ROBOSTAR ROBOT

RCS-8000 Series

USER MANUAL

☑ RCS8000 MANUAL

☐ OPTION MANUAL

☐ UNI-HOST MANUAL

Robostar

www.robostar.co.kr

Robostar Co., Ltd

About Product Warranty

Products of Robostar Co., Ltd. are manufactured under the strict quality control. All the Robostar products' warranty period is one year from the date of manufacture. During this period, Robostar is only responsible for the mechanical failures due to negligence of Robostar, or the problems on design and manufacture occurring during normal use, in which the service is free of charge. However, the service is not free of charge service in the following cases:

(1) after the warranty period has expired
(2) failures arising due to improper repair, alteration, redeployment, or other mishandling, under the instruction of you or any third party
(3) failures as a result of using parts, grease, etc. which have not been designated by Robostar
(4) failures caused by accidents, such as fire, disaster, earthquake, storms, or other natural disasters
(5) failures caused in manure, flooding, or other environment
(6) failures caused by the consumption of consumable parts
(7) failures arising when not being operated under the instructions listed in the user or instruction manual and the maintenance manual
(8) damages in cost other than the cost of robot repairing

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For Safe Use

1. Safety for Robot (Generals)

Be sure to fully understand the manuals for safe use of this product. Each manual includes the following notations for subjects requiring carefulness necessary for the safe use of this product, and therefore carefully read the manual before using this product.

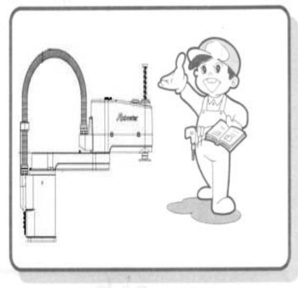
■ Safety Sings

Sign	Meaning
DANGER	This sign indicates that, if handled incorrectly, the serious life or property damage may be caused.
WARNING	This sign indicates that, if handled incorrectly, the product failure, malfunction or accident may arise.
CAUTION	This sign indicates that the product may malfunction or may not work due to incorrect use, and shows a matter requiring attention.
PROHIBITION	This sign shows the matter that is to be prohibited for normal use of the product. E.g.) Never use a fire.
Required	This sign shows the matter that must be performed for normal use of the product. E.g.) Compulsory ground is required.

Since this robot and robot controller are industrial equipments manufactured with advanced technology, please be sure to observe the following matters in order to prepare for accidents that may occur.

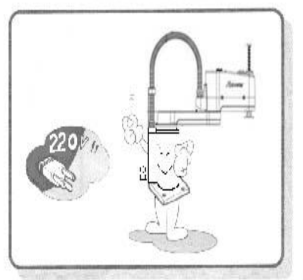
CAUTION

For safer and more efficient use, please operate the robot after reading all the documentations.



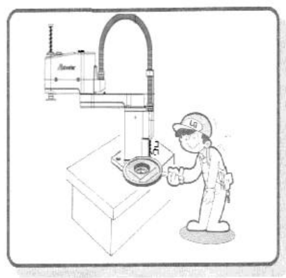
WARNING

All of the load and power must be used within the range of rated load and power spec.
In particular, make sure before use that the input power is AC 220V.



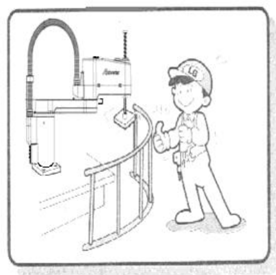
CAUTION

When installed, the robot must be securely fixed so as not to be shaken.



DANGER

For safe operation, a safety net must be installed around the robot.



CAUTION

Make sure to check the wirings of a controller before powering on it.
Due to the incorrect wirings, the machine may not work properly.

To prevent electrical shock, be sure to install FG. (Frame Ground)

DANGER

Be careful not to enter into the range of motion of a robot while the robot is operating or in the operable state.
Please note such subject even if the robot is in stationary state.

DANGER

If many people work at the same time, especially in powering ON/OFF and driving a motor manually, be sure to check the mutual safety before starting the work.

CAUTION

When in maintenance of the robot, be sure to unplug a power cord of the controller.

Constitution of User Manual

The user manual for this product is constituted as follows. When using this product first, please fully read all the manuals before use

- **RCS8000 MANUAL**
  - General contents on the controller are described. Outline, installation and interfacing method with external devices of the controller are explained.
  - Along with general method of using the controller, parameter setting, JOB program editing and the robot driving are explained.
    RRL (Robostar Robot Language), which is a robot program of Robostar and how to prepare the robot program by RRL are explained.
  - Gain setting method and responsibility according to change of gain value needed at the time of startup is explained.
  - Causes and actions for the alarm status which may occur during the controller operation are explained.

- **Option** MANUAL
  - Overall contents for CC-Link, Profibus and Device Net which are options of the controller are explained.

- **UNIHOST MANUAL**
  - 'Uni-host', which is an online PC program of Robostar is explained.

Contents

ch.1 FUNCTION AND CONFIGURATION

1.1 Summary

1) The single controller can construct the control system independently without other peripheral equipment because it is united with the single axis controller, AC servo drive and PLC function.

2) Besides the single operation function, the single controller can also operate the synchronous operation, the unlimited rotation operation, the determined position operation by external contact point.

3) Embedded PLC has contact point arithmetic, counter, and timer functions, enabling it to process several switch signals and sensors installed within the system.

4) This product is easily programmable due to the various program methods, and can respond to many kinds of AC servomotors according to digital control.

5) Enables remote operation by serial communication as well as Upload/Download of entered program and parameters.

6) Basic user I/O functions are user selectable through the contact point terminal.

7) Available for single and three-phase power source.
   (RCS-8008, 10, 15 : three-phase power source)

8) This product can be used for linear movements, rotations, conveyor systems, turret machines, and roll feeders.

1.2 Product Code

RCS SERIES

R	C	S	-	8	0	-	0	1	-	C	-	R	S	N	N	S

1-axis Controller
Single-axis Controller/Motor

Series
70: 7000 SERIES
80: 8000 SERIES

Motor Capacity/Motor
01 : 100W
02 : 200W
04 : 400W
05 : 500W
08 : 750W
10 : 1kW
15 : 1.5kW

Controller
C : CONTROLLER

Motor Specifications
R : Standard ROTARY MOTOR (8000 is excluded)/Battery
Z: INCREMENTAL ROTARY MOTOR
A : 17bit ABS MOTOR (Use of Battery)
I : 17bit INC MOTOR

Type Classification
S : Standard
L : LINE DRIVE Additional type (7000CA, 8000 are excluded)
D DEADMAN(Classified only in 7000CR, and 7000CAI, 8000 expected to be basically built in)

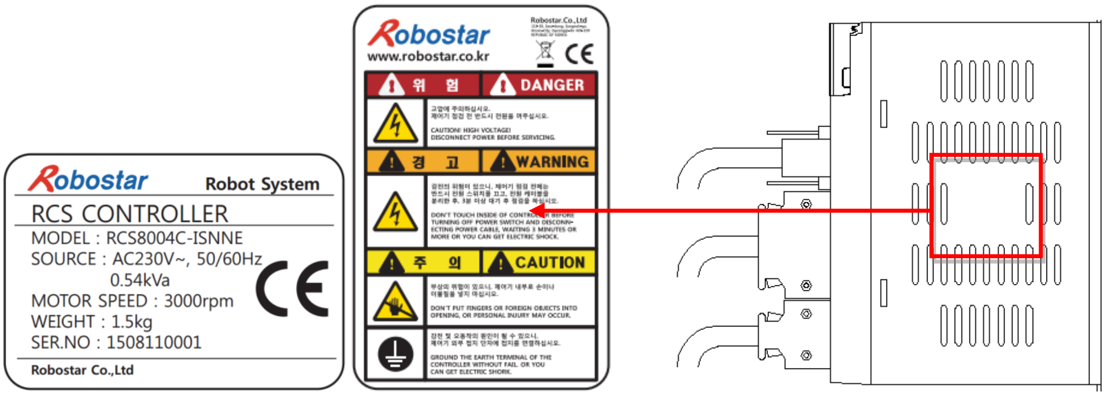
COMMON Output Method
N : NPN(N-COMMON) Standard
P : PNP(P-COMMON)

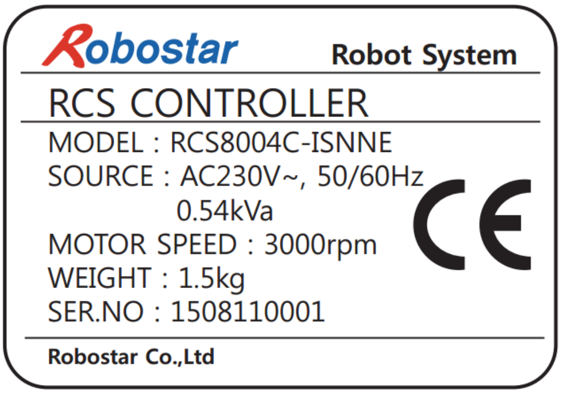
Selected Item Built-in
C : CC-Link B/D(V2.0)
B : Profibus
D : DeviceNet
N : Standard_Selected Item Non-available
F : CC-Link B/D(V3.0)
G: PROFINET
H: ETHERCAT

Classified for Sales
S : Standard(8000 excluded)
E : CE인증품
C : CASE만(CC-LINK B/D excluded)

1.3 Nameplate Configuration

The model name of this controller is specified in the attachment spot and is attached on the side of the controller as shown below. To check out the model name, refer to the product code.





	Type	Description
1	MODEL	Controller product code
2	SOURCE	Controller power capacity
3	MOTOR SPEED	Motor speed
4	WEIGHT	Controller weight
5	SER.NO	Serial number

1.4 Specifications

1.4.1 General Specifications

■ **Installation Environment**

Item \ Model		RCS 8001C	8002C	8004C	8008C	8010C	8015C
Main Power (GPS)	Voltage/Frequency	AC200V ~ 230V, 50 / 60Hz 1Φ			AC200V ~ 230V, 50 / 60Hz 1Φ, 3Φ		
	Watt (KVA)	0.3	0.46	0.89	1.35	1.89	2.67
Control Power (UPS)	Voltage/Frequency	AC200V ~ 230V, 50 / 60Hz 1Φ			AC200V ~ 230V, 50 / 60Hz 1Φ		
	Watt (W)	5					
Regenerative Resistor		-	50Ω / 50W	50Ω / 50W	50Ω / 140W	30Ω / 400W	30Ω / 400W
Cooling Type		Natural Air Cooling					
Control Type		3 phase sine wave modulated PWM					
Encoder Type		Incremental Encoder, Serial Encoder					
Input-Output (I/O)	USER	User I/O (19 points/16 points)					
	SYSTEM	Option I/O (32 points/24 points)					
Programming		Teach Pendant or PC (Above PC Windows XP)					
Robot Program Support Standard	JOB	Maximum 8 pieces					
	JOB Step	1000Line					
	Position	1024 pieces					
	Integer	255 pieces					
External Communication (option)		CC-Link, Profibus, DeviceNet, C-net					
Error Indications		Front 7-Segment, Teach Pendent					
On-Line Functions		JOB, Parameter, Integer, Position					

■ Weight per Product Model

1) Net Weight : Controller Itself
2) Gross Weight : Controller + Package

Weight	8001C, 8002C	8004C	8008C	8010C	8015C
Net (kg)	1.2	1.5	2.2	2.2	2.2
Gross (kg)	1.4	1.7	2.52+	2.52+	2.52+

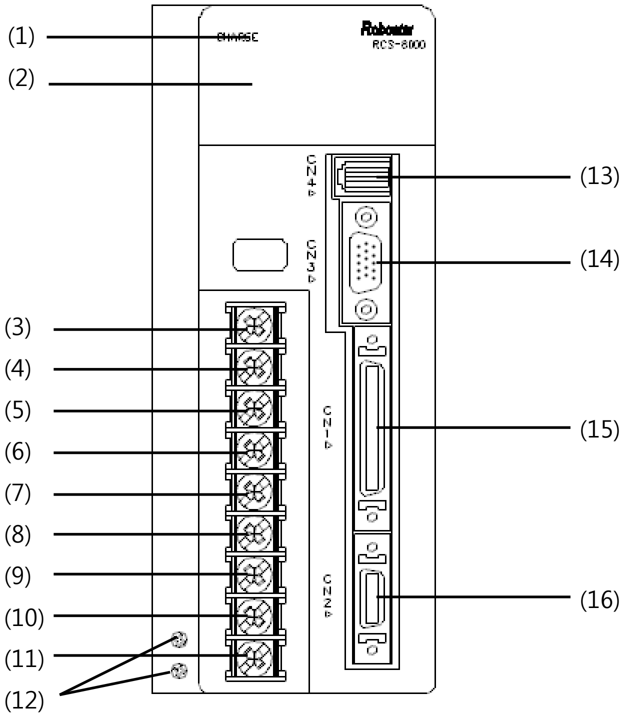
■ Table for Adopted Motor per Controller Capacity

Size	Model	Adopted Motor	Size	Model	Adopted Motor
Small	RCS-8001C	50W, 100W	Middle	RCS-8008C	750W
	RCS-8002C	200W		RCS-8010C	1kW
	RCS-8004C	400W		RCS-8015C	1.5kW

1.5 Names of Each Unit

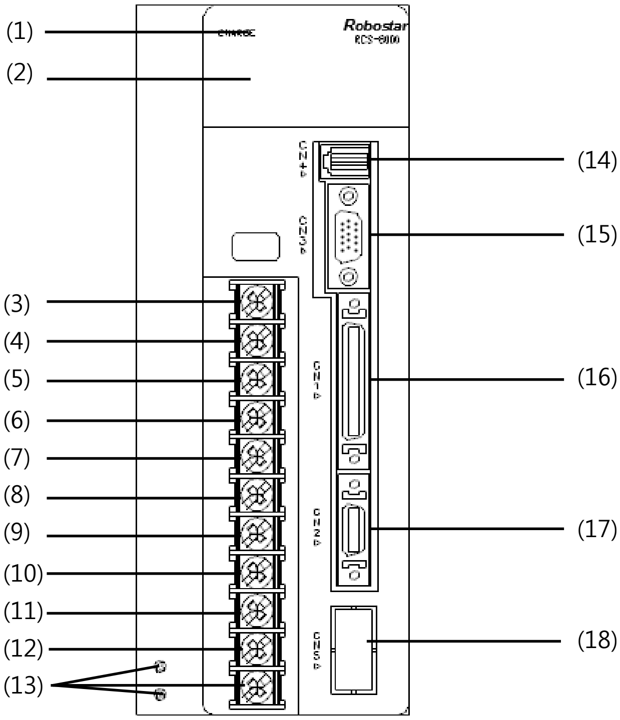
1.5.1 Controller

■ Small Capacity (8001C, 8002C, 8004C)



No.	Name·Application	
(1)	DC-Link Charge Display LED	
(2)	Status Display 7-Segment	
(3)	L1	Main Power Input
(4)	L2	
(5)	r	Control Power Input
(6)	t	
(7)	P	Regenerative Resistor Connecting Terminal
(8)	B	
(9)	U	Motor Connecting Terminal
(10)	V	
(11)	W	
(12)	FG	Ground Connecting Terminal
(13)	CN4	Encoder Signal Output
(14)	CN3	Serial Connector Teach Pendant, PC Communication
(15)	CN1	I/O Connector Input, Output Contact
(16)	CN2	Encoder Connector Motor Encoder Communication

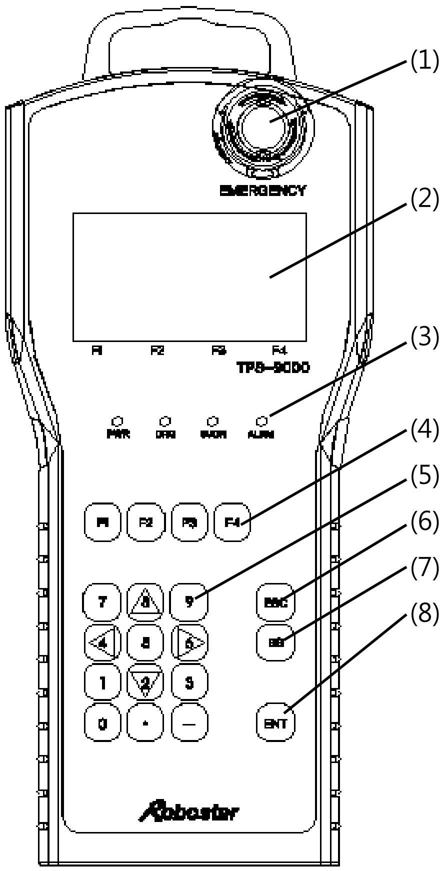
■ Medium Capacity (8008C, 8010C, 8015C)



No.	Name·Application	
(1)	DC-Link Charge Display LED	
(2)	Status Display 7-Segment	
(3)	L1	Main Power Input
(4)	L2	
(5)	L3	
(6)	r	Control Power Input
(7)	t	
(8)	P	Regenerative Resistor Connecting Terminal
(9)	B	
(10)	U	Motor Connecting Terminal
(11)	V	
(12)	W	
(13)	FG	Ground Connecting Terminal
(14)	CN4	Encoder Signal Output
(15)	CN3	Serial Connector Teach Pendant, PC Communication
(16)	CN1	I/O Connector Input, Output Contact
(17)	CN2	Encoder Connector Motor Encoder Communication
(18)	CN5	**Not used.**

1.5.2 TEACH PENDANT

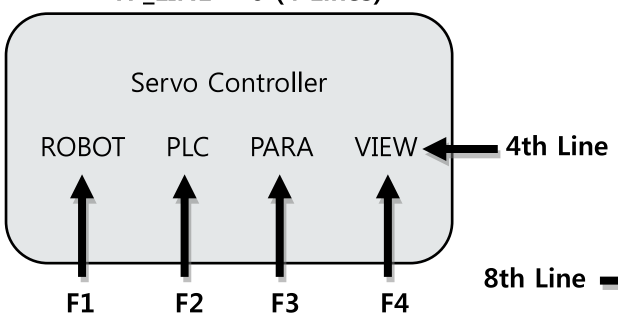
1.5.2.1 External Look



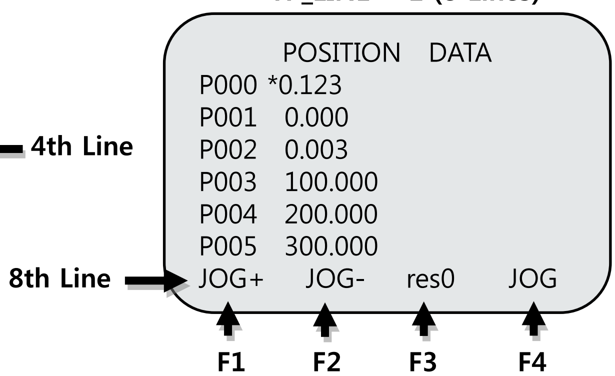
No.	Name·Application
(1)	Emergency Stop Button When the button is pressed, the controller stops its operation.
(2)	LCD Display Communications with the controller are displayed.
(3)	Status Light PWR – Turns ON while Teach Pendant is running ORG – Turns ON at completion of home return SVON – Turns on when power is applied to the motor ALRM – Turns on when the controller shows an abnormality
(4)	Mode Selection Button Used when selecting a mode.
(5)	Number Key Used for numeric input or selection of a direction.
(6)	ESC(Escape) 메뉴 탈출 버튼입니다.
(7)	BS(Back space) Program 작성 중 삭제 버튼
(8)	ENT(Enter) 선택 버튼

1.5.2.2 Screen Configuration

■ **TP_LINE = 0 (4 Lines)**



■ **TP_LINE = 1 (8 Lines)**



As shown in the figure, move the 4th or 8th line in Teach pendant to the corresponding menu using 'Mode Selection Button' in TP.

(Line settings in Teach Pendant can be done at ‘PARA→OPER→SET→ETC’의 TP_LINE.)

ch.2 Installing Method of Controller

2.1 Getting Proper Installation Environment

2.1.1 Conditions for Installation Environment

- Since the robot and the controller are not intended to be of anti-explosion, dust-proof, or drop-proof standard, they cannot be installed at the following places.

1) Environment where flammable gases, flammable liquids, etc. is used
2) Environment where conductive materials such as metal processed chip is scattering.
3) Environments with acid or alkali corrosive gas.
4) Environments with the mist such as cutting liquid or grinding liquid.
5) Environments with the mist such as cutting liquid or grinding liquid containing the oil component.
6) Environment close to the electrical noise sources, such as a large inverter, high-power frequency oscillator, a large conductor, welding machine, etc.
7) Do not attach the magnet to the controller.

2.1.2 Ambient Temperature and Humidity

Environment	Condition
Ambient temperature for use	0℃ ~ 40℃ (No freeze formed)
Ambient humidity for use	20 ~ 80% RH 이하 (No dew formed)
Ambient temperature for storage	-15℃ ~ +60℃ RH (No dew formed)
Ambient humidity for storage	10 ~ 90% RH (No dew formed)
Room Condition	No dust or corrosive Gas
Vibration	0.6G

CAUTION

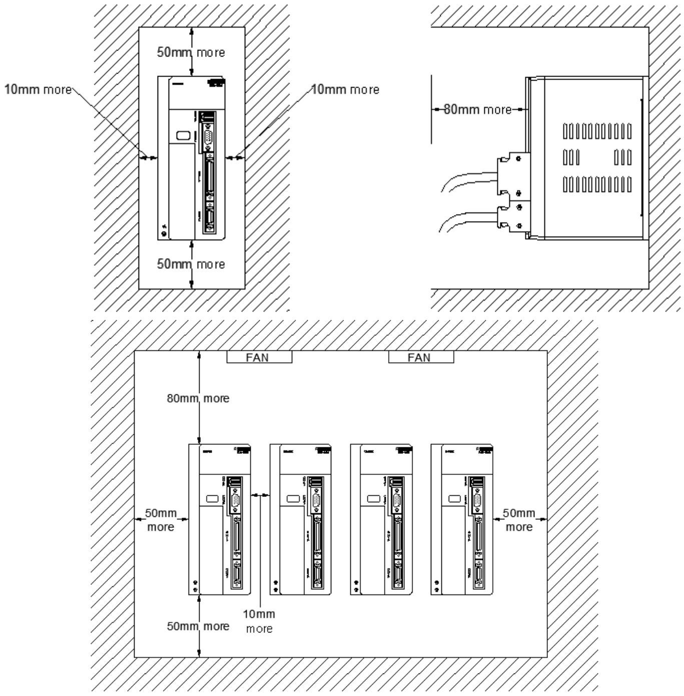
- When a magnetic material is placed around the controller, the saved data may be damaged.

2.2 Installation Controller

Prepare the enough space taking into consideration the robot cable bending, interference or the like, as shown below.

- **Preparation of Installation Space**

1) For natural cooling, gaps over 10mm for right and left sides, over 50mm for top and bottom of the controller are needed.
2) If more than 2 controllers are operated, make gaps over 50mm for right and left sides, over 80mm for top side, 50mm for bottom side, and 10mm between two controllers.
3) For spacious wiring, over 80mm for front is required.
4) Emission resistance of regenerative energy which is connected to the controller P-B terminal generates heat proportional to rated motor output power. So Emission resistance of regeneration energy shall be attached to the place where heat is well radiated and it shall be away over 20mm from the controller.
5) Installation should be done in a well ventilated place with low humidity and little dust.
6) Installation should be done in a place made easy for inspection and cleaning.

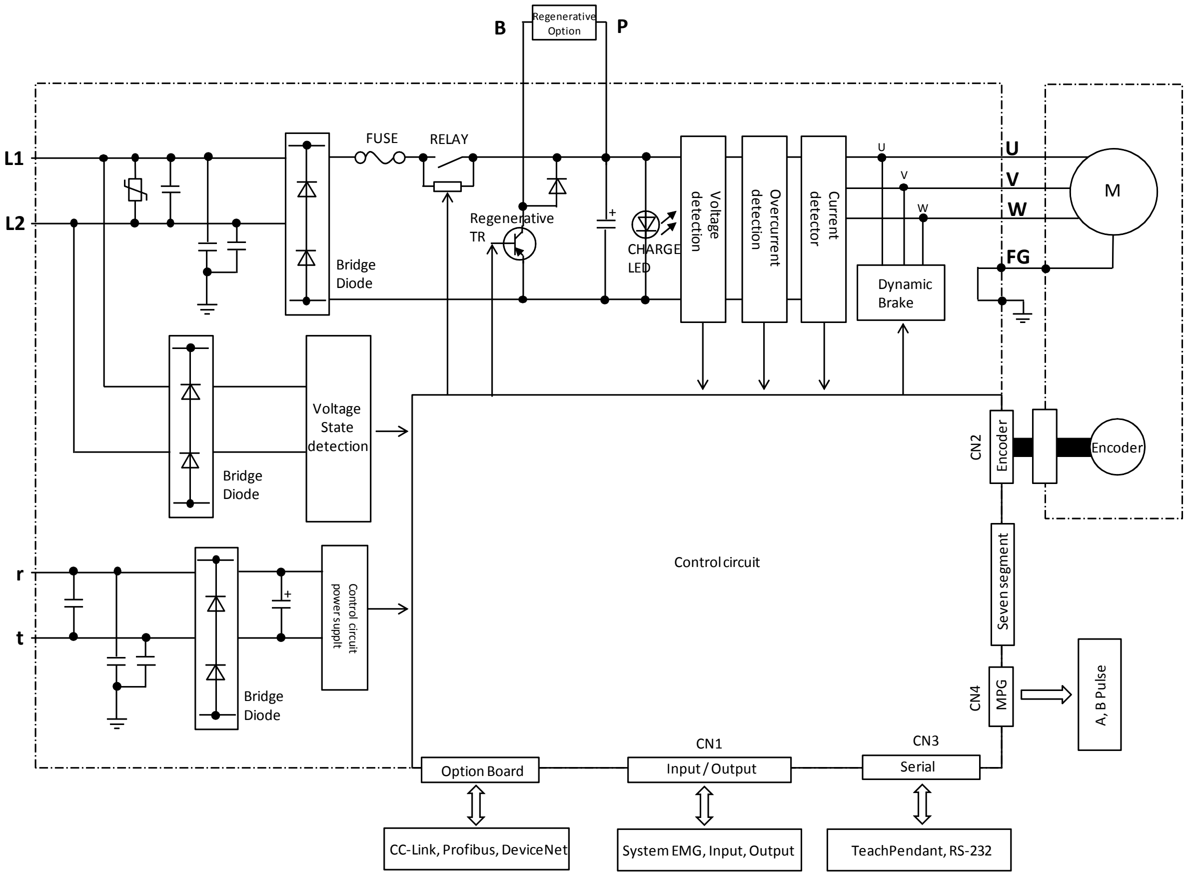


CAUTION

> - Pay attention to internal components damage due to the shock when the controller is moved.
> - Attachment to wrong direction may cause malfunction.
> - Maintain the gap between the controller and control panel inner side over specified distance.

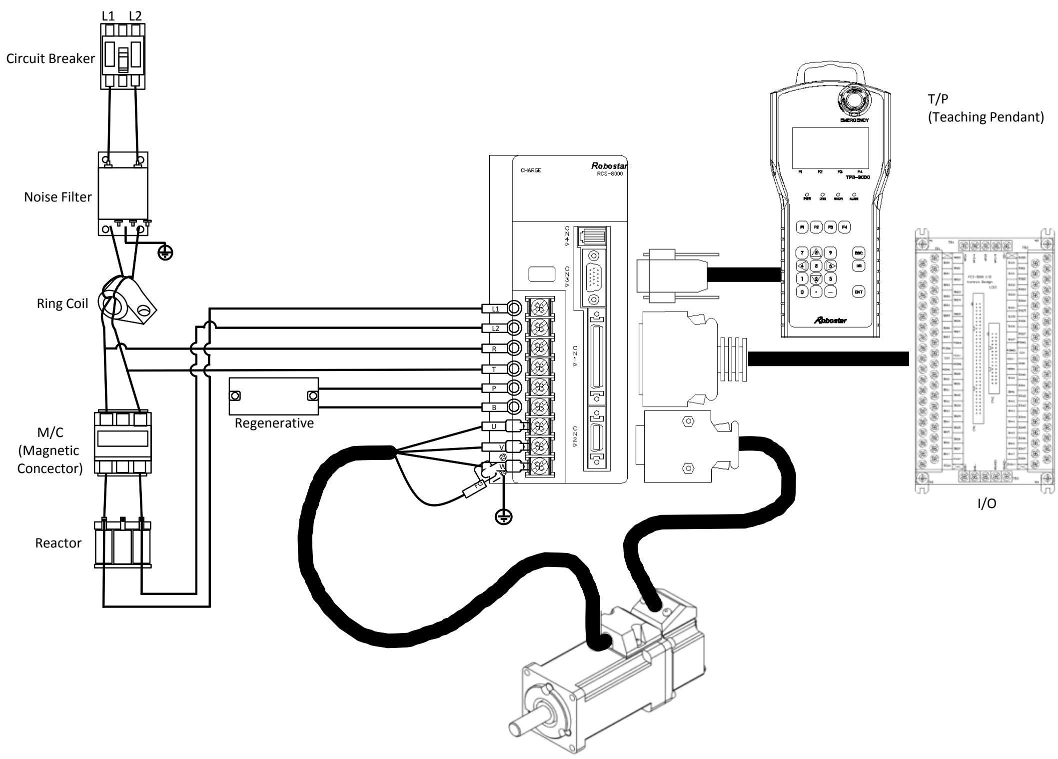
ch.3 WIRING AND INTERFACE

3.1 Function Block Diagram



3.2 Electric Wiring

■ SMALL (1Φ)



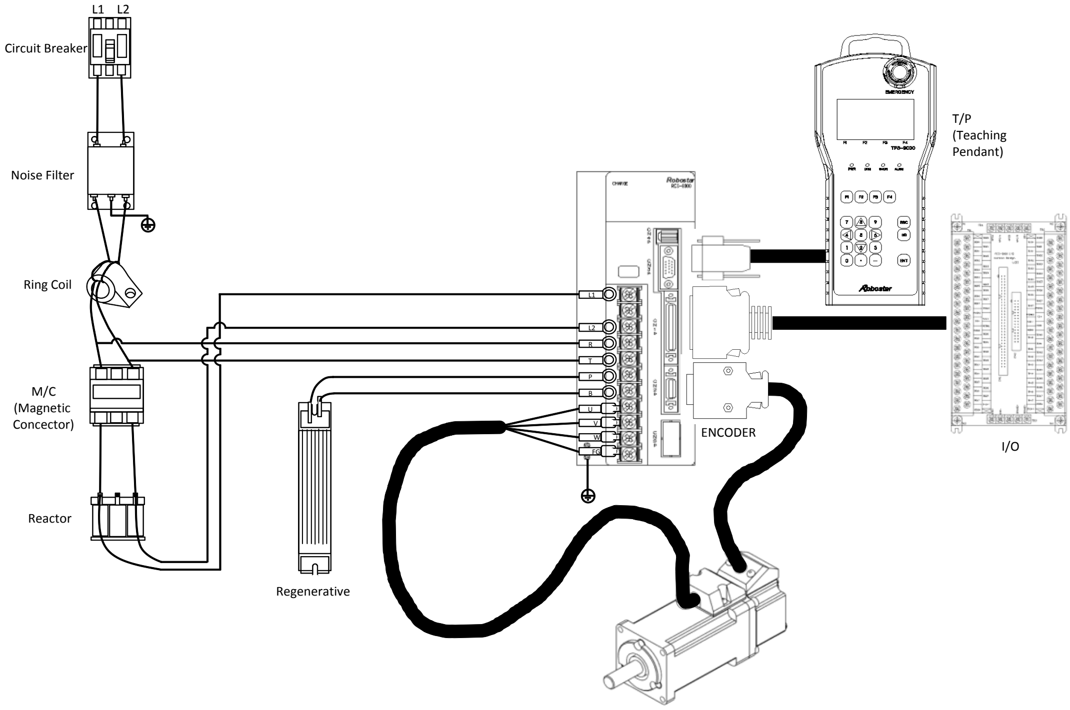
- ■ All devices and components used in the devices shall have countermeasures for electromagnetic waves so that they have no malfunction by electromagnetic waves. All devices and components shall not cause electromagnetic interchange over reasonable level at the places where they are used. And they shall have tolerance of proper level against electromagnetic waves.
- ■ If MOTOR DRIVE, INVERTER and SMPS are used, countermeasures for electromagnetic waves suggested in the manual prepared by manufacturer shall be applied.
- ■ Make sure that a ground wire shall be connected at one point of the terminal block.
- ■ If additional countermeasures are needed depending on electromagnetic waves test results, install NOISE-FILTER in MAIN power supply. Products as follows are recommended.

Type	Model	Manufacturer
Noise Filter	ES1-F20	DONG IL(DIT)
Ring core	ESD-R-47B	KEMET

CAUTION

➢ If NOISE-FILTER is used, make sure that input wires and output wires shall be separated. They shall not be in the same duct or be tied together.

■ MIDDLE(1Φ)



All devices and components used in the devices shall have countermeasures for electromagnetic waves so that they have no malfunction by electromagnetic waves. All devices and components shall not cause electromagnetic interchange over reasonable level at the places where they are used. And they shall have tolerance of proper level against electromagnetic waves.

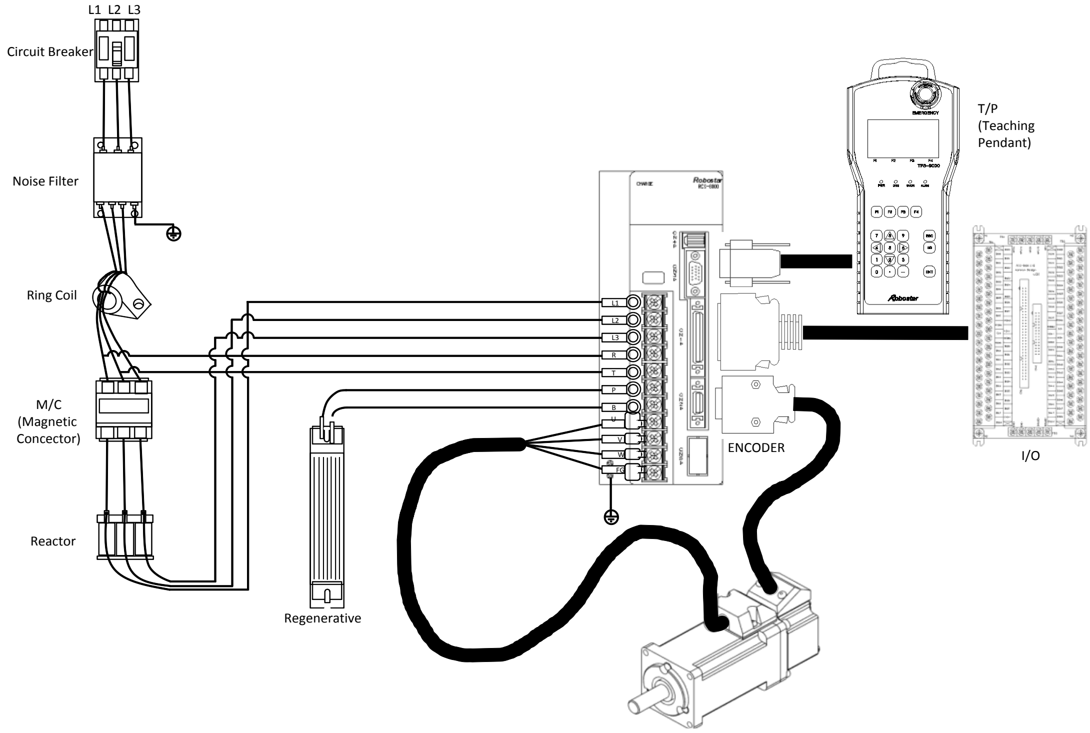
- If MOTOR DRIVE, INVERTER and SMPS are used, countermeasures for electromagnetic waves suggested in the manual prepared by manufacturer shall be applied.
- Make sure that a ground wire shall be connected at one point of the terminal block.
- If additional countermeasures are needed depending on electromagnetic waves test results, install NOISE-FILTER in MAIN power supply. Products as follows are recommended.

Type	Model	Menufacturer
Noise Filter	WYFTH30T1A	WOONYOUNG
Ring core	ESD-R-47B	KEMET

CAUTION

> ➢ If NOISE-FILTER is used, make sure that input wires and output wires shall be separated. They shall not be in the same duct or be tied together.

■ MIDDLE(3Φ)



- ■ All devices and components used in the devices shall have countermeasures for electromagnetic waves so that they have no malfunction by electromagnetic waves. All devices and components shall not cause electromagnetic interchange over reasonable level at the places where they are used. And they shall have tolerance of proper level against electromagnetic waves.
- ■ If MOTOR DRIVE, INVERTER and SMPS are used, countermeasures for electromagnetic waves suggested in the manual prepared by manufacturer shall be applied.
- ■ Make sure that a ground wire shall be connected at one point of the terminal block.
- ■ If additional countermeasures are needed depending on electromagnetic waves test results, install NOISE-FILTER in MAIN power supply. Products as follows are recommended.

Type	Model	Menufacturer
Noise Filter	WYFTH30T1A	WOONYOUNG
Ring core	ESD-R-47B	KEMET

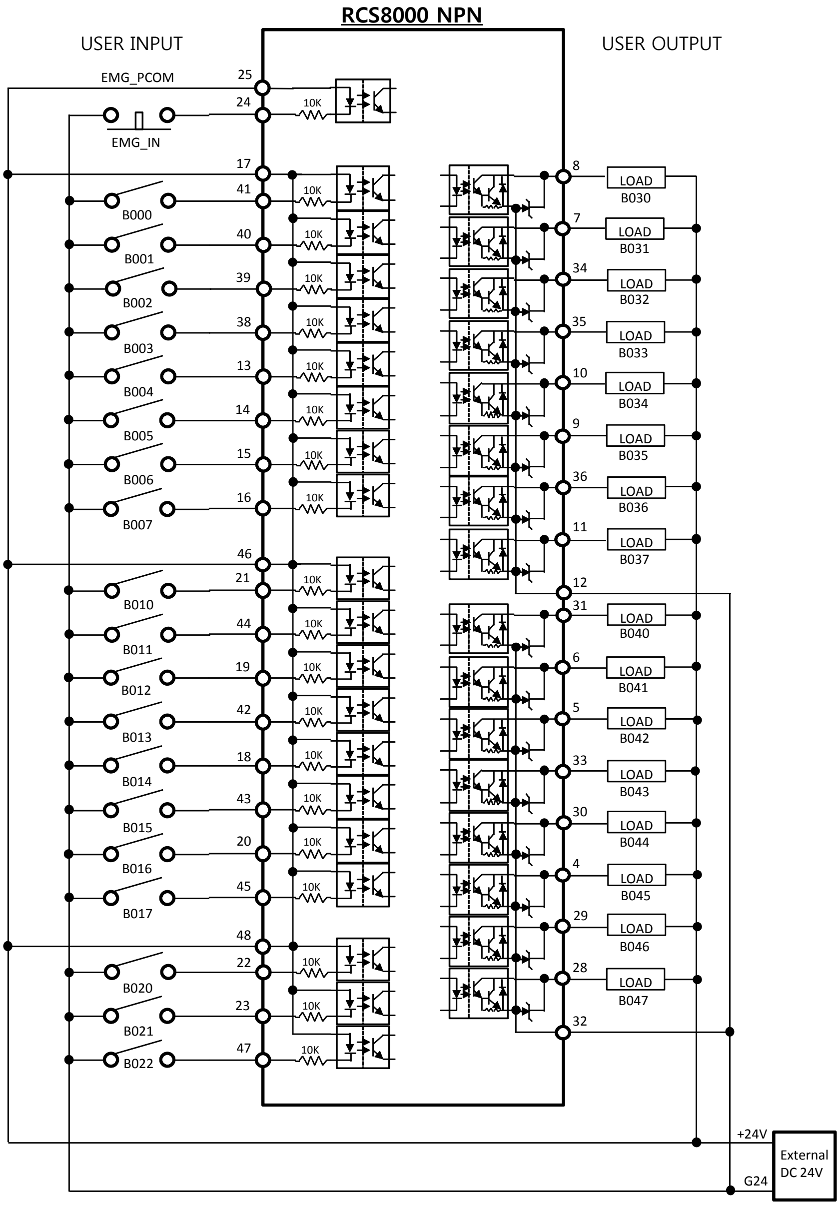
CAUTION

➢ If NOISE-FILTER is used, make sure that input wires and output wires shall be separated. They shall not be in the same duct or be tied together.

3.3 Input/Output Circuit Diagram for USER I/O

3.3.1 NPN TYPE

1) USER Input : B000 ~ B022 2) USER Output : B030 ~ B047

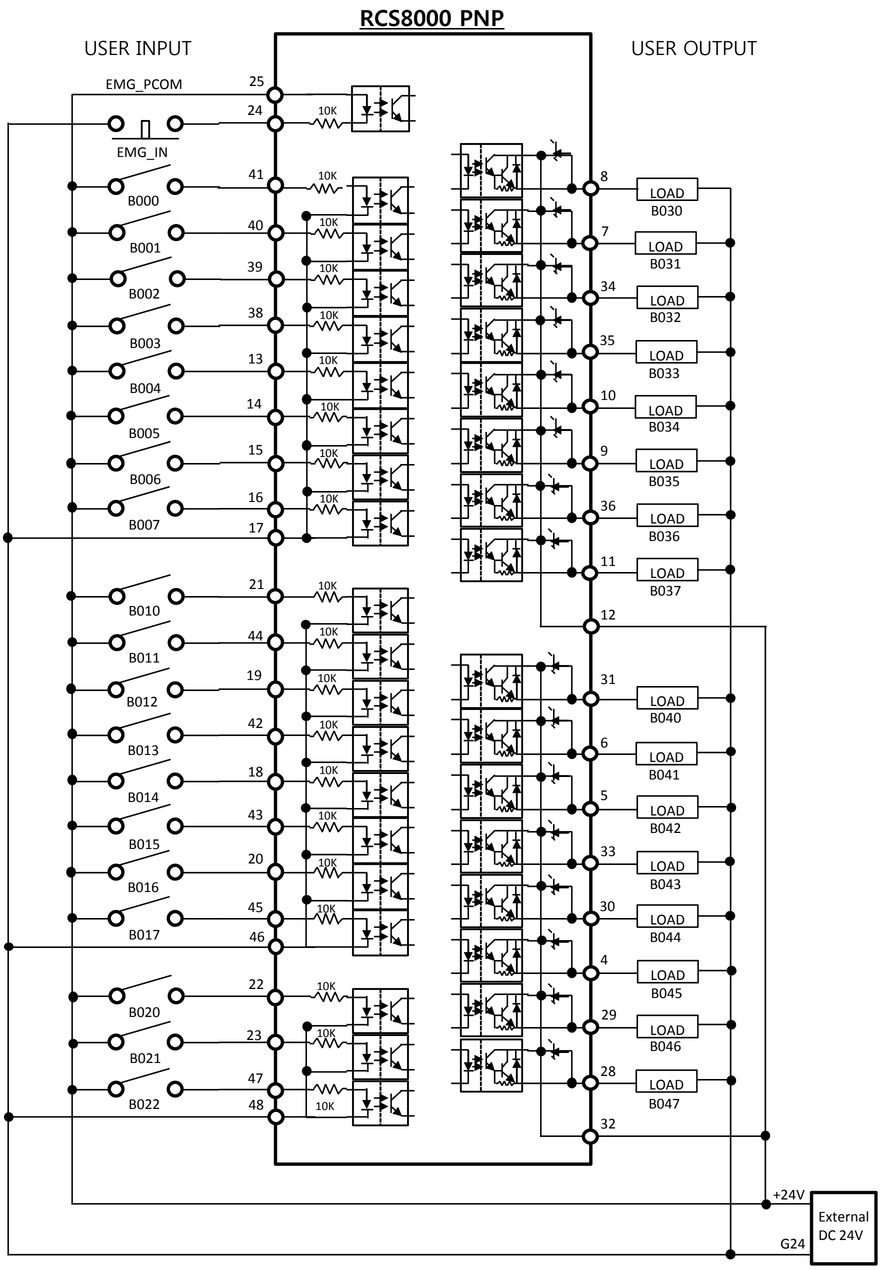


CAUTION

- Inside parenthesis represents the I/O Address.
- When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- Mis-wiring may cause the internal parts to be destroyed. In particular, take extra caution about the polarity of a common terminal for P-type and N-type.
- The external supply voltage has to be DC 24V±10%.
- When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

3.3.2 PNP TYPE

1) USER Input : B000 ~ B022 2) USER Output : B030 ~ B047



⚠ CAUTION

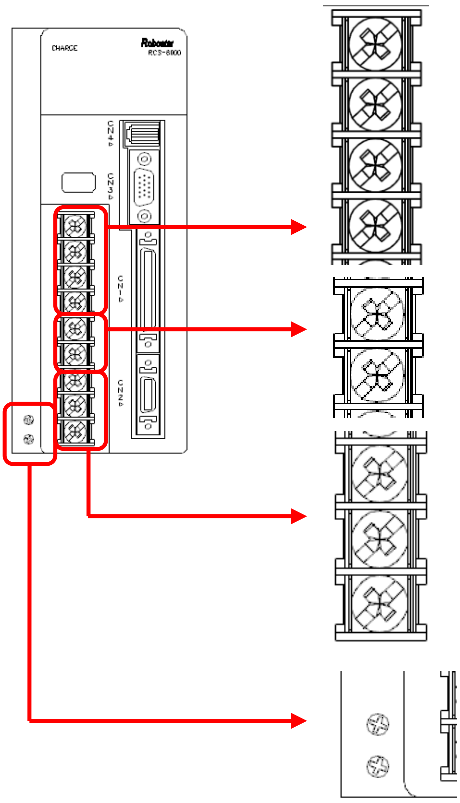
- Inside parenthesis represents the I/O Address.
- When wiring the power source, confirm that the connection polarity of DC 24V is correct.
- Misswiring may cause the internal parts to be destroyed. In particular, take extra caution about the polarity of a common terminal for P-type and N-type.
- The external supply voltage has to be DC 24V±10%.
- When soldering connector pins, provide pins with tubes to prevent short-circuit of pins.

3.4 Power supply system interface

■ **SMALL**

: It is separated into the robot power and control power. Only single phase can be applied.

Connector on Controller Side	BR1002TL-9P-8L(BEE-RYONG)
Connector on Cable Side	Spade Terminal



PIN No	Signal
L1	Robot Power
L2	
r	Control Power
t	

PIN No	Signal
P	Regenerative resistor
B	

PIN No	Signal
U	Motor Power
V	
W	

PIN No	Signal
FG	Frame Ground

1) Connect L1, L2 to the motor power and connect r, t to the control power.
2) Connect the ground(FG) of the motor on a small-capacity controller to Heat Sink FG terminal.
3) When used as a single power supply
   - Use after connecting motor power L1 and controlling power r.
   - Use after connecting motor power L2 and controlling power t.
4) AWG 14~18 is used for the wire diameter of the main power.
   AWG18 is used for the wire diameter of control power.

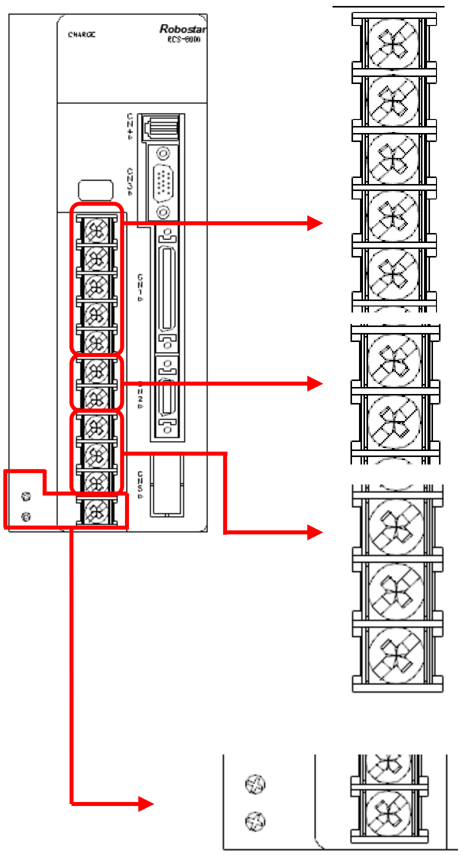
CAUTION

> ➢ 'E0501 Open DCLink' alarm occurs if the motor is driven after supplying power only to controlling power.
>
> ➢ Power is not supplied to the main board if power is supplied only to the robot.

- **MIDDLE**

: It is separated into the robot power and control power, in support of 3-phase.

Connector on Controller Side	BR-1002C-11P (BEE-RYONG)
Connector on Cable Side	Spade Terminal



PIN No	Signal
L1	Robot Power
L2	
L3	
r	Control Power
t	

PIN No	Signal
P	Regenerative resistor
B	

PIN No	Signal
U	Motor Power
V	
W	

PIN No	Signal
FG	Frame Ground

1) When making a 3-phase connection, connect L1, L2, and L3 to main power and r, t to control power.
2) When making a 2-phase connection, connect L1 and L3 to main power and r, t to control power.
3) In using as a single power
   - Use after connecting motor power L1 and controlling power r.
   - Use after connecting motor power L3 and controlling power t.
4) AWG 14~18 is used for the wire diameter of the main power

   AWG 18 is used for the wire diameter of control power.

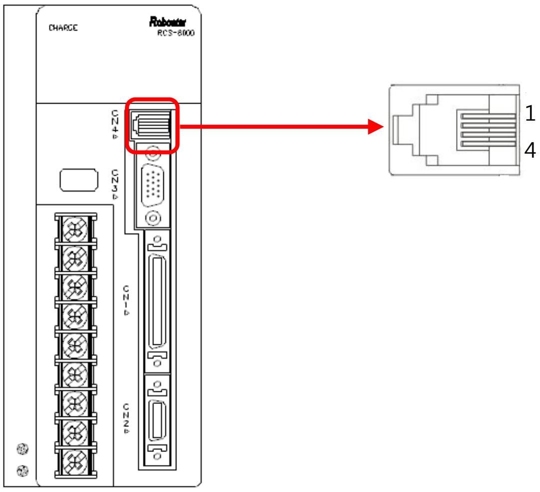
CAUTION

- 'E0501 Open DCLink' alarm occurs if the motor is driven after supplying power only to controlling power.
- Power is not supplied to the main board if power is supplied only to the robot.

3.5 Servo Motor Encoder Output

: Encoder (A, B, Z phase) Output

Connector on Controller Side	PCB-01(G-Type), 4P, PHONE
Connector on Cable Side	RJ11-4C



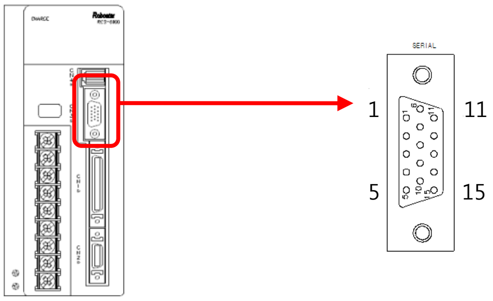
PIN No	MPG Signal	Function
1	A	Produces encoder phase A signal
2	B	Produces encoder phase B signal
3	Z	Produces encoder phase Z signal
4	GND	Connects GND

- Applicable only when using a 9-wire or 15-wire incremental encoder.
- Encoder output signal is Low output : 0V / High output : 5V.
- The signal is an uninsulated output so use caution not to make mis-wiring when connecting signals.

3.6 Serial Interface

: This interface is for serial connection.

Connector on Controller Side	HIF3H-10PB-2.54DSA (HRS)
Connector on Cable Side	DSUB SOLD 15S



PIN No.	Teach Pendant Connection	Serial Communication Connection	Description
1	+12V	–	+12V control power output
2	RxD	RxD	COM1 Port RxD signal input
3	TxD	TxD	COM1 Port TxD signal output
4	-12V		– 12V control power output
5	GND	GND	Control power ground output
6	EMG	–	Emergency stop switch signal input
7	Deadman Key	-	Deadman switch signal input
8	–	–	Not used
9	–	RxD2	COM2 Port RxD signal input
10	–	TxD2	COM2 Port TxD signal output
11	FG	FG	Connect main power ground
12	–	RS-422 RX+	RS-422 communication port
13	–	RS-422 RX-	RS-422 communication port
14	–	RS-422 TX+	RS-422 communication port
15	–	RS-422 TX-	RS-422 communication port

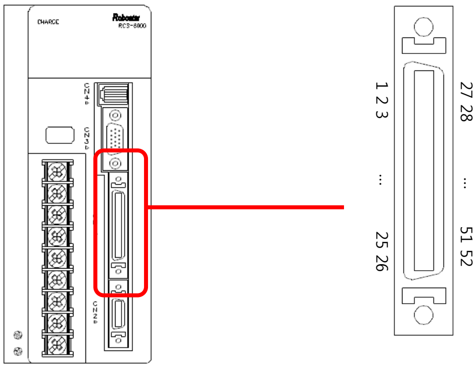
- Teaching Pendant communicates with COM1 using RxD and TxD signals.
- Communicates with COM2 using RxD2 and Txd2.
- It is possible to communicate simultaneously using COM1 and COM2.
- It is possible to connect to the online using COM1 and COM2.
- The robot can be operated automatically with a host computer and serial(RS-232C) communication.

  (Refer to 'Uni-host user's manual' for more detail.)

3.7 I/O Interface

:This interface is for I/O connection.

Connector on Controller Side	N10250-52E2PC (3M)
Connector on Cable Side	HIF3BA-50D-2.54 R(HRS)



1) USER INPUT: B000 ~ B022
2) USER OUTPUT: B030 ~ B047
3) EMG INPUT: EMG+, EMG-
4) Brake OUTPUT (Relay connection): BRAKE+, BRAKE-

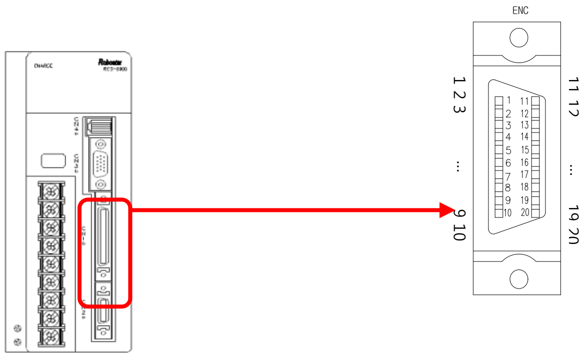
Pin	Signal		Description
1	GND(5V)		MPG signal input ground
2	/APH_OUT		MPG /Input phase A
3	/BPH_OUT		MPG /Input phase B
4	B035		User output
5	B032		User output
6	B031		User output
7	B041		User output
8	B040		User output
9	B045		User output
10	B044		User output
11	B047		User output
12	NPN type	GND(24V)	Output port control power (-)
	PNP type	24V	Output port control power (+)
13	B004		User input
14	B005		User input
15	B006		User input
16	B007		User input
17	NPN type	24V	Input port control power (+)
	PNP type	GND(24V)	Input port control power (-)
18	B014		User input
19	B012		User input
20	B016		User input
21	B010		User input
22	B020		User input
23	B021		User input
24	EMG-		Emergency stop switch input(-)
25	EMG+		Emergency stop switch input (+)

Pin	Signal Name		Description
26	APH_OUT		MPG input phase A
27	BPH_OUT		MPG input phase B
28	B037		User output
29	B036		User output
30	B034		User output
31	B030		User output
32	NPN type	GND(24V)	Output port control power (-)
	PNP type	24V	Output port control power (+)
33	B033		USER Output
34	B042		USER Output
35	B043		USER Output
36	B046		USER Output
37	FG		FG ground terminal(Shield)
38	B003		User input
39	B002		User input
40	B001		User input
41	B000		User input
42	B013		User input
43	B015		User input
44	B011		User input
45	B017		User input
46	NPN type	24V	Input port control power (+)
	PNP type	GND(24V)	Input port control power (-)
47	B022		User input
48	NPN type	24V	Input port control power (+)
	PNP type	GND(24V)	Input port control power (-)
49	BRAKE+		Motor brake output(+)
50	BRAKE-		Motor brake output (-)

3.8 Encoder Interface

:This interface is for encoder connection.

Connector on Controller Side	N10220-52B2VC (3M)
Connector on Cable Side	10320-52AO-008 (3M)



PIN No.	15 signal type	9 signal type	Serial type
1	W	-	SD+
2	/W	-	SD-
3	V	-	-
4	/V	-	-
5	U	-	-
6	/U	-	-
7	-	-	-
8	-	-	-
9	GND(5V)	GND(5V)	GND(5V)
10	-	EP5V	-
11	/Z	/Z	-
12	-	-	-
13	/B	/B	-
14	Z	Z	-
15	/A	/A	-
16	B	B	-
17	-	-	-
18	A	A	-
19	P5V	-	P5V
20	-	-	-

■ 15 signal type encoder, 9 signal type encoder

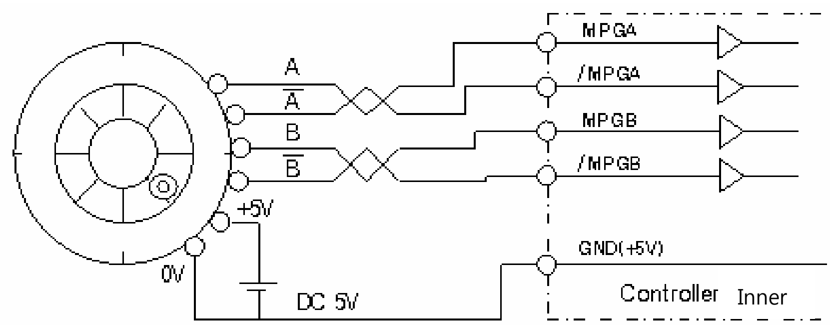
1) The encoder signal being the electric signal of motors, the U, V, W of the motor are synchronized to this signal. When an error occurs in this signal, the motor does not rotate.
2) Used to detect the position of the motor and its rotation number.
3) Z: Used to search the origin.
4) P5V: Provides Vcc power to the encoder.

■ Serial encoder

1) SD+, SD-: This is a serial response signal of 4 wire type serial encoder.
2) Used for position rpm detection for the motor using serial data.
3) It is possible to receive alarm information if the motor encoder has any problem.
4) P5V: Provides Vcc power to the encoder.
5) GND(5V): Basic electric potential for +5V and EP +5V.

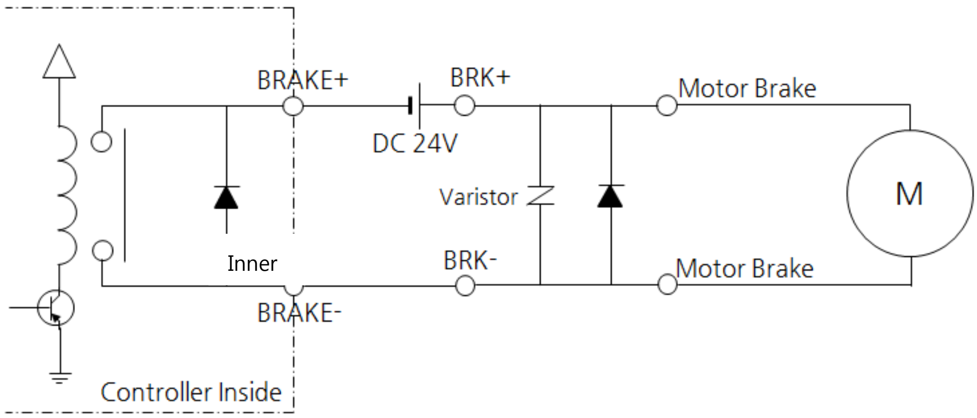
3.9 MPG and Brake Connection

1) Standard MPG connection diagram

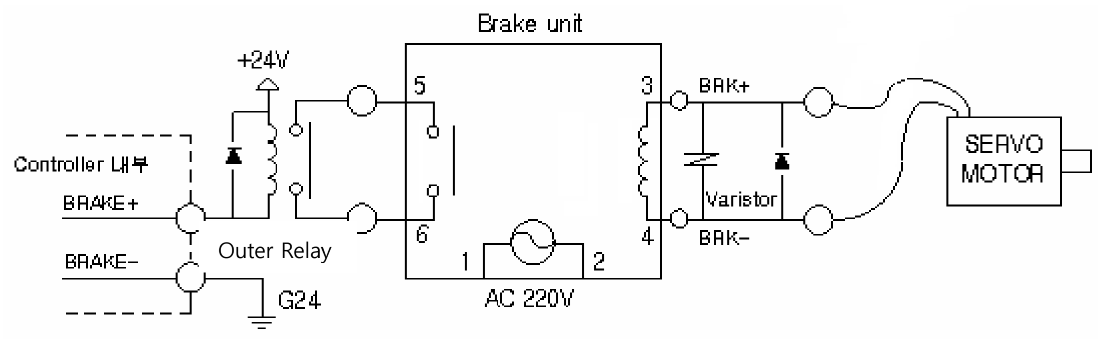


MPG(Manual Pulse Generator)

2)) Brake Connection for DC 24V



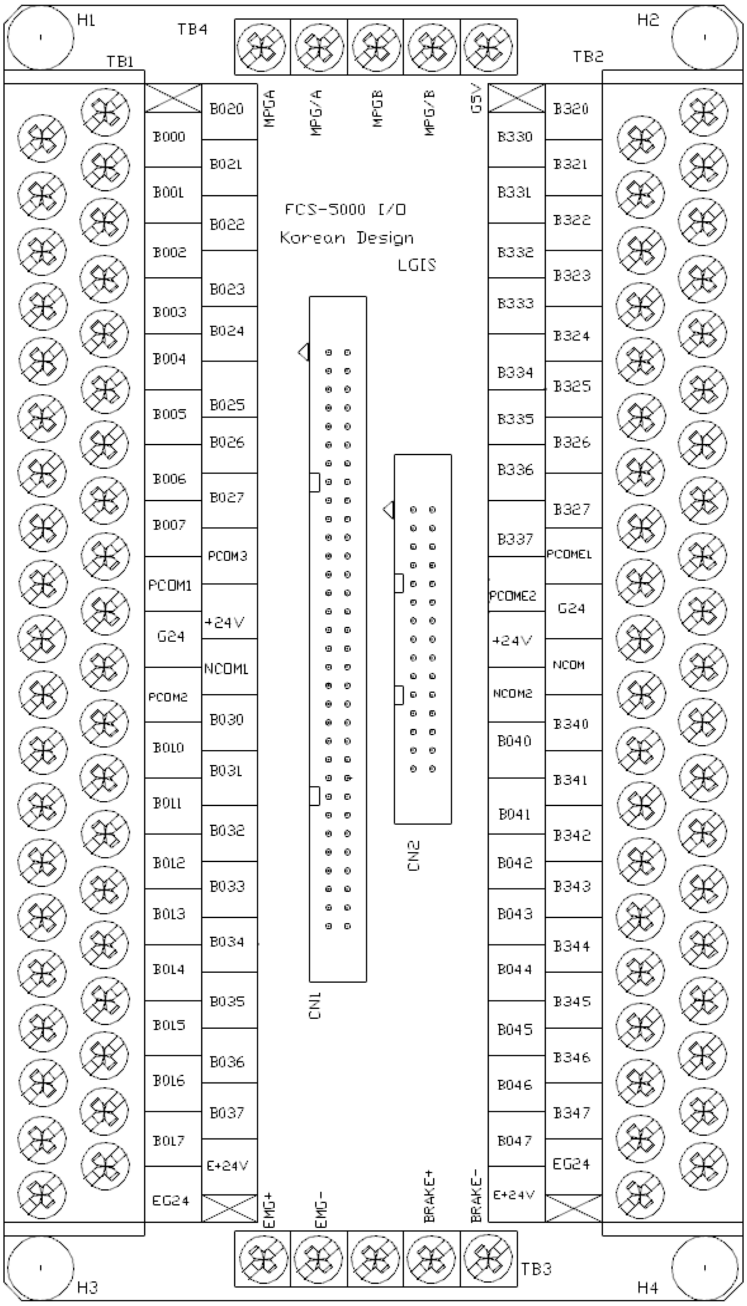
3) Brake Unit and Brake Connection for DC 90V



3.10 I/O Relay Terminal Block and Relay Cable

3.10.1 I/O Relay Terminal Bloack (NPN Type)

■ **For use of an I/O relay terminal block, a relay cable is needed.**



■ **Contact description**

1) E+24V, EG24 Port:
External power connection terminal.

2) +24V, G24:
Terminal connecting controller's internal power.

3) INPUT PCOM +24V,
OUTPUT NCOM G24V terminal:
External power connection terminal.

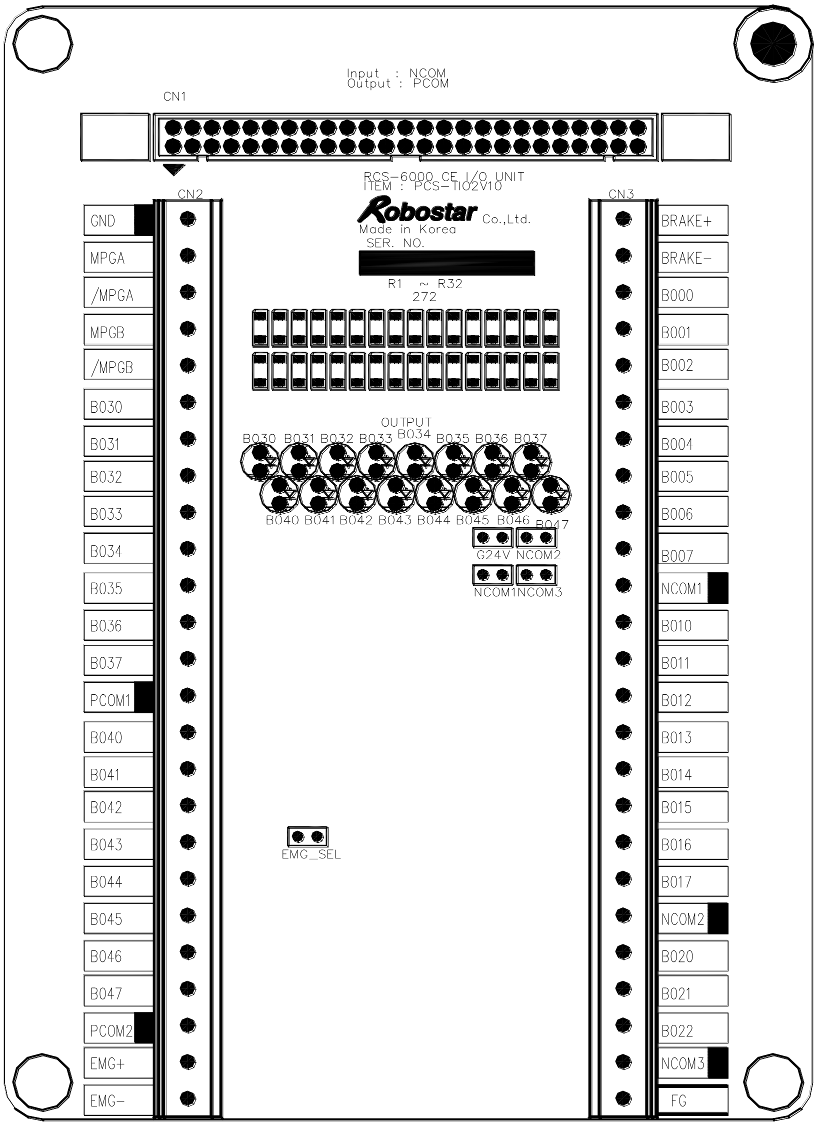
4) Each terminal among names of relay terminal blocks is consistent with user's I/O signal name.

CAUTION

➢ The controller may be damaged when the external connection terminal and internal connection terminal are connected simultaneously.

3.10.2 I/O Relay Terminal Block (PNP Type)

- **For use of an I/O relay terminal block, a relay cable is needed.**



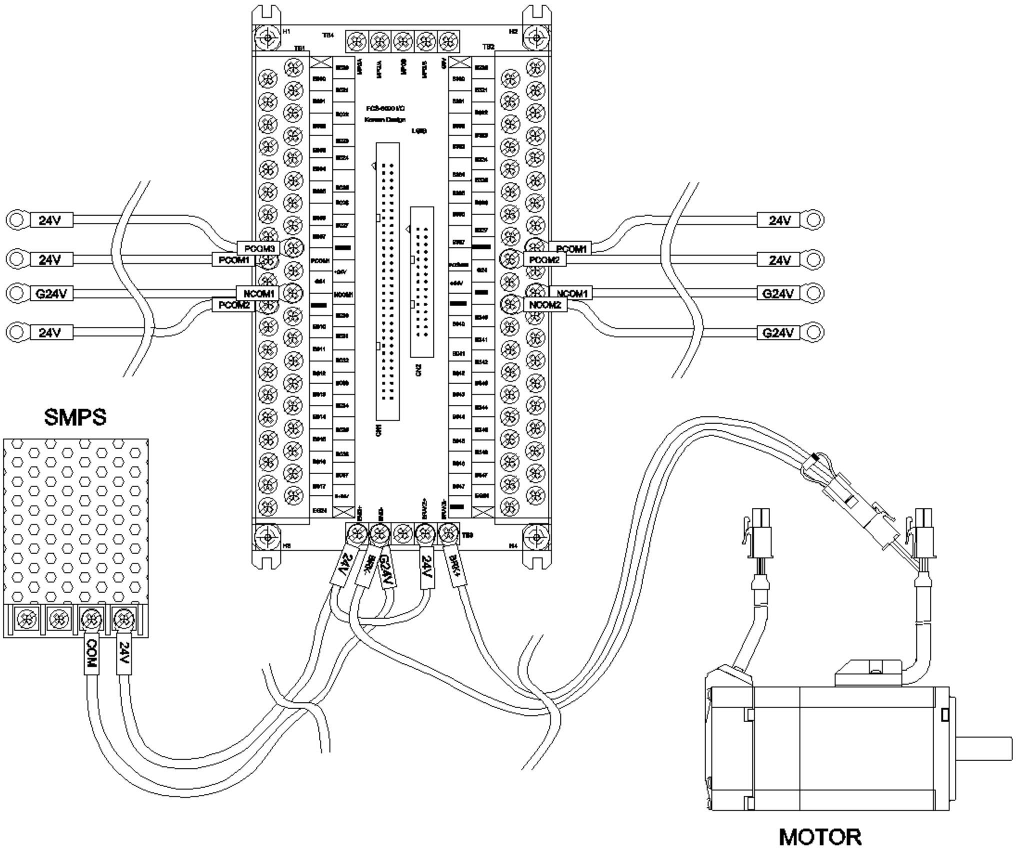
- **Contact description**
  1) Only external 24V power available for use.
  2) Connect +24V power to PCOM1, PCOM2.
  3) Connect G24V(GND) to NCOM1, 2, 3.
  4) Each terminal among names of relay terminal blocks is consistent with user's I/O signal name.

CAUTION

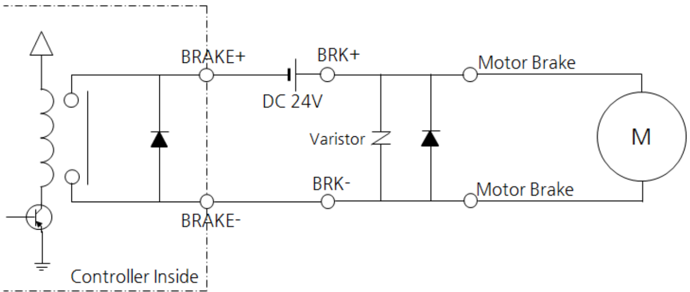
- The controller may be damaged when the external connection terminal and internal connection terminal are connected simultaneously.

3.10.3 Wiring Method

- How to connect an I/O relay terminal block
  1) Contact configuration: User input B000 ~ B022, user output: B030 ~ B047
  2) In setting CW S/W to B020, connect sensor cable CW to where the terminal block B005 is.
  3) Connect +24V to PCOM1, PCOM2, and PCOM3.
  4) Connect GND to NCOM1, NCOM2.



- Brake Connection for DC 24V



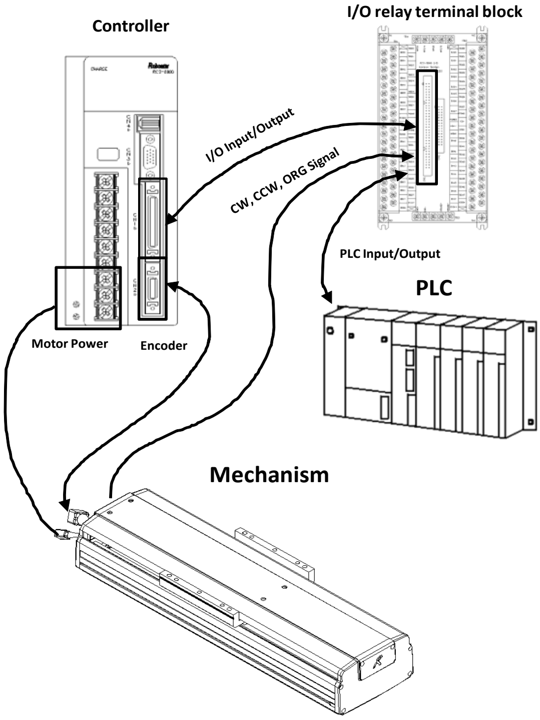
CAUTION

> ➢ EG24, E+24, G24, and +24V in the relay terminal block are not connected from the outside.

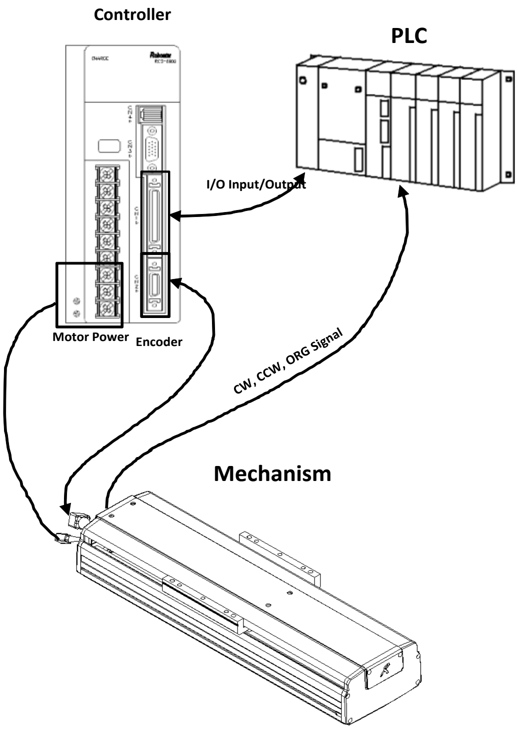
■ **Use of I/O relay terminal block**

Input/output (I/O) connection can be divided into two types.

1. Use of an I/O relay terminal block
   - Connect PLC contacts to Input, Output of the relay terminal block and connect to the controller's I/O before use.



2. Non-use of an I/O relay terminal block
   - Connect PLC contacts directly to the controller's I/O before use.



ch.4 How to Control Controller

4.1 MENU Configuration

<table>
<tr><th>Menu</th><th colspan="2">Group</th><th colspan="4">Detailed Group</th></tr>
<tr><th>Name</th><th>Name</th><th>Description</th><th>Name</th><th colspan="3">Description</th></tr>
<tr><td rowspan="4">ROBOT</td><td>PROG</td><td colspan="5">Writes Robot Program</td></tr>
<tr><td>POS</td><td colspan="5">Saving position variable and JOG</td></tr>
<tr><td>ORG</td><td colspan="5">Origin return operation</td></tr>
<tr><td>RUN</td><td colspan="5">Runs Robot Program</td></tr>
<tr><td rowspan="3">PLC</td><td>PROG</td><td colspan="5">Writes PLC Program</td></tr>
<tr><td>TEST</td><td colspan="5">Contact check</td></tr>
<tr><td>RUN</td><td colspan="5">Runs PLC Program.</td></tr>
<tr><td rowspan="13">PARA</td><td rowspan="3">SERVO</td><td rowspan="3">Sets servo-related parameters</td><td>AMP/MOT</td><td colspan="3">Sets servo motor capacity and constant</td></tr>
<tr><td>GAIN</td><td colspan="3">Sets controller gain</td></tr>
<tr><td>PROT</td><td colspan="3">Sets safety-related constants</td></tr>
<tr><td>MECH</td><td colspan="5">Sets mechanism-related parameters</td></tr>
<tr><td rowspan="5">OPER</td><td rowspan="5">Sets operation-related parameters</td><td>MODE</td><td colspan="3">Sets acceleration/deceleration and ORIGIN method in feeding power source</td></tr>
<tr><td>JOG</td><td colspan="3">Sets JOG operation</td></tr>
<tr><td>DEF</td><td colspan="3">Sets basic movement conditions</td></tr>
<tr><td rowspan="2">SET</td><td rowspan="2">Sets communication and others</td><td>COMM</td><td>Communication-related settings</td></tr>
<tr><td>ETC</td><td>Sets servo run conditions and TP</td></tr>
<tr><td rowspan="4">I/O</td><td rowspan="4">Sets contact-related parameters</td><td>INPUT</td><td colspan="3">Sets system input contact</td></tr>
<tr><td>BRAKE</td><td colspan="3">Brake ON/OFF signal</td></tr>
<tr><td>SVO</td><td colspan="3">Servo ON / OFF signal</td></tr>
<tr><td>OUTPUT</td><td colspan="3">Sets system output contact</td></tr>
<tr><td rowspan="3">VIEW</td><td>ALARM</td><td>Disables Alarm</td><td>HISTORY</td><td colspan="3">Checks out current and existing Alarms</td></tr>
<tr><td>SERVO</td><td colspan="5">Check out motor run-related information, Option , current Vdc, firmware version and operational time</td></tr>
<tr><td>INT</td><td colspan="5">Saves Integer variables</td></tr>
</table>

4.2 PARA(PARAMETER)

- Changes default parameter values.

4.2.1 Shift to Parameter Menu

- Shift to the parameter screen.

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
Servo Controller
PARA V00.22
PRESS ENT KEY

ENT

Press ENT.

Step 2. **How to shift to parameter screen**

Servo Controller
ROBOT PLC PARA VIEW

F3

Select PARA.

Parameter Setting
SERVO MECH OPER I/O

F1 **F2** **F3** **F4**

F1: Sets servo parameter
F2: Sets mechanism parameter
F3: Sets operational parameter
F4: Sets input/output contact parameters

4.2.2 Parameter Configuration and Value Change

- Parameters that are set as valid values in changing a parameter with 'F1' or 'F2' key include AMP, MOTOR_ID, ENC_PLS, DATAMODE, USERMODE, and SENSOR.
  (For further details, refer to '5.3 How to Set Parameters'.)

Step 1. **Shift to AMP/MOT screen**

Parameter Setting
SERVO MECH OPER I/O

F1

Select SERVO.

Parameter Setting
AMP/MOT GAIN PROT

F1

Select AMP/MOT.

Step 2. **Parameter Screen Configuration**

AMP/MOT Parameter
AMP *1
MOTOR ID 106
POWER B/D 100W

ENT

Press ENT.

Description of currently-selected parameter value

AMP/MOT Parameter
AMP *
MOTOR ID 106
1,10[AMP]

Range of currently-selected parameter value

Step 3. **Increase parameter value**

```
    AMP/MOT   Parameter
AMP          *1
MOTOR ID     106
          POWER B/D   100W
```

F1

Press F1.

```
    AMP/MOT   Parameter
AMP          *2
MOTOR ID     106
          POWER B/D   200W
```

F1

Value increases.

Press F1.

```
    AMP/MOT   Parameter
AMP          *4
MOTOR ID     106
          POWER B/D   400W
```

Increased to a valid value.

Step 4. **Decrease parameter value**

```
    AMP/MOT   Parameter
AMP          *4
MOTOR ID     106
          POWER B/D   400W
```

F2

PRESS F2.

```
    AMP/MOT   Parameter
AMP          *2
MOTOR ID     106
          POWER B/D   200W
```

F1

Decreased to a valid value.

4.3 ORG(ORIGIN)

4.3.1 ORIGIN Operation

Step 1 **Shift to ORIGIN return operation screen**

Servo Controller

ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control

PROG POS ORG RUN

F3

Select ORG.

Step 2. **ORIGIN run**

Origin

INC. Encoder

RUN ? Z: 0

YES NO

F1

Select YES.

(In setting ORG_RULE to '1')

No.1 CW SW Zero

is running

STOP

ORIGIN is running.

4.3.2 Run ORIGIN and check out Z-phase (INC serial encoder)
(Set parameter ENC_TYPE to '3'.)

Step 1. **Run ORIGIN and check out Z-phase**

ROBOT Control
PROG POS ORG RUN

F3

End ORIGIN normally and select ORG.
.

Origin
INC. Encoder
RUN ? Z:-104752
YES NO

Run ORIGIN and check out Z-phase.

■ **Teach Pendant screen following completion of origin return operation**

1) The number of pulses is displayed from the origin sensor to encoder Z-phase detection.
   - When the encoder resolution is 2500pulse (Quadrature)
     1 ≤ Display range ≤ 10000
   - When an encoder resolution is 17Bit(131072pules)
     1 ≤ Display range ≤ 131072
2) The value for the number of Z-phase pulses varies within ±2000 pulse range (based on 4096 pulse) whenever origin return operation is performed.
3) When the range of fluctuation in pulse value following origin run, shifting an accurate point is not possible, so check out the sensor in robot mechanism and sensor dog.

4.3.3 Run ABS Encoder ORIGIN

- Set related parameters prior to performing origin operation.
  (For details about parameter settings, refer to 'Procedure 2 Parameter Settings'.)

■ **Origin return operation of an absolute type encoder**

1) Shift to the desired position by operation and reset the encoder for setting.
2) The value set by parameter ORG_RULE is irrelevant to operation.
   (But, it is possible when ENC_TYPE is set to '2'.)

Step 1. **ABS-type encoder home return operation**

ROBOT Control
PROG POS ORG RUN

F3

Select ORIGIN.

Step 2. **Set ABS-type encoder**

Origin
ABS. Encoder
SET ?
MTUN ZERO CAL

F1 **F2** **F3**

Select F1: Multi-Turn Clear.
Select F2: Zero Calibration.
Select F3: EndPos Calibration.

Step 3-1. **Set Multi-Turn Clear**

Origin
ABS. Encoder
Multi-Turn Clear ?
YES NO

F1

Select YES.

Origin
ABS. Encoder
CUR POS : 125.386
YES NO

F1

Select YES.

Origin ABS. Encoder CUR POS : 0.000 YES NO	The current position value is changed to 0.

Step 3-2. ① **Set Zero Calibration (MDI)**

Origin Zero Calibration MDI CUR	F1	Select MDI.
Zero Calibration OFFSET : 125.386 CUR POS : 0.000 SAV		Refers to Zero Calibration MDI default screen.
Zero Calibration OFFSET : 100 CUR POS : 0.000 SAV	1 0 0	Enter a random value.
Zero Calibration OFFSET : 100.000 CUR POS : 0.000 SAV	ENT	Press ENT.
Zero Calibration OFFSET : 1000.000 CUR POS : 25.386 SAV	F1	Select SAV.

② **Set Zero Calibration (CUR)**

Origin Zero Calibration MDI <u>CUR</u>	F2	Select CUR.
Origin ABS. Encoder P1023*125.386 <u>JOG+</u> <u>JOG-</u> spd0 IJOG	F1 F2	Select F1: JOG+. Select F2: JOG-.
Origin ABS. Encoder P1023*125.386 JOG+ JOG- spd0 <u>IJOG</u>	F4	Select IJOG.
Origin ABS. Encoder P1023*100.186 <u>JOG+</u> <u>JOG-</u> spd0 JOG	F1 F2	Select F1: JOG+. Select F2: JOG-.

Step 3-3. ③ **Set EndPos Calibration (MDI)**

EndPos Calibration END POS :0.000 CUR POS :125.386 <u>MDI</u> CUR SAV CAL	F1	Set MDI.
EndPos Calibration END POS :100 CUR POS :125.386 MDI CUR SAV CAL	1 0 0	Select ‘1’, ‘0’, and ‘0’.

EndPos Calibration
END POS :100.000
CUR POS :125.386
MDI CUR SAV CAL

ENT

Press ENT.

Step 4-1 **Set EndPos Calibration (CUR)**

EndPos Calibration
END POS :125.386
CUR POS :125.386
MDI CUR SAV CAL

F2

Select CUR.

Step 4-2 **Set EndPos Calibration (SAV)**

EndPos Calibration
END POS :125.386
CUR POS :125.386
MDI CUR SAV CAL

F3

Select SAV.

Step 4-3 **Set EndPos Calibration (CAL)**

EndPos Calibration
END POS :3053.243
CUR POS :3053.243
MDI CUR SAV CAL

F4

Select CAL.

CAUTION

- Origin operation is done when it comes to an INC serial encoder (with ENC_TYPE parameter value of 3).
- Origin operation is not needed when it comes to an ABS serial encoder (with ENC_TYPE parameter value of 2), and origin operation menu can be used to reset a multi-turn value in the desired location.

4.3.4 ORIGIN Fail

How to stop the ongoing origin operation.

■ **Stop the ongoing ORIGIN operation**

```
        Origin
     INC.   Encoder
 RUN ?      Z:      0
YES   NO
```

F1 — Select YES.

```
  No.1 CW SW Zero
     is running
STOP
```

F1 — Select STOP.

```
    Not  Find
      Origin
```

Origin operation stops.

■ **if ORG_RULE is set to '0', a warning screen comes up as shown in the screen below.**

1) In case origin operation fails, check out the LIMIT sensor or ORG_RULE settings.

Step 1. **Warning screen in setting ORIGIN**

```
    ROBOT Control
PROG   POS   ORG   RUN
```

F3 — Select ORG.

```
      Warning !
  Not Origin Mode !
```

ORG_RULE set to '0'.

4.4 PROG (PROGRAM)

4.4.1 Command

For further details, check out 'Ch.9 Description of Robot Command'.

4.4.1.1 Operating Command

Command	Detailed Command	Input Data	Description of Command
SERVO	ON OFF TRQ TQS	None None 1 ~ 300 1 ~ 300	Turns ON power to servo. Turns OFF power to servo. ALARM sounds when the torque exceeds its given LIMIT. The next line is implemented after arriving at the given torque.
ALARM	None	0 ~ 255	User ALARM sounds.
SPD (Speed)	None IOSPD I	1 ~ 10000 None 0 ~ 255	Sets motor revolutions. Sets motor revolutions to a contact point. Sets motor revolutions to integer variable.
ACC (Acceleration)	None I	1 ~ 500 0 ~ 255	Sets acceleration time. Sets acceleration time to integer variable.
DEC (Decrement)	None I	1 ~ 500 0 ~ 255	Sets deceleration time. Sets deceleration time to integer variable.
FOS	None I	0 ~ 100 0 ~ 255	Program runs during movement command (MOVx).
PCLR (Position Clear)	None	None	Sets reference coordinate (Current position value) to '0.000'.

4.4.1.2 Control Command

Command	Detailed Command	Input Data	Description of Command
STOP	None	None	Stops robot program from making progress.
IF	B	000 ~ 317	Processes conditions according to contact value (Bit).
	BB	00 ~ 31	Processes conditions according to contact value (Byte).
	I	0 ~ 255	Processes conditions according to integer variable value.
	P	0 ~ 1023	Processes conditions according to position variable value.
XIF	B	000 ~ 317	Processes conditions according to contact point value (Bit) during operation.
	BB	00 ~ 31	Processes conditions according to contact point value (Byte) during operation.
	I	0 ~ 255	Processes conditions according to integer variable value during operation.
	P	0 ~ 1023	Processes conditions according to position variable value during operation.
WAIT	None	0 ~ 10000	Waits for the assigned time period.
	B	000 ~ 317	Waits until the assigned contact point turns into the default value.
	BB	00 ~ 31	
	I	0 ~ 255	Waits until the default integer variable value is available.
	P	0 ~ 1023	Waits until the default position variable value is available.
SBRT (Subroutine)	None	0 ~ 999	Displays the start of a subroutine.
RET (Return)	None	None	Displays the end of a subroutine.
CALL	None	0 ~ 999	Branches to the assigned subroutine.
GOTO	None	0 ~ 999	Branches to the assigned label.
LBL (Label)	None	0 ~ 999	Assigns the label.
LOOP	None	0 ~ 999	Performs repeated run as much as the default value to the assigned ENDL.
ENDL (End Loop)	None	0 ~ 999	Displays the end of the assigned LOOP.
JPGM (Jump Program)	None	0 ~ 7	Branches to the assigned program.
PEND (Program End)	None	None	Ends the program.

4.4.2 Write New Program

Step 1. Shift to MAIN screen

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
Servo Controller
PARA V00.22
PRESS ENT KEY

ENT

Press ENTER.

Step 2. Shift to Job Program screen

Servo Controller
ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control
PROG POS ORG RUN

F1

Select PROG.

PROGRAM No. 0			3985
*0#	1#	2	3
4	5	6	7
EDIT		COPY	DEL

The written program is displayed with #.

PROGRAM No. 2			4000
0#	1#	*2	3
4	5	6	7
EDIT		COPY	DEL

6 (2회)

Shift to an unwritten program.

PROGRAM No. 2			4000
0#	1#	*2	3
4	5	6	7
EDIT		COPY	DEL

F1

Select EDIT.

4.4.3 Edit Program

4.4.3.1 View Written Program

Step 1. **Shift to Job Program screen**

Servo Controller			
ROBOT	PLC	PARA	VIEW

F1

Select ROBOT.

ROBOT Control			
PROG	POS	ORG	RUN

F1

Select PROG.

PROGRAM No. 0			3985
*0#	1#	2	3
4	5	6	7
EDIT		COPY	DEL

F1

Select a program to edit and select EDIT.

4.4.3.2 Insert Program

Step 1. **Shift to MAIN screen**

PROGRAM No. 0 S000*SERVO ON S001 LBL 1 BLOCK JMP DEL	9 8 2 3	Shift to the position for addition. 9 : Page up (Shift 2 or 4 lines upward) 8 : Up (Shift 1 line upward) 2 : Down (Shift 1 line dowward) 3 : Page Down (Shift 2 or 4 lines downward)
S009 GOTO 1 S010*SERVO ON S011 LBL 1 BLOCK JMP DEL	ENT	From the selected position, press ENT key.
S009 GOTO 1 S010*_ S011 SERVO ON SERVO STOP MOVA MOVI	F1 F2 F3 F4	Use the mode selection key to select a command. (For example, press ‘F2’ key to add a command STOP.)
S010 STOP S011*_ S012 SERVO ON SERVO STOP MOVA MOVI	ESC	Press ESC key when there is no further addition.
S010 STOP S011*SERVO ON S012 LBL 1 BLOCK JMP DEL		

4.4.4 Save Program

Step 1 **Complete program edit**

S010 STOP
S011*SERVO ON
S012 LBL 1
BLOCK JMP DEL

ESC

After completing the edit, press ESC key.

PROGRAM No. 1
Changed. Save?

YES NO

F1

Select YES to save.

4.4.5 Copy Program

Step 1. **Shift to Job Program screen**

Servo Controller

ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control

PROG POS ORG RUN

F1

Select PROG.

Step 2 **Copy Job Program**

PROGRAM No. 0			3985
*0#	1#	2	3
4	5	6	7
EDIT		COPY	DEL

F3

Select a number to copy and select COPY.

Program No. 0
Copy to No. 7

7

ENT

Select a number to copy and select ENT key. (ex: No. 7)

PROGRAM No. 0			3985
*0#	1#	2	3
4	5	6	7#
EDIT		COPY	DEL

4.4.6 Delete Program

Step 1 **Delete Job Program**

PROGRAM No. 7			3985	
0#	1#	2	3	
4	5	6	*7#	
EDIT		COPY	DEL	

F4

Use the arrow key to move a cursor to the number to be deleted and select DEL.

Program No. 7
Delete ?
YES NO

F1

Select YES. (ex : No.7)

PROGRAM No. 7			3985
0#	1#	2	3
4	5	6	*7
EDIT		COPY	DEL

Job Program in the corresponding number has been deleted.

4.4.7 How to Set and Save Program Block

- Ex. 1: Program with a repeated use of MOVI command

Step	Command	Description
S000	SERVO ON	Turns ON SERVO.
S001	LBL 1	Assigns LABEL to 1.
S002	SPD 1000	Sets speed at 10% of parameter LMT_PRM.
S003	MOVI 100	Moves from the current position as far as 100 in user coordinate.
S004	MOVI 200	Moves from the current position as far as 200 in user coordinate.
S005	MOVI 300	Moves from the current position as far as 300 in user coordinate.
S006	MOVI 400	Moves from the current position as far as 400 in user coordinate.
S007	SPD 3000	Sets speed at 30% of parameter LMT_PRM.
S008	MOVA P0	Moves from P0 to the assigned position.
S009	GOTO 1	Program run is transferred to LBL1.
<end of file>		

4.4.7.1 Copying Multi-row Command

(Copying the entire Job from line S000 to last line S009)

Step 1. **Shift to BLOCK configuration screen**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
BLOCK             JMP    DEL
```

F1

Select BLOCK.

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
START   END   COPY   DEL
```

BLOCK related command is displayed at the bottom of the screen.

.

Step 2. **Setting Commands BLOCK, COPY**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
START    END    COPY    DEL
```

F1

Select START.

```
S000[SERVO ON
S001*LBL 1
S002 SPD 1000
START   END     COPY    DEL
```

The square bracket opens up while being displayed between S000 and SERVO ON.

```
S008>MOVA P0
S009*GOTO 1
S010 <end of file>
START   END     COPY    DEL
```

2

Move to the step(S009) for COPY.

```
S009]GOTO 1
S010*<end of file>
S011
START   END     COPY    DEL
```

F2

Select END to close the square bracket and the COPY range is set.

```
S009]GOTO 1
S010*<end of file>
S011
START   END     COPY    DEL
```

F3

Put the cursor on the step (S010) to be pasted on and select COPY.

```
S009]GOTO 1
S010*SERVO ON
S011 LBL 1
START   END     COPY    DEL
```

The commands from COPY appears from S010 in order.

4.4.7.2 Copying Single-row Command

(Adding command MOVI 100 in line S003 to line S007 coming after S006)

Step 1. **Shift to BLOCK configuration screen**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
BLOCK             JMP    DEL
```

F1

Select BLOCK.

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
START   END   COPY   DEL
```

BLOCK related commands are displayed at the bottom of the screen.

Step 2. **Set Commands BLOCK, COPY**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
START   END   COPY   DEL
```

2

Handle an arrow key to move to S003.

```
S002 SPD 1000
S003*MOVI 100
S004 MOVI 200
START   END   COPY   DEL
```

The cursor (*) is placed on S003.

```
S002 SPD 1000
S003*MOVI 100
S004 MOVI 200
START   END   COPY   DEL
```

F1

Select START.

Display	Key	Description
S003[MOVI 100 S004*MOVI 200 S005 MOVI 300 START END COPY DEL		The square bracket opens up while being displayed between S003 and MOVI 100.
S002 SPD 1000 S003[MOVI 100 S004 MOVI 200 START END COPY DEL	8	Move to S003 for single-row COPY.
S003$MOVI 100 S004*MOVI 200 S005 MOVI 300 START END COPY DEL	F2	Select END and the dollar mark($) appears.
S006 MOVI 400 S007*SPD 3000 S008 MOVA P0 START END COPY DEL	2	Move to the step(S007) to paste.
S006 MOVI 400 S007*MOVI 100 S008 SPD 3000 START END COPY DEL	F3	Select COPY to paste the copied command.

4.4.7.3 Copying Job using READ, WRITE

(Copying the entire Job from line S000 to last line S009)

Step 1. **Shift to BLOCK configuration screen**

```
PROGRAM    No. 0
S000 *SERVO ON
S001 LBL 1
BLOCK           JMP    DEL
```

F1

Select BLOCK.

```
PROGRAM    No. 0
S000 *SERVO ON
S001 LBL 1
START   END    COPY    DEL
```

BLOCK related commands are displayed at the bottom of the screen.

Step 2. **Set command BLOCK**

```
PROGRAM    No. 0
S000 *SERVO ON
S001 LBL 1
START   END    COPY    DEL
```

F1

Select START.

```
S000[SERVO ON
S001*LBL 1
S002 SPD 1000
START   END    COPY    DEL
```

The square bracket opens up while being displayed between S000 and SERVO ON.

```
S008>MOVA P0
S009*GOTO 1
S010 <end of file>
START   END    COPY    DEL
```

2

Move by handling an arrow key toward the step(S009) to copy.

S009]GOTO 1 S010*<end of file> S011 START END COPY DEL	F2	Select END and the square bracket is closed and the range to copy is set.

Step 3. **Use READ, WRITE**

S009]GOTO 1 S010*<end of file> S011 READ WRITE JMP	ENT	Press ENT and the menu at the bottom of the screen is changed.
S009]GOTO 1 S010*<end of file> S011 READ WRITE JMP	F1	Select READ to save the written program to the memory. .
S009]GOTO 1 S010*<end of file> S011 READ WRITE JMP	F2	Move to the step(S010) to paste and select WRITE.
S009]GOTO 1 S010*SERVO ON S011 LBL 1 READ WRITE JMP		Copied programs are pasted from S010 in order.

4.4.7.4 Copying Job using JMP

(Copying commands from line S003 to S004 to line S007 coming after S006)

Step 1. **Shift to BLOCK configuration screen**

```
PROGRAM     No. 0
S000 *SERVO ON
S001 LBL 1
BLOCK             JMP    DEL
```

F1

Select BLOCK.

```
PROGRAM     No. 0
S000 *SERVO ON
S001 LBL 1
START    END    COPY    DEL
```

BLOCK related commands are displayed at the bottom of the screen

Step 2. **Set command BLOCK**

```
PROGRAM     No. 0
S000 *SERVO ON
S001 LBL 1
START    END     COPY    DEL
```

2

Handle an arrow key to move the cursor (*) to S003.

```
S002 SPD 1000
S003*MOVI 100
S004 MOVI 200
START    END     COPY    DEL
```

The cursor (*) is placed on S003.

```
S002 SPD 1000
S003*MOVI 100
S004 MOVI 200
START    END     COPY    DEL
```

F1

Select START.

S003[MOVI 100 S004*MOVI 200 S005 MOVI 300 START END COPY DEL	F1	The square bracket opens up while being displayed between S003 and MOVI 100.
S003[MOVI 100 S004*MOVI 200 S005 MOVI 300 START END COPY DEL	2	Move to the step(S004) to COPY.
S004]MOVI 200 S005*MOVI 300 S006 MOVI 400 START END COPY DEL	F2	Select END and the square bracket is closed and the range to copy is set.
S004]MOVI 200 S005*MOVI 300 S006 MOVI 400 READ WRITE JMP	ENT	Press ENT and the menu at the bottom of the screen is changed.
S004]MOVI 200 S005*MOVI 300 S006 MOVI 400 READ WRITE JMP	F1	Select READ to save Program to the memory.

Step 3. **JMP Use and COPY**

Screen	Key	Description
S004]MOVI 200 S005*MOVI 300 S006 MOVI 400 READ WRITE JMP	F3	Select JMP to skip the step.
Jump to S Last line is S009		Number input for the line to jump and the last step of Program are viewed.
Jump to S007 Last line is S009	0 0 7	Enter the step number to jump.
S006 MOVI 400 S007*SPD 3000 S008 MOVA P0 READ WRITE JMP	ENT	Press ENT and the cursor (*) is placed on S007.
S006 MOVI 400 S007*SPD 3000 S008 MOVA P0 READ WRITE JMP	F2	Select WRITE to paste Block data saved to the memory.
S006 MOVI 400 S007*MOVI 100 S008 MOVI 200 READ WRITE JMP		The assigned step is copied to S007.

4.4.7.5 Deleting Command from Job Program

(Deleting MOVI 100 in line S003 from Job Program in Example 1)

Step 1. **Delete Command**

```
S002 SPD 1000
S003*MOVI 100.000
S004 MOVI 200.000
BLOCK            JMP      DEL
```

2

Handle an arrow key to move to the step (S003) to delete.

```
S002 SPD 1000
S003*MOVI 100.000
S004 MOVI 200.000
BLOCK            JMP      DEL
```

F4

Select DEL.

```
S003*MOVI   100.000
         Delete   OK ?
YES      NO
```

F1

Select YES to delete the command.

```
S002 SPD 1000
S003*MOVI 100.000
S004 MOVI 200.000
BLOCK            JMP      DEL
```

ESC

Select ESC to move to the upper level.

```
        PROGRAM No. 0
        Changed. Save?

YES      NO
```

F1

Select YES to save Program.

4.4.7.6 How to Move within Written Job Program

Step 1. **Shift 1 line at a time.**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
BLOCK           JMP     DEL
```

8 / 2

8: Raises 1 step at a time.

2: Lowers 1 step at a time.

```
S000 SERVO ON
S001*LBL 1
S002 SPD 1000
BLOCK           JMP     DEL
```

2

The cursor(*) is taken 1 step down, from S000 to S001.

Step 2. **Page Up, Page Down**

```
PROGRAM     No. 0
S000*SERVO ON
S001 LBL 1
BLOCK           JMP     DEL
```

9 / 3

9: Page UP

(Moves 4 or 8 respective steps upward)

3: Page Down

(Moves 4 or 8 respective steps downward)

```
S003*MOVI 100.000
S004 MOVI 200.000
S005 MOVI 300.000
BLOCK           JMP     DEL
```

3

The cursor(*) is taken 4 steps down, from S000 to S003.

.

4.4.7.7 How to Save Written Program

Step 1. **Save written Program**

PROGRAM No. 0
S000*SERVO ON
S001 LBL 1
BLOCK JMP DEL

ESC

When there are any changes made, press ESC to move to Program save & check menu.

PROGRAM No. 0
Changed. Save?

YES NO

F1

Select YES to save the written program.

4.5 POSITION Teaching

- Capable of displaying on the screen the position variables used in the program or modifying their values.
- Applicable position variables are 1024 (P0 ~ P1023) units in number.
- Ranges for each variable are -99999.999 ~ 99999.999.
- There are 3 ways to set position variables.

  1) Manual data input (MDI) 2) JOG input 3) Incremental JOG input
- Position values P1020~P1023 come with the functions below.

Number of Position Value	Description
P1020	Correction value for the current position when using command GOTO following XIF.
P1021	Position value corrected to the 1020 value.
P1022	Reference coordinate value for command REF.
P1023	Current position value.

4.5.1 Manual Data Input (MDI) Teaching

- **Ex) P0 Teaching**

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
Servo Controller
PARA V00.22
PRESS ENT KEY

ENT

Press ENT.

Step 2. **Shift to POS screen**

Servo Controller

ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control PROG POS ORG RUN	F2	Select POS.
POSITION DATA P0000* 0.000 P0001 0.000 MDI TCH SAV JMP	ENT F1	Press ENT or select MDI mode 'F1'.
POSITION DATA P0000*10 P0001 0.000 MDI TCH SAV JMP	1 0	Enter 10.
P0000 10 P0001*0.000 P0002 0.000 MDI TCH SAV JMP	ENT	10 has been entered.
P0000 10 P0001*0.000 P0002 0.000 MDI TCH SAV JMP	F3	Save by moving to SAV or to the previous screen.

CAUTION

- Save is not completed when turning power OFF without moving to SAV or to the previous screen after entering the position value.
- When a value is given to P1021 and command GOTO is used following command XIF, it turns into a correction value.
- Even though a value is given to P1022, it turns into the coordinate value used in command REF.
- The value in P1023 is a current position value, ignoring the input on F1 key or ENT key.

4.5.2 JOG Teaching

■ **Setting Step (Ex: P0001 Teaching)**

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3 F1: Teach Pendant F2: RS-422 Multipoint F3: Data up/Down Load	**F1**	Turn ON power to controller and select Teach Pendant.
RoboStar RCS-8000C Servo Controller PARA V00.22 PRESS ENT KEY	**ENT**	Press ENT.

Step 2. **Shift to POS screen**

Servo Controller ROBOT PLC PARA VIEW	**F1**	Select ROBOT.
ROBOT Control PROG POS ORG RUN	**F2**	Select POS.
POSITION DATA P0000* 0.10 P0001 0.000 MDI TCH SAV JMP	**F2**	Select TCH.

```
P0000 0.123
P0001*0.123
P0002 0.000
JOG+   JOG-   spd0   IJOG
```

2

Handle an arrow key to move to P001.

```
P0000 0.123
P0001*5.678
P0002 0.000
JOG+   JOG-   spd0   IJOG
```

F1

F2

Select F1:s JOG+.

Select F2: JOG-.

```
P0001 5.678
P0002*5.678
P0003 0.000
JOG+   JOG-   spd0   IJOG
```

ENT

Press ENT to save the current position value to P0001.

■ **Command description**

```
   POSITION   DATA
P0000*0.10
P0001 0.000
MDI    TCH    SAV    JMP
```

*: Position value in ongoing Teaching
MDI: Manual data input method
TCH: JOG Teaching method
SAV: Saves position data
JMP: Moves to position variable (P) number

```
P0000 0.123
P0001*0.123
P0002 0.000
JOG+   JOG-   spd0   IJOG
```

JOG+: Moves in plus(+) direction
JOG-: Moves in minus(-) direction
IJOG: Moves as much as movement amount of the predetermined position
spd0: Changes JOG movement speed
(Change in order of spd0→spd1→spd2→spd3)

P0000 0.123
P0001*0.123
P0002 0.000
JOG+ JOG- RES0 JOG

JOG+: Moves in plus(+) direction
JOG-: Moves in minus(-) direction
JOG: Moves at predetermined speed (RPM)
RES0: Changes movement amount of JOG position
(Change in order of RES0→RES1→RES2→RES3)

■ **Change speed in JOG movement**

P0000 5.678
P0001 5.678
P0002*5.678
JOG+ JOG- spd1 IJOG

F3

Movement speed is changed. (spd1->spd2)

P0000 5.678
P0001 5.678
P0002*5.678
JOG+ JOG- spd2 IJOG

F3

Movement speed is changed. (spd2->spd3)

P0000 5.678
P0001 5.678
P0002*5.678
JOG+ JOG- spd3 IJOG

F3

Movement speed is changed. (spd3->spd0)

P0000 5.678
P0001 5.678
P0002*5.678
JOG+ JOG- spd0 IJOG

Movement speed has been changed.

■ **Change JOG mode**

P0000 5.678
P0001 5.678
P0002* 5.678
JOG+ JOG- spd0 IJOG

F3

Opens TCH screen.

P0000 5.678
P0001 5.678
P0002* 5.678
JOG+ JOG- res0 IJOG

F4

Select IJOG.

CAUTION

- When JOG key is pressed and the motor fails to run and a warning message 'Press Deadman Key' comes up on T/P screen, instead, disable the Deadman function parameter or press the Deadman key at the right side of T/P to get Teaching going.
- Deadman-related parameters are set in 'OPER->ETC->JOG_DMAN'.

4.5.3 Inching Jog Teaching

- Inching Jog shows a function of moving as much as movement amount for the predetermined position.
- Move as much as the fixed position by Jog, enabling detailed movement with the use of Inching Jog.
- Press F3 key to change JOG movement amount (res0 ~ res3) and F4 key to change JOG mode.
- Whenever pressing F1, F2 keys once at a time, movement is made as much as the fixed movement amount.
- Press F1(JOG+) or F2(JOG-) key to move to the desired position and press ENT key, and the value of a position value is changed. The screen at this time turns to the staus where the next variable value can be entered.
- The next screen shows Inching Jog operation in res0 = 1.000.

Step 1. **How to operate Inching Jog**

```
        POSITION DATA
P0000 *0.00
P0001 0.000
MDI   TCH           JMP
```

F2

Select TCH.

```
        POSITION DATA
P0000* 0.123
P0001 0.000
JOG+   JOG-   spd0   IJOG
```

F4

Select IJOG.

```
        POSITION DATA
P0000* 0.123
P0001 0.000
JOG+   JOG-   res0   IJOG
```

F1

Select JOG+ to move +1mm.

```
POSITION DATA
P0000* 1.123
P0001 0.000
JOG+   JOG-   res0   IJOG
```

The value of line P000 increases by 1 to hold a value of 1.123.

```
POSITION DATA
P0000* 1.123
P0001 0.000
JOG+   JOG-   res0   IJOG
```

F1

Select JOG+ to move +1mm.

```
POSITION DATA
P0000* 2.123
P0001 0.000
JOG+   JOG-   res0   IJOG
```

Value for line P000 increases by 1 to hold a value of 2.123.

```
P0000 2.123
P0001* 2.123
P0002 0.000
JOG+   JOG-   res0   IJOG
```

ENT

Press ENT to save the current position value to P000.

■ **Change JOG movement amount**

1) In IJOG mode, press F3 and JOG movement amount is changed from res0 to res3 in order.
2) For setting movement amount, refer to 'Ch.3 Parameter Setting'.

Step 1. **Set JOG movement amount**

P0000 2.123 P0001* 2.123 P0002 0.000 JOG+ JOG- res0 IJOG	F3	Movement amount is changed. (res0->res1)
P0000 2.123 P0001* 2.123 P0002 0.000 JOG+ JOG- res1 IJOG	F3	Movement amount is changed. (res1->res2)
P0000 2.123 P0001* 2.123 P0002 0.000 JOG+ JOG- res2 IJOG	F3	Movement amount is changed. (res2->res3)
POSITION DATA P0000* 1.123 P0001 0.000 JOG+ JOG- res3 IJOG	F3	Movement amount is changed. (res3->res0)
P0000 2.123 P0001* 2.123 P0002 0.000 JOG+ JOG- res0 IJOG		Movement amount is changed.

■ **Reference**

When completing JOG and exit JOG mode by ESC, the user can set SERVO ON/OFF status by following parameter (OPER → ETC → JOG_SV) settings.

4.5.4 Forward(FWRD) Teaching

- It is possible to confirm the value by entering a position value and moving the robot.
  1) Moves to the assigned position in the absolute coordinate system based on the origin.
- Available for use by changing FWRD speed SPD(0 ~ 3).
- For the user to set FWRD speed SPD(0 ~ 3),
  1) Use by changing the speed of parameter JOG_SPD(0 ~ 3).
  2) JOG speed and FWRD speed are identiacl.
- To speed during FWRD, be sure to select STOP and make a stop prior to changing.

- **Setting step**

Step 1. **How to change Forward speed**

```
POSITION DATA
P0000*300.000
P0001 0.000
MDI   TCH   SAV   TMP
```

3 0 0

Enter an arbitrary value 300 in P000.

```
P0000 300.000
P0001*0.000
P0002 0.000
MDI   TCH   SAV   TMP
```

ENT

Press ENT to enter 300 and move to P001 simultaneously.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD   STOP        SPD0
```

6

To move to FWRD command menu, press '6' key once.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD   STOP        SPD0
```

F1

Select FWRD.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD0
```

Go FWD at speed of SPD0.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD0
```

F2

Select STOP.
(Unable to changing speed during FRWD movement.)

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD0
```

F4

Select SPD0.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD1
```

Speed has changed to SPD1.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD1
```

F1

Select FWRD.

```
P0000 300.000
P0001*0.000
P0002 0.000
FWRD    STOP          SPD1
```

Implement command FWRD at speed of SPD1.

4.6 RUN (Robot program)

Turn into SERVO ON status when running the program.

4.6.1 How to Select Robot Program to Run

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
Servo Controller
PARA V00.22
PRESS ENT KEY

ENT

Press ENTER.

Step 2. **Shift to ETC screen with operation parameter**

Servo Controller
ROBOT PLC PARA VIEW

F3

Select PARA.

Parameter Setting
SERVO MECH OPER I/O

F3

Select OPER.

OPER. Parameter
MODE JOG DFT ETC.

F4

Select ETC.

Step 3. **Set robot Program**

ETC. Setting FLO_ERR *2000 INPOS 0.050 1, 100000		Refers to default screen for ETC setting.
INPOS 0.050 ROB_PGM *0 PLC_PGM 0, 8	2 (Twice)	Handle an arrow key to move to ROB_PGM.
INPOS 0.050 ROB_PGM *5 PLC_PGM 0, 8	ENT	Select ENT and enter Program number (0 ~ 8).

CAUTION

- To set ROB_PGM to '8', select a program by coding values for contact points PGM_SEL2 ~ 0 from the outside.
  (For example, program NO.1 is selected in PGM_SEL(2 ~ 0) = 001.)
  Turn ON contact point PGM_SEL to apply the selected program number.
- When ROB_PGM is set to a value between 0 and 7, the program for the set number runs.

4.6.2 How to Implement AUTO RUN

Step 1. **ROBOT RUN screen**

Servo Controller

ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control

PROG POS ORG RUN

F4

Select RUN.

Step 2. **Implement AUTO RUN**

PROGRAM No. 0

S000*SERVO ON

S001 LBL1

RUN RESET STEP SKIP

F1

Select RUN.

■ Description : Select a program to run before running the program.

1) If the selected program is empty or program writing does not meet rules, an error occurs.
2) Then, either select a program again or edit the program properly prior to running.
3) Error types likely to occur while the program is running are included below.

- When origin return operation is not completed

Not Find
Origin ?

- When the selected program is empty

Empty JOB	
ECODE: 11.00	
HISTORY	RESET

- When a break-in point corresponding to an executable statement is not assigned

Warning !
No match LBL
PGM No.0 STEP 003

4.6.3 How to Implement STEP RUN

Step 1. **ROBOT RUN screen**

Servo Controller

ROBOT PLC PARA VIEW

F1

Select ROBOT.

ROBOT Control

PROG POS ORG RUN

F4

Select RUN.

Step 2. **Set Step run**

PROGRAM No. 0
S000*SERVO ON
S001 LBL1
RUN RESET STEP SKIP

Refers to default screen for setting Step run.

S000 SERVO ON
S001*LBL1
S002 SPD 1000
RUN RESET STEP SKIP

F3

Select STEP to run operations according to commands.

S002 SPD 1000
S003*MOVI 100.000
S004 MOVI 200.000
RUN RESET STEP SKIP

F3

Select STEP to move to S003 and perform MOVI 100.000 operation.

Display	Key	Description
S002 SPD 1000 S003*MOVI 100.000 S004 MOVI 200.000 STOP No. 0 12.159		12.159 indicates the current position of the robot in motion.
S003 MOVI 100.000 S004*MOVI 200.000 S005 GOTO 1 RUN RESET STEP SKIP	F3	Select STEP to perform MOVI 200.000 operation. .
S003 MOVI 100.000 S004*MOVI 200.000 S005 GOTO 1 STOP No. 0 171.164		171.164 indicates the current position of the robot in motion.
S004 MOVI 200.000 S005*GOTO 1 S006 <end of file> RUN RESET STEP SKIP	F3	To continue STEP RUN, select STEP.

4.6.4 How to Convert STEP RUN to AUTO RUN

(Perform Step 1, Step 2 for how to perform step run in the same way before performing Step 4.)

Step 1. **How to convert to AUTO RUN**

```
PROGRAM    No.   0
S000*SERVO ON
S001 LBL1
RUN    RESET    STEP    SKIP
```

Refers to the default screen for setting Step run.

```
S002 SPD 1000
S003*MOVI 100.000
S004 MOVI 200.000
RUN    RESET    STEP    SKIP
```

F1

Select RUN and operation is done in auto run.

```
S003 MOVI 100.000
S004*MOVI 200.000
S005 GOTO 1
STOP No. 0            159.177
```

Operates is done in auto run.

4.6.5 Initialize Robot Program Step

(Implemented following '4.6.2 How to Implement AUTO RUN'.)

Step 1. **How to initialize program step**

```
S003 MOVI 100.000
S004*MOVI 200.000
S005 GOTO 1
STOP No. 0          7859.177
```

F1

Select STOP.

```
S003 MOVI 100.000
S004*MOVI 200.000
S005 GOTO 1
RUN    RESET    STEP    SKIP
```

F2

Select RESET.

```
PROGRAM   No.   0
S000*SERVO ON
S001 LBL1
RUN    RESET    STEP    SKIP
```

Move to the default screen in setting Step run.

4.6.6 Run from Stopped Step

1) If the robot program that has been previously running does not end, a screen that asks if it continues to run from the stopped step comes up.
2) STOP, Alarm or previous STEP of power OFF, and Servo On status are maintained.
(Beginning to run from the stopped step in step run or auto run.)

Step 1. **How to implement Program from the stopped step**

```
Program stopped
PGM No.0 STEP 004
CONTINUE ?
YES    NO
```

F3

Select YES.

```
S003 MOVI 100.000
S004*MOVI 200.000
S005 GOTO 1
RUN   RESET   STEP   SKIP
```

Run begins from S004.

```
PROGRAM   No.   0
S000*SERVO ON
S001 LBL1
RUN   RESET   STEP   SKIP
```

F1

F3

F1: Restarts in auto run.
F3: Restarts in step run.

4.7 PLC

4.7.1 Select PLC Program

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
Servo Controller
PARA V00.22
PRESS ENT KEY

ENT

Pres ENTER.

Step 2. **Shift to ETC screen with operation parameter**

Servo Controller
ROBOT PLC PARA VIEW

F3

Select PARA.

Parameter Setting
SERVO MECH OPER I/O

F3

Select OPER.

OPER. Parameter
MODE JOG DFT ETC.

F4

Select ETC.

Step 3. **How to set PLC Program**

```
        ETC.      Setting
FLO_ERR   *2000
INPOS     0.050
                    1, 100000
```

Refers to default screen for ETC setting.

```
ROB_PGM 0
PLC_PGM *0
INI_TRQ    0
                    0, 3
```

2

(3회)

Handle an arrow key to move to PLC_PGM.

```
ROB_PGM 0
PLC_PGM *3
INI_TRQ    0
                    0, 3
```

ENT

Select ENT and enter Program number (0 ~ 3).

4.7.2 Run PLC Program

■ Description : Select a PLC program to run before running the program.

1) If the selected program is empty or program writing does not meet rules, an error occurs.
2) Then, either select a program again or edit the program properly prior to running.
3) Error types likely to occur while the program is running are included below.
   - When the selected program is empty

```
Empty   PLC
ECODE:    11..50
HISTORY                RESET
```

   - When no saved contact point information is present in logic operation (Syntax Error occurs)

```
      Warning !
 Needs more 1 block
PLC No.   0   STEP 000
```

■ **Setting Step**

Step 1. **Shift to MAIN screen**

```
 TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load
```

F1

Turn ON power to controller and select Teach Pendant.

```
 RoboStar RCS-8000C
Servo Controller
PARA V00.22
        PRESS ENT KEY
```

ENT

Press ENTER.

Step 2. **Implement PLC Run**

Screen	Key	Description
Servo Controller ROBOT PLC PARA VIEW	F2	Select PLC.
PLC Control PROG TEST RUN	F4	Select RUN.
PGM No.0 is Ready. RUN	F4	Select RUN.

Step 3. **Stop PLC RUN**

Screen	Key	Description
PLC Control PROG TEST RUN	F4	Refers to default screen of PLC Control. Select RUN again.
PGM No.0 is Running STOP	F1	Select STOP and PLC Program comes to a stop.

4.7.4 Check out I/O Connection

■ First of all, select an I/O contact point to use and perform the connection job.

4.7.4.1 Check out Input/Output Contact Status and TEST Method

■ Setting Step

Step 1. **Shift to PLC TEST screen**

```
Servo Controller
ROBOT   PLC   PARA   VIEW
```

F2 — Select PLC.

```
PLC Control
PROG   TEST   RUN
```

F2 — Select TEST.

Step 2

```
PORT   01234567    STATE
B00   *00000000    I
B01    00000000    I
                   JMP
```

<PORT Movement>

2 : Moves upper PORT

8 : Moves lower PORT

<BIT Movement>

4 : Moves lower BIT

6 : Moves upper BIT

■ PORT: B00 ~ B41
■ BIT Input/Output: 0(OFF), 1(ON)
■ STATE:
- I: User Input
- O: User Output
- USER: Internal Contact
- SYS I: System Input
- SYS O: System Output

4.8 VIEW

4.8.1 How to Check out Alarm Message

When the robot is in abnormal operation conditions, an error code comes up on the display in front of the controller, displaying alarm details on Teach Pendant screen.

■ **Display Alarm Message**

<Alarm Message>
<Alarm Code>
HISTORY RESET

Alarm message:
Displays details about the generated alarm.

Alarm code:
Displays the code number of the generated alarm.

■ **Example of Alarm Message Output**

T/P Emergency
ECODE: 12.00
HISTORY RESET

In case T/P EMG alarm occurs.

SYS I/O Emergency
ECODE: 12.01
HISTORY RESET

In case System I/O EMG alarm occurs.

4.8.2 Alarm History

To identify information about the controller alarm generated before, it can be confirmed through alarm history menu and the maximum number of alarm histories that can be saved is 100.

Step 1. **Shift to MAIN screen**

TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load

F1

Turn ON power to controller and select Teach Pendant.

RoboStar RCS-8000C
S/W V00.00.21 150701
PARA V00.22
PRESS ENT KEY

ENT

Press ENT.

Step 2. **Shift to VIEW screen**

Servo Controller
ROBOT PLC PARA VIEW

F4

Select VIEW.

STATUS VIEW
ALARM SERVO INT

F1

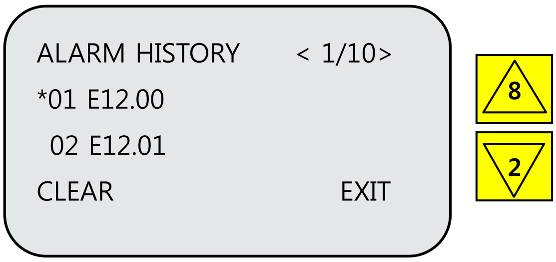
Select ALARM.

Normal Condition
HISTORY

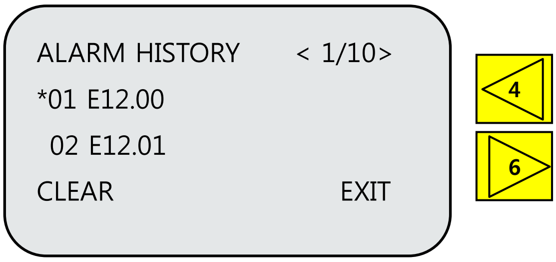
F1

Select HISTORY.

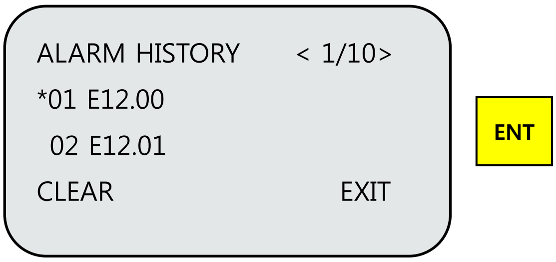
Step 3. **Identify Alarm History**



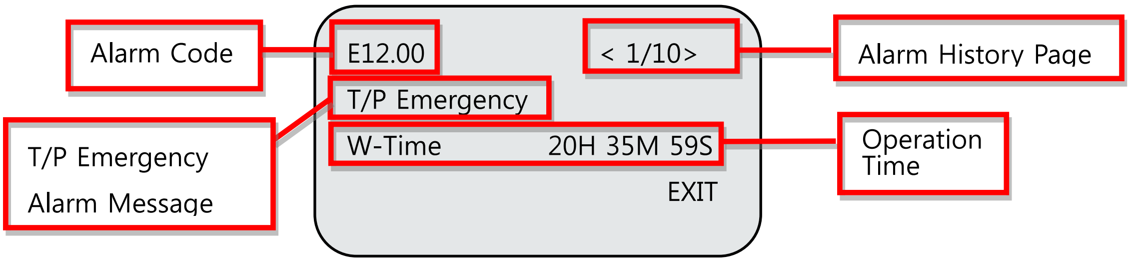
Handle an arrow key to move to Alarm to identify.



Handle an arrow key to select Alarm History Page.



Press ENT to check out detailed Alarm history.



4.8.3 INT(INTEGER) Variable

Referred to as an integer variable which is used for arithmetic operation and storing temporary input/output DATA. This variable stores 256 variables between 0 and 65535.

Step 1. **Shift to VIEW screen**

Servo Controller

ROBOT PLC PARA VIEW

F4

Select VIEW.

STATUS VIEW

ALARM SERVO INT

F1

Select ALARM.

Step 2. **Save Integer Variable Value**

INTEGER DATA

I000*0

I001 0

JMP

8

2

9

3

8: Raises 1 step at a time.

2: Lowers 1 step at a time.

9: Page UP (Moves 4 or 8 respective steps upward)

3: Page Down (Moves 4 or 8 respective steps downward)

INTEGER DATA

I000*0

I001 0

JMP

ENT

Select a number to change and press ENT key.

I000*8000

I001*0

I002 0

JMP

ENT

Enter a desired value and press ENT key. (Save a value between 0 and 65535.)

ch.5 Parameter settings

- Parameter settings are an important part and more than half of the errors generated while operating the robot are due to incorrect settings.
- For basic parameter setting values, refer to labels attached to the robot.
- Parameters are basically factory default settings. There may be situations, while installing or running the robot in the field, where parameter values should inevitably be modified according to surrounding environments. In this case, contact our customer care team.

5.1 Overview

- Refers to the mode that sets robot type and operating environment.
- Prior to running the robot (Mechanism+ Contoller), be sure to check out the default value and reset it when necessary.
  1) Data related to mechanical, electrical robot specifications
  2) Basic robot operation methods such as home return method and specific functions
  3) Computer and data communication protocols
- Basic parameters are basically factory-default settings when shipping out the robot (Mechanism+Controller).
- Upon completion of settings, be sure to record or back up the data on the computer in preparation for change to default value due to error in use.

5.2 Parameter Types

<table>
<tr><th colspan="2">Group</th><th colspan="4">Detailed Group</th></tr>
<tr><th>Name</th><th>Description</th><th>Name</th><th colspan="3">Description</th></tr>
<tr><td rowspan="3">SERVO</td><td rowspan="3">Sets servo-related parameters</td><td>AMP/MOT</td><td colspan="3">Sets servo motor capacity and constant</td></tr>
<tr><td>GAIN</td><td colspan="3">Sets controller gain</td></tr>
<tr><td>PROT</td><td colspan="3">Sets safety-related constant</td></tr>
<tr><td>MECH</td><td colspan="5">Sets mechanism-related parameters</td></tr>
<tr><td rowspan="5">OPER</td><td rowspan="5">Sets operation-related parameters</td><td>MODE</td><td colspan="3">Sets acceleration/deceleration and ORIGIN methods in feeding power supply</td></tr>
<tr><td>JOG</td><td colspan="3">Sets JOG operation</td></tr>
<tr><td>DEF</td><td colspan="3">Sets basic movement conditions</td></tr>
<tr><td rowspan="2">SET</td><td rowspan="2">Sets communication and others</td><td>COMM</td><td>Communication-related settings</td></tr>
<tr><td>ETC</td><td>Sets servo run conditions and TP</td></tr>
<tr><td rowspan="4">I/O</td><td rowspan="4">Sets contact-related parameters</td><td>INPUT</td><td colspan="3">Sets system input contact</td></tr>
<tr><td>BRAKE</td><td colspan="3">Brake ON/OFF signal</td></tr>
<tr><td>SVO</td><td colspan="3">Servo ON / OFF signal</td></tr>
<tr><td>OUTPUT</td><td colspan="3">Sets system output contact</td></tr>
</table>

5.3 How to Set Parameters

5.3.1 How to Set SERVO-related Parameters

(Servo parameters are the mode that sets the capacity of a servo driver, the capacity of the servo motor, encoder type, controller gain and brake operation conditions of the motor.)

5.3.1.1 AMP / MOT

■ **Setting Servo Motor Capacity & Constant**

Detailed Group	**Name**	Description	**Setting Range**	**Default Value**
AMP/ MOT	AMP	Sets built-in servo driver capacity	1~15	2
	MOTOR ID	Sets motor capacity and motor type	0 ~ 9999	206
	ENC TYPE	Selects encoder types INC, ABS	0 ~ 3	3
	ENC PLS	Sets encoder pulse	1000 ~ 9999999	131072
	MOT_TYPE	Sets rotary, linear	0 ~ 1 (ROT/LIN)	0
	ENC_DIR	Sets encoder direction (+ / -)	0, 1 (CW/CCW)	0
	R	Phase resistor	0 ~ 999.99 (Ω)	0.300
	L	Phase inductance	0 ~ 999.99 (mH)	7.600
	R_I	Rated current	0 ~ 999.999 (A)	1.600
	MAX_I	Maximum current	0 ~ 999.999 (A)	4.880
	BACK_EMF	Counter electromotive force	0 ~ 10 ($10^{-3}V/min^{-1}$)	17.550
	Jm	Inertia moment	0 ~ 99.99 (10^{-4}kg*m^2)	0.140
	Kt	Torque constant	0 ~ 999.99 (N*m/A)	0.410
	MAX_RPM	Maximum speed of revolution	1 ~ 10000 (RPM)	5000
	Kcp	Proportional gain of current control loop	0 ~ 999.990	42.990
	Kci	Integral gain of current control loop	0 ~ 999.990	2.870
	POLE	Number of motor poles	1 ~ 99 (POLE)	8
	Z_OFFSET	Z-phase initialization	0 ~ 360 (THETA)	30
	H_OFFSET	Hall initialization	0 ~ 360 (THETA)	0
	ELC_PIT	Distance between poles	1 ~ 1000 (0.1mm)	1

Built-in SERVO DRIVER Capacity Setting	
Set Position	SERVO ⇒ AMP/MOT ⇒ **AMP**

Parameter	Set range	Default value	Description
AMP	0~20	2	Sets the capacity of the built-in power amplifier(AMP).

Controller	Capacity	Set Value
RCS8001	100W	1
RCS8002	200W	2
RCS8004	400W	4
RCS8008	800W	8
RCS8010	1000W	10
RCS8015	1500W	15

Reference

1. This value is determined by the capacity of a single-axis controller.

Caution

- When MOTOR TYPE and MOTOR ID are incorrectly entered, the motor may be damaged so use caution.
- Incorrect capacity setting (AMP) may cause the controller and the motor may be damaged so use caution.

Motor Capacity Setting	
Set poisition	SERVO ⇒ AMP/MOT ⇒ **MOTOR ID**

Parameter	Set range	Default value	Description
MOTOR ID	0~9999	206	Motor capacity and motor type setting

MOTOR TYPE	**MOTOR ID**	**MOTOR TYPE**	**MOTOR ID**	**MOTOR TYPE**	**MOTOR ID**
MSMR01	106	MSME01	108	MSMZ01	103
MSMR02	206	MSME02	208	MSMZ02	203
MSMR04	406	MSME02	408	MSMZ04	403
MSMR08	756	MSME02	758	MSMZ05	753
MSMA10	1006	MHMD10	1008	MDMA10	1007
-	-	MSMA15	1508	MDMA15	1507

Reference

1. Values for ENC_PLS, R, L, R_I, MAX_I, BACK_EMF, jm, kt, MAX_RPM, Kcp, Kci, and POLE are set in line with Sped by set values for MOTOR ID.

2. When the set value is 0, a value can be set arbitrarily.
   (Refer to MOT_TYPE parameter.)

Caution

- When using MDMA series, LMT_RPM parameter value is set to the rated speed of 2000rpm. When the setting is not made and the system runs, error "13.00 Over Speed" sounds.
- Incorrect parameter setting may damage the controller or the device, and may cause a malfunction.

<table>
<tr><td colspan="4">ENCODER Constant Setting</td></tr>
<tr><td>Set position</td><td colspan="3">SERVO ⇒ AMP/MOT ⇒ ENC_TYPE, ENC_PLS, ENC_DIR</td></tr>
<tr><th>Parameter</th><th>Set range</th><th>Default value</th><th>Description</th></tr>
<tr><td>ENC TYPE</td><td>0~3</td><td>3</td><td>Sets an encoder type to use.
<table>
<tr><th>Set value</th><th>Type</th></tr>
<tr><td>0</td><td>9 wire Quadrature Encoder type</td></tr>
<tr><td>1</td><td>Reserved</td></tr>
<tr><td>2</td><td>Absolute Encoder type</td></tr>
<tr><td>3</td><td>Incremental Encoder type</td></tr>
</table></td></tr>
<tr><td>ENC PLS</td><td>131072 (Pulse)</td><td>131072</td><td>Sets the number of pulses per revolution to use.
<table>
<tr><th>Set value</th><th>Type</th></tr>
<tr><td>131072</td><td>Serial Type Encoder</td></tr>
<tr><td>2500</td><td>Quadrature Type Encoder</td></tr>
</table></td></tr>
<tr><td>ENC DIR</td><td>0~1</td><td>0</td><td>Sets encoder direction (+ / -).</td></tr>
</table>

Reference

1. Sets an encoder type to use.

2. A 9 wire Quadrature motor can run when setting ENC_TYPE value to 0.
   Absolute Encoder type when setting ENC_TYPE to 2.
   When setting ENC_TYPE value to 3, the encoder uses communication lines SD+, SD- pin other than power-relatred signals.

3. ABS(Absolute) 4 wire serial encoder sets 'ENC_TYPE' to '2', whereas an INC(Incremental) 4 wire serial encoder sets 'ENC_TYPE' to '3'. (Absolute one should get a separate battery installed.)

4. MOTOR ID value gets ENC_PLS value to change automatically.

5. Once the encoder type has been changed, be sure to cut off the power and re-apply it before use.

Caution

➢ Incorrect parameter setting may damage the controller or the device and may cause a malfunction.

MOT TYPE (Motor Type Setting			
Set position	SERVO ⇒ AMP/MOT ⇒ **MOT_TYPE**		
Parameter	Set range	Default value	Description
MOT TYPE	0~1	0	Sets types (Rotary, Linear Motor) of a servo motor. **Set value** / **Description**: 0 = Rotary Motor; 1 = Reserved

SERVO Motor Capacity, Constant Decision			
Set position	SERVO ⇒ AMP/MOT ⇒ **R, L, R_I, MAX_I, BACK_EMF, Jm, Kt, MAX_RPM, Kcp, Kci, POLE Z_OFFSET, H_OFFSET, ELC_PIT**		
Parameter	Set range	Default value	Description
R	0 ~ 999.99 (Ω)	3	Phase resistor
L	0 ~ 999.99 (mH)	7.6	Phase inductance
R_I	0 ~ 999.999 (A)	1.6	Rated current
MAX_I	0 ~ 999.999	1.91	Maximum current
BACK_EMF	0 ~ 10[Vrms/rpm]	10	Counter electromotive force
Jm	0 ~ 999.999 (gfcms2)	1.6	Inertia moment
Kt	0 ~ 999.99 (kgfcm/A)	0	Torque integer
MAX_RPM	1 ~ 10000 (RPM)	5000	Maximum speed of revolution
Kcp	0 ~ 50.000	47.75	Proportional gain of current control loop
Kci	0 ~ 20.00	15.1	Integral gain of current control loop
POLE	1 ~ 99 (POLE)	8	Number of motor poles
Z_OFFSET	0 ~ 360[THETA]	30	Z-phase initialization
H_OFFSET	0 ~ 360[THETA]	0	Hall initialization
ELC_PIT	1 ~ 1000[0.1mm]	1	Distance between poles

Reference

1. R ~ POLE values are automatically set when setting MOTOR_ID value, and to edit them individually, set MOTOR_ID to '0'.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.1.2 GAIN

Controller Gain Setting			
Set position	SERVO ⇒ GAIN ⇒ **POS_P, SDP_P, SPD_I**		
Parameter	Set range	Default value	Description
POS_P	15 ~ 300 (1/s)	60	Proportional gain of position control loop (Position Proportion)
SPD_P	2 ~ 500	40	Proportional gain of speed control loop (Speed Proportion)
SPD_I	10 ~ 150	25	Integral gain of speed control loop (Speed Integral)

Reference

1. POS_P(Position Proportion): Proportional gain of position control loop
   (1) Determines the responsiveness of the position control system.
   (2) If the position loop gain is set at high level, positioning time can be shortened.
   (3) But, if set too high, it may cause an oscillation, therefore use caution.
   (4) When the inertia ratio is set correctly, POS_P set unit is hertz(Hz).

2. SPD_P(Speed Proportion): Proportional gain of speed control loop
   (1) Determines the responsiveness of the speed loop.
   To improve responsiveness of the whole servo system by raising POS_P, it is necessary to set SPD_P at high level.
   (2) But, if it is too high, it may cause an oscillation, therefore use caution.

3. SPD_I(Speed Integral): Integral gain of speed control loop
   (1) Sets the integral time constant of the speed loop.
   (2) As the set value is smaller, the deviation at stop gets faster to 0.
   (3) If set to '999', integral is maintained.
   (4) If set to '1000', integral effects disappear.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Controller Gain Setting	
Set position	SERVO ⇒ GAIN ⇒ **IR, SPD_FF, SPD_FL, TCMD_FL**

Parameter	Set range	Default value	Description
IR	0 ~ 2000	300	Inertia Ratio
SPD_FF	0 ~ 2000	0	Speed Feed Forward
SPD_FL	10 ~ 1000	200	Time constant of feed forward filter (Speed Filter)
TCMD_FL	50 ~ 3000	300	Time constant of the 1st torque filter (Torque Command Filter)

Reference

1. IR
   (1) Sets the ratio of the load inertia to the inertia of a rotor. (Load inertia /Motor inertia)×100[%]
   (2) When the inertia ratio is set correctly, SPD_P set range is hertz (Hz). If the inertia ratio is larger than the actual level, SPD_P set unit gets larger, whereas when the inertia ratio is smaller than the actual level, SPD_P set range gets smaller.

2. SPD_FF
   (1) Sets the amount of speed feed forward in position control.
   (2) If set at high level, the position deviation gets smaller to improve responsiveness but allow over-shoot to form easily, so use caution.

3. SPD_FL
   (1) Sets the time constant of the delay filter inserted in the speed feed forward unit.
   (2) When speed feed forward is set at high level to generate over-shoot or sound gets bigger at time of operation, set a filter and the issued problem occasionally improves.

4. TCMD_FL
   (1) Sets the time constant of the delay filter inserted in the torque command unit.
   (2) Shows an occasional effect of restraining oscillation by torsional resonance.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.1.3 PROT

Safety-related Constant Setting			
Set position	SERVO ⇒ PROT ⇒ **OVS, OVT, OVL**		
Parameter	Set range	Default value	Description
OVS	0 ~ 5500[PRM]	5000	Maximum allowable speed of the motor in mechanism
OVT	1 ~ 1000[100ms]	25	Allowable load duration in mechanism
OVL	100 ~ 130[%]	110	Torque value of allowing load in mechanism

Reference

1. OVS(Over Speed): Maximum allowable speed of the motor in mechanism
   (1) Sets a speed limit.

2. OVT(Overload Time): Allowable load duration in mechanism
   (1) Used to limit maximum motor torque in the controller (Servo) by means of parameter settings.
   (2) General specifications allow about 3 times more in instant torque than rated torque, but when a fear may arise in regard to motor load(Machine) intensity with 3 times more in torque, this parameter is used to limit the maximum torque.

3. OVL(Overload Torque): Torque value of allowing load in mechanism
   (1) When determined as excess deviation by function 「Excess protection of position deviation」, the detection level is set to the number of deviation counters.

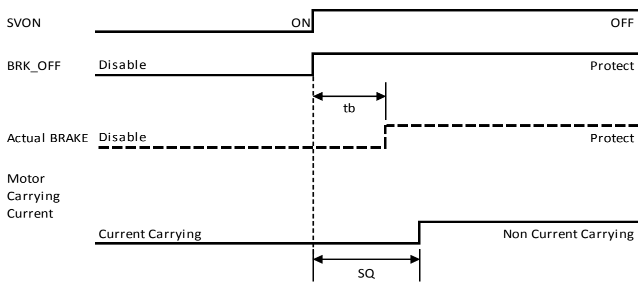
Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

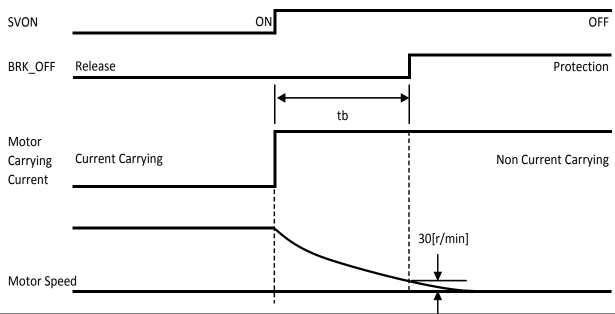
Safety-related Constant Setting			
Set position	SERVO ⇒ PROT ⇒ **BRK_S, BRK_R**		
Parameter	Set range	Default value	Description
BRK_S	0 ~ 2000[1ms]	200	With SERVO OFF while the motor stops, this refers to time taken from when brake release signal is OFF to the moment of non current carrying (SERVO FREE)
BRK_R	0 ~ 2000[1ms]	200	With SERVO OFF while the motor is rotating, this refers to time taken from when the motor is free from current carrying until the moment brake release signal is OFF.

Reference

1. BRK_S(Brake Time Stop)
   (1) To prevent the motor from making minute movement/fall due to operation delay time(tb), sequence(SQ) ≥ operation delay time (tb) of brake is arranged when turning off the primary power supply.
   (2) Sequence (SQ) unit when turning off the primary power supply: (Set value) x 8ms



2. BRK_R
   (1) Sets to prevent the brake from being deteriorated due to motor rotation.
   (2) With the servo off while the motor is rotating, time tb in the figure below becomes a shorter time of the times taken until SQ set time and motor rotation speed reach below about 30r/min.



Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Safety-related Constant Setting			
Set position	SERVO ⇒ PROT ⇒ **MAIN_PWR, ALM_SEQ, SVO_SEQ, OPEN_CHK**		
Parameter	Set range	Default value	Description
MAIN_PWR	0 ~ 3[SEQ]	0	Operating conditions for the dynamic brake when the power to motor is cut off
ALM_SEQ	0 ~ 3[SEQ]	0	Operating conditions for the dynamic brake in the event of an alarm
SVO_SEQ	0 ~ 3[SEQ]	0	Runs the dynamic brake in SERVO OFF
OPEN_CHK	0 ~ 1[ON/OFF]	0	Sets whether to check for short circuit when using the regenerative resistor. Set value 0: Open Check used, 1: Open Check not used

Reference

■ For setting MAIN_PWR, ALM_SEQ, SVO_SEQ parameters refer to the table below.

Set Value	Operating Conditions		Description of deviation counter
	Decelerating	After stop	
0	DB	DB	CLEAR
1	FREE RUN	DB	CLEAR
2	DB	FREE	CLEAR
3	FREE RUN	FREE	CLEAR

1. MAIN_PWR(Main Power Sequence)
   (1) After primary power is cut off
   - Operating conditions during deceleration or after stop
   - Sets clear handling of the description of deviation counter

2. ALM_SEQ(Alarm Sequence)
   (1) Sets operating conditions for deceleration or stop by the operation of Controller(Servo) protection functions in the event of an alarm.
   (2) Relationship between set value, operating conditions and deviation counter handling is identical to the description of MAIN_PWR.

3. SVO_SEQ(Servo Off Sequence)
   (1) After SERVO OFF
   (2) Operating conditions during deceleration or after stop.
   (3) Relationship between set value, operating conditions and deviation counter handling is identical to the description of MAIN_PWR.

4. OPEN_CHK(Register Open Check)
   (1) Sets whether to check for short circuit when using a regenerative resistor in Controller(Servo).
   (2) When the set value is '0', a check mark is used in the short circuit for regenerative resistor.
   (3) A check mark is not used in the short circuit for regenerative resistor.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.2 How to Set Mechanism (MECH) related Parameters

Operating Area Setting			
Set position	MECH => **MIN_LMT, MAX_LMT**		
Parameter	Set range	Default value	Description
MIN_LMT	-99999.999 ~ 99999.999	-99999.999	Minimum coordinate value for operating area
MAX_LMT	-99999.999 ~ 99999.999	99999.999	Minimum coordinate value for operating area

Reference

1. In the event of the position command going beyond MIN_LMT, MAX_LMT range during robot operation, it is handled as an alarm.

2. Values MIN_LMT, MAX_LMT are ignored when doing Jog operation and Origin operation, and user coordinate values and the common area calculable in the number of encoder pulses are used as a limit value.
   (-99999.999 <= User coordinate value <= 99999.999,
   -99999.999 <= Number of encoder pulses <= 99999.999)

3. When converting MIN_LMT and MAX_LMT values to the number of encoder pulses (After quadrature),
   Should be placed in -99999999 ~ 99999999 range and handled as an alarm when beyond the range.

4. To operate in unlimited orbit, the position value should be changed to '0' by using 'PCLR' command at an appropriate position when writing a program.
   (Used only in an INC serial encoder)

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Operation Limit Setting			
Set position	MECH => **LMT_RPM, LMT_TRQ**		
Parameter	Set range	Default value	Description
LMT_RPM	1 ~ 10000 (RPM)	3000	Sets maximum value of operating speed
LMT_TRQ	0 ~ 300 (%)	300	Limit torque value during operation

Reference

1. LMT_RPM value works as a basis in speed set for robot program.
   Ex) When setting LMT_RPM to '3000' and running SPD1000 in the program, the operating speed becomes 300[RPM](10% of LMT_RPM).

Caution

- When the maximum speed of the motor is lower than the preset LMT_RPM, alarm 'Over Speed' sounds.
- When using MDMA series, set the value for LMT_RPM parameter to a rated speed of 2000rpm. If the setting is not done and the system operates, alarm "13.00 Over Speed" sounds.

User Coordinate System Setting			
Set position	MECH => **ORG_OFS, ABS_OFS, CAL_POS, END_POS**		
Parameter	Set range	Default value	Description
ORG_OFS	-99999.999 ~ 99999.999	0	Coordinate value for origin position in user coordinate system
ABS_OFS	-99999.999 ~ 99999.999	0	Position value for origin setting when using an absolute encoder
CAL_POS	-99999.999 ~ 99999.999	0	Position value for calibration setting when using an absolute encoder
END_POS	-99999.999 ~ 99999.999	0	Value for end position when using an absolute encoder

Reference

1. ORG_OFS enters coordinate values for the origin position based on the coordinate system desired by the user.
2. The position used when feeding power supply is used as an ORG_OFS coordinate until the origin is found out.
3. When using the machine without an origin, ORG_OFS value is set to '0'.

Caution

Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

User Coordinate System Setting			
Set position	MECH => **MOV_MOT, MOV_MECH, MOV_POL**		
Parameter	Set range	Default value	Description
MOV_MOT	1 ~ 10000	1	Revolutions of motor
MOV_MECH	1 ~ 10000	10	Movement amount of mechanism
MOV_POL	0 ~ 1 (0: Motor rotating forward + movement) (1: Motor rotating forward - movement)	1	Sign setting on user coordinate system

Reference

1. MOV_MOT, MOV_MECH sets a conversion rate between movement amount on user coordinate system and the number of corresponding encoder pulses.
   예1) To use the coordinate system by [mm] for the machine running 10.000[mm] per revolution of motor, set MOV_MOT to '1' and MOV_MECH to '10', respectively.
   예2) To use the coordinate system by [°] for the machine running 360.000[°] per 50 revolutions of motor, set MOV_MOT to '50' and MOV_MECH to '360', respectively

2. The range applicable as the coordinate value on user coordinate system is -99999.999 ~ 99999.999.

3. The encoder pulse range used in servo operation is a 4-multiplied encoder pulse in –99999999 ~ 99999999 range.

4. Even a position value allowed in the user coordinate system issues an alarm when the number of pulses for the position goes beyond the set range.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Special Movement Condition Setting			
Set position	MECH => **MPG_PLS0, MPG_PLS1, MPG_MOV0, MPG_MOV1, T_CYCLE**		
Parameter	Set range	Default value	Description
MPG_PLS0 MPG_PLS1	1 ~ 10000	1	The number of entered MPG pulses
MPG_MOV0 MPG_MOV1	0.001 ~ 500.000	0.001	Movement amount of mechanism for the number of entered mpg pulses
T_CYCLE	0 ~ 10000.000	0	User corresponding to a single cycle of machine Position value on coordinate system (Used in MOVT command)

Reference

1. When using MOVT while giving commands to robot, assigned position value allows one of P0 ~ P15 depending on contact values IO_POS(3 ~ 0), and when contact point MOVT_ST is '1', movement begins.

2. When shifted to coordinate '360.000' in machinery structure, it returns to the start point.

3. To move from the current position '359.000' to '0.000', as much as '359.000' is needed for movement. But, when any direction will do, '0.000' and '360.000' are identical therefore movement from '359.000' to '1.000' is simply made, it is possible to reach the desired point. In this case, when T_CYCLE value is set to '360.000', movement is made automatically in a closer direction when MOVT command is delivered. This function is available for use only in an incremental encoder.

4. When T_CYCLE function is used with pneumatic pipes or wires in the load, wires may be tangled so avoid using.

5. This function is not used when setting T_CYCLE value to ''0.000'.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.3 How to Set Operation(OPER) related Parameters

Involved in setting parameters related to controller operations, such as executable program selection, origin run method.

5.3.3.1 MODE

Auto Run Setting in Feeding Power			
Set position	OPER ⇒ MODE ⇒ **AUTO_PLC, AUTO_ORG**		
Parameter	Set range	Default value	Description
AUTO_PLC	0 ~ 1 (1:PLC Auto Run)	0	Auto PLC run in feeding power
AUTO_ORG	0 ~ 1 (1:ORG Auto Run)	0	Auto Origin run in feeding power

Reference

1. Set AUTO_PLC value to '1', and the PLC program selected from PLC_PGM parameter at the time of feeding power begins to run automatically. At this moment, an alarm sounds when the corresponding PLC program has not been written or there is any grammatical error..

2. Set AUTO_ORG value to'1', automatic home return operation begins according to the method set in ORIGIN_RULE parameter at the time of feeding power. (Comes under general incremental encoder)

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Smoothing Filter Acceleration/Deceleration Setting			
Set position	OPER ⇒ MODE ⇒ **S_MODE**		
Parameter	Set range	Default value	Description
S_MODE	0 : Filter not used	3	Time constant for acceleration/deceleration filters
	1 : 2 (msec)		
	2 : 5 (msec)		
	3 : 11 (msec)		
	4 : 23 (msec)		
	5 : 47 (msec)		
	6 : 95 (msec)		
	7 : 191 (msec)		

Reference

1. An acceleration/deceleration calculator calculates acceleration/deceleration waveforms to the taget point according the set parameter.
   A trapezoidal speed waveform has each of its corners generate step-type torque (acceleration/deceleration torque) and may generate vibrations due to the step-type torque depending on the machine.
   To reduce this phenomenon, either set acceleration/deceleration time longer or adjust S_MODE values.

2. The filter operated by S_MODE is the 1st delay-type filter.
   There is a difference depending on acceleration/deceleration time settings, but when using S_MODE, the time about 4 times (maximum 8 times) longer than the filter time constant is added to movement operation when compared to trapezoidal acceleration/deceleration.

3. When the delay by S_MODE filter goes way too much, extend acceleration/deceleration time and use a short time constant filter, which can ultimately reduce operating time.

4. S_MODE operation applies to all movement commands.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Home Return Method Setting			
Set position	OPER ⇒ MODE ⇒ **ORG_RULE**		
Parameter	Set range	Default value	Description
ORG_RULE	0 ~ 16	0	Origin operation method

Origin operation method (ORG_RULE):

Set value	**Description**
0	Origin operation not done
1, 2	CW switch
3, 4	CCW switch
5, 6	CW direction, ORG switch
7, 8	CCW direction, ORG switch
9, 10	CW→CCW direction, ORG switch
11, 12	CCW→CW direction, ORG switch
13, 14	CW Damper
15, 16	CCW Damper

Reference

1. The final signal where the origin is determined is Z-phase of the encoder.

2. Forward direction in terms of the servo motor is when operating in order of U-phase→V-phase →W-phase. Installation should be made at the end of the forward rotation when using a CCW Limit switch. (CW is reverse direction)

3. Final origin positions vary depending on how to perform odd number(1 ~ 15), even numbers(2 ~ 16).
   (1) Odd number:
   - Final point of arrival = Final Z-phase pulse position + ORG_OFS parameter set value
   - Final coordinate value is '0.000.

   (2) Even number:
   - Final point of arrival = Final Z-phase pulse position
   - Final coordinate value is " ORG_OFS set value ".

4. Origin operation allows the use of DFT_ACC and DFT_DEC as acceleration/deceleration time.

5. Upon receipt of origin command signal, it switches to Servo ON status automatically even in Servo OFF status. ORG_SV (OPER→ETC→ORG_SV) parameter can be used to determine Servo ON/OFF when the origin operation is completed.

Caution

- ABS mode enables encoder value to reset by following ORIGIN setting > MTUN(Multi Turn Clear).
- ABS mode does not allow AUTO_ORG function to be applied, enabling MTUN(Multi Turn Clear) or CAL(End Position Calibration) on T/P.
- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Reference (Continued)

1. ORG_RULE Set Value 1
   Moves in CW direction to detect CW sensor and search for Z-Phase. The search point is ORG_OFS value and moves to 0.000 point from the position.

MOTOR	MSMR	ORG_RULE	1	ORG_OFS	10.000	MOV_POL	1

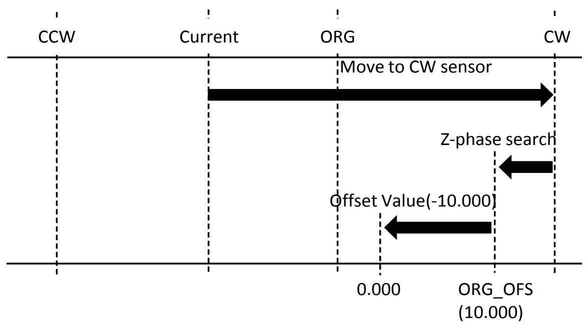


Diagram	Step	Description
	1	Move to CW sensor. (Move at speed of ORG_SPD0)
	2	Z-phase search (Move at speed of ORF_SPD1)
	3	Complete Z-phase search. (Current position = ORG_OFS)
	4	Move to 0.000 (Move at speed of DEF_SPD)
	5	Complete origin operation

2. ORG_RULE Set Value 2
   Moves in CW direction to detect CW sensor and search for Z-Phase. The search point is ORG_OFS value.

MOTOR	MSMR	ORG_RULE	2	ORG_OFS	10.000	MOV_POL	1

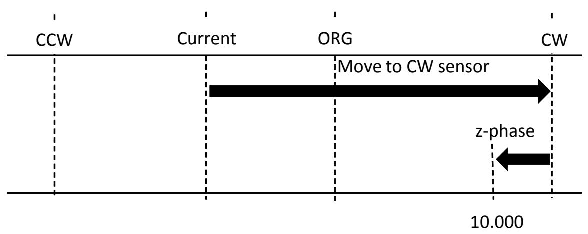


Diagram	Step	Description
	1	Move to CW sensor. (Move at speed of ORF_SPD0)
	2	Z-phase search (Move at speed of ORF_SPD1)
	3	Complete Z-phase search. (Current position = ORG_OFS)
	4	Complete origin operation.

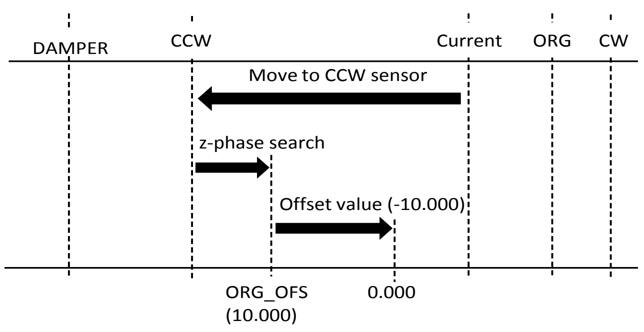
Caution

- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

Reference(Continued)

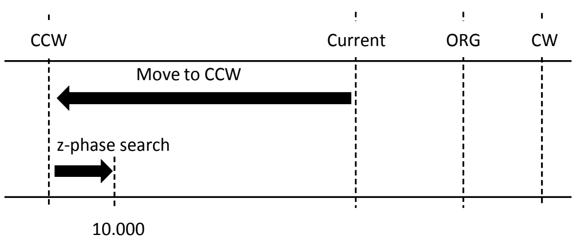
3. ORG_RULE Set Value 3
Moves in CCW direction to be placed in the sensor, assigning where Z-Phase is found to ORG_OFS value. Moves to 0.000 point from the assigned point.

MOTOR	MSMR	ORG_RULE	3	ORG_OFS	10.000	MOV_POL	1

Diagram	Step	Description
	1	Move to CCW sensor. (Move at speed of ORG_SPD0)
	2	Z-phase search (Move at speed of ORG_SPD1)
	3	Complete Z-phase search (Current position = ORG_OFS)
	4	Move to 0.000. (Move at speed of DEF_SPD)
	5	Complete origin operation.

4. ORG_RULE Set Value 4
Moves in CCW direction to be placed in the sensor, assigning where Z-Phase is found to ORG_OFS value.

MOTOR	MSMR	ORG_RULE	4	ORG_OFS	10.000	MOV_POL	1

Diagram	Step	Description
	1	Move to CCW sensor. (Move at speed of ORG_SPD0)
	2	Z-phase search (Move at speed of ORG_SPD1)
	3	Complete Z-phase search (Current position = ORG_OFS)
	4	Complete origin operation.

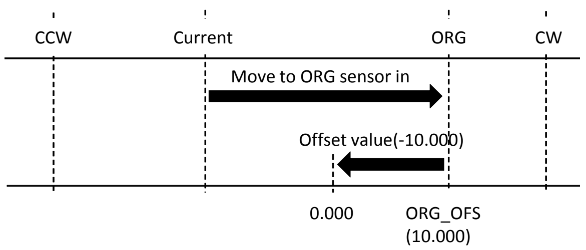
Caution

- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

Reference(Continued)

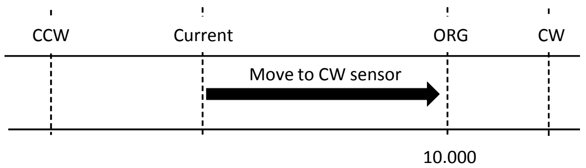
5. ORG_RULE Set Value 5
   Search for ORG sensor in CW direction. The sensed position is assigned to ORG_OFS value.
   Move to 0.000 poistion from the assigned position to complete the origin operation.

<table>
<tr><td>MOTOR</td><td>MSMR</td><td>ORG_RULE</td><td>5</td><td>ORG_OFS</td><td>10.000</td><td>MOV_POL</td><td>1</td></tr>
</table>

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="4">
</td><td>1</td><td>Move to ORG sensor in CW direction.
(Move at speed of ORG_SPD0)</td></tr>
<tr><td>2</td><td>Complete movement of ORG sensor
(Current position = ORG_OFS)</td></tr>
<tr><td>3</td><td>Move to 0.000.
(Move at speed of DEF_SPD)</td></tr>
<tr><td>4</td><td>Complete origin operation.</td></tr>
</table>

6. ORG_RULE Set Value 6
   Search for ORG sensor in CW direction. The sensed position is assigned to ORG_OFS value.

<table>
<tr><td>MOTOR</td><td>MSMR</td><td>ORG_RULE</td><td>6</td><td>ORG_OFS</td><td>10.000</td><td>MOV_POL</td><td>1</td></tr>
</table>

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="3">
</td><td>1</td><td>Move to ORG SENSOR in CW direction.
(Move at speed of ORG_SPD0)</td></tr>
<tr><td>2</td><td>Complete movement of ORG sensor.
(Current position = ORG_OFS)</td></tr>
<tr><td>3</td><td>Complete origin operation.</td></tr>
</table>

Caution

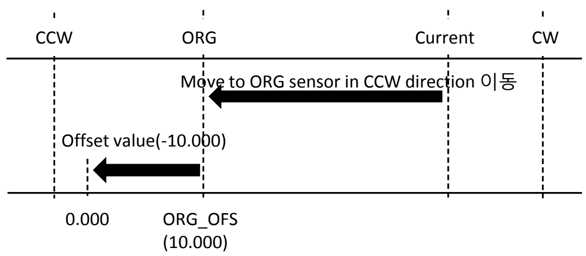
- LIMIT(CW, CCW) Alarm occurs when moving ORG sensor in the reverse direction in ORG_RULE 5, 6.
- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

Reference (Continued)

7. ORG_RULE Set Value 7

Search for ORG sensor in CCW direction. The sensed position is assigned to ORG_OFS value. Move to 0.000 position from the assigned position to complete the origin operation.

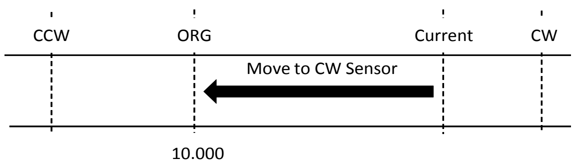
MOTOR	MSMR	ORG_RULE	7	ORG_OFS	10.000	MOV_POL	1

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="4">
</td><td>1</td><td>Move to ORG sensor in CCW direction.
(Move at speed of ORF_SPD0)</td></tr>
<tr><td>2</td><td>Complete movement of ORG sensor
(Current position = ORG_OFS)</td></tr>
<tr><td>3</td><td>Move to 0.000
(Move at speed of DEF_SPD)</td></tr>
<tr><td>4</td><td>Complete origin operation.</td></tr>
</table>

8. ORG_RULE Set Value 8

Sear for ORG sensor in CCW direction. The sensed position is assigned to ORG_OFS value.

MOTOR	MSMR	ORG_RULE	8	ORG_OFS	10.000	MOV_POL	1

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="3">
</td><td>1</td><td>Move to ORG sensor in CCW direction
(Move at speed of ORF_SPD0)</td></tr>
<tr><td>2</td><td>Complete movement of ORG sensor
(Current position = ORG_OFS)</td></tr>
<tr><td>3</td><td>Complete origin operation.</td></tr>
</table>

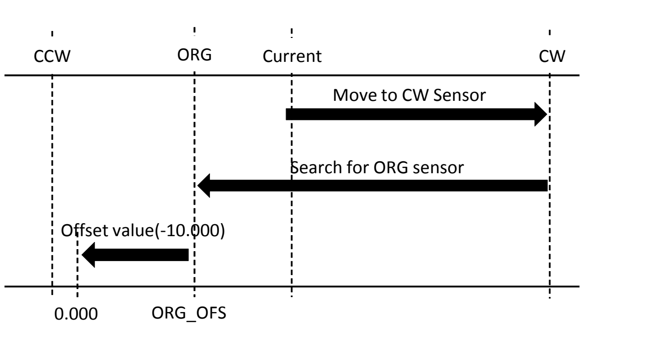
Caution

- Alarm occurs as shown below when moving in the reverse direction of ORG sensor in ORG_RULE 7,8.
- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

Reference (Continued)

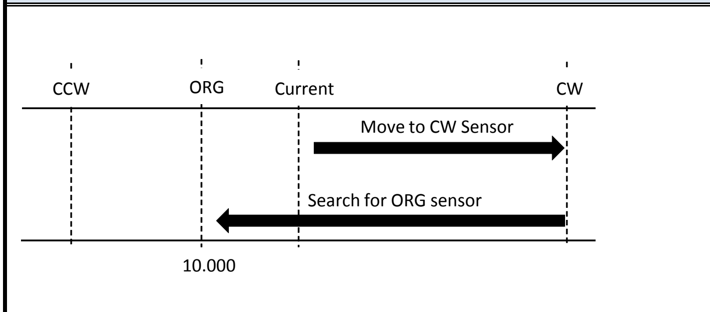
9. ORG_RULE Set Value 9
   Search for CW sensor in CW direction. Search for ORG sensor after being sensed.
   The position where ORG sensor is sensed is assigned to ORG_OFS value. Move to 0.000 position from the assigned position to complete the origin operation.

MOTOR	MSMR	ORG_RULE	9	ORG_OFS	10.000	MOV_POL	1

Diagram	Step	Description
	1	Move in CW direction. (Move at speed of ORF_SPD0)
	2	Move ORG sensor. (Move at speed of ORF_SPD0)
	3	Complete movement of ORG sensor. (Current position = ORG_OFS)
	4	Move to 0.000 (Move at speed of DEF_SPD)
	5	Complete origin operation.

10. ORG_RULE Set Value 10
    Search for CW sensor in CW direction. Search for ORG sensor after being sensed.
    The position where ORG sensor is sensed is assigned to ORG_OFS value.

MOTOR	MSMR	ORG_RULE	10	ORG_OFS	10.000	MOV_POL	1

Diagram	Step	Description
	1	Move in CW direction. (Move at speed of ORF_SPD0)
	2	MOVE ORG SENSOR (Move at speed of ORF_SPD0)
	3	Complete movement of ORG sensor (Current position = ORG_OFS)
	4	Complete origin operation.

Caution

- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

Reference(Continued)

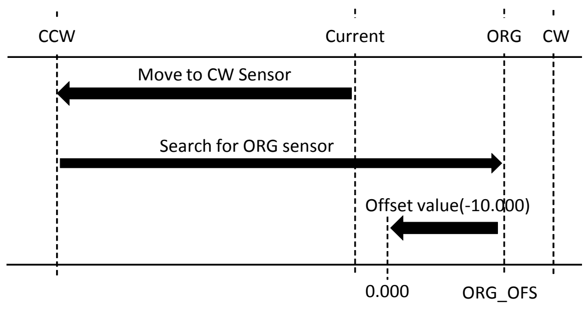
11. ORG_RULE Set Value 11

    Search for CCW sensor in CCW direction. Search for ORG sensor after being sensed.

    The position where ORG sensor is sensed is assigned to ORG_OFS value.

    Move to 0.000 position from the assigned position to complete the origin operation.

MOTOR	MSMR	ORG_RULE	11	ORG_OFS	10.000	MOV_POL	1

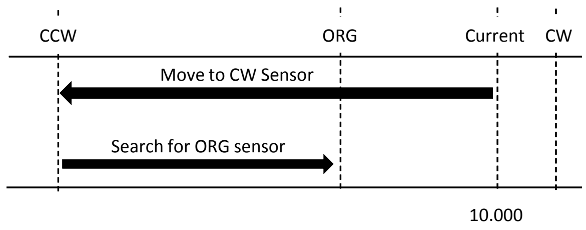
Diagram	Step	Description
	1	Move in CW direction. (Move at ORF_SPD0 speed)
	2	Move to ORG sensor (Move at ORF_SPD0 speed)
	3	Complete movement of ORG sensor (Current position = ORG_OFS)
	4	Move to 0.000. (Move at speed of DEF_SPD.)
	5	Complete origin operation.

12. ORG_RULE Set Value 12

    Search for CCW sensor in CCW direction. Search for ORG sensor after being sensed.

    The position where ORG sensor is sensed is assigned to ORG_OFS value

MOTOR	MSMR	ORG_RULE	12	ORG_OFS	10.000	MOV_POL	1

Diagram	Step	Description
	1	Move in CW direction. (Move at ORF_SPD0 speed.)
	2	Move to ORG sensor. (Move at ORF_SPD0 speed.)
	3	Complete movement of ORG sensor. (Current position = ORG_OFS)
	4	Complete origin operation.

Caution

- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.

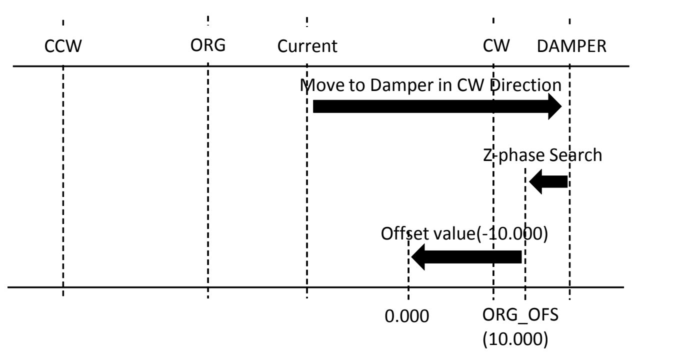
Reference(Continued)

13. ORG_RULE Set Value 13

Sear for Damper in CW direction. Search for Z-phase when the torque with ORG_TRQ error occurs. The position where Z-phase is found is assigned to ORG_OFS value.

Move to 0.000 position from the assigned position to complete the origin operation.

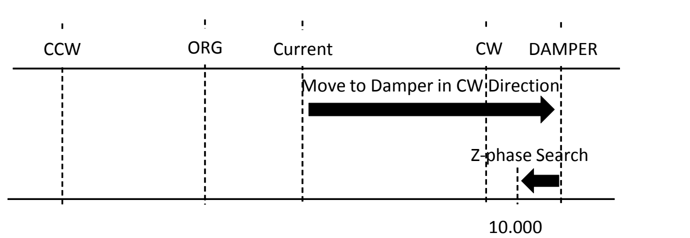
MOTOR	MSMR	ORG_RULE	13	ORG_OFS	10.000	MOV_POL	1

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="5">
</td><td>1</td><td>Move in CW direction to Damper.
(Move at speed of ORG_SPD0.)</td></tr>
<tr><td>2</td><td>Z-phase search
(Move at speed of ORG_SPD1)</td></tr>
<tr><td>3</td><td>Complete Z-phase search.
(Current position = ORG_OFS)</td></tr>
<tr><td>4</td><td>Move to 0.000.
(Move at speed of DEF_SPD)</td></tr>
<tr><td>5</td><td>Complete origin operation.</td></tr>
</table>

14. ORG_RULE Set Value 14

Sear for Damper in CW direction. Search for Z-phase when the torque above ORG_TRQ occurs. The position where Z-phase is found is assigned to ORG_OFS value

MOTOR	MSMR	ORG_RULE	14	ORG_OFS	10.000	MOV_POL	1

<table>
<tr><th>Diagram</th><th>Step</th><th>Description</th></tr>
<tr><td rowspan="4">
</td><td>1</td><td>Move in CW direction to damper.
(Move at speed of ORG_SPD0.)</td></tr>
<tr><td>2</td><td>Z-phase search
(Move at speed of ORG_SPD1)</td></tr>
<tr><td>3</td><td>Complete Z-phase search.
(Current position = ORG_OFS)</td></tr>
<tr><td>5</td><td>Complete origin operation.</td></tr>
</table>

Caution

- Over Current Alarm occurs depending on MOV_POL value and ORG_OFS directional conditions.
- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters
- When performing the origin using Damper with set values for ORG_TRQ set to high, it may cause damage to controller and mechanism.

Reference(Continued)

15. ORG_RULE Set Value 15

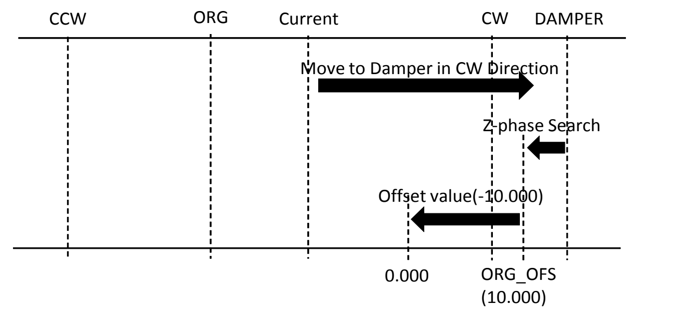
    Search for damper in CW direction. Search for Z-phase in the event of the torque above ORG_TRQ.

    The sensed position is assigned to ORG_OFS value.

    Move to 0.000 position from the assigned position to complete the origin operation.

MOTOR	MSMR	ORG_RULE	15	ORG_OFS	10.000	MOV_POL	1

Diagram



Step	Description
1	Move in CW direction to damper. (Move at speed of ORG_SPD0.)
2	Z-phase search (Move at speed of ORG_SPD1)
3	Complete Z-phase search (Current position = ORG_OFS)
4	Move to 0.000. (Move at speed of DEF_SPD)
5	Complete origin operation.

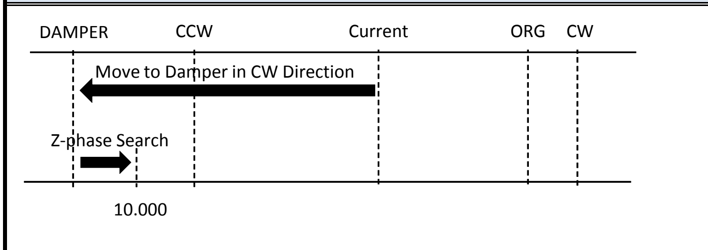
16. ORG_RULE Set Value 16

    Search for damper in CW direction. Search for Z-phase when the torque above ORG_TRQ occurs.

    The sensed position is assigned to ORG_OFS value.

MOTOR	MSMR	ORG_RULE	16	ORG_OFS	10.000	MOV_POL	1

Diagram



Step	Description
1	Move in CW direction to damper. (Move at speed of ORG_SPD0.)
2	Z-phase search (Move at speed of ORG_SPD1)
3	Complete Z-phase search. (Current position = ORG_OFS)
4	Complete origin operation.

Caution

- Over Current Alarm occurs depending on MOV_POL value and ORG_OFS directional conditions.
- According to parameter SENSOR value, it is possible to set NO or NC for ORIGIN and LIMIT(CW, CCW) sensor. (Refer to Servo Setting 4 in 5.2.3.4 ETC.)
- Acceleration/deceleration time when doing origin operation allows the use of DFT_ACC and DFT_DEC parameters.
- ORG_SV parameter can be used to set whether to keep SERVO ON following the completion of origin operation using parameters.
- When performing the origin using Damper with set values for ORG_TRQ set to high, it may cause damage to controller and mechanism.

5.3.3.2 JOG

JOG Operation Setting			
Set position	OPER ⇒ JOG ⇒ **JOG_SPD0, JOG_SPD1, JOG_SPD2, JOG_SPD3 JOG_RES0, JOG_RES1, JOG_RES2, JOG_RES3**		
Parameter	Set range	Default value	Description
JOG_SPD0	1 ~ 10000	100	JOG movement speed
JOG_SPD1		500	
JOG_SPD2		1000	
JOG_SPD3		3000	
JOG_RES0	0 ~ 99999.999	0.250	One-time movement amount in inch JOG movement
JOG_RES1		0.500	
JOG_RES2		0.750	
JOG_RES3		1.000	

Reference

1. 4-stage JOG speed can be used in JOG operation.
   Movement speed value is set in JOG_SPD(0 ~ 3).

2. When JOG_SPD(0 ~ 3) set value is '10000', operation is made at assigned speed of LMT_SPD(MECH). Speed is determined according to the rate when below '10000'. (ex: 50% when set to 5000)

3. Movement amount for one-time movement command is set in 4 stages in IJOG operation.
   Movement amount is entered with a user coordinate value.

4. JOG movement is stopped when facing CW(CCW) Limit switch while running JOG/IJOG.

5. In case of running by JOG/IJOG, DFT_ACC and DFT_DEC are used as acceleration/deceleration time.

6. Upon receipt of JOG/IJOG command, it switches automatically from servo Off to servo On.
   JOG_SV(OPER→SET→ETC→JOG_SV) can be used to turn the sero ON/OFF after JOG/IJOG operations are finished.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.3.3 DFT

Basic Movement Conditions Setting			
Set position	OPER ⇒ DFT ⇒ **DFT_SPD, DFT_ACC, DFT_DEC**		
Parameter	Set range	Default value	Description
DFT_SPD	1 ~ 10000	1000	Basic movement speed value
DFT_ACC	1 ~ 500 (10ms)	20	Basic acceleration time value
DFT_DEC	1 ~ 500 (10ms)	20	Basic deceleration time value

Reference

1. When operating the robot program, it operates on DFT_SPD value through SPD command prior to setting speed. When pausing robot operation and restarting, it operates at the speed prior to pausing it, and it operates on DFT_SPD set value when starting the operation from the beginning.

2. When the set value is '10000' at DFT_SPD, it runs at the speed assigned in LMT_RPM(MECH). Speed is determined according to the rate when below '10000'. (ex: 50% when set to '5000')

3. Application time of the acceleration time value set to DFT_ACC.
   (1) Applies when putting the robot program to RUN from the beginning.
   (2) Applies when moving by JOG/IJOG.
   (3) Applies during Origin operation.

4. Application time of the deceleration time value set to DFT_DEC.
   (1) Applies when putting the robot program to RUN from the beginning.
   (2) Applies when moving by JOG/IJOG.
   (3) Applies during Origin operation.

5. DFT_DEC value is time taken for decelerating from MAX_RPM to stop.
   Ex) When set to 10, speed is reduced by 0.10[sec].

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Origin Return Speed Setting			
Set position	OPER ⇒ DFT ⇒ **ORG_SPD0, ORG_SPD1**		
Parameter	Set range	Default value	Description
ORG_SPD0	1 ~ 10000	1000	Operating speed until final contact is confirmed in origin operation
ORG_SPD1		500	Operating speed from final contact to Z-phase in origin operation.

Reference

1. Moves at speed of ORG_SPD0 to the origin in origin operation, moving at speed of ORG_SPD1 to Z-phase point from the point.
2. When selecting ORG_RULE(MODE) that moves to ORG_OFS(MECH) set by the user, the range from Z-phase to the offset is operated by the value set in DFT_SPD(DFT).
3. When ORG_SPD(0 ~ 1) set value is '10000', it operates by LMT_RPM(MECH) set value.
   Speed is determined according to the rate when below '10000'. (ex: 50% when set to '5000')
4. Acceleration and deceleration settings during origin operation are performed by DFT_ACC, DFT_DEC value.
5. Upon receipt of origin command, it switches automatically from servo OFF to servo ON.
   ORG_SV(ETC) can be used to turn ON/OFF the servo after origin operation is finished.

Caution

- Speed setting parameters regarding origin return (ORG_SPD0, ORG_SPD1) are only for an INC serial encoder.
- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Operation Speed Setting by Contact			
Set position	OPER ⇒ DFT ⇒ **IO_SPD0, IO_SPD1, IO_SPD2, IO_SPD3**		
Parameter	Set range	Default value	Description
IO_SPD0	1 ~ 10000	500	Movement speed when setting the speed to SPD IOSPD while running the robot program
IO_SPD1		1000	
IO_SPD2		1500	
IO_SPD3		2000	

Reference

1. This function is used in connection with contact values IOSPD1, IOSPD0.

2. When SPD IOSPD command is used whiel the robot program is running, one of speed vales IO_SPD(0 ~ 3) is selected and used according to contact values IOSPD1, IOSPD0.

IOSPD1	IOSPD0	Selected Speed Value
OFF (0)	OFF (0)	IO_SPD0
OFF (0)	ON (1)	IO_SPD1
ON (1)	OFF (0)	IO_SPD2
ON (1)	ON (1)	IO_SPD3

3. When IO_SPD(0 ~ 3) is set to '10000', it operates at the speed set in LMT_RPM (MECH) parameter. Speed is determined according to the rate when below '10000'. (ex: 50% when set to 5000)

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.4 SET

5.3.4.1 COM

Communication Conditions Setting 3			
Set position	OPER => SET => ETC => **BIT RATE1, BIT RATE2, BIT RATE3, DATA MODE, MY_ID**		
Parameter	Set range	Default value	Description
BIT RATE1	0 ~ 3	0	Sets COM1 communication speed
BIT RATE2	0 ~ 3	1	Sets COM2 communication speed
BIT RATE3	0 ~ 3	1	Sets COM3 communication speed
DATA MODE	0 ~ 99	0	Determines DATA save option
MY_ID	0 ~ 255	0	Assigns 422 multi-communication address

Reference

1. BITRATE(1 ~ 3)
   (1) Set communication speeds COM1, 2, 3 by setting BITRATE 1, 2, 3.
   (2) When setting a number other than the assigned value, select it to 9,600bps.

Set value	Speed value
0	9,600bps
1	19,200bps
2	38,400bps
3	115,200bps

2. DATA MODE

Set value	Description
0	None.
10	CC Link communication mode
20	Profibus communication mode
40	CC Link B/D RS-232C communication mode
50	DeviceNet communication mode

3. MY_ID (Function expected to be implemented)
   (1) When using 422 multi-communication, assign addresses to each controller.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.4.2 ETC

Servo Operation Condition Setting 1			
Set position	OPER => SET => ETC ⇒ **FLO_ERR, INPOS, INI_TRQ**		
Set range	Set range	Default value	Description
FLO_ERR	0.001 ~ 10000.000	30.00	Criteria for error occurrence when movement error is in excess range
INPOS	0.001 ~ 99999.999	0.05	Range of error where movement is judged as completed
INI_TRQ	-300 ~ 300 (%)	0	Initial torque when servo is ON

Reference

1. FLO_ERR(Following Error)
   (1) All movement operations make use of trapezoidal acceleration/deceleration movement.
   (2) Servo control unit calculates trapezoidal acceleration/deceleration waveforms internally and controls the servo motor according to calculated position and speed.
   (3) When controller gain is incorrectly set and wiring error takes place, a substantial difference arises between the calculated position and the actual servo position.
   (4) In this case, use FLO_ERR value as the error refernece value.

2. IN POSITION
   (1) When the difference between the servo motor position and the target position enters into the values assigned to INPOS when it comes to each movement and operation commands, it recognizes as position arrival state (IN POSITION).
   (2) INPOS value is used also as the basis for determining the completion of movement operation when running the robot program.
   (3) INPOS value and FLO_ERR value make use of user coordinate unit.

3. INI_TRQ (Function expected to be implemented)
   (1) This parameter is used to prevent initial drooping in gravity load when releasing a brake and switches to servo operation.
   (2) When a negative number('-') is set, it operates by reverse torque.
   (3) Possible setting range is -300 ~ 300[%] based on rated torque.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Servo Operation Condition Setting 2			
Set position	OPER => SET => ETC => **JOG_SV, ORG_SV, ORG_TRQ,, BACKLASH**		
Parameter	Set range	Default value	Description
JOG_SV	0 ~ 1	0	Selects servo ON/OFF following JOG / IJOG
ORG_SV	0 ~ 1	0	Selects servo ON/OFF following Origin
ORG_TRQ	50 ~ 200 (%)	50	Torque in Damper Origin
BACKLASH	-99999.999 ~ 99999.999	0	BACKLASH compensation

Reference

1. JOG_SV
   (1) When setting JOG_SV to '1', Servo ON is kept after running JOG IJOG.
   (2) When the value is set to '0', Servo OFF comes after the movement.

2. ORG_SV
   (1) When setting ORG_SV to '1', Servo ON is kept after Origin operation.
   (2) When the value is set to '0', Servo OFF comes after Origin operation.

3. ORG_TRQ
   (1) ORG_TRQ determines whether the mechanism and Damper have had a collision in operating Damper Origin.
   (2) When ORG_TRQ vaue is 100[%] and a torque is rated during Damper Origin operation, it is judged as Damper collision and begins to rotate in reverse direction. (When ORG_RULE is set to no.13 ~ 16 Damper Origin)
   (3) Origin detection signal is encoder Z Pulse.

4. BACKLASH (Function expected to be implemented)
   (1) Software compensation comes when mechanical BACKLASH occurs.
   (Compensated by entering as many as BACKLASH number.)

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Servo Operation Condition Setting 3			
Set position	OPER => SET => ETC => **BCD_READ, USER MODE, SENSOR**		
Parameter	Set range	Default value	Description
BCD_READ	0, 1	0	Determines whether to apply BCD DATA
HW_LIMIT	0, 1	0	Sets Limit mode
USER MODE	0 ~ 999	0	Sets user mode
SENSOR	0 ~ 99	0	Sets sensor type

Reference

1. BCD_READ

   Determines whether to use BCD DATA. (0: Use, 1: Not use)

2. HW_LIMIT

   Sets operating conditions for LIMIT sensor according to MODE.

MODE	Direction	Limit Para	
		ON	OFF
IDLE	forward	Alarm	Don't care
	reverse	Alarm	Don't care
JOG (FWRD included)	forward	Stop	Stop
	reverse	Alarm	Don't care
ORG	forward	Org	Org
	reverse	Alarm	Don't care
RUN	forward	Alarm	Alarm
	reverse	Alarm	Don't care

3. USER MODE

   Sets the following to 7-Segment : status display, I/O input/output and release System Emergency status. For further detail, refer to 'Ch.17 Front 7-Segment Display'.

Set value	Description
911	Release SYSTEN EMERGENCY
200	Input contact display on Front 7 Segment
201	Output contact display on Front 7 Segment
202	DC Link voltage display on Front 7 Segment

4. SENSOR.

   LIMIT and ORGIN sensor type (NC/NO) setting.

Setting	LIMIT	ORIGIN
0	NC	NC
1	NC	NO
10	NO	NC
11	NO	NO

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

Run Program Selection			
Set position	OPER => SET => ETC => **ROB_PGM, PLC_PGM**		
Parameter	Set range	Default value	Description
ROB_PGM	0~8	0	Selects a robot program to run
PLC_PGM	0~3	0	Selects a PC program to run

Reference

1. ROB_PGM
   (1) When ROB_PGM is set to 0 ~ 7, the robot operates on the corresponding program numbers.
   (2) When ROB_PGM is set to 8, the robot operates on program number for I/O contact PGM_SEL(2 ~ 0) values.

PGM_SEL2	PGM_SEL1	PGM_SEL0	Selected Robot Program
OFF (0)	OFF (0)	OFF (0)	NO. 0
OFF (0)	OFF (0)	ON (1)	NO. 1
OFF (0)	ON (1)	OFF (0)	NO. 2
OFF (0)	ON (1)	ON (1)	NO. 3
ON (1)	OFF (0)	OFF (0)	NO. 4
ON (1)	OFF (0)	ON (1)	NO. 5
ON (1)	ON (1)	OFF (0)	NO. 6
ON (1)	ON (1)	ON (1)	NO. 7

2. PLC_PGM
   (1) Program numbers run by PLC_RUN command are determined by PLC_PGM value.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

TP Operation Setting			
Set position	OPER => SET => ETC => **TP_TYPE, TP_LINE, JOG_DMAN**		
Parameter	Set range	Default value	Description
TP_TYPE	0, 1	0	Sets TP type(NC / NO)
TP_LINE	0, 1	0	Sets the number of TP Lines
JOG_DMAN	0, 1	0	Sets Deadman function

Reference

1. TP_TYPE
   (1) When setting'0', it is set to 'Normal Open(NO)'.
   (2) When setting '1', it is set to 'Normal Close(NC)'.
2. TP_LINE
   (2) When setting '0', it applies to 4 line TP.
   (3) When setting '1', it applies to 8 line TP.
3. JOG_DMAN
   (1) When making JOG operation, whether to use Deadman key function is determined. ('0' : Used, '1' : Not used)

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.4.3 IP

IP Operation Setting	
Set position	OPER => SET => IP => **PNETSIZE, IP_ADD1, IP_ADD2, IP_ADD3, IP_ADD4, G/W_ADD1, G/W_ADD2, G/W_ADD3, G/W_ADD4**

Parameter	Set range	Default value	Description
PNETSIZE	0, 1	1	Sets Data Map size of PROFINET among OPTIONs
IP_ADD1	0, 255	192	Sets IP address. (IP_ADD1 . IP_ADD2 . IP_ADD3 . IP_ADD4) (Default value : 192 . 168 . 1 . 0)
IP_ADD2	0, 255	168	
IP_ADD3	0, 255	1	
IP_ADD4	0, 255	0	
G/W_ADD1	0, 255	192	Sets Gateway address. (G/W_ADD1 . G/W_ADD2 . G/W_ADD3 . G/W_ADD4) (Default value : 192 . 168 . 1 . 4)
G/W_ADD2	0, 255	168	
G/W_ADD3	0, 255	1	
G/W_ADD4	0, 255	4	

Reference

1. PNETSIZE
   (1) For '0' setting, INPUT : 8, OUTPUT : 8 are taken as setting.
   (2) For '1' setting, INPUT : 32, OUTPUT : 32 are taken as setting.

2. IP_ADD1~4
   (1) Sets IP address.

3. G/W_ADD_1~4
   (1) Sets Gateway address.

Caution

- Change PNETSIZE, IP, Gateway and turn power OFF/ON.
- When PROFINET options are not set and IP is saved, select 'F4, SAVE' to save to DPRAM in Option Board.
- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.5 How to Set Input/Output(I/O) related Parameters

5.3.5.1 How to Set System Input Contact

Common Things for System Input Setting

1. System input is installed in B350 ~ B387 of S/W contact.
2. Contact address between B000 and B317 is selected among contact areas, the corresponding value is copied by system input and the system function operates.
   Besides, B000 ~ B022 are input contacts and can also be used as system contact in setting parameters.
   Non-use contacts in the process of system input is set as 'Not Used'.
3. Error occurs when different signals use one identical contact..
4. When PLC program produces operation results with a desired contact from system input contact area (B350 ~ B357), system operation by PLC program is also enabled. In this case, the parameter for the contact should be set to 'Not'..
5. Parameter is set at 'I/O → INPUT → Contact'.
6. Values for all contacts except for contacts CW S/W, CCW S/W, and ORG S/W are changed to new values in every 3[msec].
7. For CW S/W, CCW S/W, ORG S/W contact values, their changed values are recognized within 1[msec after input is stabilized.

Types of Contact

Contact Address	Number of Bytes	Contact Property	Use or Non-use of Input/Output
B000 ~ B022	3	Input contact	Used as system and user input contacts.
B030 ~ B047	2	Output contact	Used as system and user output contacts.
B050 ~ B317	27	Internal contact	Used as user internal contacts.
B320 ~ B337 B340 ~ B347	3	Reserved	Reserved
B350 ~ B387	4	System input contact	Used as internal system input contacts.
B390 ~ B417	3	System output contact	Used as internal system output contacts.

Caution

- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

System Input Setting			
Set position	I/O ⇒ INPUT		
Contact name	Bit position	Default value	Description
ROB_RUN	B350	Not Use	◆ Robot program execution program command ('1') ◆ When starting the robot program first time, set parameter values DFT_SPD, DFT_ACC, DFT_DEC as movement conditions prior to beginning the robot program. ◆ In case of stopping the ongoing robot program, continue the robot program operation from the status before being stopped.
PLC_RUN	B351	B000	◆ PLC program start command ('1')
STOP	B352	B001	◆ Robot program stop command ('1')
RESET	B353	B002	◆ Alarm Reset command ('1') ◆ Not valid if not in alarm.
SVON	B354	Not Use	◆ Servo ON command ('1')
SVOFF	B355	B003	◆ Servo OFF command ('1') ◆ Not valid when the robot program is running.
ORIGIN	B356	Not Use	◆ Origin implementation command('1') ◆ Not value when ORG_RULE set value is set to 0 (Origin not implemented).
STEP_RUN	B357	Not Use	Robot program Step Run command ('1')
PGM_SEL	B360	Not Use	◆ Robot program reset command ('1') ◆ Valid only when the robot program is stopped from making progress. ◆ Resets all the progress of the current robot program. When ROB_PGM is set to 0 ~ 7 range, get the corresponding program ready to be performed, whereas when ROBOT_PGM is set to 8, select the program number according to PGM_SEL(2 ~ 0) value. ◆ Reset the program number to run or the step to perform according to the corresponding contact.
PGM_SEL0	B361	Not Use	◆ Robot program selection code. Input signal ◆ A total of 8 programs (0~7) are selectable.
PGM_SEL1	B362	Not Use	
PGM_SEL2	B363	Not Use	

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

<table>
<tr><th colspan="3">System Input Setting</th><th></th></tr>
<tr><td>Set position</td><td colspan="3">I/O ⇒ INPUT</td></tr>
<tr><th>Contact name</th><th>Bit position</th><th>Default value</th><th>Description</th></tr>
<tr><td>JOG+</td><td>B364</td><td>Not Use</td><td rowspan="2">◆ JOG movement command ('1')
◆ When JOG_MODE contact value is 0, JOG operation is made, and when 1, IJOG operation made.
◆ When making JOG operation, it keeps moving while this Bit is '1', whereas when making IJOG operation, it moves once each time this Bit becomes '0' to '1'.</td></tr>
<tr><td>JOG-</td><td>B365</td><td>Not Use</td></tr>
<tr><td>JOG_SET0</td><td>B366</td><td>Not Use</td><td rowspan="2">◆ Selection code for JOG movement conditions
This contact value is used only in JOG operation by JOG+, JOG- contacts.
<table><tr><th>JOG_SET1</th><th>JOG_SET0</th><th>JOG Mode</th><th>IJOG Mode</th></tr><tr><td>OFF(0)</td><td>OFF(0)</td><td>JOG_SPD0</td><td>JOG_RES0</td></tr><tr><td>OFF(0)</td><td>ON(1)</td><td>JOG_SPD1</td><td>JOG_RES1</td></tr><tr><td>ON(1)</td><td>OFF(0)</td><td>JOG_SPD2</td><td>JOG_RES2</td></tr><tr><td>ON(1)</td><td>ON(1)</td><td>JOG_SPD3</td><td>JOG_RES3</td></tr></table></td></tr>
<tr><td>JOG_SET1</td><td>B367</td><td>Not Use</td></tr>
<tr><td>JOG_MODE</td><td>B370</td><td>Not Use</td><td>◆ Selecting JOG movement method
◆ When JOG_MODE contact value is '0', JOG operation is made, and when '1', IJOG operation is made.
◆ This contact value is used only in JOG operation by JOG+, JOG- contacts.</td></tr>
<tr><td>IOPOS0</td><td>B371</td><td>Not Use</td><td rowspan="8">◆ Selection code for movement position in MOVT command of the robot program
◆ Used in connection with MOVT_ST contact. (0: OFF, 1: ON)
<table><tr><th>IOPOS7~0</th><th>Movement Position</th></tr><tr><td>0 0 0 0 0 0 0 0</td><td>P0</td></tr><tr><td>0 0 0 0 0 0 0 1</td><td>P1</td></tr><tr><td>0 0 0 0 0 0 1 0</td><td>P2</td></tr><tr><td>⋮</td><td>⋮</td></tr><tr><td>1 1 1 1 1 0 1 1</td><td>P251</td></tr><tr><td>1 1 1 1 1 1 0 0</td><td>P252</td></tr><tr><td>1 1 1 1 1 1 0 1</td><td>P253</td></tr></table></td></tr>
<tr><td>IOPOS1</td><td>B372</td><td>Not Use</td></tr>
<tr><td>IOPOS2</td><td>B373</td><td>Not Use</td></tr>
<tr><td>IOPOS3</td><td>B374</td><td>Not Use</td></tr>
<tr><td>IOPOS4</td><td>B375</td><td>Not Use</td></tr>
<tr><td>IOPOS5</td><td>B376</td><td>Not Use</td></tr>
<tr><td>IOPOS6</td><td>B377</td><td>Not Use</td></tr>
<tr><td>IOPOS7</td><td>B380</td><td>Not Use</td></tr>
</table>

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

<table>
<tr><th colspan="4">System Input Setting</th></tr>
<tr><td>Set position</td><td colspan="3">I/O ⇒ INPUT</td></tr>
<tr><th>Contact name</th><th>Bit position</th><th>Default value</th><th>Description</th></tr>
<tr><td>IOSPD0</td><td>B381</td><td>Not Use</td><td rowspan="2">◆ Movement speed in command SPD IOSPD of robot program
Input signal of selected codes
<table><tr><th>IOSPD1</th><th>IOSPD0</th><th>Movement Speed</th></tr><tr><td>OFF(0)</td><td>OFF(0)</td><td>IO_SPD0</td></tr><tr><td>OFF(0)</td><td>ON(1)</td><td>IO_SPD1</td></tr><tr><td>ON(1)</td><td>OFF(0)</td><td>IO_SPD2</td></tr><tr><td>ON(1)</td><td>ON(1)</td><td>IO_SPD3</td></tr></table></td></tr>
<tr><td>IOSPD1</td><td>B382</td><td>Not Use</td></tr>
<tr><td>CW S/W</td><td>B383</td><td>Not Use</td><td rowspan="2">◆ Limit switch value NC(Normal Close)
◆ When meeting the switch during Jog operation, the motor does not rotate anymore.
◆ When meeting the switch while robot program is in progress, Hardware Limit Alarm occurs.</td></tr>
<tr><td>CCW S/W</td><td>B384</td><td>Not Use</td></tr>
<tr><td>ORG S/W</td><td>B385</td><td>Not Use</td><td>◆ Origin switch value NC(Normal Close)</td></tr>
<tr><td>MPG_RATE</td><td>B386</td><td>Not Use</td><td>◆ In ‘MOVM’ command, select the selection input signal for the rate between Movement pulse and feed.
<table><tr><th>MPG_RATE</th><th>Feed Rate Selection</th></tr><tr><td>OFF(0)</td><td>MPG_PLS0, MPG_MOV0</td></tr><tr><td>ON(1)</td><td>MPG_PLS1, MPG_MOV1</td></tr></table></td></tr>
<tr><td>MOVT_ST</td><td>B387</td><td>Not Use</td><td>◆ Command for starting movement for MOVT command ('1')
◆ MOVT command starts to move only when it receives this command, determining a target position according to the contact values IOSPD(3 ~ 0) at the time of receiving this contact input.</td></tr>
</table>

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

5.3.5.2 How to Set System Output Contact

Common Things in System Output Setting

1. System output is installed in B390 ~ B417 of S/W contact
2. System output can be used as an input in PLC program.
3. What is needed in the process of system output can be used by being delivered instantly from parameter to output contact before use. (Delivered every 3[msec])
4. Parameter is set at 'I/O → OUTPUT → Contact'.

Types of Contact

Contact Address	Number of Bytes	Contact Property	Use or Non-use of Input/Output
B000 ~ B022	3	Input contact	Used as system and user input contacts.
B030 ~ B047	2	Output contact	Used as system and user output contacts.
B050 ~ B317	27	Internal contact	Used as user internal contacts.
B320 ~ B337	2	Reserved	Reserved
B340 ~ B347	1		
B350 ~ B387	4	System input contact	Used as internal system input contact.
B390 ~ B417	3	System output contact	Used as internal system output contact.

Caution

➢ Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

<table>
<tr><td colspan="3">System Output Setting</td><td></td></tr>
<tr><td>Set position</td><td colspan="3">I/O ⇒ OUTPUT</td></tr>
<tr><td>Contact name</td><td>Bit position</td><td>Default value</td><td>Description</td></tr>
<tr><td>ALARM</td><td>B390</td><td>Not Use</td><td>◆ Set(1) is made in the event of an alarm.
◆ Comes out as output contacts ALARM(3~0) along with alarm code depending on an alarm type.
◆ The alarm being produced only sends the main alarm number, and detailed alarm number and content can be identified through T/P. (Refer to Ch.17 Alarm.)</td></tr>
<tr><td>READY</td><td>B391</td><td>Not Use</td><td>◆ Set(1) is made when the power is applied and self-diagnosis is completed with no error found.
◆ Clear(0) is made in the alarm status.</td></tr>
<tr><td>ORIGIN</td><td>B392</td><td>Not Use</td><td>◆ Set(1) is made upon completion of Origin operation.</td></tr>
<tr><td>IN_POS</td><td>B393</td><td>Not Use</td><td>◆ Set(1) is made when the difference between the target position and the current position is within INPOS(ETC) parameter value.</td></tr>
<tr><td>ALARM 0</td><td>B394</td><td>Not Use</td><td rowspan="4">◆ Description of alarm codes in the event of alarm
◆ Valid when alarm contact is ‘1’.
<table>
<tr><th>ALARM 3~0</th><th>Description of Alarm Codes</th></tr>
<tr><td>0000</td><td>Normal Condition</td></tr>
<tr><td>0001</td><td>Over Current (IPM Error)</td></tr>
<tr><td>0010</td><td>Over Load</td></tr>
<tr><td>0011</td><td>Over Voltage</td></tr>
<tr><td>0100</td><td>Over Heat</td></tr>
<tr><td>0101</td><td>Power Fail</td></tr>
<tr><td>0110</td><td>Data Back-up Error</td></tr>
<tr><td>0111</td><td>Encoder Error</td></tr>
<tr><td>1000</td><td>Hardware Limit</td></tr>
<tr><td>1001</td><td>Software Limit</td></tr>
<tr><td>1010</td><td>Following Error</td></tr>
<tr><td>1011</td><td>Program Error</td></tr>
<tr><td>1100</td><td>Emergency Stop</td></tr>
<tr><td>1101</td><td>Over Speed</td></tr>
<tr><td>1110</td><td>Parameter Error</td></tr>
<tr><td>1111</td><td>Software Alarm</td></tr>
</table></td></tr>
<tr><td>ALARM 1</td><td>B395</td><td>Not Use</td></tr>
<tr><td>ALARM 2</td><td>B396</td><td>Not Use</td></tr>
<tr><td>ALARM 3</td><td>B397</td><td>Not Use</td></tr>
<tr><td>BRAKE</td><td>B400</td><td>Not Use</td><td>◆ Output when starting the brake of a servo motor</td></tr>
<tr><td>PGMRUN</td><td>B401</td><td>Not Use</td><td>◆ Output when the robot program is being implemented</td></tr>
</table>

Caution

- In the event of Alarm, Output is unable to be identified due to initialization of B030~B217 area. Run internal PLC to prevent the above area from being initialized.(Refer to ‘6.1.1 Contact Point Configuration’.)
- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

<table>
<tr><th colspan="4">System Output Setting</th></tr>
<tr><td>Set position</td><td colspan="3">I/O ⇒ OUTPUT</td></tr>
<tr><td>Contact name</td><td>Bit position</td><td>Default value</td><td>Description</td></tr>
<tr><td>PGM_NUM0</td><td>B402</td><td>Not Use</td><td rowspan="3">◆ Outputs the currently-set JOB number to PGM_NUM0 ~ 2 contact.
<table>
<tr><th>PGM_NUM 2~0</th><th>JOB Number</th></tr>
<tr><td>000</td><td>No.0</td></tr>
<tr><td>001</td><td>No.1</td></tr>
<tr><td>010</td><td>No.2</td></tr>
<tr><td>011</td><td>No.3</td></tr>
<tr><td>100</td><td>No.4</td></tr>
<tr><td>101</td><td>No.5</td></tr>
<tr><td>110</td><td>No.6</td></tr>
<tr><td>111</td><td>No.7</td></tr>
</table></td></tr>
<tr><td>PGM_NUM1</td><td>B403</td><td>Not Use</td></tr>
<tr><td>PGM_NUM 2</td><td>B404</td><td>Not Use</td></tr>
<tr><td>SVON OUT</td><td>B405</td><td>Not Use</td><td>◆ Set(1) is made when the current Servo ON operates.</td></tr>
<tr><td>WARN</td><td>B406</td><td>Not Use</td><td>◆ Set(1) is made prior to alarm occurrence.
◆ Outputs produced to output contacts WARN(2~0) depending on warning type.</td></tr>
<tr><td>WARN0</td><td>B407</td><td>Not Use</td><td rowspan="3">
<table>
<tr><th>WARN 2~0</th><th>System warning</th></tr>
<tr><td>000</td><td>Normal</td></tr>
<tr><td>001</td><td>ABS Low Battery</td></tr>
<tr><td>010</td><td>Overload</td></tr>
<tr><td>⋮</td><td>Reserved</td></tr>
</table>
1. ABS Low Battery :
Occurs when ENC_TYPE is set to ABS(2) and Battery connection is not made in normal conditions.

2. OverLoad :
Occurs when Load figure is over 85%.</td></tr>
<tr><td>WARN1</td><td>B410</td><td>Not Use</td></tr>
<tr><td>WARN2</td><td>B411</td><td>Not Use</td></tr>
</table>

Caution

- In the event of an alarm, Output contact is unable to be identified due to initialization of B030~B217 area. Run internal PLC to prevent the above area from being initialized. (Refer to '6.1.1 Contact Point Configuration'.)
- Incorrect parameter settings may damage the controller or the device, and may cause a malfunction.

ch.6 INPUT/OUTPUT(I/O) Connection

6.1 I/O Description

6.1.1 Port Structure

1) The scope of I/O data consists of 42 ports from B00 to B41, each port consists of 8 bits.
2) Each port consists of 8 bits.
3) The system contact points are from B350 to B417. Reserved from B320 to B347.
   Therefore, the available numbers of the contact point are 256 (32 x 8).

Port	Bit Address								Usage
B00	B000	B001	B002	B003	B004	B005	B006	B007	User Input
B01	B010	B011	B012	B013	B014	B015	B016	B017	User Input
B02	B020	B021	B022	-	-	-	-	-	User Input
B03	B030	B031	B032	B033	B034	B035	B036	B037	User Input
B04	B040	B041	B042	B043	B044	B045	B046	B047	User Input
B05	B050	B051	B052	B053	B054	B055	B056	B057	Internal contact
:	:	:	:	:	:	:	:	:	:
B31	B310	B311	B312	B313	B314	B315	B316	B317	Internal contact
B32	B320	B321	B322	B323	B324	B325	B326	B327	
B33	B330	B331	B332	B333	B334	B335	B336	B337	Reserved
B34	B340	B341	B342	B343	B344	B345	B346	B347	
B35	B350	B351	B352	B353	B354	B355	B356	B357	System Input
B36	B360	B361	B362	B363	B364	B365	B366	B367	System Input
B37	B370	B371	B372	B373	B374	B375	B376	B377	System Input
B38	B380	B381	B382	B383	B384	B385	B386	B387	System Input
B39	B390	B391	B392	B393	B394	B395	B396	B397	System Output
B40	B400	B401	B402	B403	B404	B405	B406	B407	System Output
B41	B410	B411	B412	B413	B414	B415	B416	B417	System Output

CAUTION

- B030~B217 bits will be cleared '0' when the controller is an alarm state, except for while PLC program is running.
- B220~B310 bits retain the previous state when the controller is in alarm state.
- All I/O bits will be cleared when the power off.

6.1.2 Contact point description

1) User input
   - The user input could be used as ordinary user input and system input, Set up it previously if you use as system input.
2) User output
   - The user output can be used as ordinary user output and system output. Set up it previously if you use as system output.
3) NPN Type is 2 of NCOM, 3 of PCOM, PNP Type is 3 of NCOM, 2 of PCOM.
4) User can treat user I/O directly by controller, outer wiring and PC.
5) The internal contact point can use parts of internal memory of controller as a contact point variable, it can be treated by the Program, T/P and PC.
6) The state of I/O contact point can confirm real-time by using T/P and PC.
7) I/O of system the value of contact point is copied into relating System input, if selecting contact point from B000 to B337 among the parts of contact point by user's setting up parameter necessary for system input, and the function of System operates in accordance with the value.
8) System I/O should not be revised freely by user.

■ **Input contact point**

Add.	Description	Add.	Description	Add.	Description
B350	ROB_RUN	B365	JOG-	B382	IOSPD1
B351	PLC_RUN	B366	JOG_SET0	B383	CW S/W
B352	STOP	B367	JOG_SET1	B384	CCW S/W
B353	RESET	B370	JOG_MODE	B385	ORIGIN S/W
B354	SVON	B371	IOPOS0	B387	MOVT_ST
B355	SVOFF	B372	IOPOS1	-	-
B356	ORIGIN	B373	IOPOS2	-	-
B357	STEP	B374	IOPOS3	-	-
B360	PRM_SEL	B375	IOPOS4	-	-
B361	PRM_SEL0	B376	IOPOS5	-	-
B362	PRM_SEL1	B377	IOPOS6	-	-
B363	PRM_SEL2	B380	IOPOS7	-	-
B364	JOG+	B381	IOSPD0	-	-

■ Output contact point

Add.	Description	Add.	Description	Add.	Description
B390	ALARM	B400	BRAKE	B410	WARN1
B391	READY	B401	PGMRUN	B411	WARN2
B392	ORIGIN_OK	B402	PGM_NUM0	B402 ~ B417	NOT USED
B393	IN_POS	B403	PGM_NUM1		
B394	ALARM0	B404	PGM_NUM2		
B395	ALARM1	B405	SVON OUT		
B396	ALARM2	B406	WARN		
B397	ALARM3	B407	WARN0		

CAUTION

- Be careful that internal contact point and output contact point are not cleared after Alarm and EMG reset.
- In case of power-OFF, internal contact point and output contact point is cleared as "0.
- Embedded PLC program keeps operation state after alarm or EMG reset, once it executed.
- This may not be operated the desirable movement if the process time of embedded PLC program and Robot program contact point and processing time of outer signal not accord. This is no trouble but the case that outer signal is not accorded. Please check processing time of signal.
- PLC If PLC program in on operation, it retains output and internal contact point even in ALAM state, while output and internal contact point is cleared as "0" if it not on operation.

6.1.3 Signal Format in Connecting Input/Output(I/O) Connectors

- **Connecting Input/Output(I/O) Connector**
  1) Select an input/output contact to use and set a parameter.

- **Types of Input·Output contacts**

Contact Address	Number of Bytes	Contact Property	Use or Non-use of Input/Output
B000 ~ B022	3	Input contact	Used as system and user input contacts.
B030 ~ B047	2	Output contact	Used as system and user output contacts.
B050 ~ B317	27	Internal contact	Used as user internal contacts.
B320 ~ B337	2	Reserved	Reserved
B340 ~ B347	1		
B350 ~ B387	4	System input contact	Used as an internal system input contact.
B390 ~ B417	3	System output contact	Used as an internal system output contact.

1) Selecting input/output contacts and setting input/output contacts
   - Inputs to use are assigned in B000 ~ B022 range.
   - Outputs to use are assigned in B030 ~ B047 range.

ch.7 VIEW Setting

7.1 Overview

- Capable of setting alarm history, status monitoring on the current motor, whether to use option card and INTEGER values.

Group		Detailed Group		
Name	**Description**	**Name <Page>**		**Description**
ALARM	Refers to alarm history	HISTORY		Detailed alarm history
SERVO	Checks out current status	SPD CMD	<1/8>	Target speed
		CUR SPD		Current speed
		POS CMD	<2/8>	Target position
		CUR POS		Current position
		TORQUE	<3/8>	Current torque value
		MAXTRQ		Maximum torque value
		LOAD	<4/8>	OverLoad value
		POSERR		Position deviation value
		Multi_T	<5/8>	Multi turn value
		SingleT		Single turn value
		EncTime	<6/8>	The number of signals disconnected during encoder-controller communication
		EncPoll		The number of signals going incorrect during encoder-controller communication
		Vdc	<7/8>	Current voltage
		THERE IS NO OPTION		When no option card is present
		Option1. Installed CC-Link		: In case CC-Link card is installed
		Option 2. Installed PROFIBUS		: In case PROFIBUS card is installed
		Option 3. Installed DeviceNet		: In case DeviceNet card is installed
		Option 4. DPRAM INIT ERROR		: In case option cards are not normal
		S/W	<8/8>	Current firmware version
		PARA		Current parameter version
		W/T		Operation time up to the present
INT	I0 ~ 255			Integer variable

7.2 SERVO STATUS

■ Servo Motor Capacity & Constant Check

Detailed Group	Name	Page	Description
SERVO	SPD CMD	<1/8>	Target speed
	CUR SPD		Current speed
	POS CMD	<2/8>	Target position
	CUR POS		Current position
	TORQUE	<3/8>	Current torque value
	MAXTRQ		Maximum torque value
	LOAD	<4/8>	OverLoad value
	POSERR		Position deviation value
	Multi_T	<5/8>	Multi turn value
	SingleT		Single turn value
	EncTime	<6/8>	The number of signals disconnected during encoder-controller communication
	EncPoll		The number of signals going incorrect during encoder-controller communication
	Vdc	<7/8>	Current voltage
	THERE IS NO OPTION		In case no option cards are present
	Option1. Installed CC-Link Option 2. Installed PROFIBUS Option 3. Installed DeviceNet Option 4. DPRAM INIT ERROR		: In case CC-Link card is installed : In case PROFIBUS card is installed : In case DeviceNet card is installed : In case option cards are not normal
	S/W	<8/8>	Firmware version
	PARA		Parameter version
	WTIME		Operating time

ch.8 Writing JOB Program

8.1 Overview of JOB Program Writing

- The number of robot programs that can be written is 8 (No.0 ~ No.7) in total.

- The maximum number of steps in each program is 1000 steps (4000 Word).

- Refer to the example below for easy writing.

- To write a program, first of all the user should decide 2 things.
  1) User I/O list to be used should be selected.
  2) The number of a point to work on should be assigned.

8.1.1 Robot Commands (Reference in Program Input)

■ **Turn and selection key for commands by Job Program**

Group	Turn	Selection Key	PROG
Screen movement BS <-> ENT	1	F1	SERVO
		F2	STOP
		F3	MOVA
		F4	MOVI
	2	F1	MOVR
		F2	MOVM
		F3	MOVT
		F4	FOS
	3	F1	REF
		F2	PCLR
		F3	SPD
		F4	ACC
	4	F1	DEC
		F2	IF
		F3	XIF
		F4	WAIT
	5	F1	GOTO
		F2	LBL
		F3	SBRT
		F4	RET
	6	F1	CALL
		F2	JPGM
		F3	LOOP
		F4	ENDL
	7	F1	ALARM
		F2	B
		F3	BB
		F4	I
	8	F1	P
		F2	PEND
		F3	-
		F4	-

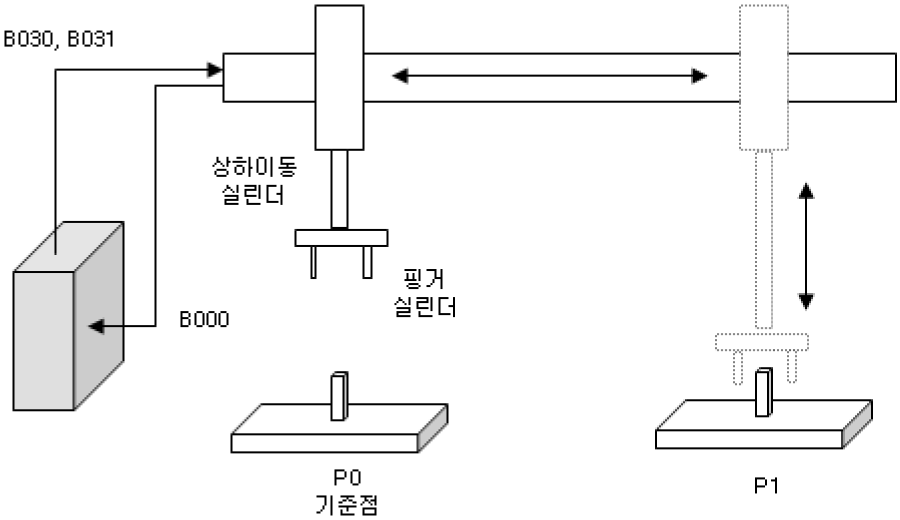
8.2 Writing New Job Program Using Examples

8.2.1 Description of Program Operation

■ **Pick & Place Systems with palletizer function**

1) Operation simulation

Picks up the product on P0(Reference point) by sending the signal that operates a up/down movement cylinder and a finger cylinder once the start signal (B000) is entered, moving it to P1 and returns to the reference point.



2) Pick & Place System Job Program

Step	Command	Description
S000	SERVO ON	: Turns SERVO ON.
S001	SPD 1000	: Sets speed to 10% of parameter LMT_RPM.
S002	LBL 1	: Sets LABEL to 1.
S003	MOVA P0	: Moves from P0 to the assigned position.
S004	B040 = 1	: Sends output contact B040(Arrival signal at reference point) to '1'.
S005	WAIT B000 = 1	: Wait until input cotact B000 (Operation start contact) is '1'.
S006	B040 = 0	: Outputs contact B040(Reference point arrival signal) to '0'.
S007	B030 = 1	: Outputs B030(Up/down cylinder drive signal: Drive downward) to '1'.
S008	B031 = 1	: Outputs B031(Finger cylinder drive signal: Grip) to '1'.
S009	B030 = 0	: Outputs B030(Up/down cylinder drive signal: Drive upward) to '0'.
S010	MOVA P1	: Moves from P1 to the assigned position.
S011	B030 = 1	: Outputs B030(Up/down cylinder drive signal: Drive downward) to '1'.
S012	B031 = 0	: Outputs B031(Finger cylinder drive signal: Release) to '0'.
S013	B030 = 0	: Outputs B030(Up/down cylinder drive signal: Drive upward) to '0'.
S014	GOTO 1	: Moves program execution to LBL.
	<end of file>	

8.2.2 Job Program Writing

8.2.2.1 How to Handle Teach Pendant for Writing Job Program

■ **Setting Procedure**

Step 1. **Shift to MAIN screen**

```
TPS-9000T Ver1.3
 F1: Teach Pendant
 F2: RS-422 Multipoint
 F3: Data up/Down Load
```

F1 — Turn ON power to controller and select Teach Pendant.

```
RoboStar RCS-8000C
Servo Controller
PARA V00.22
        PRESS ENT KEY
```

ENT — Press ENTER.

Step 2. **Shift to Job Program screen**

```
      Servo Controller

  ROBOT  PLC  PARA  VIEW
```

F1 — Select ROBOT.

```
       ROBOT Control

  PROG   POS   ORG   RUN
```

F1 — Select PROG.

```
PROGRAM No. 0        3985
  *0#    1#    2     3
   4     5     6     7
EDIT          COPY   DEL
```

The written program is displayed with #(Sharp).

Shift to an unwritten program.

```
PROGRAM No. 2          4000
   0#      1#     *2      3
   4       5      6       7
EDIT              COPY   DEL
```

6

(Twice)

Select EDIT.

```
PROGRAM No. 2          4000
   0#      1#     *2      3
   4       5      6       7
EDIT              COPY   DEL
```

F1

Step 3. **Shift to command writing screen**

Refers to initial screen of Program writing.

```
PROGRAM   No. 2
S000*<end of file>
S001
BLOCK             JMP    DEL
```

Step 4. **Write S000 SERVO ON**

Press ENT to search for a command to use.

```
PROGRAM   No. 2
S000*
S001 <end of file>
SERVO   STOP   MOVA   MOVI
```

ENT

Select SERVO.

```
PROGRAM   No. 2
S000*
S001 <end of file>
SERVO   STOP   MOVA   MOVI
```

F1

PROGRAM No. 2 S000*SERVO S001 <end of file> ON OFF TRQ TQS	SERVO command is entered into S000.
PROGRAM No. 2 S000*SERVO S001 <end of file> ON OFF TRQ TQS **F1**	Select ON.
PROGRAM No. 2 S000*SERVO ON S001 <end of file>	ON is entered after SERVO.

Step 5. **Write S001 SPD 1000**

S000 SERVO ON S001* S002 <end of file> SERVO STOP MOVA MOVI **ENT**	Press ENT to move the cursor (*) to S001.
S000 SERVO ON S001* S002 <end of file> REF PCLR SPD ACC **ENT** (Twice)	Enter ENT twice to search for SPD. .

S000 SERVO ON
S001*
S002 <end of file>
REF PCLR SPD ACC

F3

Select SPD.

S000 SERVO ON
S001*SPD
S002 <end of file>
IOSPD I

SPD is entered into S001.

S000 SERVO ON
S001*SPD 1000
S002 <end of file>
IOSPD I

1
0
0
0

1000 is entered after S001 SPD.

S001 SPD 1000
S002*
S003 <end of file>
REF PCLR SPD ACC

ENT

Press ENT to move the cursor (*) to S002.

Step 6. **Write S002 LBL 1**

S001 SPD 1000
S002*
S003 <end of file>
GOTO LBL SBRT RET

ENT
(Twice)

Enter ENT twice to search for LBL
.

```
S001 SPD 1000
S002*
S003 <end of file>
GOTO   LBL   SBRT   RET
```

F2

Select LBL.

```
S001 SPD 1000
S002*LBL
S003 <end of file>
```

LBL is entered into S002.

```
S001 SPD 1000
S002*LBL 1
S003 <end of file>
```

1

1 is entered after LBL.

Step 7. **Writing S003 MOVA P0**

```
S002 LBL 1
S003*
S004 <end of file>
GOTO   LBL   SBRT   RET
```

ENT

Press ENT to move the cursor (*) to S003.

```
S002 LBL 1
S003*
S004 <end of file>
SERVO   STOP   MOVA   MOVI
```

ENT

(4 times)

Enter ENT 4 times to search for MOVA

.

```
S002 LBL 1
S003*
S004 <end of file>
SERVO   STOP   MOVA   MOVI
```

F3

Select MOVA.

```
S002 LBL 1
S003*MOVA
S004 <end of file>
P       PI
```

MOVA is entered into S003.

```
S002 LBL 1
S003*MOVA
S004 <end of file>
P       PI
```

F1

Select P.

```
S002 LBL 1
S003*MOVA P
S004 <end of file>
```

P is entered after S003 MOVA.

```
S002 LBL 1
S003*MOVA P0
S004 <end of file>
```

0

0 is entered after S003 MOVA P.

Step 8. **Write S004 B040=1**

```
S003 MOVA P0
S004*
S005 <end of file>
SERVO   STOP   MOVA   MOVI
```

ENT

Press ENT to move the cursor (*) to the following S00.

```
S003 MOVA P0
S004*
S005 <end of file>
ALARM      B      BB      I
```

ENT

Enter ENT 6 times to search for B.

```
S003 MOVA P0
S004*
S005 <end of file>
ALARM      B      BB      I
```

F2

Select B.

```
S003 MOVA P0
S004*B
S005 <end of file>
```

Command B is entered into line S004.

```
S003 MOVA P0
S004*B040
S005 <end of file>
=     NOT
```

0 **4** **0**

040 is entered after S004 B.

S003 MOVA P0
S004*B040
S005 <end of file>
= NOT

F1

Select =(equal).

S003 MOVA P0
S004*B040=
S005 <end of file>

=(equal) is entered after line S004 B040.

S003 MOVA P0
S004*B040=1
S005 <end of file>

1

1 is entered after S004 B040=.

Step 9. **Write S005 WAIT B000=1**

S004 B040 = 1
S005*
S006 <end of file>
ALARM B BB I

ENT

Press ENT to move the cursor (*) to S005.

S004 B040 = 1
S005*
S006 <end of file>
DEC IF XIF WAIT

ENT
(5 times)

Enter ENT 5 times to search for WAIT.

```
S004 B040 = 1
S005*
S006 <end of file>
DEC    IF    XIF    WAIT
```

F4

Select WAIT.

```
S004 B040 = 1
S005*WAIT
S006 <end of file>
B    BB    I    P
```

WAIT is entered into S005.

```
S004 B040 = 1
S005*WAIT
S006 <end of file>
B    BB    I    P
```

F1

Select B.

```
S004 B040 = 1
S005*WAIT B
S006 <end of file>
```

B is entered into S005 WAIT.

```
S004 B040 = 1
S005*WAIT B000
S006 <end of file>
=
```

0

0

0

000 is entered after S005 WAIT.

S004 B040 = 1
S005*WAIT B000
S006 <end of file>
=

F1

Select =(equal).

S004 B040 = 1
S005*WAIT B000=
S006 <end of file>

=(equal) is entered after S005 WAIT B000.

S004 B040 = 1
S005*WAIT B000=1
S006 <end of file>

1

1 is entered after S005 WAIT B000=.

S005 WAIT B000 = 1
S006*
S007 <end of file>

ENT

Press ENT to move the cursor(*) to be after S006.

Step 10.

CS006 command, B040=0
S007, S011 command, B030=1
S008 command, 'B031=1'
S009, S013 command, B030=0
S012 command, B031=0

Identical to Step 8. How to write S004 B040=1 so refer to it.

Step 11. **S010 command, MOVA P1 →**

Identical to Step 7. How to write S003 MOVA P0 so refer to it.

Step 12. **Write S014 GOTO 1**

S013 B030 = 0
S014*
S015 <end of file>
GOTO LBL SBRT RET

ENT

Write until S013 and press ENT to move the cursor(*) to S014.

S013 B030 = 0
S014*
S015 <end of file>
GOTO LBL SBRT RET

ENT

Enter ENT consecutively to search for GOTO.

S013 B030 = 0
S014*
S015 <end of file>
GOTO LBL SBRT RET

F1

Select GOTO.

S013 B030 = 0
S014*GOTO
S015 <end of file>

GOTO is entered into S014.

S013 B030 = 0
S014*GOTO 1
S015 <end of file>

1

1 is entered after S014 GOTO.

ch.9 Description of Robot Commands

- A robot program command is a language for position control that is implemented in order and consists of
  1) Command for operating condition
  2) Operating command
  3) Variable processing command
  4) Input/output processing command
  5) Program control command

9.1 Commands for Operating Conditions

Command	Detailed command	Input Data	Description of command
SERVO	ON OFF TRQ TQS	None None 1 ~ 300 1 ~ 300	Turns ON power to servo. Turns OFF power to servo. Alarm occurs when exceeding the given torque limit. Executes the following line after reaching the given torque.
ALARM	None	0 ~ 255	Generates user ALARM.
SPD (Speed)	None IOSPD I	1 ~ 10000 None 0 ~ 255	Sets motor rotation speed. Sets motor rotation speed as a contact point. Sets motor rotation speed as an integer variable.
ACC (Acceleration)	None I	1 ~ 500 0 ~ 255	Sets acceleration time. Sets acceleration time as an integer variable.
DEC (Decrement)	None I	1 ~ 500 0 ~ 255	Sets deceleration time. Sets deceleration time as an integer variable.
FOS	None I	0 ~ 100 0 ~ 255	The pgoram makes progress during operating command (MOVx).
PCLR (Position Clear)	None	None	Set the reference coordinate (Current position) to '0.000'.

9.1.1 SERVO

Function Turns ON/OFF power to servo.

Alarm occurs in regard to torque value or the following line is implemented.

Form
SERVO ON
SERVO OFF
SERVO TRQ <Torque value>
SERVO TQS < Torque value >

Term <Torque value> : Means torque values in 1~300% range.

Description

Command	Description
SERVO ON	Turns ON power to servo.
SERVO OFF	Turns OFF power to servo.
SERVO TRQ <Torque value>	ALARM when beyond <Torque value >.
SERVO TQS < Torque value >	Executes the following line after reaching <Torque value>.

- When connecting power to SERVO or cutting power, operation is made in connection with the start of a mechanical brake according to the value set in the parameter
- Opeartion is made at 300% when writing TRQ, TQS torque values at more than 300%.

Ex1

Servo power ON.		
S000	SERVO ON	Turn ON power to servo
S001	MOVA 10.000	Move MOVA to 10.000
S002	SERVO OFF	Turn OFF power to servo

Ex2

Alarm occurs when beyond the preset torque value		
S000	SERVO ON	Turn ON power to servo
S001	SERVO TRQ 150	Alarm occurs if torque value is over 150%.
S002	MOVA 100.000	Move MOVA to100.000

Ex3

Execute the following step when beyond the preset torque value.		
S000	SERVO ON	Turn ON power to servo
S001	SERVO TQS 150	Execute S002 command if the torque value is over 150%.
S002	MOVA 100000	Move MOVA to 100.000.

9.1.2 ALARM

Function Generates user ALARM to stop the program from making progress.

Form ALARM <Alarm number>

Term < Alarm number > : Alarm number to generate

Description

Command	Description
ALARM <Alarm number>	Generate alarm <Alarm number>.

- When a command is used, 'Software Alarm <Alarm number>' occurs.
- Alarm number available for use is 0 ~ 255. When the program is stopped by command ALARM, ALARM Bit is assigned to Set(1) among output contact, and T/P screen turns into ALARM and Software Alarm number is displayed.
- To continue the program in ALARM, press RESET contact input or T/P RESET key to disable ALARM and RUN.

Ex1

Software alarm occurrence.		
S000	SERVO ON	Turn ON power to servo
S001	MOVA 10.000	Move MOVA to10.000
S002	ALARM 1	No.1 alarm ocurs
S003	SERVO OFF	Turn OFF power to servo

9.1.3 SPD (SPEED)

Function Sets movement speed.

Form
SPD <Set value>
SPD I<Number>
SPD IOSPD

Term
<Set value> : Speed value for 1~10000
<Number> : INTEGER number from 0 to 255

Description

Command	Description
SPD <Set value>	Set to speed suited for <Set value>.
SPD I<Number>	Set to speed stored in INTEGER variable, that is, 'I <Number>'.
SPD IOSPD	Set at speed of parameter IO_SPD0~3 according to the value set to I/O contact IOSPD0, 1.

- Set range for SPD value is 1 ~ 10000 and it unit is 1/100[%]. When set to 10000, movement is made at the speed set in parameter LMT_RPM.
- When implementing the robot program the first time, the set value for parameter DFT_SPD is applied to movement speed.
- When SPD value is set to 0, alarm 'E2023, Invalid SPD Value' occurs.

Ex.1

Setting by direction input.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set speed at 100%
S002	MOVA 10.000	Move MOVA to 10.000

Ex.2

Setting SPD value using an Integer variable.		
S000	SERVO ON	Turn ON power to servo
S001	SPD I0	Set to the value saved in INTEGER variable 0 (I0 set value 1000)
S002	MOVA 10.000	Move MOVA to 10.000

Ex.3

Setting SPD value using an IOSPD contact.		
S000	SERVO ON	Turn ON power to servo
S001	SPD IOSPD	Set speed at 20% (Contact IOSPD1 Set, IOSPD2 Set, parameter IO_SPD2 vlaue 2000)
S002	MOVA 10.000	Move MOVA to 10.000

9.1.4 PCLR (POSITION CLEAR)

Function Involved in changing the current position on reference coordinate system to 0.000.

Form PCLR

Description

- When changing the coordinate system with PCLR command, the coordinate value following PCLR operation is 0.000.
- When the coordinate system is changed to PCLR in a state where the following command is supposed to be implemented before movement operation is finished by setting FOS configuration, a new coordinate system sets the position to 0.000 when performing the command and the stop position for the movement command keeps the position set in the previous coordinate system.
- This command can be used only in the incremental encoder.

Ex.1

Reset the current position.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set the speed at 100%
S002	MOVA 10.000	Move MOVA to 10.000
S003	PCLR	Change the current position on the coordinate system to 0.000.
S004	MOVA 15.000	Move to 15.000 (25.000 in the previous coordinate system) on the new coordinate system

9.1.5 ACC (ACCELERATION), DEC (DECELERATION)

Function ACC : Acceleration time

DEC : Deceleration time

Form ACC <Set value>

ACC I<Number>

DEC <Set value>

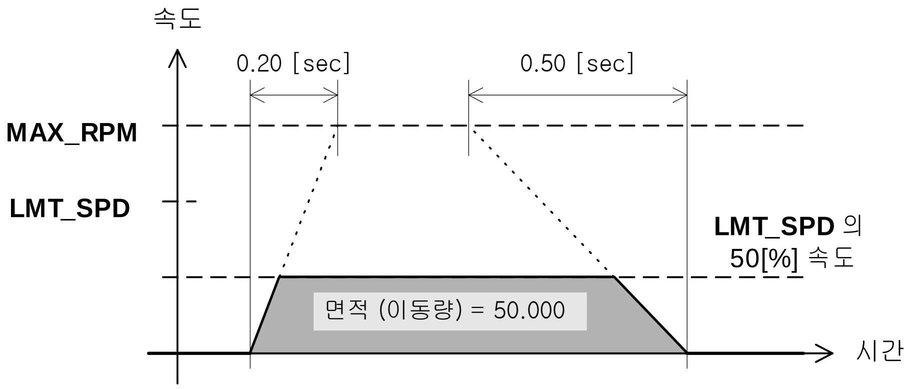
DEC I<Number>

Term <Set value> : Speed value for 1~500

<Number> : INTEGER number from 0 to 255

Description

Command	Description
ACC <Set value> DEC <Set value>	Set at <Set value> speed.
ACC I<Number> DEC I<Number>	Set at the speed in an INTEGER variable, 'I <Number>'.



- ACC, DEC commands are set based on parameter MAX_RPM.
- The set range for ACC, DEC values is 1 ~ 500, and set unit is 10[msec].
- The acceleration/deceleration times when performing the robot program first time are implemented by the values set respectively in parameter DFT_ACC and DFT_DEC.
- When changing acceleration/deceleration by commands ACC, DEC during movement by FOS command, the changed value is applied.

Ex.1

Set by direct input.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set speed at 100%
S002	ACC 20	Set acceleration time to 20 (Unit: 10ms) → 0.2 seconds
S003	DEC 50	Set acceleration time to 50 (Unit: 10ms) → 0.5 seconds
S004	MOVA 10.000	Move MOVA to 10.000

Ex.2

Set value using an integer variable.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set speed at 100%
S002	ACC I0	Set acceleration time to the value saved in INTEGER 0 (I0 set value :20)
S003	DEC I1	Set deceleration time to the value saved in INTEGER 1 (I1 set value 50)
S004	MOVA 10.000	Move MOVA to 10.000

9.1.6 FOS

Function Involved in helping the following make progress before movement command(MOVx) implementation is finished.

Form FOS <Set value>
FOS I<Number>

Term <Set value> : Speed value for 0~100%
<Number> : INTEGER number from 0 to 255

Description

Command	Description
FOS <Set value>	The following program is performed when it is placed in the rate for <Set value> from start point to end point while movement command is being implemented.
FOS I<Number>	The following program is performed when it is placed in the rate saved in INTEGER variable, 'I <Number>' from start point to end point while movement command is being implemented.

- FOS Set value is maintained to the following command FOS.
- Upon the receipt of a new command FOS while performing movement command using a command FOS, the previous movement command is performed and completed, which is then applied from the following movement command.
- When performing the robot program first time, FOS default value is set to 100.
- FOS operation is the start point of movement.

Ex1

Value set by direct input		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set speed at 100%
S002	MOVA 0.000	Move MOVA to 0.000
S003	FOS 50	Set to make the program go when moving 50[%]
S004	MOVA 1000.000	Perform S005 line in 500.000 due to 'S003 FOS 50' while moving MOVA to 1000.000
S005	PCLR	Perform S005 line in 500.000.
S006	MOVA 10.000	Set the current position to 0.000 Move MOVA as much as 10.000

Ex2

Set the value using an integer variable		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set speed at 100%
S002	B050 = 0	Set contact B050 to '0'
S003	MOVA 0.000	Move MOVA to 0.000
S004	FOS I0	Set to make the program go when moving 50[%], the rate saved in INTEGER variable 0 (I0 set value, 50)
S005	MOVA 10.000	Perform S006 line in 5.000 due to 'S004 FOS I0' while moving MOVA to 10.000
S006	B050 = 1	Set contact B050 to '1'
S007	MOVA 10.000	Perform S008 line in 5.000 due to 'S004 FOS I0' while moving MOVA to 10.000
S008	B050 = 1	Set contact B050 to '1'
S009	FOS I1	(I1 set value 100) Set to make the program go when moving 100[%], the rate saved in INTEGER variable 1 (I1 set value, 100)

9.2 Operating Commands

■ When commands MOVA, MOVI, MOVR, and MOVT are implemented, Servo On comes up.

Command	Detailed Command	Input Data	Description of Command
MOVA	None	-99999.999 ~ 99999.999	Moves from the origin to the assigned place.
	P	0 ~ 1023	Moves from the origin to where the assigned position value is placed.
	PI	0 ~ 255	
MOVI	None	-99999.999 ~ 99999.999	Moves from the current position to the assigned place.
	P	0 ~ 1023	Moves from the current position to where the assigned position value is placed.
	PI	0 ~ 255	
MOVR	None	-99999.999 ~ 99999.999	Moves from the reference position to the assigned place.
	P	0 ~ 1023	Moves from the reference position to where the assigned position value is placed. The reference position is assigned by a REF command.
	PI	0 ~ 255	
MOVT	None	IOPOS 0~7	Use contacts IOPOS(0~7) to select the assigned position value and makes a movement using a MOVT_ST contact.
REF	None	-99999.999 ~ 99999.999	Sets the value assigned in the position value as the reference position. Assigns the reference position of MOVR.
	P	0 ~ 1023	
	PI	0 ~ 255	

9.2.1 MOVA

Function Moves to the assigned position from the absolute coordinate system with the origin as the basis.

Form
MOVA <Set value>
MOVA P<Number>
MOVA PI<Number>

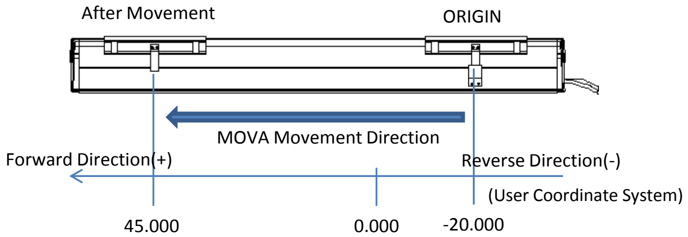
Term
<Set value> : MIN_LMT, MAX_LMT range set in the parameter
<Number> : INTEGER number from 0 to 255

Description

Command	Description
MOVA <Set value>	Moves 0.000 on the absolute coordinate system to <Set value>.
MOVA P <Number>	Moves to the position value saved in the position variable ‘P<Number>’.
MOVA PI <Number>	Moves from 0.000 on the absolute coordinate system as much as the value saved in the number 'P', the position value set to INTEGER variable ‘I<Number>’.

- ➢ Before identifying the origin, the position at the time of feeding power supply is used as the origin.
  (When using an incremental encoder)
- ➢ Processed as an error when the target point for movement goes beyond the values sets in parameters MIN_LMT, MAX_LMT.

ORG_OFS -20.000



Ex.1

Move to the assigned position.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set movement speed at LMT_RPM의 100[%] of LMT_RPM.
S002	MOVA 45.000	Move MOVA to coordinate 45.000
S003	MOVA P10	Move MOVA to the coordinate set to P10 (Suppose that P10 is 45.000.)
S004	MOVA PI1	In I1 = 10, MOVA is moved to the coordinate set to P10.

9.2.2 MOVI

Funct-ion Based on the current position, an incremental movement is made as much as the assigned position value.

Form MOVI <Set value>

MOVI P<Number>

MOVI PI<Number>

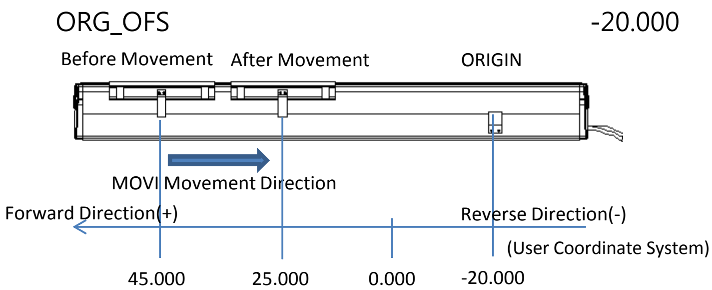
Term <Set value> : MIN_LMT, MAX_LMT range set in the parameter

<Number> : INTEGER number from 0 to 255

Descr-iption

Command	Description
MOVI <Set value>	Moves from the current position to <Set value>.
MOVI P<Number>	Moves to the position value saved in the position variable ‘P<Number>‘.
MOVI PI<Number>	Moves from current position as much as the value saved in the number 'P', the position value set to INTEGER variable ‘I<Number>’

- Processed as an error when the target point for movement goes beyond the values sets in parameters MIN_LMT, MAX_LMT.
- The position value delivered in the previous command is used for the position prior to movement.



(Suppose that the coordinate value (based on a command) before movement is 45.000.)

Ex.1

Move to the assigned position.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVI -20.000	Make incremental movement as much as about -20.000 from the current position.
S003	MOVI P10	Make incremental movement as much value as set in P10 from the current position.
S004	MOVI PI1	In I1 = 10, MOVA is incrementally moved as much value as set in P10.

9.2.3 REF, MOVR

Function REF command is used to set the reference position to move as much value as set with the use of MOVR command.

Form

REF <Set value>
REF P <Number>
REF PI <Number>

MOVR <Set value>
MOVR P <Number>
MOVR PI <Number>

Term

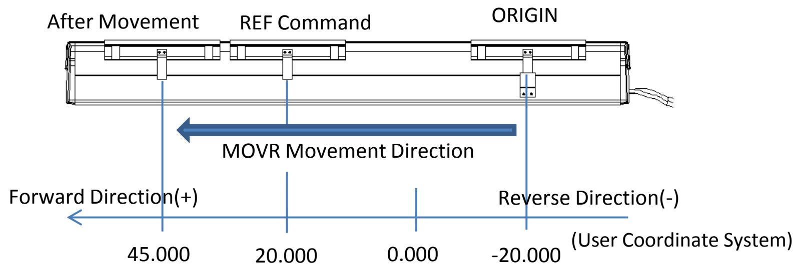
<Set value> : MIN_LMT, MAX_LMT range set in the parameter
<Number> : INTEGER number from 0 to 255.

Description

Command	Description
REF <Set value>	Set <Coordinate value> as the reference position.
REF P <Number>	Set the value assigned in the position variable as the reference position.
REF PI <Number>	Set as the reference position the value saved in the number of the position variable 'P' set to INTEGER variable 'I<Number>'
MOVR <Set value>	Move from the reference position as much as <Set value>.
MOVR P <Number>	Move from the reference position as much as the position value saved to the position variable 'P<Number>'.
MOVR PI <Number>	Move from the reference position as much as the value saved in the number for the position value 'P' set to INTEGER variable 'I<Number>'.

- Processed as an error when the target point for movement goes beyond the values sets in parameters MIN_LMT, MAX_LMT.
- The reference position set as a REF becomes the reference value and is saved to position variable P1022.
- A temporary reference position set as a REF is maintained until a REF command is used again or P1022 is changed with other methods.
- Commands REF, MOVR also allow position values to be entered in the form of Pxxx or PIxx, as seen in MOVA or MOVI.

ORG_OFS -20.000



(The reference position is set by REF command. This position value is aved to P1022.)

Ex.1

Move from the reference position as much as the assigned position.		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	REF 20.000	Set the reference position to coordinate 20.000.
S003	MOVR 25.000	Make incremental movement as much as 25.000 from the reference position.

9.2.4 MOVT

Function Moves to the coordinate value of the position variable assigned in value IOPOS (0 ~ 7).

Form MOVT

Description

Command	Description
MOVT	Select the position value assigned as contact IOPOS(0~7) and make a movement using contact MOVT_ST.

- Command MOVT begins to move only when contact value MOVT_ST changes from '0' to '1'. Besides, IO_POS contact values also utilize the value when MOVT_ST contact changes from '0' to '1'.
- How to move is identical to MOVA command.
- Position variable values assigned as contact values IOPOS3, IOPOS2, IOPOS1, and IOPOS0 are used as a movement position. (Refer to the table below.)

	P0	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15
IOPOS0	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
IOPOS1	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
IOPOS2	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
IOPOS3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON

Ex.1

Move from IOPOS to the assigned position.

S001 SERVO ON Turn ON power to servo
S002 SPD 10000 Set movement speed at 100[%] of LMT_RPM.
S003 MOVT

IOPOS0	IOPOS1	IOPOS2	IOPOS3	P8
OFF	OFF	OFF	ON	(25.000)

Move MOVA as much as 25.000.

9.3 Variable Processing Command

9.3.1 I, P

Function Sets values for integer variables (I) or position variables (P).

Form I <Integer variable number >
P <Position variable number >

Term < Integer variable number > : Integer variable number from 0 to 255
< Position variable number > : Position variable number from 0 to 1023

Description

Command	Input Data	Description
I (Integer)	0 ~ 255	Sets integer variable value.
P (Position)	0 ~ 1023	Sets position variable value.

- The range of an integer variable is 0 ~ 65535.
- The range of a position variable is –99999.999 ~ 99999.999.
- Even though a value is entered into position variable P1021, this changes to the correction value when GOTO command is used following XIF command.
- Even though a value is entered into the position variable P1022, this changes to the coordinate value used in REF command.
- The value in position variable P1023 changes to the current position value.

Ex.1

Integer variable.		
S000	I1 = 10	Set integer variable I1 to 10.
S001	I1 = I2	Set integer variable I1 to the value in integer variable
S002	I1 = II2	I2.
	(ex: I2 = 5, I5 = 10)	Set to I1 = I(I2) → I1 = I(5) → I1 = 10.
S003	I1 += 10	
S004	I1 += I2 (ex: I2 = 5)	Set to I1 = I1+10.
S005	I1 += II2	Set to I1 = I1+I2 → I1 = I1+5.
	(ex: I2 = 5, I5 = 10)	Set to I1 = I1+I(I2) → I1 = I1+I(5) → I1 = I1+10.
S006	I1 -= 10	Set to I1 = I1-10.
S007	I1 -= I2 (ex: I2 = 5)	Set to I1 = I1-I2 → I1 = I1-5.
S008	I1 -= II2	Set to I1 = I1-I(I2) → I1 = I1-I(5) → I1 = I1-10.
	(ex: I2 = 5, I5 = 10)	

Ex.2

Position variable.		
S000	P1 = 10.000	Set Position variable P1 to 10.000.
S001	P1 = P2	Set Position variable P1 to the value in Position
S002	P1 = PI2 (ex: I2 = 5)	variableP2.
S003	P1 += 10	Set to P1 = P(I2) → P1 = P5.
S004	P1 += P2	Set to P1 = P1+10.
S005	P1 += PI2	Set to P1 = P1+P2.
	(ex: I2 = 5)	Set to P1 = P1+P(I2) → P1 = P1+P5.
S006	P1 -= 10	
S007	P1 -= P2	Set to P1 = P1-10.
S008	P1 -= PI2	Set to P1 = P1-P2.
	(ex: I2 = 5)	Set to P1 = P1-P(I2) → P1 = P1-P5.

9.4 Input/output Processing Command

9.4.1 B, BB

Function Sets a contact value.

Form B<Bit number>
BB<Byte number>

Term <Bit number> : Contact number for Bit unit
<Byte number> : Contact number for Byte unit

Description

Command	Description
B	Processes a contact in Bit unit.
BB	Processes a contact in Byte unit

- The value allocated from command BB is from Bit(LSB) 0.
- Command BB is unable to set an input contact (Base: B00 ~ B02). Now that contact points (Bxxx, BBxx) are commonly used with a PLC program, it is not possible to know which value comes up when the two programs (Robot and PLC program) set different values to the identical bit. Use caution when writing a program.
- In BB04 = 00..11.., the mark "." means 'don's care' that does not modify the previous value.

Ex.1

Change a contact value.		
S000	B030 = 0	Set contact B030 to '0'.
S001	B031 = 1	Set contact B031 to '1'.
S002	B032 NOT	Inverts the contact value for contact B032.
	⋮	⋮
S003	BB03 = 11000011	B030,B031,B036,B037 = 1; B032, B033, B034, B035 = 0
S004	BB04 = 00..11..	B030,B031 = 0; B034, B035 = 1; The rest bits maintain previous values.

9.5 Program Control Command

Command	Detailed Command	Input Data	Description of Command
STOP	None	None	Stops robot program from making further progress.
IF	B	000 ~ 317	Processes conditions according to a contact value (Bit).
	BB	00 ~ 31	Processes conditions according to a contact value (Byte).
	I	0 ~ 255	Processes conditions according to an integer variable value.
	P	0 ~ 1023	Processes conditions according to a position variable value.
XIF	B	000 ~ 317	Processes conditions according to a contact value (Bit) during operation.
	BB	00 ~ 31	Processes conditions according to a contact value (Byte) during operation.
	I	0 ~ 255	Processes conditions according to an integer variable value during operation.
	P	0 ~ 1023	Processes conditions according to a position variable value during operation.
WAIT	None	0 ~ 10000	Wait as much time as assigned.
	B	000 ~ 317	Wait until the assigned contact becomes the set value.
	BB	00 ~ 31	Wait until the assigned contact becomes the set value.
	I	0 ~ 255	Wait until the set integer variable value is seen.
	P	0 ~ 1023	Wait until the set position variable value is seen.
SBRT (Subroutine)	None	0 ~ 999	Displays the start of subroutine.
RET (Return)	None	None	Displays the end of subroutine.
CALL	None	0 ~ 999	Branches to the assigned subroutine.
GOTO	None	0 ~ 999	Branches to the assigned label.
LBL (Label)	None	0 ~ 999	Assigns a label.
LOOP	None	0 ~ 999	Performs repeated run as much value as set to the assigned ENDL.
ENDL (End Loop)	None	0 ~ 999	Displays the end of assigned LOOP.
JPGM (Jump Program)	None	0 ~ 7	Displays on the assigned program.
PEND (Program End)	None	None	Displays the end of program.

9.5.1 STOP

Function Stops the program from making further progress.

Form STOP

Description

Command	Description
STOP	Stops the ongoing program.

- When the program is stopped by command STOP, the program makes progress only by entering RUN contact.

Ex.1

Program stop.		
S000	SERVO ON	Turn ON power to servo
S001	MOVA 100.000	Move MOVA to 10.000
S002	IF B010 = 1	When contact B010 is ‘1’, the program is stopped
S003	STOP	from moving.

9.5.2 IF

Function When the status for contact values, Integer variable values, Position variable values is consistent with conditions, the command for the following step is implemented, whereas if not, it is not implemented.
(When inconsistent, run the command for the following step.)

Form
IF I<Integer variable number>
IF P<Position variable number>
IF B<Bit number>
IF BB< Byte number >

Term
<Integer variable number> : Integer variable number from 0 to 255.
<Position variable number> : Position variable number from 0 to 1023

Description

Command	Description
IF I<Integer variable number>	Processes conditions according to integer variable variables.
IF P<Position variable number>	Processes conditions according to position variable variables.
IF B <Contact value (Bit)>	Processes conditions according to contact value (Bit).
IF BB <Contact value(Byte)>	Processes conditions according to contact value (Byte).

The following are conditions applicable in IF condition.
<Inspect contact value>
B010 = 1 : Inspect bit unit.
B01 = 11..00.. : Inspect byte unit.
(Bit represented as '.' is not inspected.)

<Inspect Integer variable value>
IF I0 > 10 If I0 is greater than 10.
IF I0 < I1 If I0 is smaller than I1.
IF I0 = II3 Precondition I3=**1**, if I0 is equal to I1.
IF II2 != 10 Precondition I2=0, if I0 is different from 10.
IF II2 > I1 Precondition I2=0, if I0 is greater than I1.
IF II2 < II3 Preconditions I2=**0**, I3=**1**, if I**0** is smaller than I**1**

<Inspect position variable value>	
IF P0 = 10.000	If P0 is equal to 10.000.
IF P0 != P1	If P0 is different from P1.
IF P0 > PI3	Precondition I3=**1**, if P0 is greater than P**1**.
IF PI2 < 10.000	Precondition I2=**0**, If P0 is smaller than 10.000.
IF PI2 = P1	Precondition I2=**0**, If P0 is equal to P1.
IF PI2 != PI3	Precondition I2=**0**, I3=**1**, If P0 is smaller than P**1**

(> Greater, < Smaller, = Equal, != Not equal)

- Integer variable can be used from I0 to I255 and integer variable values are from 0 to 65535.
- Position variable can be used from P0 to P1023 and position variable values are from -99999.999 to 99999.999.

Ex.1

Change movement position by a contact		
S000	SERVO ON	Turn ON power to servo
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	IF B010 = 1	When contact B010 is ‘1’,
S003	MOVA 10.000	coordinate 1 moves to 0.000.
S004	IF B010 = 0	When contact B010 is ‘0’,
S005	MOVA -10.000	Coordinate –1 moves to 0.000.

9.5.3 XIF

Function Inspects conditions while performing time-consuming commands (MOVx, WAIT).

Form XIF I<Integer variable number>

XIF P< Position variable number>

XIF B<Bit number>

XIF BB< Byte number>

Term <Integer variable number> : Integer variable number from 0 to 255

<Position variable number> : Position variable number from 0 to 1023

<Bit number> : Bit unit contact number

<Byte number> : Byte unit contact number

Description

Command	Description
XIF I <Integer variable number>	Processes conditions according to integer variable values during operation.
XIF P <Position variable number>	Processes conditions according to position variable values during operation.
XIF B < Bit number >	Processes conditions according to contact variable (Bit) values during operation.
XIF BB < Byte number >	Processes conditions according to contact variable (Byte) values during operation.

- Conditions applicable in command XIF are identical to IF.
- Commands used after XIF are limited to SPD, ACC, DEC, and GOTO. When command GOTO comes after XIF, movement or WAIT operation are stopped as long as conditions are met, running the program in LBL position. (While the system is moving, this command instantly reduces speed to stop and saves the value for the stop point to position variable P1021253.)
- Enabled to use XIF conditions up to three and operating conditions in parallel with MOVx, WAIT.
- When XIF is used following the command other than MOVx, WAIT, it is processed identically to IF.

Ex.1

Change maximum speed according to the contact during movement		
S000	SERVO ON	Turn ON servo.
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVA 50.000	Move to coordinate 50.000.
S003	XIF B001 = 1	When B001 becomes '1' during movement, set
S004	SPD 5000	movement speed at 50[%] of LMT_RPM.

9.5.4 WAIT

Function Used to stop the program from running for a certain period of time.

Form
WAIT <Time>
WAIT I<Integer variable number>
WAIT P< Position variable number>
WAIT B<Bit number>
WAIT BB< Byte number >

Term <Time> : time in unit of 1/10 second

Description

Command	Description
WAIT <Time>	Wait as much time as assigned.
WAIT I <Integer variable value>	Wait until the set integer variable value is seen.
WAIT P <Position variable value>	Wait until the set position variable value is seen.
WAIT B <Contact value>	Wait until the assigned contact becomes the set value.
WAIT BB <Contact value>	Wait until the assigned contact becomes the set value.

- Time range set by WAIT command is 0 ~ 10000, and time unit is 100[msec].
- Conditions applicable in command WAIT are identical to IF. (Contact value, integer/position variable value).

Ex. 1

Wait by contact status		
S000	SERVO ON	Turn ON servo.
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVA 100.000	Move to coordinate 100.000.
S003	WAIT 100	Wait for 10[Sec].
S004	MOVA 200.000	Move to coordinate 200.000.
S005	WAIT B010 = 1	Wait until contact B010 becomes ‘1’.

9.5.5 CALL, SBRT, RET

Function Runs a program written in the form of subroutines.

Form CALL <Number >
SBRT <Number>
RET

Term <Number> : Subroutine number

Description

Command	Description
CALL <Number>	Branches into the assigned subroutine.
SBRT <Number>	Displays the start of subroutine.
RET	Displays the end of subroutine.

- SBRT number assignable to CALL is 0 ~ 255.
- An identical SBRT number can be used in different programs.
- When an identical SBRT number is discovered more than twice in the program or there is no assigned SBRT number to CALL, grammar check program processes it as an error.
- When there is no RET command in response to SBRT, grammar check program processes it as an error.
- Another SBRT in SBRT can be used by using command CALL prior to RET. But, it cannot be repeated more than 16times and if beyond, it is processed as an error during RUN.

Ex. 1

Movement using subroutines		
S000	SERVO ON	Turn ON servo.
S001	SPD 1000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVA 10.000	Move to coordinate 10.000.
S003	CALL 1	Run the program between SBRT 1 and RET. (MOVA -10.000)
S004	MOVA 30.000	Move to coordinate 30.000.
	⋮	⋮
S005	SBRT 1	Start of subroutine 1.
S006	MOVA -10.000	Move to coordinate -10.000.
S007	RET	End of subroutine 1.

9.5.6 GOTO, LBL

Function Used to move the progress point of the program.

Form GOTO <Number>
LBL <Number>

Term <Number> : Assigned label number

Description

Command	Description
GOTO <Number>	Branches into the assigned label.
LBL <Number>	Assigns a label.

- LBL number assignable to GOTO is 0 ~ 255.
- An identical LBL number can be used in different programs.
- When an identical LBL number is discovered more than twice in the program or there is no assigned LBL number to CALL, grammar check program processes it as an error.

Ex.1

Unlimited repeat movement		
S000	SERVO ON	Turn ON servo.
S001	SPD 1000	Set movement speed at 100[%] of LMT_RPM.
S002	LBL 1	Assigns LBL 1.
S003	MOVA 100.000	Move MOVA to coordinate 100.000.
S004	MOVA -100.000	Move MOVA to coordinate 100.000.
S005	GOTO 1	Move the ongoing program to LBL 1.

9.5.7 LOOP, ENDL

Function Used to repeat the program at a certain section.

Form LOOP <Number> L <Number of times>
ENDL <Number>

Term <Number> : LOOP number
<Number of times> : Times to repeat

Description

Command	Description
LOOP <Number>	Performs repeated run as much as the default value to the assigned ENDL.
ENDL <Number>	Displays the end of the assigned LOOP.

- ENDL number assignable to LOOP is 0 ~ 255.
- An identical ENDL number can be used in different programs.
- When an identical ENDL number is discovered more than twice in the program or there is no assigned ENDL number to LOOP, grammar check program processes it as an error.
- Another LOOP in LOOP can be used. But, it cannot be repeated more than 16times and if beyond, it is processed as an error during RUN.

Ex.1

Move by repeating as many time as desired		
S000	SERVO ON	Turn ON servo.
S001	SPD 1000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVA 10.000	Move MOVA to coordinate 10.000.
S003	<u>LOOP 1 L 10</u>	Repeat the program between LOOP 1 L 10 and ENDL 1 10 times.
S004	MOVA 20.000	Move MOVA to coordinate 20.000.
S005	MOVA -20.000	Move MOVA to coordinate -20.000.
S006	<u>ENDL 1</u>	Complete LOOP 1.
S007	MOVA 10.000	Move MOVA to coordinate 10.000.

9.5.8 JPGM

Function Used by calling another program.

Form JPGM <Number>

Term <Number> : Program number to run

Description

Command	Description
JPGM <Number>	Implements program <Number>.

- Unable to allow JPGM to assign the program number being currently written.
- The program called by JPGM can call another program using JPGM again. But, it cannot be repeated more than 8 times and if beyond, it is processed as an error during RUN.

Ex.1

Move to another program.		
S000	SERVO ON	Turn ON SERVO.
S001	SPD 10000	Set movement speed at 100[%] of LMT_RPM.
S002	MOVA 10.000	Move MOVA to coordinate 10.000.
S003	JPGM 1	Call program 1. Proceed to PEND or <end of file> in program 1
S004	MOVA 20.000	Proceed from S004. Move MOVA to coordinate 20.000.

9.5.9 PEND

Function Indicates the end of the executable program.

Form PEND

Description

Command	Description
PEND	Indicates the end of program.

- Write a subroutine after PEND and make CALL, and the corresponding subroutine is implemented. (Refer to Ex.1.)

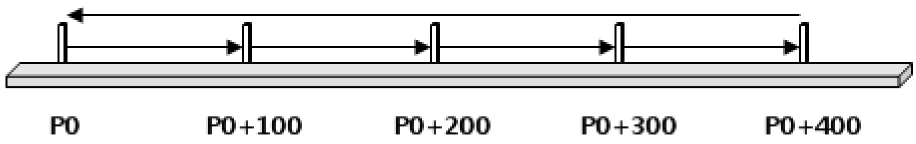
Ex.1

Indicates the end of program.		
S000	SERVO ON	Turn ON SERVO.
S001	SPD 10000	Set movement speed at 100[%].
S002	CALL 1	Run the program between SBRT 1 and RET.
S003	MOVA 10.000	Move to coordinate 10.
S004	PEND	The program following PEND is not implemented.
S005	MOVA 20.000	MOVA 20.000 is not implemented due to PEND.
S006	SBRT 1	Start of Subroutine 1.
S007	MOVA -10.000	Move to coordinate -10.000.
S008	RET	End of Subroutine 1.

ch.10 Examples for Robot Program

10.1 Location Movement Program at Regular Intervals

■ Description: Moves at regular intervals set by the user and when the movement as many times as assigned is completed, speed is changed to return to the original position.



1) Program with repeated use of MOVI command

SERVO ON	: Turn ON SERVO.
LBL 1	: Assign LABEL to 1.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
MOVI 100	: Move from current position(P0) as far as 100 in user coordinate.
MOVI 100	: Move from current position(P0+100) as far as 100 in user coordinate.
MOVI 100	: Move from current position(P0+200) as far as 100 in user coordinate.
MOVI 100	: Move from current position(P0+300) as far as 100 in user coordinate.
SPD 3000	: Set speed at 30% of parameter LMT_RPM.
MOVA P0	: Move from P0 to the assigned position.
GOTO 1	: Move the ongoing program to LBL 1.
<end of file>	

2) Program using a command LOOP

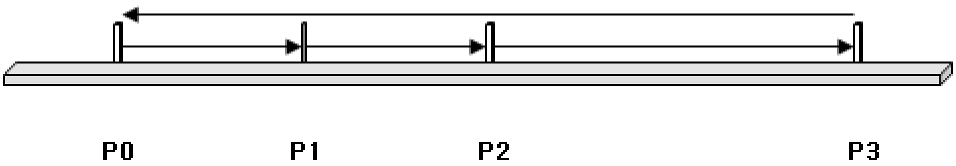
SERVO ON	: Turn ON SERVO.
LBL 1	: assign LABEL to 1.
SPD 1000	: set speed at 10% of parameter LMT_RPM.
LOOP 1L 4	: set a LOOP whose LABEL is 1 and repeat times are 4.
MOVI 100	: Move from current position as far as 100 in user coordinate.
ENDL 1	: Indicates the end of a LOOP whose LABEL is 1.
SPD 3000	: Set speed at 30% of LMT_RPM.
MOVA P0	: Move from P0 to the assigned position.
GOTO 1	: Move the ongoing program to LBL 1.
<end of file>	

3) Program using an integer variable as a counter

```
SERVO ON        : Turn ON SERVO.
LBL 1           : Set LABEL to 1.
I0 = 0          : Set integer variable I0 to 0.
SPD 1000        : Set speed at 10% of parameter LMT_RPM.
LBL 2           : Set LABEL to 2.
MOVI 100        : Move from current position as far as 100 in user coordinate.
I0 += 1         : Add 1 to integer variable I0.
IF I0 = 4
GOTO 3          : When integer variable I0 is 4, it moves to LBL 3, otherwise it
GOTO 2          moves to LBL 2.
LBL 3           : Set LABEL to 3.
SPD 3000        : Set speed at 30% of parameter LMT_RPM.
MOVA P0         : Moves from P0 to the assigned position.
GOTO 1          : Move the ongoing program to LBL 1.
<end of file>
```

10.2 Location Movement Program using Contact

■ Description: After waiting until the assigned contact meet conditions, it moves to the assigned position. Produce the contact point assigned from the final position and wait for 1 second before returning to the original position.



1) Example program

SERVO ON	: Turn ON SERVO.
LBL 1	: Set LABEL to 1.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
WAIT B020 = 1	: Wait until input contact B020 becomes '1'.
MOVA P1	: Move from P1 to the assigned position.
WAIT B021 = 0	: Wait until input contact B021 becomes '0'.
MOVA P2	: Move from P2 to the assigned position.
WAIT BB02 = ...01	: Wait until input contact B026 becomes '0' and B027 '1'.
MOVA P3	Move from P3 to the assigned position.
B040 = 1	: Produce output contact B040 to '1'.
SPD 3000	: Set speed at 30% of parameter LMT_RPM.
WAIT 10	: Wait for 1second.
MOVA P0	: Move from P0 to the assigned position.
GOTO 1	: Move the ongoing program to LBL 1.
<end of file>	

10.3 Movement Program at Infinitely Constant Speed

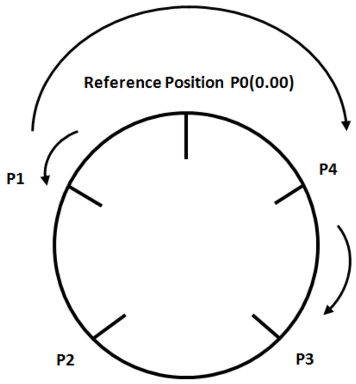
■ Description:	Moves unlimitedly at the speed set by the user and when the assigned input occurs during movement, it stops. (The command PCLR used in this program is applicable only to an incremental encoder.)

1) Example program

SERVO ON	: Turn ON SERVO.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
FOS 50	: Move to 50% of target position and implement the following program step.
LBL 1	: Set LABEL to 1.
MOVA 100	: Move to 100 in user coordinate.
XIF B027 = 1 GOTO 2 PCLR	: When input contact B027 is '1' during movement, it moves to LBL2, otherwise it changes the reference coordinate system to the coordinate system with 0.000 as the current position.
GOTO 1	: Move the ongoing program to LBL 1.
LBL 2	: Assigns LABEL to 2.
STOP	: Stop the program from running.
<end of file>	

10.4 Turret Run Program

- Description: The system returns to the original position when moving the fixed coordinate value due to its unique structure and it can move the nearest path by using MOVT command when rotational direction does not have any relevance.
  (But, be sure to set parameters T_CYCLE as well as IOPOS(0 ~ 7), MOVT_ST.)

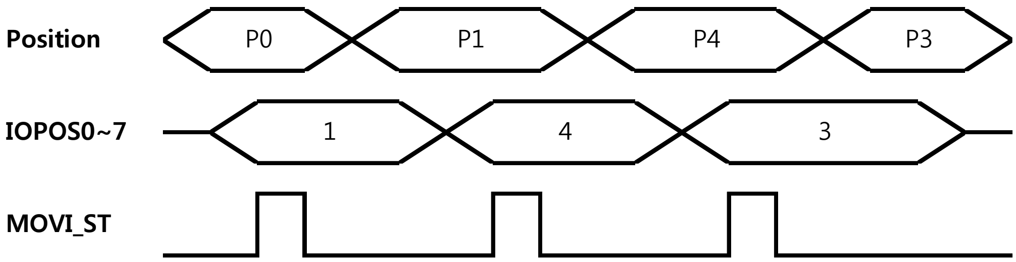


- Set value
  T_CYCLE = 360.000
  P0 = 0.000
  P1 = 70.000
  P2 = 150.000
  P3 = 230.000
  P4 = 290.000

1) Example program

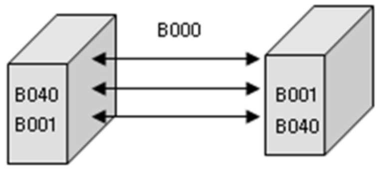
SERVO ON	: Turn ON SERVO.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
LBL 1	: Set LABEL to 1.
MOVT	: When contact MOVT_ST changes from '0' to '1', it moves to the position coordinate value set in IOPOS(0 ~ 7).
GOTO 1	: Move the ongoing program to LBL 1.
<end of file>	

2) Program Operation Diagram



10.5 Multiple Run Program

■ Description: Configures 2-axis robot using the user contact.
(But, this applies when there are no circular and linear interpolation.)



Single-axis Controller 1(X-axis) **Single-axis Controller 2(Y-axis)**

Movement Path

X-axis	Y-axis
100	1000
1500	100
0	0

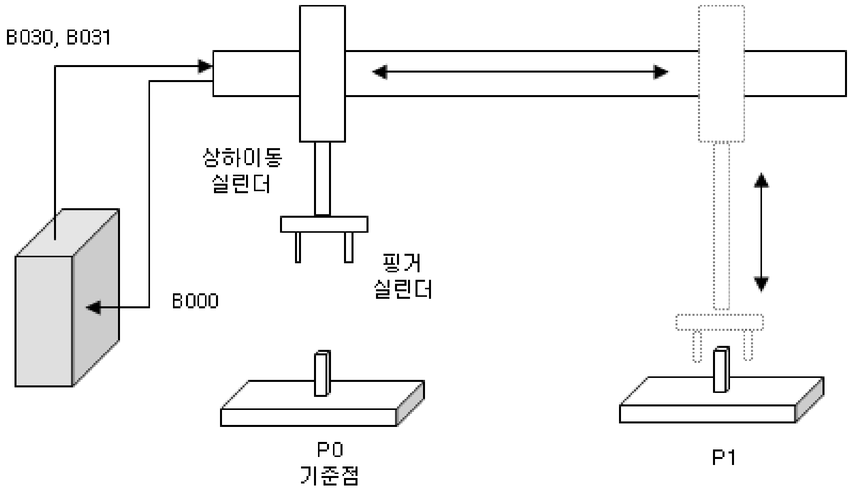
1) Example program

This program refers to X-axis and what is in the brackets shows modifications to Y-axis program.

SERVO ON	: Turn ON SERVO.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
LBL 1	: Set LABEL to 1.
WAIT B000 = 1	: Wait until input contact B000 (Contact at time of operation)
CALL 10	becomes '1'.
MOVA 100	: Call SBRT10.
CALL 10	: Move to 100 in user coordinate.
MOVA 1500	: Call SBRT10.
CALL 10	: Move to 1500(100) in user coordinate.
MOVA 0	: Call SBRT10.
SBRT 10	: Move to 0 in user coordinate.
B040 = 1	: Start of SBRT10.
WAIT B001 = 1	: Produce output contact B040 to '1'.
B040 = 0	: Wait until input contact B001 becomes '1'.
RET	: Produce output contact B040 to '0'.
<end of file>	: End SBRT10 and return to be after command CALL.

10.6 Simple Pick & Place Systems with Palletizer Function

■ Description: When the start signal (B000) is fed, the system outputs the signal that starts an up/down cylinder and a finger cylinder to pick up the product in '0'(Reference point), move it to P1, place it and return to the reference point.



1) Example program

SERVO ON	: Turn ON SERVO.
SPD 1000	: Set speed at 10% of parameter LMT_RPM.
LBL 1	: Set LABEL to 1.
MOVA P0	: Move from P0 to the assigned position.
B040 = 1	: Produce output contact B040 (Reference point arrival signal) to '1'.
WAIT B000 = 1	: Wait until input point B000 (Operation start contact) becomes '1'.
B040 = 0	: Produce output contact B040(Reference point arrival signal) to '0'.
B030 = 1	: Output B030(Up/down cylinder start signal: Start downward) to '1'.
B031 = 1	: Output B031(Finger cylinder start signal: Grip) to '1'.
B030 = 0	: Output B030(Up/down cylinder start signal: Start upward) to '0'.
MOVA P1	: Move from P1 to the assigned position.
B030 = 1	: Output B030(Up/down cylinder start signal: Start downward) to '1'.
B031 = 0	: Output B031(Finger cylinder start signal: Release) to '0'.
B030 = 0	: Output B030(Up/down cylinder start signal: Start upward) to '0'.
GOTO 1	: Move the ongoing program to LBL 1.
<end of file>	

ch.11 Running Robot Program and PLC Program

11.1 Use of I/O Contact

■ Description:	After running the robot program and PLC program, it checks out proper operation status using the teach pendant, enabling I/O contact to be performed in the outside.

■ **This short-cut controller operates also by I/O alone as shown below.**

1) JOG operation
2) Origin operation
3) Robot program implementation
4) PLC program implementation

■ **Prior to I/O operation, related system contacts should be set in the parameter. (Refer to Ch.3)**

11.1.1 Operating Contact in JOG Operation

■ **JOG + , JOG -**

1) Rotates the motor in directions where position coordinates increase and decrease. (Rotates when '1' is fed).
2) When JOG_MODE contact value is '0', JOG operation is made, and when '1', IJOG operation is made.
3) Continuous movement is made while this contact stays in '1' in JOG operation, whereas in one time movement at a time is made when this contact changes from '0' to '1' in IJOG operation.

■ **JOG_MODE**

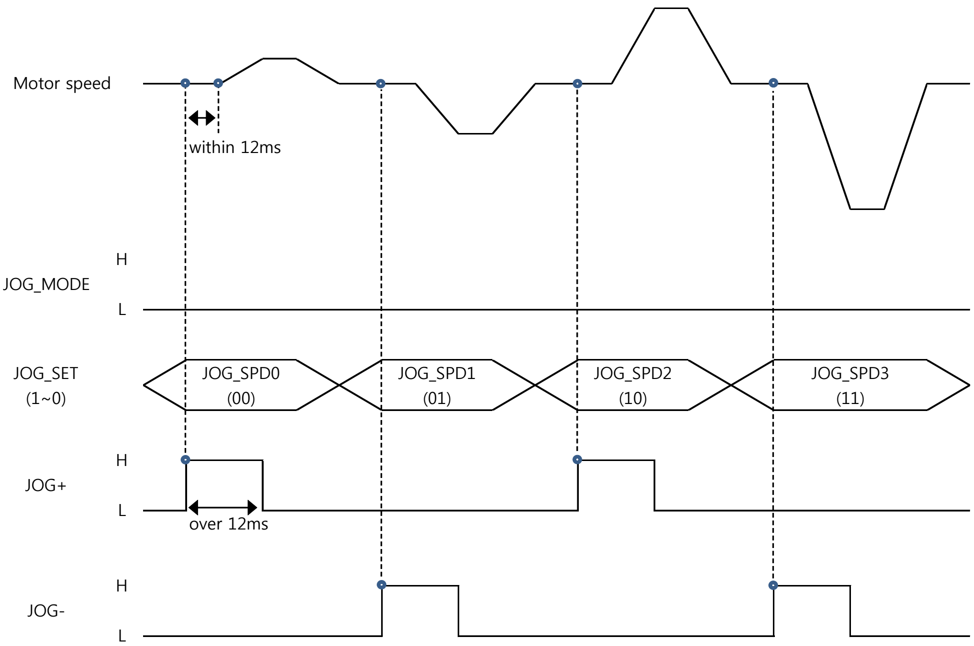
Selects JOG operation and IJOG operation. ('0': JOG, '1': IJOG).

■ **JOG_SET(0 ~ 1)**

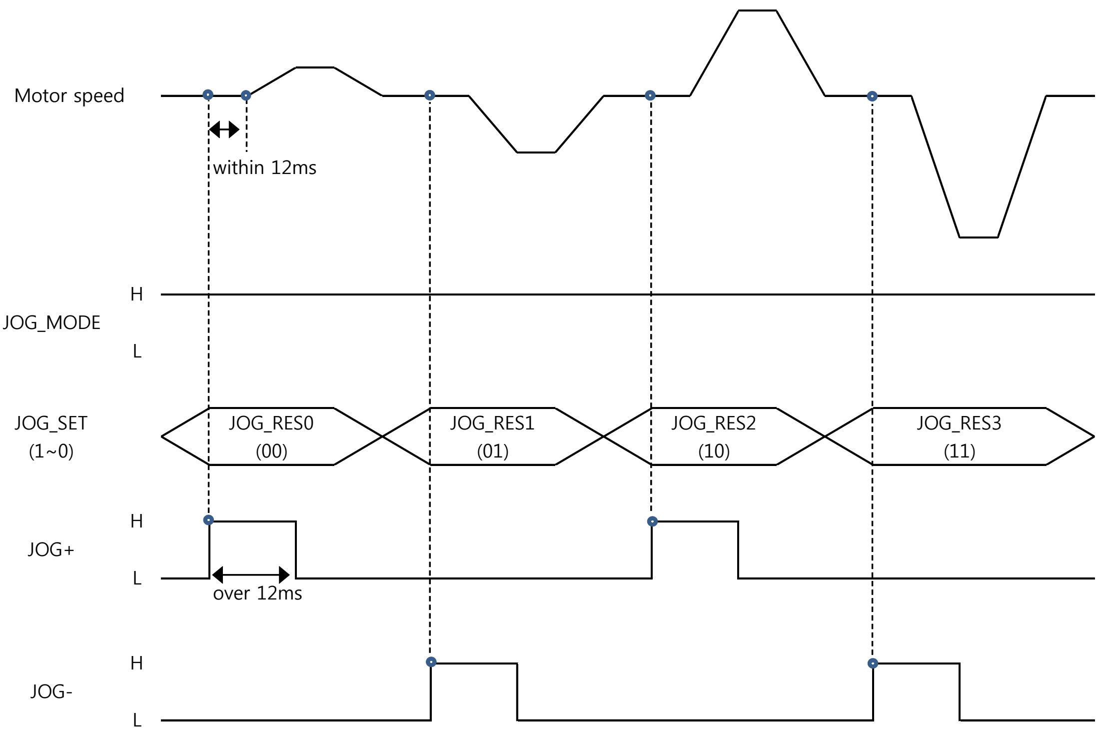
Sets JOG movement speed and the amount of movement. (When JOG_MODE is '0', movement speed is seen and when '1', the amount of movement is seen.)

11.1.1.1 Operation Timing Diagram in JOG Operation

■ **JOG_MODE = 0 (JOG Operating Mode)**



■ **JOG_MODE = 1 (IJOG Operating Mode)**



11.1.2 ORIGIN Operation Using External Contact (In using absolute value encoder)

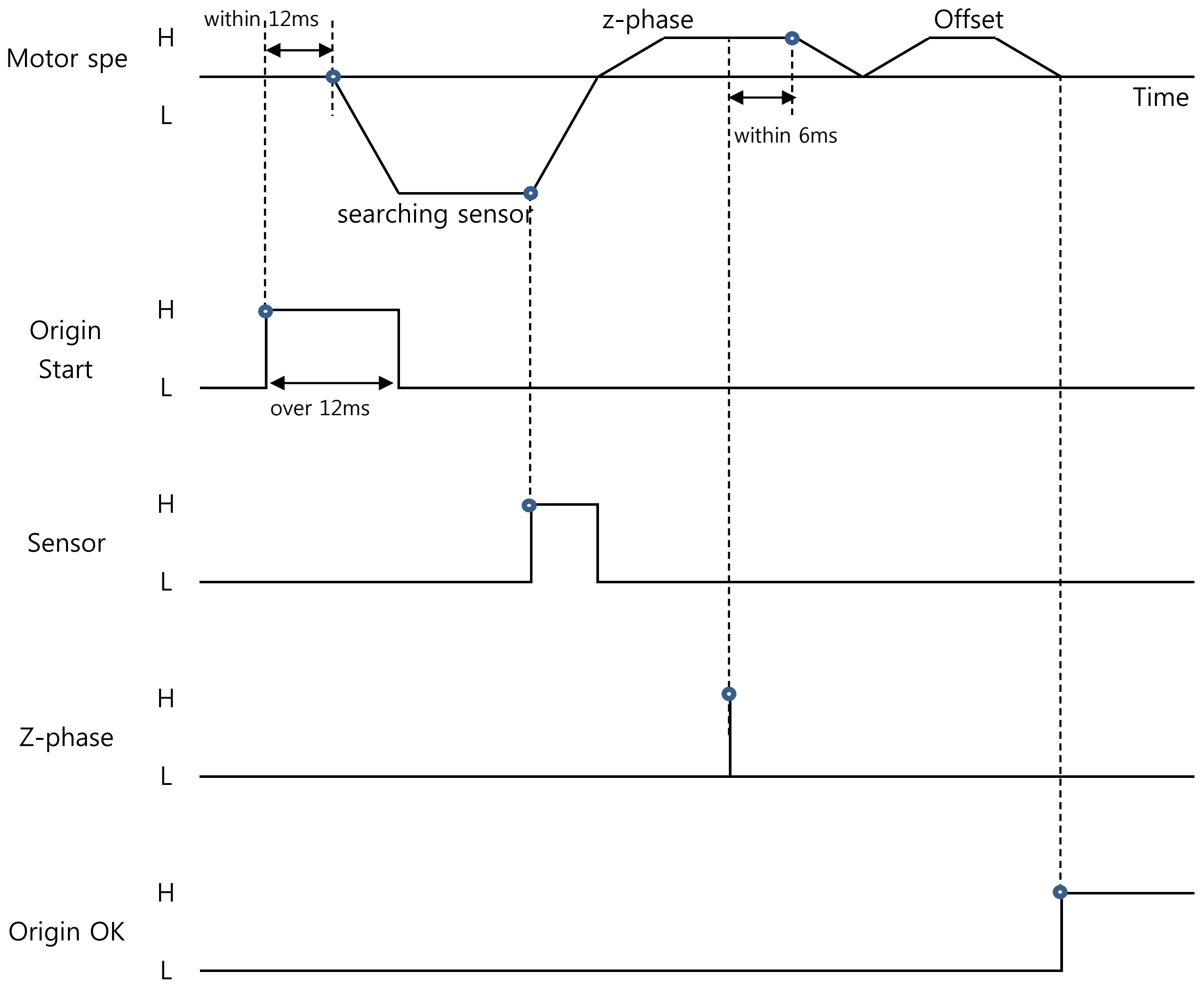
11.1.2.1 Operating Contact in ORIGIN Operation

■	Description:	**ORIGIN**: Origin operation begins as contact value changes from '0' to '1'
		CW S/W, CCW S/W: Limit Switch
		ORG S/W: Origin Switch

11.1.2.2 Operation Timing Diagram in ORIGIN Operation

< Parameter Set value >

ORG_RULE	1
MOV_POL	1
MOTOR	MSMR
ORG_OFS	10

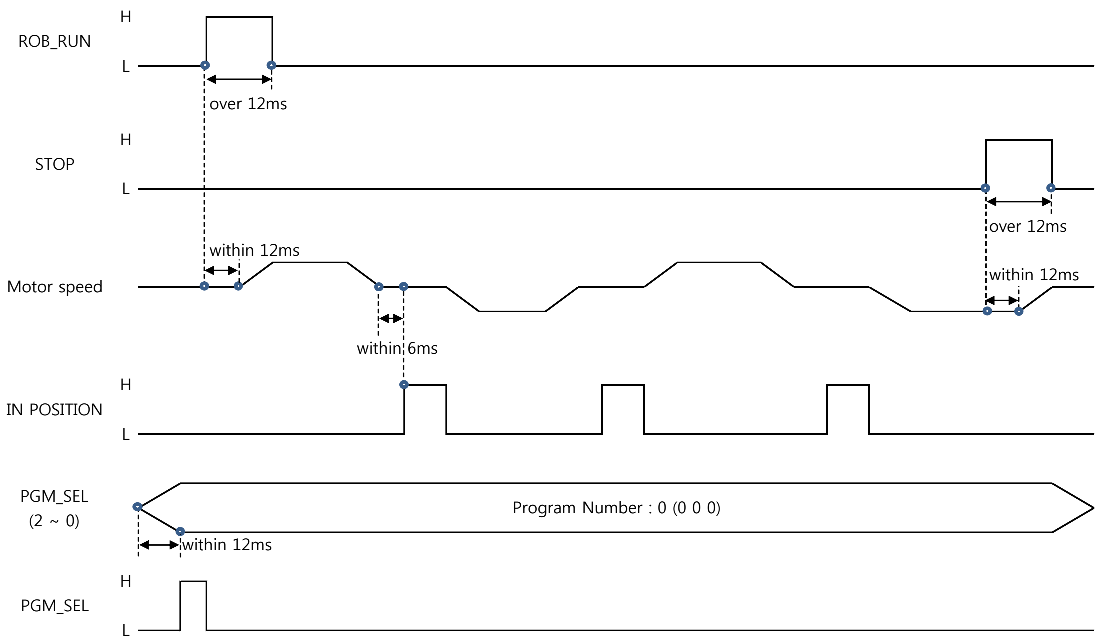


11.1.3 Robot Program Operation Using External Contact

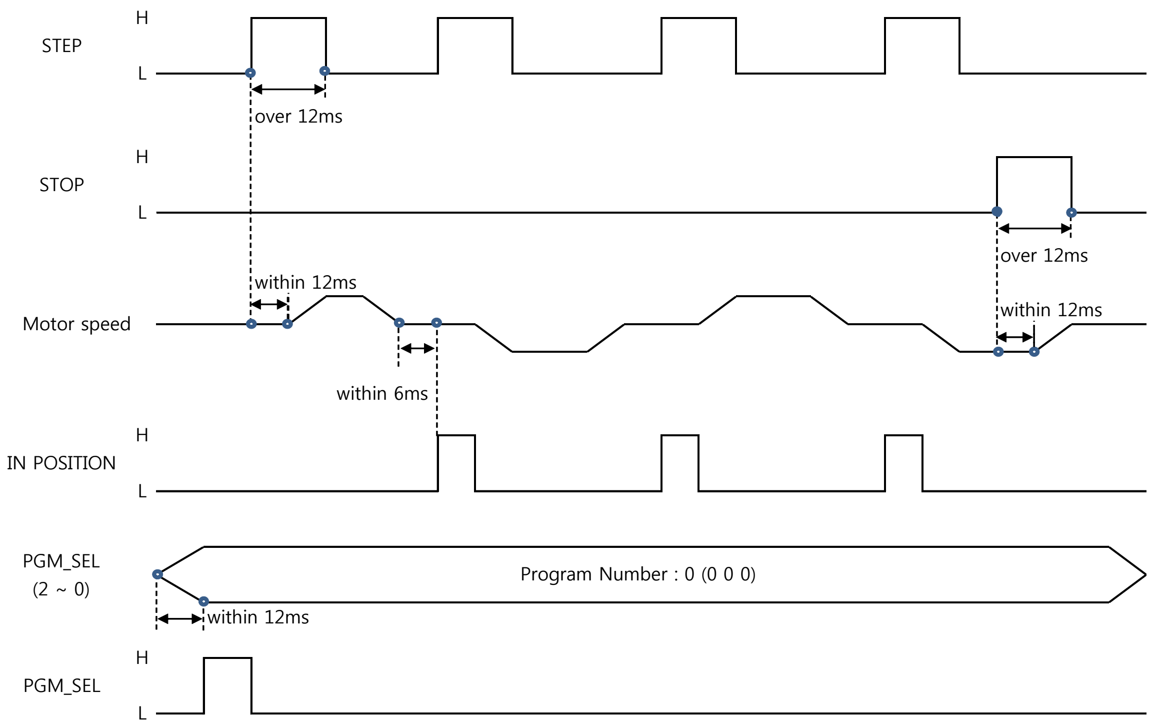
11.1.3.1 Operating Contact in Robot Program Operation

■	Description:	**ROB_RUN**: Run the robot program. But, the robot program should be free from syntax error. **STOP**: Stop the robot program from running. **STEP**: Run the robot program one step at a time. **PGM_SEL(2 ~ 0)**: Select the robot program to run. **PGM_SEL**: When PGM_SEL value is '1', the program assigned to PGM_SEL(2 ~ 0) is selected.

11.1.3.2 Operation Timing Diagram in Putting Program in AUTO RUN



11.1.3.3 Operation Timing Diagram in Putting Program in STEP RUN



ch.12 Description of PLC Command

■ **Robot PLC program commands consist of**

1) Commands for logical operation
2) Commands for contact input/output
3) Relation commands

12.1 Logical Operation Command

Command	Detailed Command	Input Data	Description of Command
AND	None	Contact Address	Connects logical operations in series. (Contact 'a')
	NOT	Contact Address	Connects logical operations in series. (Contact 'b')
	LOAD	None	Connects two blocks in series.
OR	None	Contact Address	Connects logical operations in parallel. (Contact 'a')
	NOT	Contact Address	Connects logical operations in parallel. (Contact 'b')
	LOAD	None	Connects two blocks in parallel.
D	None	Contact Address	When input condition rises, a pulse comes out during 1 scan.
	NOT	Contact Address	When input condition falls, a pulse comes out during 1 scan.

12.2 Contact Input/Output Command

Command	Detailed Command	Input Data	Description of Command
SET	None	Contact Address	Sets the assigned contact to '1'.
RST	None	Contact Address	Clears the assigned contact to '0'.
OUT	None	Contact Address	Outputs the assigned contact to '1'.

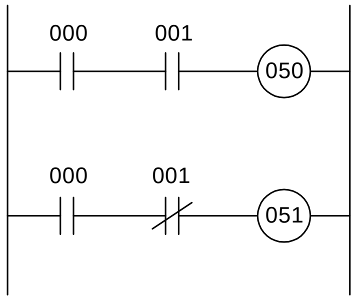
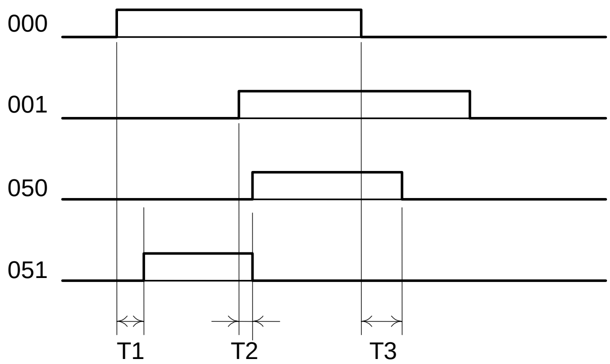
12.3 Relation Command

Command	Detailed Command	Input Data	Description of Command
LOAD	None	Contact Address	Start of a logical operation. (Contact 'a')
	NOT	Contact Address	Start of a logical operation. (Contact 'b')
NOT	None	Contact Address	Reverses operation results.
MCS	None	None	Sets common interlock.
MCSC	None	None	Clears common interlock set.
TMR	BXXX<D>Value	Contact Address	Subtracted according to conditions to ouput when reaching '0'.
CTR	BXXX<D>Value	0 ~ 10000	Subtracted according to conditions and input pulses to output when reaching '0'.

■ Example of Writing a PLC Program

1) AND, AND NOT

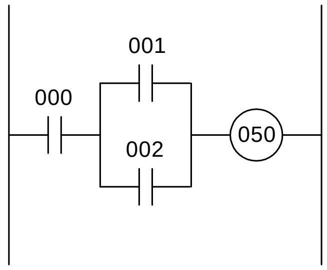
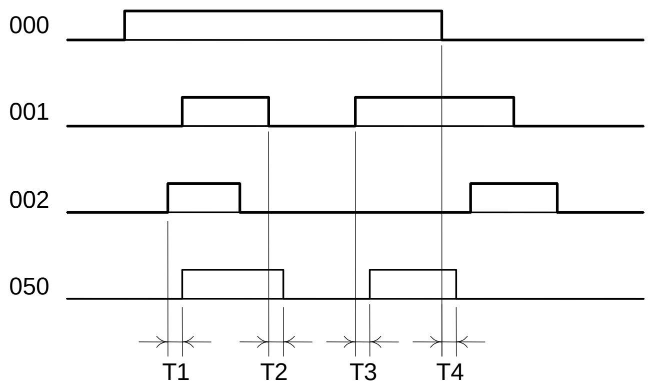
- AND: Serial connection of logical operation. (Contact 'a')
- AND NOT: Serial connection of logical operation. (Contact 'b')

<table>
<tr><th>– Sequence Layout</th><th>– Program</th></tr>
<tr><td>
</td><td>⋮
LOAD 000
AND 001
OUT 050
LOAD 000
AND NOT 001
OUT 051
⋮</td></tr>
<tr><th colspan="2">– Time Chart</th></tr>
<tr><td colspan="2">

(T1, T2, T3 : Within 12 msec)</td></tr>
</table>

2) AND LOAD

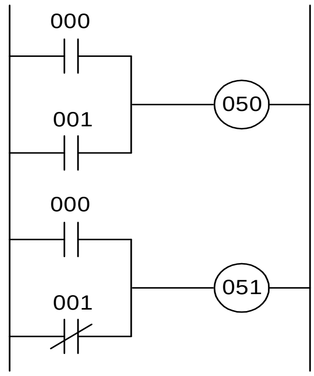
- AND LOAD: Connect two blocks in series.

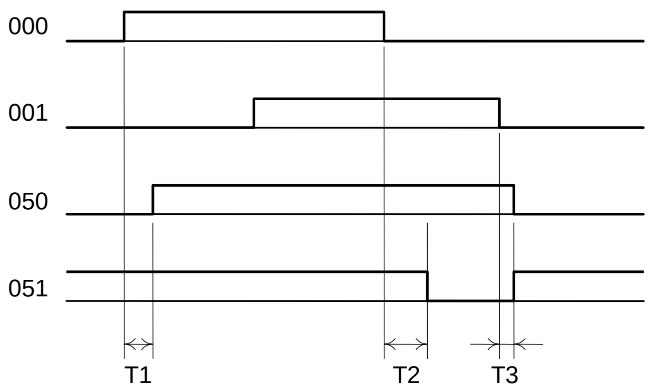
<table>
<tr><th>– Sequence Layout</th><th>– Program</th></tr>
<tr><td>
</td><td>⋮
LOAD 000
AND 001
OR 002
AND LOAD
OUT 050
⋮</td></tr>
<tr><th colspan="2">– Time Chart</th></tr>
<tr><td colspan="2">

(T1, T2, T3, T4 : within 12 msec)</td></tr>
</table>

3) OR, OR NOT

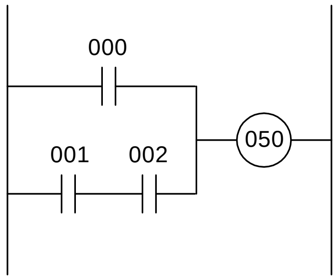
- OR: Parallel connection of logical operation. (Contact 'a')
- OR NOT: Parallel connection of logical operation. (Contact 'b')

– **Sequence Layout**	– **Program**
	⋮ LOAD 000 OR 001 OUT 050 LOAD 000 OR NOT 001 OUT 051 ⋮

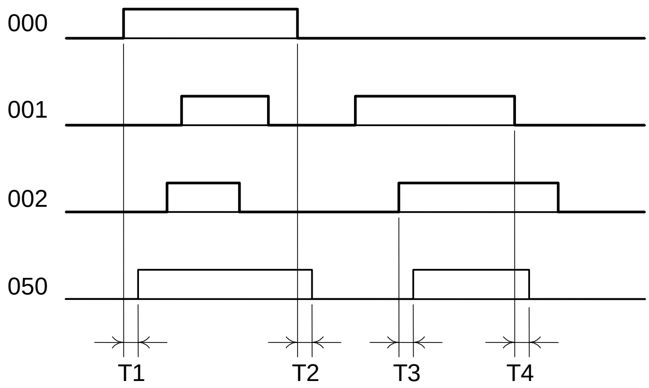
– **Time Chart**
 (T1, T2, T3 : within 12 msec)

4) OR LOAD

- OR LOAD: Connects two blocks in parallel.

– Sequence Laout	– Program
	⋮ LOAD 000 LOAD 001 AND 002 OR LOAD OUT 050 ⋮

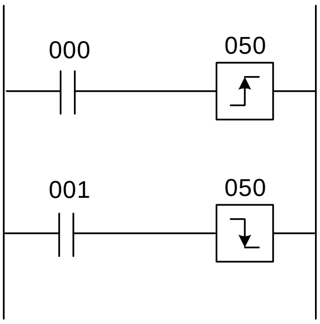
– **Time Chart**



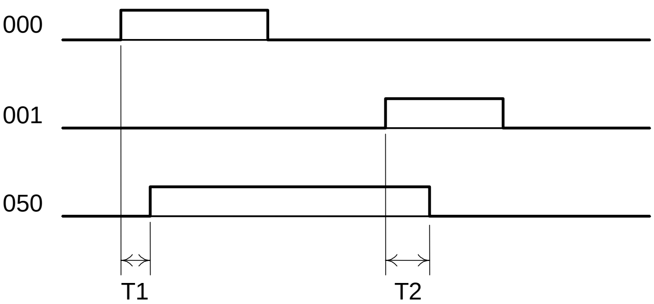
(T1, T2, T3, T4 : Within 12 msec)

5) SET, RST

- SET: Sets the assigned contact to '1'.
- RST: Sets the assigned contact to '0'.

– Sequence Layout	– Program
	⋮ LOAD 000 SET 050 LOAD 001 RST 050 ⋮

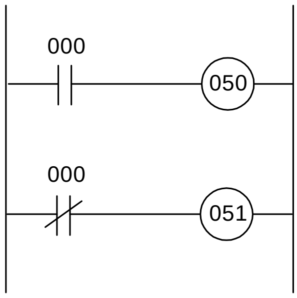
– **Time Chart**



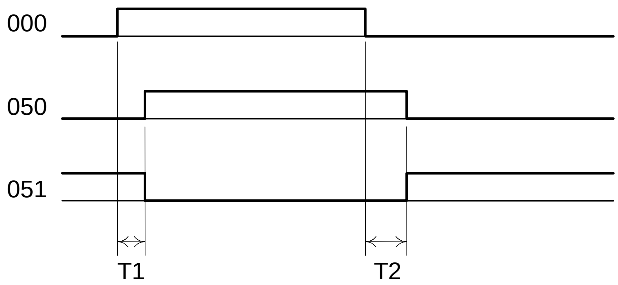
(T1, T2 : Within 12 msec)

6) OUT

- OUT: Outputs the assigned contact to '1'.

– Sequence Layout	– Program
	⋮ LOAD 000 <u>OUT 050</u> LOAD NOT 000 <u>OUT 051</u> ⋮

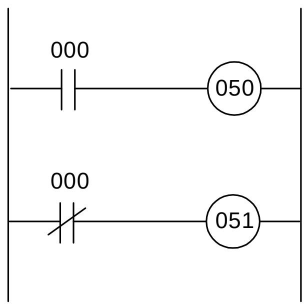
– Time Chart



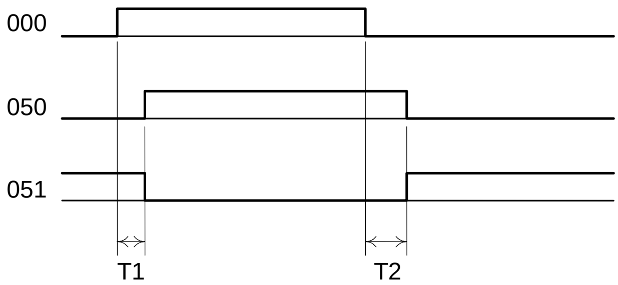
(T1, T2 : Within 12 msec)

7) LOAD, LOAD NOT

- LOAD: Start of logical operation. (Contact 'a')
- LOAD NOT: Start of logical operation. (Contact 'b')

– Sequence Layout	– Program
 	⋮ LOAD 000 OUT 050 LOAD NOT 000 OUT 051 ⋮

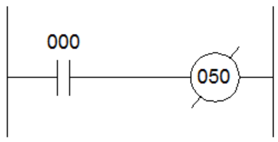
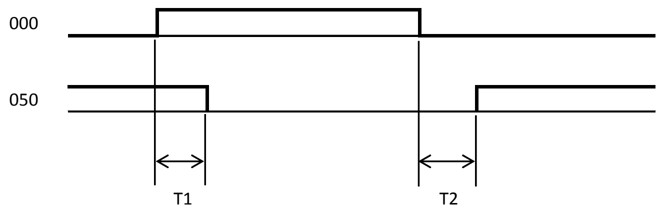
– Time Chart



(T1, T2 : within 12 msec)

8) NOT

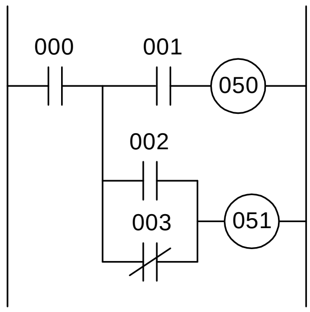
- NOT : Reverses operation results.

<table>
<tr><th>– Sequence Layout</th><th>– Program</th></tr>
<tr><td>
</td><td>⋮
LOAD 000
NOT
OUT 050
⋮</td></tr>
<tr><th colspan="2">– Time Chart</th></tr>
<tr><td colspan="2">

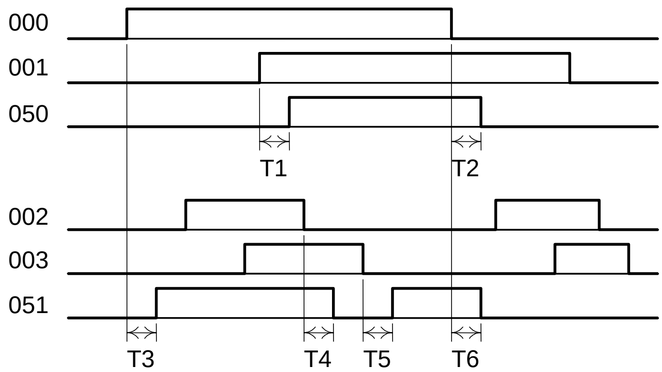
(T1, T2 : within 12msec)</td></tr>
</table>

9) MCS, MCSC

- MCS: Sets common interlock.
- MCSC: Sets and clears common interlock.

– **Sequence Layout**	– **Program**
	⋮ LOAD 000 MCS LOAD 001 OUT 050 LOAD 002 OR NOT 003 OUT 051 MCSC ⋮

– **Time Chart**

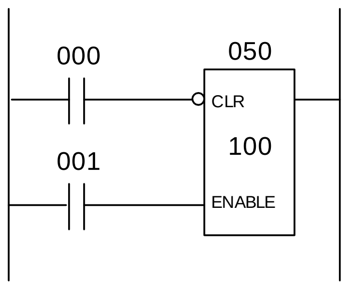


(T1 ~ T6 : within 12 msec)

10) TMR

- TMR: Subtracts according to conditions to output when reaching '0' .

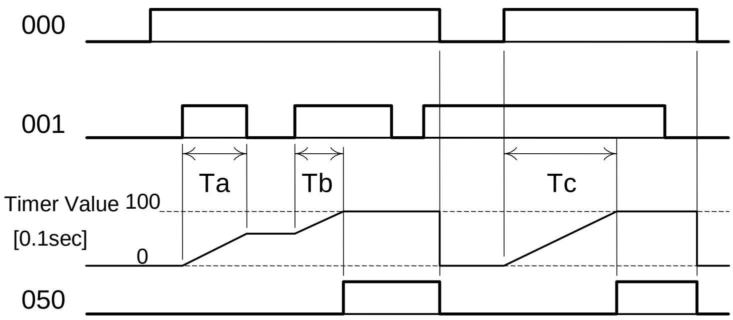
– **Sequence Layout**



– **Program**

⋮
LOAD 000
LOAD 001
TMR 050<D>100
⋮

– **Time Chart**

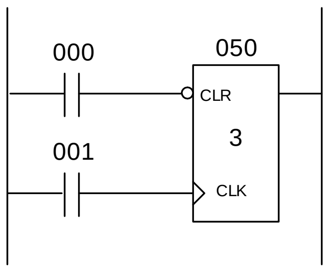


Ta+Tb = 10.0 [sec], Tc = 10.0[sec]
(Ta, Tb, Tc´Â 0 ~ 12 msec error found)

11) CTR

- CTR: Subtracts according to conditions and input pulses to output when reaching '0'.

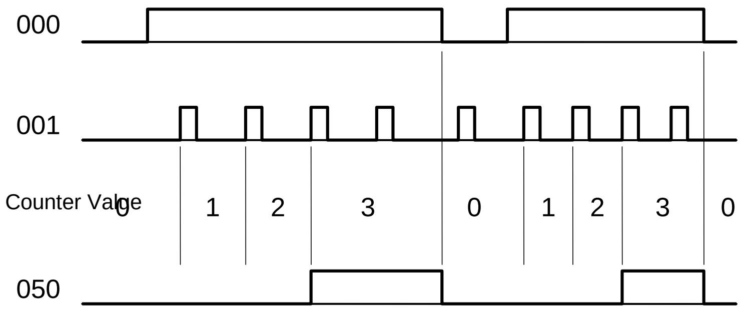
– Sequence Layout



– Program

⋮
LOAD 000
LOAD 001
TMR 050<D>100
⋮

– Time Chart



(Signal 0 or 1 in each input should keep 12msec or above.)

ch.13 ALARM

13.1 Alarm List

13.1.1 Over Current (E01.00~E01.02)

Code	Alarm Name	Description
E01.00	OVER Current	The current of the alarmed axis motor exceeds the permissible maximum value.
E01.01	IPM FAULT	Failure in IPM of servo module
E01.02	Current Sensing Err	If ADC input voltage is over 1V during booting.

13.1.2 Over Load (E02.00)

Code	Alarm Name	Description
E02.00	Over Load	Torque load rate exceeds the system parameter (OVL)

13.1.3 Over Voltage (E03.00 ~ E03.01)

Code	Alarm Name	Description
E03.00	Over Voltage	DC link voltage of the servo module exceeds 400V.
E03.01	Open Regenerative	If a regenerative resistor not connected.

13.1.4 Power Fail (E05.00 ~ E05.01)

Code	Alarm Name	Description
E05.00	Under Voltage DCLink	DC link voltage of the servo module is under 180V
E05.01	Open DCLink	If main power is turned off.

13.1.5 Data Back-up Error (E06.00)

Code	Alarm Name	Description
E06.00	Back up RAM Data Error	If data stored in the Back up RAM is abnormal.

13.1.6 Encoder Error (E07.00 ~ E07.13)

Code	Alarm Name	Description
E07.00	Enc Time Out	There is no reply from a communicational encoder
E07.01	Enc Sys Down	The battery voltage of an absolute encoder is under 2.5V
E07.02	Enc Over Speed	Failure in multi-turn data detection in an absolute encoder
E07.03	Enc Status Err	Power source is applied when an absolute encoder rotates over 100 rpm
E07.04	Enc S-Turn Err	Failure in 1-turn data of an absolute encoder
E07.05	Enc Over Flow Err	Multi-turn data overflow of an absolute encoder
E07.06	Enc M-Turn Err	Failure in multi-turn counter of an absolute encoder
E07.07	Enc Type Miss	The setup value of the system parameter is different from the encoder type of the actual motor
E07.08	Enc ID Data Miss	If received data of the motor encoder is not correct.
E07.10	Enc Open Err	Disconnection of an encoder line when in use of a pulse encoder
E07.11	Enc Init Err	Failure in an encoder signal during initialization of a servo module
E07.12	Enc Hall Open	Failure in a Hall sensor signal of the encoder
E07.13	Enc Hall Init	Failure in a Hall sensor signal of the encoder during initialization of a servo module

13.1.7 H/W Limit (E08.00 ~ E08.01)

Code	Alarm Name	Description
E08.00	H/W Limit -	H/W limit sensor signal is detected
E08.01	H/W Limit +	H/W limit sensor signal is detected

13.1.8 S/W Limit (E09.00 ~ E09.03)

Code	Alarm Name	Description
E09.00	S/W Limit -	Deviation from the operation range of the robot parameter
E09.01	S/W Limit +	Deviation from the operation range of the robot parameter
E09.02	TRQ Limit	If real torque value is higher than the setting value when TRQ command is used.
E09.03	TQS Limit	If real torque value is the setting value when TQS command is used.

13.1.9 Following Error (E10.00)

Code	Alarm Name	Description
E10.00	Following Error	Positional error value of a motor exceeds the setup value range of the system parameter

13.1.10 Program Error (E11.00 ~ E11.04, E11.50 ~ E11.51)

Code	Alarm Name	Description
E11.00	Empty JOB	If there is currently no JOB to perform.
E11.01	Compile Error	If performing JOB is abnormal when I/O(ROB_RUN) is performed.
E11.03	Not JPGM in SBRT	If JPGM is used by SBRT command.
E11.04	Not JPGGM in LOOP	If JPGM is used by LOOP command.
E11.50	Empty PLC	If there is no PLC JOB to perform.
E11.51	PLC Compile Error	If PLC JOB which is to be performed is abnormal.

13.1.11 Emergency Stop (E12.00 ~ E12.03)

Code	Alarm Name	Description
E12.00	T/P Emergency	In case of emergency stop by the emergency stop switch of the Teaching Pendant.
E12.01	System I/O Emergency	If I/O is not connected.
E12.02	Host Emergency	In case of emergency stop by emergency stop protocol at host mode.
E12.03	System PLC Emergency	If emergency occurs at CNET.

13.1.12 Over Speed (E13.00 ~ E13.02)

Code	Alarm Name	Description
E13.00	Over Speed	The error which occurs if speed command is over the specified value.
E13.01	Servo On Fail	Occurs when SERVO ON fails.

13.1.13 Program Error (E14.00 ~ E14.04)

Code	Alarm Name	Description
E14.00	Parameter Err	If the motor ID setting is wrong when power is ON.
E14.01	Curr Pos Buf Err	If current position is over the specified value.
E14.02	Speed Command Buf Err	If speed command is over the specified value.
E14.03	Acc Command Buf Err	If acceleration command is over the specified value.
E14.04	Dec Command Buf Err	If deceleration command is over the specified value.

13.1.14 Software Alarm (E15.00)

Code	Alarm Name	Description
E15.00	Software Alarm	If ALARM command is performed.
E15.01	Not found origin	If Origin is not completed.

13.1.15 JOB (E20.00 ~ E20.19)

Code	Alarm Name	Description
E20.00	Invalid JOB Command	If JOB command is abnormal.
E20.01	No match Label	Branch point position corresponding to execute statement is not designated.
E20.02	Same Label Number	If branch point position corresponding to execute statement exist more than 2 points.
E20.03	RET Before SBRT	If 'subroutine end' command is used prior to 'subroutine start' command
E20.04	No match SBRT	If designated command corresponding to call command of sub execute statement does not exist.
E20.05	Same SBRT Number	If the same SBRT number is used more than twice in one program.
E20.06	JPGM too many	If branches of the designated program is over 8 times.
E20.07	JPGM to itself	If the user wants to branch to the designated program
E20.08	JPGM to empty pgm	If non-existent program is selected.
E20.09	No Match ENDL	If there is no command which indicates the end of the designated LOOP
E20.10	Same ENDL number	If there are more than 2 commands which indicate the end of the designated LOOP.
E20.11	LOOP too many nest	If repetitive statement is used more than 16 times.
E20.12	No match LOOP	If there is no LOOP command corresponding to ENDL or if ENDL is incorrectly used.
E20.13	Same LOOP Number	If there are more than 2 commands which indicate the start of designated LOOP.
E20.14	ENDL before LOOP	If there is the command expressing repetitive statement end prior to that expressing start.
E20.15	Not Output Port	If there is no designated port for output contact point.
E20.16	Not pair SBRT, RET	If SBRT and RET do not match as a pair.
E20.17	Not pair LOOP, ENDL	If LOOP and ENDL do not match as a pair.
E20.18	Invalid XIF Command	If the command can not be operated.
E20.19	Not mapping IOPOS	If coordinate value of position parameter IOPOS is not designated.
E20.20	Too Many SBRT Call	If SBRT and CALL are repeated and used more than 16 times.
E20.21	PNT Index Range Over	If the number of a point variable is incorrectly set.
E20.22	INT Index Range Over	If the number of an integer variable is incorrectly ranged.
E20.23	CONST Val Range Over	If the range of position value is incorrectly set.
E20.24	Invalid SPD Value	If a SPD command value is 0.

13.1.16 JOB Command (E20.50~20.99)

Code	Alarm Name	Description
E20.50	Invalid SERVO Command	If detailed SERVO command are not normal.
E20.51	Invalid MOVA Command	If detailed MOVA command are not normal.
E20.52	Invalid MOVI Command	If detailed MOVI command are not normal.
E20.53	Invalid MOVR Command	If detailed MOVR command are not normal.
E20.54	Invalid MOVM Command	If detailed MOVM command are not normal.
E20.55	Invalid FOS Command	If detailed FOS command are not normal.
E20.56	Invalid REF Command	If detailed REF command are not normal.
E20.57	Invalid SPD Command	If detailed SPD command are not normal.
E20.58	Invalid ACC Command	If detailed ACC command are not normal.
E20.59	Invalid DEC Command	If detailed DEC command are not normal.
E20.60	Invalid IF Command	If detailed IF command are not normal.
E20.61	Invalid WAIT Command	If detailed WAIT command are not normal.
E20.62	Invalid BIT Command	If detailed BIT command are not normal.
E20.63	Invalid BYTE Command	If detailed BYTE command are not normal.
E20.64	Invalid INT Command	If detailed INT command are not normal.
E20.65	Invalid POS Command	If detailed POS command are not normal.
E20.66	Invalid GOTO Command	If detailed GOTO command are not normal.

13.1.17 PLC (E21.00 ~ E21.13)

Code	Alarm Name	Description
E21.00	Invalid PLC Command	If Back up RAM 's PLC program area is damaged.
E21.01	Invalid bit addr	If contact point address which is set in the program is out of the corresponding range.
E21.02	LOAD Command too many	If stored unnecessary logic calculus command exceeds 30.
E21.03	LOAD Command expected	If contact point information which is stored at the start of logic calculus uses MCS, NOT command.
E21.04	Needs more 2 blocks	If stored contact point information at LOAD command use is less than 2.
E21.05	Not Output Port	If there is no designated port for output contact point.
E21.06	D(CNT) Command too many	If D or D NOT command exceeds 288 times.
E21.07	Needs more 1 block	If there is no stored contact point information at logic calculus.
E21.08	MCS too many nest	If common interlock set (Clear) is duplicated over 30 times
E21.09	MCS block not end	If all contact point information is not used at the start of logic calculus.
E21.10	No MCS block	If Clear command is only used without common interlock set.

E21.11	TMR Command too many	If TMR command usage exceeds 64 times.
E21.13	Program Not END	If all contact point information is not used at the start of logic calculus.

13.1.18 ETC (E22.00 ~ 22.20)

Code	Alarm Name	Description
E22.00	Last code step	If input value for Jump function usage goes beyond last line.
E22.01	Same Input port para	If input contact point setting is duplicated.
E22.03	Not Change in	If parameter is changed for Servo ON state.
E22.04	Pre Para Not Change	If MOTOR_ID value of CONTROLLER(SERVO) is different from that of Quadrature motor.
E22.06	Not Edit in	If the program is edited while the robot program is performed.
E22.07	Not Delete in	If the program is deleted while the robot program is performed.
E22.08	is not empty	If another program is copied to already existing program.
E22.09	is empty	If non-existence program is copied.
E22.10	Not copy itself	If the same program is copied.
E22.11	Invalid number	If the range is beyond the setting range when program is edited or parameter is set.
E22.12	Step not enough.	If the specified step number and capacity is out of range for Block programming.
E22.13	Not end block set	If block unit is edited when program is still running.
E22.14	Clipboard Empty	If 'Write' is performed without storing to the memory after Block is programmed.
E22.15	Too large block	The size of programmed Block is out of the setting range.
E22.16	Robot is running	If Jog or Origin is tried to be performed during Robot Run performing.
E22.17	Jog is running	If Robot Run or Origin is tried to be performed during Jog running.
E22.18	Origin running	If Robot Run or Jog is tried to be performed during Origin running.
E22.19	Not Origin Mode	If Origin is performed after setting ORG_RULE value as '0'.
E22.20	Not Save in	If parameter is tried to be stored during Robot Run.
E22.21	Not Input port	If output contact point is set to input contact point for parameter value setting.
E22.22	Not Output port	If input contact point is set to output contact point for parameter value setting.

13.1.19 Alarm End Code (E99.98 ~ E99.99)

Code	Alarm Name	Description
E99.98	Wrong Alarm code	If Alarm code exceeds front 2 digits.
E99.99	UNDEF ERR CODE	If it does not exist at current Alarm code.

13.2 Alarm Scene and Troubleshooting (Alarm Code Description)

13.2.1 Over Current (E01.00 ~ E01.02)

E01.00 OVER Current		
Alarm Description	The current of the alarmed axis motor exceeds the permissible maximum value.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E01.00	
7	Over Current	

Cause	**Troubleshooting**
■ Motor cable U, V, W short circuited	– Check motor U·V·W·FG cable for short circuit and connect correctly. – Check if controller's U·V·W·FG and motor input terminal U·V·W·FG are in right order. – Accurately connect encoders on each axis and U·V·W cables in pair.
■ Motor burnt out	– Check the motor for insulation resistance and wire resistance and if error is found, replace it.
■ Fusion of the relay for a dynamic brake due to frequent Servo On-Off	– Check that the dynamic brake relay on the servo module is working and replace the servo module. (Do not turn servo ON/OFF when the dynamic brake relay shows an error.)
■ Vibration or noise takes place due to poor gain adjustment	– Readjust GAIN.
■ Abnormal rating and excessive acceleration/deceleration setting	Monitor maximum torque when starting the robot and in the event of 300% or over, change acceleration/deceleration settings and increase motor capacity.

E01.01 IPM FAULT		
Alarm Description	Failure in IPM of servo module	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E01.01	
T/P Display	IPM Fault	

Cause	Troubleshooting
■ U, V, W short-circuit on motor power cable	– Check motor U·V·W·FG cable for short circuit and connect correctly. – Check if controller's U·V·W·FG and motor input terminal U·V·W·FG are in right order. – Accurately connect encoders on each axis and U·V·W cables in pair.
■ Maximum allowable current limit of IPM on each axis has exceeded.	– Monitor maximum torque and in the event of 300% or over, adjust the deceleration time of a parameter at long range. – Adjust GAIN. – Increase the capacities of the motor and servo.
■ Maximum allowable temperature limit for IPM module has exceeded.	– Check around the controller for ventilation.
■ IPM damaged	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacturer.

E01.02 Current Sensing Err		
Alarm Description	If ADC input voltage is over 1V during booting	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E01.02	
T/P Display	Current Sen Err	

Cause	Troubleshooting
■ Error in ADC circuit	– Get an inspection from our authorized dealer and manufacture.

13.2.2 Over Load (E02.00)

E02.00 Over Load		
Alarm Description	Torque load rate exceeds the system parameter (OVL)	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E02.00	
T/P Display	Over Load	

Cause	Troubleshooting
■ Abnormal rating The motor runs for a certain time period when an effective torque over rated range has exceeded the rated torque	– Increase the capacities of servo module and motor. – Set acceleration/deceleration operation time at long range. – Reduce load weight.
■ Vibration or noise takes place due to poor gain adjustment	– Readjust GAIN.
■ Wrong wiring of motor cable or short circuit	– Check motor U·V·W·FG cable for short circuit and connect correctly. – Check if controller's U·V·W·FG and motor's input terminals U·V·W·FG are in right order. – Accurately connect encoders on each axis and U·V·W cables in pair.
■ Occurrence of mechanical external interference during operation implementation	– Check for mechanical external interference.
■ Malfunction of the electronic motor brake	– Check the brake terminal for wiring and operating condition.
■ System parameter (OVL) value set to low	– When the set value for system parameter (OVL) is set to low, change it moderately.

13.2.3 Over Voltage (E03.00 ~ E03.01)

E03.00 Over Voltage		
Alarm Description	DC link voltage of the servo module exceeds 400V	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E03.00	
T/P Display	Over Voltage	

Cause	Troubleshooting
■ Acceleration/deceleration time too short compared to motor load	– Set acceleration/deceleration time of system parameter at long range.
■ Failure in regenerative resistor of servo module	– Check if the regenerative resistor is installed. – Check out the resistance value and conditions for a regenerative resistor.
■ Input voltage in excess of allowable voltage	– Check out the voltage in input power and impress correct voltage.
■ Controller (SERVO) failure	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacture.

E03.01 Open Regenerative		
Alarm Description	Regenerative resistor not connected.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E03.01	
T/P Display	Open Regenerative	

Cause	Troubleshooting
■ Failure of the regenerative resistor on servo module	– Check if the regenerative resistor is installed. – Check out the resistance value and conditions for a regenerative resistor.
■ Controller (SERVO) failure	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacture.

13.2.4 Power Fail (E05.00 ~ E05.01)

E05.00 Under Voltage DCLink		
Alarm Description	DC link voltage of the servo module is under 180V	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E05.00	
T/P Display	Under Voltage	
Cause	**Troubleshooting**	
■ Acceleration/deceleration time too short compared to motor load	– Set acceleration/deceleration time of system parameter at long range	
■ Power voltage lower than allowable input voltage	– Check out the applied power voltage and impress right voltage.	
■ Power relay failure in electric module	– Check if the power relay on the electric module is working. – Replace the electric module.	
■ Controller (SERVO) failure	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacture.	

E05.01. Open DCLink		
Alarm Description	If main power is turned off	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Servo	
Alarm Code	E05.01	
T/P Display	Open DCLink	
Cause	**Troubleshooting**	
■ Control power voltage lower than allowable input voltage	– Check out the applied control power voltage and impress right voltage.	
■ Power relay failure in electric module	– Check if the power relay on the electric module is working. – Replace the electric module.	
■ Controller (SERVO) failure	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacture.	

13.2.5 Data Back-up Error (E06.00)

E06.00 Back up RAM Data Error		
Alarm Description	If data stored in the Back up RAM is abnormal	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E06.00	
T/P Display	File System Err	
Cause	**Troubleshooting**	
■ Damage to file storage memory	– Initialize the file system.	
■ Magnet in touch with Back up RAM	– Get an inspection from our authorized dealer and manufacture.	

13.2.6 Encoder Error (E07.00 ~ E07.13)

E07.00 Enc Time Out		
Alarm Description	There is no reply from a communicational encoder	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.00	
T/P Display	Enc Time Out	
Cause	**Troubleshooting**	
■ Loose contact of an encoder connector	– Check out the connection of the encoder connector at both ends of controller and motor.	
■ Encoder power voltage running low	– Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. – When below 4.75V, reinforce power on the robot cable or shorten the cable.	
■ In the event of communication error due to external noise	– Check out AC power, FG lines of motor U·V·W cable. – Install the ferrite core on the controller's output stage of U·V·W cable.	
■ Set value for servo parameter (MOTOR) and the actual not consistent	– Check out the set value for the servo parameter and the actual motor.	

CAUTION

➢ Upon the occurrence of the above alarm, a mechanical position error may occur, so an ORG completion signal is initialized.

E07.01 Enc Sys Down		
Alarm Description	The battery voltage of an absolute encoder is under 2.5V	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.01	
T/P Display	Enc Sys Down	
Cause	**Troubleshooting**	
■ Built-in condenser voltage below the standard level due to turning off power to a 17-bit absolute encoder or battery power	– After replacing the battery, do multi–turn clear for an absolute encoder.	

E07.02 Enc Over Speed		
Alarm Description	Failure in multi-turn data detection in an absolute encoder	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.02	
T/P Display	Enc Over Speed	
Cause	**Troubleshooting**	
■ Encoder power voltage running low	– Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. – When below 4.75V, reinforce power on the robot cable or shorten the cable.	
■ Motor revolutions going beyond standard value when feeding battery power supply at time of power outage in a 17-bit absolute encoder.	– After connecting the power for battery, do multi–turn clear for an absolute encoder.	

E07.03 Enc Status Err		
Alarm Description	Power source is applied when an absolute encoder rotates over 100 rpm	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.03	
T/P Display	Enc Status Err	
Cause	**Troubleshooting**	
■ 17-bit absolute encoder making rotations beyond standard value when feeding power supply	– Check the motor moves when feeding power and if any movement is detected, keep it from moving.	

E07.04 Enc S-Turn Err		
Alarm Description	Failure in 1-turn data of an absolute encoder	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.04	
T/P Display	Enc S-Turn Err	
Cause	**Troubleshooting**	
■ 17-bit absolute encoder in detection of the error in the first-round counter	– Replace the motor.	

E07.05 Enc Over Flow Err		
Alarm Description	Multi-turn data overflow of an absolute encoder	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.05	
T/P Display	Enc Over Flow	
Cause	**Troubleshooting**	
■ 17-bit absolute encoder in detection of the error in a multi-round counter	– Replace the motor.	

E07.06 Enc M-Turn Err

Alarm Description	Failure in multi-turn counter of an absolute encoder	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.06	
T/P Display	Enc M-Turn Err	

Cause	Troubleshooting
■ 17-bit absolute encoder in detection of the error in a multi-round counter	– Replace the motor.

E07.07 Enc Type Miss

Alarm Description	The setup value of the system parameter is different from the encoder type of the actual motor	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.07	
T/P Display	Enc Type Miss	

Cause	Troubleshooting
■ Set values for system parameters ■ (ABS, ENC, WATT)and actual motor not consistent	– Check out the set value for system parameter (ABS, ENC, WATT) and the encoder type of an actual motor. Ex) The motor with 2500 pulses per revolution of motor allows only INC to be supported in system parameter (ABS) and the above alarm occurs if set to ABS.

E07.08 Enc ID Data Miss

Alarm Description	If received data of the motor encoder is not correct	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.08	
T/P Display	Enc ID Miss	

Cause	Troubleshooting
■ Loose contact of an encoder connector	– Check out the connection of the encoder connector at both ends of controller and motor.
■ Encoder power voltage running low	– Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. – When below 4.75V, reinforce power on the robot cable or shorten the cable.
■ In the event of communication error due to external noise	– Check out AC power, FG lines of motor U·V·W cable. – Install the ferrite core on the controller's output stage of U·V·W cable.

E07.10 Enc Open Err		
Alarm Description	Disconnection of an encoder line when in use of a pulse encoder	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.10	
T/P Display	Enc Open	

Cause	Troubleshooting
■ Loose contact of an encoder connector	– Check out the connection of the encoder connector at both ends of controller and motor.
■ Encoder power voltage running low	– Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. – When below 4.75V, reinforce power on the robot cable or shorten the cable.
■ Encoder cable disconnected	– Check the encoder cable for disconnection and when error is found, replace it.

E07.11 Enc Init Err		
Alarm Description	Failure in an encoder signal during initialization of a servo module	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.11	
T/P Display	Enc INIT Err	

Cause	Troubleshooting
■ Loose contact of an encoder connector	– Check out the connection of the encoder connector at both ends of controller and motor.
■ Encoder power voltage running low	– Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. – When below 4.75V, reinforce power on the robot cable or shorten the cable.
■ Encoder cable disconnected	– Check the encoder cable for disconnection and when error is found, replace it.

E07.12 Enc Hall Open		
Alarm Description	Failure in a Hall sensor signal of the encoder	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.12	
T/P Display	Enc Hall Open	

Cause	Troubleshooting
■ Loose contact of an encoder connector	− Check out the connection of the encoder connector at both ends of controller and motor.
■ Encoder power voltage running low	− Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. − When below 4.75V, reinforce power on the robot cable or shorten the cable.
■ Encoder cable disconnected	− Check the encoder cable for disconnection and when error is found, replace it.

E07.13 Enc Hall Init		
Alarm Description	Failure in a Hall sensor signal of the encoder during initialization of a servo module	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Encoder	
Alarm Code	E07.13	
T/P Display	Enc Hall Init	

Cause	Troubleshooting
■ Loose contact of an encoder connector	− Check out the connection of the encoder connector at both ends of controller and motor.
■ Encoder power voltage running low	− Check out the power voltage (4.75 ~ 5.25V) on the motor encoder. − When below 4.75V, reinforce power on the robot cable or shorten the cable.
■ Encoder cable disconnected	− Check the encoder cable for disconnection and when error is found, replace it.

13.2.7 H/W Limit (E08.00 ~ E08.01)

E08.00 H/W Limit -		
Alarm Description	H/W limit sensor signal is detected	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E08.00	
T/P Display	H/W Limit -	
Cause	**Troubleshooting**	
■ Limit sensor recognized during robot operation	– Check and adjust teaching point. – Check if the actual robot specifications and robot parameter (Arm length (LENG), OFFSET, Deceleration ratio) are consistent.	
■ Error in recognition by a limit sensor	– Inspect or replace the sensor and harness system.	
■ Error in limit sensor input port	– Replace the servo module.	

E08.01 H/W Limit +		
Alarm Description	H/W limit sensor signal is detected	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E08.01	
T/P Display	H/W Limit +	
Cause	**Troubleshooting**	
■ Limit sensor recognized during robot operation	– Check and adjust teaching point. – Check if the actual robot specifications and robot parameter (Arm length (LENG), OFFSET, Deceleration ratio) are consistent.	
■ Error in recognition by a limit sensor	– Inspect or replace the sensor and harness system.	
■ Error in limit sensor input port	– Replace the servo module.	

13.2.8 S/W Limit (E09.00 ~ E09.03)

E09.00 S/W Limit -		
Alarm Description	Deviation from the operation range of the robot parameter	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E09.00	
T/P Display	S/W Limit -	

Cause	Troubleshooting
■ Error in setting the operation range of system parameter (Range)	– Change the value for operating range of system parameter to the value listed on the robot nameplate. – Check and adjust work teaching point when an error occurs when working on origin operation or job implementation.
■ Command LIMIT deviating from range during work in progress	– Adjust the operating range where JOB program sets command LIMIT. – Check if the teaching point is within the set range and adjust accordingly.

E09.01 S/W Limit +		
Alarm Description	Deviation from the operation range of the robot parameter	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E09.01	
T/P Display	S/W Limit +	

Cause	Troubleshooting
■ Error in setting the operation range of system parameter (Range)	– Change the value for operating range of system parameter to the value listed on the robot nameplate. – Check and adjust work teaching point when an error occurs when working on origin operation or job implementation.
■ Command LIMIT deviating from range during work in progress	– Adjust the operating range where JOB program sets command LIMIT. – Check if the teaching point is within the set range and adjust accordingly.

E09.02 TRQ Limit		
Alarm Description	If real torque value is higher than the setting value when TRQ command is used	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E09.02	
T/P Display	TRQ Limit	

Cause	**Troubleshooting**
■ Set value for command TRQ set to low during the normal operation in progress	– Check out the maximum torque value on the configured axis and raise the set value to a higher level.
■ Occurrence of mechanical external interference during operation implementation	– Check for mechanical external interference.
■ Vibration or noise takes place due to poor gain adjustment	– Readjust GAIN.

E09.03 TQS Limit		
Alarm Description	If real torque value is the setting value when TQS command is used.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E09.03	
T/P Display	TQS Limit	

Cause	**Troubleshooting**
■ Reaching the set value for command TQS during the normal operation in progress	– No troubleshooting measures required Run the next line in JOB.

13.2.9 Following Error (E10.00)

E10.00 Following Error		
Alarm Description	Positional error value of a motor exceeds the setup value range of the system parameter	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E10.00	
T/P Display	Following Err	

Cause	**Troubleshooting**
■ Entering excessive speed command, beyond the range of robot specifications	– Set maximum RPM speed to low. – Set acceleration/deceleration time long.
■ Occurrence of mechanical external interference during operation implementation	– Check for mechanical external interference.
■ Vibration or noise takes place due to poor gain adjustment	– Readjust GAIN.

13.2.10 Program Error (E11.00 ~ E11.04, E11.50 ~ E11.51)

E11.00 Empty JOB		
Alarm Description	If there is currently no JOB to perform.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.00	
T/P Display	Empty JOB	

Cause	**Troubleshooting**
■ JOB not found in the number set to parameter (ROB_PGM)	– Set a JOB number to run on parameter (ROB_PGM) again.
■ Incorrectly-set JOB number to parameter (ROB_PGM)	

E11.01 Compile Error		
Alarm Description	If performing JOB is abnormal when I/O(ROB_RUN) is performed.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.01	
T/P Display	JOB Compile Err	
Cause	**Troubleshooting**	
■ JOB to run not in normal condition	– Delete the abnormal JOB, rewrite and run it.	

E11.03 Not JPGM in SBRT		
Alarm Description	If JPGM is used by SBRT command.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.03	
T/P Display	JPGM in SBRT	
Cause	**Troubleshooting**	
■ JPGM used in SBRT command	– Do not use JPGM command in SBRT command.	

E11.04 Not JPGM in LOOP		
Alarm Description	If JPGM is used by LOOP command.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.04	
T/P Display	JPGM in LOOP	
Cause	**Troubleshooting**	
■ JPGM used in LOOP command	– Do not use JPGM command in LOOP command.	

E11.50 Empty PLC		
Alarm Description	If there is no PLC JOB to perform	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.50	
T/P Display	Empty PLC	
Cause	**Troubleshooting**	
■ PLC JOB number incorrectly set to parameter (PLC_PGM)	– Set a PLC JOB number to run on parameter (PLC_PGM) again	

E11.51 PLC Compile Error		
Alarm Description	If PLC JOB which is to be performed is abnormal	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	JOB	
Alarm Code	E11.51	
T/P Display	PLC Compile Err	
Cause	**Troubleshooting**	
■ PLC JOB to run, not in normal condition	– Delete the abnormal PLC JOB, rewrite and run it.	

13.2.11 Emergency Stop (E12.00 ~ E12.03)

E12.00 T/P Emergency		
Alarm Description	In case of emergency stop by the emergency stop switch of the Teaching Pendant.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E12.00	
T/P Display	T/P Emergency	
Cause	**Troubleshooting**	
■ Emergency stop switch on teaching pendant is pressed down.	– Turn off the emergency stop switch on teaching pendant and reset the controller alarm.	
■ Error in overall switch line of an emergency stop switch on teaching pendant	– Repair or replace the teaching pendant.	

E12.01 System I/O Emergency		
Alarm Description	If I/O is not connected..	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E12.01	
T/P Display	SYS I/O Emergency	

Cause	Troubleshooting
■ I/O cable not connected in normal conditions	– Check out I/O cable connection.
■ I/O cable not present	– Disable the alarm by setting 911 in parameter (USER_MODE).

E12.02 Host Emergency		
Alarm Description	In case of emergency stop by emergency stop protocol at host mode.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E12.02	
T/P Display	Host Emergency	

Cause	Troubleshooting
■ Emergency stop status by emergency stop protocol in Host mode	– Clear out emergency stop situations and reset the controller.

E12.03 System PLC Emergency		
Alarm Description	If emergency occurs at CNET.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E12.03	
T/P Display	SYS PLC Emergency	

Cause	Troubleshooting
■ Emergency stop status by emergency stop protocol in Host mode	– Clear out emergency stop situations and reset the controller..

13.2.12 Over Speed (E13.00 ~ E13.02)

E13.00 Over Speed		
Alarm Description	The error which occurs if speed command is over the specified value.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E13.00	
T/P Display	Over Speed	

Cause	**Troubleshooting**
■ Error in system parameter (OVS) setting	– If the set value for parameter (OVS) is set to low, adjust the set value.
■ Error in parameter setting	– Adjust the set values for parameters (LMT_RPM, DFT_SPD, DFT_ACC, DFT_DEC, JOG_SPD0~3).
■ Error in robot commands for operation	– Check out MOVE command in JOB, operating conditions (FOS, ACC, DEC) and suitability for teaching point.

E13.02 Servo on Fail		
Alarm Description	Occurs when SERVO ON fails.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E13.02	
T/P Display	SERVO ON FAIL	

Cause	**Troubleshooting**
■ Servo on occurs due to AMP error.	– If this keeps occurring after disabling the alarm, get an inspection from our authorized dealer and manufacture.

13.2.13 Parameter Error (E14.00 ~ E14.04)

E14.00 Parameter Err		
Alarm Description	If the motor ID setting is wrong when power is ON	
Disabling Alarm	☐ RESET	☑ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E14.00	
T/P Display	Default Motor ID Err	
Cause	**Troubleshooting**	
■ System encountered a problem	– Turn power OFF / ON.	
■ RAM encountered with a problem	– Get an inspection from our authorized dealer and manufacture.	

E14.01 Curr Pos Buf Err		
Alarm Description	If current position is over the specified value	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E14.01	
T/P Display	CURR POS Buff Err	
Cause	**Troubleshooting**	
■ Error in robot commands for operation	– Check out MOVE command in JOB, operating conditions (SPD) and suitability for teaching point.	

E14.02 Speed Command Buf Err		
Alarm Description	If speed command is over the specified value	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E14.02	
T/P Display	SPEED CMD Buff Err	
Cause	**Troubleshooting**	
■ Error in robot commands for operation	– Check out MOVE command in JOB, operating conditions (SPD) and suitability for teaching point.	

E14.03 Acc Command Buf Err		
Alarm Description	If acceleration command is over the specified value	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E14.03	
T/P Display	ACC CMD Buff Err	
Cause	**Troubleshooting**	
■ Error in robot commands for operation	− Check out MOVE command in JOB, operating conditions (FOS, ACC, DEC) and suitability for teaching point.	

E14.04 Dec Command Buf Err		
Alarm Description	If deceleration command is over the specified value.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E14.04	
T/P Display	DEC CMD Buff Err	
Cause	**Troubleshooting**	
■ Error in robot commands for operation	− Check out MOVE command in JOB, operating conditions (FOS, ACC, DEC) and suitability for teaching point.	

13.2.14 Software Alarm (E15.00)

E15.00 Software Alarm		
Alarm Description	If ALARM command is performed.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E15.00	
T/P Display	Software Alarm	
Cause	**Troubleshooting**	
■ Generated by the use of ALARM command in JOB	− Reset the alarm.	

E15.01 Not found origin		
Alarm Description	Origin not completed	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Protection	
Alarm Code	E15.01	
T/P Display	Not Found Origin	

Cause	Troubleshooting
■ Occurs when the origin is not completed in activating the robot (Auto, Step) using IO.	– Activate the robot following origin implementation.

13.3 Warning Code Scene and Troubleshooting (Alarm Code Description)

13.3.1 JOB (E20.00 ~ E20.24)

E20.00 Invalid JOB Command		
Alarm Description	If JOB command is abnormal.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.00	
T/P Display	Invalid number	

Cause	Troubleshooting
■ Robot program area Back up RAM damaged ■ Use of an invalid JOB command	– Delete the corresponding program. – Double-check the commands used in JOB program.

E20.01 No match Label		
Alarm Description	Branch point position corresponding to execute statement is not designated.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.01	
T/P Display	No match LBL	

Cause	Troubleshooting
■ No LBL xxx corresponding to GOTO xxx is found.	– Insert LBL xxx.

E20.02 Same Label Number		
Alarm Description	If branch point position corresponding to execute statement exist more than 2 points.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.02	
T/P Display	Same LBL number	
Cause	**Troubleshooting**	
■ More than 2 LBL xxx corresponding to GOTO xxx are present.	– Keep only 1 LBL xxx alive and delete the other LBL xxx.	

E20.03 RET Before SBRT		
Alarm Description	If 'subroutine end' command is used prior to 'subroutine start' command.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.03	
T/P Display	RET before SBRT	
Cause	**Troubleshooting**	
■ RET command used earlier than SBRT command	– Use RET command after SBRT.	

E20.04 No match SBRT		
Alarm Description	If designated command corresponding to call command of sub execute statement does not exist.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.04	
T/P Display	No match SBRT	
Cause	**Troubleshooting**	
■ There is no SBRT xxx corresponding to CALL xxx.	– Write a SBRT corresponding to CALL to the program. – Delete CALL command.	

E20.05 Same SBRT Number		
Alarm Description	If the same SBRT number is used more than twice in one program.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.05	
T/P Display	Same SBRT number	
Cause	**Troubleshooting**	
■ Use of SBRT with the same name more than twice	– Write the number in different ways.	

E20.06 JPGM too many		
Alarm Description	If branches of the designated program is over 8 times.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.06	
T/P Display	JPGM too many	
Cause	**Troubleshooting**	
■ JPGM command used more than 8 times	– Limit the use of JPGM command to 8 times at maximum.	

E20.07 JPGM to itself		
Alarm Description	If the user wants to branch to the designated program.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.07	
T/P Display	JPGM to itself	
Cause	**Troubleshooting**	
■ JOB number to branch is the current program.	– Set the number to branch.	

E20.08 JPGM to empty pgm		
Alarm Description	If non-existent program is selected	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.08	
T/P Display	JPGM to empty pgm	
Cause	**Troubleshooting**	
■ Attempt to move to the unwritten program	– Write a command to the corresponding program number. – From the parameter, select the program number where a command is written.	

E20.09 No Match ENDL		
Alarm Description	If there is no command which indicates the end of the designated LOOP.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.09	
T/P Display	No match ENDL	
Cause	**Troubleshooting**	
■ There is no END xxx corresponding to LOOP xxx Lyy	– Delete LOOP xxx Lyy or insert ENDL xxx.	

E20.10 Same ENDL number		
Alarm Description	If there are more than 2 commands which indicate the end of the designated LOOP.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.10	
T/P Display	Same ENDL number	
Cause	**Troubleshooting**	
■ There are more than 2 END xxx corresponding to LOOP xxx Lyy.	– Keep only 1 NDL xxx alive and delete the rest ENDL xxx.	

E20.11 LOOP too many nest		
Alarm Description	If repetitive statement is used more than 16 times.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.11	
T/P Display	LOOP too many nest	

Cause	Troubleshooting
■ LOOP is used more than 16 times within LOOP.	– Limit LOOP repeat between LOOP and ENDL to less than 16 times.

E20.12 No match LOOP		
Alarm Description	If there is no LOOP command corresponding to ENDL or if ENDL is incorrectly used	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.12	
T/P Display	No match LOOP	

Cause	Troubleshooting
■ There is no LOOP xxx Lyy corresponding to ENDL xxx.	– Delete ENDL xxx or insert LOOP xxx Lyy.

E20.13 Same LOOP Number		
Alarm Description	If there are more than 2 commands which indicate the start of designated LOOP	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.13	
T/P Display	Same LOOP Number	

Cause	Troubleshooting
■ There are more than 2 LOOP xxx Lyy corresponding to ENDL xxx.	– Keep only 1 LOOP xxx Lxx alive and delete the rest LOOP xxx Lxx.

E20.14 ENDL before LOOP

Alarm Description	there is the command expressing repetitive statement end prior to that expressing start.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.14	
T/P Display	ENDL before LOOP	

Cause	Troubleshooting
■ ENDL command used earlier than LOOP command.	– Use LOOP and ENDL commands prior to ENDL command and after LOOP command. – Change positions for ENDL command and LOOP command.

E20.15 Not Output Port

Alarm Description	If there is no designated port for output contact point.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.15	
T/P Display	Not Output port	

Cause	Troubleshooting
■ The contact assigned to Bxxx, BBxx is the input port.	– Assign a contact to output to an output port or an internal contact.

E20.16 Not Pair SBRT RET

Alarm Description	SBRT and RET not in consistent as a pair.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.16	
T/P Display	Not pair SBRT, RET	

Cause	Troubleshooting
■ JOB command SBRT and RET not consistent as a pair	– Check out the number of SBRTs and RETs.

E20.17 Not Pair LOOP ENDL		
Alarm Description	LOOP and ENDL not consistent as a pair	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.16	
T/P Display	Not pair LOOP, ENDL	
Cause	**Troubleshooting**	
■ JOB commands LOOP and ENDL not consistent as a pair	– Check out the number of LOOPs and ENDLs.	

E20.18 Invalid XIF Command		
Alarm Description	If the command can not be operated.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.18	
T/P Display	Invalid XIF command	
Cause	**Troubleshooting**	
■ Commands SPD, ACC, DEC, and GOTO do not come after XIF.	Limit commands coming after XIF to SPD, ACC, DEC, and GOTO.	

E20.19 Not mapping IOPOS		
Alarm Description	If coordinate value of position parameter IOPOS is not designated.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.19	
T/P Display	Not mapping IOPOS	
Cause	**Troubleshooting**	
■ IOPOS(0 ~ 3) and MOVT_ST are not assigned as a contact when using a MOVAT command in the program	– Set a contact for IOPOS(0 ~ 3) and MOVT_ST in the parameter before use.	

E20.20 Too Many SBRT CALL		
Alarm Description	SBRT and CALL repeated more than 16 times	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.20	
T/P Display	Too Many SBRT Call	
Cause	**Troubleshooting**	
■ SBRT and CALL LOOP is used more than 16 times.	– Limit SBRT and CALL to be repeated to less than 16 times.	

E20.21 Point Range Over		
Alarm Description	The number of Point variable is incorrectly set.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.21	
T/P Display	PNT Index Range Over	
Cause	**Troubleshooting**	
■ The number of Point variable beyond the range.	– Check if the number is in 0 ~ 1023 range.	

E20.22 Integer Range Over		
Alarm Description	The number range for integer variable is incorrectly set.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.22	
T/P Display	INT Index Range Over	
Cause	**Troubleshooting**	
■ The number of Integer variable beyond the range	– Check if the number is in 0 ~ 255 range.	

E20.23 Const Value Range Over		
Alarm Description	The range of Position value is incorrectly set.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.23	
T/P Display	CONST Val Range Over	
Cause	**Troubleshooting**	
■ Position variable beyond the range	– Check if the value is in -99999.999 ~ 99999.999 range.	

E20.24 Invalid SPD Value		
Alarm Description	SPD command value is not 0.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.24	
T/P Display	Invalid SPD Value	
Cause	**Troubleshooting**	
■ SPD command value is 0.	– Change SPDSet value to a value exceeding 0.	

13.3.2 JOB Command (E20.50~20.99)

E20.50 Invalid SERVO Command		
Alarm Description	Detailed SERVO command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.50	
T/P Display	Invalid SERVO cmd	
Cause	**Troubleshooting**	
■ Detailed SERVO command not in normal condition	– Check out SERVO command again.	

E20.51 Invalid MOVA Command		
Alarm Description	Detailed MOVA command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.51	
T/P Display	Invalid MOVA command	
Cause	**Troubleshooting**	
■ Detailed MOVA command not in normal condition	– Check out MOVA command again.	

E20.52 Invalid MOVI Command		
Alarm Description	Detailed MOVI command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.52	
T/P Display	Invalid MOVI command	
Cause	**Troubleshooting**	
■ Detailed MOVI command not in normal condition	– Check out MOVI command again.	

E20.53 Invalid MOVR Command		
Alarm Description	Detailed MOVR command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.53	
T/P Display	Invalid MOVI command	
Cause	**Troubleshooting**	
■ Detailed MOVR command not in normal condition	– Check out MOVR command again.	

E20.54 Invalid MOVM Command		
Alarm Description	Detailed MOVM command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.54	
T/P Display	Invalid MOVM command	
Cause	**Troubleshooting**	
■ Detailed MOVM command not in normal condition	– Check out MOVM command again.	

E20.55 Invalid FOS Command		
Alarm Description	Detailed FOS command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.55	
T/P Display	Invalid FOS command	
Cause	**Troubleshooting**	
■ Detailed FOS command not in normal condition	– Check out FOS command again.	

E20.56 Invalid REF Command		
Alarm Description	Detailed REF command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.56	
T/P Display	Invalid REF command	
Cause	**Troubleshooting**	
■ Detailed REF command not in normal condition	– Check out REF command again.	

E20.57 Invalid SPD Command		
Alarm Description	Detailed SPD command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.57	
T/P Display	Invalid SPD command	
Cause	**Troubleshooting**	
■ Detailed SPD command not in normal condition	– Check out SPD command again.	

E20.58 Invalid ACC Command		
Alarm Description	Detailed ACC command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.58	
T/P Display	Invalid ACC command	
Cause	**Troubleshooting**	
■ Detailed ACC command not in normal condition	– Check out ACC command again.	

E20.59 Invalid DEC Command		
Alarm Description	Detailed DEC command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.59	
T/P Display	Invalid DEC command	
Cause	**Troubleshooting**	
■ Detailed DEC command not in normal condition	– Check out DEC command again.	

E20.60 Invalid IF Command		
Alarm Description	Detailed IF command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.60	
T/P Display	Invalid IF command	
Cause	**Troubleshooting**	
■ Detailed IF command not in normal condition	– Check out IF command again.	

E20.61 Invalid WAIT Command		
Alarm Description	Detailed WAIT command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.61	
T/P Display	Invalid WAIT command	
Cause	**Troubleshooting**	
■ Detailed WAIT command not in normal condition	– Check out WAIT command again.	

E20.62 Invalid BIT Command		
Alarm Description	Detailed BIT command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.62	
T/P Display	Invalid BIT command	
Cause	**Troubleshooting**	
■ Detailed BIT command not in normal condition	– Check out BIT command again.	

E20.63 Invalid BYTE Command		
Alarm Description	Detailed BYTE command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.63	
T/P Display	Invalid BYTE command	
Cause	**Troubleshooting**	
■ Detailed BYTE command not in normal condition	– Check out BYTE command again.	

E20.64 Invalid INT Command		
Alarm Description	Detailed INT command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.64	
T/P Display	Invalid INT command	
Cause	**Troubleshooting**	
■ Detailed INT command not in normal condition	– Check out INT command again.	

E20.65 Invalid POS Command		
Alarm Description	Detailed POS command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.65	
T/P Display	Invalid POS command	
Cause	**Troubleshooting**	
■ Detailed POS command not in normal condition	– Check out POS command again.	

E20.66 Invalid GOTO Command		
Alarm Description	Detailed GOTO command not in normal condition	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E20.66	
T/P Display	Invalid GOTO command	
Cause	**Troubleshooting**	
■ Detailed GOTO command not in normal condition	– Check out GOTO command again.	

13.3.3 PLC (E21.00 ~ E21.13)

E21.00 Invalid PLC Command		
Alarm Description	PLC program area in Back up RAM is damaged	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.00	
T/P Display	Invalid number	
Cause	**Troubleshooting**	
■ Robot program area in Back up RAM is damaged. ■ Use of invalid PLC command	– Delete the corresponding program. – Double-check PLC command and rewrite it.	

E21.01 Invalid bit addr		
Alarm Description	If contact point address which is set in the program is out of the corresponding range.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.01	
T/P Display	Invalid bit addr	
Cause	**Troubleshooting**	
■ The contact address set in the program goes beyond the range.	– Check out signal specification in connecting the manual 2.2.3.5. input/output connector and change it to the contact address in the range.	

E21.02 LOAD Command too many		
Alarm Description	If stored unnecessary logic calculus command exceeds 30.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.02	
T/P Display	LOAD too many	

Cause	Troubleshooting
■ Contact information saved with the use of LOAD(LOAD NOT) command is not used as commands D, OUT, while saving more than 30 pieces of the information	– Delete LOAD(LOAD NOT) command which is not used as such command as D, OUT.

E21.03 LOAD Command expected		
Alarm Description	If contact point information which is stored at the start of logic calculus uses MCS, NOT command.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.03	
T/P Display	LOAD expected	

Cause	Troubleshooting
■ Contact information saved with the use of LOAD(LOAD NOT) command uses MCS, NOT commands.	– Check out PLC JOB.

E21.04 Needs more 2 blocks		
Alarm Description	If stored contact point information at LOAD command use is less than 2	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.04	
T/P Display	Needs more 2 blocks	

Cause	Troubleshooting
■ Contact information saved with the use of LOAD(LOAD NOT) command is less than 2 pieces.	– Use LOAD command to use 2 or more pieces of contact information.

E21.05 Not Output Port		
Alarm Description	If there is no designated port for output contact point.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.05	
T/P Display	Not Output port	
Cause	**Troubleshooting**	
■ A contact to output is set to an input contact.	− Input contact is unable to be used in output contacts such as D, SET, OUT.	

E21.06 D(CNT) Command too many		
Alarm Description	If D or D NOT command exceeds 288 times.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.06	
T/P Display	D(CNT) too many	
Cause	**Troubleshooting**	
■ Command D or D NOT is used over 288 times.	− Put the use of command D or DNOT below 288 times.	

E21.07 Needs more 1 block		
Alarm Description	If there is no stored contact point information at logic calculus.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.07	
T/P Display	Needs more 1 block	
Cause	**Troubleshooting**	
■ Command OUT is used without contact information saved by using LOAD(LOAD NOT) command	− Available to be used only when there is contact information saved by using LOAD(LOAD NOT) command.	

E21.08 MCS too many nest		
Alarm Description	If common interlock set (Clear) is duplicated over 30 times.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.08	
T/P Display	MCS too many nest	
Cause	**Troubleshooting**	
■ MCS ~ MCSC Block is overlapping 30 times or more.	– Limit overlapping of MCS ~ MCSC Block below 30 times.	

E21.09 MCS block not end		
Alarm Description	If all contact point information is not used at the start of logic calculus.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.09	
T/P Display	MCS block not end	
Cause	**Troubleshooting**	
■ None of contact information saved by LOAD(LOAD NOT) between MCS and MCSC Block is used.	– Contact information saved by command LOAD(LOAD NOT) between MCS and MCSC Block should all be used with the use of commands OUT, D.	

E21.10 No MCS block		
Alarm Description	If Clear command is only used without common interlock set.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.10	
T/P Display	No MCS block	
Cause	**Troubleshooting**	
■ MCSC command is used without the use of MCS command.	– MCS command should be used with MCS in pair.	

E21.11 TMR Command too many		
Alarm Description	If TMR command usage exceeds 64 times.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.11	
T/P Display	TMR too many	
Cause	**Troubleshooting**	
■ TMR command is used more than 64 times.	– Put the use of TMR command below 64 times.	

E21.13 Program Not END		
Alarm Description	If all contact point information is not used at the start of logic calculus.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E21.13	
T/P Display	Program not end	
Cause	**Troubleshooting**	
■ None of contact information saved by LOAD(LOAD NOT) command is used.	– Contact information saved by LOAD(LOAD NOT) command should be used with the use of commands D, OUT.	

13.3.4 ETC (E22.00 ~ 22.20)

E22.00 Last code step		
Alarm Description	If input value for Jump function usage goes beyond last line.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.00	
T/P Display	Last step	
Cause	**Troubleshooting**	
■ The value beyond the last line is entered when using a Line Jump function.	– Enter the value suited to the range.	

E22.01 Same Input port para		
Alarm Description	If input contact point setting is duplicated.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.01	
T/P Display	Same Input port	
Cause	**Troubleshooting**	
■ Setting the same input contact to different function when setting an input contact parameter.	– Set other contacts to each function.	

E22.03 Not Change in		
Alarm Description	If parameter is changed for Servo ON state.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.03	
T/P Display	Not Change in	
Cause	**Troubleshooting**	
■ Parameter is changed in Servo ON.	– Change parameter value following Servo OFF.	

E22.06 Not Edit in		
Alarm Description	If the program is edited while the robot program is performed.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.06	
T/P Display	Not Edit in	
Cause	**Troubleshooting**	
■ To edit the program while the robot program is running.	– Stop the robot program from running and edit the program.	

E22.07 Not Delete in

Alarm Description	If the program is deleted while the robot program is performed	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.07	
T/P Display	Not Delete in	

Cause	Troubleshooting
■ To delete the program while the program is running.	– Stop the robot program from running and edit the program.

E22.08 is not empty

Alarm Description	If another program is copied to already existing program.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.08	
T/P Display	is not empty	

Cause	Troubleshooting
■ To copy another program to the saved program.	– Delete the saved program and copy it again. – Copy to another empty program.

E22.09 is empty

Alarm Description	If non-existence program is copied	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.09	
T/P Display	is empty	

Cause	Troubleshooting
■ To copy an empty program.	– Write and copy the program.

E22.10 Not copy itself

Alarm Description	If the same program is copied.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.10	
T/P Display	Not copy itself	

Cause	Troubleshooting
■ To copy the same program.	– Copy is possible only to other empty program.

E22.11 Invalid number

Alarm Description	If the range is beyond the setting range when program is edited or parameter is set.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.11	
T/P Display	Invalid number	

Cause	Troubleshooting
■ Going beyond the input range when program editing or parameter setting	– Enter a value suited to the range.

E22.12 Step not enough.

Alarm Description	If the specified step number and capacity is out of range for Block programming.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.12	
T/P Display	Step not enough.	

Cause	Troubleshooting
■ Program exceeds 100 steps or 400 words when copying or writing the set program Block to the program.	– Each program should be written in 1000 step or 4000 word range.

E22.13 Not end block set		
Alarm Description	If block unit is edited when program is still running.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.13	
T/P Display	Not end block set	
Cause	**Troubleshooting**	
■ To edit in block unit without completion of setting program block	– Complete program block setting and implement editing in block unit.	

E22.14 Clipboard Empty		
Alarm Description	If 'Write' is performed without storing to the memory after Block is programmed.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.14	
T/P Display	Clipboard Empty	
Cause	**Troubleshooting**	
■ Implementing block write by reading the set block and not saving it to the memory	– Read the set block and save it to the memory before running block write.	

E22.15 Too large block		
Alarm Description	The size of programmed Block is out of the setting range.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.15	
T/P Display	Too large block	
Cause	**Troubleshooting**	
■ The set block goes beyond 2500Byte.	– Block should be within 2500Byte.	

E22.16 Robot is running		
Alarm Description	If Jog or Origin is tried to be performed during Robot Run performing.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.16	
T/P Display	Robot is running	
Cause	**Troubleshooting**	
■ To operate Jog or Origin while the robot program is running.	– Stop the robot program from running and operate the Origin.	

E22.17 Jog is running		
Alarm Description	If Robot Run or Origin is tried to be performed during Jog running.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.17	
T/P Display	Jog is running	
Cause	**Troubleshooting**	
■ To operate robot program or Origin while Jog is running.	– Stop jog operation and operate robot program or origin.	

E22.18 Origin running		
Alarm Description	If Robot Run or Jog is tried to be performed during Origin running.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.18	
T/P Display	Origin running	
Cause	**Troubleshooting**	
■ To operate robot program or Jog while Origin is running.	- Finish Origin operation and run the robot program or Jog.	

E22.19 Not Origin Mode		
Alarm Description	If Origin is performed after setting ORG_RULE value as '0'.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.19	
T/P Display	Not Origin Mode	
Cause	**Troubleshooting**	
■ To set ORG_RULE to '0' and run Origin.	– Set ORG_RULE to other value, instead of '0'.	

E22.20 Not Save in		
Alarm Description	If parameter is tried to be stored during Robot Run.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.20	
T/P Display	Not Save in	
Cause	**Troubleshooting**	
■ To save the parameter while the robot program is running.	– Stop the robot program from running and save the parameter.	

E22.21 Not Input port		
Alarm Description	If output contact point is set to input contact point for parameter value setting.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.21	
T/P Display	Not Input port	
Cause	**Troubleshooting**	
■ Output contact is set to input contact parameter	– Area except for output contacts B03, B04 is set to input contact.	

E22.22 Not Output port		
Alarm Description	If input contact point is set to output contact point for parameter value setting.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E22.22	
T/P Display	Not Output port	
Cause	**Troubleshooting**	
■ Input contact is set to output contact parameter	– Output contact is set to the values for B03~B31 area.	

13.3.5 Alarm End Code (E99.98 ~ E99.99)

E99.98 Wrong Alarm code		
Alarm Description	If Alarm code exceeds front 2 digits.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Main	
Alarm Code	E99.98	
T/P Display	Wrong Alarm code	
Cause	**Troubleshooting**	
■ Back up RAM error prevents an alarm code from saving in normal order.	– Initialize either an alarm code or Back up RAM.	

E99.99 UNDEF ERR CODE		
Alarm Description	If it does not exist at current Alarm code.	
Disabling Alarm	☑ RESET	☐ POWER ON/OFF
Alarm Classification	Undefine	
Alarm Code	E99.99	
T/P Display	UNDEF ERR CODE	
Cause	**Troubleshooting**	
■ An unidentified alarm occurs.	– In the event of a persistent alarm, get an inspection from our authorized dealer and manufacture.	

ch.14 Abnormal Symptom Troubleshooting

14.1 Troubleshooting for Abnormal Symptoms Likely to Occur in JOG Operation

■ **Occurrence of mechanical noise**

NO	Cause	Troubleshooting
1	Poor precision (Floor plan) of an installation surface	Do the installation after correcting (Floor plan) using thickness tape.
2	Mixed foreign material	Rinse the area mixed with foreign material and inject grease again.
3	Used beyond the speed limit	Lower speed below the speed limit.
4	Coupling unfastened	Refasten the coupling. (Coupling may be unfastened by vibration and below limit acceleration/deceleration time.)
5	Lack of grease	Remove existing grease and inject new grease.
6	Incorrect GAIN settings	Adjust Gain.
7	Inappropriate timing belt tension	Adjust the tension of a timing belt.
8	Damage to ball screws or operation for over 15000 hours	Replace ball screws.
9	Damage to a linear-motion bearing or operation for over 25000km	Replace the linear-motion bearing.
10	Abnormal operation of a brake	Replace the brake.
11	Interference by damage to mechanism body	Replace the component.

■ **Vibration occurrence**

NO	Cause	Troubleshooting
1	Used beyond the speed limit	Lower speed below the speed limit.
2	Used below limit acceleration/deceleration time	Adjust acceleration/deceleration time longer.
3	Insufficient rigidity of a bracket	Improve bracket rigidity and fasten the floor surface with anchor bolts.
4	Poor fastening of bolts for robot installation	Check if bolts are completely fastened. Ensure bolt length is appropriate. Check out the above and fasten with standard fastening torque. Take preventive measures against bolt loosening. (Loctite coating, fastening nylok bolts)
5	Overload	Lower speed or adjust acceleration/deceleration time longer.
6	Incorrect GAIN settings	Refer to '5.3.1.2 GAIN'.
7	Resonates with other devices	Adjust acceleration/deceleration speed.

■ **Unstable robotic operation & congestion occurrence**

NO	Cause	Troubleshooting
1	Different in Pitch/Rev(Gear Ratio) value	Modify Pitch/Rev(Gear Ratio) value.
2	Origin sensor and encoder Z-phase are consistent or adjacent (In INC serial encoder)	After completing the origin on Teach Pendant, adjust the origin sensor or coupling location when Z-phase pulse value is not in 1 ~ 2000 range. .

■ **Occurrence of poor positioning precision**

NO	Cause	Troubleshooting
1	Error in mechanical lead	Contact our company when there is a need for positioning precision in process.

■ **Occurrence of poor positioning precision**

NO	Cause	Troubleshooting
1	Damage to ball screws	Replace ball screws.
2	Poor precision (Floor plan) of an installation surface	Refer to the above item 'Poor precision (Floor plan) of an installation surface'.
3	Low in Position Gain	Raise the Position Gain. (Refer to '5.3.1.2 GAIN'.)
4	Poor fastening of bolts for robot installation	Refer to the above item 'Poor fastening of bolts for robot installation'.
5	Insufficient rigidity of a bracket	Refer to the above item 'Insufficient rigidity of a bracket'.
6	Coupling unfastened or damaged	Fasten the coupling or replace it.

14.2 Move Robot by JOG to Check out Operating Status of Limit Sensor on Axis

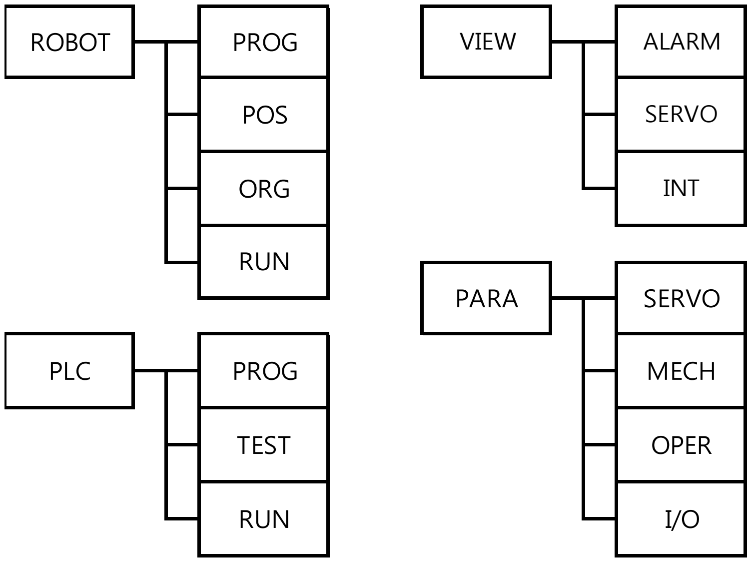
- At this time, the robot is in normal operation when an alarm sounds on Teach Pendant, and when an alarm does not sound, it is not normal operation, so check out what is listed below.
  1) Check all connections are made properly?
  2) Is the interval of sensor's sensing distance attached within 1mm?
  3) Is the limit sensor installed within the interference range between axis and mechanism?
  4) Is the origin sensing dog (Magnet) attached to the carrier free of error (Damage, Polarity)?
  5) Are the limit sensor (CW, CCW) specifications accurate (Normal B contact)?
  6) Are the origin sensor specifications accurate (Normal A contact)?
  7) Is I/O contact accurately set to the parameter?

- **Poor operation of the origin sensor**

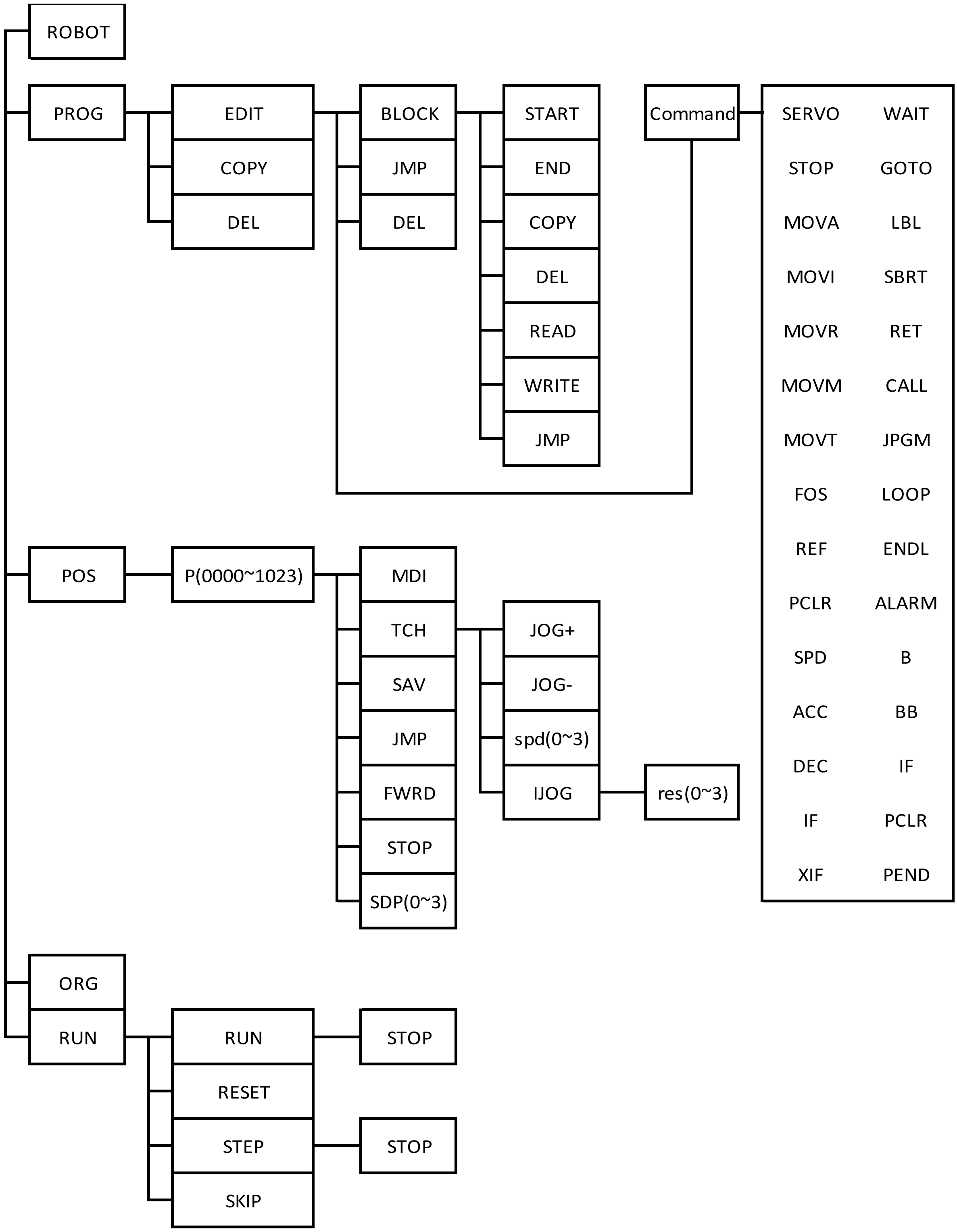
NO	Cause	Troubleshooting
1	Large interval between proximity sensor(Reed S/W) and magnet	Adjust the interval of a proximity sensor (Rees S/W). (1mm)
2	Damage to proximity sensor (Reed S/W)	Replace the proximity sensor (Reed S/W).
3	Origin parameter incorrectly set	Set the origin parameter again.

ch.15 TEACH PENDANT MENU TREE

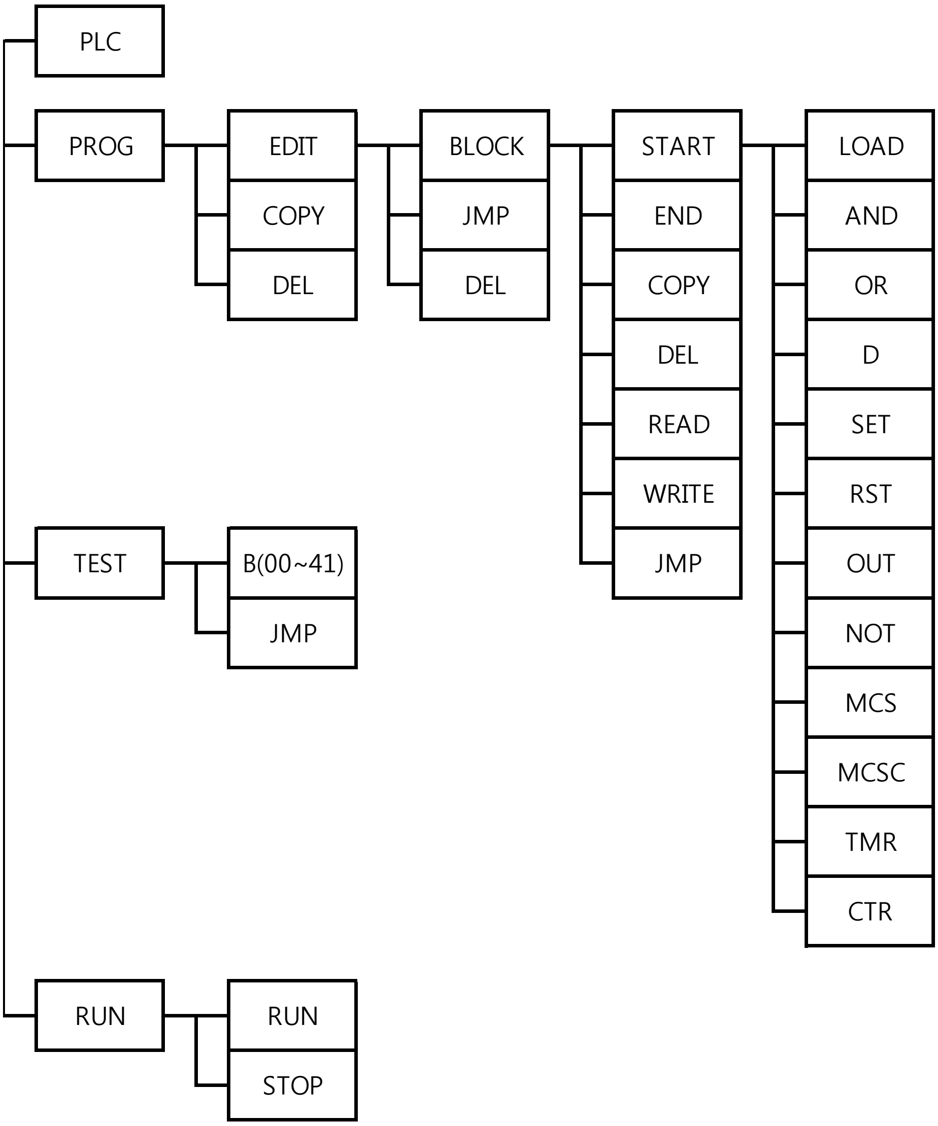
15.1 MAIN MENU



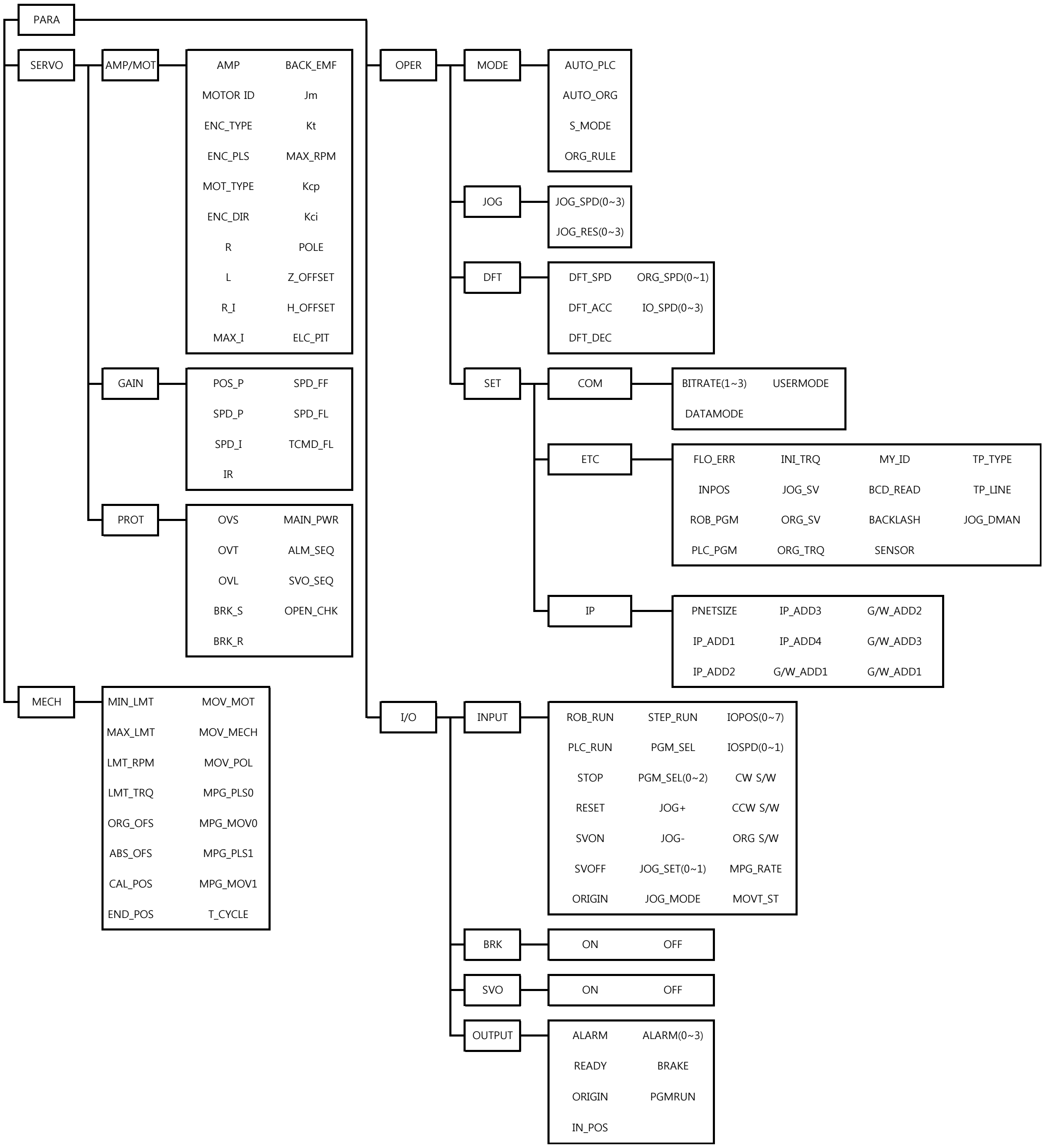
15.2 ROBOT MENU



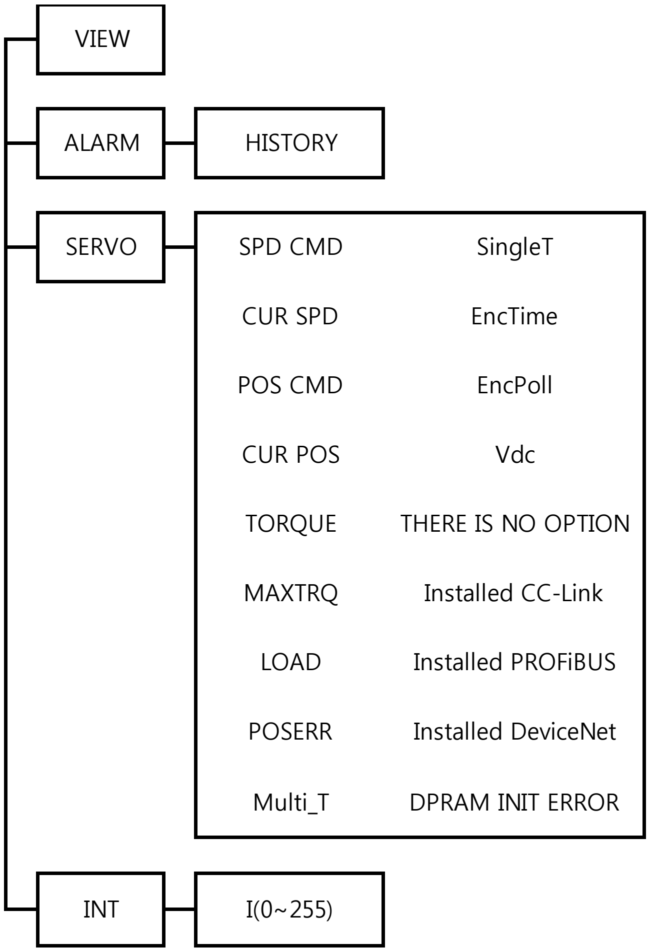
15.3 PLC MENU


PLC
PROG
EDIT
COPY
DEL
BLOCK
JMP
DEL
START
END
COPY
DEL
READ
WRITE
JMP
LOAD
AND
OR
D
SET
RST
OUT
NOT
MCS
MCSC
TMR
CTR
TEST
B(00~41)
JMP
RUN
RUN
STOP

15.4 PARAMETER MENU



15.5 VIEW MENU



ch.16 Description of Operating Modes per Function

16.1 Initialization Setting Mode (Hidden Initial Mode)

Step 1. **Shift to MAIN screen**

```
 TPS-9000T Ver1.3
F1: Teach Pendant
F2: RS-422 Multipoint
F3: Data up/Down Load
```

F1

Turn ON power to controller and select Teach Pendant.

```
RoboStar RCS-8000C
S/W V00.00.21
PARA V00.22
        PRESS ENT KEY
```

ENT

PRESS ENT.

Step 2. **Shift to hidden screen**

```
      Servo Controller

ROBOT   PLC   PARA   VIEW
```

F4

Select VIEW.

```
      STATUS     VIEW

 ALARM    SERVO        INT
```

F3

.

Press F3 and push '.'(Period).

Data Initial <0/1>

POS INT PARA

F1 F2 F3

F1: Initializes position setting.
F2: Initializes the set integer.
F3: Initializes the parameter.

Data Initial <1/1>

JOB PLC

F1 F2

F1: Initializes JOB setting.
F2: Initializes PLC setting.

Step 3-1. **Initialize position setting <0/1>**

Do you want
Position Initial?
NO YES

F2

Select YES to initialize position setting.

Step 3-2. **Initialize integer setting <0/1>**

Do you want
Integer Initial?
NO YES

F2

Select YES to initialize integer area.

Step 3-3. **Initialize parameter setting<0/1>**

Do you want
Current and FRAM
Parameter initial?
NO YES

F2

Select YES to initialize parameter setting.

Step 3-5. **Initialize JOB setting <1/1>**

Do you want
JOB Initial?
NO YES

F2

Select YES to initialize the whole JOB program.

.

Step 3-6. **Initialize PLC setting<1/1>**

Do you want
PLC Initial?
NO YES

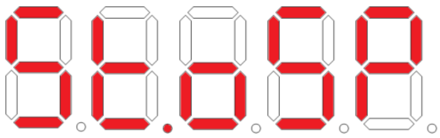
F2

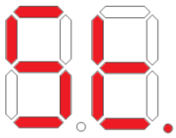
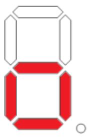
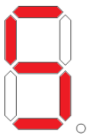
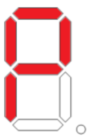
Select YES to initialize the whole PLC program.

ch.17 Front 7-Segment Display

17.1 Normal Condition

■ Description: Displayed when the controller is in normal condition after turning ON power to controller.



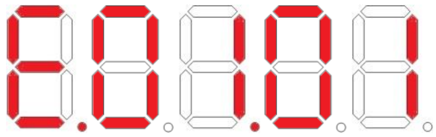
	1) Displays controller status ● Normal status: 'St.' ● Alarm occurrence: 'Er.' ● Robot program being run: 'Ln.' ● DC link voltage monitoring: 'dc' ● Input: I ● Output: o
	2) Displays origin status ● Before origin operation: '.' ● After completing origin operation normally: 'o'
	3) Displays servo status ● Servo On: 'S' ● Servo Off: '.'
	4) Displays PLC program run status ● PLC Run: 'P' ● PLC Not run: '.'

17.2 Alarm Occurrence

■ **Description:** **In the event of an alarm, it is displayed as shown in the figure below, indicating a 2-digit main alarm and a 2-digit detailed alarm.**

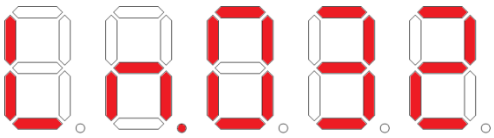
. For alarm codes and description, refer to page 3-30.

ex) When E01.01 → IPM alarm occurs.



17.3 During Robot Program Operation

■ **Description:** **When the robot program is running, this displays the current step number.**



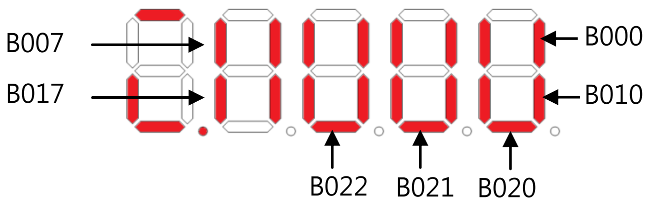
(Step no. 32 currently running)

17.4 Display by Setting User Mode Parameter

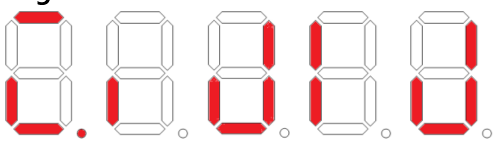
17.4.1 Display Input Contact when User Mode Parameter is '200'

- **Input contact range for parameter setting**
  1) Input contact range values
     - B000, B001, B002, B003, B004, B005 B006, B007
       B010, B011, B012, B013, B014, B015, B016, B017
       B020, B021, B022
  2) Positions of input contacts displayed on 7-segment
     - Displayed from top-right B000 on 7-segment toward the left to B007, also displaying from bottom-right B010 toward the left to B017 and from B020 at bottom-right toward the left to B022, showing a total of 19 contacts from B000 to B022.

- **Description: Output is made to 7-segment according to values for input contact range.**



- **Description: Input contact status is displayed as shown below.**
  Contact segment in ON status is turned on.



B004, B003, B000
B017, B015, B014, B013, B011 B010
B022, B020
Contacts are turned ON.

17.4.2 Display Output Contact when User Mode Parameter is '201'

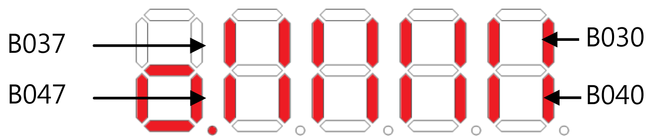
1) Output contact range values

- B030, B031, B032, B033, B034, B035 B036, B037
  B040, B041, B042, B043, B044, B045, B046, B047

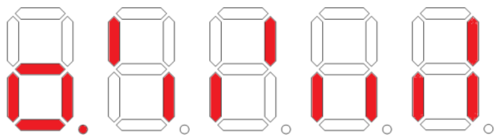
2) Positions of output contacts displayed on 7-segment

- 16 contacts are displays starting from top-right B030 on 7-segment toward the left to B037, also starting at bottom-right B040 toward the left to B047.

■ **Description: Output is made to 7-segment according to values for input contact range.**



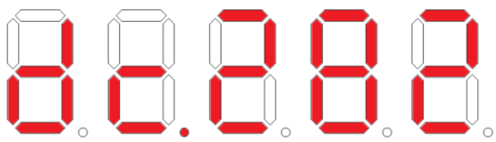
■ **Description: Output contact status is displayed as shown below.**



B037, B034, B030,
B046, B045, B043, B042, B041 B040
Contacts are turned ON.

17.4.3 Display DC LINK Voltage when User Mode Parameter is '202'

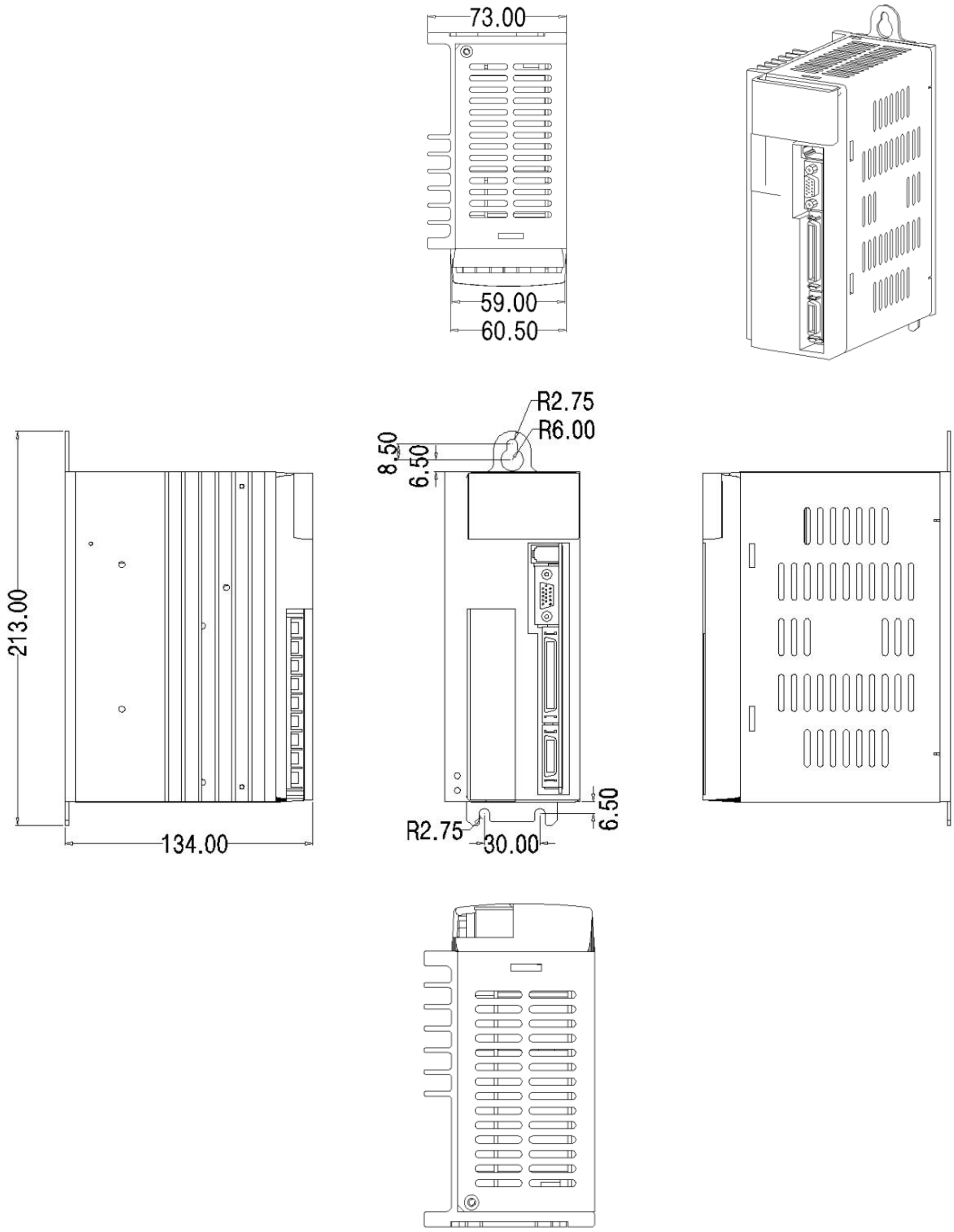
■ **Description: DC LINK voltage is displayed as follow.**



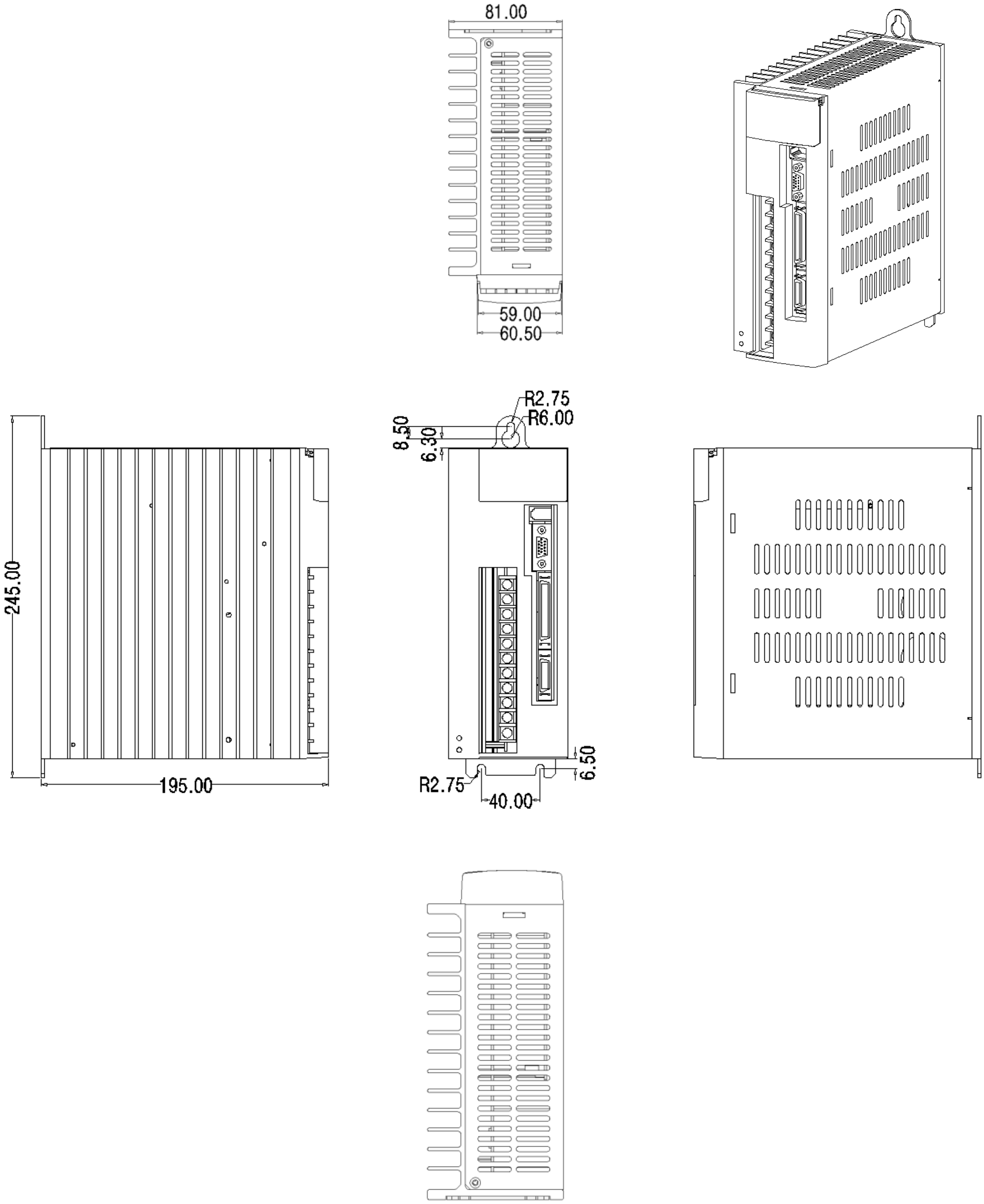
Displays DC link voltage.
Shows current 282 V is displayed.

ch.18 External-look Dimension Drawing

■ **Small capacity (RCS-8001C ~ 8004C) external look and dimension**



■ **Medium capacity (RCS-8008 ~ 15C) external look and dimension**



ch.19 Cable

19.1 Configuration of Robot Cable Model

RAK CABLE

R A K - X - N - 0 5 - I - 5 - S P D - N

RAK
N1, RCS7000CA(I),RCS8000 Cable
ABS ENCODER CABLE

Axis Name (LABEL)

X	X(1), Y(2), Z(3), W(4), 5, 6
1	RCS7000CA(I), 8000

Operation Mode

N :	Non-operation type
F :	Operation type

CABLE length

1 :	1MT
2 :	2MT
...	
25 :	25MT

ENC

I :	INC
A :	ABS
L	LINEAR

CONNECTOR specification 1

5 :	DDK JM□P2516M standard
H :	HOUSING
D :	DSUB 25P (LINEAR CONVERTER)
8 :	DDK JM□P2528M MSMZ

CONNECTOR specification 2

S :	STRAIGHT
E :	ELBOW
B :	HOUSING BAT(O)
N :	NULL

MOTOR specification

Z1 :	PANA MSMZ(15 wire)
A1 :	PANA MSMA(9 wire)
PD	PANASONIC MSMR
PE	PANASONIC MSME

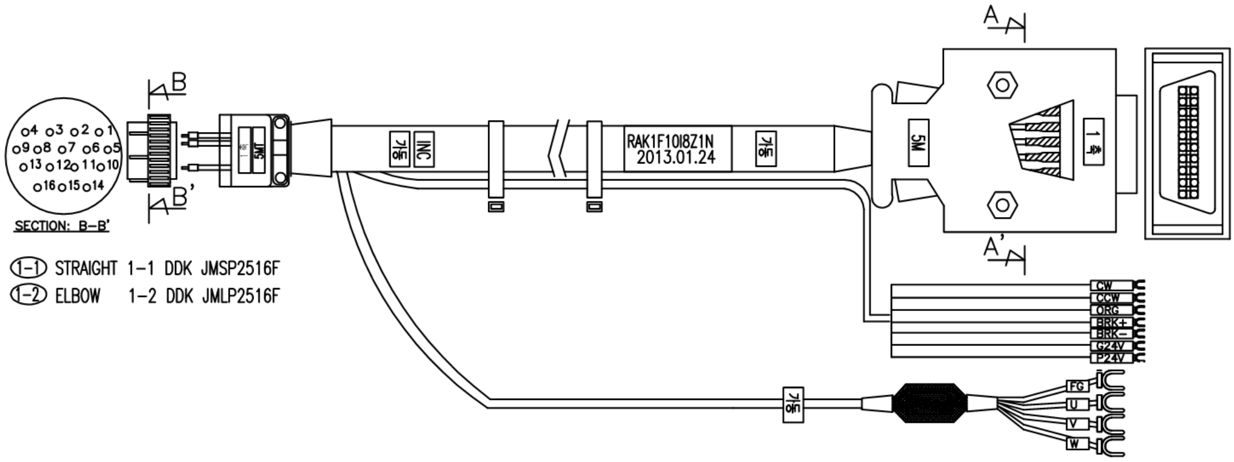
Sale classification (Sensor,special)

N :	NCOM sensor
P :	PCOM sensor

19.2 Robot Cable Type

Type	Type of controller side	Type of motor side	Configuration
RAK1 Robot Cable	CN1(20pin)	STRAIGHT/ELBOW	ENCODER BATTERY MOTOR SENSOR BRAKE
		HOUSING	
RCK Robot Cable		STRAIGHT/ELBOW	ENCODER MOTOR SENSOR BRAKE
		HOUSING	

19.2.1 RAK1 Robot Cable (STRAIGHT/ELBOW Type)



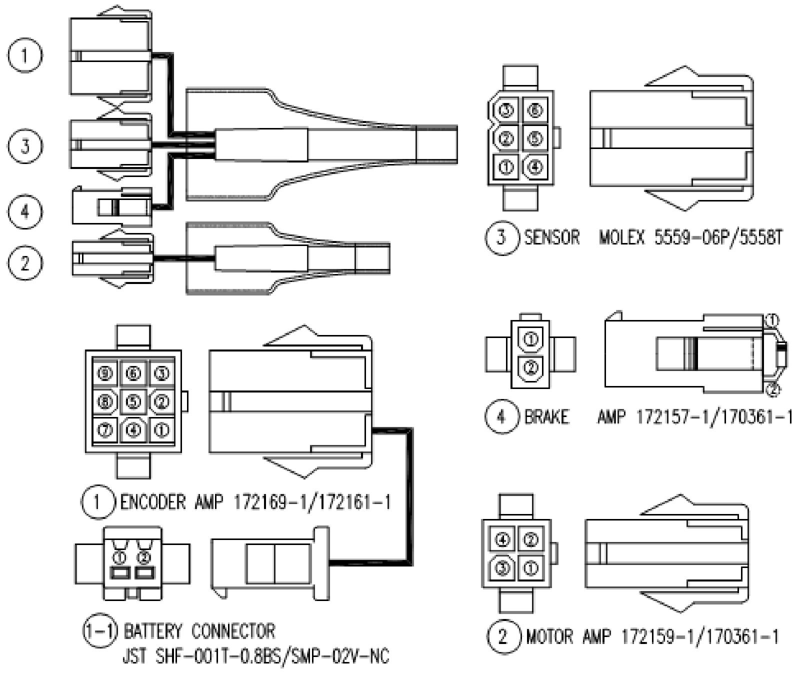
■ **B Connector of motor side**

PIN No	Signal	
	INC	ABS
1	P5V	P5V
2	G5V	G5V
3	PS	PS
4	/PS	/PS
5	CW	-
6	CCW	-
7	P24V	-
8	G24V	-
9	ORG	-
10	BRK+	BRK+
11	BRK-	BRK-
12	FG(ENC)	FG(ENC)
13	FG(MOTOR)	FG(MOTOR)
14	U	U
15	V	V
16	W	W

■ **A CN1 Connector of Controller side**

PIN No	Signal	PIN No	Signal
1	PS	11	-
2	/PS	12	SHIELD
3	-	13	-
4	-	14	-
5	-	15	-
6	-	16	-
7	-	17	-
8	-	18	-
9	G5V	19	P5V
10	-	20	-

19.2.2 RAK1 Robot Cable (HOUSING Type)



■ ① ENCODER Connector

PIN No	Signal	PIN No	Signal
1	BAT+	6	-
2	BAT-	7	P5V
3	FG	8	G5V
4	SD	9	-
5	/SD		

■ (1-1) BATTERY Connector

PIN No	Signal
2	BAT-
1	BAT+

■ ③ SENSOR Connector

PIN No	Signal	
	NX	PX
1	P24V	G24V
2	G24V	P24V
3	CW	CW
4	CCW	CCW
5	ORG	ORG
6	-	-

■ ② MOTOR Connector

PIN No	Signal	PIN No	Signal
1	U	3	W
2	V	4	FG

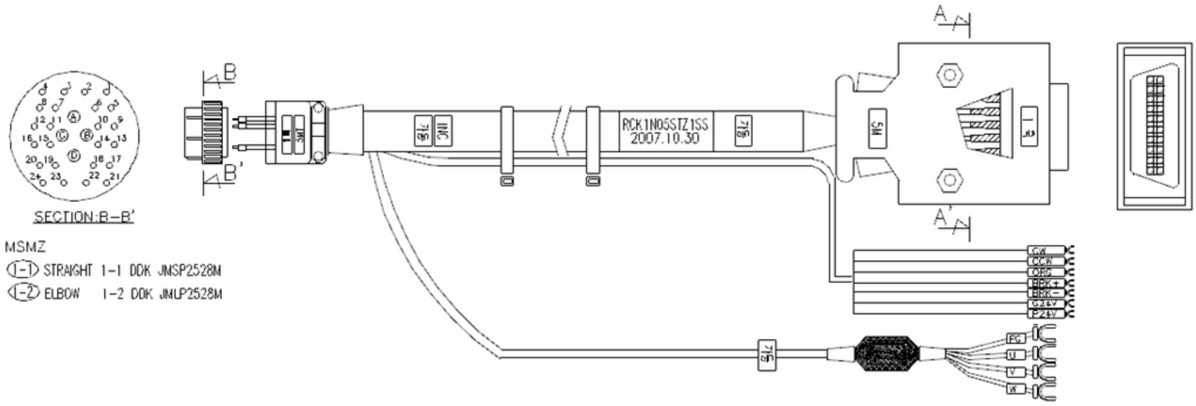
■ ④ BRAKE Connector

PIN No	Signal
1	BRK+
2	BRK-

CAUTION

➢ The battery connector is used for the absolute type controller and added to the housing type

19.2.3 RCK1 Robot Cable (STRAIGHT/ELBOW Type)



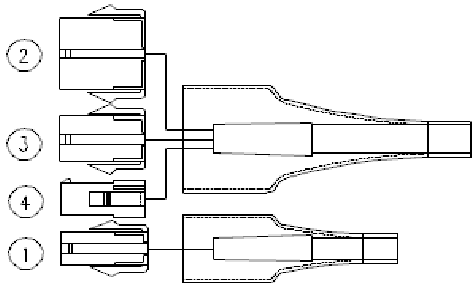
■ **B (Connector of motor side)**

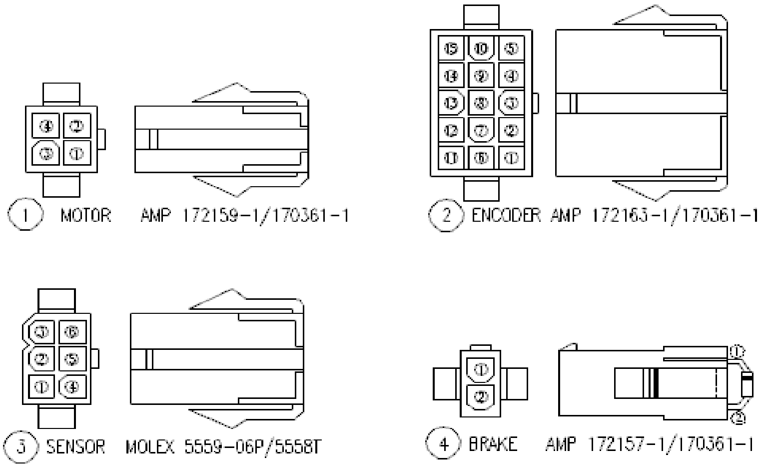
<table>
<tr><th>PIN No</th><th>Signal</th><th colspan="2">PIN No</th><th>Signal</th></tr>
<tr><td>1</td><td>P5V</td><td colspan="2">17</td><td>/CW</td></tr>
<tr><td>2</td><td>-</td><td colspan="2">18</td><td>/CCW</td></tr>
<tr><td>3</td><td>G5V</td><td rowspan="2">19</td><td>NX</td><td>24V</td></tr>
<tr><td>4</td><td>-</td><td>PX</td><td>G24</td></tr>
<tr><td>5</td><td>A</td><td rowspan="2">20</td><td>NX</td><td>G24</td></tr>
<tr><td>6</td><td>/A</td><td>PX</td><td>24V</td></tr>
<tr><td>7</td><td>U</td><td colspan="2">21</td><td>/ORG</td></tr>
<tr><td>8</td><td>/U</td><td colspan="2">22</td><td>BRK+</td></tr>
<tr><td>9</td><td>B</td><td colspan="2">23</td><td>-BRK-</td></tr>
<tr><td>10</td><td>/B</td><td colspan="2">24</td><td>FG</td></tr>
<tr><td>11</td><td>V</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>12</td><td>/V</td><td colspan="2">A</td><td>U</td></tr>
<tr><td>13</td><td>Z</td><td colspan="2">B</td><td>V</td></tr>
<tr><td>14</td><td>/Z</td><td colspan="2">C</td><td>W</td></tr>
<tr><td>15</td><td>W</td><td colspan="2">D</td><td>FG</td></tr>
<tr><td>16</td><td>/W</td><td colspan="2">-</td><td>-</td></tr>
</table>

■ **A (CN1 Connector of controller side)**

PIN No	Signal	PIN No	Signal
1	W	11	/Z
2	/W	12	SHIELD
3	V	13	/B
4	/V	14	Z
5	U	15	/A
6	/U	16	B
7	-	17	-
8	-	18	A
9	G5V	19	P5V
10	-	20	-

19.2.4 RCK1 Robot Cable (HOUSING Type)





■ ① **Motor Connector**

PIN No	Signal	PIN No	Signal
1	U	3	W
2	V	4	FG

■ ② **Encoder Connector**

PIN No	Signal	PIN No	Signal
1	A	9	V
2	/A	10	/V
3	B	11	W
4	/B	12	/W
5	Z	13	P5V
6	/Z	14	G5V
7	U	15	-
8	/U	CASE	SHIELD

■ ③ **Sensor Connector**

PIN No	Signal	
	NX	PX
1	P24V	G24V
2	G24V	P24V
3	CW	CW
4	CCW	CCW
5	ORG	ORG
6	-	-

■ ④ **BRAKE Connector**

PIN No	Signal
1	BRK+
2	BRK-

19.2.5 Serial Cable (RS 232C)

■ COM1

Signal	9pin connector of PC side	15pin connector of Serial side
RxD – TxD	2 (RxD)	3 (TxD)
TxD – RxD	3 (TxD)	2 (RxD)
GND	5	5
DTR. DSR	No. 4. 6 short circuit	-
RTS. CTS	No. 7. 8 short circuit	
SHILED	Connector conductor	

■ COM2

Signal	9pin connector of PC side	15pin connector of Serial side
RxD – TxD	2 (RxD)	10 (TxD2)
TxD – RxD	3 (TxD)	9 (RxD2)
GND	5	5
DTR. DSR	No.4 6 short circuit	-
RTS. CTS	No. 7. 8 short circuit	
SHILED	Connector conductor	

ch.20 PC Communication

20.1 Protocol

- **The Data format to send to a Controller is as follows.**
  1) You have to select and input MY_ID among 1~255 in the PARA-ETC mode of a controller to communicate with RS-485. (MY_ID is currently not implemented.)
  2) If the MY_ID number is "0", RS-232 communication is available with REMOTE terminal. But No RS-485 communication by the RS-485 communication terminal at this time. (Currently not implemented.)

- **Protocol format**
  1) The Protocol is the same to the Protocol used in the UniHost but the ID information should be inserted in the communication Data to communicate with RS-485.
  2) ID format : ID header + ID No.

     ID header : '#'(ASCII code) – 1 Byte data

     ID No. : 1~255(Decimal) or 0x01 ~ 0x20 – 1 Byte data
  3) RS-485 communication packet is as follows.

Transmission shaft	STX	ID header	ID No.	DATA	ETX	LRC	
Reception shaft							ACK

STX: 0x02: Starts communication packet.
ETX : 0x03: Ends communication packet.
ACK: 0x06: Transmitted from the reception side when the received packet data and LRC value are not consistent.
NAK: 0x15: When the received packet data and LRC value are not consistent.
RST: 0x12: When communication time limit has been exceeded.

  4) How to calculate LRC (exclusive-OR except STX, LRC)

     LRC = [ID header]^[ID No.]^DATA[0]^DATA[1]^....^DATA[N]^ETX
  5) If the value of LRC is 0, ETX.

     Ex)Select and read position, integer data in the controller.(In case Y_ID = 1)

STX	'#'	1	'X'	'L'	D1	ETX	LRC						ACK
								STX	D2	DATA	ETX	LRC	

  6) Number of the position or integer(3 bytes) + position or integer variable(3 bytes) -4 bytes
  7) 0x30(OK flag)
  8) DATA : Data that stored in the position or interger variable.

ch.21 Cautions on installing Servo Motor

21.1 Check item when the goods arrives

- Please check item when the goods arrives as bellows.
  1) Confirm in the NAME PLATE of Motor whether the goods accords with the ordered product or not.
  2) Confirm the appearance where there is trouble or not.
  3) Confirm a MOTOR whether the output axis rotates softly by hand or not.
     (But, if does not rotate in attaching with BRAKE)
  4) Confirm whether the connection part of screw loses or not.
  5) If there is the above problem, contact our company.

21.2 Measures before the installation

- Since the paint against rust is painted during preservation in the axis part or FLANGE part of AC SERVO MOTOR, wipe this with the thinner before installation at this time, be careful lest other part the thinner should smear.

21.3 Selection good place to install

- Generally, it makes it a rule to install indoors. use it in the following circumstance.
  1) The place where there is no corrosive and explosive GAS.
  2) The palce where the temperature is 0~+40℃.
  3) The place where it is well ventilated, dust or mote and humidity are few.
  4) The place where it is easy to clean and check.

  - AC SERVO MOTOR can be protected form little oil and water by the basic structure. Howerve, in case of using it in a lot of water and oil, work out a counter measure by attaching with the extra COVER.

21.4 Use circumstance

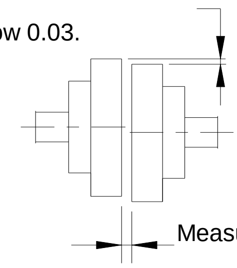
- Neighboring temperature : 0~40℃
- Preservation temperature : -20~+80℃
- Humidity : 80%RH(Max)

21.5 Combination with the opposite machinery

- It is important to accord the axis center of MOTOR axis and opposite machinery. Otherwise, it will cause vibration and it is possible to damage the BEARING.

- If installing the COUPLING, relieve the shock lest the excessive power should act on axis and BEARING by using the rubber hammer.(see Figure1)

- Figure1.



21.6 Allowable laod of BEARING

- Be careful lest the excessive RADIAL load, THRUST load should be given to AC SERVO MOTOR

21.7 Check item when testing the operation

- Check the following items before the test operation.
  1) Whether the connection with machinery and equipment, wiring, FUSE, grounding is done well or not
  2) Where the each connection has the looseness or not
  3) Whether in case of the attachment type with OIL-SEAL, it is damaged or the oil is given to it, or not

  If the above should occur, take a proper measure immediately. Also during the test operation, AC SERVO MOTOR should be operated without load to prevent from the unexpected accident. Unavoidably, in case of the test operation with opposite machinery, operate it in a condition that the emergency stop is possible

21.8 Maintenance and Inspections

- The maintenance of AC SERVO MOTOR is enough with the ordinary simple check because there is no abrasion. See the below table.
- Check this in proper time according to the use circumstance and condition, since the check time in the table is reference.
- Also, do not disjoint AC SERVO MOTOR. Unavoidably, in case of the disjoint, call our company.

M & I	Check time	Check and cleaning Method	Remarks
Vibration and noise	Every day	By the sense of touch and hearings	The change and increase of level should not be existed comparing to the ordinary times
Appearance	Depends on the stain and damage	Clean with a piece of cloth and an air	
Insulation resistance	Every year	Lose the contact with the control layer and measure the terminal with 500 V Megger	Refer to our company in case of less than 10MΩ
OIL-SEAL	5,000 Hours	Check the state of damage by separating it from the machinery	The exchange is necessary in case of the damage
Overall check	20,000 Hours or 5 year	Contact to our company.	Exchange and clean

21.9 Problem and Measures

- In case when the trouble occurred during the operation, treat a trouble properly with the method of the below table. In case when the trouble is not revised despite the examination and measure as below, call our company.

Symptom	Cause	Inspection Technique	Troubleshooting
A Motor does not work	The Motor terminal voltage declined	Measure the Motor Lead terminal by TESTER	Rated voltage.
	Inferiority of motor		Change the Motor in case of rated voltage.
	Excessive heavy load	Driving with no load.	In case when the Motor is oper-rated, reduce the load or replace with big capacity Motor.
	Connection is loosed Failure of external wiring	Check the connection by a screw drive, check the wiring.	Tighten up the loosed part, wire correctly with consulting the connection chart.
The rotation is not stable	Inferiority of Connection	Check the contact of Motor LEAD terminal.	Maintenance the wrong part.
The Motor is overheated	The neighboring temperature is high	Confirm whether the neighboring temperature is less than 40℃ or not.	Confirm whether the neighboring temperature is less than 40℃ or not.
	The surface of Motor is stained	Confirm whether other substance is attached on the surface of Motor or not.	
	The excessive load is carried	Driving with no load.	In case when the Motor is operated, reduce the load or replace with big capacity Motor.
The unusal sound is occurred	Inferiority of installation	Check the stat of screw tightness in the installation part and the concentric degree in the connection part	Tighten the screw and revise the wrongly passing in the connection part
	The trouble of BEARING	Inspect the gap near the Bearing and the vibration	Contact to our company.
	Vibration from a relative machine	Check the mechanical moving part for damage or transformation due to foreign material intrusion.	Contact the machine maker.

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