	Encoder A	1
14	/A	Encoder/A	2
15	B	Encoder B	3
16	/B	Encoder/B	4
17	Z	Encoder Z	5
18	/Z	Encoder/Z	6
19	DC 5V	Power Supply 5V	7
20	GND	Common grounding of power supply	10

3.7 Links to Communication Units

When connecting with computer and other communication equipments, please use the special cable.

■■ Name & Function of Power Connector Terminal

No.	Signal Name	Description
1		
2	SG	Signal Ground (Separation Net)
3	SIG-A	DATA +
4		
5	SG	Signal Ground (Separation Net)
6	SIG-B	DATA -
7		
8	SG	Signal Ground (Separation Net)

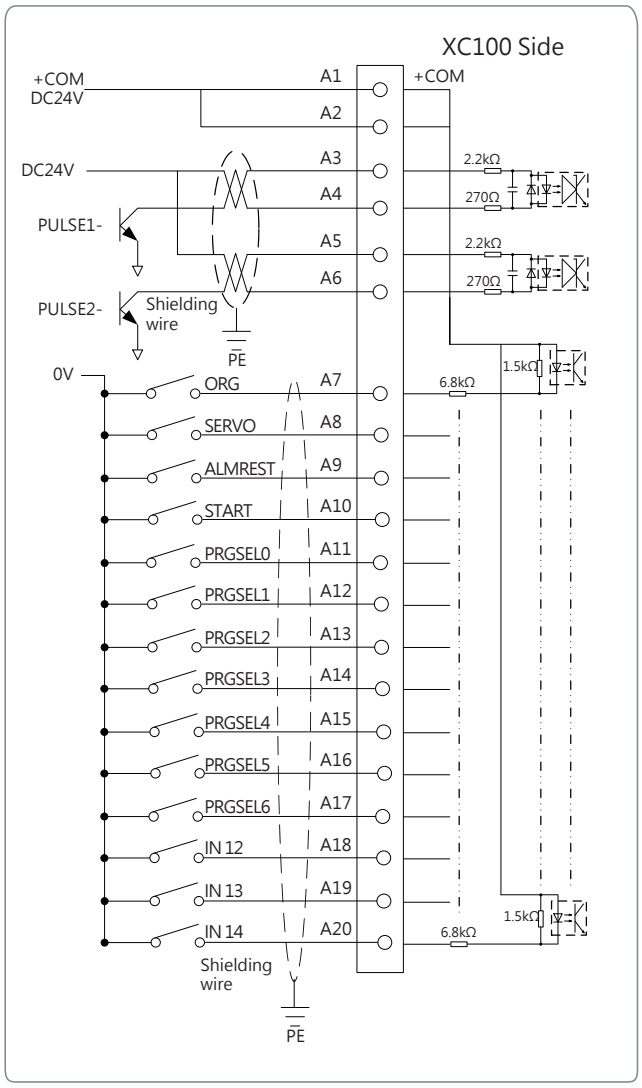


3.8 IN/OUT Signal Wiring

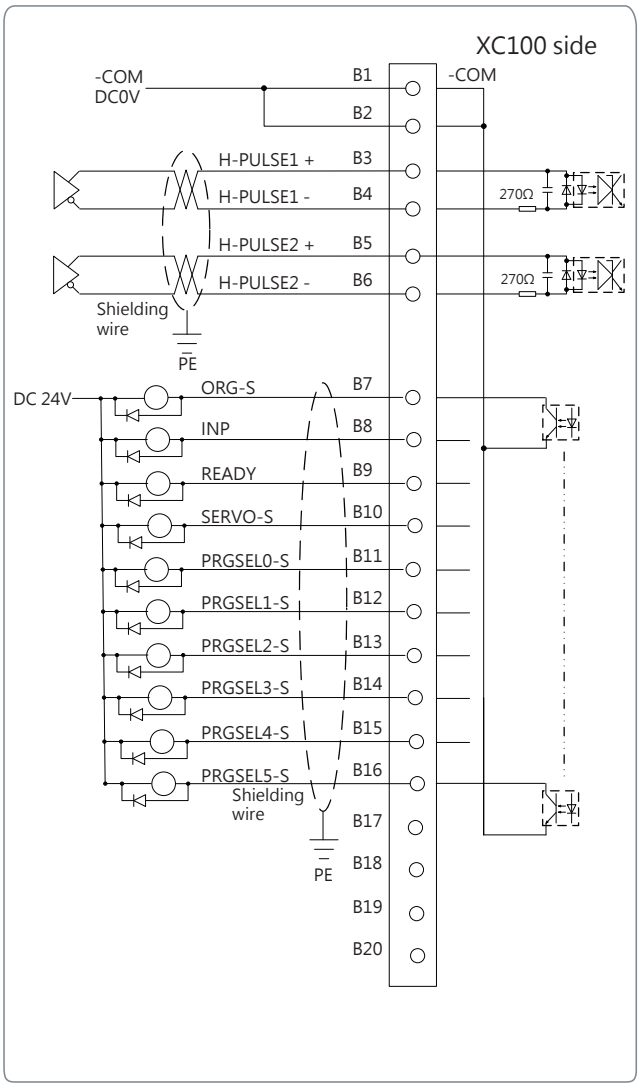
Connect the robot cable to the connector interface on the front of the controller.

1. Connection Method(NPN)

■■ IO Input

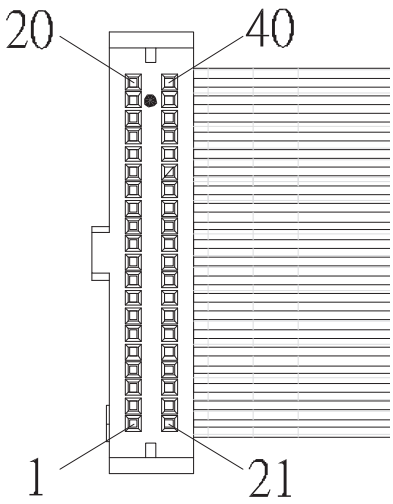


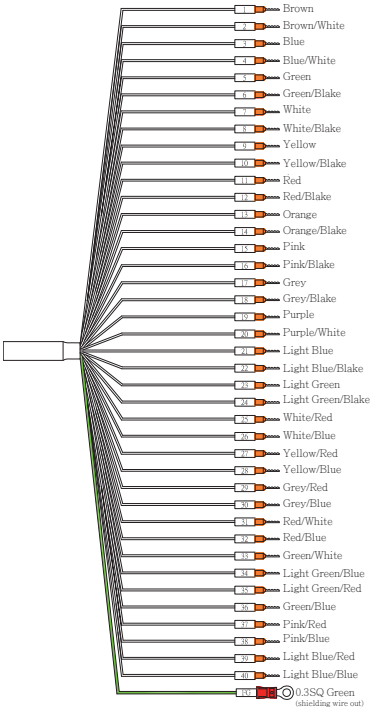
■■ IOutput



When connecting with computer and other communication equipments, please use the special cable.

2.Name & Function of Power Connector Terminal





3. CN-4 IO Pin Definition

NO	Color	Signal Name	Description	NO	Color	Signal Name	Description
1	Brown	+COM	I/O supply +24V	21	Light Blue	-COM	I/O power 0V
2	Brown/ White			22	Ligth Blue/ Black		
3	Blue	PULSE1+	CW、phase B、PULSE	23	Light Green	H-PULSE1+	CW、phase B、PULSE
4	Blue/ White	PULSE1-		24	Light Green/ Black	H-PULSE1-	
5	Green	PULSE2+	CCW、phase A、DIR	25	White/ Red	H-PULSE2+	CCW、phase A、DIR
6	Green/ Black	PULSE2-		26	White/ Blue	H-PULSE2-	
7	White	IN 1	ORG	27	Yellow/ Red	OUT1	ORG-S
8	White/ Black	IN 2	SERVO	28	Yellow/ Blue	OUT2	INP
9	Yellow	IN 3	ALM_RESET	29	Grey/ Red	OUT3	READY
10	Yellow/ Black	IN 4	START	30	Grey/ Blue	OUT4	SERVO-S
11	Red	IN 5	PRGSEL0	31	Red/ White	OUT5	PRGSEL0-S
12	Red/ Black	IN 6	PRGSEL1	32	Red/ Blue	OUT6	PRGSEL1-S
13	Orange	IN 7	PRGSEL2	33	Green/ White	OUT7	PRGSEL2-S
14	Orange/ Black	IN 8	PRGSEL3	34	Light Green/ Blue	OUT8	PRGSEL3-S
15	Pink	IN 9	PRGSEL4	35	Light Green/ Red	OUT9	PRGSEL4-S
16	Pink/ Black	IN 10	PRGSEL5	36	Green/ Blue	OUT10	PRGSEL5-S
17	Grey	IN 11	PRGSEL6	37	Pink/ Red	-	-
18	Grey/ Black	IN 12	Customizable	38	Pink/ Blue	-	-
19	Purple	IN 13	Customizable	39	Light Blue/ Red	-	-
20	Purple/ White	IN 14	Customizable	40	Light Blue/ Blue	-	-

4. IO Function Description

① DI Definition

If the controller function is used, please use the default IO definition. Do not change it discretionarily; or else UI cannot operate.

INPUT Digital input signal Point 12/IO function is freely configurable / NPN		
NO.	IO Signal	Function Description
1	ORG	Start of origin reset
2	/SERVO	Servo ON
3	ALM RESET	Clearing error
4	START	Program starts
5	JOG+	Positive shift of jog
6	JOG-	Negative shift of jog
7	MANUAL	Manual mode
8	TEACH	Point location teaching
9	LOCK	Interlock/pause
10	ORG_SIG	Signal of origin reset sensor
11	BK_OFF	Brake control (at SERVO_OFF)
12	PRGSEL 0	Selection of program from No.0 ~ No.127 bit 0
13	PRGSEL 1	Selection of program from No.0 ~ No.127 bit 1
14	PRGSEL 2	Selection of program from No.0 ~ No.127 bit 2
15	PRGSEL 3	Selection of program from No.0 ~ No.127 bit 3
16	PRGSEL 4	Selection of program from No.0 ~ No.127 bit 4
17	PRGSEL 5	Selection of program from No.0 ~ No.127 bit 5
18	PRGSEL 6	Selection of program from No.0 ~ No.127 bit 6
19	CONT_MODE	Switching function between position mode and torque mode (Effective when ModeSwitch is 1)
20	FULL_COUNT	Switch to FULL-COUNT for judgment

② DO Definition

If the controller function is used, please use the default IO definition.
Do not change it discretionarily; or else UI cannot operate.

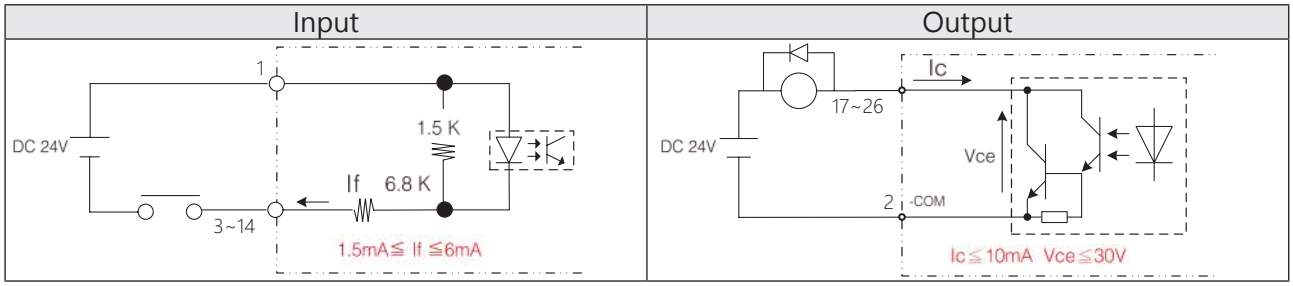
OUT PUT Digital Output Signal Point 10/IO function is freely configurable / NPN		
NO.	IO	Function
1	INP	Reach Signal
2	ALARM	Error Output
3	READY	Preparation is done
4	MOVE	In movement
5	ORG-S	Completion of origin reset
6	SERVO-S	Servo State
7	PRGSEL 0-S	Selection of program from No.0 ~ No.127 bit 0
8	PRGSEL 1-S	Selection of program from No.0 ~ No.127 bit 1
9	PRGSEL 2-S	Selection of program from No.0 ~ No.127 bit 2
10	PRGSEL 3-S	Selection of program from No.0 ~ No.127 bit 3
11	PRGSEL 4-S	Selection of program from No.0 ~ No.127 bit 4
12	PRGSEL 5-S	Selection of program from No.0 ~ No.127 bit 5
13	PRGSEL 6-S	Selection of program from No.0 ~ No.127 bit 6
14	INRANGE	Output signal in the interval range set
15	TRQ_LMT	Set current reaches the level of output signal
16	ERR 0	Error code output display bit0
17	ERR 1	Error code output display bit1
18	ERR 2	Error code output display bit2
19	ERR 3	Error code output display bit3
20	NEAR	Output when moving within the range of the target position The target position is set by point position operation mode ABS or INC
21	SOFLMT	Software ultimate output LED

⚠ Attention：

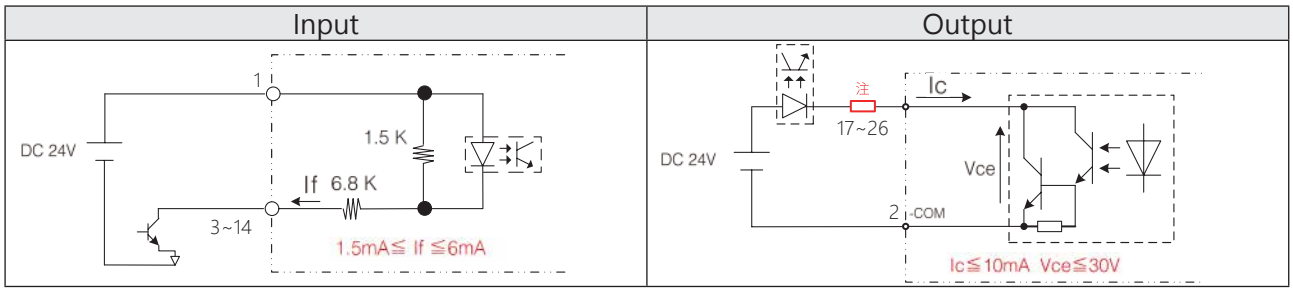
Please pay attention not to connect the wrong terminal number and make the terminal short circuit. Miswiring may cause controller damage. Please check the arrangement of terminals carefully when connecting the wires and be careful not to short-circuit the terminals.

3.9 Contact Wiring Diagram

1. Relay Contact Wiring



2. Transistor Contact



Note) Please take the outputted saturation voltage 1V (when output current is 10mA) of the optocoupler into consideration.

4. Data Setting

To run the robot by using of Series XC100, both coordinate point data and parameter data must be set.

4.1 Overview

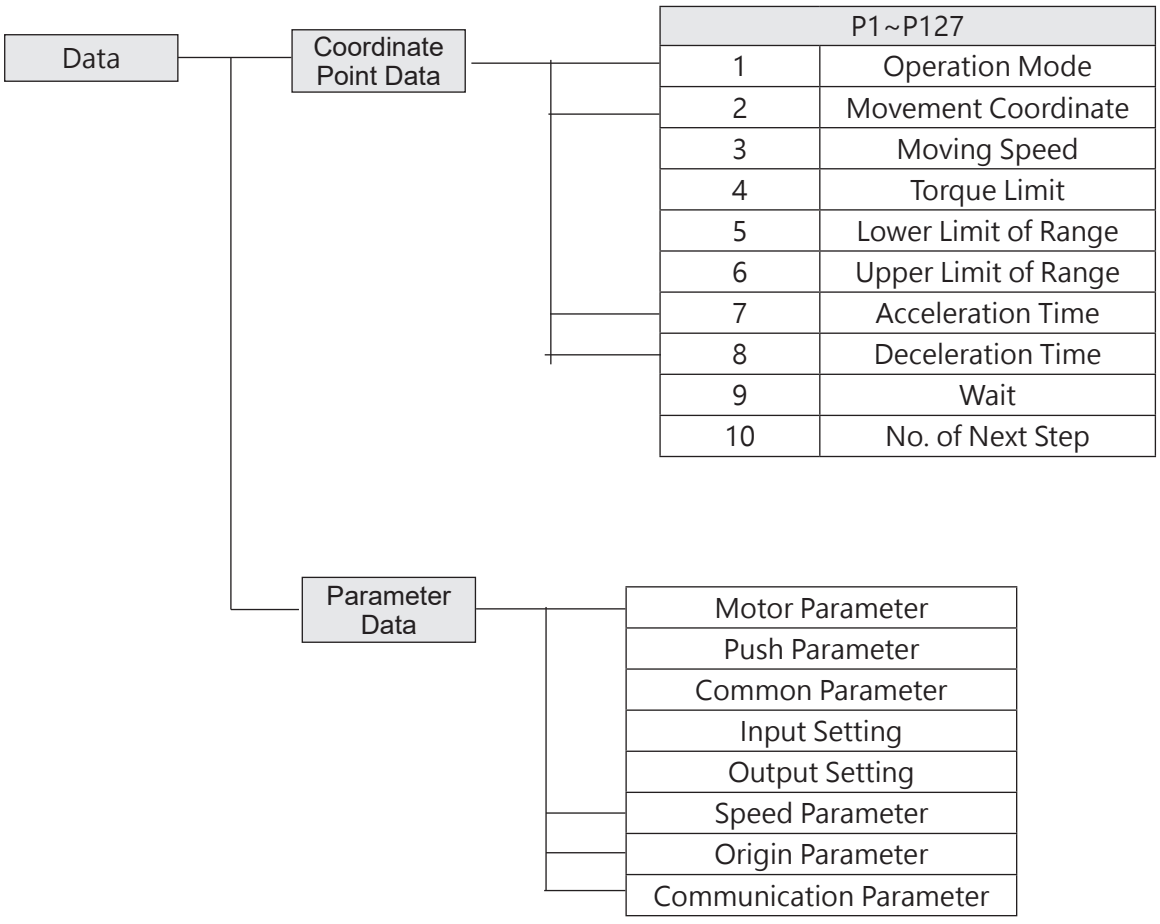
1.Coordinate Point Data Setting :

With regard to coordinate point data, the "Standard Setting" for optimal positioning can be provided by specifying the weight to be conveyed and "Custom Settings" for speed and acceleration etc. can be made through SI unit system, which can be selected according to the purpose. The coordinate point data for positioning contains "Operation Mode", "Position" and "Speed" and other items. The data of total 127 points P1 ~ P127 can be registered.

2. Parameter Data Setting :

Parameter data can be divided into "Position Control Parameter", "Torque Control Parameter", "Common Parameter", "Input Port Allocation Parameter", "Output Port Allocation Parameter", "Position Control Speed Parameter", "Origin Reset Parameter" & "Communication Setting Parameter".。

3.Composition of Data：



4. Data Item of Coordinate Point：

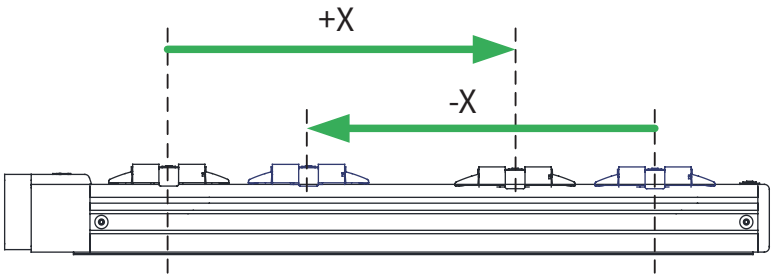
P1~P127					
Item		Content	Scope	Unit	Initial Value
1	Operation Mode	For setting the type of operation.	9 Modes	-	0
2	Movement Coordinate	For setting target position or movement during running.	-9999.99~9999.99	mm	0.00
3	Moving Speed	For setting running speed (%)	1~100	%	100
4	Torque Limit	For setting current limit at running.	1~1000	0.1%	1000
5	Lower limit of the range	For setting the range of "Single Area Output".	-9999.99~9999.99	mm	0.00
6	Upper limit of the range				
7	Acceleration Time	The time of acceleration to the speed set	1-30000	msec	300
8	Deceleration Time	The time from the set speed to stop	1-30000	msec	300
9	Wait	Time for waiting and delay after the movement ends.	0~30000	ms	0
10	No. of Next Step	The no. of next step to be executed after the movement ends.	1~127	-	-1

4.2 Detailed Description of Coordinate Point Data

Each item of coordinate data is described in detail as below.

1.Description of Each Operation：

INC: shift of relative position
Positioning after the specified movement (Distance) X from the current position.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action Description:

1. Point P2 moves 250 mm in the positive direction from the "Relative Position" at a speed of 100%

■■ Case 2

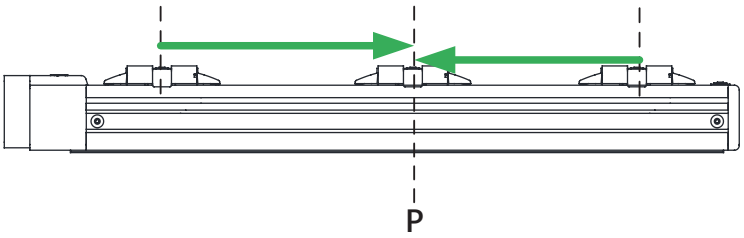
Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC	-128.55	50	823	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action Description:

1. Point P3 moves to 128.55 mm in the negative direction from the "Relative Position" at a speed of 50%

ABS : Absolute Shift

Positioning after moving to the absolute coordinate P from origin that is taken as the reference.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	ABS	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action Description:

Point P2 moves to the position of 250 mm from the "Absolute Position" at a speed of 100%

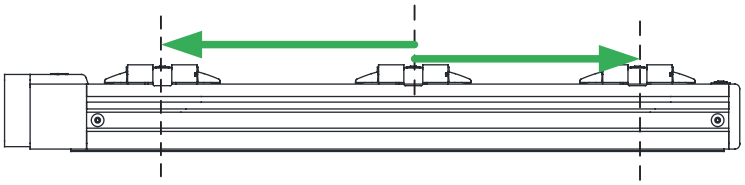
■■ Case2

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC	250.00	100	500	0.00	0.00	300	300	0	-1
3	ABS	128.55	50	823	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action Description:
Point P3 moves to 128.55 mm from the "Absolute Position" at a speed of 50%

ORG：movement of origin reset

Movement from current position to the original.



ORG：the origin position is dependent on the parameter setting.
Sub motor side and reverse motor side.

■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	ORG	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

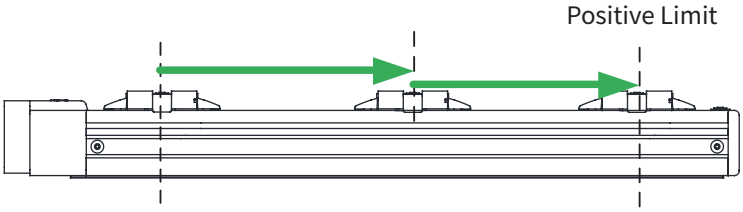
Action Description:

Point P2 moves towards the origin from any position with "Origin Reset" and "ORG-S" is OFF when it moves. "ORG-S" is ON after the movement ends.

Note) In ORG mode, the moving speed, torque limit and interval judgment are invalid and the torque and velocity of origin reset are mainly set based on the setting of origin parameter.

+TSL : Positive Torque Search

Positive Torque Search at Current Position.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	+TSL	250.00	100	335	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

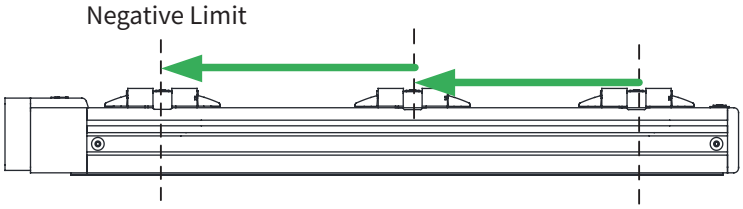
Action Description:

Point P2 moves towards the positive limit at any position with "Positive Torque Search" and stops when the torque reaches 33.5%. If no torque has been detected, it will stop at the limit position.

Note) The parameter of moving coordinate is invalid. It is mainly dependent on speed and torque. The signal of torque reaching can be added with parameter setting.

-TSL : Negative Torque Search

Negative Torque Search at Current Position.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC	0.00	100	500	0.00	0.00	300	300	0	-1
2	-TSL	250.00	100	445	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action Description:

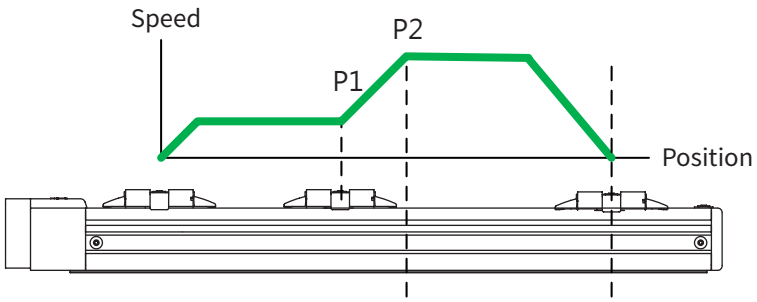
Point P2 moves towards the negative limit at any position with "Negative Torque Search" and stops when the torque reaches 44.5%. If no torque has been detected, it will stop at the limit position.

Note) The parameter of moving coordinate is invalid. It is mainly dependent on speed and torque. The

signal of torque reaching can be added with parameter setting

ABS-R : Continuous Operation

Change speed without stop and move to multiple coordinations continuously.



P1、P2 are absolute coordination based on origin point
(1)Specific speed when speeding up to P2
(2)Keep moving to P2 when arriving P1

■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	ABS-R	100.00	30	1000	0.00	0.00	300	300	0	2
2	ABS-R	250.00	100	1000	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :

Move from origin point to P1 and then accelerate/decelerate speed to move to P2 (non stop from P1 to P2)

■■ Case 2

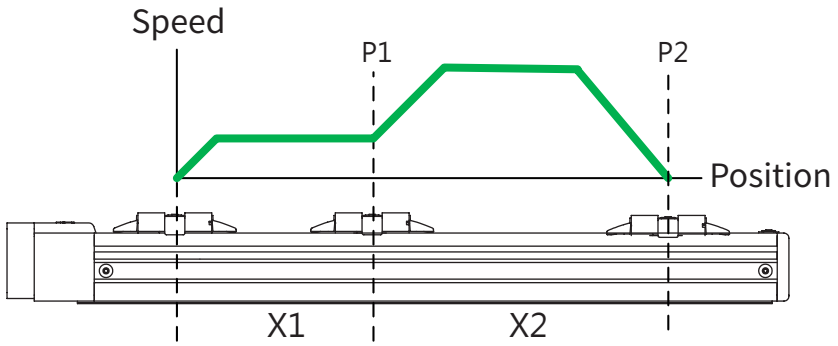
Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	ABS-R	210.00	100	500	0.00	0.00	300	300	0	2
2	ABS-R	250.00	20	200	0.00	0.00	300	300	0	-1
3	ABS	200.00	50	823	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :

Move to position 210mm with "absolute position", speed 100% and torque 50%, then move to position 250mm with "absolute position", speed 20% and torque 20% (non stop from P1 to P2)

INC-R : Continuous Operation

Changing the speed without stopping and passing multiple coordinate points continuously.



The amount of movement (distance) specified for passing multiple sections from the current position.
(1) Amount of movement (X1) specified
(2) After reaching the specified amount of X1, the specified movement X2 to P2 with speed increase (decrease) to the specified speed.

■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-R	100.00	30	1000	0.00	0.00	300	300	0	2
2	INC-R	250.00	100	1000	0.00	0.00	300	300	0	-1
3	INC	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :
The moving value from any point to P1 under unstop status(non stop from P1 to P2)

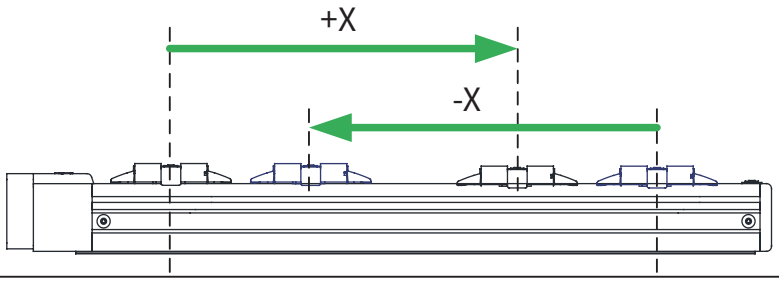
■■ Case 2

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-R	210.00	100	500	0.00	0.00	300	300	0	2
2	INC-R	50.00	20	200	0.00	0.00	300	300	0	-1
3	ABS	200.00	50	823	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :
Move to position 210mm with "absolute position", speed 100% and torque 50%, then move to position 250mm with "absolute position", speed 20% and torque 20% (non stop from P1 to P2)

INC-T : Relative Position Movement

From current position moves a certain value(distance)X, in position.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000)x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC-T	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :

P2 moves positively 250mm with "relative position", speed 100% and torque 50%. If torque is more than 50% then it will stop at the position of 50% and output a reach torque limit signal.

■■ Case 2

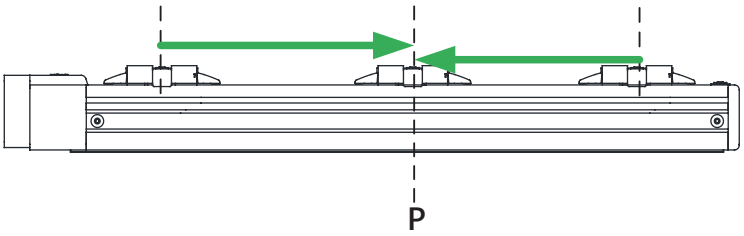
Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC-T	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC-T	-128.55	50	823	0.00	0.00	300	300	0	-1
4	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1

Action description :

P3 moves negatively 128.55mm with "relative position", speed 50% and torque 82.3%. If torque is more than 82.3% then it will stop at the position of 82.3% and output a reach torque limit signal.

ABS-T：Absolute Position Movement

Move to absolute coordination P which is based on origin point, then in position.



■■ Case 1

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
2	ABS-T	250.00	100	500	0.00	0.00	300	300	0	-1
3	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
4	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1

Action description：

P2 moves to 250mm with "absolute position", speed 100% and torque 50%. If torque is more than 50% then it will stop at position of 50% and output a reach torque limit signal.

■■ Case 2

Point Position	Operation	Movement	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acceleration time msec	Deceleration time msec	Wait Time ms	Next step
1	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
2	INC-T	250.00	100	500	0.00	0.00	300	300	0	-1
3	ABS-T	128.55	50	823	0.00	0.00	300	300	0	-1
4	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
5	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1
6	INC-T	0.00	100	500	0.00	0.00	300	300	0	-1

Action description：

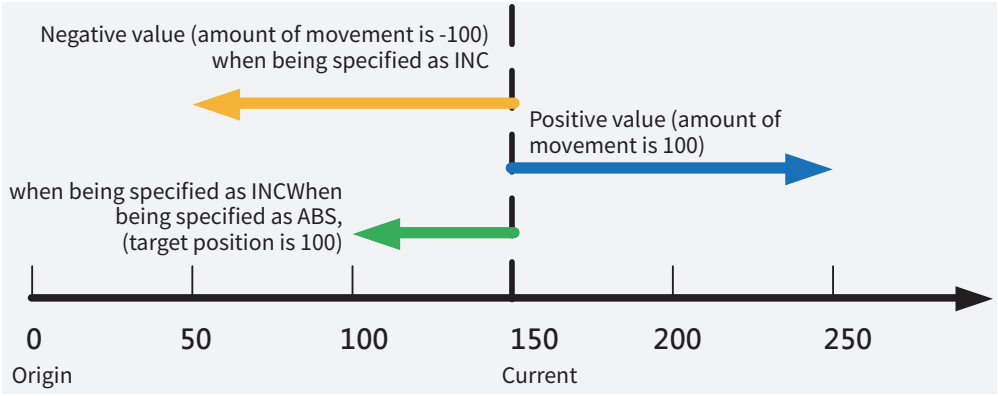
P3 moves to 128.55mm with "absolute position", speed 50% and torque 82.3%. If torque is more than 82.3% then it will stop at the position of 82.3% and output a reach torque limit signal.

4.3 Movement Coordinate

Various depending on the operational mode.

■■ ABS: Absolute Position with the set value as the target position.

■ ■ INC: Relative Position with set value as the amount of movement and positive and negative direction. The following figure is the movement coordinate and the movement difference when 100 is set:



4.4 Moving Speed

For setting the speed of movement based on the percentage (%) of the maximum speed of each

⚠ Note :
When using the torque search mode, lower the speed below 30% to improve accuracy of the torque-forced feedback.

4.5 Torque Limit

For setting the current limit when moving. To be set based on the percentage (%) of rated current of each robot.

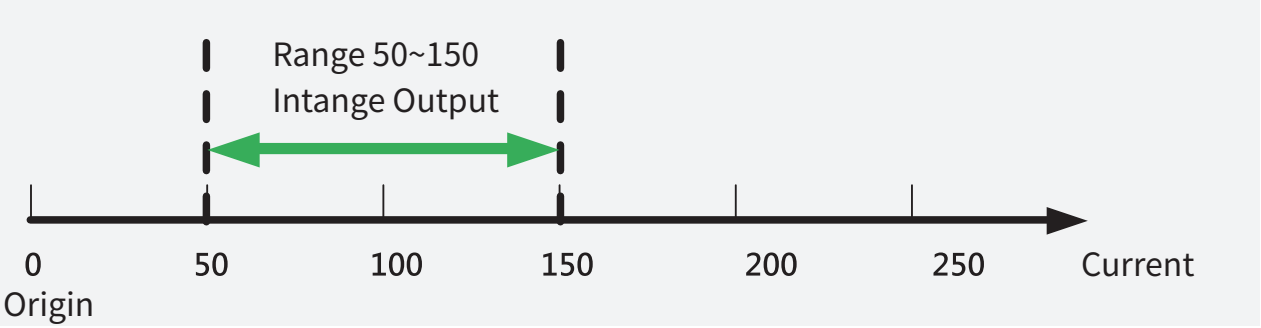
⚠ Note :
Unit of the torque limit is set at 0.1%. Therefore, 100% means 1000 as the rated current of each robot. The current value of each robot varies due to different friction forces of hardware.

4.6 Setting of Interval Range (Upper /Lower Limit)

For setting the upper and lower limits of the interval range, in which the special signal "INRANGE" may be outputted.

To output a dedicated signal, it is necessary to set the parameter of IO at first.

The following figure is an example of interval setting for the absolute position of 50 ~ 150 from the origin:

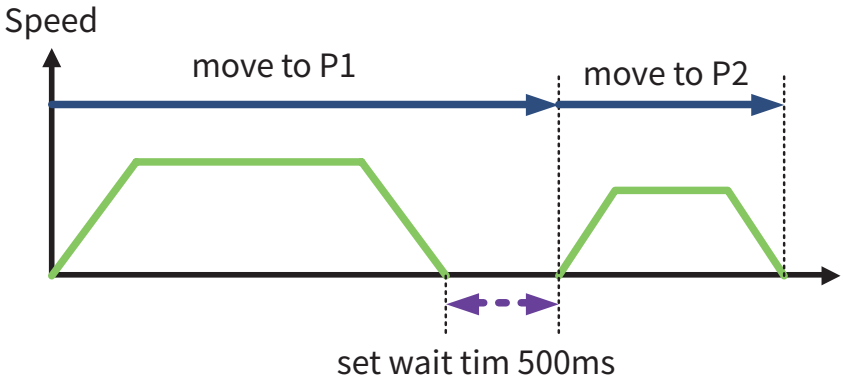


4.7 Wait

For setting the waiting time required after a movement at a point position ends. A complete movement state contains the waiting time and only after the end of the time, "READY" and "MOVE" will change.

■■ Case 1

Point Posi-tion	Ope-ration	Move-ment	Move Speed (1~100)%	Torque Limit (1~1000) x0.01	Lower limit of range mm	Upper limit of range mm	Acce-leration time msec	Dece-leration time msec	Wait Time ms	Next step
1	INC-R	210.00	100	500	0.00	0.00	300	300	500	2
2	INC-R	50.00	20	200	0.00	0.00	300	300	0	-1
3	ABS	200.00	50	823	0.00	0.00	300	300	0	-1
4	INC	0.00	100	500	0.00	0.00	300	300	0	-1



Action Description: moving to P1 at first and moving to P2 after waiting for 500ms.

5. Parameter Data

5.1 Motor Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0108 H	2	FullCountValue	Counter overflow alarm value (Pulse)	A FullCount alarm will be released when the Pulse between current position and the specified position is bigger than the value.	-	x
2	010A H	1	InPositionZone	Setting of reaching interval range for Signal INPOSTION (Pulse)	Signal INPOSTION may be on constantly when the value set is too big or the moving speed is too slow. When difference between the specified position and current posistion is smaller than the value set, the signal will be ON.	0~ 1000	x
3	010B H	1	ElectroGearNum	Numerator of electronic gear	Number of pulses of the encoder for 1 turn of the motor. (Initial value 1) Pulse no. of the encoder after change = Basic pulse no. of the encoder÷(Numerator of electronic gear ÷ Denominator of electronic gear), only displayed in pulse mode	1~ 10000	o
4	010C H	1	ElectroGearDen	Denominator of electronic gear		1~ 10000	o
5	0114 H	1	PosDir	An external pulse instruction, for setting rotary direction	0: rotary direction of motor CW 1: rotary direction of motor CCW	0~1	o
6	0115 H	1	SelComPulse	External pulse instruction	0: CW/CCW (Initial Value) 1: PULSE/DIR 2: Phase A/B	0~2	o
7	011D H	1	NearZone	For setting output interval range of signal NEAR (Pulse)	When near target is smaller than the set value, the signal will be ON (initial value 4)	0~ 10000 pulse	x

5.2 Push Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0400 H	1	PushTrqRateCw	Torque rate (×0.1%) with push in the positive direction	-	0~1000 ×0.1%	x
2	0401 H	1	PushTrqRateCcw	Torque rate (×0.1%) with push in the negative direction	-	0~1000	x
3	0402 H	1	TrqLmtTime	Torque limit detection time (msec)	-	0~10000	o

5.3 Common Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0515 H	1	ServoState	For setting servo state after power is on	0: Servo ON (Initial Value) 1: Servo OFF	0~1	+X
2	051B H	1	OrgRetRestrict	Action limit when origin reset is not completed	Any action will be limited when the origin reset is not completed 0: unlimited (the action will still proceed when the origin reset is uncompleted) 1: limited (the action can only proceed with completed origin reset) (Initial Value)	0~1	x
3	0503 H	1	ModeSwitch	Mode switch under the Pulse control	0: Position mode (initial value) 1: Torque mode	0~1	x
4	0515 H	1	ServoState	Brake On/Off when Servo is OFF	0: Servo ON(initial value) 1: Servo OFF	0~1	x
5	051B H	1	OrgRetRestrict	Action limits when origin return is not complete, refer to ORG-S	Any action is restricted when the origin return is not complete 0: Unrestricted (origin return is not complete, but actions are allowed) 1: Restricted (actions can be performed only after completing the origin return) (initial value)	0~1	X
6	051E H	1	UseTotalRev	Switch for the function of specifying the motor to calculate the cumulative number of turns	0: invalid (initial value) 1: valid	0~1	O

5.4 Input Setting

NO	Parameter	Word N	Abbreviation	Description	Remark	Modify & Restart
1	0601 H	1	JOG+	JOG + : + JOG Movement (effective when MANUAL is ON)	CN4 Interface INPUT No. Setting. effective when set value is 0	o
2	0602 H	1	JOG-	JOG - : - JOG Movement (effective when MANUAL is ON)		
3	0603 H	1	MANUAL	Manual mode		
4	0604 H	1	TEACH	TEACH: for saving point position (effective when MANUAL is ON)		
5	0607 H	1	LOCK	Pause/ Interlock		
6	0609 H	1	CONT_MODE	CONT_MODE: switching function between position mode and torque mode(effective when ModeSwitch is 1)		
7	060E H	1	PRGSEL4	Selection of program from No. 0 ~ 127 Bit4		
8	060F H	1	PRGSEL5	Selection of program from No. 0 ~ 127 Bit5		
9	0610 H	1	PRGSEL6	Selection of program from No. 0 ~ 127 Bit6		
10	0611 H	1	ORG_SIG	Signal for detected origin reset		
11	0612 H	1	BK_OFF	BK_OFF: Signal Brake ON/OFF (effective when SERVO is OFF)		
12	0613 H	1	FULL_COUNT	FULL-COUNT: switch to FULL-COUNT judgment (effective at initialization)		

5.5 Output Setting

NO	Parameter	Word N	Abbreviation	Description	Remark	Modify & Restart
1	0700 H	1	INPOSITION	Signal Inposition	CN4 Interface OUTPUT No. Setting. Interactive when the set value is 0	o
2	0701 H	1	ALARM	Signal Error		
3	0702 H	1	READY	Preparation is completed and the next point position can be executed		
4	0703 H	1	MOVE	In movement		
5	0705 H	1	SERVO-S	State SERVO ON		
6	0706 H	1	PRGSEL0-S	Selection of program from No. 0 ~ 127 Bit0		
7	0707 H	1	PRGSEL1-S	Selection of program from No. 0 ~ 127 Bit1		
8	0708 H	1	PRGSEL2-S	Selection of program from No. 0 ~ 127 Bit2		
9	0709 H	1	PRGSEL3-S	Selection of program from No. 0 ~ 127 Bit3		
10	080A H	1	PRGSEL4-S	Selection of program from No. 0 ~ 127 Bit4		
11	070B H	1	PRGSEL5-S	Selection of program from No. 0 ~ 127 Bit5		
12	070C H	1	PRGSEL6-S	Selection of program from No. 0 ~ 127 Bit6		
13	070D H	1	TRQ_LMT	Torque Limit		
14	070E H	1	ERR0	Error No. Bit0		
15	070F H	1	ERR1	Error No. Bit1		
16	0710 H	1	ERR2	Error No. Bit2		
17	0711 H	1	ERR3	Error No. Bit3		
18	0712 H	1	INRANGE	Output in the interval range set		
19	0713 H	1	NEAR	Output when moving within the range of the target		
20	0714 H	1	SOFTLMT	Software ultimate output LED		

5.6 Speed Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0800 H	2	LowSpeed	For setting the starting speed (pps)	When the moving speed is set as 0%, it will not be affected by 0802. It is just like the standby state of a motorcyle.	-	x
2	0802 H	2	HighSpeed	For setting highest rotary speed (pps)	The rated upper limit of rotary speed and the value can be analyzed with rotary speed (RPM)/60*Encoder.	-	x
3	0804 H	1	AccelTim	For setting acceleration time (msec)	For setting acceleration time.	1~30000 msec	x

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
4	0805 H	1	DecelTime	For setting deceleration time (msec)	For setting deceleration time.	1~30000 msec	x
5	0807 H	2	TrqLimitPress	For setting torque tolerance (Pulse)	The pulse value when moving to the value set after reaching torque limit in the operational mode of TSL.	pulse	x
6	080A H	1	MoveSttSet	Setting of movement state	Setting of action state. 0: movement state is off after the specified PULSE is outputted 1: movement state is off and Inposition is ON after the specified PULSE is outputted.	0~1	x
7	080F H	1	JogInchingSpd	Setting speed when JOG moves (×0.1%)	Active in IO control.	1~1000	x
8	0810 H	2	JogInchingData	Setting amount of movement when JOG moves (Pulse)	Active in IO control.		x
9	0812 H	1	JogInchingWait	Setting waiting time after JOG moves (msec)	Active in IO control.	0~1000 msec	x
10	0813 H	2	PlusSoftLimit	Software limit in positive direction (mm)	Setting software limit in positive direction. Invalid when software limit is 0.	-	x
11	0815 H	2	MinusSoftLimit	Software limit in negative direction (mm)	Setting software limit in negative direction. Invalid when software limit is 0.	-	x

5.7 Origin Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0900 H	1	OrgMode	Direction of origin reset	Setting direction of origin reset. 0: torque reset in positive direction 1: torque reset in negative direction 2: reversing for rearching Phase Z after torque reset in positive direction 3: reversing for searching Phase Z after torque reset in negative direction 4: searching signal ORG_SIG in positive direction 5: searching signal ORG_SIG in negative direction 6: reversing for searching Phase Z after searching signal ORG_SIG 7: reversing for searching Phase Z after searching signal ORG_SIG in negative direction	0~7	x
2	0901 H	1	OrgSpeed	Speed of origin reset (%)	For setting moving speed of origin reset and it is recommended the speed should be set below 20% when torque reset is used. When the value is 1% ~ 100%, the velocity is the percentage of the highest speed of 0802 H. When the value is 0%, the velocity is initial velocity of 0800 H set.	0~ 100%	x
3	0902 H	2	OrgOffset	For setting the offset of origin reset (Pluse)	The offset of movement after origin reset is completed. Refer to torque value of 0400h and 0401h for the movement.		x
4	0904 H	1	OrgOffsetSpeed	The movement speed for the home return offset	When the torque is returned to the origin, the torque will be detected and then moved in the opposite direction by an offset amount of movement speed. When the value is from 1% to 100%, the speed is the percentage of the highest speed of 0802 H. When the value is 0%, the speed is the set value of the initial speed of 0800 H.	0 ~ 100%	x
5	0905 H	2	OrgData	The data of home return	The data used to set a position after the home return is finished		x

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
6	0907 H	1	OrgTrqLimit	Torque setting when the origin returns(x 0.1%)	The torque required to hit the hardware limit when the origin returns.	0 ~ 1000 ×0.1 %	x
7	0908 H	2	OrgOffset_Z	The amount of offset (Pluse) before Z is detected	When the origin return hits the hardware limit, offset this value, and then look for the Z phase. This movement refers to the torque values of 0400h and 0401h.	PULSE	x
8	090A H	1	OrgTrqLmtTime	The torque detection time during the home return	If the torque reaches the set time when the torque origin returns, the judgment condition is established.	0~10000	x
9	090B H	1	OrgSpeed_Z1	Z-phase detection speed _1(%)	Speed adjustment of Z phase search during origin return action. (Based on the set value of 0802H at 100%)	1~100 %	x
10	090C H	1	OrgSpeed_Z2	Z-phase detection speed _2(%)	After the Z-phase is found at a speed specified in 090B H, find the Z-phase again in an opposite way at a speed specified in 090C H.	1~100 %	x

5.8 Communication Parameter

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
1	0A00 H	1	BaudRate	Communi-cation Rate	Setting of Communication Rate. 0: 9600bps 1: 19200bps (Initial Value) 2: 38400bps 3: 57600bps 4: 115200bps	0~4	o
2	0A01 H	1	DataSize	Setting for Bit of Character String	Bit setting of 1 character string. 0: 8bit (Initial Value) 1: 7bit	0~1	o
3	0A02 H	1	Parity	Odd-even Check	Setting of odd-even check. 0: None (Initial Value) 1: Even 2: Odd	0~2	o
4	0A03 H	1	Broadcast	Broadcast Setting	Setting for broadcast. Information of broadcast station 0 will be ignored when invalid. 0: Invalid (Initial Value) 1: Valid	0~1	x

NO	Parameter	Word N	Abbreviation	Description	Remark	Scope	Modify & Restart
5	0A04 H	1	Protocol	Communi-cation Protocol	Setting of protocol MODBUS for PS485. 0: MODBUS-ASCII (Initial Value) 1: MODBUS-RTU	0~1	o

6. Input & Output Function Description

6.1 Input & Output Specifications

XC100 can conduct signal communications with surrounding devices through IO interface.

IO is a flat 40PIN cable and its specifications are depending on its length, which should be decided prior to purchase.

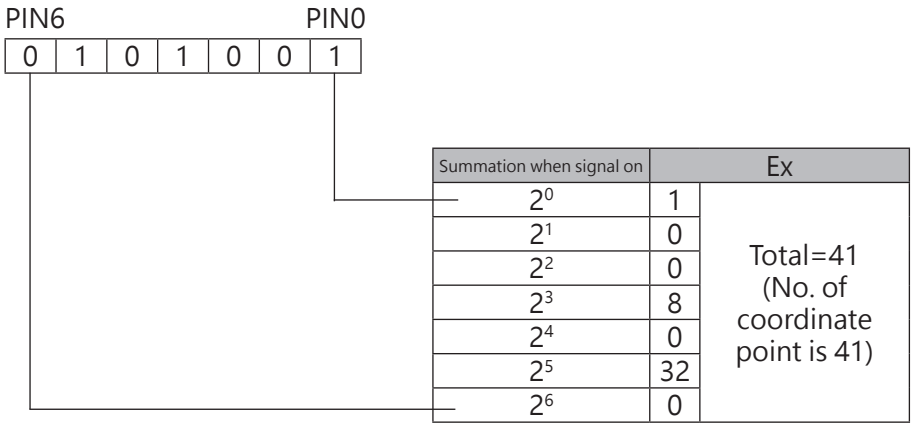
IO Specifications: NPN

40PIN Shielding wire {
- 14 IN DC24V · ±10% · 1.5~6mA/ point, common anode.
- 10 OUT DC24V · ±10% · <10mA/point, common anode.
- PULSE +/-
- DIR +/-

6.2 IO Signal List

NO	Color	Signal Name	Description	NO	Color	Signal Name	Description
1	Brwon	+COM	I/O power +24V	21	Light Blue	-COM	I/O power 0V
2	Brown/White			22	Light Blue/ Blake		
3	Blue	PULSE1+	CW、phase B、PULSE	23	Light Green	H-PULSE1+	CW、phase B、PULSE
4	Blue/White	PULSE1-		24	Light Green/ Blake	H-PULSE1-	
5	Green	PULSE2+	CCW、phase A、DIR	25	White/Red	H-PULSE2+	CCW、phase A、DIR
6	Green/Blake	PULSE2-		26	White/Blue	H-PULSE2-	
7	White	IN 1	ORG	27	Yellow/Red	OUT1	ORG-S
8	White/Blake	IN 2	SERVO	28	Yellow/Blue	OUT2	INP
9	Yellow	IN 3	ALM_RESET	29	Grey/Red	OUT3	READY
10	Yellow/Blake	IN 4	START	30	Grey/Blue	OUT4	SERVO-S
11	Red	IN 5	PRGSEL0	31	Red/White	OUT5	PRGSEL0-S
12	Red/Blake	IN 6	PRGSEL1	32	Red/Blue	OUT6	PRGSEL1-S
13	Orange	IN 7	PRGSEL3	33	Green/White	OUT7	PRGSEL3-S
14	Orange/Blake	IN 8	PRGSEL2	34	Light Green/ Blue	OUT8	PRGSEL2-S
15	Pink	IN 9	PRGSEL4	35	Light Green/ Red	OUT9	PRGSEL4-S
16	Pink/Blake	IN 10	PRGSEL5	36	Green/Blue	OUT10	PRGSEL5-S
17	Grey	IN 11	PRGSEL6	37	Pink/Red	-	-
18	Grey/Blake	IN 12	customizable	38	Pink/Blue	-	-
19	Purple	IN 13	customizable	39	Light Blue/ Red	-	-
20	Purple/White	IN 14	customizable	40	Light Blue/ Blue	-	-

6.3 Detailed Description of Input Signals

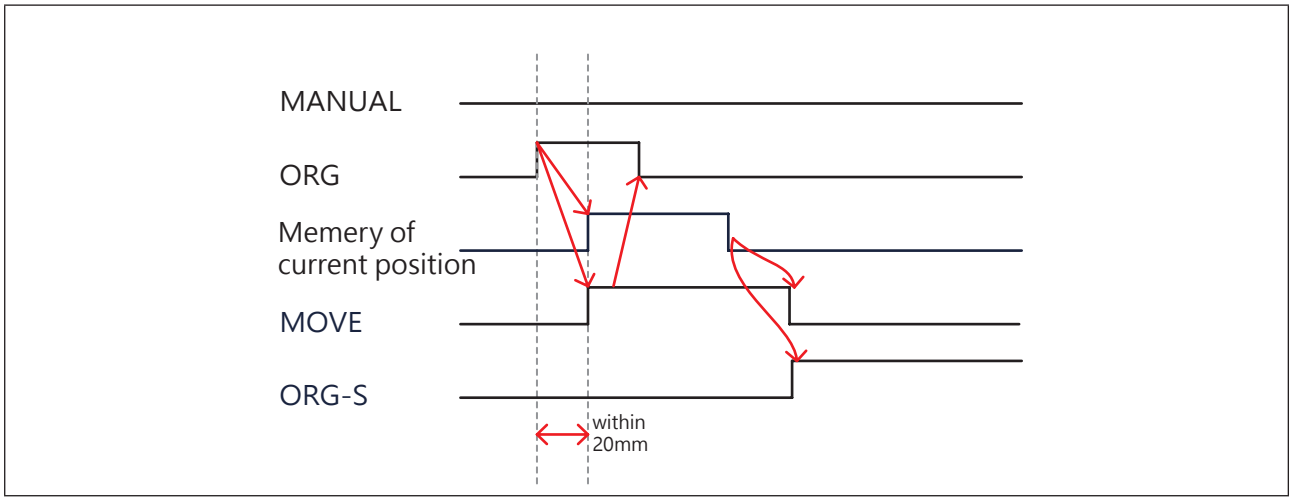
NO	Signal Name	Description
1	ORG	Origin reset, which to be executed after start to make point coordinate valid.
2	ALM_RESET	The following actions occur when this signal is ON: Alarm reset after an alarm is released. This signal can be used to relieve the alarm after concerned measured has been taken.
3	/SERVO	This signal is contact B. The servo is on when it isOFF and servo is off when it is ON. Note: the servo cannot control the state of alarm or emergency stop; so the servo is off during the states mentioned above.
4	/LOCK	This signal is contact B. If this signal is ON in operation, the robot will slow down and stop. If you want to restart, you must turn this signal off. Note: interlock is not a safe switch. Please do not use it for the purpose of safety. The servo will not be OFF and will keep existing state at interlock.
5	START	For executing the positioned operation with specified coordinate point data in the selection of point position (PRGSEL0 ~ PRGSEL6). Note: valid only when Manual mode is OFF.
6	PRGSEL0 ~ PRGSEL6	Read the seven-bit binary coded point number before using the START or TEACH signals. 
7	JOG+/ JOG-	In Manual mode, the motor moves in the specified direction (+/-) as long as JOG (+/-) is ON until the signal is OFF or the software limit is reached.
8	MANUAL	When this signal is ON, you will enter manual mode. Actions including JOG(+/-), TEACH and PRGSEL 0~PRGSEL 6 etc. can be executed in Manual mode.
9	TEACH	When the signal is ON, current position value will be stored in the specified position.
10	CONT_MODE	Switching function between position mode and torque mode (Effective when ModeSwitch is 1)
11	BK_OFF	Signal Brake ON/OFF (effective when SERVO is OFF)
12	FULL-COUNT	Switch to FULL-COUNT judgment (effective at initialization)

6.4 Detailed Description of Output Signals

<table>
<tr><th>NO</th><th>Signal Name</th><th>Description</th></tr>
<tr><td>1</td><td>IN-POSITION</td><td>This is in-position signal and will be on when specified position is same as current position. If value of parameter InPositionZone
is too big or the movement is too slow, signal InPosition is ON constantly.</td></tr>
<tr><td>2</td><td>ALARM</td><td>The signal is on when the controller is abnormal.</td></tr>
<tr><td>3</td><td>READY</td><td>When controller is in standby state and can accept external signals or communication instructions, the signal is ON.</td></tr>
<tr><td>4</td><td>MOVE</td><td>The signal is ON during movement.</td></tr>
<tr><td>5</td><td>ORG-S</td><td>The signal is on after origin reset ends and is off during origin reset.</td></tr>
<tr><td>6</td><td>SERVO-S</td><td>The signal will be ON after servo excitation and off at emergency stop or error.</td></tr>
<tr><td>7</td><td>PRGSEL0-S ~
PRGSEL6-S</td><td>PIN6 PIN0
0 1 0 1 0 0 1
<table>
<tr><th>Summation when signal is on</th><th colspan="2">Ex</th></tr>
<tr><td>2^0</td><td>1</td><td rowspan="7">Total=45
(No. of coordinate point is 45)</td></tr>
<tr><td>2^1</td><td>0</td></tr>
<tr><td>2^2</td><td>4</td></tr>
<tr><td>2^3</td><td>8</td></tr>
<tr><td>2^4</td><td>0</td></tr>
<tr><td>2^5</td><td>32</td></tr>
<tr><td>2^6</td><td>0</td></tr>
</table>
</td></tr>
<tr><td>8</td><td>TRQ_LMT</td><td>When the motor is moving and the current value reaches the set value, this signal is ON.</td></tr>
<tr><td>9</td><td>ERR0~ERR3</td><td>When a controller error occurs, the error code will be outputted in binary, indicating the error status of 16 groups.</td></tr>
<tr><td>10</td><td>INRANGE</td><td>When the motor runs within the set range, the signal is ON.</td></tr>
<tr><td>11</td><td>NEAR</td><td>Output when moving within the range of the target position The target position is set by point position operation mode ABS or INC</td></tr>
<tr><td>12</td><td>SOFTLMT</td><td>When current position moves to the software limit, the signal is ON.</td></tr>
</table>

7. Action Sequence

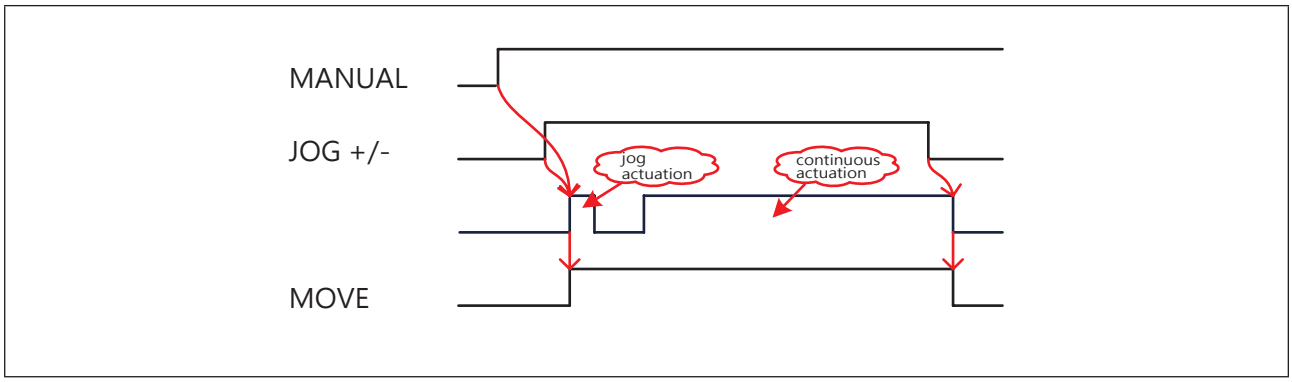
7.1 Origin Reset



Description:

1. After normal startup, servo signal will be normally ON.
2. Signal "ORG" will be inputted and the signal will be on ON.
3. Start to execute origin reset, signal "MOVE" is ON and it will be off after signal "ORG" is inputted.
4. Signal "MOVE" will be OFF after origin reset is completed; signal "ORG-S" will be ON after origin reset is completed.

7.2 IO Controls JOG Actuation

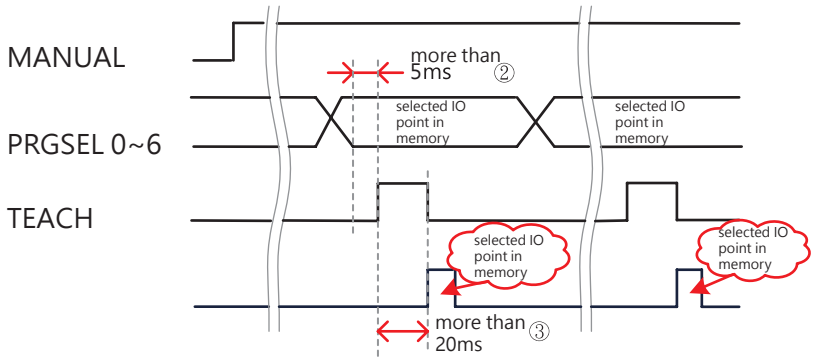


Description:

Effective only when signal "MANUAL" is ON.

1. Turn signal "MANUAL" on.
2. When signal "JOG +/-" is ON, the motor starts to move and signal "MOVE" is ON.
3. When signal "JOG +/-" is OFF, the motor starts to move and signal "MOVE" is OFF.

7.3 IO Point Position Teach

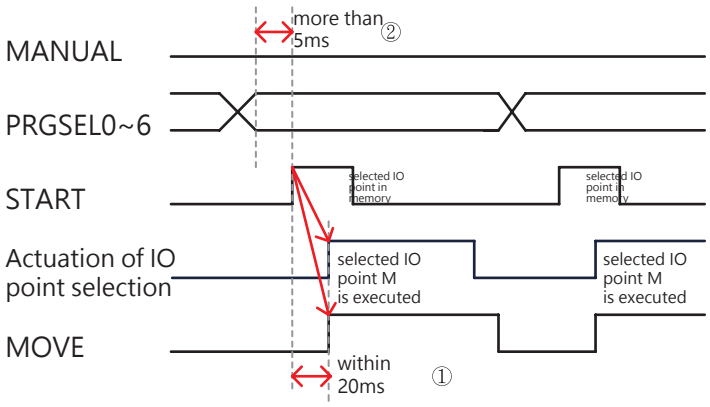


Description

Effective only when signal "MANUAL" is ON .

1. Turn signal"MANUAL" on.
2. Point position to be taught is selected according to signal "PRGSEL0~6" (numbered in binary).
3. Turn signal "TEACH" ON for at least 20ms to complete the memory of current position.

7.4 Actuation of IO Point Selection



Description:

Effective only when signal "MANUAL" is OFF.

1. Turn signal "MANUAL" off.
2. Point position to be moved is selected according to signal "PRGSEL0~6" (numbered in binary).
3. After signal "START" is ON and selection of IO point is completed, the motor will start to move and signal "MOVE" will be ON.

Remark:

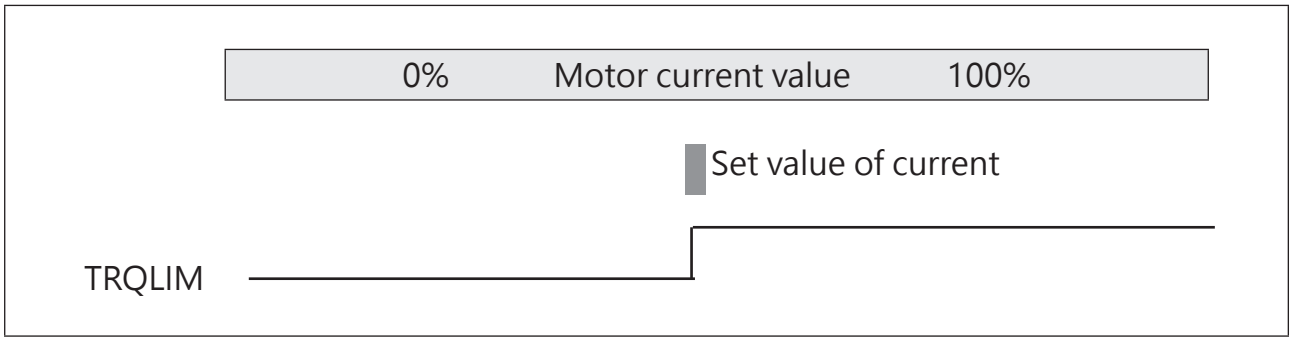
① Signal ORG and START can accept the min time.

② Stable time of signal PRGSEL n.

③ The shortest time acceptable for a signal of point position memory.

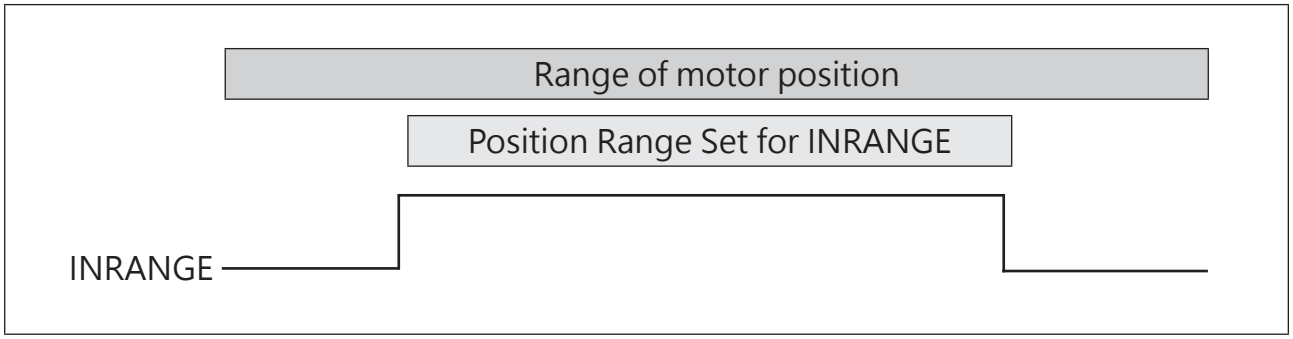
④ During JOG operation, fine tuning distance, waiting time and working time can be set in the parameters.

7.5 TRQLIM Signal Output



7.6 INRANGE Signal Output

For setting point position, the upper and lower limits of INRANGE should be set and the signal will be outputted as long as the motor moves within the range



7.7 Indication of LEDs on the controller

LED Status	PWR: power supply (Green) : bright when drive + control power supply is on active service; the green dots flash when the drive power is turned off. SON: Servo (Green): Constant on when Servo Motor is on; off when an error occurs. ERR: Abnormal (Red): the error message can be determined by the number of flashes.

8. Communication_RS485

8.1 Communication Specifications

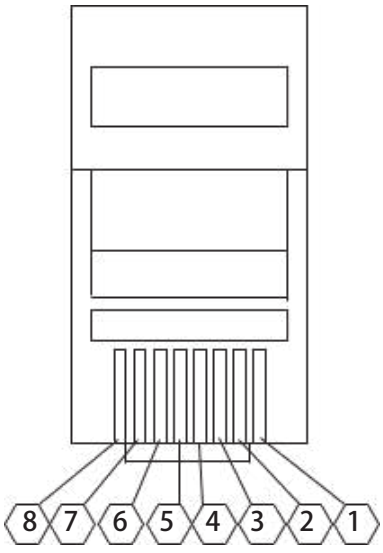
This device communicates with MODBUS PROTOCOL.
There are two modes of transfer: ASCII or RTU(Binary).

Item	ASCII Mode	RTU Mode
Communication Protocol	MODBUS Hex	MODBUS RTU
Communication Mode	RS-485 2-wire type (half-duplex)	
	USB2.0	-
Communication Distance	RS-485: maximum length of the cable is 500 meters	
	USB 2.0：5 meters	-
Connection Mode	RS-485： 1 to multiple units (Max 16 units)	
	USB 2.0：1 to 1	-
Communication Speed	9600、19200、38400、57600、115200 bps	
Initial Bit	1 BIT	
Data Length	7、8 BIT	8 BIT
Parity Check	None, even and odd parity	
Stop Bit	1 BIT	
Communication Code	ASCII	Binary
Startup Code	" : " (3A H)	N
End Code	CR+LF (0D H+0A H)	N
Check Code	LRC	CRC-16
Max Unit No. Connected	16 Units	

Note) If you want to use UI to connect XC100 controller in serial, you need to set it in ASCII mode.

■■ Pins of connector CN6or CN7 (RJ-45) are defined as following:

Pin	Signal Name	Description
1		
2	SG	Signal Ground (Separation Net)
3	SIG-A	DATA +
4		
5	SG	Signal Ground (Separation Net)
6	SIG-B	DATA -
7		
8	SG	Signal Ground (Separation Net)



8.2 Data Structure

■■ Reading State

Position	WORD N	Abbreviation	Description	Remark	Range/ Unit
1000 H	1	ActionStatus	Action status	0: stop 1: in action 2: abnormal stop	0~2
1001 H	1	InpStatus	Existing state of signal in-position	0: existing position has not reached the set range 1: existing position has reached the set range	0~1
1004 H	1	TrqLmtStatus	Torque limit status	0: not reaching the set range 1: reaching the set range	
1005 H	1	AlarmStatus	Alarm status	0: No alarm 1: Loop error 2: Full Count 3: Overspeed 4: Poor gain adjustment 5: Overvoltage 6: Abnormal initialization 7: EEPROM abnormal 8: Power voltage of major circuit is not enough 9: Overcurrent 10: Abnormal retrogradation 11: Emergent stop 12: Broken motor wire 13: Broken encoder wire 14: Protective current value 15: Putting power supply in service again 17: Action timed out	
1006 H	1	MonSpeed	Motor rotary speed		rpm
1007 H	1	MonCurrent	Motor current		*0.1%
1008 H	2	CmdNowPos	Existing command position		
100A H	2	EcdPos	Encoder position		
100C H	1	ServoStatus	Servo State	0: servo is OFF 1: servo is ON	0~1
100D H	1	ErrorStatus	Error status	0: no error 1: receiving action instructions in action 2: error in upper/lower limit 3: position error 4: format error 5: error in control mode 6: power-off and restart 7: power coefficient detection is not completed 8: error in Servo ON/OFF 9: LOCK 10: software limit 11: insufficient write permission for parameters 12: origin reset is not completed 13: Brake released	

Position	WORD N	Abbreviation	Description	Remark	Range/ Unit
100E H	1	StepNo	Step selection number	Indicating the step no. executed finally. If no program has been executed, STEP is "-1"	-1~127
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)	Individual output state	Output state of OUT 1; 0: OFF 1:ON	0~1
1022 H	1	PORT (OUT 2)	Individual output state	Output state of OUT 2; 0: OFF 1:ON	0~1
1023 H	1	PORT (OUT 3)	Individual output state	Output state of OUT 3; 0: OFF 1:ON	0~1
1024 H	1	PORT (OUT 4)	Individual output state	Output state of OUT 4; 0: OFF 1:ON	0~1
1025 H	1	PORT (OUT 5)	Individual output state	Output state of OUT 5; 0: OFF 1:ON	0~1
1026 H	1	PORT (OUT 6)	Individual output state	Output state of OUT 6; 0: OFF 1:ON	0~1
1027 H	1	PORT (OUT 7)	Individual output state	Output state of OUT 7; 0: OFF 1:ON	0~1
1028 H	1	PORT (OUT 8)	Individual output state	Output state of OUT 8; 0: OFF 1:ON	0~1
1029 H	1	PORT (OUT 9)	Individual output state	Output state of OUT 9; 0: OFF 1:ON	0~1
102A H	1	PORT(OUT10)	Individual output state	Output state of OUT 10; 0: OFF 1:ON	0~1
1040 H	1	PORT (IN1~IN14、phase Z)	Overall input state	Input bit 0 (IN 1) ~ bit 13 (IN 14), bit14 (Phase Z) 0: OFF 1: ON	0~ 32767
1041 H	1	PORT (IN 1)	Individual input state	Input state of IN 1; 0: OFF 1:ON	0~1
1042 H	1	PORT (IN 2)	Individual input state	Input state of IN 2; 0: OFF 1:ON	0~1
1043 H	1	PORT (IN 3)	Individual input state	Input state of IN 3; 0: OFF 1:ON	0~1
1044 H	1	PORT (IN 4)	Individual input state	Input state of IN 4; 0: OFF 1:ON	0~1
1045 H	1	PORT (IN 5)	Individual input state	Input state of IN 5; 0: OFF 1:ON	0~1
1046 H	1	PORT (IN 6)	Individual input state	Input state of IN 6; 0: OFF 1:ON	0~1
1047 H	1	PORT (IN 7)	Individual input state	Input state of IN 7; 0: OFF 1:ON	0~1
1048 H	1	PORT (IN 8)	Individual input state	Input state of IN 8; 0: OFF 1:ON	0~1
1049 H	1	PORT (IN 9)	Individual input state	Input state of IN 9; 0: OFF 1:ON	0~1
104A H	1	PORT (IN 10)	Individual input state	Input state of IN 10; 0: OFF 1:ON	0~1
104B H	1	PORT (IN 11)	Individual input state	Input state of IN 11; 0: OFF 1:ON	0~1
104C H	1	PORT (IN 12)	Individual input state	Input state of IN 12; 0: OFF 1:ON	0~1
104D H	1	PORT (IN 13)	Individual input state	Input state of IN 13; 0: OFF 1:ON	0~1
104E H	1	PORT (IN 14)	Individual input state	Input state of IN 14; 0: OFF 1:ON	0~1
104F H	1	Input state of Phase Z	Input state of Phase Z	Input state of Phase Z; 0: OFF 1:ON	0~1

■■ Reading 50 Error Logs

Position	WORD N	Abbreviation	Description
1060 H	1	AlarmList 01	50 error logs -01
1061 H	1	AlarmList 02	50 error logs -02
1062 H	1	AlarmList 03	50 error logs -03
1063 H	1	AlarmList 04	50 error logs -04
1064 H	1	AlarmList 05	50 error logs -05
1065 H	1	AlarmList 06	50 error logs -06
1066 H	1	AlarmList 07	50 error logs -07
1067 H	1	AlarmList 08	50 error logs -08
1068 H	1	AlarmList 09	50 error logs -09
1069 H	1	AlarmList 10	50 error logs -10
106A H	1	AlarmList 11	50 error logs -11
106B H	1	AlarmList 12	50 error logs -12

Position	WORD N	Abbreviation	Description
106C H	1	AlarmList 13	50 error logs -13
106D H	1	AlarmList 14	50 error logs -14
106E H	1	AlarmList 15	50 error logs -15
106F H	1	AlarmList 16	50 error logs -16
1070 H	1	AlarmList 17	50 error logs -17
1071 H	1	AlarmList 18	50 error logs 18
1072 H	1	AlarmList 19	50 error logs -19
1073 H	1	AlarmList 20	50 error logs -20
1074 H	1	AlarmList 21	50 error logs -21
1075 H	1	AlarmList 22	50 error logs -22
1076 H	1	AlarmList 23	50 error logs -23
1077 H	1	AlarmList 24	50 error logs -24
1078 H	1	AlarmList 25	50 error logs -25
1079 H	1	AlarmList 26	50 error logs -26
107A H	1	AlarmList 27	50 error logs -27
107B H	1	AlarmList 28	50 error logs -28
107C H	1	AlarmList 29	50 error logs -29
107D H	1	AlarmList 30	50 error logs -30
107E H	1	AlarmList 31	50 error logs -31
107F H	1	AlarmList 32	50 error logs -32
1080 H	1	AlarmList 33	50 error logs -33
1081 H	1	AlarmList 34	50 error logs -34
1082 H	1	AlarmList 35	50 error logs -35
1083 H	1	AlarmList 36	50 error logs -36
1084 H	1	AlarmList 37	50 error logs -37
1085 H	1	AlarmList 38	50 error logs -38
1086 H	1	AlarmList 39	50 error logs -39
1087 H	1	AlarmList 40	50 error logs -40
1088 H	1	AlarmList 41	50 error logs -41
1089 H	1	AlarmList 42	50 error logs -42
108A H	1	AlarmList 43	50 error logs -43
108B H	1	AlarmList 44	50 error logs -44
108C H	1	AlarmList 45	50 error logs -45
108D H	1	AlarmList 46	50 error logs -46
108E H	1	AlarmList 47	50 error logs -47
108F H	1	AlarmList 48	50 error logs -48
1090 H	1	AlarmList 49	50 error logs -49
1091 H	1	AlarmList 50	50 error logs -50

■■ Controller Information

Position	WORD N	Abbreviation	Description	Remark
10D0 H	1	MotorType	Motor Type	Max 31 characters (half-width alphanumeric)
10E0 H	1	Controller	Model of the Controller	"XC100"
10F0 H	1	FirmwareNo	Firmware Version	HEX-ASCII Format, 100 is Version 1.00

■■ Action

Position	Word N	Abbreviation	Description	Remark	Range/ Unit
2000 H	2	INCamount	Relative amount of movement	For setting relative moving distance (effective at position control or torque control (initial value is 0)	0.01mm/ 1pulse
2002 H	2	ABSamount	Absolute amount of movement	For setting absolute moving distance (effective at position control or torque control (initial value is 0)	0.01mm/ 1pulse
2005 H	1	TrqStopDir	Direction of torque at search stop	0: Direction +; 1: Direction -. Effective at torque control.	0~1
2006 H	2	PosAmount	Specified position data	For setting command and existing position value (Initial value is 0)	0.01mm/ 1pulse
2011 H	1	Servo ON/OFF	Servo is ON/ OFF	0: servo is ON ; 1: servo is OFF	0~1
2014 H	1	MovSpeedSet	For setting position/ torque control speed (relative position movement, absolute position movement, JOG)	Speed is the value set based on specific proportion of max speed 0802H when the value is 1% ~ 100%. When the value is 0%, the velocity is initial velocity of 0800 H set.	0~100%
201E H	1	MovType	Movement Type	0: INC relative movement 1: ABS absolute movement 2: TSL torque searching movement (direction is set with 2005H) 3: ORG origin reset 4: for setting command and existing position value 5: reserved 6: alram reset 7: offset removal (to make the command position same as existing position) 8: deceleration stopping 9: Emergent stop 10: reserved 11 : + JOG 12 : - JOG	0~12
2040 H	1		Analog input setting (Binary)	Input status change (IN1 ~ IN14) Bit0 : IN1 ~ Bit13 : IN14 0: OFF 1: ON After setting, the current value is the input value of controller IO simulation, which is accumulated in binary (bit 0~bit 13)	0~1
2041 H	1		IN1 Analog input setting	IN1 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1

Position	Word N	Abbreviation	Description	Remark	Range/ Unit
2042 H	1		IN2 Analog input setting	IN2 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received bythe controller.	0~1
2043 H	1		IN3 Analog input setting	IN3 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received bythe controller.	0~1
2044 H	1		IN4 Analog input setting	IN4 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received bythe controller.	0~1
2045 H	1		IN5 Analog input setting	IN5 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received bythe controller.	0~1
2046 H	1		IN6 Analog input setting	IN6 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received bythe controller.	0~1
2047 H	1		IN7 Analog input setting	IN7 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
2048 H	1		IN8 Analog input setting	IN8 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
2049 H	1		IN9 Analog input setting	IN9 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
204A H	1		IN10 Analog input setting	IN10 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
204B H	1		IN11 Analog input setting	IN11 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
204C H	1		IN12 Analog input setting	IN12 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
204D H	1		IN13 Analog input setting	IN13 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1
204E H	1		IN14 Analog input setting	IN14 Analog input setting 0 : OFF ; 1 : ON After setting, current value is used as the signal or physical signal received by the controller.	0~1

■■ Step Instruction Description

Position	Word N	Step	Brief	Description	Range/Unit
9010 H	1	the First Step	Moving mode	for setting moving mode: 0: INC relative movement (initial value) 1: ABS Absolute position movement [Position mode] 2: ORG Home return 3: +TSL Positive torque search movement 4: -TSL Negative torque search movement 5: Unopened 6: Unopened 7: Unopened 8: CLR Deviation clear (to make the command position equal to the current position)9: Unopened 10:Unopened 11:Unopened 12: INC-R Relative position movement (continuous) 13: ABS-R Absolute position movement (continuous) 14:Unopened 15:INC-T relative position movement [torque mode] 16:ABS-T absolute position movement [torque mode]	0~16
9011 H	2		Amount of movement/ Position Movement	For setting amount of movement or target position. Mode Definition: ABS = Target Position (Position movement) INC = Relative Position (Amount of movement) ABS-R = Target Position (Position movement) INC-R = Relative Position (Amount of movement) Except for the modes stated above, other modes are invalid (initial value 0)	- 2147483648 ~ 214748648 pulse
9013 H	1		Moving Speed	For setting moving speed. Speed is a specific percentage of max speed 0802H when the value is 1% ~ 100%. When the value is 0%, the velocity is initial velocity of 0800 H set. This function will be invalid when 9000 H is ORG in moving mode.	0~100%
9014 H	1		Torque	Other moving modes will be affected by it other than signal searching mode	0~1000 x0.1%
9015 H	1		Reserved		0
9016 H	2		Range L	Lower limit of interval range. When current position is less than the set value, the specified IO of inrange will be outputted. (initial value is 0)	
9018 H	2		Range H	Upper limit of interval range. When current position is bigger than the set value, the specified IO of in range will be outputted. (initial value is 0)	
901A H	1		Acceleration Time	For setting acceleration time. (initial value is 300)	1~ 30000msec
901B H	1		Deceleration Time	For setting deceleration time. (initial value is 300)	1~ 30000msec
901C H	1		Waiting Time	The time for wait after movement ends. (initial value is 0)	0~ 30000msec
901D H	1		Next Step	Skipping to the designated program after completion. (initial value is -1)	-1 ~ 127 -1 is the ending step

Position	Word N	Step	Brief	Description	Range/Unit
9020 H ~ 902D H	14	the Second Step			

■■ Parameter Annotation And Storage

Position	Word N	Brief	Description	Range/Unit
9999 H	1	Parameter Storage	0: Current Parameter ; 1: Default Data	0~1

■■ Open Write Instruction

Character ASCII

Character ASCII	:	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
	Startup Code	Station No. Controller Knob Plus 1		Function Code		Writing Start Position				Number of Words Written				Number of Bytes Written		Data of First Word				Data of Second Word				Data of Third Word				Data of Fourth Word				Verification code (LRC)		Ending Code (CR/LF)	
						Data String																													

■■ Parameter Writing Process

Opening Write Instructions → Parameter Modification Instruction (available for multiple instructions) → Parameter Storage

■■ RTU Mode Configuration

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

■■ ASCII Mode Configuration

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

■■ Structure Description

1、Station No.

When the designated station number is transferred, only the machine of which station number is same as the specified station number can receive the data and other stations with inconsistent station numbers will ignore the data.

> ⚠ **Note：**
> The specified station number for communication is the value set for knob CH on the controller plus 1. Eg: if the value of CH is "1", the specified station no. should be "2"

2、Function Code

Specified Function Code

Function Code	Function
03 H	Data
06 H	Data Writing(1Word)
10 H	Continuous Data Writing(1Word ↑)

3、Data

The data necessary to execute the specified function code and the data structure may vary depending on the function code specified.

Function Code	Function
03 H	Data Position, Number of Data Read
06 H	Data Position, Number of Data Written
10 H	Data Position, Number of Data Written & Content Written

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: format CRC-16 is adopted.

ASCII: format LRC is used.

8.3 Detailed Error Message

If an error other than the response condition is detected, the error code corresponding to the type of error will be sent back.

1、Error of Function Code

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

Eg：

Character	:	0	1	0	4	2	0	1	E	0	0	0	3	B	A	CR	LF
ASCII	3A	30	31	30	34	32	30	31	45	30	30	30	33	42	41	0D	0A
Startup Code	Station No. 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
ASCII	3A	30	31	38	34	30	31	37	41	0D	0A
Startup Code	Station No. Controller Knob plus 1			Function Code		Error Code		Verification Code (LRC)		End Code (CR/LF)	

② If the error of inputted function code is above "80 H", the received function code will respond with the original function code

Eg：

Character	:	0	1	9	0	2	0	1	E	0	0	0	3	2	E	CR	LF
ASCII	3A	30	31	39	30	32	30	31	45	30	30	30	33	32	45	0D	0A
Startup Code	Station No. Controller Knob plus 1			Function Code		Data Position				Data Action Code				Verification Code (LRC)		End Code (CR/LF)	
						Data String											

Character	:	0	1	9	0	0	1	6	E	CR	LF
ASCII	3A	30	31	39	30	30	31	36	45	0D	0A
Startup Code	Station No. Controller Knob plus 1			Function Code		Error Code		Verification Code (LRC)		End Code (CR/LF)	

2、Error Code

Error Code	Description
01 H	Error of Function Code. When receiving function codes other than those specified.
02 H	Error of Station No. When reading dedicated writing position. When writing dedicated reading position. When reading (writing) a nonexistent position.
03 H	Data Error. When the data value written exceeds valid range. When number of data read exceeds the range. When being written into a parameter position unmodifiable. When the data written is inconsistent with the number specified.

⚠ Note：

Smaller the value of an error code is, higher the priority of the error code is. When there are several errors, the error code with high priority order will be replied firstly. Eg: when an error is detected for a function code, "01" will be used for reply only at first even if there is some error of data or station no.

8.4 Structure of Message Required by RTU

1、WORD Data Reading

Word data is read continuously from the reading-out start position.
After reading WORD data, the data will be sent out in the sequence from Upper Bytes to Lower Bytes.

■■ Structure of Message Required

Station No.		01 H~10 H
Function Code		03 H
Reading Start Position	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Reading WORD Data	Upper Bytes	0001 H~0003 H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Responding Message

Station No.		01 H~10 H
Funnction Code		03 H
Reading Bytes		02 H~7F H
First WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Next WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
⋮	⋮	⋮
Last WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Exceptional Responding Message

Station No.		01 H~10 H
Function Code		83 H
Error Code		01 H~03 H
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

RTU Reading Example Status: reading
Data Position: 1000 H (action status data)
WORD number: 1 word

Character	01	03	10	00	00	01	80	CA
	Station No. Controller Knob plus 1	Function Code	Reading Start Position		Reading WORD Data		CRC-16	
			Data String					

2、WORD Data Writing

Specifying the position where the Word data to be written and write the data.
The data is sent out in the order from the upper bytes to the lower bytes of the word data.

■■ Structure of Message Required

Station No.		01 H~10 H
Function Code		06 H
Writting Start Position	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Number of Words Written	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Responding Message

Station No.		01 H~10 H
Function Code		06 H
Writting Start Position	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Number of Words Written	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Exceptional Responding Message

Station No.		01 H~10 H
Function Code		86 H
Error Code		01 H~03 H
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

RTU Writing Example
Eg: Origin Reset
Data Position: 201E H
Data Action Code: 0003 H (Origin Reset)

Character	01	06	20	1E	00	03	A2	0D
	Station No. Controller Knob plus 1	Function Code	Reading Start Position		Reading WORD Data		CRC-16	
			Data String					

3、Continuous WORD Data Writing

Word data is written continuously from start position writing to word number writing.
The data is sent out in the order from the upper bytes to the lower bytes of the word data.

■■ Structure of Message Required

Station No.		01 H~10 H
Function Code		10 H
Writting Start Position	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Number of Words Written	Upper Bytes	0001 H~003F H
	Lower Bytes	
Number of Bytes Written		02 H~7F H
First WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Next WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
⋮	⋮	⋮
Last WORD Data	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Responding Message

Station No.		01 H~10 H
Function Code		10 H
Writting Start Position	Upper Bytes	0000 H~FFFF H
	Lower Bytes	
Number of Words Written	Upper Bytes	0001 H~003F H
	Lower Bytes	
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

■■ Structure of Exceptional Responding Message

Station No.		01 H~10 H
Function Code		86 H
Error Code		01 H~03 H
CRC-16	Upper Bytes	0000 H~FFFF H
	Lower Bytes	

RTU Continuous Writing Example
Eg: writing data of relative movement
Data Position: 2000 H (Setting relative moving distance)
WORD Number: 2 words

Character	01	10	20	00	00	02	04	00	00	00	64	6B	85
	Station No. Controller Knob plus 1	Function Code	Reading Start Position		Reading WORD Data		Number of Bytes Written	First WORD Data		Second WORD Data		CRC-16	
			Data String										

4、Calculation Example of CRC-16

CRC-16 is the wrong acknowledgment on 2 Bytes (16Bit).
CRC-16 is calculated sequentially from the position of station no. to the end of the data.

1. Announcing CRC is the initial value of FFFF H.
2. Using CRC and 1 Byte in the message of the first time for XOR. Then the calculated value is substituted into CRC.
3. CRC variable is shifted by 1 Bit (the next Bit) to the right.
4. If the carry flag "c_carry" is 1, CRC and A001 H will be used for "XOR" calculation.
5. Repeating the results for 3, 4 and 8 cycles.
6. Using CRC and 1 Byte in the message of the next time for XOR. Then the calculated value is substituted into CRC.
7. Repeating 3 ~ 6 items for values other than CRC.
8. Until the last byte is computed, the data will be sent in the order from lower to upper CRC variables.

■■ CRC-16 is calculated by taking VB 6.0 as an example: variable is declared as follows:

```
Dim CRC As Long
Dim i, j, arry_count As Integer Dim c_next, c_carry As Long Dim crc_arry(64) As Integer

i = 0
CRC = 65535
For i = 0 To arry_count c_next = crc_arry(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
```

They will be added to the end of error codes and messages. Please pay attention to the sequence of lower bit and upper bit of CRC.

8.5 Structure of ASCII Message Required

1、WORD Data Reading

Word data is read continuously from the reading-out start position.

After reading WORD data, the data will be sent out in the sequence from Upper Bytes to Lower Bytes.

■■ Structure of Message Required

Startup Code		" : "
Station No.		"0" , "1"~"1" , "0"
Function Code		"0" , "3"
Reading-out Start Position	Upper Bytes	"0" , "0"~"F" , "F"
	Lower Bytes	"0" , "0"~"F" , "F"
Reading-out WORD Data	Upper Bytes	"0" , "0"~"0" , "0"
	Lower Bytes	"0" , "0"~"3" , "C"
Check Code LRC		"0" , "0"~"F" , "F"
End Code		CR , LF

■■ Structure of Responding Message

Startup Code		" : "
Station No.		"0" , "1"~"1" , "0"
Function Code		"0" , "3"
Reading Bytes		"0" , "2"~"7" , "F"
First WORD Data	Upper Bytes	"0" , "0"~"F" , "F"
	Lower Bytes	"0" , "0"~"F" , "F"
Next WORD Data	Upper Bytes	"0" , "0"~"F" , "F"
	Lower Bytes	"0" , "0"~"F" , "F"
:	:	:
:	:	:
Last WORD Data	Upper Bytes	"0" , "0"~"F" , "F"
	Lower Bytes	"0" , "0"~"F" , "F"
Check Code LRC	Upper Bytes	"0" , "0"~"F" , "F"
End Code	Lower Bytes	CR , LF

■■ Structure of Exceptional Responding Message

Startup Code		" : "
Station No.		"0" , "1"~"1" , "0"
Function Code		"8" , "3"
Error Code		"0" , "1"~"0" , "3"
Check Code LRC	Upper Bytes	"0" , "0"~"F" , "F"
End Code	Lower Bytes	CR , LF

ASCII Reading Example Status: reading
Data Position:1000H (action status data)
WORD Number: 1 words

Character	:	0	1	0	3	1	0	0	0	0	0	0	1	E	B	CR	LF
ASCII	3A	30	31	30	33	31	30	30	30	30	30	30	31	45	42	0D	0A
	Startup Code	Station No. Controller Knob plus 1		Function Code		Reading Start Position				Reading WORD Data				Verification Code (LRC)		End Code (CR/LF)	
						Data String											

2、WORD Data Writing

Specifying the position where the Word data to be written and write the data.
The data is sent out in the order from the upper bytes to the lower bytes of the word data.

■■ Structure of Message Required

Startup Code		" : "
Station No.		"0" · "1"~"1" · "0"
Function Code		"0" · "6"
Reading Start Position	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Reading WORD Data	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Check Code LRC		"0" · "0"~"F" · "F"
End Code		CR · LF

■■ Structure of Responding Message

Startup Code		" : "
Station No.		"0" · "1"~"1" · "0"
Function Code		"0" · "6"
Reading Start Position	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Reading WORD Data	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Check Code LRC		"0" · "0"~"F" · "F"
End Code		CR · LF

■■ Structure of Exceptional Responding Message

Startup Code	" : "
Station No.	"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

ASCII Writing Example
Eg: Origin Reset
Data Position: 201E H
Data Action Code: 0003 H (Origin Reset)

Character	:	0	1	0	6	2	0	1	E	0	0	0	3	B	8	CR	LF
ASCII	3A	30	31	30	36	32	30	31	45	30	30	30	31	42	38	0D	0A
	Startup Code	Station No. 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

Word data is written continuously from start position writing to word number writing. The data is sent out in the order from the upper bytes to the lower bytes of the word data.

■■ Structure of Message Required

Startup Code		" : "
Station No.		"0" · "1"~"1" · "0"
Function Code		"1" · "0"
Reading Start Position	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Reading WORD Data	Upper Bytes	"0" · "0"~"0" · "0"
	Lower Bytes	"0" · "0"~"3" · "C"
Number of Bytes Written		"0" · "2"~"7" · "6"
First WORD Data	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Next WORD Data	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
⋮	⋮	⋮
Last WORD Data	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Check Code LRC		"0" · "0"~"F" · "F"
End Code		CR · LF

■■ Structure of Responding Message

Startup Code		" : "
Station No.		"0" · "1"~"1" · "0"
Function Code		"1" · "0"
Reading Start Position	Upper Bytes	"0" · "0"~"F" · "F"
	Lower Bytes	"0" · "0"~"F" · "F"
Reading WORD Data	Upper Bytes	"0" · "0"~"0" · "0"
	Lower Bytes	"0" · "1"~"3" · "B"
Check Code LRC		"0" · "0"~"F" · "F"
End Code		CR · LF

■■ Structure of Exceptional Responding Message

Startup Code	" : "
Station No.	"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

ASCII Continuous Data Writing
Eg: writing relative movement data
Data Position: 2000 H (Setting relative moving distance)
WORD Number: 2 words

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
ASCII	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
Startup Code	Station No. Controller Knob plus 1		Function Code	Writing Start				Number of Words												Verification Code (LRC)		End Code (CR/LF)					
				Data String																							

4、Calculation of LRC:

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

1. Starting from the beginning (station number) of the data to sum calculation at the end of the data.
2. When the calculated result exceeds FF H, for example, over 100 H, "1" shall be omitted. (Eg: 153 H=>53 H)
3. Complement of result of the addition (BIT inversion) is the result plus 1.
4. Lrc_arry array is composed of 2 characters, whose value needs to be calculated after conversion with decimal system.

(Eg: 0106201E0003=>01 06 20 1E 00 03)

● LRC is calculated by taking VB 6.0 as example: Dim LRC As Integer

```
Dim i As Integer
Dim arry_count As Integer Dim lrc_arry(128) As Integer

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

8.6 EtherCAT Internet setup：

1.When running OMRON PLC, the ESI file path is as below:

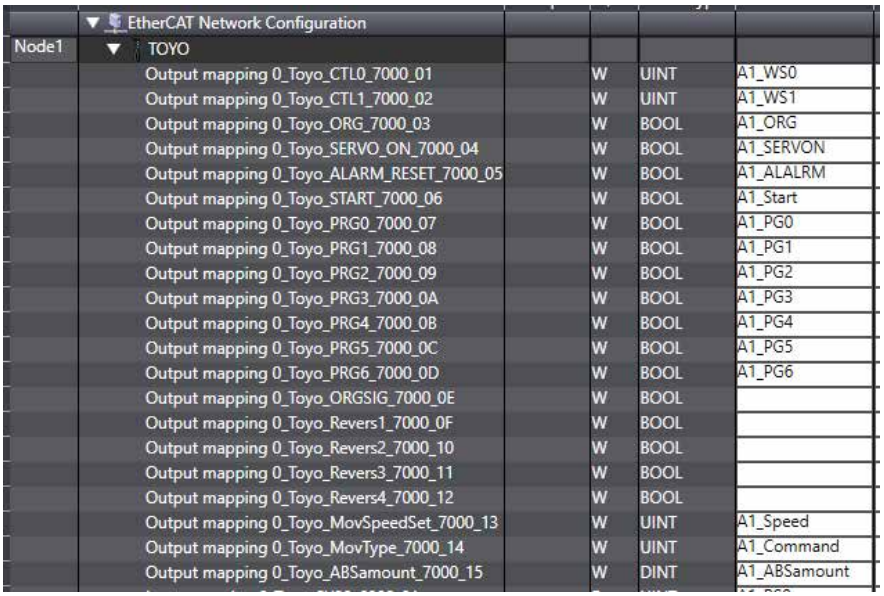
本機磁碟 (C:) > Program Files (x86) > OMRON > Sysmac Studio > IODeviceProfiles > EsiFiles > UserEsiFiles

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
Servotronix_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 running BACKOFF PLC, the ESI file path is as below:

1. copy "TOYO-Device-1Axis.xml" file to "EtherCAT Master" tool file
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	Info Format	TAG	Brief	Description	Range
READ	BOOL	Same as OUT1~10 defined name	Overall intro power status	bit 0(OUT 1)~bit 9(OUT 10) Default set: H1020 0：OFF 1：ON (default IO as below) OUT1:ORG-S OUT2:INP OUT3:READY OUT4:SERVO-S OUT5:PRGSEL0-S OUT6:PRGSEL1-S OUT7:PRGSEL2-S OUT8:PRGSEL3-S OUT9:PRGSEL4-S OUT10:PRGSEL5-S	-
READ	UINT	AlarmStatus	Alarm status	0：no alarm 1：over torque 2：over deviation of position 3：over speed 4：bad adjustment of gain 5：over voltage 6：error of defaulting 7：EEPROM error 8：insufficient voltage of main power 9：over current 10：resurrect error 11：under emergency stop 12 : motor offline 13：Encoderoffline 14 : protection of current value 15：need to shut down and restart	-
READ	DINT	EcdPos	Encoder position	Current position value	-
WRITE	BOOL	same as IN1~14	intro power status change	bit 0(IN 1)~bit 13(IN 14) Default set: H2040 0：OFF 1：ON (default definition as below) IN1：ORG IN2：SERVO IN3：ALM-RESET IN4：START IN5：PRGSEL0 IN6：PRGSEL1 IN7：PRGSEL2 IN8：PRGSEL3 IN9：PRGSEL4 IN10：PRGSEL5 IN11：PRGSEL6 IN12：ORGSIG	-

READ/ WRITE	Info Format	TAG	Brief	Description	Range
WRITE	UINT	MovType	Moving type	1：absolute position movement 3：origin point reset 6：alarm reset 8：deceleration stop D : clear command	0~f
WRITE	DINT	ABSamount	Absolute moving value	Set distance of absolute moving (available in position control and torque control) (Default value: 0)	2~2000
WRITE	UINT	MovSpeedSet	Action speed set of position/ torque control Absolute position moving	The highest speed(based on set value of 0802H) is set as 100%(default value 100) If the set value is 0%, move with start speed(0800H)	0~100%
WRITE	UINT	Toyo_CTL0	system control	Must to be set as 1	-

Note:

1. ID knob can only be set as 0 on TC100/XC100
2. Station No. of ECAT-TC100 is set by upper position Master
3. EtherCAT IN PORT is CN6
4. EtherCAT OUT PORT is CN7

9.TOYO-Single Operation Instructions

9.1 TOYO-Single Introduction

1、Brief Introduction

In order to help the customers to use the product series developed by our company, our company has specially designed a professional control software Toyo-Single to provide customers with a satisfactory using experience.

2、Installation & Software Requirements

Minimum Software Requirements	
OS	Microsoft Windows 2000/XP/Vista/7/8.1/10
CPU	At least the one recommended by the OS used
Memory	At least the one recommended by the OS used
Hard-Disk Space	20MB or above
Communication Port	RS-485, USB
Controller	XC100

9.2 Installation and Removal of TOYO-Single

1、Installation

This chapter describes how to install Toyo-Single by opening the installation file of [Toyo-Single-Setup.exe] at first, as shown in Figure (1). It is recommended to execute the installation program as a system administrator to avoid installation exceptions caused by insufficient permissions.

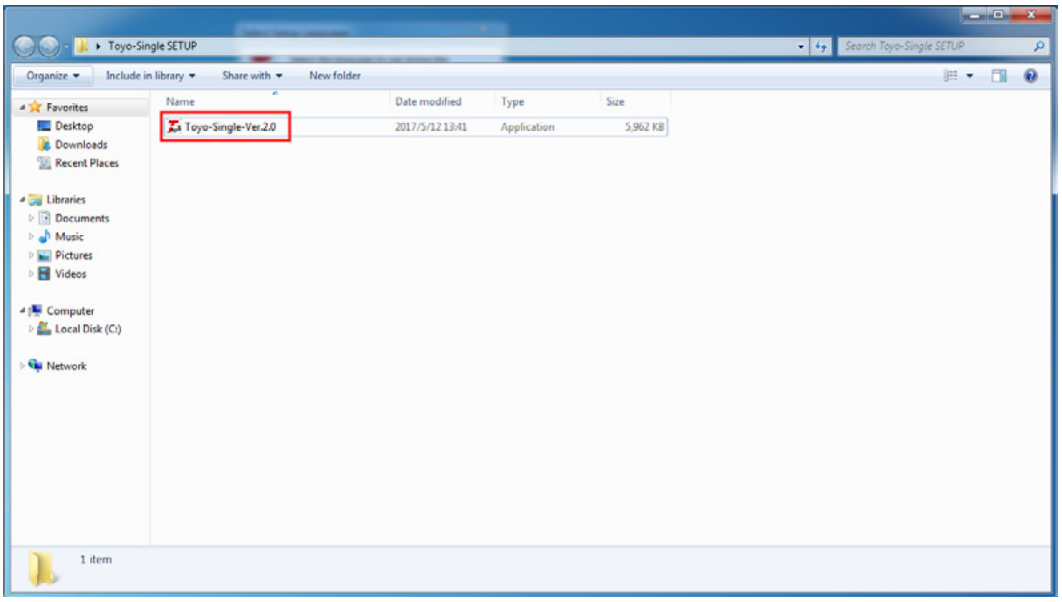


Figure (1) Toyo-Single.exe

① **Framework Detection**

If the software detects that the Microsoft.net Framework 4 is not installed on your computer, it will ask you to download and install it, as shown in Figure (2). If this screen does not show, please skip to section 1.2 to continue the installation. Please press [Yes] to download, [No] to leave the installation program. If you do not want automatic download, you can download Microsoft.net Framework 4 for installation at the official website of Microsoft

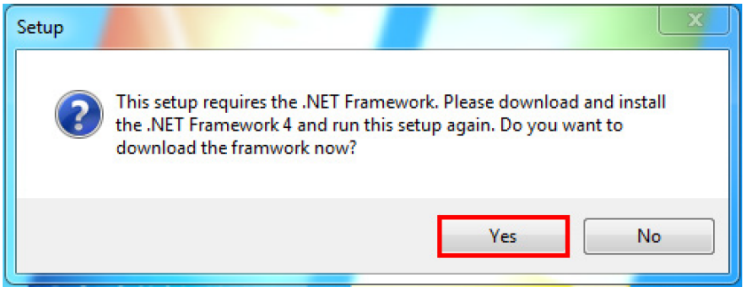


Figure (2) asks to install Microsoft .NET Framework 4

After the installation file is opened, please read the license terms carefully, then tick "I've read and accept the license terms" and press "Install", as shown in Figure (3).

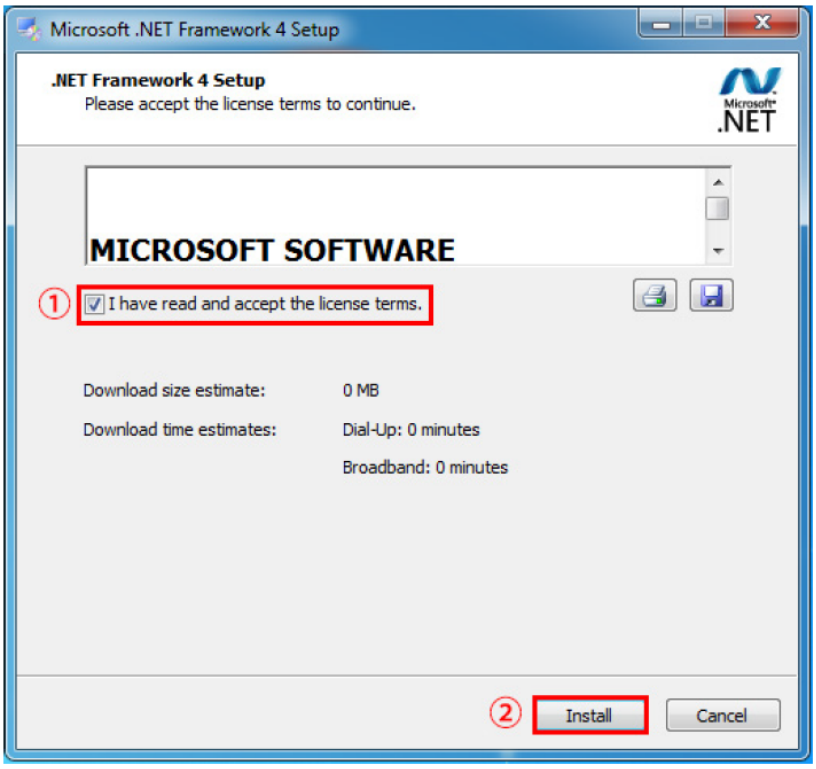


Figure (3) Installation Screen of Microsoft.NET Framework 4

Please wait patiently after entering the installation program as it will execute the installation for a period of time as shown in Figure (4).

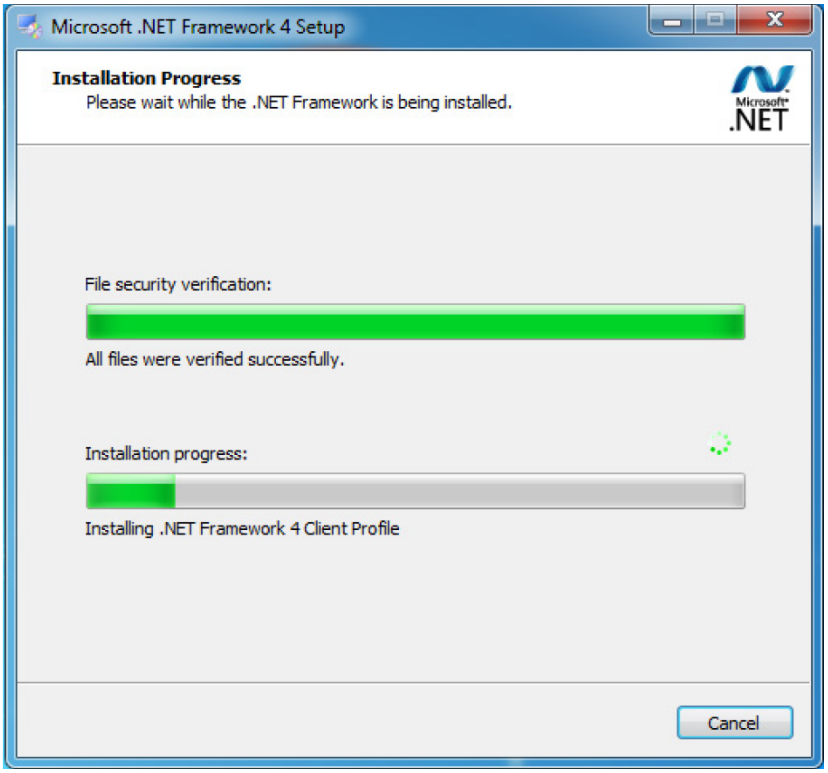


Figure (4) Installation Program

Click [Finish] to complete the installation program, as shown in figure (5).

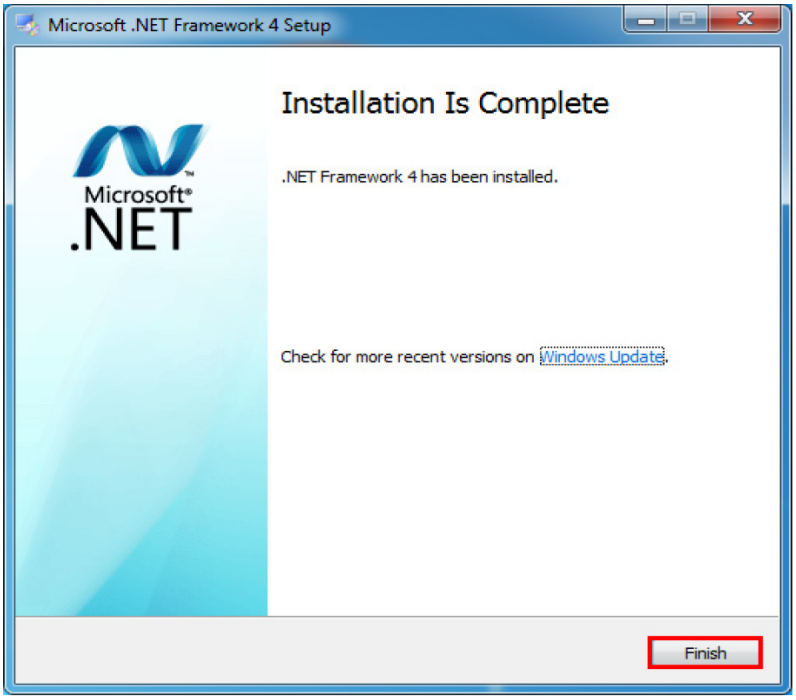


Figure (5) Screen of Completion of Installation of Framework.

② **Installation Program of Toyo-Single**

After the installation file is opened, you will be asked about the language used during installation. The language may be switched according to the user's habits. Press "[OK (確定)]" after it is chosen as shown in Figure (6).

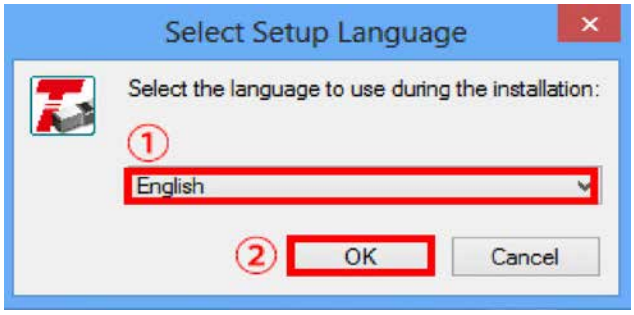


Figure (6) Language Selection

Entering the information screen. After reading the Copyright Declaration of Toyo Single, press [next (下一步)] to continue the installation, as shown in Figure (7).

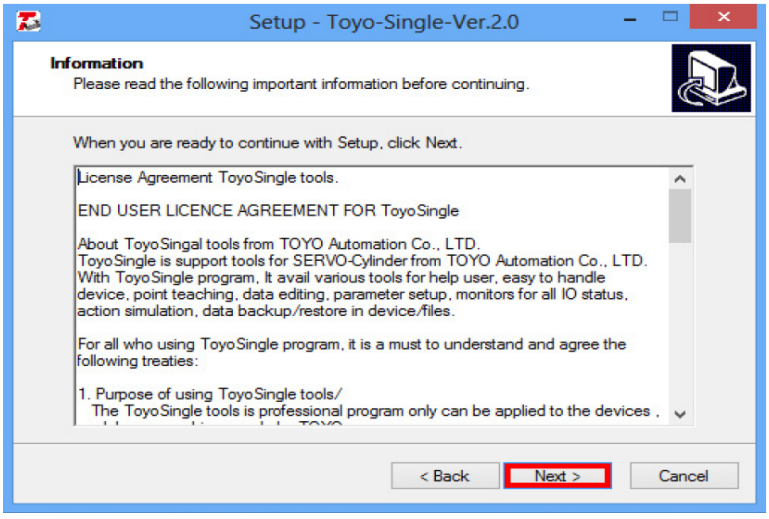


Figure (7) Screen of Copyright Declaration

Entering the screen of installation position selection. If you need to select another installation position, press [Browse] to select the position where you want to install the files. It is recommended the software be installed in the default path. Press [Next] to continue the installation after the selection is confirmed, as shown in Figure (8).

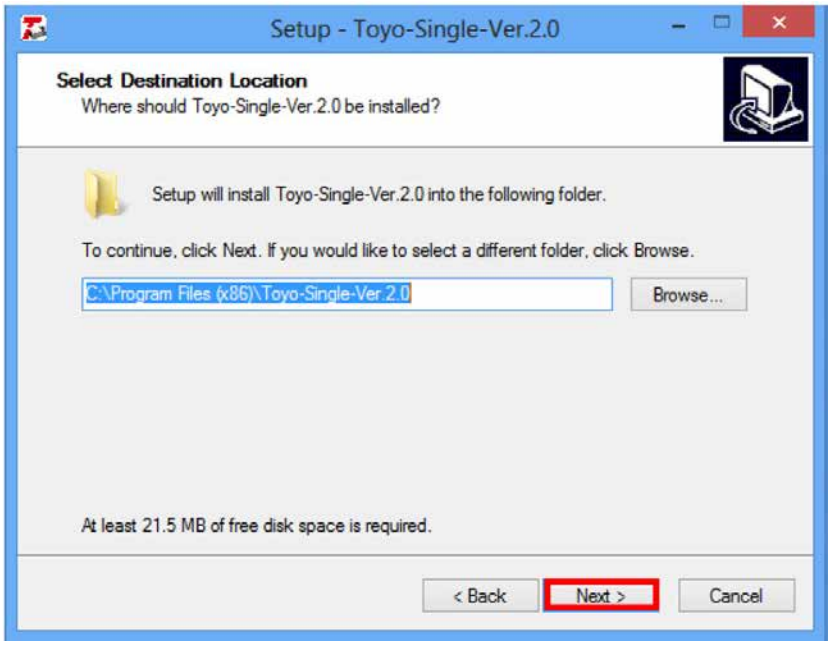


Figure (8) Screen of Installation Position

Entering the screen of selection of additional work: if there is no USBDriver in the computer, please check installation (recommended), otherwise uncheck. Please refer to Section 1.3 for the installation procedure. If you need to create a desktop shortcut, please check "Create A Desktop Icon ". Otherwise uncheck it.Press [Next Step] to continue the installation after the settings are confirmed, as shown in Figure (9).

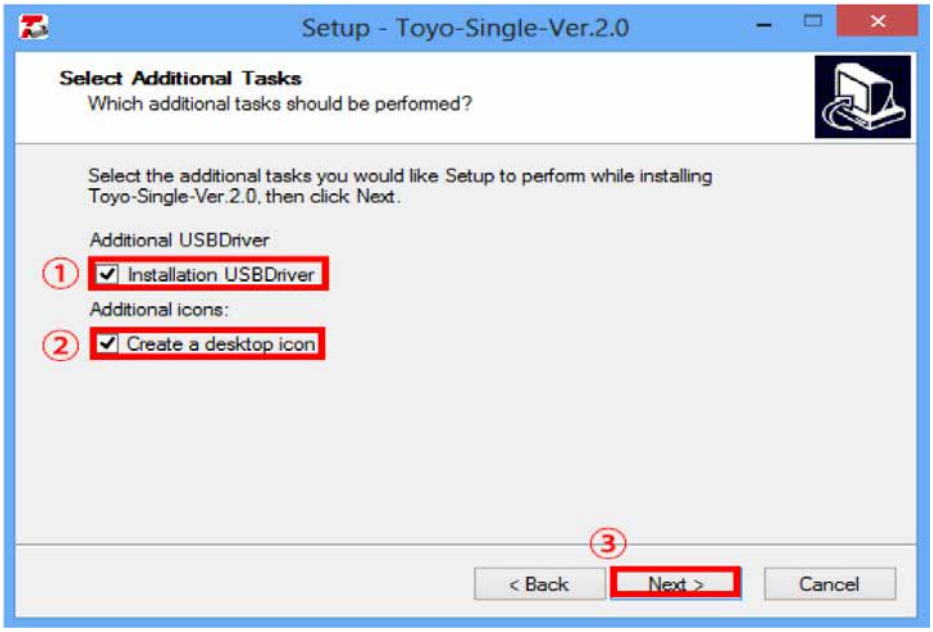


Figure (9) Screen of Creating a Desktop Shortcut

Enter the confirmation installation screen and press [Installation] to proceed after confirming the installation information, as shown in Figure (10).

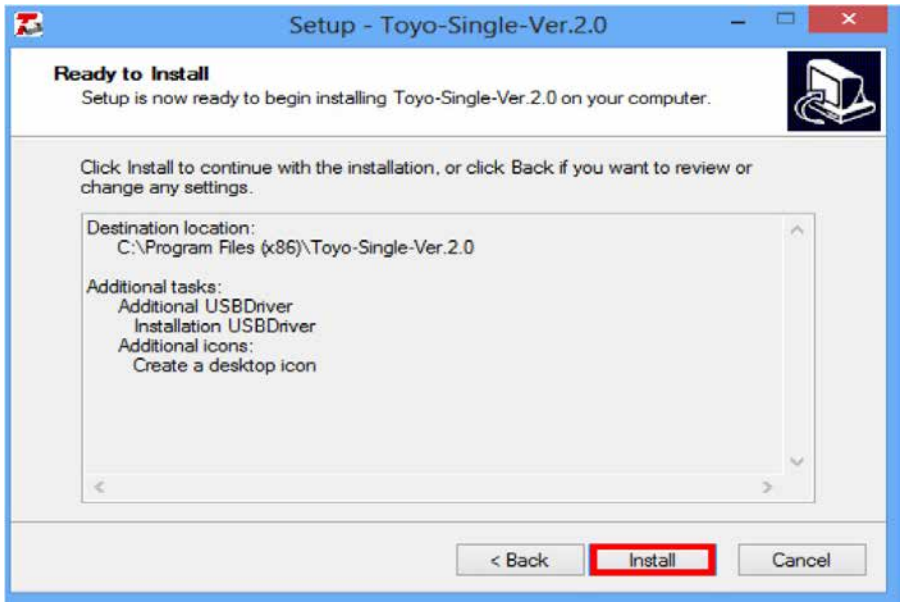


Figure (10) Screen of Installation Confirmation Enter the screen of installation completion.

If you need Toyo-Single software to be opened automatically after completing the installation, please check [Execute Toyo-Single], otherwise uncheck.
Finally, Press the "Finish" button to end the installation program, as shown in Figure (11).

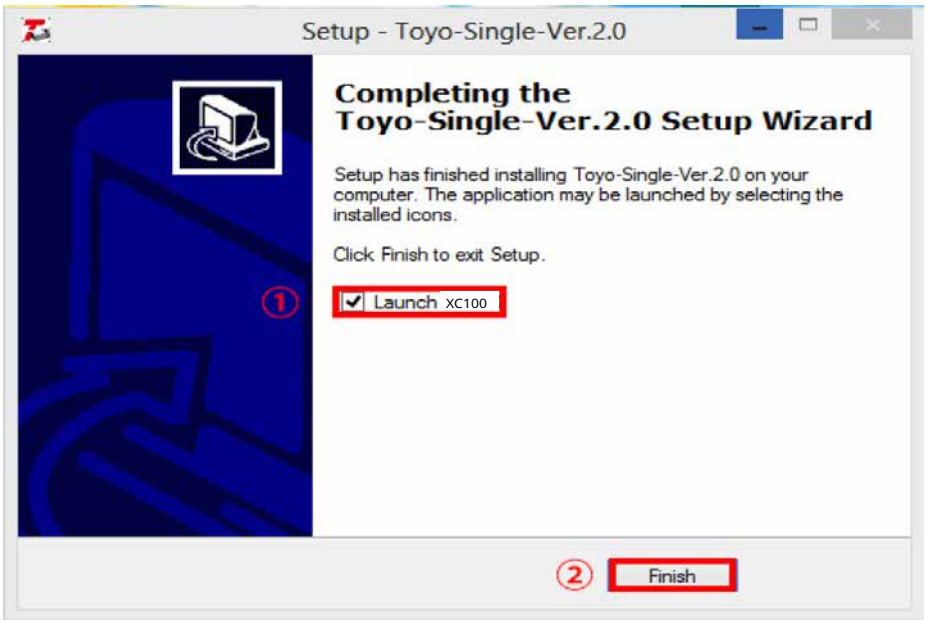


Figure (11) Screen of Installation Completion

③ **USBDriver-FTDI**

How to install the driver FTDI will be introduced in this chapter. Press [Extract] after entering the screen of installation, as shown in Figure (12).

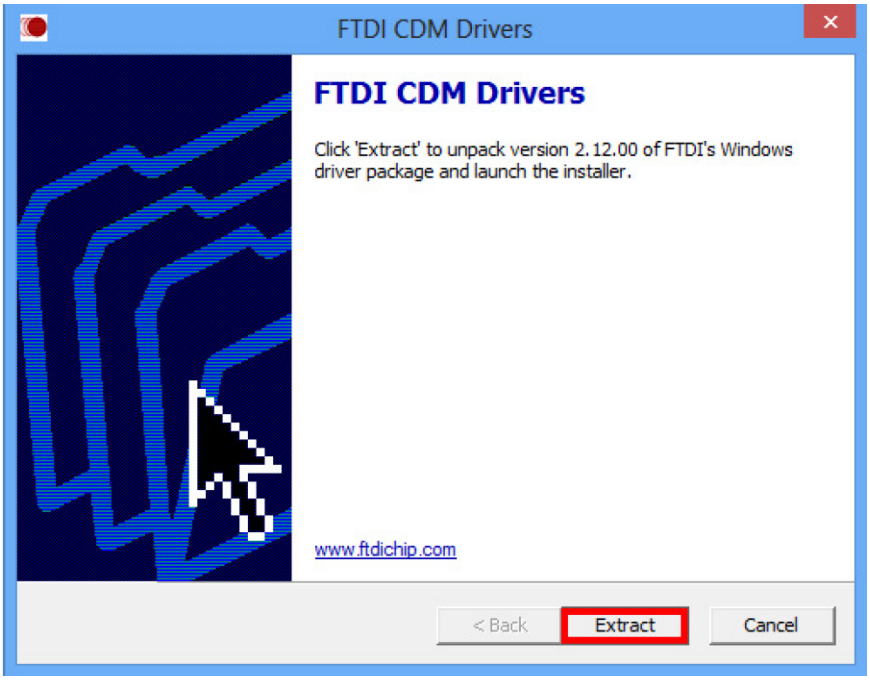


Figure (12) Screen of Entering the Program

Please press [Next Step] after entering the install wizard of the driver, as shown in Figure (13).

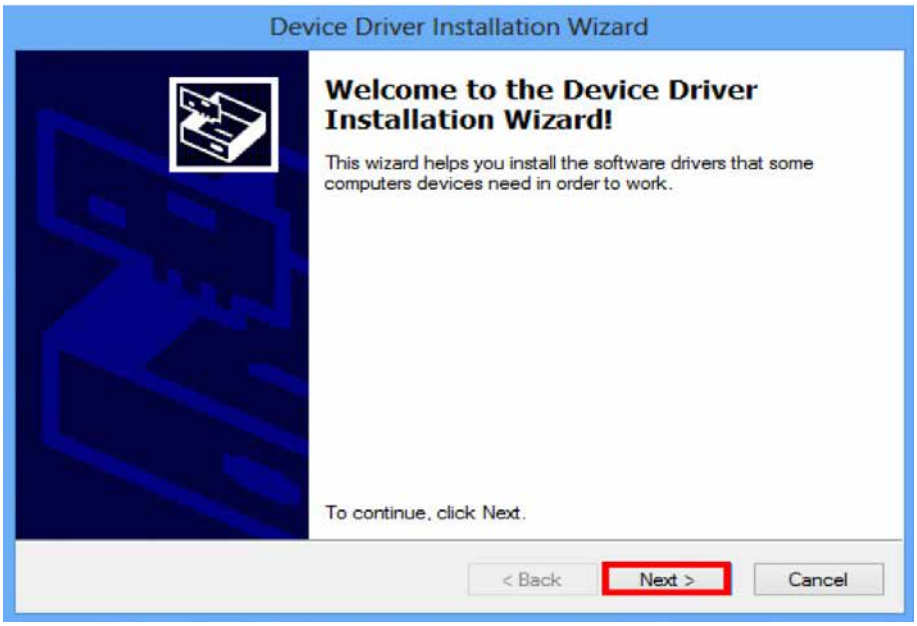


Figure (13) Install Wizard

After entering the screen of license agreement, please read the contract carefully, then tick "I accept this contract" and press "Next ", as shown in Figure (14).

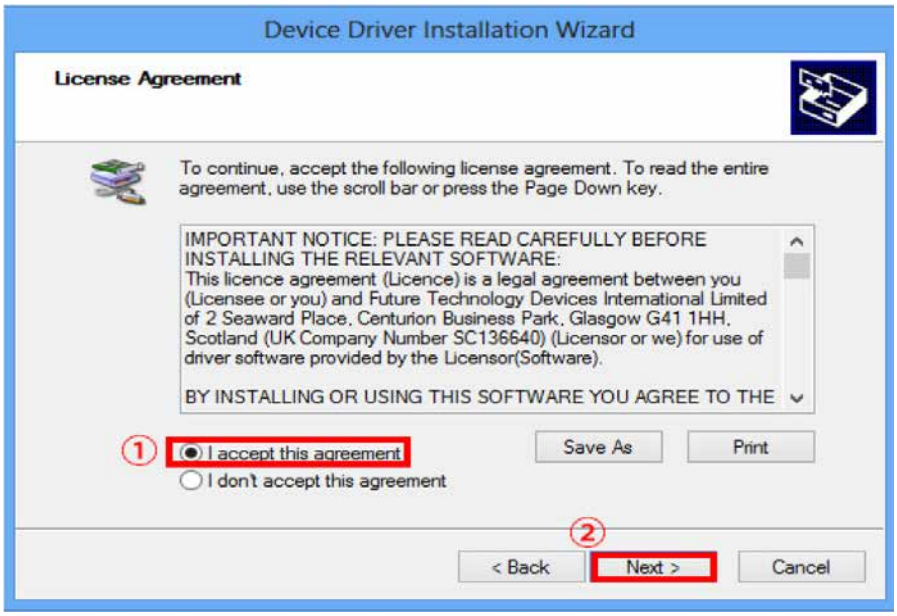


Figure (14) Licensing Screen Finally

after confirming status of the installer, press [Finish] to end the installation procedure as shown in Figure (15).

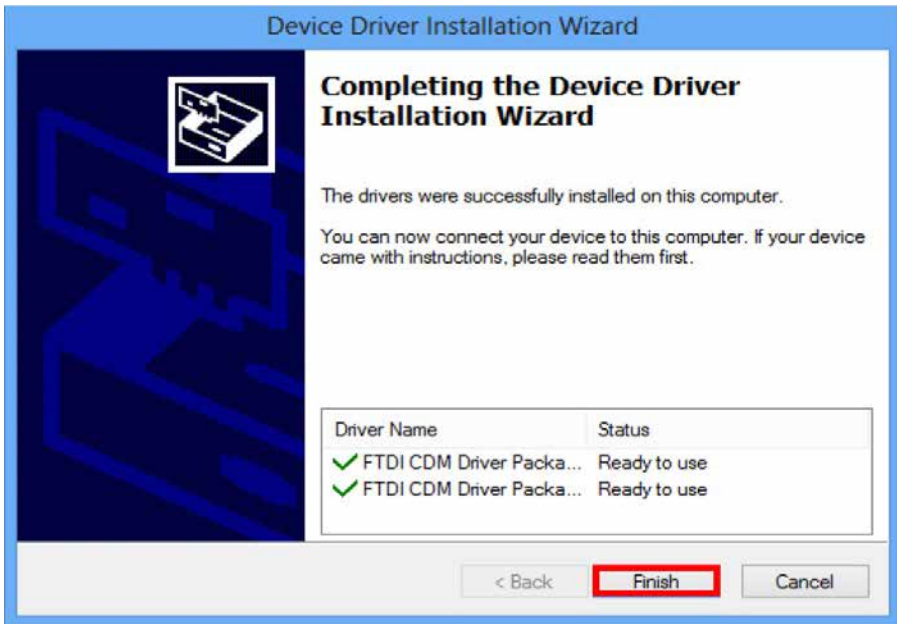


Figure (15) Screen of Installation Completion

2、Removal

In this chapter, how to remove the software Toyo-Single will be described. You may enter the screen of [Program Uninstall or Change] by the path of [Console] -> [Assembly] ->[Uninstall Program] to select [Toyo-Single] for removal, as shown in Figure (16).

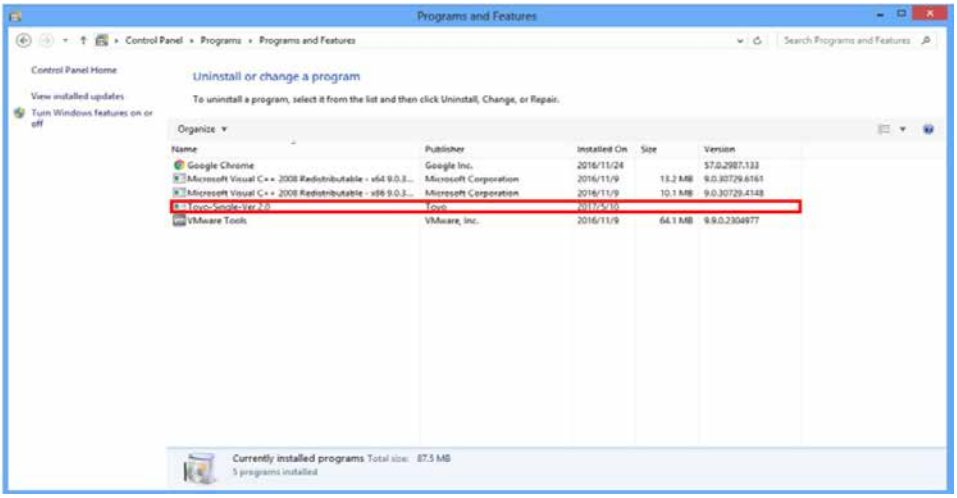


Figure (16) Screen of Uninstalling or Changing the Program

After opening the screen of removal, the system will ask if you want to delete the software. If so, select [Yes], otherwise select [No], as shown in Figure (17).

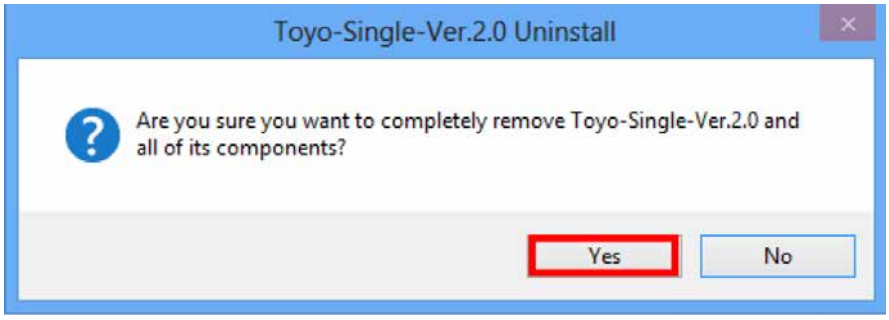


Figure (17) After the software is removed

press "OK" to complete the removal, as shown in Figure (18).

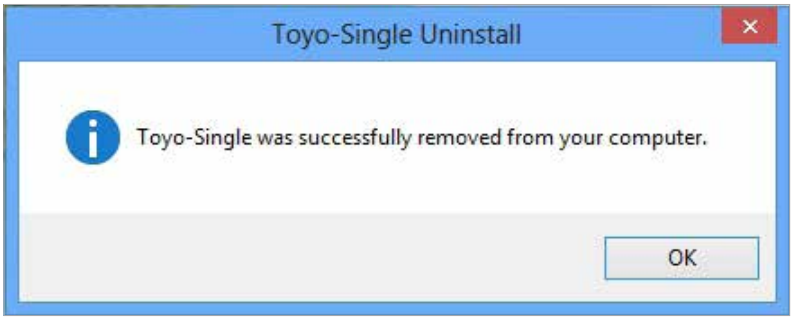


Figure (18) Screen of Successful Removal

9.3 TOYO-Single Interface Description

1、Initial Screen

This chapter will introduce the basic connection screen according to different functions, as shown in Figure (1).

▼ **Basic Connection Screen**

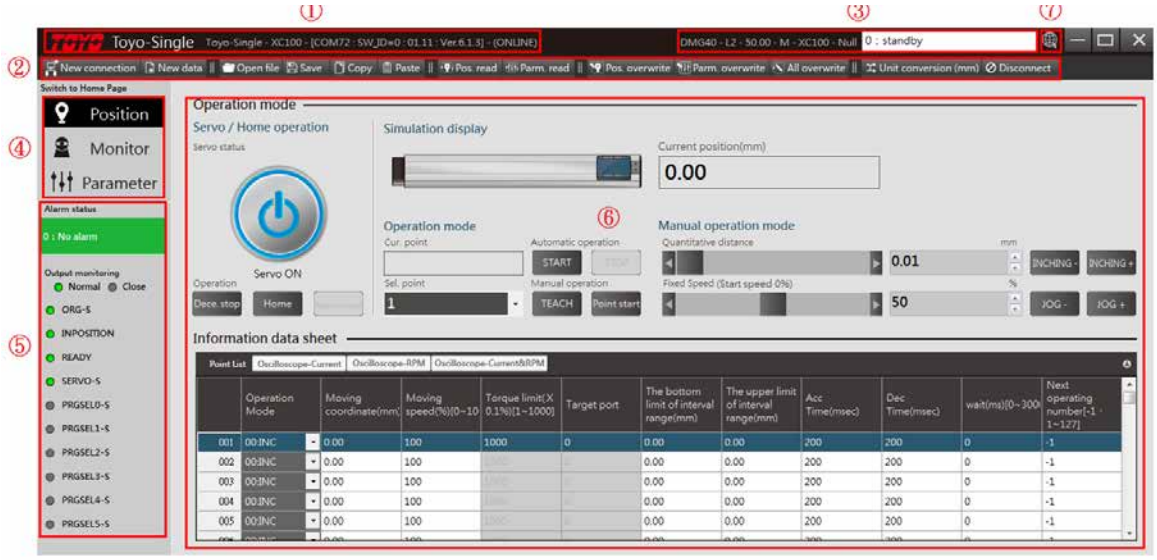


Figure (1) Initial Screen of the System

① **Basic Status Bar**

Showing current basic state of the system involving [Software Name], [Controller Name], [COM], [SW_ID], [Firmwave Version (Firmware)],
[Software Version] and [Connection State] from left to right, as indicated in Figure (2).

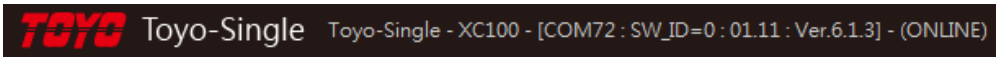


Figure (2) Bar of Basic State

② **Tool Bar**

This section provides the basic system functions, as shown in Figure (3). Specific functions are described as follows:

1. New Connection: The system can be connected via this function. Existing value of point position and parameters in the controller will be loaded when the system is connected and the system operation can be carried out after the system is connected.
2. New data: this function can be used to add new data for a single machine and the file content can be exported for subsequent writing after the new data is added.
3. Open: a file saved previously can be loaded for your editing.
4. Save: this function can be used to store the file content in current page. The file that can be stored in this system includes point position file (.prg) and parameter file (.par).
A point position file can be saved by pressing [Save] in [Screen of Point Position] and a parameter file can be saved by pressing [Save] in [Screen of Parameters].
5. Copy :can be used to copy a column selected or multiple columns from point position data columns and the shortcut key Ctrl+C also can be used for this function.
6. Paste : You can paste a copied column into a point position data file or use the shortcut key Ctrl+V for this function.
7. Point Reading: You can perform this function to read the point position value in the controller currently into the point position data column.
8. Parameter Reading: this function can be performed to read the parameter values in the controller currently to the parameter page.
9. Point Writing : Any modified point position value in current point position data columns or all point position values can be written into the controller with this function.
10. Parameter Writing : any parameter value modified on current page or all parameter values can be written into the controller with this function.
11. All Writing : any parameter value modified on current page and all point position data can be written into the controller with this function.
12. Unit Conversion : This function can be used to convert to the units including mm, Pulse and mil.
13. Connection Termination: Current system connected can be terminated with this function.

Figure (3) Tool Bar

③ **Other Status Bars**

Current other states of the system are displayed in this section of which the right side shows current operation mode and the left side shows current model and specification. States including [Model], [Lead], [Travel Distance], [Motor Direction], [Controller Name] and [Special Codes] are listed from the left to the right side, as shown in Figure (4). ◦

Figure (4) Bar of Other Statuses

④ **Function Page**

Three system functions are provided in this section for page switching as shown in Figure (5) . And specific functions are described individually below:

1. Point Position: control and editing of point position are available through the software on this page; detailed descriptions will be provided in the following sections for this feature.
2. Monitoring: values related to the controller can be read on this page so as to monitor existing values. In the following chapters, this function will be described in detail.
3. Parameters: you can browse current parameters related to the controller and edit the parameters in this page. The following sections will give specific descriptions for this function.

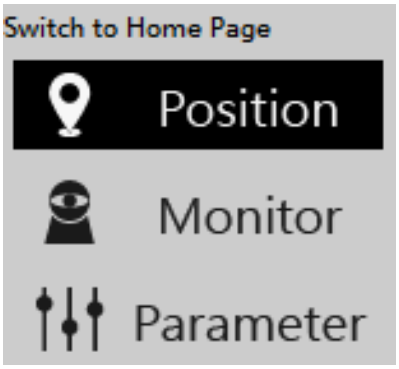


Figure (5) Function Page

⑤ Output Monitoring

Feedback data for the controller is provided in this section as shown in Figure (6).

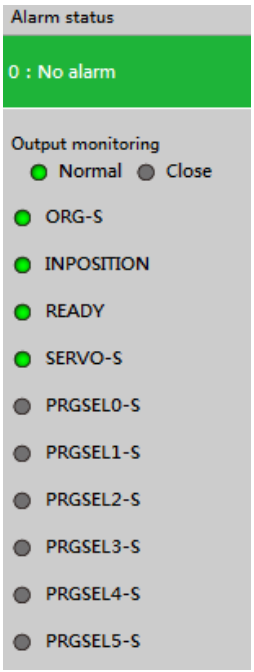


Figure (6) Output Monitoring

⑥ Main Operating Area

A user can conduct real-time operation, edit parameters and values of point positions and monitor feedback data of the controller and so on in this area, as indicated in Figure (7).

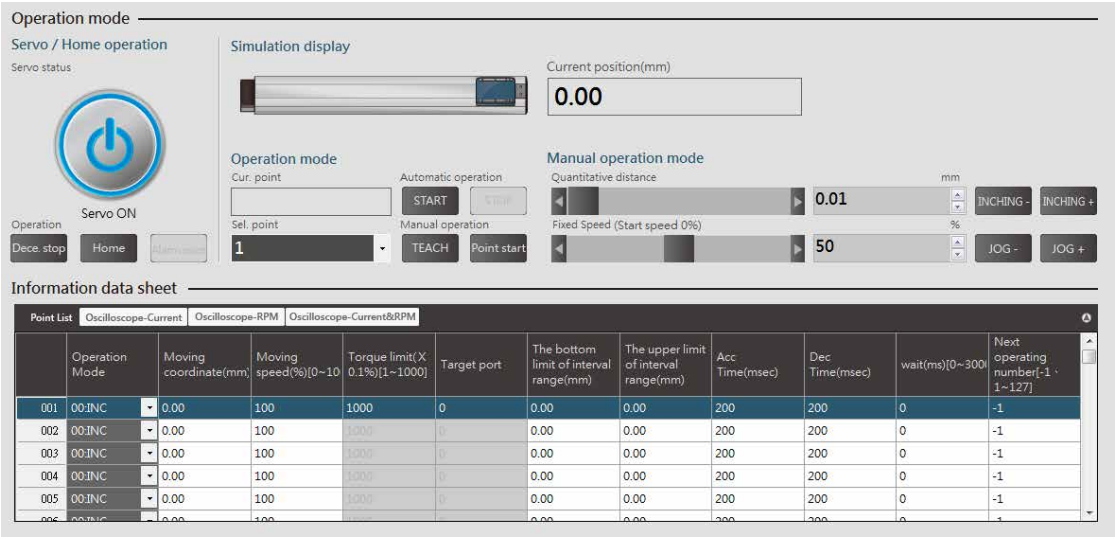


Figure (7) Main Operating Area

⑦ Hyperlink of the Official Website

Providing a link to the official website of TOYO to the users so that they may acquire the latest product information of the company.

Figure (8) Hyperlink Button

2、Description of Point Position Page

The main purpose of point position page is teach of point position as shown in Figure (9).

In order to facilitate the users to complete the operation quickly, this system has been set with different operation modes including [Servo/ Origin Operation], [Operation Mode] and [Manual Mode]; moreover the function of point position editing and oscilloscope switching are available at the lower side.

In stand-alone mode, this page displays only a point position form for user's editing.

▼ Screen of Point Position Teach at Sliding Table

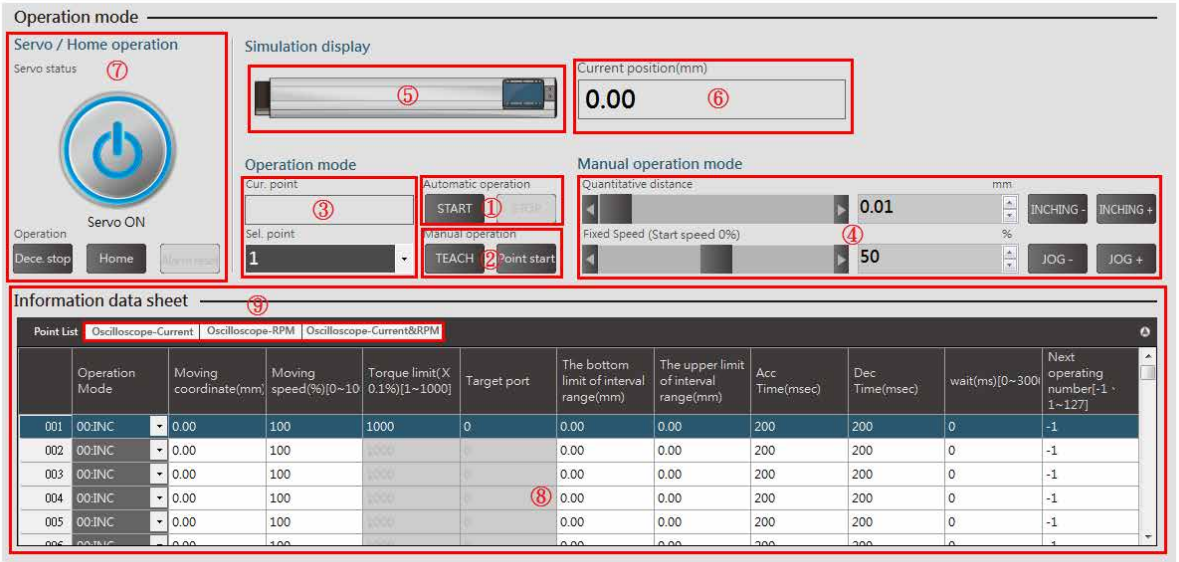


Figure (9) Page of Point Position

① Automatic Operation

Automatic operation of this function is available according to the operation mode of a point position in the form for point position selection currently as indicatd in Figure (10).

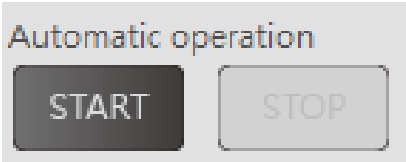


Figure (10) Automatic Operation

② Manual Operation

In this screen, [TEACH] and [Point START] of a point position selected currently can be performed. The Point START function is only for [Moving Coordinates] and [Moving Speed] in a single point operation mode as shown in Figure (11).

Figure (11) Manual Operation

③ **Executing Point Position**

This feature can be used to display and select point position currently executed as indicated in Figure (12).

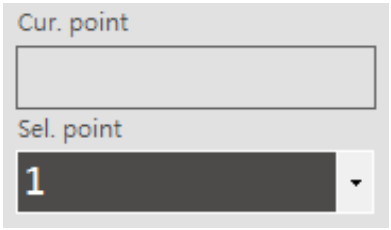


Figure (12) Execution of Point Position

④ **Manual Operation**

The feature can be used for common manual operation of the users, as indicated in Figure (13).

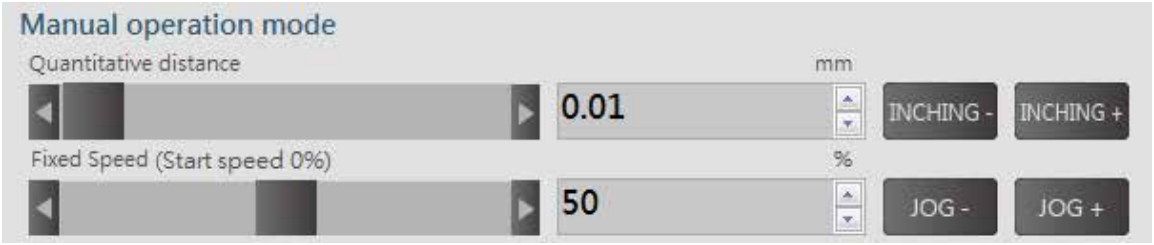


Figure (13) Manual Operation

⑤ **Simulation Display**

With this function, current actual position of the sliding table can be simulated and manual movement of the sliding seat for operation is possible as shown in Figure (14).

Figure (14) Simulation Display

⑥ **Current Position**

This feature can be used to indicate the position information of the feedback sliding table of the controller at present, as shown in Figure (15).

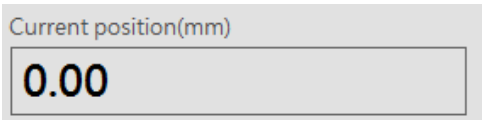


Figure (15) Current Position

⑦ Servo/ Origin Operation

This function can be used for SERVO ON/OFF, deceleration stop, origin reset, alarm reset and so on, as shown in Figure (16).

Figure (16) Servo/ Origin Operation

⑧ Form of Point Position

Displays information about existing 127 point positions in TOYO-Single, as shown in Figure (17).

The operation mode of the uniaxial system consists of seven kinds: INC, ABS, ORG, +TSL, -TSL, INC-R and ABS-R ; and the operation mode of clamping system is classified into 6 kinds: INC-T, ABS-T, CLOSE, CLOSE-R, OPEN and OPEN-R ; among whichfor the operational conditions of ORG, +TSL, -TSL, CLOSE, CLOSE-R, OPEN and OPEN-R, the items in gray cannot be used as reference, but for those of INC, ABS, INC-R, ABS-R, INC-T and ABS-T all items should be used as the reference; so please note this during setting.

	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

Figure (17) Form of Point Position

⑨ Oscillometer

This function runs with START and STOP under IO control as indicated in Figure (18).

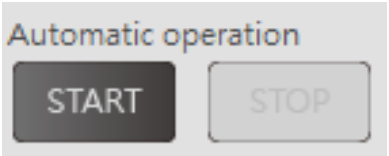


Figure (18) Automatic Operation

The record start and stop record buttons are displayed under PULSE control, as shown in Figure (19).

Figure (19) Record Start/ Record Stop

This function includes three displays:
The first kind shows the current value recorded in one minute while the motor is running, as indicated in Figure (20).
The second kind shows the number of turns recorded in one minute while the motor is running, as suggested in Figure (21).
The third kind shows current value and number of turns recorded in one minute when the motor is running, as shown in Figure (22).
If the chart needs to be enlarged for display, you can drag horizontally the interval range of the required section directly on the chart; if you need to restore size of the chart, click the button at the lower left corner as shown in Figure (23).

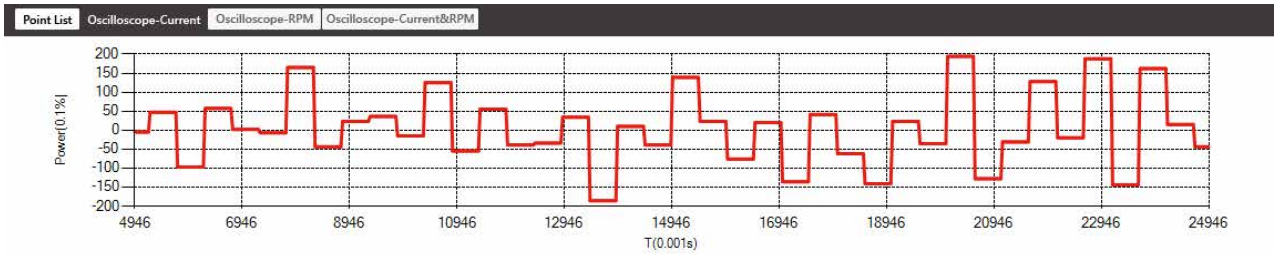


Figure (20) Oscilloscope-Current

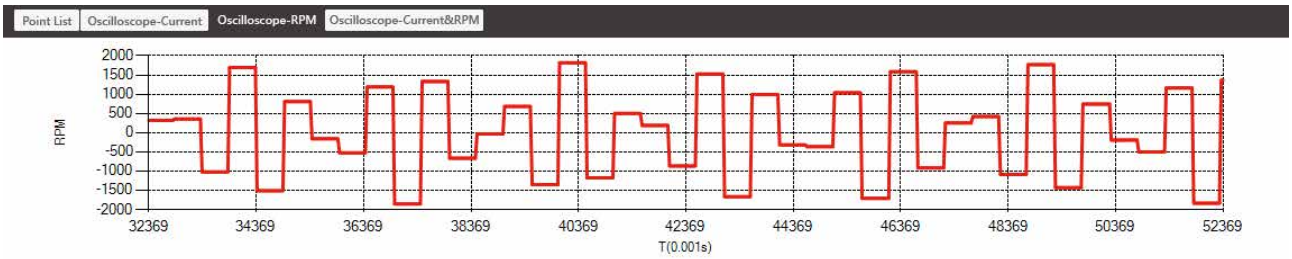


Figure (21) Oscilloscope-RPM

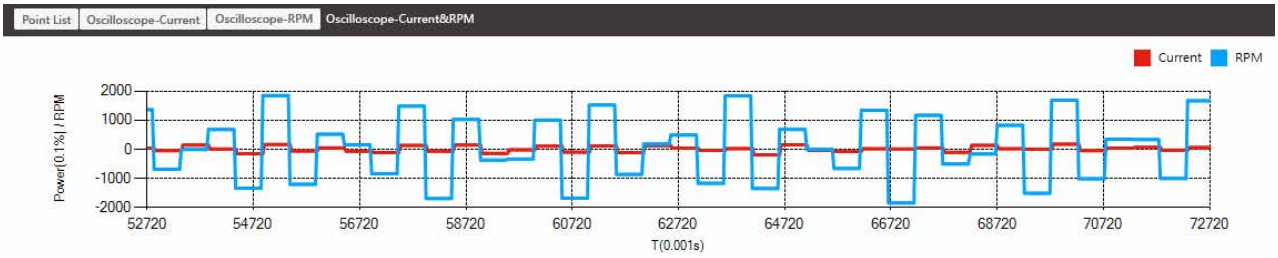


Figure (22) Oscilloscope-Current&RPM

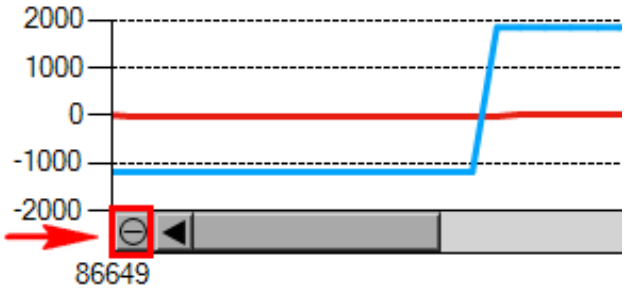


Figure (23) Button of Chart Restoration

3. Monitoring Page Description

Main purpose of the monitoring page is to monitor the relevant information fed back to the sliding table by the controller at present, conduct the point position operation by using of the input monitoring and read error messages and so on, as shown in Figure (24).

▼ Monitoring Page

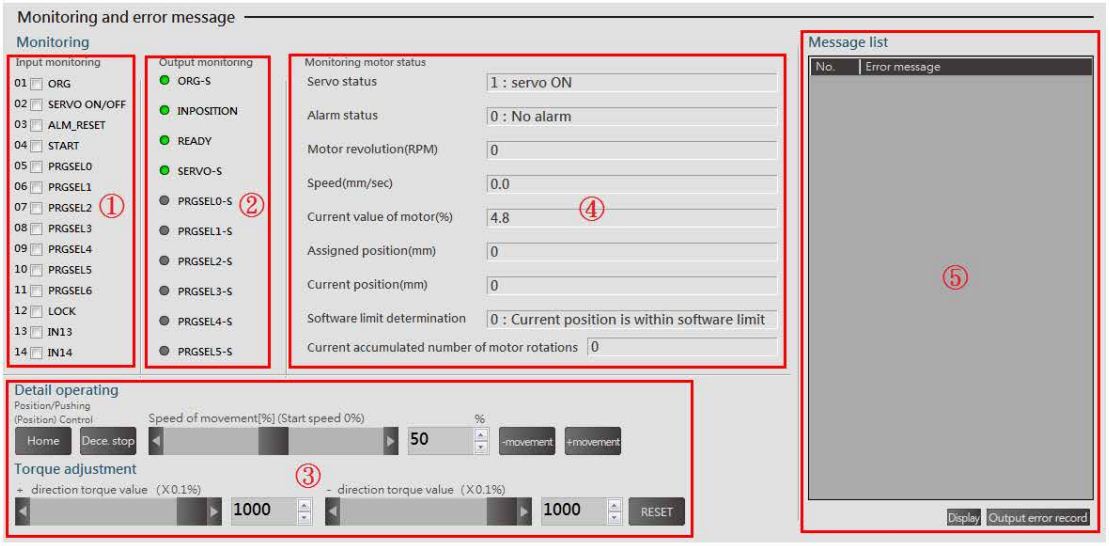


Figure (24) Monitoring Page

① **Input Monitoring**

In this section, relevant display of input signals of the controller can be monitored. Signal lights will light up when different communication modes are used and corresponding functions can be triggered by ticking relevant items for operation as shown in Figure (25).

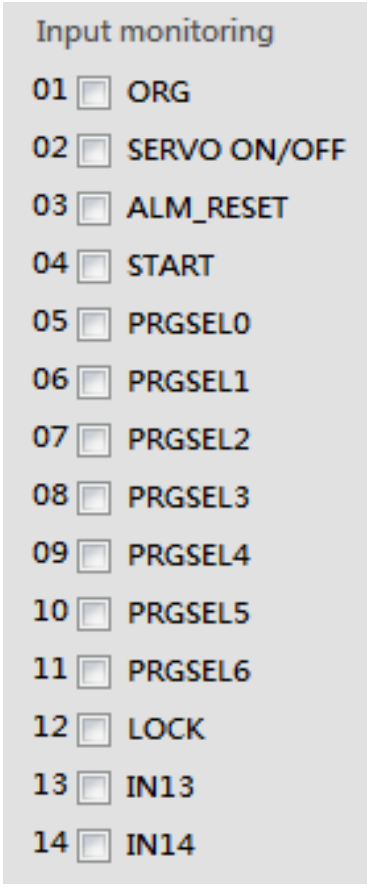


Figure (25) Input Monitoring

② **Output Monitoring**

In this section, relevant display of output signals of the controller can be monitored. Signal lights will light up when different communication modes are used as indicated in Figure (26).

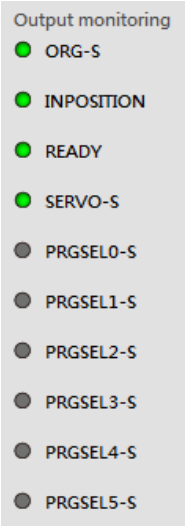


Figure (26) Output Monitoring

③ **Detailed Operation/ Torque Adjustment**

In this section, functions including position/ push (position) control and torque value adjustment etc. can be performed as indicated in Figure (27).

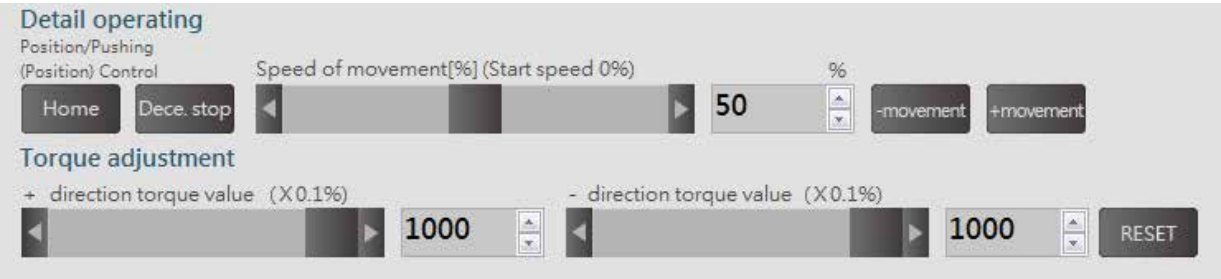


Figure (27) Detailed Operation/ Torque Value Adjustment

④ **Motor State Monitoring**

Relevant information of the current controller feedback sliding table, as indicated in Figure (28).

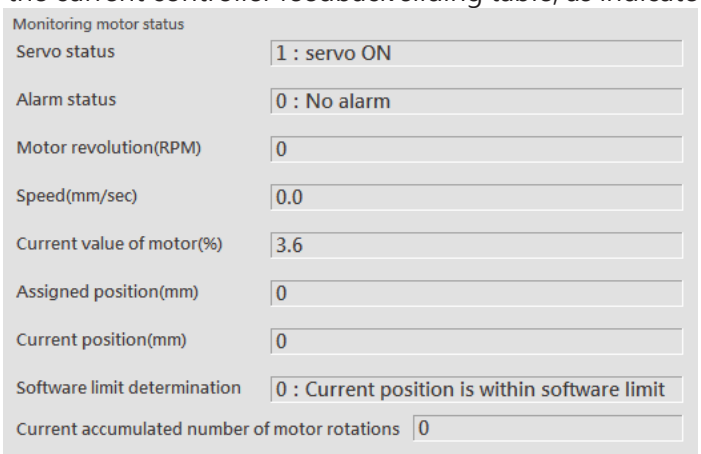


Figure (28) Motor State Monitoring

⑤ **Error Message List**

In this section, the error message recorded by the controller during operation error can be queried as shown in Figure (29).

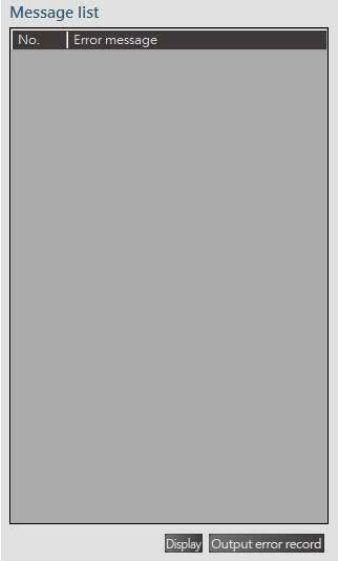


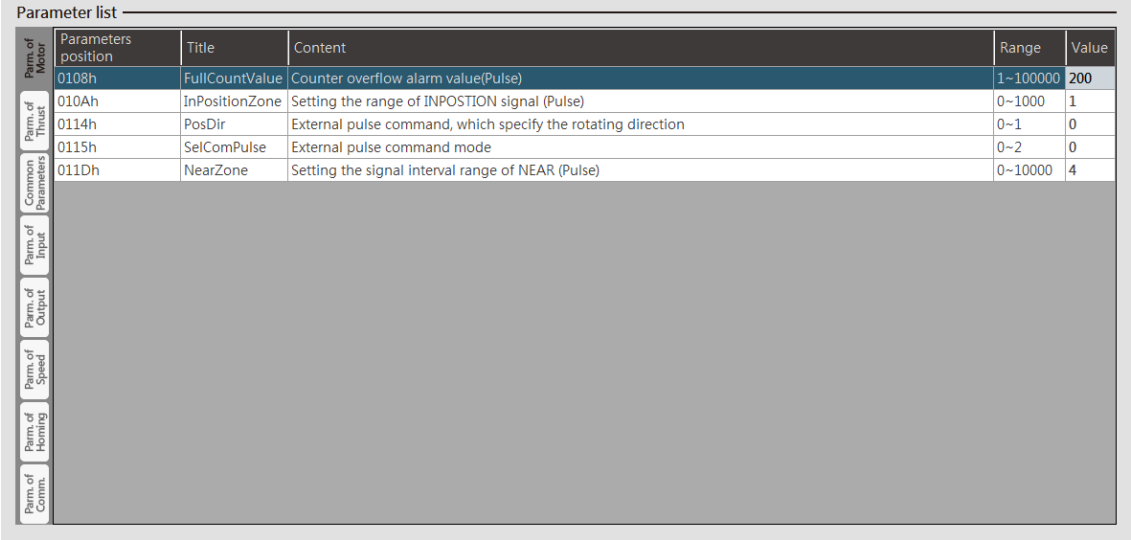
Figure (29) Error Message List

4. Description of Parameter Page

The main purpose of the parameters page is to display the parameters related to setting the controller, as shown in Figure (30).

This page is composed of eight parameters: [motor parameters], [thrust parameters], [common parameters], [input settings], [output settings], [speed parameters], [origin parameters] and [communication parameters], to allow the users to do the settings.

▼ **Parameter Page**



Parameters position	Title	Content	Range	Value
0108h	FullCountValue	Counter overflow alarm value(Pulse)	1~100000	200
010Ah	InPositionZone	Setting the range of INPOSTION signal (Pulse)	0~1000	1
0114h	PosDir	External pulse command, which specify the rotating direction	0~1	0
0115h	SelComPulse	External pulse command mode	0~2	0
011Dh	NearZone	Setting the signal interval range of NEAR (Pulse)	0~10000	4

Figure (30) Parameter Page

9.4 Software Operating Instructions of Uniaxial System

1、Connection of the Controller

This section describes how to make this software connection with the controller.
At first, open TOYO-Single as indicated in Figure (31).

Figure (31) Software TOYO-Single

After entering the welcome page, you can set the system, as shown in Figure (32). Specific function are described as follows. After confirming that the settings are complete, please select the corresponding system.

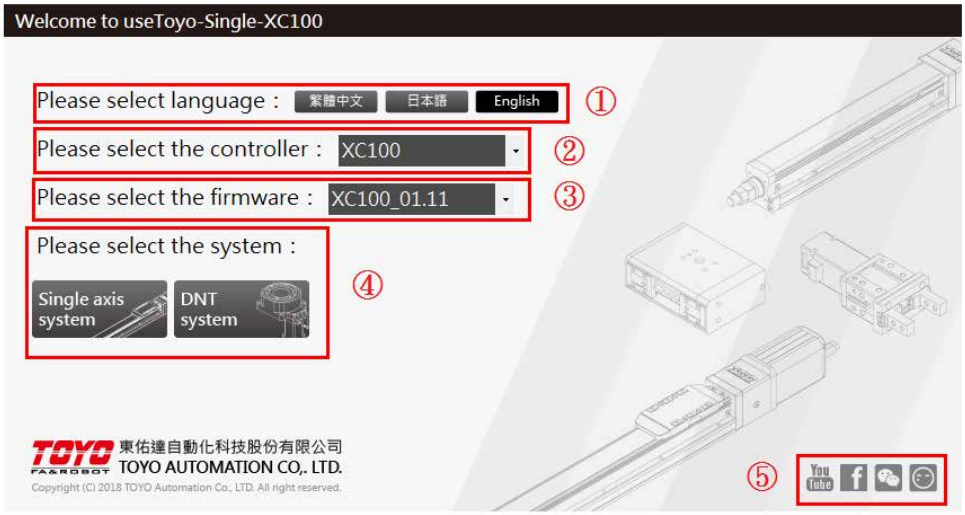


Figure (32) Welcome Page

① Language Selection
The user may change the language.
② Controller Selection
The user may select the controller.
③ Version Selection
The user can select the firmware version corresponding to the controller.
④ System Selection
The user can select the system.
⑤ Company Information
Links to relevant information of our company are provided here.

After entering the system, please select the [New Connection] button on the toolbar, as shown in Figure (33).

Figure (33) Button of New Connection

Set information including relevant station no., Com Port and connection baud rate as indicated in Figure (34). In addition, button [RES] can be used to reorganize com port for connection of the computer, and button [Search] at the lower side can be used to automatically determine whether there is any connection available. After confirming that it is connected, please press the button of [Executing Connection].

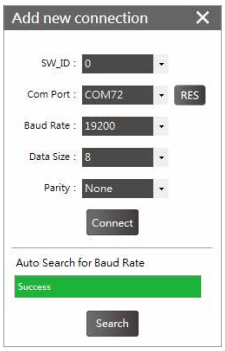


Figure (34) Setting of New Connection

Confirmation on information about controller connection as shown in Figure (35).. Please press [Confirm] to read value of point position and parameters relevant.

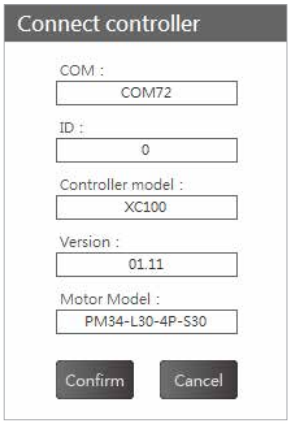


Figure (35) Information about Controller Connection

After the point position value and parameters are read, you will enter the initial screen of the system as shown in Figure (36).

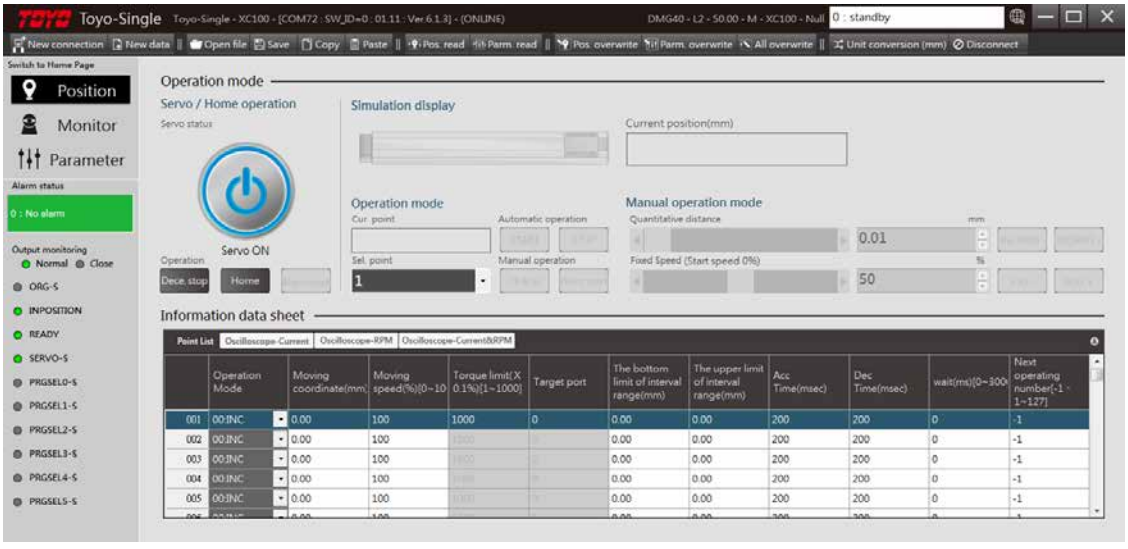


Figure (36) System Initial Screen

2、Origin Reset

If the sliding table has not returned to the original state before operation, the ORG-S signal light will go off. In this case, the action of origin reset must be performed. The following part will explain how to operate.

If the left ORG-S signal light is not on, the action of origin reset must be performed. Please press the button of origin reset as shown in Figure (37).

(a) ORG-S Signal Light (b) Button of Origin Reset
Figure (37) Operation of Origin Reset

A message is displayed when the origin reset is complete as indicated in Figure (38).

Figure (38) Message of Completion of Origin Reset

System screen after the completion is shown in Figure (39).

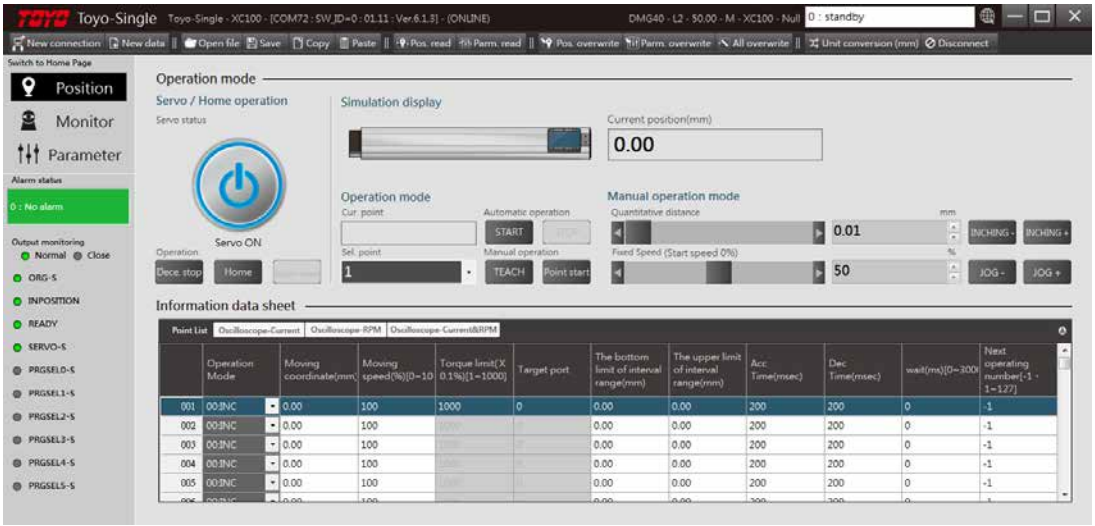


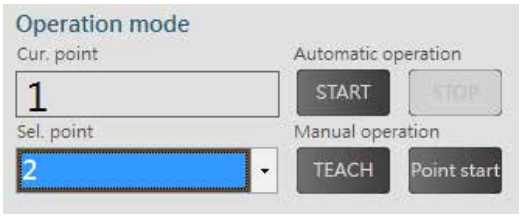
Figure (39) System Screen after Completion

3、Movement of Point Position

Point movement can be divided into automatic operation and manual operation. In automatic operation, movement of multiple points is available according to arrangement of the point position selected. In manual operation, single point movement is available according to the point position selected. The following part will explain how to operate.

There are two ways to select point positions: the first one is to pull the scroll bar to select, as indicated in Figure (40).

The second one is to directly click the form of point position for selection, as shown in Figure (41).



(40) Pull the Scroll Bar for Selection

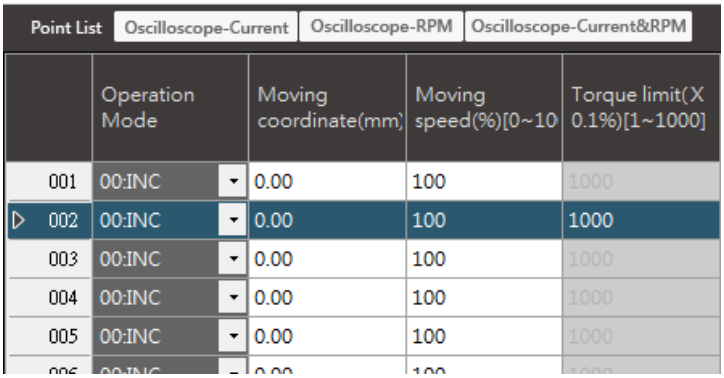


Figure (41) Selection on the Form

Next [Automatic Operation] can be conducted Please press [START] as shown in Figure (42) to start automatic operation of point position

Figure (42) Button of START

Please press [STOP] as indicated in Figure (43) to end the operation.

Figure (43) STOP

If you want to perform [Manual Operation], please click button of [Point Start] after selecting the point position, as shown in Fig. (44) to perform manual operation of the point position.

Figure (44) Button of Point START

4、Manual Movement

Movement through manual operation includes inch movement, micro movement and manual movement; the following sections will explain how to conduct the operation.

① Inch Movement

The distance to be moved can be set before inch movement, as shown in the Figure (45).

Figure (45) Quantifying Distance

Next inch movement can be conducted as indicated in Fig. (46) . Clicking the button can achieve the movement as per the value set by the quantified distance.

Figure (46) Button of Inch Movement

② Micro Movement

The speed required for the movement can be set before micro movement, as shown in Figure (47).

Figure (47) Constant Speed

As shown in Fig. (48), clicking the button to achieve the movement according to the speed set with [Constant Speed].

Figure (48) Button of Micro Movement

③ Manual Movement

The speed required for the movement can be set before manual movement, as shown in Figure (49).

Figure (49) Constant Speed

Next the manual movement can be conducted. As shown in Fig. (50), the movement is conducted as per the speed set with [Constant Speed].

Figure (50) Manual Movement

5、Point Teach

After performing the manual movement, you can use the button of TEACH to conduct teach, which is described below. Firstly you need choose the point position to teach as indicated in Fig. (51).

Figure (51) Selection of Point Position

Next you need to press [TEACH] to conduct the operation as shown in Fig. (52).

Figure (52) Button of TEACH

The system will fill the movement coordinates of the selected point position according to current position value as shown in Figure (53) and the operation mode will be changed to [ABS], as shown in Figure (54).

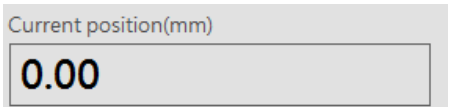


Figure (53) Current Position

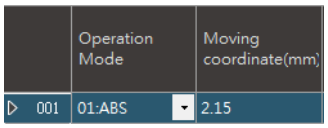


Figure (54) Completion of Teach

6、Add New Data

According to the user's product series, sliding table model, motor direction etc., the initial parameters can be set automatically with Add New Data, which is helpful to reduce the user's inconvenience in setting parameters. The section following will explain how to conduct the operation.

At first, click the button of [Add New Data] on the toolbar, as shown in Figure (55).

Figure (55) Button of New Data

The setting window of [Add New Data] will show up as Fig. (56) indicates.

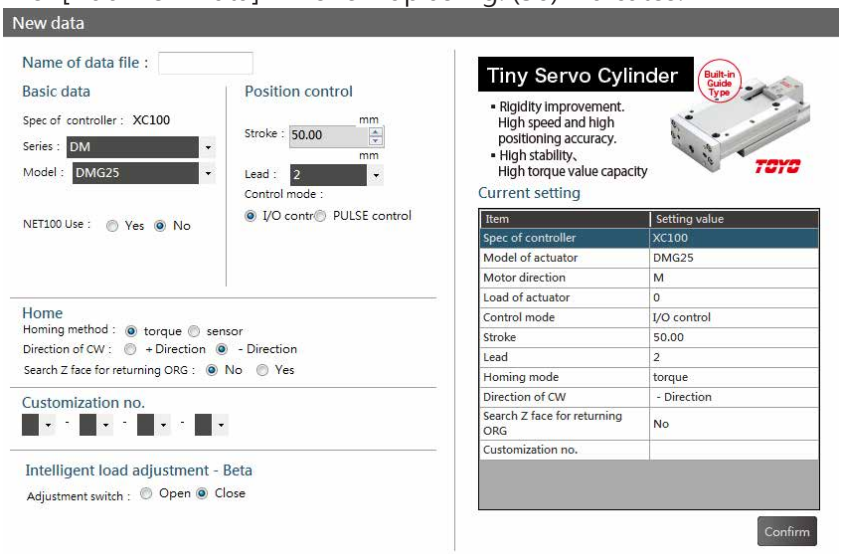


Figure (56) Setting Window of Add

New Data If the user needs PULSE control, the corresponding option can be checked, as shown in Fig. (57).

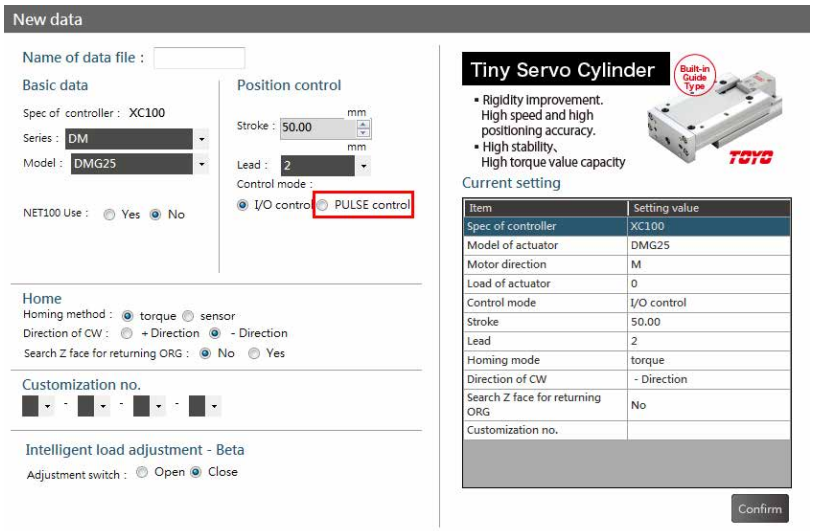


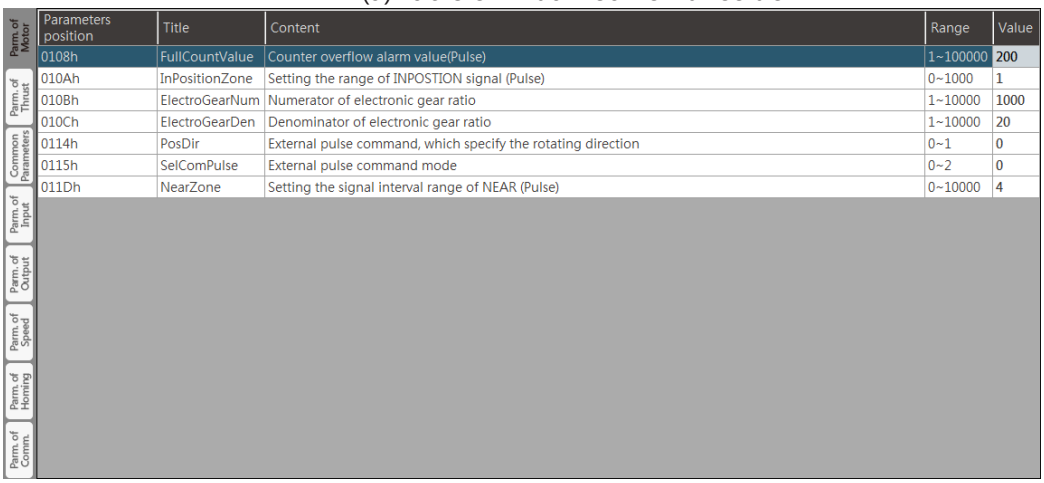
Figure (57) Options of PULSE Control

The user needs to set relevant initial data in this window to facilitate automatic generation of initialized parameter values. After the setting is completed, please press the button of [Confirm].
Then the system will automatically generate a table of initialized point positions and the initialized parameter values automatically generated according to the data set in the previous step, as shown in Figure (58).

Point List

	Operation Mode	Moving coordinate(mm)	Moving speed(%)[0~100]	Torque limit(X 0.1%)[1~1000]	The bottom limit of interval range(mm)	The upper limit of interval range(mm)	Acc Time(msec)	Dec Time(msec)	wait(ms)[0~3000(	Next operating number[-1、1~127]
001	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
002	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
003	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
004	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
005	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
006	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
007	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
008	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
009	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
010	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
011	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
012	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
013	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
014	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
015	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
016	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
017	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1
018	00:INC	0.00	100	1000	0.00	0.00	200	200	0	-1

(a) Table of Initialized Point Position



Perm. of Motor | Perm. of Thrust | Common Parameters | Perm. of Input | Perm. of Output | Perm. of Speed | Perm. of Homing | Perm. of Comm.

Parameters position	Title	Content	Range	Value
0108h	FullCountValue	Counter overflow alarm value(Pulse)	1~100000	200
010Ah	InPositionZone	Setting the range of INPOSTION signal (Pulse)	0~1000	1
010Bh	ElectroGearNum	Numerator of electronic gear ratio	1~10000	1000
010Ch	ElectroGearDen	Denominator of electronic gear ratio	1~10000	20
0114h	PosDir	External pulse command, which specify the rotating direction	0~1	0
0115h	SelComPulse	External pulse command mode	0~2	0
011Dh	NearZone	Setting the signal interval range of NEAR (Pulse)	0~10000	4

(b) Initialized Parameter Values
Figure (58) Initialized Values

If the parameter writing is to be performed after the parameter setting is completed, a message indicating inconsisent motor model may appear, as shown in Figure (59). This is because the system detects that the motor model of the new-added sliding table is not consistent with the motor model in current controller. Writing parameters may cause an incorrect operation. Therefore, you need to modify the sliding table model after confirmation. Press the button of [Confirm] to write motor data in; otherwise please select the button of [Cancel]

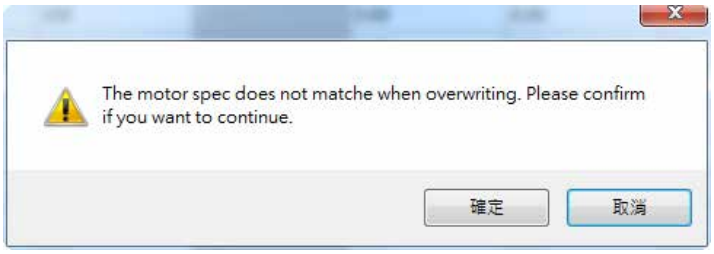


Figure (59) Message of Inconsistent Motor Model

Press "Confirm" to cut off and restart the power as the message displayed on the screen, as shown in Figure (60). Afterwards the system will continue to write.

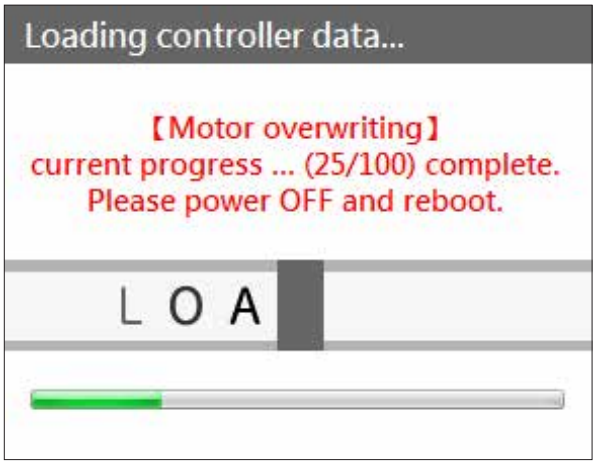


Figure (60) Message of Power Cutting-off & Restart

Next cut off and restart the power as the message displayed on the screen, as shown in Figure (61). Afterwards the system will continue to write.

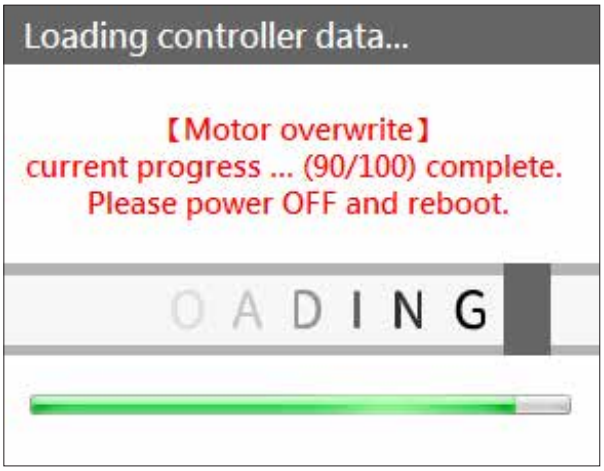


Figure (61) Message of Power Cutting-off & Restart

The system then shows a message to ask whether to write back the parameters, as shown in Figure (62). If you select [Yes], the system will write back all the parameters, and if not, please select [No].

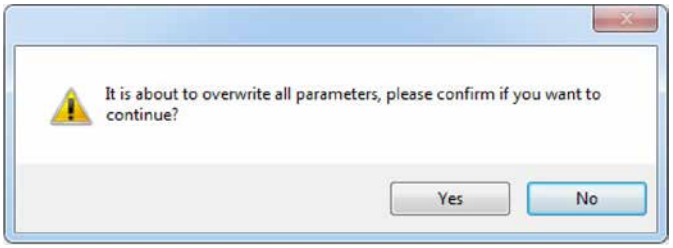


Figure (62) Confirmation on Parameter Writing-back

10. Appendix

10.1 Error Messages

■■ Controller LED Description

LED Name	Function Description	LED Color
PWR	The LED lights up when the main power supply and control power supply are switched on. When some parameters are written in, it will flash if the power supply needs to be reset.	Green
SON	The LED lights up when servo is ON normally.	Green
ERR	The LED lights up when XC100 is in an exceptional state.	Red
	The cause of fault can be judged according to the number of flashes.	
	The fault signal light flashes once every second in intervals of two seconds.	

10.2 Alarm Dismissal

Fault	Alarm Status	Cause	Check/ Solution
1	Loop error	The load is excessive.	Please reduce the load.
		Motor speed is inconsistent with frequency of the command pulse.	Please set the maximum frequency of the command pulse below the maximum rated rotary speed of the motor.
		A motor wire is broken.	Please check wires of the motor.
2	Full Count	Overload.	Please extend the time for .
		Motor speed is inconsistent with frequency of the command pulse.	Please set the maximum frequency of the command pulse below the.
		A motor wire is broken.	Please check wires of the motor.
3	Overspeed	Motor speed is too fast.	Please set the maximum frequency of the command pulse below the maximum rated rotary speed of the motor.
4	Poor gain adjustment	Abnormal vibration of motor due to poor adjustment.	Rest the gain.
		Input command pulse without acceleration/ deceleration.	Reset acceleration/ deceleration.
5	Overvoltage	Abnormal voltage rise of internal major loop due to retrogradation.	Please extend the time for acceleration/ deceleration.
			Reduce load inertia.
			Add a retrogradation resistor.
6	Abnormal Initialization	The electrical power is connected under the condition of overload.	Please reduce the load.
7	Abnormal EEPROM	EEPROM DATA is abnormal.	Please contact the manufacturer or dealer.
8	Power voltage of major circuit is not enough	Lower than power voltage of major circuit.	Please check whether capacity of the power supply is insufficient and it is

Fault	Alarm Status	Cause	Check/ Solution
9	Overcurrent	The motor coil shorted out.	Change the motor.
		Controller circuit is damaged.	Change the controller.
10	Abnormal Retrogradation	The absorption circuit inside the base plate has reached its extreme limit.	Add a retrogradation resistor.
11	Emergent Stop	The input signal of Emergent Stop is OFF.	Please check the emergent stop
12	Broken Motor Wire	A wire of Phase A or B of the motor is broken.	Please check wires of the motor.
13	Broken Encoder Wire	A wire of Phase A or B of the encoder is broken.	Please check encoder wiring.
14	Protective Current Value	Motor current exceeds the value set during the period set.	Overload or touch with other hardware of the device.
15	Action Overtime	Action can not finish within set time.	Check the mechanism or set an appropriate value.

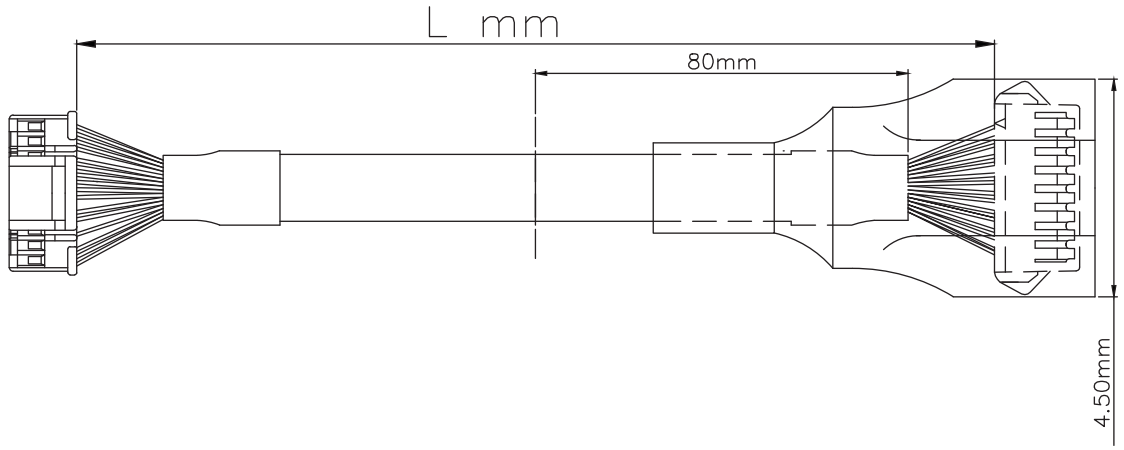
10.3 Troubleshooting

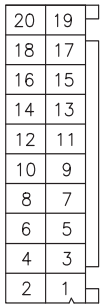
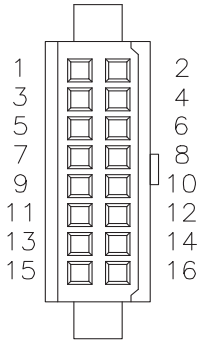
Error status	Cause	Solution
Receiving action instructions in action	· Executing movement commands or a program runs during operation · Set parameters with rewriting prohibition during operation · Program data set during program running	Please execute after stopping motor and program running
Error in upper/lower limit	An out-of-range value is set among the parameters	Please set the value within the range
Position error	When reading parameters continuously, the word limit is exceeded	Please communicate according to the word limit
Format error	When writing parameters, the word limit is exceeded	Please communicate according to the word limit
Control mode error	Execute actions of different control mode	Check the set value of parameter 0503H and input the status of setting "CONT_MODE" then execute
Power-off & Restart	Necessary parameters need to be rewritten after power is switched on again	Please turn on the control power again
Power coefficient detection is not completed	The action command is executed before initialization is finished (IO& Communication)	Please execute the action command after initialization is finished
Error in Servo ON/OFF	· Execute the action command with Servo OFF · Execute alarm reset with Servo ON	· Please execute the action command with Servo ON · Please reset the alarm (201E H - 6) with Servo OFF (2011 H - 1)
LOCK	· Please execute the action command with Signal Lock ON · SignalLOCK is ON during the action	Please execute the action command after turning Signal LOCK OFF
Software Limit	Current position will stop while reaching the software limit	Please execute the action within software limit
Insufficient write permission for parameters	Parameter writing is restricted by permissions	Please raise the parameter writing permission level
Origin reset is not completed	Execute an action command or program running when the origin reset is not completed	Perform origin reset or set 0 in OrgRetRestrict (051B H) to remove the action restriction
Brake released	Brake release command under effective status and execute servo ON/OFF	Disable the brake release command

10.4 Cable Material

XC100 Motor Cable Set			
Length	Model	Length (L1)	Unit
1 m	XC100-CAB-STA-01	940	mm
3 m	XC100-CAB-STA-03	2940	mm
5 m	XC100-CAB-STA-05	4940	mm
10 m	XC100-CAB-STA-10	9940	mm

■■ Motor Cable Set - controller side



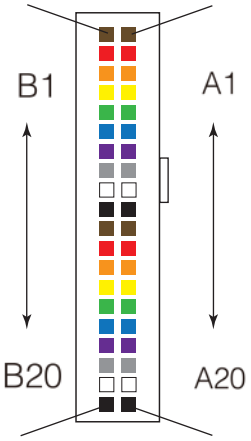
Controller side	Controller side PUDP-20V-S Description	Pin		PIN No. of connector of motor side
	1	W	Phase W of Motor	13
	2	E	Motor Ground Wire	
	3	V	Phase V of Motor	12
	4	-	-	
	5	U	Phase U of Motor	11
	6	-	-	
	7	SERVO	Servo Excitation State	8
	8	ERROR	Error State	9
	9	-	-	
Motor Side	10	DC 24V	Power 24V	
	11	BK+	Brake Power +	14
	12	BK-	Brake Power -	15
	13	A	Encoder A	1
	14	/A	Encoder /A	2
	15	B	Encoder B	3
	16	/B	Encoder /B	4
	17	Z	Encoder Z	5
	18	/Z	Encoder /Z	6
	19	DC 5V	Power 5V	7
	20	GND	Power Grounding	10

10.5 Data of Extended Module

Instructed Servo State	ON(Fixed)	OFF(Fixed)	OFF->ON->OFF	OFF->ON->OFF
I/O Servo State	OFF->ON->OFF	OFF->ON->OFF	ON(Fixed)	OFF(Fixed)
Actual Servo State of Controller	ON->ON->OFF	OFF->ON->OFF	ON->ON->ON	OFF->ON->OFF

10.6Definition and Function of Pins of IO Rainbow Flat Cable of Old Version

When connecting with computer and other communication equipments, please use the special cable.



CN-4 IOIO Pin Definition

NO	Signal Name	Description	Remark	NO	Signal Name	Description	Remark
A1/1	+COM	I/O Power +24V	DC24V ±10%	B1/21	-COM	I/O Power 0V	DC24V ±10%
A2/2				B2/22			
A3/3	PULSE1+	CW、B Phase 、PULSE	Dedicated Contact of Open	B3/23	H-PULSE1+	CW、B Phase、PULSE	Dedicated Contact of
A4/4	PULSE1-			B4/24	H-PULSE1-		
A5/5	PULSE2+	CCW、A Phase 、DIR		B5/25	H-PULSE2+	CCW、A Phase、DIR	
A6/6	PULSE2-			B6/26	H-PULSE2-		
A7/7	IN 1	ORG	Parameters : ORG_SIG MANUAL JOG+ JOG TEACH BK_OFF CONT_MODE FULL_COUNT	B7/27	OUT1	ORG-S	Parameters : ALARM MOVE PRGSEL6-S TRQLIM ERR0 : ERR3 INRANGE NEAR SOFTLMT
A8/8	IN 2	SERVO		B8/28	OUT2	INP	
A9/9	IN 3	ALM_RESET		B9/29	OUT3	READY	
A10/10	IN 4	START		B10/30	OUT4	SERVO-S	
A11/11	IN 5	PRGSEL0		B11/31	OUT5	PRGSEL0-S	
A12/12	IN 6	PRGSEL1		B12/32	OUT6	PRGSEL1-S	
A13/13	IN 7	PRGSEL3		B13/33	OUT7	PRGSEL3-S	
A14/14	IN 8	PRGSEL2		B14/34	OUT8	PRGSEL2-S	
A15/15	IN 9	PRGSEL4		B15/35	OUT9	PRGSEL4-S	
A16/16	IN 10	PRGSEL5		B16/36	OUT10	PRGSEL5-S	
A17/17	IN 11	PRGSEL6		B17/37	-	-	Reserved
A18/18	IN 12	Customizab		B18/38	-	-	
A19/19	IN 13	Customizab		B19/39	-	-	
A20/20	IN 14	Customizab		B20/40	-	-	

User's Manual

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