

User's Manual

1-Axis MICRO STEP DRIVE & CONTROLLER

MQ-1A Series



NS SYSTEM Co., Ltd.

NS SYSTEM

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Safety Instructions

(After being familiar with this user's manual, use the MQ-1A Series Micro Drive.)

Do not attempt to install, operate, maintain or inspect the MQ-1A and step motor until you have read through this User's Manual and appended documents carefully.

After reading all, keep the manual well in order that the user of product can easily access it.

In this User's Manual, the safety instruction levels are classified into "DANGER" and "CAUTION".



DANGER : Indicates that incorrect handling may cause hazardous conditions to make the death or severe injury



CAUTION : Indicates that incorrect handling may cause hazardous conditions to make the medium and slight injury to personnel or may cause physical damage.

☞ Note that the "CAUTION" level may lead to a serious result according to conditions.
Please follow the instructions of both levels because they are important to personnel safety.
Be sure to keep it.



DANGER ☞ **To prevent electric shock, note the following:**

- ▶ Operate the switches with dry hand to prevent from an electric shock.
- ▶ The cables should not be damaged, stressed loaded or pinched. Otherwise, you may get an electric shock.
- ▶ The wiring should be done by the professional electrician. There might be the electric shock or fire.



DANGER ☞ **To prevent fire, note the following:**

- ▶ Do not install the MQ-1A and step motor on or near combustibles. Otherwise, a fire may cause.
- ▶ When the MQ-1A has becomes faulty, switch off the main power side.
Continuous flow of a large current may cause a fire.
- ▶ When installing the MQ-1A and step motor in enclosed space, install the cooling fan to make the ambient temperature around the MQ-1A and step motor less than 55℃.



CAUTION ☞ **To prevent injury, note the following:**

- ▶ Care must be taken during the transportation. Falling to the foot may cause the injury.
- ▶ Only the voltage specified in the User's Manual should be applied to each terminal.
Otherwise, a burst, damage, etc. may occur.
- ▶ Connect the terminals correctly to prevent a burst, damage, etc.
- ▶ During power-on or some time after power-off, do not touch the MQ-1A fins, step motor.
Their temperatures may be high and you may get burnt.

 **CAUTION**  **Transportation**

- ▶ Transport the products correctly according to their weights.
- ▶ Do not climb or stand on MQ-1A equipment. Do not put heavy objects on MQ-1A.

 **CAUTION**  **Installation and Storage**

- ▶ Install the MQ-1A in a load-bearing place in accordance with the User's Manual.
- ▶ Leave specified clearance between the MQ-1A and control enclosure walls or other equipment.
- ▶ Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the MQ-1A.
- ▶ For safety of personnel, always cover rotating and moving parts.
- ▶ The step motor with reduction gear must be installed in the specified direction to prevent from oil leakage.
- ▶ Use the MQ-1A and step motor under the following environmental conditions.

Environment		Step Driver (MQ-1A)	Step Motor
Temperature	operate	0°C ~ +55°C (non-freezing)	0°C ~ +40°C ((non-freezing)
	storage	-20°C ~ +65°C ((non-freezing)	-15°C ~ +70°C ((non-freezing)
Humidity	operate	80%RH or less (non-condensing)	80%RH or less (non-condensing)
	storage	90%RH or less (non-condensing)	90%RH or less (non-condensing)
Ambience		Indoor(no direct sunlight) free from corrosive gas, flammable gas, oil mist, dust and dirt	
Altitude		Max. 1000m above sea level	
Vibration		0.6G or less	2.5G or less

 **CAUTION**  **Wiring**

- ▶ Connect the power terminal correctly. Otherwise, the MQ-1A may be damaged.
- ▶ Connect the motor terminal correctly. Otherwise, the MQ-1A may be damaged.
- ▶ Do not install a capacitor, surge absorber or noise filter between the step motor and MQ-1A.
- ▶ The surge absorbing diode installed on the DC output signal relay must be wired in the specified direction. Otherwise, the output damaged by over-current permanently.

 **CAUTION**  **Test run and Usage**

- ▶ Before operation, check the parameter setting. Improper settings cause some machines to perform unexpected operation.
- ▶ Do not change the wiring or do not remove the connector during being energized.
- ▶ Use a noise filter to minimize the influence of electromagnetic interference.
- ▶ Before resetting an alarm, make sure that the run signal is off to prevent an accident running.
- ▶ When any alarm has occurred, eliminate its cause and deactivate the alarm before restarting.

 **CAUTION**  **Maintenance and Inspection**

- ▶ With age, the electrolytic capacitor will deteriorate. To prevent a second accident due to fault, it is recommended to replace the electrolytic capacitor every 5 years when used in general environment.
- ▶ Since the MQ-1A is designed with the electronic circuit, foreign material or dust cause the malfunction, periodic (1 year) cleansing and tightening of screw is required.

CHAPTER 1. FUNCTIONS AND SPECIFICATIONS

1-1. FEATURES AND THE PRODUCT

The NS SYSTEM "MQ-1A" series general purpose micro step motor drive and controller is the full-digital driver for high speed and accuracy by use of 16bit intelligent CPU. It is applicable to wide range of FA fields, not only precision positioning of machine tools and general automatic industrial machines but also line speed control and 1-axis robot control. In addition, the I/O function is able to be applied in the various way such as sensor detection, cylinder control and interface with the host device. Also "SETUP" function makes the first learner operate easily. Serial communication function (RS-232C) allows a PC or similar device to be for parameter setting, remote control, test operation and system monitoring, etc.

"MQ-1A" series is the best micro step driver and controller to realize the fantastic function and cost-effective performance.

■ FEATURES OF PRODUCT

- It is easy to implement complex motions by virtue of the convenient and diverse commands.
- Convenient editing and powerful program check-up make it easier and faster to input program.
- Big program space (4 file X 45 step).
- Owing to the system set-up functions, the design and modification of the system is convenient.
- Interface with external device is easy with the help of large I/O (input:14, output:8).
- It is possible to edit program and parameters by operating loader or PC.
- It is easy to implement the operating panel by virtue of panel type loader.
- Indication of the system's malfunction makes it possible for users to make a fast correction.
- Initial wiring check and corrective maintenance are easily performed by the exact check mode.
- Mechanical systems are safely protected by the following functions : Prevention from leaving off the operation range(over-travel) by H/W & S/W, Driver error detection, Allowed time for home return etc.
- Remote control is available for the following operations : program input, automatic operation, manual operation, system check etc.

1-2. OPERATION MODE

AUTO RUN MODE

An user program is used to control the speed and direction of a step motor and performs precision positioning(100000 pulse/rev.). It is easy to implement complex motions by virtue of the convenient and diverse commands and big program space. It has a scaling factor that is the function to set the pulse movement amount per unit length (mm or inch) or unit revolution (360 deg.).

MANUAL MODE

It performs manual operation by the loader or external switch input. This mode is used for checking of machine and step driver status, measuring machine stroke, deciding desired operation speed etc. Point teaching provides very useful distance input method when the exact estimation of the distance is difficult.

HOME RETURN MODE

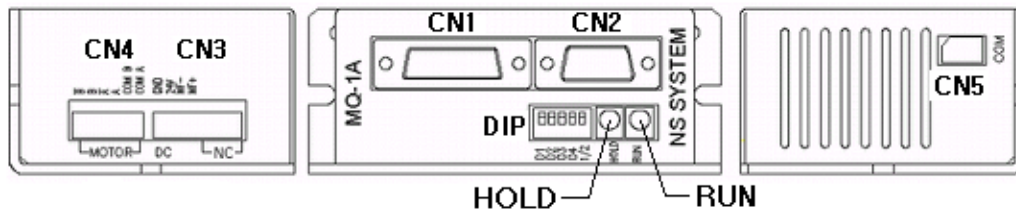
It performs home return operation by the loader or external switch input. After the mechanical home is set by home sensor, the 2nd(work) home can be set by moving the amount of offset value. Mechanical systems are safely protected by the functions of allowed time for home return.

1-3. STANDARD SPECIFICATIONS

Model		MQ-1A C02	MQ-1A C03
Item			
Power supply	Input Voltage	DC 24 ~ 36[V]	
	Input Current	3[A] min.	4[A] min.
Applicable motor	Winding	2/4 phase unipolar step motor	
	Resistance	10[Ω] or less	10[Ω] or less
	Output Current	0.1 ~ 2.2[A]	0.1 ~ 3.0[A]
Excitation Method		Micro step unipolar constant current chopper	
Micro step resolution		4, 5, 8, 10, 15, 16, 20, 25, 30, 32, 40, 50, 64, 100, 200, 500	
Position Unit	Linear system	0.01 / 0.001 [mm] or [inch]	
	Index system	0.01 / 0.001 [deg]	
Max. position	Linear system	±9999.99 / 999.999 [mm] or [inch]	
	Index system	±9999.99 / 999.999 [deg]	
Scaling factor		1/1000 ~ 60000 [pulse/mm], [pulse/inch], [pulse/deg]	
Operation mode		Auto run, Step by step run, Manual run	
Home return		Manual home, File run home, Program home	
Program	Input device	Built-in servo key, Handy loader, Panel loader, PC	
	Capacity	180 step (4 file x 45 step)	
	File selection	Internal parameter or external switch input	
In/out	Input	14 point, photo-coupler isolation	
	Output	8 point, photo-coupler isolation	
Instruction	Positioning	G00(positioning), G05(point positioning), G06(external point positioning), G26(saved point positioning), G99(block positioning), G93(home return), G31(BCD positioning)	
	Continuous run	G22(continuous speed running), G39(position compare jump)	
	Preparatory function	G04(dwelling), G08(acc. time), G90(abs.), G91(inc.), G25(save position), G29(compare position), G92(set coordinate), G94(set home position)	
	Program control	M00(pause), M10,M11,M12,M13(loop control), M30,M31(end program), M40(call subroutine), M42(return to main), M50(jump), M56(ext. jump), M64(error stop), M65(user error stop), M99(no operation), M41(long call), M51(long jump)	
	Counter	M20,M21,M22(work), M23,M24,M25,M26,M27,M28,M29(general)	
	In/out	M60(output on), M61(output off), M62(multi output on), M63(multi output off), M57(multi input compare jump), M70(wait input on), M71(wait input off), M52(input on jump), M53(input off jump)	
	Speed	F00(speed). F10(BCD speed)	
Protective functions	Driver	Over-current	
	Controller	Loader error, H/W limit, S/W limit, home error, emergency stop switch input error, program error	
Option		Panel loader, Handy loader, BCD panel, I/O terminal board, I/O cable, Motor cable, Power cable	
Communication		RS232C (Option)	
Ambient temperature		0~55℃	
Ambient humidity		80%RH or less (non-condensing)	
Insulation resistance		DC 500[V], 10[MΩ] or more	
Structure		Book Type	
Cooling method		Natural air cooling	
Weight		0.23 Kg	

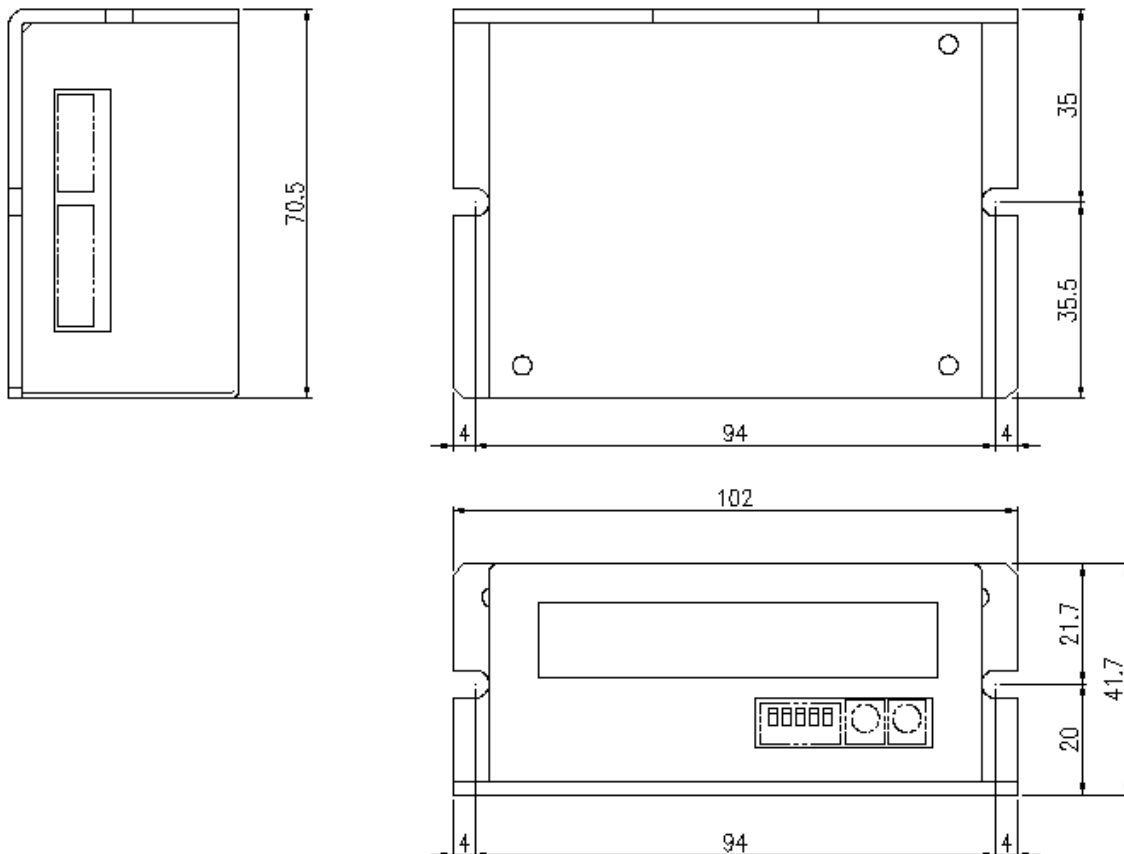
1-4. PARTS IDENTIFICATION AND DIMENSIONS OF MQ-1A

1-4-1. PARTS IDENTIFICATION



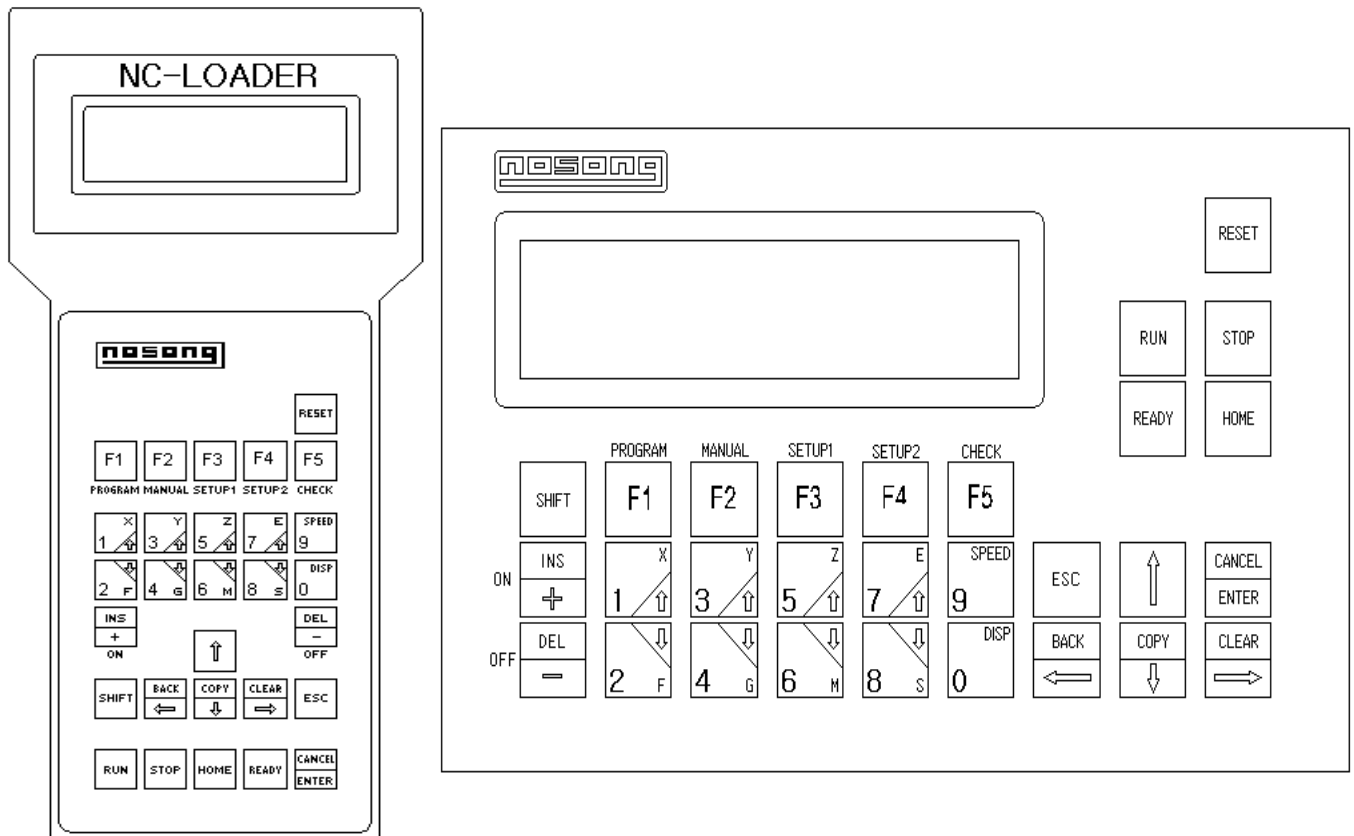
CN1	Connect control input/output signals
CN2	Connect operating loader
CN3	Connect step motor
CN4	Connect power and motor free input
CN5	RS232C Communication
DIP-D1	Micro step resolution setting
DIP-D2	Micro step resolution setting
DIP-D3	Micro step resolution setting
DIP-D4	Micro step resolution setting
DIP-1/2	Factory setting switch (off) Do not change this switch.
RUN	Running current setting volume
HOLD	Holding current setting volume

1-4-2. DIMENSIONS



1-5. PARTS IDENTIFICATION AND DIMENSIONS OF OPERATING LOADER

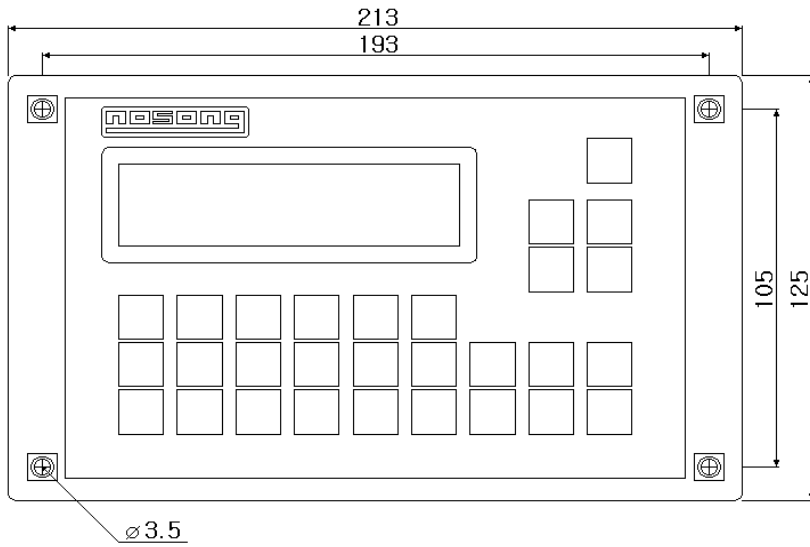
1-5-1. PARTS IDENTIFICATION



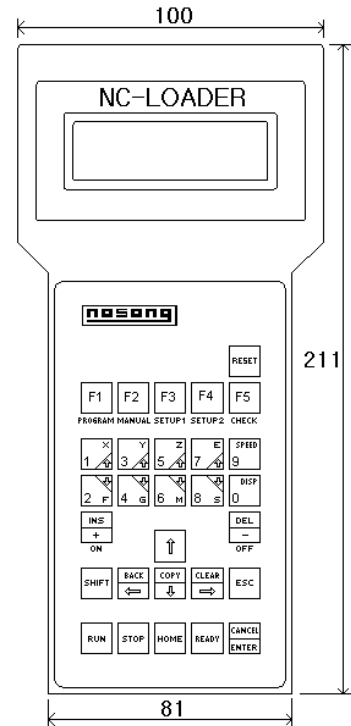
Button	Functions	Button	Functions
RESET	System reset	+	Positiveness of the set data
SHIFT+F1	Program mode	SHIFT+ +	1-STEP Insert of the program
SHIFT+F2	Manual mode	-	Negativeness of the set data
SHIFT+F3	Setup parameter mode	SHIFT+ -	1-STEP Delete of the program
SHIFT+F4	Reserved	SHIFT	Shift (Simultaneous push button)
SHIFT+F5	Check mode	↑	Screen up Manual high speed
1	Number "1"	←	Screen left Manual move (CW)
2	Number "2"	SHIFT+ ←	Delete one character backward
SHIFT+2	Instruction(command) F-code	↓	Screen down Manual jog speed
3	Number "3"	SHIFT+ ↓	Copy program file
4	Number "4"	→	Screen right Manual move (CCW)
SHIFT+4	Instruction(command) G-code	SHIFT+ →	Clear program file
5	Number "5"	ESC	Return to the previous state
6	Number "6"	RUN	Automatic Operation Start
SHIFT+6	Instruction(command) M-code	STOP	Automatic Operation Stop, Home Return Stop
7	Number "7"	HOME	Home Return Start
8	Number "8"	READY	Reserved
9	Number "9"	ENTER	Enter
0	Number "0", Display selection	SHIFT+ENTER	Cancel data input

1-5-2. DIMENSIONS

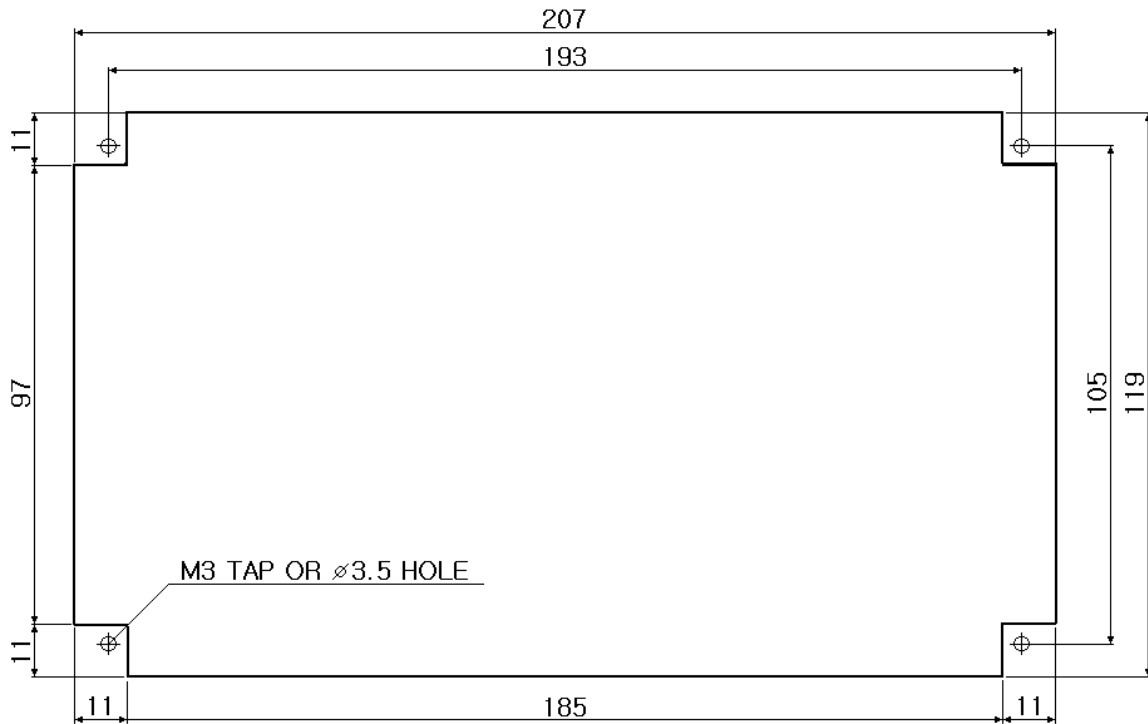
(Dimensions of panel loader)



(Dimensions of handy loader)



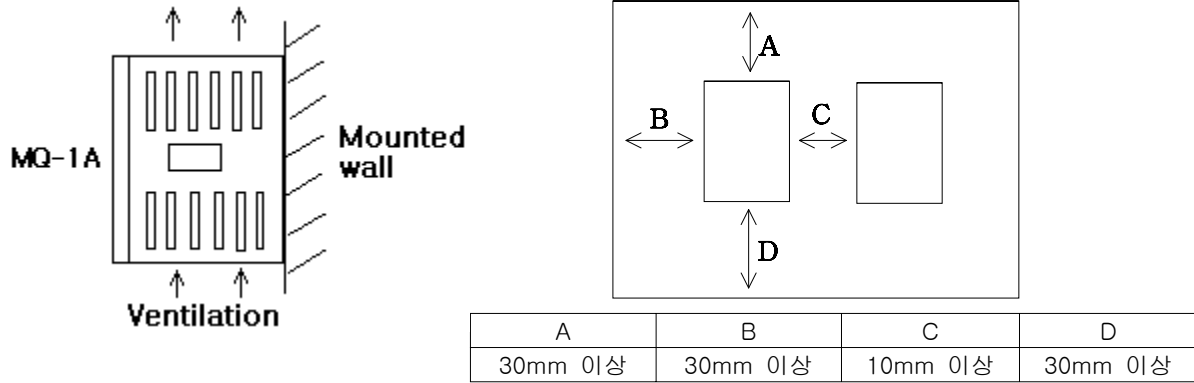
(Dimensions of panel loader cutting)



CHAPTER 2. INSTALLATION

2-1. INSTALLATION DIRECTION AND CLEARANCES

MQ-1A is designed for vertical installation type. For natural cooling, the vertical installation direction should be observed as the following figure. If the ambient temperature excess the allowable temperature range(55℃), the cooling fan should be installed in the control box. Since the ambient temperature has the close relationship with the lifetime, keep it at the lower temperature as possible. Install the MQ-1A under the following clearance conditions.



When installing the MQ-1A in a control box, prevent drill chips and wire fragments from MQ-1A. When installing the control box in a place where there are toxic gas, dirt and dust, provide positive pressure in the control box by forcing in clean air to prevent such materials from entering the control box. The way of clamping the cable must be fully examined so that flexing stress and cable's own weight stress are not applied to the cable connection.

2-2. INSTALLATION OF STEP MOTOR

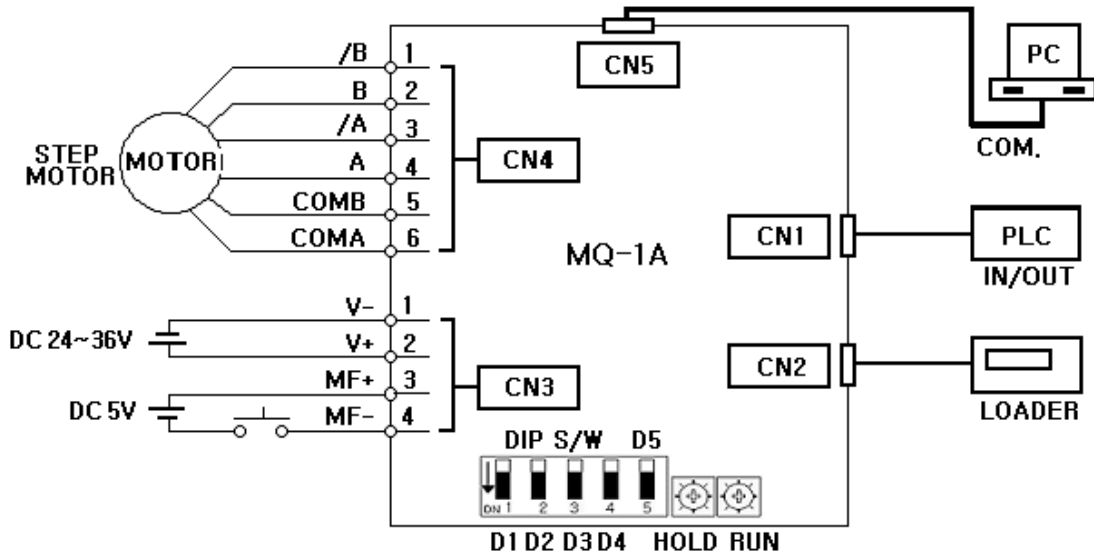
The step motor is available for both vertical and horizontal installation. But since the bad environment of the installation condition affects the lifetime of motor and the unexpected accident, it should be installed according to the following descriptions.

- ☞ Since the rust-preventative is coated on the shaft and flange surface for rust-proof during the preservation, be sure to clean the rust-preventative before installation.
- ☞ The step motor is subject to be used in indoor environment. If there are much water and oil drops around, the cover should be attached.
- ☞ When connecting with load, the shaft of motor should be aligned exactly with that of the counter load. Otherwise, it cause the vibration, acoustic noise and damages.
The concentricity and gap should be less than 3/100mm.
- ☞ The excessive external shock may break the motor bearing.
If the reducer, pulley and coupling are used, do not apply the excessive shock(50G and above) to the motor shaft.

2-3. ENVIRONMENTAL CONDITIONS

Environment		Step driver (MQ-1A)	Servo Motor
Ambient Temperature	operate	0℃ ~ +55℃(non-freezing)	0℃ ~ +40℃((non-freezing)
	storage	-20℃ ~ +65℃((non-freezing)	-15℃ ~ +70℃((non-freezing)
Ambient Humidity	operate	80%RH or less (non-condensing)	80%RH or less (non-condensing)
	storage	90%RH or less (non-condensing)	90%RH or less (non-condensing)
Ambience		Indoor(no direct sunlight) free from corrosive gas, flammable gas, oil mist, dust and dirt	
Altitude		Max. 1000m above sea level	
Vibration		0.6G or less	2.5G or less

CHAPTER 3. SIGNALS AND WIRING
 3-1. CONNECTION DIAGRAM



3-2. MICRO STEP RESOLUTION AND CURRENT SETTING



Res.	1/4	1/5	1/8	1/10	1/15	1/16	1/20	1/25	1/30	1/32	1/40	1/50	1/64	1/100	1/200	1/500
D1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
D2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
D3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
D4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON

RUN Volume: The output current to the motor in rotation is set by the variable resistor "RUN".
 HOLD Volume: The output current to the motor at stationary is set by the variable resistor "HOLD".

Current setting	0	1	2	3	4	5	6	7	8	9	10
RUN Current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
HOLD Current	0%	5%	9%	14%	18%	23%	27%	32%	36%	40%	45%

- ▶ The current value is set by the percent to max. output current (MQ-1AC02=2.2A, MQ-1AC03=3A).
- ▶ When the step resolution is changed after the power supply is turned on, it may not be transmitted.
- ▶ The holding current decreases at approximately 1 second after the last pulse input.

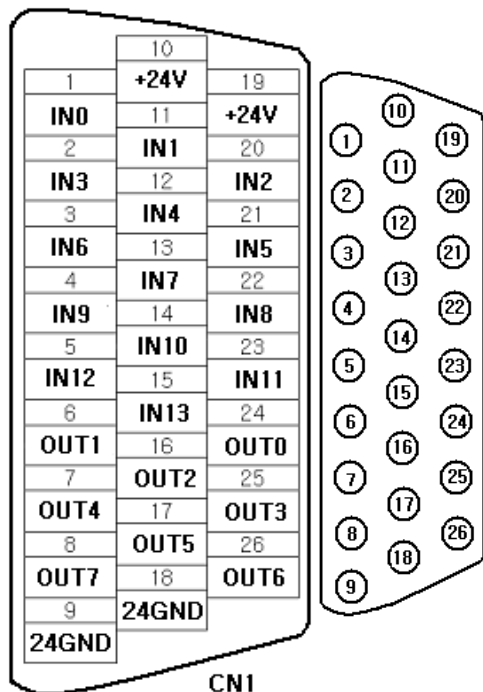
3-3. MOTOR AND POWER CONNECTION

<p>Motor</p> <p>CN4</p> <table border="1"> <tr> <th>No.</th> <th>Motor Wire</th> </tr> <tr> <td>1</td> <td>/B</td> </tr> <tr> <td>2</td> <td>B</td> </tr> <tr> <td>3</td> <td>/A</td> </tr> <tr> <td>4</td> <td>A</td> </tr> <tr> <td>5</td> <td>B COM.</td> </tr> <tr> <td>6</td> <td>A COM.</td> </tr> </table>	No.	Motor Wire	1	/B	2	B	3	/A	4	A	5	B COM.	6	A COM.	<p>Power and Motor Free</p> <p>CN3</p> <table border="1"> <tr> <th>No.</th> <th>Name</th> </tr> <tr> <td>1</td> <td>V- (Input Power)</td> </tr> <tr> <td>2</td> <td>V+ (Input Power)</td> </tr> <tr> <td>3</td> <td>MF+ (Motor Free)</td> </tr> <tr> <td>4</td> <td>MF- (Motor Free)</td> </tr> <tr> <td>5~8</td> <td>No Connection</td> </tr> </table>	No.	Name	1	V- (Input Power)	2	V+ (Input Power)	3	MF+ (Motor Free)	4	MF- (Motor Free)	5~8	No Connection	<p>Wire-side Connector</p> <table border="1"> <tr> <th></th> <th>CN3</th> <th>CN4</th> </tr> <tr> <td>PCB-side</td> <td>SMAW250-08P</td> <td>SMAW250-06P</td> </tr> <tr> <td>Wire-side</td> <td>SMH250-08</td> <td>SMH250-06</td> </tr> <tr> <td>Terminal</td> <td>YST025</td> <td>YST025</td> </tr> <tr> <td>Maker</td> <td>Yeonho(Korea)</td> <td>Yeonho(Korea)</td> </tr> </table>		CN3	CN4	PCB-side	SMAW250-08P	SMAW250-06P	Wire-side	SMH250-08	SMH250-06	Terminal	YST025	YST025	Maker	Yeonho(Korea)	Yeonho(Korea)
No.	Motor Wire																																										
1	/B																																										
2	B																																										
3	/A																																										
4	A																																										
5	B COM.																																										
6	A COM.																																										
No.	Name																																										
1	V- (Input Power)																																										
2	V+ (Input Power)																																										
3	MF+ (Motor Free)																																										
4	MF- (Motor Free)																																										
5~8	No Connection																																										
	CN3	CN4																																									
PCB-side	SMAW250-08P	SMAW250-06P																																									
Wire-side	SMH250-08	SMH250-06																																									
Terminal	YST025	YST025																																									
Maker	Yeonho(Korea)	Yeonho(Korea)																																									

3-4. I/O SIGNALS OF CN1 (CONTROL SIGNALS)

3-4-1. SIGNAL LAYOUTS AND ASSIGNMENT

[CN1 signal layout]



[CN1 signal assignment]

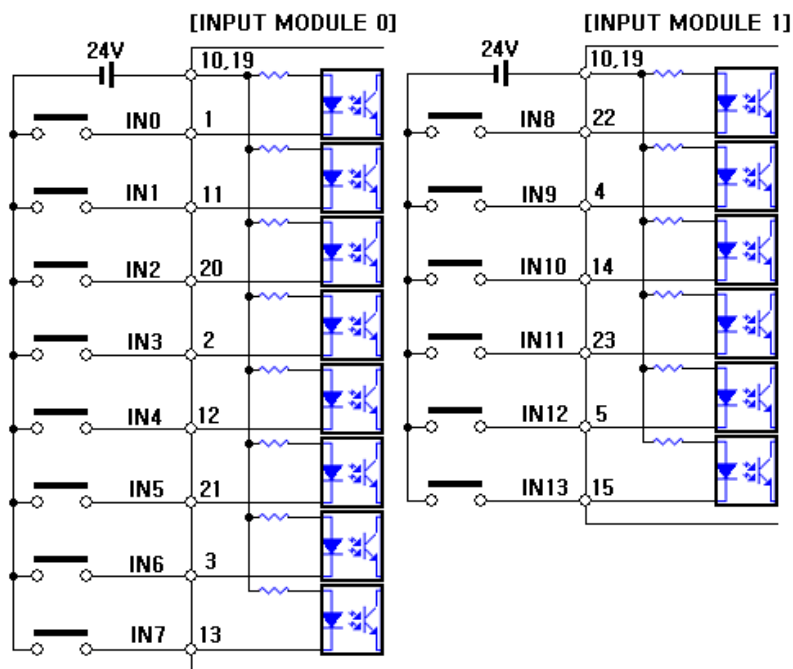
Pin No.	Symbol	Signal Name	Pin No.	Symbol	Signal Name	Pin No.	Symbol	Signal Name
1	IN0	Input0	10	+24V	+24V	19	+24V	+24V
2	IN3	Input3	11	IN1	Input1	20	IN2	Input2
3	IN6	Input6	12	IN4	Input4	21	IN5	Input5
4	IN9	Input9	13	IN7	Input7	22	IN8	Input8
5	IN12	Input12	14	IN10	Input10	23	IN11	Input11
6	OUT1	Output1	15	IN13	Input13	24	OUT0	Output0
7	OUT4	Output4	16	OUT2	Output2	25	OUT3	Output3
8	OUT7	Output7	17	OUT5	Output5	26	OUT6	Output6
9	24GND	24GND	18	24GND	24GND			

3-4-2. INPUT INTERFACE

The power supply for input interface is 24Vdc±10%, 1[A] or more.

The symbol of the ground for 24Vdc is 24GND hereafter.

All input interface signals are isolated by photo-coupler.

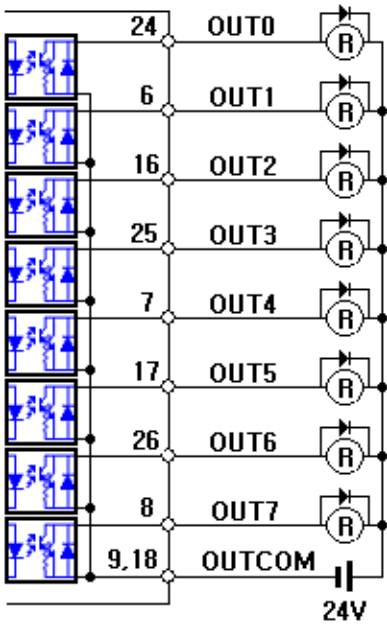


1. It is composed of 2 input modules.

Input module	
Input module 0	IN0 ~ IN7
Input module 1	IN8 ~ IN13

2. Recommended driving current is 10~15 mA.
Never use the direct TTL output for driving circuit.
3. Use a twisted-pair shield cable to minimize the influence of electromagnetic interference.
4. The diode for protection of reverse voltage is installed on the internal circuit.

3-4-3. OUTPUT INTERFACE



All output interface signals are isolated by photo-coupler. Each output port has the capacity of 100Vdc, 120mA. The surge absorbing diode installed on the DC output signal relay must be wired in the specified direction. Otherwise, the output is damaged by over-current permanently.

3-4-4. IN/OUT SIGNALS OF CN1

Name	Pin No.	Functions	I/O										
IN0	1	<p>* INPUT 0 / RUN : Setup-20 "I0/RN" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-touch type of external run input</td> </tr> </table>	0	General-purpose input	1	One-touch type of external run input	I						
0	General-purpose input												
1	One-touch type of external run input												
IN1	11	<p>* INPUT 1 / STOP : Setup-21 "I1/ST" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external stop input --> restart by run input</td> </tr> <tr> <td>2</td> <td>Lock type of external stop input --> restart by itself off</td> </tr> </table> <p>In manual mode, this input determines manual speed when the setting value is "1" or "2",</p> <table border="1"> <tr> <td>Off</td> <td>Manual high speed</td> </tr> <tr> <td>On</td> <td>Manual jog(low) speed</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external stop input --> restart by run input	2	Lock type of external stop input --> restart by itself off	Off	Manual high speed	On	Manual jog(low) speed	I
0	General-purpose input												
1	One-Touch type of external stop input --> restart by run input												
2	Lock type of external stop input --> restart by itself off												
Off	Manual high speed												
On	Manual jog(low) speed												
IN2	20	<p>* INPUT 2 / RESET : Setup-22 "I2/RS" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external reset input</td> </tr> <tr> <td>2</td> <td>Lock type of external emergency stop input (normally open) --> reset by itself off</td> </tr> <tr> <td>3</td> <td>Lock type of external emergency stop input (normally close) --> reset by itself on</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external reset input	2	Lock type of external emergency stop input (normally open) --> reset by itself off	3	Lock type of external emergency stop input (normally close) --> reset by itself on	I		
0	General-purpose input												
1	One-Touch type of external reset input												
2	Lock type of external emergency stop input (normally open) --> reset by itself off												
3	Lock type of external emergency stop input (normally close) --> reset by itself on												
IN3	2	<p>* INPUT 3 / MANUAL : Setup-23 "I3/MN" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Lock type of external manual mode input</td> </tr> </table>	0	General-purpose input	1	Lock type of external manual mode input	I						
0	General-purpose input												
1	Lock type of external manual mode input												

Name	Pin No.	Functions	I/O						
IN4	12	<p>* INPUT 4 / HOME : Setup-24 "I4/HM" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external home input</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external home input	I		
0	General-purpose input								
1	One-Touch type of external home input								
IN5	21	<p>* INPUT 5 / HOME SENSOR : Setup-25 "I5/HS" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Home sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Home sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Home sensor (normally open)	2	Home sensor (normally close)	I
0	General-purpose input								
1	Home sensor (normally open)								
2	Home sensor (normally close)								
IN6	3	<p>* INPUT 6 / LEFT(CW) LIMIT SENSOR : Setup-26 "I6/LL" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Left(CW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Left(CW) limit sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Left(CW) limit sensor (normally open)	2	Left(CW) limit sensor (normally close)	I
0	General-purpose input								
1	Left(CW) limit sensor (normally open)								
2	Left(CW) limit sensor (normally close)								
IN7	13	<p>* INPUT 7 / RIGHT(CCW) LIMIT SENSOR : Setup-27 "I7/RL" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Right(CCW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Right(CCW) limit sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Right(CCW) limit sensor (normally open)	2	Right(CCW) limit sensor (normally close)	I
0	General-purpose input								
1	Right(CCW) limit sensor (normally open)								
2	Right(CCW) limit sensor (normally close)								
IN8	22	<p>* INPUT 8 / LEFT(CW) MANUAL MOVE : Setup-28 "I8/LM" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External left(CW) manual move input</td> </tr> </table>	0	General-purpose input	1	External left(CW) manual move input	I		
0	General-purpose input								
1	External left(CW) manual move input								
IN9	4	<p>* INPUT 9 / RIGHT(CCW) MANUAL MOVE : Setup-29 "I9/RM" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External right(CCW) manual move input</td> </tr> </table>	0	General-purpose input	1	External right(CCW) manual move input	I		
0	General-purpose input								
1	External right(CCW) manual move input								
IN10	14	<p>* INPUT 10 / BCD BIT 0 Basically, it is used for general-purpose input. When BCD function is used, it is used for bit 0 position of BCD input.</p>	I						
IN11	23	<p>* INPUT 11 / BCD BIT 1 Basically, it is used for general-purpose input. When BCD function is used, it is used for bit 1 position of BCD input.</p>	I						
IN12	5	<p>* INPUT 12 / BCD BIT 2 Basically, it is used for general-purpose input. When BCD function is used, it is used for bit 2 position of BCD input.</p>	I						
IN13	15	<p>* INPUT 13 / BCD BIT 3 Basically, it is used for general-purpose input. When BCD function is used, it is used for bit 3 position of BCD input.</p>	I						
+24V	10 19	<p>* +24V It is +24V common terminal for all input.</p>							

Name	Pin No.	Functions	I/O				
OUT0	24	<p>* OUTPUT 0 / RUNNING MONITOR : Setup-31 "O0/RN" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Running monitor output</td> </tr> </table>	0	General-purpose output	1	Running monitor output	O
0	General-purpose output						
1	Running monitor output						
OUT1	6	<p>* OUTPUT 1 / ERROR MONITOR : Setup-32 "O1/ER" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Error monitor output</td> </tr> </table>	0	General-purpose output	1	Error monitor output	O
0	General-purpose output						
1	Error monitor output						
OUT2	16	<p>* OUTPUT 2 / MACHINE READY MONITOR : Setup-33 "O2/MR" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Machine ready monitor output</td> </tr> </table>	0	General-purpose output	1	Machine ready monitor output	O
0	General-purpose output						
1	Machine ready monitor output						
OUT3	25	<p>* OUTPUT 3 It is used for general-purpose output.</p>	O				
OUT4	7	<p>* OUTPUT 4 / HOMING MONITOR : Setup-35 "O4/HM" determines it's function.</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Homing monitor output</td> </tr> </table>	0	General-purpose output	1	Homing monitor output	O
0	General-purpose output						
1	Homing monitor output						
OUT5	17	<p>* OUTPUT 5 It is used for general-purpose output.</p>	O				
OUT6	26	<p>* OUTPUT 6 It is used for general-purpose output.</p>	O				
OUT7	8	<p>* OUTPUT 7 It is used for general-purpose output.</p>	O				
24 GND	9 18	<p>* OUTPUT COMMON AND 24V GROUND It is the output common terminal for all output and 24V ground.</p>					

CHAPTER 4. SETUP PARAMETER MODE

4-1. DEFINITION OF SETUP PARAMETER

Setup means the act of input the basic information about mechanical system (parameter) into controller by the manufacturer of the system. Therefore, users must be careful when they want to change the setup parameters. For the trouble shooting and maintenance, the setting value of parameters are in need of document recording.

4-2. SELECTION OF SETUP PARAMETER MODE

If you push the button "SHIFT+F3" in run ready state, you can select the setup parameter mode in the following display.

00	-	F I L E #	-	+	000000	
01	-	B S S P D	-	+	001000	< Setup parameter edit mode>

No. Name Sign Setting value

No. : Setup parameter no. (00~63)
Name : Setup parameter name
Sign : Sign of setting value
Value : Setting value

4-3. OPERATION OF THE LOADER

A. Screen shift

The cursor () on the screen moves up and down if you push the button UP, DOWN (↑,↓) on the front panel. When the cursor () is on the first row, the screen is up if you push button UP (↑). When the cursor () is on the second row, the screen is down if you push button DOWN (↓). For notifying the last setup line to the user, the screen displays as follows.

63	-	X X X X X	-	+	000000	
<<	E N D	O F	F I L E	>>		< The last line >

B. Selection of the set-up number

The screen displays the contents of selected setup number if the desired number is typed when the cursor is placed at the first letter of the number by using the button LEFT, RIGHT (←,→).

C. Input of the setup value

If the cursor is placed at the 'Sign' position and the sign button (+, -) is pushed, the present value is cleared and the cursor is placed at the first of the value position (6 figures). If you enter the desired number of value (data) and push "ENTER" button at this state, the value is memorized and the cursor is down to the next row. If the value is out of the allowed range, the data cannot be entered and the cursor returns to the 'Sign' position. **In case the input number is wrong**, move the cursor to the desired position and input the right number again. A button "SHIFT + BACK" is used for the function of backspace. For the cancellation of the changing value, push the button "SHIFT + CANCEL" then return to the original value.

D. Return to the run ready state

If you push the button "ESC", the system returns to the run ready state.

At this time, all setup parameters are saved into the memory. Therefore, never power off before return to the run ready state.

4-4. DETAILED DESCRIPTION OF SETUP PARAMETERS

No.	Name	Description	Range																					
			Min.	Max.																				
00	FILE#	<p>* PROGRAM FILE NUMBER</p> <p>The file number to be run in automatic operation is set. There are 4 files (00~03) and each file is composed of 45 steps. If the setting value is 4, The file number to be run in automatic operation is determined by external BCD input (input-13,12) from the master device (PLC, switches, etc.)</p> <table border="1"> <tr> <td>0 ~ 3</td> <td>Setting value determines the file number of auto-operation</td> </tr> <tr> <td>4</td> <td>External BCD input (input-13,12) determines the file number of auto-operation</td> </tr> </table>	0 ~ 3	Setting value determines the file number of auto-operation	4	External BCD input (input-13,12) determines the file number of auto-operation	0	4																
0 ~ 3	Setting value determines the file number of auto-operation																							
4	External BCD input (input-13,12) determines the file number of auto-operation																							
01	BSSPD	<p>* BASIC SPEED</p> <p>Basic operation speed in automatic operation when it is not set by the program instruction (F00). The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed. The unit is pps.</p>	2	8000																				
02	XXXXX	* RESERVED	0	1																				
03	BSACC	<p>* BASIC ACCELERATION AND DECELERATION TIME</p> <p>Basic acceleration/deceleration time in automatic operation when it is not set by the program instruction (G08). The unit is 0.01sec.</p>	0	100																				
04	BSDIM	<p>* BASIC COORDINATE SYSTEM</p> <p>Basic coordinate system in automatic operation when it is not set by program instruction (G90) or (G91).</p> <table border="1"> <tr> <td>0</td> <td>Absolute coordinate</td> </tr> <tr> <td>1</td> <td>Incremental(Relative) coordinate</td> </tr> </table>	0	Absolute coordinate	1	Incremental(Relative) coordinate	0	1																
0	Absolute coordinate																							
1	Incremental(Relative) coordinate																							
05	BUNIT	<p>* BASIC UNIT</p> <p>It determines the minimal movement unit of coordinate system.</p> <table border="1"> <thead> <tr> <th rowspan="2">Unit</th> <th colspan="3">Setting value : Setup-05 "BUNIT"</th> </tr> <tr> <th>0</th> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Setup-43 "INDEX"</td> <td>0=mm</td> <td>0.01 mm</td> <td>0.001 mm</td> <td>0.1 mm</td> </tr> <tr> <td>1=inch</td> <td>0.01 inch</td> <td>0.001 inch</td> <td>0.1 inch</td> </tr> <tr> <td>2=deg</td> <td>0.01 deg</td> <td>0.001 deg</td> <td>0.1 deg</td> </tr> </tbody> </table>	Unit	Setting value : Setup-05 "BUNIT"			0	1	2	Setup-43 "INDEX"	0=mm	0.01 mm	0.001 mm	0.1 mm	1=inch	0.01 inch	0.001 inch	0.1 inch	2=deg	0.01 deg	0.001 deg	0.1 deg	0	1
Unit	Setting value : Setup-05 "BUNIT"																							
	0	1	2																					
Setup-43 "INDEX"	0=mm	0.01 mm	0.001 mm	0.1 mm																				
	1=inch	0.01 inch	0.001 inch	0.1 inch																				
	2=deg	0.01 deg	0.001 deg	0.1 deg																				
06	MANSP	<p>* MANUAL HIGH SPEED</p> <p>Settings of the speed in high speed manual operation. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed. The unit is pps.</p>	2	8000																				
07	JOGSP	<p>* MANUAL JOG(LOW) SPEED</p> <p>Settings of the speed in jog(low) speed manual operation. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed. The unit is pps.</p>	2	8000																				

No.	Name	Description	Range	
			Min.	Max.
08	MACCT	<p>* MANUAL ACCELERATION AND DECELERATION TIME</p> <p>Settings of the acceleration/deceleration time for manual operation. The unit is 0.01sec.</p>	0	100
09 10	SCALE DSCAL	<p>* 09 : NUMERATOR OF MACHINE SCALE</p> <p>* 10 : DENOMINATOR OF MACHINE SCALE</p> <hr/> <p>1. IN CASE OF LINEAR MOTION SYSTEM (SETUP-43 "INDEX" = 0 or 1)</p> <p>If the Setup-43 "INDEX" is set in "0", mm unit is available. If the Setup-43 "INDEX" is set in "1", inch unit is available. Setting of the number of pulses required when it moves 1 mm(inch). In general case, only setup-09 "SCALE" determines the machine scale and setup-10 "DSCAL" is set in "1". Don't make a fractional case that degrades the precision of machine, as soon as possible. If machine scale is a fraction that has a decimal point, user can raise up precision by the setup-10 "DSCAL".</p> <p>[Example 1] Case of fixed number</p> <p>Micro step resolution : 10 Pulse/revolution : 200 X 10 = 2000 ppr Ball screw pitch : 10 mm(inch) Pulse/1mm(inch) : 2000pulse / 10 = 200 [pulse/mm(inch)] Setup-09 "SCALE" = 200 Setup-10 "DSCAL" = 1</p> <p>[Example 2] Case of fraction number (Don't make this case as possible as)</p> <p>Micro step resolution : 25 Pulse/revolution : 200 X 25 = 5000 ppr Ball screw pitch : 6 mm(inch) Pulse/1mm(inch) : 5000/6 = 833.33 = 8333/10 [pulse/mm(inch)] Setup-09 "SCALE" = 8333 Setup-10 "DSCAL" = 10</p> <hr/> <p>2. IN CASE OF INDEX MOTION SYSTEM (SETUP-43 "INDEX" = 2)</p> <p>In case of index system, setup-43 "INDEX" is set in "2". Setting value determines the number of pulses required when it moves 1 revolution (360 deg). For detailed description, refer to setup-43 "INDEX"</p>	1 1	60000 1000

No.	Name	Description	Range					
			Min.	Max.				
11	HTIME	<p>* ALLOWABLE HOME TIME</p> <p>Setting of the allowed time for home return. The unit is 0.1sec. If home return is not successful within the allowed time owing to the malfunction of home sensor, step driver, mechanical error, etc., home return stops and error message ("HOME OVER TIME") is displayed. The time is infinite (ignored) when the value is set in "0". For safety operation, be sure to use this function.</p>	0	250				
12	HTYPE	<p>* HOME SENSOR OFF-EDGE DETECTION</p> <p>Setting the method of home sensor off-edge detection for the exact home position. 0 : off-edge detection by opposite direction to the home start. 1 : off-edge detection by same direction with the home start.</p> <p>If the setting value of home offset (Setup-19 "HMOFF") is available, home offset movement action is performed. It is used for the work home position or precision adjustment of machine home position.</p>	0	1				
13	HFILE	<p>* COMPLEX HOME RETURN</p> <p>Setting the program file number for complex home return.</p> <table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">-1</td> <td style="text-align: center;">General home return</td> </tr> <tr> <td style="text-align: center;">0 ~ 3</td> <td style="text-align: center;">Program file number for complex home return</td> </tr> </table> <p>It provides an another home return function which requires complex motion (general home, additional motion, in/out functions, etc.).</p>	-1	General home return	0 ~ 3	Program file number for complex home return	-1	+3
-1	General home return							
0 ~ 3	Program file number for complex home return							
14	XXXXX	* RESERVED	0	1				
15	HMSPD	<p>* HOME HIGH SPEED</p> <p>Setting of the high home return speed to find home sensor. The unit is pps. Also, this speed is applied when home offset movement is done. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed. [Note] The width of the sensor detection dog of the home, left limit, right limit sensor should be so wide that the system does not pass the sensor even when it decelerates and stops at high speed. If the width is too narrow, the system will pass the sensor when it decelerates and stops. So, the system may consider the wrong point as the home.</p>	2	8000				

No.	Name	Description	Range											
			Min.	Max.										
16	HMCSP	<p>* HOME CREEP SPEED</p> <p>Setting of the creep speed to find exact off-edge position after the detection of home sensor in home return process. The unit is pps. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed.</p> <p>[Note] If the setting value is too high, it may cause a malfunction of search for the exact home sensor off-edge position.</p>	2	1000										
17	HMACC	<p>* HOME ACCELERATION / DECELERATION TIME</p> <p>Setting of acc./dec. time to start high speed home return or to stop when the home sensor is detected. The unit is 0.01sec.</p> <p>[Note] If the acceleration/deceleration time is too long, the system will pass the sensor when it decelerates and stops.</p>	0	100										
18	HMDIR	<p>* HOME RETURN DIRECTION</p> <p>Setting of the starting direction of home return.</p> <table border="1"> <tr> <td>0</td> <td>Start CW-direction</td> </tr> <tr> <td>1</td> <td>Start CCW-direction</td> </tr> </table> <p>If it meets the limit, it moves back to the opposite direction to find the home sensor. if there is only home sensor (no limit sensors), home sensor should be installed at the end of one side and home return direction should be proper for the case.</p>	0	Start CW-direction	1	Start CCW-direction	0	1						
0	Start CW-direction													
1	Start CCW-direction													
19	HMOFF	<p>* HOME OFFSET POSITION</p> <p>After the mechanical home is set by home sensor, the 2nd home (work home) is set by moving the amount of offset value. The unit of offset value is determined by Setup-05 "BUNIT", moving speed is determined by Setup-15 "HMSPD" and acc./dec. time is determined by Setup-17 "HMACC".</p> <p>The 2nd home is called work home that is mainly used for the working coordinate. "+" moves in CW-direction. "-" moves in CCW-direction. After the 2nd home is completed, coordinate value is cleared.</p> <p>If G94 is processed in the program, the present coordinate value changes to the home offset position data.</p>	-999999	+999999										
20	I0/RN	<p>* INPUT 0 / RUN</p> <p>Determine whether the input 0 is used for "general-purpose input" or "external run input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-touch type of external run input</td> </tr> </table>	0	General-purpose input	1	One-touch type of external run input	0	1						
0	General-purpose input													
1	One-touch type of external run input													
21	I1/ST	<p>* INPUT 1 / STOP</p> <p>Determine whether the input 1 is used for "general-purpose input" or "external stop input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external stop input-->restart by run input</td> </tr> <tr> <td>2</td> <td>Lock type of external stop input --> restart by itself off</td> </tr> </table> <p>In manual mode, this input determines manual speed when the setting value is "1" or "2",</p> <table border="1"> <tr> <td>Off</td> <td>Manual high speed</td> </tr> <tr> <td>On</td> <td>Manual jog(low) speed</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external stop input-->restart by run input	2	Lock type of external stop input --> restart by itself off	Off	Manual high speed	On	Manual jog(low) speed	0	2
0	General-purpose input													
1	One-Touch type of external stop input-->restart by run input													
2	Lock type of external stop input --> restart by itself off													
Off	Manual high speed													
On	Manual jog(low) speed													

No.	Name	Description	Range									
			Min.	Max.								
22	I2/RS	<p>* INPUT 2 / RESET</p> <p>Determine whether the input 2 is used for "general-purpose input" or "external reset input" or "external emergency stop input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external reset input</td> </tr> <tr> <td>2</td> <td>Lock type of external emergency stop input (normally open) --> reset by itself off</td> </tr> <tr> <td>3</td> <td>Lock type of external emergency stop input (normally close) --> reset by itself on</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external reset input	2	Lock type of external emergency stop input (normally open) --> reset by itself off	3	Lock type of external emergency stop input (normally close) --> reset by itself on	0	3
		0	General-purpose input									
		1	One-Touch type of external reset input									
		2	Lock type of external emergency stop input (normally open) --> reset by itself off									
3	Lock type of external emergency stop input (normally close) --> reset by itself on											
23	I3/MN	<p>* INPUT 3 / MANUAL</p> <p>Determine whether the input 3 is used for "general-purpose input" or "external manual mode input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Lock type of external manual mode input</td> </tr> </table>	0	General-purpose input	1	Lock type of external manual mode input	0	1				
		0	General-purpose input									
		1	Lock type of external manual mode input									
24	I4/HM	<p>* INPUT 4 / HOME</p> <p>Determine whether the input 4 is used for "general-purpose input" or "external home input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external home input</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external home input	0	1				
		0	General-purpose input									
		1	One-Touch type of external home input									
25	I5/HS	<p>* INPUT 5 / HOME SENSOR</p> <p>Determine whether the input 5 is used for "general-purpose input" or "external home sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Home sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Home sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Home sensor (normally open)	2	Home sensor (normally close)	0	2		
		0	General-purpose input									
		1	Home sensor (normally open)									
		2	Home sensor (normally close)									
26	I6/LL	<p>* INPUT 6 / LEFT(CW) LIMIT SENSOR</p> <p>Determine whether the input 6 is used for "general-purpose input" or "external left(CW) limit sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Left(CW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Left(CW) limit sensor (normally close)</td> </tr> </table> <p>Left/right limit direction may change according to the installed method of motor. In this case, we can change easily the limit direction without hard-wired replacement by Setup-40 "LTDIR".</p>	0	General-purpose input	1	Left(CW) limit sensor (normally open)	2	Left(CW) limit sensor (normally close)	0	2		
		0	General-purpose input									
		1	Left(CW) limit sensor (normally open)									
		2	Left(CW) limit sensor (normally close)									
27	I7/RL	<p>* INPUT 7 / RIGHT(CCW) LIMIT SENSOR</p> <p>Determine whether the input 7 is used for "general-purpose input" or "external right(CCW) limit sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Right(CCW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Right(CCW) limit sensor (normally close)</td> </tr> </table> <p>Left/right limit direction may change according to the installed method of motor. In this case, we can change easily the limit direction without hard-wired replacement by Setup-40 "LTDIR".</p>	0	General-purpose input	1	Right(CCW) limit sensor (normally open)	2	Right(CCW) limit sensor (normally close)	0	2		
		0	General-purpose input									
		1	Right(CCW) limit sensor (normally open)									
		2	Right(CCW) limit sensor (normally close)									

No.	Name	Description	Range					
			Min.	Max.				
28	I8/LM	<p>* INPUT 8 / LEFT(CW) MANUAL Determine whether the input 8 is used for "general-purpose input" or "external left(CW) manual move input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External left(CW) manual move input</td> </tr> </table> <p>The manual move input is available when manual mode is derived from external manual mode input (input 3) and Setup-23 "I3/SM" is set in 2.</p>	0	General-purpose input	1	External left(CW) manual move input	0	1
0	General-purpose input							
1	External left(CW) manual move input							
29	I9/RM	<p>* INPUT 9 / RIGHT(CCW) MANUAL Determine whether the input 9 is used for "general-purpose input" or "external right(CCW) manual move input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External right(CCW) manual move input</td> </tr> </table> <p>The manual move input is available when manual mode is derived from external manual mode input (input 3) and Setup-23 "I3/SM" is set in 2.</p>	0	General-purpose input	1	External right(CCW) manual move input	0	1
0	General-purpose input							
1	External right(CCW) manual move input							
30	XXXXX	* RESERVED	0	1				
31	O0/RN	<p>* OUTPUT 0 / RUNNING MONITOR Determine whether the output 0 is used for "general-purpose output" or "running monitor output".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Running monitor output</td> </tr> </table>	0	General-purpose output	1	Running monitor output	0	1
0	General-purpose output							
1	Running monitor output							
32	O1/ER	<p>* OUTPUT 1 / ERROR MONITOR Determine whether the output 1 is used for "general-purpose output" or "error monitor output".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Error monitor output</td> </tr> </table>	0	General-purpose output	1	Error monitor output	0	1
0	General-purpose output							
1	Error monitor output							
33	O2/MR	<p>* OUTPUT 2 / MACHINE READY MONITOR Determine whether the output 2 is used for "general-purpose output" or "machine ready monitor output".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Machine ready monitor output</td> </tr> </table>	0	General-purpose output	1	Machine ready monitor output	0	1
0	General-purpose output							
1	Machine ready monitor output							
34	XXXXX	* RESERVED	0	1				
35	O4/HM	<p>* OUTPUT 4 / HOMING MONITOR Determine whether the output 4 is used for "general-purpose output" or "homing monitor output".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Homing monitor output</td> </tr> </table>	0	General-purpose output	1	Homing monitor output	0	1
0	General-purpose output							
1	Homing monitor output							
36	RANGE	<p>* SPEED RANGE FACTOR Setting of the speed range (multiplication) factor. All the setting values relative to the moving speed are multiplied by the designated range factor.</p> <p>Example) 1 : 2 ~ 8000 PPS 2 : 4 ~ 16000 PPS 3 : 6 ~ 24000 PPS</p>	1	12				

No.	Name	Description	Range													
			Min.	Max.												
37	SRTSP	<p>* START SPEED Setting of the starting speed. The unit is pps. Too low value makes the acceleration and deceleration time longer. On the contrary, too high value may give a shock to motor or even not to start. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed. ※ 200[pps] is good for the safe start and fast operating time.</p>	2	250												
38	RS232	<p>* DEVICE ID Used to set the device identity number for the serial communication. The setting value should be "0" when the serial communication is not used. The MQ-1A responds to the request of host when ID. number is matched.</p> <table border="1"> <tr> <td>0</td> <td>Not used</td> </tr> <tr> <td>1 ~ 255</td> <td>ID. Number</td> </tr> </table>	0	Not used	1 ~ 255	ID. Number	0	255								
0	Not used															
1 ~ 255	ID. Number															
39	BRATE	<p>* BAUD RATE Determine the serial communication speed.</p> <table border="1"> <tr> <td>0</td> <td>2400 BPS</td> </tr> <tr> <td>1</td> <td>4800 BPS</td> </tr> <tr> <td>2</td> <td>9600 BPS</td> </tr> <tr> <td>3</td> <td>14400 BPS</td> </tr> </table>	0	2400 BPS	1	4800 BPS	2	9600 BPS	3	14400 BPS	0	3				
0	2400 BPS															
1	4800 BPS															
2	9600 BPS															
3	14400 BPS															
40	LTDIR	<p>* LEFT / RIGHT LIMIT DIRECTION Determine the direction of limit sensors. The definition of default direction and coordinate polarity is as follows.</p> <table border="1"> <tr> <td>Left move</td> <td>"+" direction</td> <td>CW revolution</td> </tr> <tr> <td>Right move</td> <td>"-" direction</td> <td>CCW revolution</td> </tr> </table> <p>Left/right limit direction may change according to the installed method of motor. In this case, we can change easily the limit direction without hard-wired replacement as follows.</p> <table border="1"> <tr> <td>0</td> <td>"+" direction : left(CW) limit,</td> <td>"-" direction : right(CCW) limit</td> </tr> <tr> <td>1</td> <td>"+" direction : right(CCW) limit,</td> <td>"-" direction : left(CW) limit</td> </tr> </table>	Left move	"+" direction	CW revolution	Right move	"-" direction	CCW revolution	0	"+" direction : left(CW) limit,	"-" direction : right(CCW) limit	1	"+" direction : right(CCW) limit,	"-" direction : left(CW) limit	0	1
Left move	"+" direction	CW revolution														
Right move	"-" direction	CCW revolution														
0	"+" direction : left(CW) limit,	"-" direction : right(CCW) limit														
1	"+" direction : right(CCW) limit,	"-" direction : left(CW) limit														
41	SEND+	<p>* + DIRECTION SOFT LIMIT Setting of "+" direction software limit value as 2nd safety protection in addition to the protection by limit switch. If this value is set in "0", this function is invalid. If current position is greater than it, the motion stops and error message ("S/W LIMIT ALARM ") is displayed. Be sure to use this function for safety of operation.</p>	0	999999												
42	SEND-	<p>* - DIRECTION SOFT LIMIT Setting of "-" direction software limit value as 2nd safety protection in addition to the protection by limit switch. If this value is set in "0", this function is invalid. If current position is less than it, the motion stops and error message ("S/W LIMIT ALARM ") is displayed. Be sure to use this function for safety of operation.</p>	-999999	0												

No.	Name	Description	Range					
			Min.	Max.				
43	INDEX	<p>* INDEX MODE If this value is set in "0", mm unit is available. If this value is set in "1", inch unit is available. If this value is set in "2", index mode is available.</p> <p>Index mode changes it's coordinate system from mm(inch) to degree. In case of index system, the formula of machine scale is as follows. SETUP-09 "SCALE" = Pulses per 1 revolution (360 deg) / 100</p> <p>In general case, only setup-09 "SCALE" determines the machine scale and setup-10 "DSCAL" is set in "1". Don't make a fractional case that degrades the precision of machine, as soon as possible. If machine scale is a fraction that has a decimal point, user can raise up precision by the setup-10 "DSCAL".</p> <p>[Example 1] Case of fixed number Micro step resolution : 50 Motor pulse/revolution : 200 X 50 = 10000 ppr Gear reduction : 1 / 4 (Pulse/revolution)/100 : (10000 * 4) / 100 = 400 pulse/360deg. Setup-09 "SCALE" = 400 Setup-10 "DSCAL" = 1</p> <p>[Example 2] Case of fraction number (Don't make this case as possible as) Micro step resolution : 50 Motor pulse/revolution : 200 X 50 = 10000 ppr Gear reduction : 3 / 1 (Pulse/revolution)/100 : 10000/(3*100)=33.333=33333/1000 pulse/360deg. Setup-09 "SCALE" = 33333 Setup-10 "DSCAL" = 1000</p>	0	2				
44	XXXXX	* RESERVED	0	1				
45	DISPL	<p>* LCD DISPLAY Determine the display mode of LCD installed on loader as follows. It can be changed anytime regardless of control state.</p> <table border="1"> <tr> <td>0</td> <td>Current position, selected file no. executed program line</td> </tr> <tr> <td>1</td> <td>Work counter, general purpose counter 0</td> </tr> </table>	0	Current position, selected file no. executed program line	1	Work counter, general purpose counter 0	0	1
0	Current position, selected file no. executed program line							
1	Work counter, general purpose counter 0							
46	1STEP	<p>* STEP BY STEP (1-STEP) RUN If this value is set in "1", the "step by step run" function is available. By executing the user program step by step, the operation of the program can be checked in detail. It is stopped at every 1-step and continuously run by run input.</p>	0	1				
47 ~ 62	PNT00 ~ PNT15	<p>* POINT DATA 00 ~ 15 There are 16 point data which has a special coordinate value. The point data supplies an useful indirect appointment method of target coordinate value. There are two commands which use a point data indirectly. One is "G05", the other is "G06". In case of command "G05", point number is appointed directly from the data of command. In case of command "G06", point number is appointed indirectly from the BCD value of input-13,12,11,10. There are two ways of point data input. One is the direct editing of point data. The other is the indirect point teaching in manual mode</p>	-999999	+999999				
63	XXXXX	* RESERVED	0	1				

CHAPTER 5. PROGRAM MODE

5-1. SELECTION OF PROGRAM MODE

If you push the button "SHIFT+F1" in run ready state, you can select the program edit mode in the following display.

```

00-00-F00+010000
00-01-G08+000010 < Program edit mode >
  A   B   C   D   E

```

A	File number	File number (0~3) to be edited
B	Step number	Step number (00~44) of file
C	Command(code)	Command (G/ M/ F-code)
D	Sign	Sign of setting data (blank in case of no data)
E	Data	Setting data of command (blank in case of no data)

5-2. OPERATION OF THE LOADER

A. Screen shift

The cursor () on the screen moves up and down if you push the button UP, DOWN (↑,↓) on the front panel. When the cursor () is on the first row, the screen is up if you push button UP (↑). When the cursor () is on the second row, the screen is down if you push button DOWN (↓). For notifying the last setup line to the user, the screen displays as follows.

```

00-95-M30
<<END OF FILE>> < The last line >

```

B. Fast shift between the steps

Place the cursor () at step number position by pushing the button (← , →). If the cursor is placed at the first position of step number and the step number (2 figures) is typed, then the desired step is displayed. If the input number is larger than the present file size, the value is ignored and the cursor comes back to the first position.

C. Cancellation of the step number input

In case you input the wrong number, you can cancel the input by pushing the "SHIFT+CANCEL" button.

D. Selection of the file number

The basically displayed file number is the number which is set at the setup-00 "FILE#". If you want to display another file number, you should place the cursor () at the file number position using button (← , →), and then type the file number you want.

E. Input of Command (code)

If you want to input the desired command, you should place the cursor () at the first letter of the command position and then type the character and number you want. The cursor comes back to the first letter of command position if the command does not exist in controller.

F. Cancellation of Command Input

When you typed the wrong number or changed the number by mistake, you can cancel the input and get the previous command by pushing the button "SHIFT+CANCEL".

G. Input of Code Value

The cursor () moves to the first of data position (6 figures) when you push the sign button (+, -) after the cursor is placed the sign position. If you type the number to set data and push the "ENTER" button, the value is memorized and the cursor moves to the next row. If the value is out of the allowed range, the value is not entered and the cursor moves back to the sign position.

H. The case of wrong number input

Place the cursor at the number you want to change and re-enter the correct number. Or, if you push the button "SHIFT+BACK", the cursor moves to left direction and deletes letters one by one.

I. Cancellation of input

If you want to cancel the input value or disappeared by mistake, you can display the previous set value by pushing the button "SHIFT+CANCEL" .

J. Insert (INS)

If you want to add a step to the program, place the cursor at the line you want to insert and then push the button "SHIFT+INS". Then, a new line is inserted where the command become "M99". The next line numbers increase a step automatically.

※ In the insert process a black quadrangle twinkles. Do not reset or power off in that case.

K. Delete (DEL)

If you want to delete a step from the program, place the cursor at the line to delete and then push the button "SHIFT+DEL". Then, the line is deleted and the next line numbers decrease a step automatically.

※ In the delete process a black quadrangle twinkles. Do not reset or power off in that case.

L. File copy

This is for the case when you want to copy all the contents of the file on the screen to another file. The following screen is displayed when you push the button "SHIFT+COPY".

```
T A R G E T   F I L E : [ 0 0 ]
Y E S = E N T E R , N O = E S C
```

If you type the number of target file (to be filled with copied program) in the above file no position, the file number is displayed. For example, the target file number is 2 and if you push "02", the screen displays as follows.

```
T A R G E T   F I L E : [ 0 2 ]
Y E S = E N T E R , N O = E S C
```

Then the file copy is done if you push "ENTER" button.

If you want to cancel the file copy function, push "ESC" button, it will be cancelled.

M. FILE ALL CLEAR

This is for the case when you want to delete all the contents of the file on the screen.

The following screen is displayed when you push the "SHIFT+CLEAR" button.

```
F I L E   A L L   C L E A R ?
Y E S = E N T E R , N O = E S C
```

Then if you push "ENTER" button the file is cleared out to the initial state ("M99").

If you want to cancel the file all clear function, push "ESC" button, it will be cancelled.

N. Initial state of the program

At the initial state when the program input is not made, all area of the program is filled with the command "M99" (No operation command) and the file length is 2 step.

O. Return to run ready state

If you push the "ESC" button, it will return to the run ready state.

5-3. DETAILED DESCRIPTION OF PROGRAM COMMANDS

Command	Description	Range																																																
		Min.	Max.																																															
P O S I T I O N I N G	<p>* POSITIONING</p> <p>Move to the designated position. In case of incremental coordinate system, moving direction is determined by the sign of data and distance is determined by the absolute value of data. In case of absolute coordinate system, moving direction and distance is determined by the relative value between target position and current position.</p>	-999999	+999999																																															
	<p>1. The minimal movement unit of coordinate is as follows.</p> <table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Unit</th> <th colspan="2">Setting value : Setup-05 "BUNIT"</th> </tr> <tr> <th>0</th> <th>1</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Setup-43 "INDEX"</td> <td>0=mm</td> <td>0.01 mm</td> <td>0.001 mm</td> </tr> <tr> <td>1=inch</td> <td>0.01 inch</td> <td>0.001 inch</td> </tr> <tr> <td>2=deg</td> <td>0.01 deg</td> <td>0.001 deg</td> </tr> </tbody> </table> <p>2. The coordinate system is determined as follows. It is pre-determined by the Setup-04 "BSDIM". It is determined by the command(G90,G91) in program when you want.</p> <table border="1"> <thead> <tr> <th>Coordinate system</th> <th>Setup-04 "BSDIM"</th> <th>Command</th> </tr> </thead> <tbody> <tr> <td>Absolute coordinate</td> <td>0</td> <td>G90</td> </tr> <tr> <td>Incremental coordinate</td> <td>1</td> <td>G91</td> </tr> </tbody> </table> <p>3. The positioning speed is pre-determined by the Setup-01 "BSSPD". It is determined by the command (F00) in program when you want.</p> <p>4. The acc./dec. time is pre-determined by the Setup-03 "BSACC". It is determined by the command (G08) in program when you want.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>			Unit		Setting value : Setup-05 "BUNIT"		0	1	Setup-43 "INDEX"	0=mm	0.01 mm	0.001 mm	1=inch	0.01 inch	0.001 inch	2=deg	0.01 deg	0.001 deg	Coordinate system	Setup-04 "BSDIM"	Command	Absolute coordinate	0	G90	Incremental coordinate	1	G91	File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03
Unit		Setting value : Setup-05 "BUNIT"																																																
		0	1																																															
Setup-43 "INDEX"	0=mm	0.01 mm	0.001 mm																																															
	1=inch	0.01 inch	0.001 inch																																															
	2=deg	0.01 deg	0.001 deg																																															
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File	Step	Code	Data	Description																																														
00	00	G91		Declaration of incremental coordinate																																														
00	01	F00	+1000	Speed=1000 pps																																														
00	02	G08	+10	Acc./dec. time=0.1sec																																														
00	03	G00	+10000	Move +100.00 mm																																														
G05	<p>* POSITIONING BY POINT NO.</p> <p>Move to the point data position appointed by command data. Point data exist in Setup area (16 point : Setup-47 ~ Setup-62). This command is mainly used in absolute coordinate system. #. The usage is same as "G00".</p>	0	15																																															
<p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G90</td> <td></td> <td>Declaration of absolute coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G05</td> <td>+1</td> <td>Move to the point data 1 (set by Setup-61)</td> </tr> </tbody> </table>	File			Step	Code	Data	Description	00	00	G90		Declaration of absolute coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G05	+1	Move to the point data 1 (set by Setup-61)																							
File	Step	Code	Data	Description																																														
00	00	G90		Declaration of absolute coordinate																																														
00	01	F00	+1000	Speed=1000 pps																																														
00	02	G08	+10	Acc./dec. time=0.1sec																																														
00	03	G05	+1	Move to the point data 1 (set by Setup-61)																																														

Command		Description			Range																																																		
					Min.	Max.																																																	
P O S I T I O N I N G	G06	<p>* POSITIONING BY BCD.</p> <p>Move to the point data position appointed by external BCD input. Point data exist in Setup area (16 point : Setup-47 ~ Setup-62). This command is mainly used in absolute coordinate system. External BCD input is determined by input-13,12,11,10. The BCD input is useful when you want to select the point no. by external inputs (PLC, switches, etc.) #. The usage is same as "G00".</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G90</td> <td></td> <td>Declaration of absolute coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G06</td> <td></td> <td>Input-13,12,11,10=Off,Off,On,Off, then BCD=2 Move to the point data 2 (set by Setup-62)</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	00	G90		Declaration of absolute coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G06		Input-13,12,11,10=Off,Off,On,Off, then BCD=2 Move to the point data 2 (set by Setup-62)	NO	NO																								
	File	Step	Code	Data	Description																																																		
	00	00	G90		Declaration of absolute coordinate																																																		
00	01	F00	+1000	Speed=1000 pps																																																			
00	02	G08	+10	Acc./dec. time=0.1sec																																																			
00	03	G06		Input-13,12,11,10=Off,Off,On,Off, then BCD=2 Move to the point data 2 (set by Setup-62)																																																			
G26	<p>* POSITIONING BY STORAGE POINT NO.</p> <p>Move to the storage position appointed by command data. Current position is saved by command ("G25","G27","G28") in program. This command is mainly used in absolute coordinate system. It's process is as follows. Save a current position at the desired storage point room, then perform other operation, return to the storage position. #. The usage is same as "G00".</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>G00</td> <td>+10000</td> <td>Move 100.00 mm</td> </tr> <tr> <td>00</td> <td>02</td> <td>G25</td> <td></td> <td>Save the current position to storage point</td> </tr> <tr> <td>00</td> <td>03</td> <td>M10</td> <td>+5</td> <td>Loop (For) = 5</td> </tr> <tr> <td>00</td> <td>04</td> <td>G00</td> <td>+1000</td> <td>Move +10.00 mm</td> </tr> <tr> <td>00</td> <td>05</td> <td>M11</td> <td></td> <td>Loop end (Next)</td> </tr> <tr> <td>00</td> <td>06</td> <td>G90</td> <td></td> <td>Declaration of absolute coordinate</td> </tr> <tr> <td>00</td> <td>07</td> <td>G26</td> <td></td> <td>Move to the storage point (-100.00 mm)</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	G00	+10000	Move 100.00 mm	00	02	G25		Save the current position to storage point	00	03	M10	+5	Loop (For) = 5	00	04	G00	+1000	Move +10.00 mm	00	05	M11		Loop end (Next)	00	06	G90		Declaration of absolute coordinate	00	07	G26		Move to the storage point (-100.00 mm)	NO	NO					
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G93	<p>* HOME RETURN</p> <p>It performs the home return according to the procedure set by Setup parameters. The Setup parameters relative to home return are as follows.</p> <table border="1"> <thead> <tr> <th>Setup</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>HTIME</td> <td>Allowable home time</td> </tr> <tr> <td>12</td> <td>HTYPE</td> <td>Home sensor off-edge detection</td> </tr> <tr> <td>13</td> <td>HFILE</td> <td>Complex home return</td> </tr> <tr> <td>15</td> <td>HMSPD</td> <td>Home high speed</td> </tr> <tr> <td>16</td> <td>HMCSP</td> <td>Home creep speed</td> </tr> <tr> <td>17</td> <td>HMACC</td> <td>Home acc./dec. time</td> </tr> <tr> <td>18</td> <td>HMDIR</td> <td>Home return direction</td> </tr> <tr> <td>19</td> <td>HMOFF</td> <td>Home offset position</td> </tr> <tr> <td>25</td> <td>I5/HS</td> <td>Home sensor logic</td> </tr> </tbody> </table> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>G93</td> <td></td> <td>Home return</td> </tr> <tr> <td>00</td> <td>04</td> <td>G04</td> <td>+100</td> <td>Dwell for 1 sec</td> </tr> <tr> <td>00</td> <td>05</td> <td>M60</td> <td>+3</td> <td>Output-3 on</td> </tr> </tbody> </table>			Setup	Name	Description	11	HTIME	Allowable home time	12	HTYPE	Home sensor off-edge detection	13	HFILE	Complex home return	15	HMSPD	Home high speed	16	HMCSP	Home creep speed	17	HMACC	Home acc./dec. time	18	HMDIR	Home return direction	19	HMOFF	Home offset position	25	I5/HS	Home sensor logic	File	Step	Code	Data	Description	00	03	G93		Home return	00	04	G04	+100	Dwell for 1 sec	00	05	M60	+3	Output-3 on	NO	NO
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Command		Description				Range		
						Min.	Max.	
P O S I T I O N I N G	G99	<p>* BLOCK POSITIONING</p> <p>If the current position is equal with designated comparison position, then make the designated output on or off while it moves to the designated position set by command data.</p> <p>The block positioning command (G99) should be ended by the block end command (G30). Only the position comparison command (G29) followed by the output command (M60,M61) can be used between G99 and G30. The multiple position comparison command are available.</p> <p>#. The usage is same as "G00".</p>				-999999	+999999	
		[Example]						
		File	Step	Code	Data			Description
		00	00	G91				Declaration of incremental coordinate
		00	01	F00	+1000			Speed=1000 pps
		00	02	G08	+10			Acc./dec. time=0.1sec
		00	03	G99	+10000			Move +100.00 mm
		00	04	G29	+1000			Compare with +10.00 mm
		00	05	M60	+0			If reaches +10.00 mm, then make output-0 on
		00	06	G29	+5000			Compare with +50.00 mm
		00	07	M60	+1			If reaches +50.00 mm, then make output-1 on
		00	08	G29	+8000			Compare with +80.00 mm
		00	09	M61	+0			If reaches +80.00 mm, then make output-0 off
00	10	G29	+9000	Compare with +90.00 mm				
00	11	M61	+1	If reaches +90.00 mm, then make output-1 off				
00	12	G30		Block end (wait for the end of +100.00 mm)				
	G31	<p>* POSITIONING BY EXTERNAL DECIMAL ROTARY SWITCH (optional)</p> <p>Move to the designated position set by optional external decimal rotary switch position unit. Moving direction is determined by the sign of data. ("0" means CW and "1" means CCW direction)</p> <p>This command is mainly used in incremental coordinate system.</p>				0	1	
		[Example]						
		File	Step	Code	Data			Description
		00	00	G91				Declaration of incremental coordinate
		00	01	F10				Speed set by rotary switch speed unit
		00	02	G08	+10			Acc./dec. time=0.1sec
		00	03	G31	0			Positioning toward CW direction by rotary switch

Command		Description	Range																																			
			Min.	Max.																																		
C O N T I N U O U S R U N N I N G	G22	<p>* CONTINUOUS SPEED RUN</p> <p>Rotate the servo motor at constant designated speed. The unit is rpm The rotational direction is determined by the sign of the data ("+"=CW, "-"=CCW) and speed is determined by the absolute value of data. The acc./dec. time is pre-determined by the Setup-03 "BSACC" or determined by the command (G08) in program when you want. If the set value is "0", it stops. For example, this command preforms the function as follows. Check sensor or compare position while it run continuously, then some function is performed according to sensor status or position.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G22</td> <td>+1000</td> <td>Continuously run at +1000 pps</td> </tr> <tr> <td>00</td> <td>04</td> <td>M70</td> <td>+2</td> <td>Wait for input-2 on</td> </tr> <tr> <td>00</td> <td>05</td> <td>G22</td> <td>+0</td> <td>Stop</td> </tr> <tr> <td>00</td> <td>06</td> <td>M60</td> <td>+5</td> <td>Output-5 on</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G22	+1000	Continuously run at +1000 pps	00	04	M70	+2	Wait for input-2 on	00	05	G22	+0	Stop	00	06	M60	+5	Output-5 on	-8000	+8000				
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G23	<p>* RESERVED</p>	NO	NO																																			
G39	<p>* COMPARE POSITION & JUMP</p> <p>It is subsidiary command of "G22". If the program reaches "G22" for the first time, motor begins to run. If the program meets "G39", compare the current position with the set position. If the current position exceeds the set position, jump to the next but one step(+2). Otherwise, if the current position is less than the set position, go to the next step(+1). For example, this command preforms the function as follows. Compare current position while it run continuously, then some function is performed according to current position.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>02</td> <td>G92</td> <td>+0</td> <td>Position clear</td> </tr> <tr> <td>00</td> <td>03</td> <td>G22</td> <td>+1000</td> <td>Continuously run at +1000 pps</td> </tr> <tr> <td>00</td> <td>04</td> <td>G39</td> <td>+5000</td> <td>Compare with 50.00 mm</td> </tr> <tr> <td>00</td> <td>05</td> <td>M50</td> <td>+4</td> <td>If less than 50.00 mm, jump to step 4</td> </tr> <tr> <td>00</td> <td>06</td> <td>G22</td> <td>+0</td> <td>If greater than 50.00 mm, then stop</td> </tr> <tr> <td>00</td> <td>07</td> <td>M60</td> <td>+4</td> <td>Output-4 on</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	02	G92	+0	Position clear	00	03	G22	+1000	Continuously run at +1000 pps	00	04	G39	+5000	Compare with 50.00 mm	00	05	M50	+4	If less than 50.00 mm, jump to step 4	00	06	G22	+0	If greater than 50.00 mm, then stop	00	07	M60	+4	Output-4 on	-999999	+999999
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P R E P A R A T O R Y F U N C T I O N	<p>* DWELL</p> <p>Wait for the set time. The unit is 0.01sec After a lapse of set time, it continues to execute the next step. It is used for delay after positioning end or for timing of in/out process.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>G04</td> <td>+100</td> <td>Wait for 1 sec</td> </tr> <tr> <td>00</td> <td>05</td> <td>G00</td> <td>-10000</td> <td>Move -100.00 mm</td> </tr> <tr> <td>00</td> <td>06</td> <td>M60</td> <td>+1</td> <td>Output-1 on</td> </tr> <tr> <td>00</td> <td>07</td> <td>G04</td> <td>+50</td> <td>Wait for 0.5 sec</td> </tr> <tr> <td>00</td> <td>08</td> <td>M61</td> <td>+1</td> <td>Output-1 off</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G00	+10000	Move +100.00 mm	00	04	G04	+100	Wait for 1 sec	00	05	G00	-10000	Move -100.00 mm	00	06	M60	+1	Output-1 on	00	07	G04	+50	Wait for 0.5 sec	00	08	M61	+1	Output-1 off	1	3000
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<p>* ACCELERATION / DECELERATION TIME</p> <p>Set the acceleration and deceleration time. The unit is 0.01sec It is continuously valid until "G08" is re-declared. The acceleration time is same as the deceleration time. If "G08" is not set in program, that time is automatically set by the Setup-03 "BSACC".</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G00	+10000	Move +100.00 mm	0	150																										
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<p>* ABSOLUTE COORDINATE</p> <p>Declare the absolute coordinate. It is continuously valid until coordinate system is re-declared. The target position is absolutely set on the basis of home position. If "G90" is not set in program, the coordinate system is automatically set by the Setup-04 "BSDIM".</p>	NO	NO																																																			
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<p>* INCREMENTAL (RELATIVE) COORDINATE</p> <p>Declare the incremental (relative) coordinate. It is continuously valid until coordinate system is re-declared. The target position is relatively set on the basis of current position. If "G91" is not set in program, the coordinate system is automatically set by the Setup-04 "BSDIM".</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>10</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>11</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm from the current position</td> </tr> <tr> <td>00</td> <td>12</td> <td>G90</td> <td></td> <td>Declaration of absolute coordinate</td> </tr> <tr> <td>00</td> <td>13</td> <td>G00</td> <td>+100</td> <td>Move to +1.00 mm on the basis of home</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	10	G91		Declaration of incremental coordinate	00	11	G00	+10000	Move +100.00 mm from the current position	00	12	G90		Declaration of absolute coordinate	00	13	G00	+100	Move to +1.00 mm on the basis of home	NO	NO																										
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P R E P A R A T O R Y F U N C T I O N	G92	<p>* POSITION RESET Reset the coordinate value to the designated data. If G92 is processed, the present coordinate value changes to the designated data.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>02</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>03</td> <td>G22</td> <td>+1000</td> <td>Continuous run at +1000 pps</td> </tr> <tr> <td>00</td> <td>04</td> <td>M70</td> <td>+2</td> <td>Wait for input-2 on</td> </tr> <tr> <td>00</td> <td>05</td> <td>G22</td> <td>+0</td> <td>stop</td> </tr> <tr> <td>00</td> <td>06</td> <td>G04</td> <td>+10</td> <td>Wait for 0.1sec(for completion of deceleration)</td> </tr> <tr> <td>00</td> <td>07</td> <td>G92</td> <td>+0</td> <td>Clear coordinate value</td> </tr> <tr> <td>00</td> <td>08</td> <td>G00</td> <td>+10000</td> <td>Move -100.00 mm</td> </tr> </tbody> </table>				File	Step	Code	Data	Description	00	02	G91		Declaration of incremental coordinate	00	03	G22	+1000	Continuous run at +1000 pps	00	04	M70	+2	Wait for input-2 on	00	05	G22	+0	stop	00	06	G04	+10	Wait for 0.1sec(for completion of deceleration)	00	07	G92	+0	Clear coordinate value	00	08	G00	+10000	Move -100.00 mm	-999999	+999999														
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G94	<p>* HOME OFFSET POSITION Reset the coordinate value to the home offset position data. If G94 is processed, the present coordinate value changes to the home offset position data (Setup-19 "HMOFF"). After the 2nd home is set by moving the amount of offset value, the coordinate value is reset at "0" irrespective of home offset position.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G93</td> <td></td> <td>Home return</td> </tr> <tr> <td>00</td> <td>01</td> <td>G94</td> <td></td> <td>Coordinate value is reset at Setup-19 "HMOFF"</td> </tr> <tr> <td>00</td> <td>02</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>				File	Step	Code	Data	Description	00	00	G93		Home return	00	01	G94		Coordinate value is reset at Setup-19 "HMOFF"	00	02	G91		Declaration of incremental coordinate	00	03	G00	+10000	Move +100.00 mm	NO	NO																														
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G25	<p>* CURRENT POSITION STORAGE The current position value is saved at storage point. There is one storage points. It's process is as follows. Save a current position at the storage point room, then perform other operation, return to the storage position by command "G26".</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>-10000</td> <td>Move -100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>G25</td> <td></td> <td>Save current position at storage point</td> </tr> <tr> <td>00</td> <td>05</td> <td>M10</td> <td>+5</td> <td>Loop (For) = 5</td> </tr> <tr> <td>00</td> <td>06</td> <td>G00</td> <td>+1000</td> <td>Move +10.00 mm</td> </tr> <tr> <td>00</td> <td>07</td> <td>M11</td> <td></td> <td>Loop end (Next)</td> </tr> <tr> <td>00</td> <td>08</td> <td>G90</td> <td></td> <td>Declaration of absolute coordinate</td> </tr> <tr> <td>00</td> <td>09</td> <td>G26</td> <td></td> <td>Move to the storage point (-100.00 mm)</td> </tr> </tbody> </table>				File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G00	-10000	Move -100.00 mm	00	04	G25		Save current position at storage point	00	05	M10	+5	Loop (For) = 5	00	06	G00	+1000	Move +10.00 mm	00	07	M11		Loop end (Next)	00	08	G90		Declaration of absolute coordinate	00	09	G26		Move to the storage point (-100.00 mm)	NO	NO
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G27	<p>* ADD POSITION TO STORAGE POINT Add or subtract the designated position value to the storage point. [Usage] Storage point value = (Storage point value) + (Value to be added)</p>				-999999	+999999																																																							

Command		Description	Range																																																																							
			Min.	Max.																																																																						
P R E P A R A T O R Y F U N C T I O N	G28	* RESERVED	NO	NO																																																																						
	G29	<p>* COMPARE POSITION IN BLOCK POSITIONING</p> <p>It compares the current position with designated position in block positioning function (between G99 and G30), then make the output on or off. "G29" should be followed by the output command (M60,M61). If not, the motion stops and error message ("(G99-G30) ERROR") is displayed.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G99</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>G29</td> <td>+1000</td> <td>Compare with +10.00 mm</td> </tr> <tr> <td>00</td> <td>05</td> <td>M60</td> <td>+0</td> <td>If reaches +10.00 mm, then make output-0 on</td> </tr> <tr> <td>00</td> <td>06</td> <td>G29</td> <td>+5000</td> <td>Compare with +50.00 mm</td> </tr> <tr> <td>00</td> <td>07</td> <td>M60</td> <td>+1</td> <td>If reaches +50.00 mm, then make output-1 on</td> </tr> <tr> <td>00</td> <td>08</td> <td>G29</td> <td>+8000</td> <td>Compare with +80.00 mm</td> </tr> <tr> <td>00</td> <td>09</td> <td>M61</td> <td>+0</td> <td>If reaches +80.00 mm, then make output-0 off</td> </tr> <tr> <td>00</td> <td>10</td> <td>G29</td> <td>+9000</td> <td>Compare with +90.00 mm</td> </tr> <tr> <td>00</td> <td>11</td> <td>M61</td> <td>+1</td> <td>If reaches +90.00 mm, then make output-1 off</td> </tr> <tr> <td>00</td> <td>12</td> <td>G30</td> <td></td> <td>Block end (wait for the end of +100.00 mm)</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G99	+10000	Move +100.00 mm	00	04	G29	+1000	Compare with +10.00 mm	00	05	M60	+0	If reaches +10.00 mm, then make output-0 on	00	06	G29	+5000	Compare with +50.00 mm	00	07	M60	+1	If reaches +50.00 mm, then make output-1 on	00	08	G29	+8000	Compare with +80.00 mm	00	09	M61	+0	If reaches +80.00 mm, then make output-0 off	00	10	G29	+9000	Compare with +90.00 mm	00	11	M61	+1	If reaches +90.00 mm, then make output-1 off	00	12	G30		Block end (wait for the end of +100.00 mm)	-999999	+999999
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00	12	G30		Block end (wait for the end of +100.00 mm)																																																																						
G30	<p>* BLOCK END</p> <p>The block positioning command (G99) should be ended by the block end command (G30). Only the position comparison command (G29) followed by the output command (M60,M61) can be used between G99 and G30. If there are any other commands except for G29,M60,M61 then the motion stops and error message ("(G99-G30) ERROR") is displayed.</p>	NO	NO																																																																							

Command	Description	Range																								
		Min.	Max.																							
P R E P A R A T O R Y F U N C T I O N	<p>* POSITIONING SPEED</p> <p>Used to set the positioning speed. The unit is pps. It is continuously valid until "F00" is re-declared. If "F00" is not set in program, the positioning speed is automatically set by the Setup-01 "BSSPD".</p>	2	8000																							
	<p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>00</td> <td>G91</td> <td></td> <td>Declaration of incremental coordinate</td> </tr> <tr> <td>00</td> <td>01</td> <td>F00</td> <td>+1000</td> <td>Speed=1000 pps</td> </tr> <tr> <td>00</td> <td>02</td> <td>G08</td> <td>+10</td> <td>Acc./dec. time=0.1sec</td> </tr> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	00	G91		Declaration of incremental coordinate	00	01	F00	+1000	Speed=1000 pps	00	02	G08	+10	Acc./dec. time=0.1sec	00	03	G00
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00	03	G00	+10000	Move +100.00 mm																						
F01	<p>* RESERVED</p>	NO	NO																							
F10	<p>* POSITIONING SPEED BY EXTERNAL DECIMAL ROTARY SWITCH (optional)</p> <p>Used to set the positioning speed by optional external decimal rotary switch speed unit. The unit is pps. It is continuously valid until "F10" is re-declared. It has a same function as "F00" command ("F10" affects "F00" speed) except that speed is set by BCD unit. The maximum reference speed is determined by Setup-01 "BSSPD" as follows.</p> <p>BCD input range (BCD) : 0 ~ 99 Determined speed = BSSPD X BCD / 100</p>	NO	NO																							
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00	03	G31	0	Move +100.00 mm																						

Command		Description				Range																																					
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P R O G R A M C O N T R O L	M00	<p>* PAUSE Give pause to advance of program. If the RUN Key is pushed or external RUN input is on, it starts again. It is used when manual operation is required in automatic operation or when step by step operation is required for checking of program.</p>				NO	NO																																				
		<p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>M60</td> <td>+1</td> <td>Output-1 on</td> </tr> <tr> <td>00</td> <td>05</td> <td>M00</td> <td></td> <td>Pause, if RUN is on, then go to next step</td> </tr> <tr> <td>00</td> <td>06</td> <td>M61</td> <td>+1</td> <td>Output-1 off</td> </tr> <tr> <td>00</td> <td>07</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>						File	Step	Code	Data	Description	00	03	G00	+10000	Move +100.00 mm	00	04	M60	+1	Output-1 on	00	05	M00		Pause, if RUN is on, then go to next step	00	06	M61	+1	Output-1 off	00	07	G00	+10000	Move +100.00 mm						
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M10	<p>* LOOP i START (FOR i) Declare the start of the loop program and set the number of repeating. This pairs with "M11" and composes a loop (repeat the steps between "M10" and "M11"). Jump to the next step of "M11" after finishing the prescribed number of repeating.</p>				1	60000																																					
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M11	<p>* LOOP i END (NEXT i) Declare the end of loop program in pair with "M10". Jump to the next step of "M11" after finishing the prescribed number of repeating. And, jump to the next step of "M10" when not reached. If the program meets the command "M11" without declaration of "M10", then the motion stops and error message ("(M10-M11) LOOP I") is displayed.</p>				NO	NO																																					
M12	<p>* LOOP j START (FOR j) Declare the start of the loop program and set the number of repeating. This pairs with "M13" and composes a loop (repeat the steps between "M12" and "M13"). Jump to the next step of "M13" after finishing the prescribed number of repeating.</p>				1	60000																																					
M13	<p>* LOOP j END (NEXT j) Declare the end of loop program in pair with "M12". Jump to the next step of "M12" after finishing the prescribed number of repeating. And, jump to the next step of "M12" when not reached. If the program meets the command "M13" without declaration of "M12", then the motion stops and error message ("(M12-M13) LOOP J") is displayed.</p>				NO	NO																																					

Command	Description	Range																																																								
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P R O G R A M C O N T R O L	<p>* SUBROUTINE CALL</p> <p>Call the subroutine program which begins at the designated step in a file. Subroutine call must be ended by "M42" (return from subroutine). When the program meets the command "M42", it returns to the main program from the subroutine by "M40". The step to return is the next step of "M40".</p> <p>Successive subroutine calls are possible for 3 times, if over then the motion stops and error message ("SUB-CALL OVER 3 ") is displayed.</p> <p>[Example]</p> <p>Main program</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>M40</td> <td>+20</td> <td>Subroutine call from step "20"</td> </tr> <tr> <td>00</td> <td>05</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>06</td> <td>M40</td> <td>+20</td> <td>Subroutine call from step "20"</td> </tr> <tr> <td>00</td> <td>07</td> <td>M30</td> <td></td> <td>Program end</td> </tr> </tbody> </table> <p>Subroutine program</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>20</td> <td>M60</td> <td>+1</td> <td>Output-1 on</td> </tr> <tr> <td>00</td> <td>21</td> <td>G04</td> <td>+100</td> <td>Wait for 1sec</td> </tr> <tr> <td>00</td> <td>22</td> <td>M61</td> <td>+1</td> <td>Output-1 off</td> </tr> <tr> <td>00</td> <td>23</td> <td>M42</td> <td></td> <td>Return to main program</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	03	G00	+10000	Move +100.00 mm	00	04	M40	+20	Subroutine call from step "20"	00	05	G00	+10000	Move +100.00 mm	00	06	M40	+20	Subroutine call from step "20"	00	07	M30		Program end	File	Step	Code	Data	Description	00	20	M60	+1	Output-1 on	00	21	G04	+100	Wait for 1sec	00	22	M61	+1	Output-1 off	00	23	M42		Return to main program	0	44
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M42	<p>* RETURN FROM SUBROUTINE</p> <p>It returns to the main program from the subroutine by "M40". The step to return is the next step of "M40". If the program meets the command "M42" without declaration of "M40", then the motion stops and error message ("SUB-RETURN ERROR") is displayed.</p>	NO	NO																																																							
M50	<p>* JUMP</p> <p>Jump to the designated step in a file and continues to execute the program.</p>	0	44																																																							
M56	<p>* JUMP BY BCD</p> <p>Jump to the designated step in a file if the designated BCD value is equal to the external BCD input, or jump to the next step if the designated BCD value is not equal to the external BCD input. External BCD input is determined by input-13,12,11,10. The BCD input is useful when you want to branch the program by external inputs (PLC, switches, etc.).</p> <p>[Usage]</p> <p>$(00 \sim 15) \times 100 + (00 \sim 44)$</p> <p>Upper 2 figures Lower 2 figures BCD input Jump step</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>04</td> <td>M56</td> <td>+1007</td> <td>If input-13,12,11,10 = on,off,on,off (BCD=10) then jump to step "7", if not equal jump to next step</td> </tr> <tr> <td>00</td> <td>05</td> <td>M30</td> <td></td> <td>Program end</td> </tr> <tr> <td>00</td> <td>06</td> <td>M99</td> <td></td> <td>No operation</td> </tr> <tr> <td>00</td> <td>07</td> <td>M60</td> <td>+1</td> <td>Output-1 on</td> </tr> <tr> <td>00</td> <td>08</td> <td>M30</td> <td></td> <td>Program end</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	03	G00	+10000	Move +100.00 mm	00	04	M56	+1007	If input-13,12,11,10 = on,off,on,off (BCD=10) then jump to step "7", if not equal jump to next step	00	05	M30		Program end	00	06	M99		No operation	00	07	M60	+1	Output-1 on	00	08	M30		Program end	0	1544																				
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Command		Description				Range																							
						Min.	Max.																						
P R O G R A M C O N T R O L	M64	<p>* ERROR STOP</p> <p>If the program meets the command "M64", then the motion stops and error message ("ERROR CODE STOP ") is displayed.</p>				NO	NO																						
		<p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>M52</td> <td>+0106</td> <td>If input-1 is on then jump to step "6"</td> </tr> <tr> <td>00</td> <td>04</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>05</td> <td>M50</td> <td>+3</td> <td>Jump to step "3"</td> </tr> <tr> <td>00</td> <td>06</td> <td>M64</td> <td></td> <td>Error stop</td> </tr> </tbody> </table>						File	Step	Code	Data	Description	00	03	M52	+0106	If input-1 is on then jump to step "6"	00	04	G00	+10000	Move +100.00 mm	00	05	M50	+3	Jump to step "3"	00	06
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00	06	M64		Error stop																									
M65	<p>* USER ERROR STOP</p> <p>If the program meets the command "M65", then the motion stops and error message ("USER ERROR: No. ") is displayed.</p> <p>User can arbitrarily determine the error number according to the error condition.</p>				0	99																							
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00	06	M65	+10	User error (no. 10) stop																									
M30	<p>* PROGRAM END</p> <p>If the program meets the command "M30", then the motion stops and the system returns to the run ready state.</p> <p>The coordinate system is return to the state of Setup-04 "BSDIM".</p> <p>"M30" must be declared at the last step of the program.</p> <p>If the step number is greater than 95, then the motion stops and error message ("STEP OVER ALARM ") is displayed.</p>				NO	NO																							
M31	<p>* TEMPORARY PROGRAM END</p> <p>This command is used for remote program control which is temporally down-loaded by serial communication.</p> <p>If the program meets the command "M31", then the motion stops and the system returns to the run ready state.</p> <p>The coordinate system keeps the last declared coordinate system.</p> <p>"M31" must be declared at the last step of the remote program control.</p> <p>If the step number is greater than 95, then the motion stops and error message ("STEP OVER ALARM ") is displayed.</p>				NO	NO																							
M99	<p>* NO OPERATION</p> <p>It just occupies a step without any operation.</p> <p>It is used for reserved program space and paragraph.</p>				NO	NO																							

Command		Description				Range								
						Min.	Max.							
IN / OUT	M60	<p>* OUTPUT ON Turn on the designated output. If the output number is out of range, then the motion stops and error message ("OUT RANGE OVER ") is displayed.</p>				0	7							
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	File	Step	Code	Data	Description									
	00	03	M60	+1	Output-1 on									
M61	<p>* OUTPUT OFF Turn off the designated output. If the output number is out of range, then the motion stops and error message ("OUT RANGE OVER ") is displayed.</p>				0	7								
	<p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>05</td> <td>M61</td> <td>+1</td> <td>Output-1 off</td> </tr> </tbody> </table>						File	Step	Code	Data	Description	00	05	M61
File	Step	Code	Data	Description										
00	05	M61	+1	Output-1 off										
M62	<p>* MULTI OUTPUT ON Turn the multiple outputs on at the same time. Each 4 outputs are set by BCD value. The outputs set in "1" become on and outputs set in "0" remain former status. If the BCD value is out of range (00~15), then the motion stops and error message ("OUT RANGE OVER ") is displayed. [Usage] (BCD value of upper 4 outputs)X100 + BCD value of lower 4 outputs $\frac{(00 \sim 15) \times 100}{\text{BCD of upper 4}} + \frac{(00 \sim 15)}{\text{BCD of lower 4}}$ Output no. : 7,6,5,4 3,2,1,0</p>				0	1515								
	<p>[Example] 1=output on, 0=remain former status</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>04</td> <td>M62</td> <td>+1005</td> <td>Output 7,6,5,4=1,0,1,0 (Upper 4 BCD=10) Output 3,2,1,0=0,1,0,1 (Lower 4 BCD=05)</td> </tr> </tbody> </table>						File	Step	Code	Data	Description	00	04	M62
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00	04	M62	+1005	Output 7,6,5,4=1,0,1,0 (Upper 4 BCD=10) Output 3,2,1,0=0,1,0,1 (Lower 4 BCD=05)										
M63	<p>* MULTI OUTPUT OFF Turn the multiple outputs off at the same time. Each 4 outputs are set by BCD value. The outputs set in "1" become off and outputs set in "0" remain former status. If the BCD value is out of range (00~15), then the motion stops and error message ("OUT RANGE OVER ") is displayed. [Usage] (BCD value of upper 4 outputs)X100 + BCD value of lower 4 outputs $\frac{(00 \sim 15) \times 100}{\text{BCD of upper 4}} + \frac{(00 \sim 15)}{\text{BCD of lower 4}}$ Output no. : 7,6,5,4 3,2,1,0</p>				0	1515								
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Command		Description			Range																																				
					Min.	Max.																																			
IN / OUT	M57	<p>* MULTI INPUT COMPARE</p> <p>Compare the on or off states of the multiple inputs with designated value. If not equal then go to the next step(+1). Or if it equal, jump to the next but one step(+2). If the designated value is out of range (00~15), then the motion stops and error message ("INPUT RANGE OVER ") is displayed.</p> <p>[Usage]</p> <p>Input module no.X10000 + BCD of upper 4 inputsX100 + BCD of lower 4 inputs (0 ~ 1)X10000 + (00 ~ 15)X100 + (00 ~ 15)</p> <p>Input module no. BCD of upper 4 inputs BCD of lower 4 inputs Input 00~07: 0 Input 07~04 Input 03~00 Input 08~13: 1 Input 13~12 Input 11~08 (Input 15~14=0)</p>			0	11515																																			
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00	08	M60	+1	Output-1 on																																					
	M70	<p>* INPUT ON WAIT</p> <p>Go to the next step if the designated input is on. Otherwise, wait the on signal.</p> <p>If the designated value is out of range (00~13), then the motion stops and error message ("INPUT RANGE OVER") is displayed.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>M70</td> <td>+1</td> <td>Go to next step if input-1 is on. Otherwise, wait for off</td> </tr> <tr> <td>00</td> <td>04</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	03	M70	+1	Go to next step if input-1 is on. Otherwise, wait for off	00	04	G00	+10000	Move +100.00 mm	0	13																				
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	M71	<p>* INPUT OFF WAIT</p> <p>Go to the next step if the designated input is off. Otherwise, wait the off signal.</p> <p>If the designated value is out of range (00~13), then the motion stops and error message ("INPUT RANGE OVER") is displayed.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>03</td> <td>M71</td> <td>+1</td> <td>Go to next step if input-1 is off. Otherwise, wait for on</td> </tr> <tr> <td>00</td> <td>04</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	03	M71	+1	Go to next step if input-1 is off. Otherwise, wait for on	00	04	G00	+10000	Move +100.00 mm	0	13																				
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Command		Description	Range																										
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IN / OUT	M52	<p>* INPUT ON JUMP</p> <p>Jump to the designated step in a file if the designated input is on, or jump to the next step if the designated input is off. If the designated value is out of range (00~13), then the motion stops and error message ("INPUT RANGE OVER") is displayed. If the designated step is out of range (00~44), then the motion stops and error message ("STEP RANGE OVER ") is displayed.</p> <p>[Usage] Input no.X100 + Jump step no. <u>(00~13)X100</u> + <u>(00 ~ 44)</u></p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>13</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>14</td> <td>M52</td> <td>+716</td> <td>Go to step 16 if input-7 is on. If not, next step</td> </tr> <tr> <td>00</td> <td>15</td> <td>M30</td> <td></td> <td>Program end if input-7 is off</td> </tr> <tr> <td>00</td> <td>16</td> <td>M50</td> <td>+13</td> <td>Jump to step 13</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	13	G00	+10000	Move +100.00 mm	00	14	M52	+716	Go to step 16 if input-7 is on. If not, next step	00	15	M30		Program end if input-7 is off	00	16	M50	+13	Jump to step 13	0	1344
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M53	<p>* INPUT OFF JUMP</p> <p>Jump to the designated step in a file if the designated input is off, or jump to the next step if the designated input is on. If the designated value is out of range (00~13), then the motion stops and error message ("INPUT RANGE OVER") is displayed. If the designated step is out of range (00~44), then the motion stops and error message ("STEP RANGE OVER ") is displayed.</p> <p>[Usage] Input no.X100 + Jump step no. <u>(00~13)X100</u> + <u>(00 ~ 44)</u></p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>13</td> <td>G00</td> <td>+10000</td> <td>Move +100.00 mm</td> </tr> <tr> <td>00</td> <td>14</td> <td>M53</td> <td>+716</td> <td>Go to step 16 if input-7 is off. If not, next step</td> </tr> <tr> <td>00</td> <td>15</td> <td>M30</td> <td></td> <td>Program end if input-7 is on</td> </tr> <tr> <td>00</td> <td>16</td> <td>M50</td> <td>+13</td> <td>Jump to step 13</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	13	G00	+10000	Move +100.00 mm	00	14	M53	+716	Go to step 16 if input-7 is off. If not, next step	00	15	M30		Program end if input-7 is on	00	16	M50	+13	Jump to step 13	0	1344	
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M54	<p>* OUTPUT ON JUMP</p> <p>Jump to the designated step in a file if the designated output is on, or jump to the next step if the designated output is off. If the designated value is out of range (0~7), then the motion stops and error message ("OUT RANGE OVER ") is displayed. If the designated step is out of range (00~44), then the motion stops and error message ("STEP RANGE OVER ") is displayed.</p> <p>[Usage] Output no.X100 + Jump step no. <u>(0~7)X100</u> + <u>(00 ~ 44)</u></p>	0	744																										
M55	<p>* OUTPUT OFF JUMP</p> <p>Jump to the designated step in a file if the designated output is off, or jump to the next step if the designated output is on. If the designated value is out of range (0~7), then the motion stops and error message ("OUT RANGE OVER ") is displayed. If the designated step is out of range (00~44), then the motion stops and error message ("STEP RANGE OVER ") is displayed.</p> <p>[Usage] Output no.X100 + Jump step no. <u>(0~7)X100</u> + <u>(00 ~ 44)</u></p>	0	744																										

Command		Description	Range																																				
			Min.	Max.																																			
C O U N T E R	M20	<p>* WORK COUNTER SET</p> <p>The initial value of work counter is set in the designated value. The work counter is used for counting the total output production. If the display mode is set at counter mode (mode 1), the work counter and general-purpose counter 0 is displayed. In order to display the total output production, the initial value will be set in "0". Then, the work counter is increased by 1 when program meets "M21". In order to display the remainder of daily production, the initial value will be set in the target value. Then, the work counter is decreased by 1 when program meets "M22".</p>	0	60000																																			
	M21	<p>* WORK COUNTER UP</p> <p>It increases the work counter by 1. It is used for the display of total output production. In order to display the total output production, the initial value will be set in "0". Then, the work counter is increased 1 by 1 when the program meets this command.</p>	NO	NO																																			
	M22	<p>* WORK COUNTER DOWN</p> <p>It decreases the work counter by 1. It is used for the display of remainder production. In order to display the remainder of daily production, the initial value will be set in the target value. Then, the work counter is decreased 1 by 1 when the program meets this command.</p>	NO	NO																																			
	M23	<p>* GENERAL-PURPOSE COUNTER SET</p> <p>The initial value of designated general-purpose counter (0~3) is set in designated value. The general-purpose counter can be used for various purposes. If the display mode is set at counter mode (mode 1), the work counter and general-purpose counter 0 is displayed at screen.</p> <p>[Usage] Counter no.X10000 + initial value (0 ~ 3)X10000 + (0000 ~ 9999)</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>13</td> <td>M23</td> <td>+10000</td> <td>Initial value of counter1 is set in "0"</td> </tr> <tr> <td>00</td> <td>14</td> <td>G00</td> <td>+1000</td> <td>Move 10.00 mm</td> </tr> <tr> <td>00</td> <td>15</td> <td>M24</td> <td>+1</td> <td>Counter1 up by 1</td> </tr> <tr> <td>00</td> <td>16</td> <td>M29</td> <td>+10100</td> <td>Compare counter1 with 100</td> </tr> <tr> <td>00</td> <td>17</td> <td>M28</td> <td>+14</td> <td>If less than 100, go to step 14</td> </tr> <tr> <td>00</td> <td>18</td> <td>M30</td> <td></td> <td>If equal 100, then program end</td> </tr> </tbody> </table>	File	Step	Code	Data	Description	00	13	M23	+10000	Initial value of counter1 is set in "0"	00	14	G00	+1000	Move 10.00 mm	00	15	M24	+1	Counter1 up by 1	00	16	M29	+10100	Compare counter1 with 100	00	17	M28	+14	If less than 100, go to step 14	00	18	M30		If equal 100, then program end	0	39999
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M24	<p>* GENERAL-PURPOSE COUNTER UP</p> <p>Increases the designated general-purpose counter (0~3) by 1.</p>	0	3																																				
M25	<p>* GENERAL-PURPOSE COUNTER DOWN</p> <p>Decreases the designated general-purpose counter (0~3) by 1.</p>	0	3																																				
M29	<p>* GENERAL-PURPOSE COUNTER COMPARE</p> <p>Compare the designated general-purpose counter (0~3) with designated value and prepare the conditions of counter relative jump commands (M26,M27,M28). The counter relative jump commands should be declared after the execution of "M29"</p> <p>[Usage] Counter no.X10000 + target value (0 ~ 3)X10000 + (0000 ~ 9999)</p>	0	39999																																				

Command		Description			Range																																									
					Min.	Max.																																								
C O U N T E R	M26	<p>* GENERAL-PURPOSE COUNTER EQUAL JUMP</p> <p>If the counter value is equal to the designated number after "M29" is executed, jump to the designated step. Otherwise, go to the next step.</p> <p>[Example]</p> <table border="1"> <thead> <tr> <th>File</th> <th>Step</th> <th>Code</th> <th>Data</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>13</td> <td>M23</td> <td>+00000</td> <td>Initial value of counter0 is set in "0"</td> </tr> <tr> <td>00</td> <td>14</td> <td>G00</td> <td>+1000</td> <td>Move 10.00 mm</td> </tr> <tr> <td>00</td> <td>15</td> <td>M24</td> <td>+0</td> <td>Counter0 up by 1</td> </tr> <tr> <td>00</td> <td>16</td> <td>M29</td> <td>+00100</td> <td>Compare counter0 with 100</td> </tr> <tr> <td>00</td> <td>17</td> <td>M26</td> <td>+19</td> <td>If equal 100, go to step 19</td> </tr> <tr> <td>00</td> <td>18</td> <td>M50</td> <td>+14</td> <td>If not equal 100, then go to step 14</td> </tr> <tr> <td>00</td> <td>19</td> <td>M30</td> <td></td> <td>Program end</td> </tr> </tbody> </table>			File	Step	Code	Data	Description	00	13	M23	+00000	Initial value of counter0 is set in "0"	00	14	G00	+1000	Move 10.00 mm	00	15	M24	+0	Counter0 up by 1	00	16	M29	+00100	Compare counter0 with 100	00	17	M26	+19	If equal 100, go to step 19	00	18	M50	+14	If not equal 100, then go to step 14	00	19	M30		Program end	0	44
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00	16	M29	+00100	Compare counter0 with 100																																										
00	17	M26	+19	If equal 100, go to step 19																																										
00	18	M50	+14	If not equal 100, then go to step 14																																										
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M19	<p>* COUNTER SET BY EXTERNAL DECIMAL ROTARY SWITCH (optional)</p> <p>The initial value of designated general-purpose counter (0~3) is set by external decimal rotary switch speed unit. The setting value means the counter number to be initialized.</p>			0	3																																									

Command	Description	Range																																																					
		Min.	Max.																																																				
S P E C I A L L O N G C O M M A N D	<p>* LONG SUBROUTINE CALL</p> <p>Call the subroutine program which begins at the designated step in the designated file. It is mainly used for long call function (file to file). Subroutine call must be ended by "M42" (return from subroutine). When the program meets the command "M42", it returns to the main program from the subroutine by "M41". The step to return is the next step of "M41".</p> <p>Successive subroutine calls are possible for 3 times, if over then the motion stops and error message ("SUB-CALL OVER 3 ") is displayed.</p> <p>[Usage]</p> <p style="text-align: center;">(0 ~ 3)X100 + (00 ~ 44)</p> <p style="text-align: center;">Upper 1 figure Lower 2 figures File number Step number</p>	0	344																																																				
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CHAPTER 6. RUN READY MODE

6-1. STATUS DISPLAY

The handy loader or panel loader displays as follows when the power is on. The first displayed screen when the power is on can be selected at the Setup-45 "DISPL" (0=display0, 1=display1). Whenever you push the "0" button, the run ready state displays are sequentially displayed. The output 2 ("machine ready" monitor output) becomes on when the Setup-33 "O2/MR" is set in "1".

A. Run ready display 0

```

POS: +0000.00 MM
FILE: 00 <AUTO>
    
```

POS	Current position	Display the current position. The minimal movement unit of coordinate is determined by Setup-05 "BUNIT" (0=0.01, 1=0.001).
MM	Unit	Display the unit. The unit is determined by Setup-43 "INDEX" (0=MM, 1=INCH, 2=DEG)
FILE	File no.	Display the file number to be executed.
AUTO	Operation type	The type of operation is determined by Setup-46 "1STEP" 0=<AUTO> (auto run), 1=<STEP> (step by step run)

B. Run ready display 1

COUNTER-W: 00000	COUNTER-W	Display the value of work counter.
COUNTER-0: 00000	COUNTER-0	Display the value of general-purpose counter0.

6-2. OPERATION

6-2-1. OPERATION OF THE LOADER

A. Auto-run mode :

If you push the button "RUN", the program of file which is selected by Setup-00 "FILE#" is run automatically. There are 4 files (00~03) and each file is composed of 45 steps. If the setting value is 4, The file number to be run in automatic operation is determined by external BCD input (input-13,12) from the master device (PLC, switches, etc.).

0 ~ 3	Setting value determines the file number.
4	External BCD input (input-13,12) determines the file number.

The output 0 ("running" monitor output) becomes on when the Setup-31 "O0/RN" is set in "1".

B. Home return mode :

If you push the button "HOME", the home return function is performed according to the method set by Setup-13 "HFILE" as follows.

-1	General home return
0 ~ 3	Program file number for complex home return

The complex home return provides an another home return function which requires complex motion (general home, additional motion, in/out functions, etc.).

The output 4 ("homing" monitor output) becomes on during home return, and becomes off after the end of home return, when the Setup-35 "O4/HM" is set in "1".

C. Program mode :

If you push the button "SHIFT+F1", you can select the program edit mode.

D. Manual mode :

If you push the button "SHIFT+F2", you can select the manual mode.

E. Setup parameter mode :

If you push the button "SHIFT+F3", you can select the setup parameter edit mode.

F. Check mode :

If you push the button "SHIFT+F5", you can select the check mode.

G. Display mode :

Whenever you push the "0" button, the run ready state displays are sequentially changed.

6-2-2. OPERATION OF THE EXTERNAL INPUT

A. Auto-run mode :

The input 0 is used for "external run input" when the Setup-20 "I0/RN" is set in "1".
If "external run input" is on, the program of file which is selected by Setup-00 "FILE#" is run automatically. There are 4 files (00~03) and each file is composed of 45 steps.
If the setting value is 4, The file number to be run in automatic operation is determined by external BCD input (input-13,12) from the master device (PLC, switches, etc.).

0 ~ 3	Setting value determines the file number.
4	External BCD input (input-13,12) determines the file number.

The output 0 ("running" monitor output) becomes on when the Setup-31 "O0/RN" is set in "1".

B. Home return mode :

The input 4 is used for "external home input" when the Setup-24 "I4/HM" is set in "1".
If "external home input" is on, the home return function is performed according to the method set by Setup-13 "HFILE" as follows.

-1	General home return
0 ~ 3	Program file number for complex home return

The complex home return provides an another home return function which requires complex motion (general home, additional motion, in/out functions, etc.).

The output 4 ("homing" monitor output) becomes on during home return, and becomes off after the end of home return, when the Setup-35 "O4/HM" is set in "1".

C. Manual mode :

The input 3 is used for "external manual input" when the Setup-23 "I3/MN" is set in "1".
If "external manual input" is on, you can select the manual mode.

CHAPTER 7. AUTO RUN MODE

7-1. START OF AUTO RUN

If you push the button "RUN", or "external run input" is on (when the Setup-20 "IO/RN" is set in "1") the program of file which is selected by Setup-00 "FILE#" is run automatically. There are 4 files (00~03) and each file is composed of 45 steps. If the setting value is 4, The file number to be run in automatic operation is determined by external BCD input (input-13,12) from the master device (PLC, switches, etc.).

0 ~ 3	Setting value determines the file number.
4	External BCD input (input-13,12) determines the file number.

The output 0 ("running" monitor output) becomes on when the Setup-31 "O0/RN" is set in "1".

7-2. STATUS DISPLAY

The screen displayed in automatic operation can be selected at the Setup-45 "DISPL" (0=display0, 1=display1). Whenever you push the "0" button, the auto-run state displays are sequentially displayed. The display1 is same as that of run ready state.

The 2nd line of display0 shows the contents of program step in operation, which is effective to check the process of program.

P	O	S	:	+	0	0	0	0	.	0	0		M	M	
0	0	-	0	6	-	G	0	4	+	0	0	0	1	0	0

 ---> Contents of program step in operation

7-3. PAUSE OF AUTO RUN

A. In case of the "STOP" button

If you push the button "STOP" in the automatic operation, the operation stops. Then, if you push the button "RUN", automatic operation starts again. When you want to remove an obstacle for the operation, this function will be convenient. The output 0 ("running" monitor output) becomes off when the Setup-31 "O0/RN" is set in "1".

B. In case of the external stop input

If "external stop input" (input 1) is on when the Setup-21 "I1/ST" is set in "1" or "2", the operation stops. The restart conditions are as follows.

1	One-Touch type of external stop input-->restart by run input
2	Lock type of external stop input --> restart by itself off

The output 0 ("running" monitor output) becomes off when the Setup-31 "O0/RN" is set in "1".

C. In case of "M00" command

If the program runs to the **program pause command (M00)** in automatic operation, the operation stops. Then, if you push the button "RUN", or "external run input" is on (when the Setup-20 "IO/RN" is set in "1"), the operation re-starts. This is convenient when you want to insert manual operation in the middle of automatic operation by "M00" or when step by step operation is required for checking of program.

7-4. RESET AND EMERGENCY STOP

In the case of emergency, if you push the button "RESET" or "external reset input (input 2)" is on (when the Setup-22 "I2/RS" is set in "1"), all the system resets to the first state when the power is on. If "external emergency input (input 2)" is on (when the Setup-22 "I2/RS" is set in "2" or "3"), then all the system stops and error message ("EMERGENCY STOP ") is displayed.

The "external emergency input" or "external reset input" is determined by Setup-22 "I2/RS" as follows.

Setup-22 "I2/RS"	
1	One-Touch type of external reset input
2	Lock type of external emergency stop input (normally open) --> reset by itself off
3	Lock type of external emergency stop input (normally close) --> reset by itself on

7-5. STEP BY STEP RUN

It is the operation of the first test run when the program input is done. To check the correct operation of the system, the system is run step by step. To run "step by step operation" the value of Setup-46 "1STEP" should be "1". If you push the button "RUN", the program runs one step and then stops. Whenever you push the button "RUN", the program runs the next one step.

7-6. PROTECTION OF MECHANICAL SYSTEM

There are two kinds of protections when the value is out of the allowed range because the wrong coordinate value is set up or the program has a problem.

- A. **Protection by H/W** : If the left/right limit switch is operated, then the system stops automatically and displays the error message.
- B. **Protection by S/W** : If the left/right soft-limit is operated, then the system stops automatically and displays the error message.
- C. The system is protected by the following Setup parameters.

No.	Name	Description	
26	I6/LL	External left(CW) limit sensor input	
		1	Left(CW) limit sensor (normally open)
		2	Left(CW) limit sensor (normally close)
27	I7/RL	External right(CCW) limit sensor input	
		1	Right(CCW) limit sensor (normally open)
		2	Right(CCW) limit sensor (normally close)
40	LTDIR	Left/right limit direction may change according to the installed method of motor. In this case, we can change easily the limit direction without hard-wired replacement.	
		0	"+" direction : left(CW) limit, "-" direction : right(CCW) limit
		1	"+" direction : right(CCW) limit, "-" direction : left(CW) limit
41	SEND+	Setting of "+" direction software limit value as 2nd safety protection in addition to the protection by limit switch. If this value is set in "0", this function is invalid. If current position is greater than it, the motion stops and error message ("S/W LIMIT ALARM ") is displayed.	
42	SEND-	Setting of "-" direction software limit value as 2nd safety protection in addition to the protection by limit switch. If this value is set in "0", this function is invalid. If current position is less than it, the motion stops and error message ("S/W LIMIT ALARM ") is displayed.	

7-7. ESCAPING FROM LIMIT STATE

A. Screen display at limit state

S	Y	S	T	E	M		E	R	R	O	R	:	0	7		S	Y	S	T	E	M		E	R	R	O	R	:	0	8
L	E	F	T		E	N	D		A	L	A	R	M			R	I	G	H	T		E	N	D		A	L	A	R	M

B. Escaping from the limit state

1. If you push the button "RESET", all the system resets to the first state when the power is on.
2. If you push the button "SHIFT+F2", you can select the manual mode.
3. Escape from the limit state by pushing the button "1" or "2".

CHAPTER 8. MANUAL MODE

8-1. OPERATION OF THE LOADER

If you push the button "SHIFT+F2" in run ready state, you can select the manual mode.

A. Manual mode display

```

POS: +0000.00 MM
HIGH <--MOVE-->
    
```

HIGH	Manual high speed	If you push the button "↑", manual high speed is selected.
JOG	Manual low(jog) speed	If you push the button "↓", manual low(jog) speed is selected.
1	Move to CW(+)	If you push the button "←", move to CW(+) direction.
2	Move to CCW(-)	If you push the button "→", move to CCW(-) direction.

B. The Setup parameters relative to manual operation are as follows.

No.	Name	Description				
06	MANSP	Settings of the speed in high speed manual operation. The unit is pps. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed.				
07	JOGSP	Settings of the speed in jog(low) speed manual operation. The unit is pps. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed.				
08	MACCT	Settings of the acceleration/deceleration time for manual operation. The unit is 0.01sec.				
21	I1/ST	The input 1 is "external stop input" when the Setup-21 "I1/ST" is set in "1" or "2". In manual mode, "external stop input" determines manual speed. <table border="1" style="margin-left: 20px;"> <tr> <td>OFF</td> <td>manual high speed is selected</td> </tr> <tr> <td>ON</td> <td>manual low(jog) speed is selected</td> </tr> </table>	OFF	manual high speed is selected	ON	manual low(jog) speed is selected
OFF	manual high speed is selected					
ON	manual low(jog) speed is selected					
23	I3/MN	Determine whether the input 3 is used for "general-purpose input" or "external manual mode input". <table border="1" style="margin-left: 20px;"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Lock type of external manual mode input</td> </tr> </table>	0	General-purpose input	1	Lock type of external manual mode input
0	General-purpose input					
1	Lock type of external manual mode input					
28	I8/LM	Determine whether the input 8 is used for "general-purpose input" or "external left(CW) manual move input". <table border="1" style="margin-left: 20px;"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External left(CW) manual move input</td> </tr> </table> <p>The manual move input is available when manual mode is derived from external manual mode input (input 3) and Setup-23 "I3/MN" is set in 1.</p>	0	General-purpose input	1	External left(CW) manual move input
0	General-purpose input					
1	External left(CW) manual move input					
29	I9/RM	Determine whether the input 9 is used for "general-purpose input" or "external right(CCW) manual move input". <table border="1" style="margin-left: 20px;"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>External right(CCW) manual move input</td> </tr> </table> <p>The manual move input is available when manual mode is derived from external manual mode input (input 3) and Setup-23 "I3/MN" is set in 1.</p>	0	General-purpose input	1	External right(CCW) manual move input
0	General-purpose input					
1	External right(CCW) manual move input					

C. Return to run ready state

If you push the "ESC" button, it will return to the run ready state.

8-2. OPERATION OF THE EXTERNAL INPUT

The input 3 is used for "external manual input" when the Setup-23 "I3/MN" is set in "1".
If "external manual input" is on, you can select the manual mode.

A. Manual mode display

```

P O S : + 0 0 0 0 . 0 0 M M
H I G H 1 < - M O V E - > 2
    
```

HIGH	Manual high speed	If input 1 is off, manual high speed is selected.
JOG	Manual low(jog) speed	If input 1 is on, manual low(jog) speed is selected.
Input 8	Move to CW(+)	If input 8 is on, move to CW(+) direction.
Input 9	Move to CCW(-)	If input 9 is on, move to CCW(-) direction.

B. Return to run ready state

If you push the "ESC" button, it will return to the run ready state.

8-3. LIMIT ALARM

If the left/right limit switch is operated in manual operation, then the motor does not run in the same way and displays the error message as follows. If the reverse manual input is on, motor starts to rotate and the alarm is cleared.

```

P O S : + 0 0 0 0 . 0 0 M M
H I G H < R I G H T E N D >
P O S : + 0 0 0 0 . 0 0 M M
H I G H < L E F T E N D >
    
```

8-4. POINT TEACHING

A. What is point teaching ?

Place the mechanical system at desired position by manual operation and then feed the coordinate value input to the designated POINT position. It provides very useful distance input method when the exact estimation of the distance is difficult. (※ To use the point teaching, the position of the origin is set in advance by using home return.)

B. Method for point teaching

First, select manual operation mode in run ready state and then move to the desired position by manual operation. If you push the button "SHIFT+INS", the point number is displayed. Type the point number (00~15) you want and then push "ENTER" button for the storage of coordinate value.

```

I N P O I N T N O : [ 0 0 ]
Y E S = E N T E R , N O = E S C
    
```

The point relative command ("G05", "G06") use some special coordinate values as the destination coordinate value after they are memorized in point data. It is convenient in the case when only the coordinate values are varying while the number of coordinate values is constant. It is because that users can set each point to the point number exclusively.

CHAPTER 9. HOME RETURN MODE

9-1. HOME RETURN METHOD

The home return function is performed according to the method set by Setup-13 "HFILE" as follows.

-1	General home return
0 ~ 3	Program file number for complex home return

The complex home return provides an another home return function which requires complex motion (general home, additional motion, in/out functions, etc.).

The output 4 ("homing" monitor output) becomes on during home return, and becomes off after the end of home return, when the Setup-35 "O4/HM" is set in "1".

A.. General home return

The general home return is performed when Setup-13 "HFILE" is set in "-1".

If you push the button "HOME", or If "external home input" is on when the Setup-24 "I4/HM" is set in "1", then the home return function is performed.

The output 4 ("homing" monitor output) becomes on during home return, and becomes off after the end of home return, when the Setup-35 "O4/HM" is set in "1".

The screen in the home return process is displayed as follows.

```

HOME RETURN

```

B. Complex home return

The complex home return is performed when Setup-13 "HFILE" is set in "0" ~ "3".

The complex home return is required in case of followings.

1. In order to operate the mechanical system, some initialization conditions are required.
2. Before the home return, other interference conditions should be removed.

The designated value is the file number of complex home return.

The file number of complex home return should not be overlapped with that of auto-run.

[Example]

File	Step	Code	Data	Description
15	00	M60	+1	Output-1 on
15	01	G04	+100	Wait for 1sec
15	02	M61	+1	Output-1 off
15	03	G93		Home return
15	04	M60	+2	Output-2 on
15	05	M30		Complex home end

C. Pause of home return

If you push the "STOP" button, the process stops. Then, home return re-starts by ."HOME" button. Consider the case of stopping by "external stop input" (Setup-21 "I1/ST" is set in "1" or "2").

If "external stop input" is on, the process stops. When Setup-21 "I1/ST" is set in "1", home return re-starts by "external home input". But, when Setup-21 "I1/ST" is set in "2", it keeps on stopping until "external stop input" is off. The screen displays as follow when home return stops.

```

HOME RETURN
STOP!

```

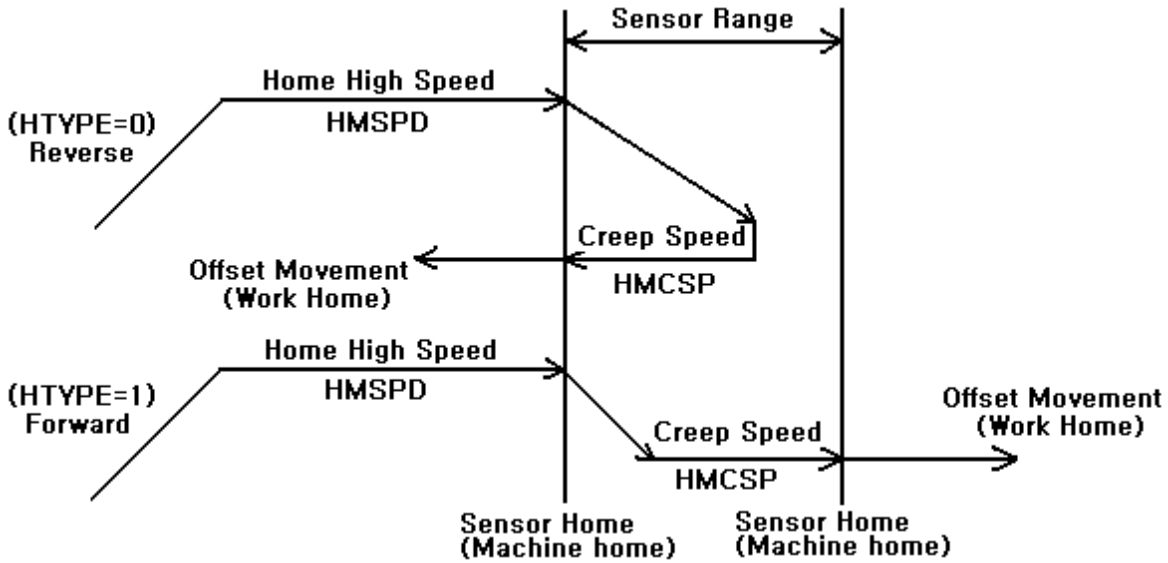
9-2. SETUP PARAMETERS FOR HOME RETURN

No.	Name	Description				
11	HTIME	<p>* ALLOWABLE HOME TIME</p> <p>Setting of the allowed time for home return. The unit is 0.1sec. If home return is not successful within the allowed time owing to the malfunction of home sensor, amplifier, mechanical error, etc., home return stops and error message ("HOME OVER TIME") is displayed. The time is infinite (ignored) when the value is set in "0". For safety operation, be sure to use this function</p>				
12	HTYPE	<p>* HOME SENSOR OFF-EDGE DETECTION</p> <p>Setting the method of home sensor off-edge detection for the exact home position.</p> <table border="1"> <tr> <td>0</td> <td>Off-edge detection by opposite direction to the home start.</td> </tr> <tr> <td>1</td> <td>Off-edge detection by same direction with the home start.</td> </tr> </table>	0	Off-edge detection by opposite direction to the home start.	1	Off-edge detection by same direction with the home start.
0	Off-edge detection by opposite direction to the home start.					
1	Off-edge detection by same direction with the home start.					
13	HFILE	<p>* COMPLEX HOME RETURN</p> <p>Setting the program file number for complex home return.</p> <table border="1"> <tr> <td>-1</td> <td>General home return</td> </tr> <tr> <td>0 ~ 3</td> <td>Program file number for complex home return</td> </tr> </table> <p>It provides an another home return function which requires complex motion (general home, additional motion, in/out functions, etc.).</p>	-1	General home return	0 ~ 3	Program file number for complex home return
-1	General home return					
0 ~ 3	Program file number for complex home return					
15	HMSPD	<p>* HOME HIGH SPEED</p> <p>Setting of the high home return speed to find home sensor. The unit is pps. Also, this speed is applied when home offset movement is done. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed.</p> <p>[Note] If the setting value is too high against deceleration time and dog width, it may cause a malfunction of home return.</p>				
16	HMCSP	<p>* HOME CREEP SPEED</p> <p>Setting of the creep speed to find exact off-edge position after the detection of home sensor in home return process. The unit is pps. The real output speed is multiplied by range factor (Setup-36 "RANGE") to the setting speed.</p> <p>[Note] If the setting value is too high, it may cause a malfunction of search for the exact home sensor off-edge position.</p>				
17	HMACC	<p>* HOME ACCELERATION / DECELERATION TIME</p> <p>Setting of acceleration/deceleration time to start high speed home return or to stop when the home sensor is detected. The unit is 0.01sec.</p> <p>[Note] If the acceleration/deceleration time is too long, the system will pass the home sensor when it decelerates and stops.</p>				
18	HMDIR	<p>* HOME RETURN DIRECTION</p> <p>Setting of the starting direction of home return.</p> <table border="1"> <tr> <td>0</td> <td>Start CW-direction</td> </tr> <tr> <td>1</td> <td>Start CCW-direction</td> </tr> </table>	0	Start CW-direction	1	Start CCW-direction
0	Start CW-direction					
1	Start CCW-direction					

No.	Name	Description												
19	HMOFF	<p>* HOME OFFSET POSITION</p> <p>After the mechanical home is set by home sensor, the 2nd home (work home) is set by moving the amount of offset value.</p> <p>The unit of offset value is determined by Setup-05 "BUNIT", moving speed is determined by Setup-15 "HMSPD" and acc./dec. time is determined by Setup-17 "HMACC". The 2nd home is called work home that is mainly used for the working coordinate. "+" moves in CW-direction. "-" moves in CCW-direction.</p> <p>After the 2nd home is completed, coordinate value is cleared. If G94 is processed in the program, the present coordinate value changes to the home offset position data.</p>												
24	I4/HM	<p>* INPUT 4 / HOME</p> <p>Determine whether the input 4 is used for "general-purpose input" or "external home input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>One-Touch type of external home input</td> </tr> </table>	0	General-purpose input	1	One-Touch type of external home input								
0	General-purpose input													
1	One-Touch type of external home input													
25	I5/HS	<p>* INPUT 5 / HOME SENSOR</p> <p>Determine whether the input 5 is used for "general-purpose input" or "external home sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Home sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Home sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Home sensor (normally open)	2	Home sensor (normally close)						
0	General-purpose input													
1	Home sensor (normally open)													
2	Home sensor (normally close)													
26	I6/LL	<p>* INPUT 6 / LEFT(CW) LIMIT SENSOR</p> <p>Determine whether the input 6 is used for "general-purpose input" or "external left(CW) limit sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Left(CW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Left(CW) limit sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Left(CW) limit sensor (normally open)	2	Left(CW) limit sensor (normally close)						
0	General-purpose input													
1	Left(CW) limit sensor (normally open)													
2	Left(CW) limit sensor (normally close)													
27	I7/RL	<p>* INPUT 7 / RIGHT(CCW) LIMIT SENSOR</p> <p>Determine whether the input 7 is used for "general-purpose input" or "external right(CCW) limit sensor input".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose input</td> </tr> <tr> <td>1</td> <td>Right(CCW) limit sensor (normally open)</td> </tr> <tr> <td>2</td> <td>Right(CCW) limit sensor (normally close)</td> </tr> </table>	0	General-purpose input	1	Right(CCW) limit sensor (normally open)	2	Right(CCW) limit sensor (normally close)						
0	General-purpose input													
1	Right(CCW) limit sensor (normally open)													
2	Right(CCW) limit sensor (normally close)													
35	O4/HM	<p>* OUTPUT 4 / HOME END MONITOR</p> <p>Determine whether the output 4 is used for "general-purpose output" or "home end monitor output".</p> <table border="1"> <tr> <td>0</td> <td>General-purpose output</td> </tr> <tr> <td>1</td> <td>Home end monitor output</td> </tr> </table>	0	General-purpose output	1	Home end monitor output								
0	General-purpose output													
1	Home end monitor output													
40	LTDIR	<p>* LEFT / RIGHT LIMIT DIRECTION</p> <p>Determine the direction of limit sensors.</p> <p>The definition of default direction and coordinate polarity is as follows.</p> <table border="1"> <tr> <td>Left move</td> <td>"+" direction</td> <td>CW revolution</td> </tr> <tr> <td>Right move</td> <td>"-" direction</td> <td>CCW revolution</td> </tr> </table> <p>Left/right limit direction may change according to the installed method of motor.</p> <p>In this case, we can change easily the limit direction without hard-wired replacement as follows.</p> <table border="1"> <tr> <td>0</td> <td>"+" direction : left(CW) limit,</td> <td>"-" direction : right(CCW) limit</td> </tr> <tr> <td>1</td> <td>"+" direction : right(CCW) limit,</td> <td>"-" direction : left(CW) limit</td> </tr> </table>	Left move	"+" direction	CW revolution	Right move	"-" direction	CCW revolution	0	"+" direction : left(CW) limit,	"-" direction : right(CCW) limit	1	"+" direction : right(CCW) limit,	"-" direction : left(CW) limit
Left move	"+" direction	CW revolution												
Right move	"-" direction	CCW revolution												
0	"+" direction : left(CW) limit,	"-" direction : right(CCW) limit												
1	"+" direction : right(CCW) limit,	"-" direction : left(CW) limit												

9-3. HOME RETURN SEQUENCE

The operating sequence of home return are as follows.



1. Determine the contact logic of home sensor at Setup-25 "I5/HS".
2. Determine the contact logic of left limit sensor at Setup-26 "I6/LL".
3. Determine the contact logic of right limit sensor at Setup-27 "I7/RL".
4. Determine the direction of limit sensors. at Setup-40 "LTDIR".
5. Set the allowed time for safe home return at Setup-11 "HTIME".
6. Home return is started toward the direction designated by Setup-18 "HMDIR".
Moving speed is "home high speed" set by Setup-15 "HMSPD".
Acceleration and deceleration time is set by Setup-17 "HMACC".
7. If it meets the limit sensor, it moves back to the opposite direction to find the home sensor and home return is done. It certainly occurs when home return starts from the state that the system passed the home sensor. Hence, if there is not limit sensor, this case is not applicable.
8. When it finds the home sensor, then it decelerates to the home creep speed (Setup-16 "HMCSP").
And it moves toward the designated direction (set by Setup-12 "HTYPE") to search the off-edge position of home sensor at home creep speed.
9. The off-edge position of home sensor becomes the mechanical home position.
10. After the mechanical home is set by home sensor, the 2nd home (work home) is set by moving the amount of offset value. The unit of offset value is determined by Setup-05 "BUNIT", moving speed is determined by Setup-15 "HMSPD" and acc./dec. time is determined by Setup-17 "HMACC".
The 2nd home is called "work home" that is mainly used for the reference position of working coordinate. After the 2nd home is completed, coordinate value is cleared.

9-4. HOME RETURN ERROR

If home return is not successful within the allowed time owing to the malfunction of home sensor, step driver, mechanical error, etc., or if the input 5 doesn't function as "external home sensor".
The home return stops and error message is displayed as follows.

```

SYSTEM ERROR: 09
HOME OVER TIME
  
```


9-5. PRECAUTIONS OF HOME RETURN

A. The width of the sensor detection dog of the home, left limit and right limit sensor should be so wide that the system does not pass the sensor even when it decelerates and stops at high speed. If the width is too narrow, the system will pass the sensor when it decelerates and stops. As a result, the system may consider the wrong point as the home position.

[Requirement to be considered]

1. The width of the dog should be suitably wide in consideration of speed and deceleration time.
 2. The "home high speed" should be suitably high in consideration of deceleration time and dog width.
 3. The "deceleration time" should be suitably short in consideration of speed and dog width.
- B. If the setting value of "home creep speed" is too high, it may cause a malfunction of search for the exact home sensor off-edge position.
So, "home creep speed" should be less than 1000 pps.
- C. When the mechanical contact sensor (micro switch, limit switch) is used as home sensor, the mechanical chattering (vibration) phenomena should be considered. The settling time of the mechanical chattering should be shorter than **10 msec**.
- D. Home sensor should be fixed between the right limit and the left limit.

CHAPTER 10. CHECK MODE

10-1. SELECTION OF CHECK MODE

If you push the button "SHIFT+F5" in run ready state, you can select the check mode in the following display. It makes all outputs to be off.

2	=	I	N	P	U	T	,	4	=	O	U	T
6	=	L	O	A	D	E	R	K	E	Y		

 < Selection of check mode >

2 : input check mode, 4 : output check mode, 6 : loader check mode

10-2. INPUT CHECK MODE

If you push the button "2", you can select the input check mode in the following display.
If you push the button "ESC" in input check mode, then returns to the "selection of check mode"

I	N	#	:	0				0	1	2	3	4	5	6	7		
O	=	O	N					O	X	O	X	O	X	O	X		

 ← Input port number
← On/Off status (On=O, Off=X)

1. IN#(Input module number) : Whenever you push the "2" button, the input module number is selected from 0 to 1 in sequence.

IN#0 : input port number 0~7

IN#1 : input port number 8~15, (Input 14,15 doesn't exist)

2. Input port number : It displays the each bit number of selected input module.

If the input module number is 0, input port number 0~7 means bit 0~7.

If the input module number is 1, input port number 0~7 means bit 8~15.

3. On/off status : The on/off status (On="O", Off="X") is displayed under the each input port.

10-3. OUTPUT CHECK MODE

If you push the button "4", you can select the output check mode in the following display.
If you push the button "ESC" in output check mode, then returns to the "selection of check mode"

O	U	T	P	U	T	:	0	1	2	3	4	5	6	7		
O	=	O	N				X	O	X	O	X	O	X	O		

 ← Output port number
← On/Off status (On=O, Off=X)

1. Output port number : It displays the each bit number of outputs.

2. On/off status : The on/off status (On="O", Off="X") is displayed under the each output port.

3. Output Method :

Push the button (←,→) to place the cursor under the output port number to be checked.

if you push the button "+", the selected output port turns to "ON".

If you push the button "-", the selected output port turns to "OFF".

10-4. RETURN TO RUN READY MODE

If you push the button "ESC" in "selection of check mode", it will return to the run ready state.
At this time, it make all outputs to be off.

CHAPTER 11. ERROR (ALARM) STATUS

CAUTION

☞ When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.

- Alarm output (output 1) when alarm status.
If the Setup-32 "O1/ER" is set in "1", then error monitor output (output 1) is on and the step motor is stopped.
- Reset operation when alarm status.
It is reset by the button "RESET", or by external reset input (input 2) when the Setup-22 "I2/RS" is set in "1".
- Reset operation when emergency stop.
It is reset by returning to normal state when the Setup-22 "I2/RS" is set in "2" or "3".

11-1. TYPE OF ERROR

A. System error

It means the general system error including emergency stop.
The 1st line shows the system error number and 2nd line shows the detailed contents of error.

```
S Y S T E M   E R R O R : 0 0   ← System error number
O V E R   S P E E D   A L A R M ← Detailed contents of error
```

B. Program error

It means the program error derived from grammatical mistake.
The 1st line shows the program error number and occurred place (file no. and step no.).
The 2nd line shows the detailed contents of error.

```
E R R O R : 0 0   F 0 0 - S 2 2 ← Program error no., file no.(FXX), step no.(SXX)
I N P U T   R A N G E   O V E R ← Detailed contents of error
```

C. User error

User can arbitrarily determine the error number according to the error condition in program.
The 1st line shows the user error number and occurred place (file no. and step no.).
User error message ("USER ERROR STOP ") is displayed at 2nd line.

```
E R R O R : 0 0   F 0 0 - S 2 2 ← User error no., file no.(FXX), step no.(SXX)
U S E R   E R R O R   S T O P ← User error message
```

11-2. DETAILED DESCRIPTION OF ERROR ITEMS

A. Detailed description of system errors

00	Display	LOADER KEY ALARM	
	Contents	Loader button is pressed when power-on or reboot.	
	Cause & Action	1. Loader H/W faulty. 2. Loader operation mistake.	Change the loader or loader cable. Review operation.
04	Display	MEMORY ALARM	
	Contents	Memory is abnormal.	
	Cause & Action	Faulty parts in the main control board.	Change the main control board.
07	Display	LEFT END ALARM	
	Contents	Left H/W limit is operated in automatic operation.	
	Cause & Action	1. Contact logic is mismatched	Change contact logic (Setup-26 "I6/LL").
		2. Out of the set value of S/W limit.	Change the S/W limit values(Setup-41 "SEND+") or review program.
		3. The sensor is out of order.	Change the sensor.
4. Sensor miswire.		Connect correctly.	
08	Display	RIGHT END ALARM	
	Contents	Right H/W limit is operated in automatic operation.	
	Cause & Action	1. Contact logic is mismatched.	Change contact logic (Setup-27 "I7/RL").
		2. Out of the set value of S/W limit.	Change the S/W limit values(Setup-42 "SEND-") or review program.
		3. The sensor is out of order.	Change the sensor.
4. Sensor miswire.		Connect correctly.	
09	Display	HOME OVER TIME	
	Contents	The allowed time (Setup-11 "HTIME") for home return is over.	
	Cause & Action	1. The allowed time is too short.	Adjust the allowed time for home return.
		2. Home speed (high or creep) is low.	Adjust the speed (high or creep).
		3. Home & limit sensor are out of order.	Change the sensor.
		4. External home sensor is not selected.	Set the Setup-25 "I4/HS" in 1.
5. Faulty parts in the MQ-1A.		Change the MQ-1A.	
6. Mechanical defect.	Review mechanical conditions.		
10	Display	STEP OVER ALARM	
	Contents	Step number is out of range (45).	
	Cause & Action	M30 is omitted at the end of program.	Review program.

17	Display	DIV. DATA ALARM	
	Contents	The division result is out of the allowed number.	
	Cause & Action	The division calculation has problem owing to the abnormal state of the system.	Check all parameters. Change the MQ-1A.
18	Display	MUL. DATA ALARM	
	Contents	The multiplication result is out of the allowed number.	
	Cause & Action	The multiplication calculation has problem owing to the abnormal state of the system.	Check all parameters. Change the MQ-1A.
19	Display	EMERGENCY STOP	
	Contents	Emergency stop switch is active.	
	Cause & Action	Emergency stop is normally active.	Eliminate it's cause and escape from emergency stop.
		Emergency stop is abnormally active.	Set correctly. (Setup-21 "I1/ST")
20	Display	S/W LIMIT ALARM	
	Contents	Left or right S/W limit is operated in automatic operation.	
	Cause & Action	1. The setting value of S/W limit is less than the machine stroke	Set correctly. (Setup-41 "SEND+"), (Setup-42 "SEND-")
		2. Coordinate value is too high.	Review program
21	Display	CHECK HOME S/W	
	Contents	"External home switch" is on before the power is supplied.	
	Cause & Action	1. External home switch is out of order. 2. Faulty parts in the main control board.	Correct the wiring or change the switch. Change the main control board.
22	Display	CHECK RESET S/W	
	Contents	"External reset switch" is on before the power is supplied.	
	Cause & Action	1. External reset switch is out of order. 2. Faulty parts in the main control board.	Correct the wiring or change the switch. Change the main control board.
23	Display	CHECK MAN + S/W	
	Contents	"External manual(CW) switch" is on before the power is supplied.	
	Cause & Action	1. External manual switch is out of order. 2. Faulty parts in the main control board.	Correct the wiring or change the switch. Change the main control board.
24	Display	CHECK MAN - S/W	
	Contents	"External manual(CCW) switch" is on before the power is supplied.	
	Cause & Action	1. External manual switch is out of order. 2. Faulty parts in the main control board.	Correct the wiring or change the switch. Change the main control board.

B. Detailed description of program errors

00	Display	(M10–M11) LOOP I	
	Contents	"M11" cannot make a loop.	
	Cause & Action	"M11" is met without the declaration of "M10".	Review program and remove the error.
01	Display	(M12–M13) LOOP J	
	Contents	"M13" cannot make a loop.	
	Cause & Action	"M13" is met without the declaration of "M12".	Review program and remove the error.
02	Display	COUNTER UP OVER	
	Contents	Counter value exceeded the maximum value.	
	Cause & Action	Work counter exceeded 9999 at "M24"	Check the work counter up command.
		General counter exceeded 60000 at "M21"	Check the general counter up command.
03	Display	COUNTER DEC OVER	
	Contents	Counter value has become negative value.	
	Cause & Action	Work counter becomes negative at "M25"	Check the work counter down command.
		General purpose counter becomes negative at "M22"	Check the general purpose counter down command.
04	Display	STEP RANGE OVER	
	Contents	Program step number exceeded 45.	
	Cause & Action	Step label of jump command exceeded 45.	Check the step no. of jump command.
		Step label of call command exceeded 45.	Check the step no. of call command.
05	Display	SUB-CALL OVER 3	
	Contents	Subprogram is called successively more than 3 times.	
	Cause & Action	"M40" or "M41" is used successively more than 3.	Check the number of successive call.
06	Display	FILE RANGE OVER	
	Contents	Program file number exceeded 3.	
	Cause & Action	File label of jump command exceeded 3.	Check the file no. of jump command.
		File label of call command exceeded 3.	Check the file no. of call command.
07	Display	SUB-RETURN ERROR	
	Contents	There is no step to return from subroutine.	
	Cause & Action	"M42" is met without the declaration of "M40" or "M41".	Check the main-routine or sub-routine.
08	Display	INPUT RANGE OVER	
	Contents	Input number exceeded the allowed range.	
	Cause & Action	Input number exceeded 13	Check the input number.
		The value of BCD exceeded 15	Check the BCD number.
09	Display	OUT RANGE OVER	
	Contents	Output number exceeded the allowed range.	
	Cause & Action	Output number exceeded 7	Check the output number.
		The value of BCD exceeded 15	Check the BCD number.
10	Display	I/O RANGE OVER	
	Contents	Input module number exceeded the allowed range.	
	Cause & Action	Input module number exceeded 1.	Check the input module number.
11	Display	HOME OVER TIME	
	Contents	The allowed time for home return is over at the command "G93".	
	Cause & Action	The allowed time is too short.	Adjust the allowed time for home return.
		External home sensor is not selected.	Set the Setup-25 "I4/HS" in 1.
12	Display	(G99–G30) ERROR	
	Contents	There is a grammatical mistake between "G99" and "G30".	
	Cause & Action	Only "G29" followed by "M60" or "M61" can be used between "G99" and "G30".	Check the commands between "G99" and "G30".

13 ~	Display	Reserved	
	Contents		
19	Cause & Action		
	Display	SYNTAX ERROR	
20	Contents	There is wrong command that is not allowed.	
	Cause & Action	There is wrong command.	Review program. Perform system initialization.
21	Display	ERROR CODE STOP	
	Contents	The case when error is made by the command "M64".	
	Cause & Action	Forced stop by the command "M64".	Reset and eliminate it's cause.

C. Detailed description of user errors

```

ERROR: 00 F00 - S22 ← User error no., file no.(FXX), step no.(SXX)
USER ERROR STOP ← User error message

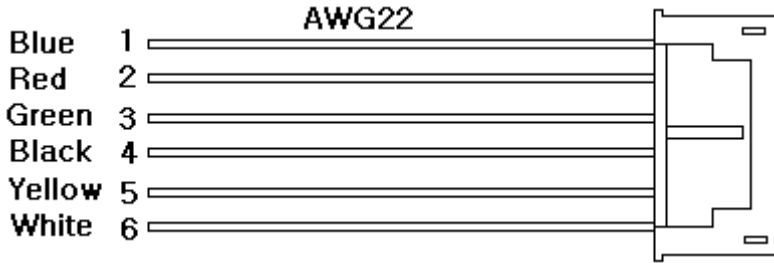
```

User can arbitrarily determine the error number according to the error condition in program. The 1st line shows the user error number and occurred place (file no. and step no.). User error message ("USER ERROR STOP ") is displayed at 2nd line. The next 2 figures of "ERROR:" shows user error number, the next 2 figures of "F" shows file number of occurred place, the next 2 figures of "S" shows step number of occurred place.

CHAPTER 12. OPTIONS

12-1. MOTOR AND POWER CABLE

(MOTOR CABLE)



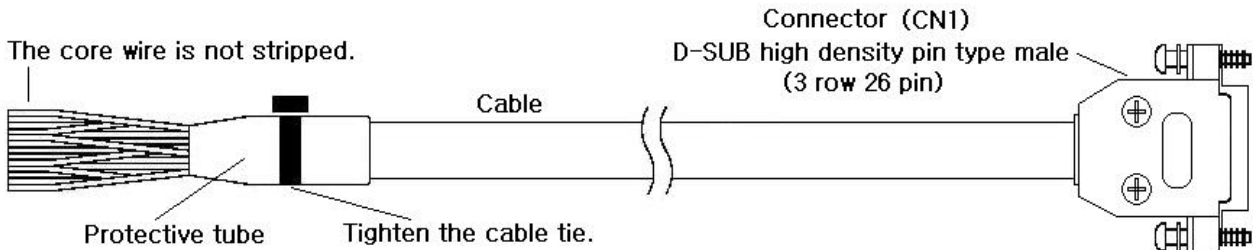
Model name	Length
MQAM-05M	0.5m
MQAM-2M	2m
MQAM-3M	3m
MQAM-5M	5m

(POWER CABLE)



Model name	Length
MQAP-05M	0.5m
MQAP-2M	2m
MQAP-3M	3m
MQAP-5M	5m

12-2. IN/OUT CABLE

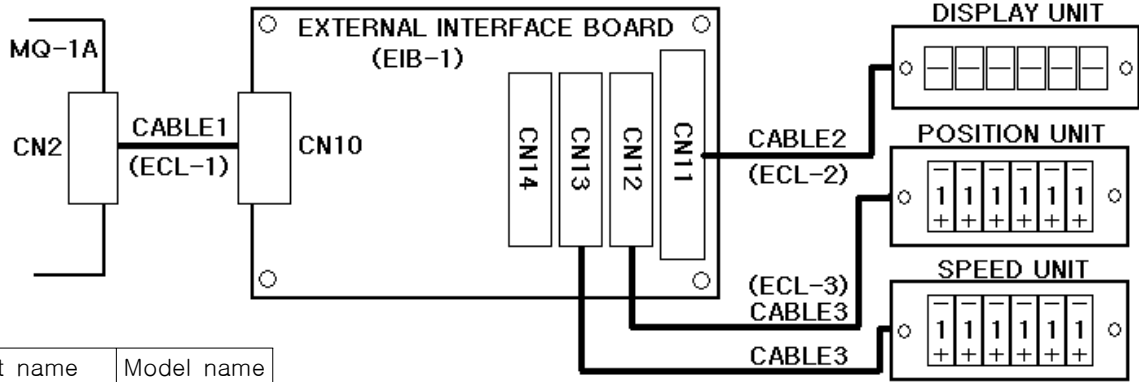


Pin No	Symbol	Color	Pin No	Symbol	Color	Pin No	Symbol	Color	Model name	Length
1	IN0	orange/black1	10	+24V	pink/red1	19	+24V	pink/black2	MQIO-2M	2m
2	IN3	orange/red1	11	IN1	orange/black2	20	IN2	pink/red2	MQIO-3M	3m
3	IN6	grey/black1	12	IN4	orange/red2	21	IN5	grey/black3	MQIO-5M	5m
4	IN9	grey/red1	13	IN7	grey/black2	22	IN8	grey/red3	MQIO-10M	10m
5	IN12	white/black1	14	IN10	grey/red2	23	IN11	white/black3		
6	OUT1	white/red1	15	IN13	white/black2	24	OUT0	white/red3		
7	OUT4	yellow/black1	16	OUT2	white/red2	25	OUT3	yellow/black3		
8	OUT7	yellow/red1	17	OUT5	yellow/black2	26	OUT6	yellow/red3		
9	24GND	pink/black1	18	24GND	yellow/red2					

CHAPTER 13. EXTERNAL DECIMAL ROTARY SWITCH AND DISPLAY UNIT

It performs the position setting(G30), speed setting(F10), counter setting(M19) and other special functions by external decimal rotary switches and display unit.

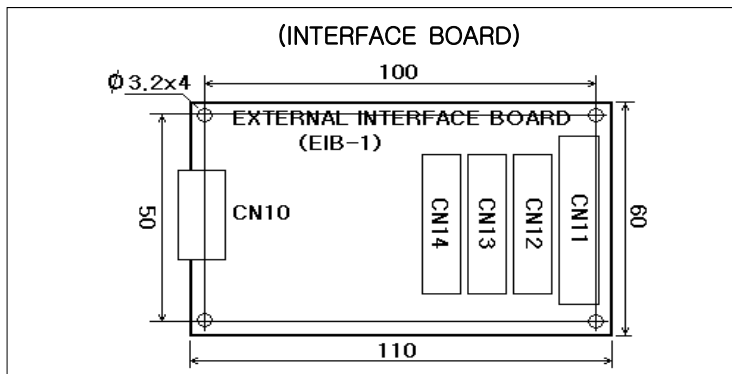
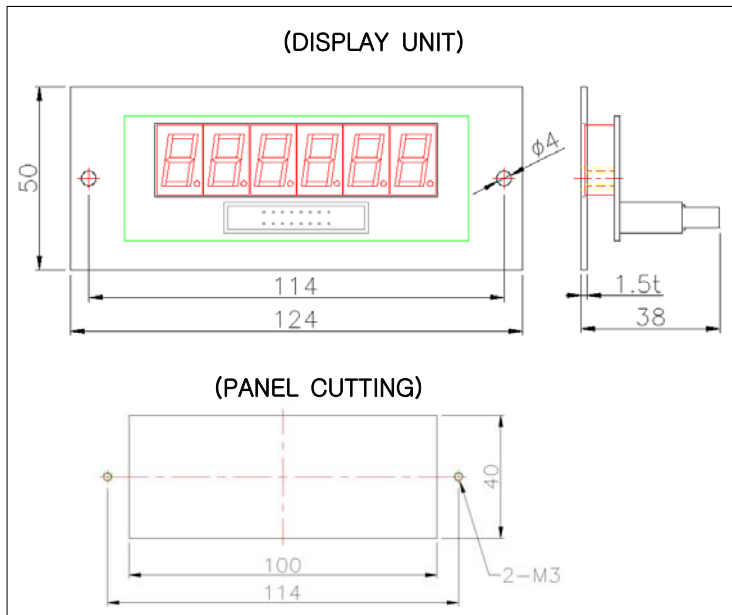
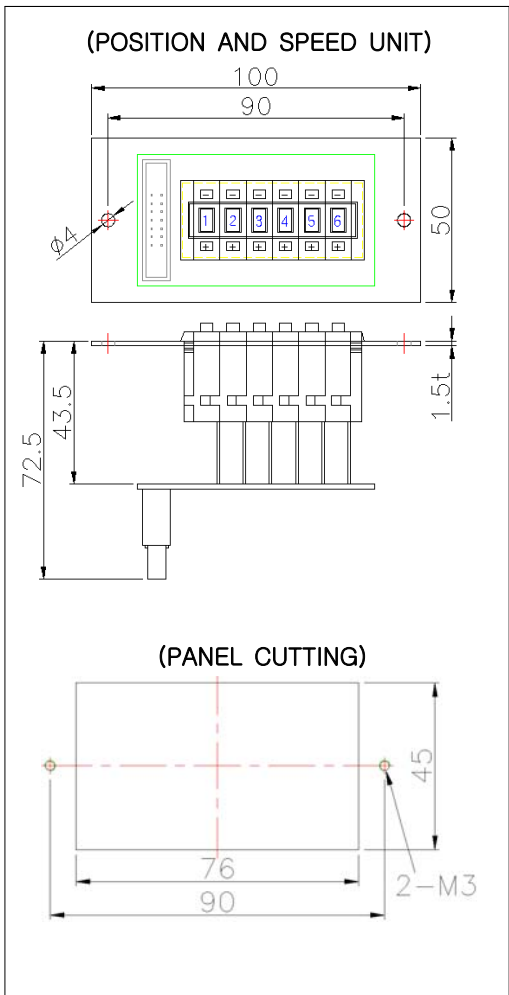
[External interface board and connection diagram]



Part name	Model name
Interface board	EIB-1
Display unit	EID-1
Position unit	EIP-1
Speed unit	EIS-1

Part name	Model name
Cable1	ECL-1
Cable2	ECL-2
Cable3	ECL-3

[Dimensions]



CHAPTER 14. MAINTENANCE AND INSPECTION

CAUTION Maintenance and Inspection

- ▶ Do not test the MQ-1A with a megger (measure insulation resistance), or it may become faulty.
- ▶ Do not disassemble and/or repair the equipment on customer side

14-1. INSPECTION

It is recommended to make the following checks periodically.

1. Check for loose terminal block screw. Retighten any loose screws.
2. Check the cables and the like for scratches and cracks. Perform periodic inspection according to operating condition.
3. Check the step motor bearings, motor connection, etc. for unusual noise.
4. Check the step motor shaft and coupling for misalignment.

Inspection	Period	Action
Vibration, Unusual noise	Every day	Comparing with the normal
Foreign material adhesion	At occurrence	Clean by vacuum cleaner
Motor insulation resistance	Every 1 year	DC 500[V], 10[MΩ] and more
Overall check	Every 2000 hours or 5 years	Contact to our office or sales representative

14-2. LIFE

The following parts must be changed periodically as listed below.

If any part is found faulty, it must be changed immediately even when it has not reached the end of its life, which depends on the operating method and environmental conditions.

With age, the smoothing capacitor will deteriorate. To prevent a second accident due to fault, it is recommended to replace the electrolytic capacitor every 5 years when used in general environment.

For parts replacement, please contact your sales representative.

Part Name	Life Guideline
Smoothing capacitor	5 years
Cable	2 years

CHAPTER 15. SUMMARY OF LISTS

15-1. SETUP PARAMETER LISTS

No.	Name	Description
00	FILE#	Program file number
01	BSSPD	Basic speed
02	XXXXX	Reserved
03	BSACC	Basic acc./dec. time
04	BSDIM	Basic coordinate system
05	BUNIT	Basic unit
06	MANSP	Manual high speed
07	JOGSP	Manual jog(low) speed
08	MACCT	Manual acc./dec. time
09	SCALE	Numerator of machine scale
10	DSCAL	Denominator of machine scale
11	HTIME	Allowable home time
12	HTYPE	Home sensor off-edge detection
13	HFILE	Complex home return
14	XXXXX	Reserved
15	HMSPD	Home high speed
16	HMCSP	Home creep speed
17	HMACC	Home acc./dec. time
18	HMDIR	Home return direction
19	HMOFF	Home offset position
20	I0/RN	Input 0 / Run
21	I1/ST	Input 1 / Stop
22	I2/RS	Input 2 / Reset
23	I3/MN	Input 3 / Manual
24	I4/HM	Input 4 / Home
25	I5/HS	Input 5 / Home sensor
26	I6/LL	Input 6 / Left(CW) limit sensor
27	I7/RL	Input 7 / Right(CCW) limit sensor
28	I8/LM	Input 8 / Left(CW) manual
29	I9/RM	Input 9 / Right(CCW) manual
30	XXXXX	Reserved
31	O0/RN	Output 0 / Running monitor
32	O1/ER	Output 1 / Error monitor
33	O2/MR	Output 2 / Machine ready monitor
34	XXXXX	Reserved
35	O4/HM	Output 4 / Home end monitor
36	RANGE	Speed multiplication range
37	SRTSP	Start speed
38	RS232	Decice ID
39	BRATE	Baud rate
40	LTDIR	Left / right limit direction
41	SEND+	+ Direction soft limit
42	SEND-	- Direction soft limit
43	INDEX	Index mode
44	XXXXX	Reserved
45	DISPL	LCD display
46	1STEP	Step by step run

No.	Name	Description
47	PNT00	Point Data 00
48	PNT01	Point Data 01
49	PNT02	Point Data 02
50	PNT03	Point Data 03
51	PNT04	Point Data 04
52	PNT05	Point Data 05
53	PNT06	Point Data 06
54	PNT07	Point Data 07
55	PNT08	Point Data 08
56	PNT09	Point Data 09
57	PNT10	Point Data 10
58	PNT11	Point Data 11
59	PNT12	Point Data 12
60	PNT13	Point Data 13
61	PNT14	Point Data 14
62	PNT15	Point Data 15
63	XXXXX	Reserved

15-2. COMMAND LISTS

Code	Description
G00	Positioning
G05	Positioning by point no.
G06	Positioning by BCD
G26	Positioning by storage point no.
G93	Home return
G99	Block positioning
G31	Positioning by rotary switch unit (optional)
G22	Continuous speed run
G39	Compare position & jump
G04	Dwell
G08	Acc./dec. time
G90	Absolute coordinate
G91	Incremental (relative) coordinate
G92	Position reset
G94	Home offset position
G25	Current position storage
G27	Add position to storage point
G28	Reserved
G29	Compare position in block positioning
G30	Block end
F00	Positioning speed
F10	Positioning speed by rotary switch (optional)
M00	Pause
M10	Loop i start (For i)
M11	Loop i end (Next i)
M12	Loop j start (For j)
M13	Loop j end (Next j)
M40	Subroutine call
M42	Return from subroutine
M50	Jump

Code	Description
M56	Jump by BCD
M64	Error stop
M65	User error stop
M30	Program end
M31	Temporary program end
M99	No operation
M60	Output on
M61	Output off
M62	Multi output on
M63	Multi output off
M57	Multi input compare
M70	Input on wait
M71	Input off wait
M52	Input on jump
M53	Input off jump
M54	Output on jump
M55	Output off jump
M20	Work counter set
M21	Work counter up
M22	Work counter down
M23	General purpose counter set
M24	General purpose counter up
M25	General purpose counter down
M29	General purpose counter compare
M26	General purpose counter equal jump
M27	General purpose counter above jump
M28	General purpose counter below jump
M19	Counter set by rotary switch unit (optional)
M41	Long subroutine call
M51	Long jump

15-3. ERROR (ALARM) LISTS

No.	Description
System error	
00	Loader key alarm
01	Reserved
02	Reserved
03	Reserved
04	Memory alarm
05	Reserved
06	Reserved
07	Left end alarm
08	Right end alarm
09	Home over time
10	Step over alarm
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	Reserved
17	Division data alarm
18	Multiplication data alarm
19	Emergency stop
20	S/W limit alarm

No.	Description
21	Check home switch
22	Check reset switch
23	Check man. + switch
24	Check man. - switch
Program error	
00	(M10-M11) loop i
01	(M12-M13) loop j
02	Counter up over
03	Counter down over
04	Step range over
05	Sub-call over 3
06	File range over
07	Sub-return error
08	Input range over
09	Output range over
10	I/O range over
11	Home over time
12	(G99-G30) error
20	Syntax error
21	Error code stop
13	Reserved
14	Reserved

No.	Description
15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved
User error stop	
00	User defined error 00
01	User defined error 01
02	User defined error 02
03	User defined error 03
04	User defined error 04
05	User defined error 05
06	User defined error 06
07	User defined error 07
08	User defined error 08
09	User defined error 09
10	User defined error 10
11	User defined error 11
12	User defined error 12
13	User defined error 13
14	User defined error 14

CHAPTER 16. COMMUNICATION FUNCTIONS

MQ-1A has the RS-232C serial communication functions.

These functions can be used to perform remote operation, parameter changing, monitor function, etc.

The Setup-39 "BRATE" set the serial communication speed as follows.

[Setup-39 "BRATE"]

[Baud Rate]

0	2400 BPS
1	4800 BPS
2	9600 BPS
3	14400 BPS

The Setup-38 "RS232" set the device identity number for the serial communication.

The setting value should be "0" when the serial communication is not used

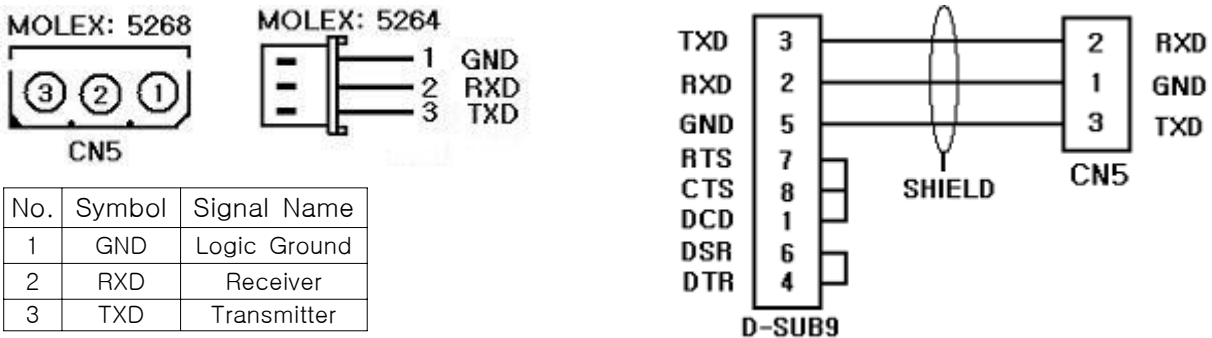
MQ-1A responds to the request of host when ID. number is matched.

[Setup-38 "RS232"]

0	Not used
1 ~ 255	ID. Number

16-1. COMMUNICATION CONNECTOR

Cable length is 10m max. in environment of little noise and 5m max. in 4800bps or more.



16-2. COMMUNICATION SPECIFICATIONS

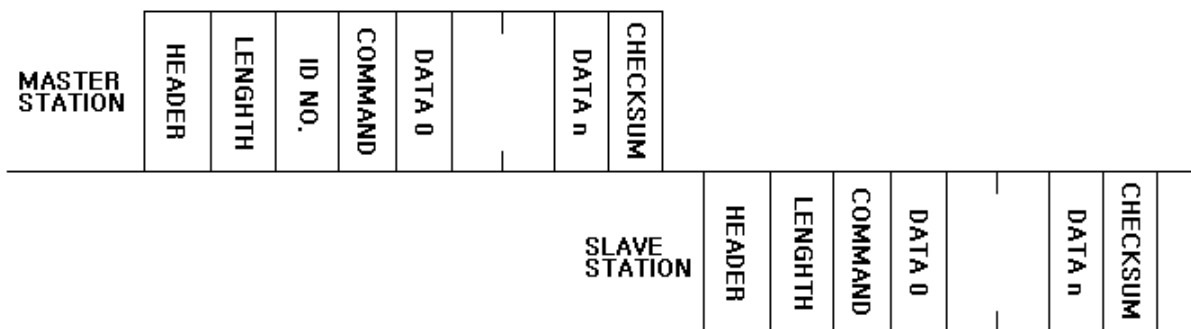
MQ-1A is designed to send a reply on receipt of an instruction.

The device which gives this instruction (e.g. personal computer) is called a master station and the

device which sends a reply in response to the instruction (driver) is called a slave station.

Items	Description
Baudrate	2400/4800/9600/14400 [bps] asynchronous system
Frame	Start bit : 1bit Data bit : 8bit Stop bit : 1bit Parity bit : Not used
Transfer protocol	NS SYSTEM Hexadecimal Code, half-duplex communication system

16-3. PROTOCOL



16-3-1. DOWN LOAD

The transmission of data from master station to slave station is call a "Down Load"
 The transfer protocol is as follows

HEADER / LENGTH / ID NO. / COMMAND / DATA 0 / .../ DATA n / CHECKSUM

Items	Description
HEADER	SOH(start of head). Hexadecimal "75H"
LENGTH	Number of total bytes which are transmitted. Length range : sum of total bytes from ID NO. to DATA n.
ID NO.	Device identity number of slave station.
COMMAND	Command to be performed by slave station.
DATA 0 ~ DATA n	Data followed by the command. The data length depends on the command.
CHECKSUM	The checksum is sent as a hexadecimal code representing the lower one byte of the logical sum of hexadecimal values from ID NO. to DATA n. Checksum range : from ID NO. to DATA n.

16-3-2. UP LOAD

The transmission of data from slave station to master station is call a "Up Load"
 The transfer protocol is as follows

HEADER / LENGTH / COMMAND / DATA 0 / .../ DATA n / CHECKSUM

Items	Description
HEADER	SOH(start of head). Hexadecimal "75H"
LENGTH	Number of total bytes which are transmitted. Length range : sum of total bytes from COMMAND to DATA n.
COMMAND	Return the same command received from master station.
DATA 0 ~ DATA n	Reply data. The data length depends on the command.
CHECKSUM	The checksum is sent as a hexadecimal code representing the lower one byte of the logical sum of hexadecimal values from COMMAND to DATA n. Checksum range : from COMMAND to DATA n.

16-4. COMMUNICATION CODES

Hex.	Code	Description
10H	Auto run	The selected program is run automatically.
	Data	Not used.
	Reply & Action	1. Normal case : Run ready state and stop input is off. Reply ACK(40H) -> Go into the auto run mode. 2. Abnormal case : Reply NCK(41H)
11H	Home return	Home return function is performed.
	Data	Not used.
	Reply & Action	1. Normal case : Run ready state and stop input is off. Reply ACK(40H) -> Go into the home return mode. 2. Abnormal case : Reply NCK(41H) 3. Stopping on the way to home return : Reply ACK(40H) -> Return to home return.
12H	Stop	Stop the operation of auto run or home return.
	Data	Not used.
	Reply & Action	1. Normal case : On the way of auto run or home return. Reply ACK(40H) -> Go into the stop state. 2. Abnormal case : Not on the way of auto run or home return. Reply NCK(41H)
13H	Restart	Restart from the stop state.
	Data	Not used.
	Reply & Action	1. Normal case : Stop state and stop input is off. Reply ACK(40H) -> Return to auto run or home return. 2. Abnormal case: Stop state and stop input is on, or not in the stop state. Reply NCK(41H)
14H	In/out	Up-load in/out status.
	Data	Not used.
	Reply & Action	1. Normal case: Reply ACK(40H) -> Up-load in/out status. Data0(in0~in7)+Data1(in8~in15)+Data2(out0~out7) 2. Abnormal case : Reply NCK(41H)
15H	Output on	Turn on the designated output.
	Data	Output port number.
	Reply & Action	1. Normal case: Reply ACK(40H) -> Turn on the designated output. 2. Abnormal case : Reply NCK(41H)
16H	Output off	Turn off the designated output.
	Data	Output port number.
	Reply & Action	1. Normal case: Reply ACK(40H) -> Turn off the designated output. 2. Abnormal case : Reply NCK(41H)
17H	Work counter	Up-load the value of work counter.
	Data	Not used.
	Reply & Action	1. Normal case : Reply ACK(40H) -> Up-load the value of work counter. Data0(LSB)+Data1(MSB) 2. Abnormal case : Reply NCK(41H)

Hex.	Code	Description					
18H	Servo status	Up-load the current status of driver.					
	Data	Not used.					
	Reply & Action	<p>1. Normal case : Reply ACK(40H) -> Up-load the status of driver.</p> <table border="1" style="margin-left: 40px;"> <tr> <td>[Status data]</td> <td>Error</td> <td>9(Data0) + Error no.(Data1)</td> </tr> <tr> <td></td> <td>Normal</td> <td>1(Data0) + Status(Data1)</td> </tr> </table> <p style="margin-left: 40px;">Data1 : 0 = Run ready mode 1 = Auto run mode 2 = Home return mode 3 = Manual mode 4 = Stopping</p> <p>2. Abnormal case : Reply NCK(41H)</p>	[Status data]	Error	9(Data0) + Error no.(Data1)		Normal
[Status data]	Error	9(Data0) + Error no.(Data1)					
	Normal	1(Data0) + Status(Data1)					
40H	ACK	Acknowledgement on reception.					
	Data	Not used.					
	Reply & Action	Non-executable command.					
41H	NCK	No-Acknowledgement on reception.					
	Data	Not used.					
	Reply & Action	Non-executable command.					
42H	Reset	System reset.					
	Data	Not used.					
	Reply & Action	Normal case : Reply ACK(40H) -> Make servo reset.					
85H	Position	Up-load the current position data.					
	Data	Not used.					
	Reply & Action	<p>1. Normal case : Reply ACK(40H) -> Up-load the current position. Position Data : Signed 4-byte, Unit: pulse</p> <p>2. Abnormal case : Reply NCK(41H)</p>					
96H	Read program	Up-load the program file.					
	Data	Not used					
	Reply & Action	<p>1. Normal case : Run ready state Reply ACK(40H) -> Up-load the program file -> ACK(40H) Step range: step00~step45 Because each step has 4 byte data, total 180 byte are transferred. Please wait for ACK(40H) reply after the end of transmission.</p> <p>2. Abnormal case : Not run ready state then Reply NCK(41H)</p>					
98H	Temporary write program	Down-load the temporary executable program file.					
	Data	<p>1. Data0: target file number. 2. Total step number to be transferred. 3. Data2~Data4: step00~step44 Because each step has 4 byte data, 4 times of step no. byte are transferred.</p>					
	Reply & Action	<p>1. Normal case : Run ready state The received program are temporarily saved at RAM -> Reply ACK(40H) Because it should not to be permanently saved at EEPROM, it is replaced by the saved program which is designated by Setup-00 after resetting. Please wait for ACK(40H) reply after the end of transmission.</p> <p>2. Abnormal case : When auto run mode then Reply NCK(41H)</p>					

90H	Read setup1	Up-load the 1st half (00~31) of setup parameters.
	Data	Not used
	Reply & Action	1. Normal case : Run ready state Reply ACK(40H) -> Up-load 1st half of setup parameters -> ACK(40H) Setup parameters range: Setup-00 ~ Setup-31 Because each parameter has 4 byte data, total 128 byte are transferred. Please wait for ACK(40H) reply after the end of transmission. 2. Abnormal case : Not run ready state then Reply NCK(41H)
91H	Read setup2	Up-load the 2nd half (32~63) of setup parameters.
	Data	Not used
	Reply & Action	1. Normal case : Run ready state Reply ACK(40H) -> Up-load 2nd half of setup parameters -> ACK(40H) Setup parameters range: Setup-32 ~ Setup-63 Because each parameter has 4 byte data, total 128 byte are transferred. Please wait for ACK(40H) reply after the end of transmission. 2. Abnormal case : Not run ready state then Reply NCK(41H)
92H	Write setup1	Down-load the 1st half (00~31) of setup parameters.
	Data	Setup parameters range: Setup-00 ~ Setup-31 Because each parameter has 4 byte data, total 128 byte are transferred.
	Reply & Action	1. Normal case : Run ready state The received setup parameters are temporarily saved at RAM and permanently saved at EEPROM -> Reply ACK(40H) Please wait for ACK(40H) reply after the end of transmission. 2. Abnormal case : Not run ready state then Reply NCK(41H)
93H	Write setup2	Down-load the 2nd half (32~63) of setup parameters.
	Data	Setup parameters range: Setup-32 ~ Setup-63 Because each parameter has 4 byte data, total 128 byte are transferred.
	Reply & Action	1. Normal case : Run ready state The received setup parameters are temporarily saved at RAM and permanently saved at EEPROM -> Reply ACK(40H) Please wait for ACK(40H) reply after the end of transmission. 2. Abnormal case : Not run ready state then Reply NCK(41H)
94H	Write program	Down-load the program file.
	Data	1. Data0: target file number. 2. Data1~Data180: step00~step44 Because each step has 4 byte data, total 180 byte are transferred.
	Reply & Action	1. Normal case : Run ready state The received program are temporarily saved at RAM and permanently saved at EEPROM -> Reply ACK(40H) Please wait for ACK(40H) reply after the end of transmission. 2. Abnormal case : Not run ready state then Reply NCK(41H)