

M0007852

***Stepping motor
with driver unit***

<RS-485 Interface>

DB2 series

U s e r ' s M a n u a l

SANYO DENKI CO.,LTD

Revision History

Version	Date	Revision contents	Notes
First version	2 0 0 7 / 3 / 1	• First version created	

Since this product does not correspond to the strategic materials specified in the “Foreign Exchange and Foreign Trade Law”, it is unnecessary to apply to the Ministry of International Trade and Industry to export the product. However, since customs may require explanations for non-correspondence, we will send you documents for it on request.

When this product is combined with other machines, be sure to follow their corresponding/non-corresponding judgments.

PREFACE

This product integrates the motor with the driver, and mounts the operation instruction by a train of impulses, a serial interface, and an external signal. It is possible to control from one host by using RS485 as a serial interface on the cereal network.

The starting point return and the positioning function can be installed, and high-ranking host's load be reduced.

Moreover, the I/O input mode by a pulse row mode, a communication, a positional control mode, and an external signal can be selected.

This manual explains the function, the wiring for "DB2", the installation, and driving, maintenance, and the specification, etc.

Please read this manual to the last minute and use it ahead of the use correctly to demonstrate the function of "DB2" enough.

Please keep the read manual in the place in which it can take it out when it is necessary.



This manual

"Stepping motor with driver unit" is described, "Driver" for short.

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0.SAFETY PRECAUTIONS [Observe these precautions]

SAFETY PRECAUTIONS

**This chapter summarizes the precautions to ensure the safe operation of the F series “DB2”.
Make sure you read this chapter before operation.**

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0.SAFETY PRECAUTIONS [Observe these precautions]

0.1 Introduction

The driver and the stepping motor are designed to be used for general industrial equipment. Therefore, note the following precautions.

- To ensure proper operation, read the Instruction Manual carefully before installation, wiring, and operation.
- Do not modify the product.
- For installation or maintenance, consult our dealer or authorized agency.
- When using the product for the following purposes, special measures such as system multiplication or emergency power generator installation should be taken regarding operation, maintenance, and management of the product. In these cases, consult us.

Use in medical equipment affecting people's lives.

Use in equipment that may lead to physical injury, for example, trains or elevators.

Use in a computer system that may be socially or publicly influential.

Use in other equipment related to physical safety or equipment that may affect the functions of public facilities.

- For use in an environment subject to vibration, for example, on-vehicle use, consult us.

Make sure you read all parts of this manual before use (installation, operation, maintenance, inspection, etc.) to properly use the equipment and only start using it after completely understanding all aspects, safety information, and precautions relating to the equipment.

Keep this manual handy after reading it.

0.2 Product Guarantee

This product is guaranteed for 1 year after purchase.

However, the following cases fall outside the terms of the guarantee during the guarantee year and a repair fee must be paid.

When a mistake is made during use or when caused by unauthorized repair or modifications

When the fault is caused by something other than the product purchased

When it is used outside the specification values

Additionally, when it is caused by a natural disaster, a disaster, or a secondary disaster






In addition, this guarantee only covers damage done to this product and does not cover any damage caused by this product.

0.SAFETY PRECAUTIONS [Observe these precautions]









0.3 Meaning of Warning Indications

The following indications are used in this Instruction Manual to indicate points concerning safety. All of the contents of the indications are important, so make sure you observe the indications and their contents at all times.

There are 4 kinds of safety note ranks as follows.





 DANGER	Incorrect operation may result in dangerous situations which may lead to death or serious injury.
 CAUTION	Incorrect operation may result in dangerous situations which may lead to medium or slight injury or only material damage.
	 Note that some indications marked as CAUTION may lead to serious results depending on the situation.
 PROHIBITED	Indicates what should not be done.
 COMPULSORY	Indicates what must be done.

There are 8 kinds of safety note symbol displays as follows.

Type	Example display	
Symbolic indications of danger	 DANGER, INJURY	 ELECTRIC SHOCK
Symbolic indications calling attention	 CAUTION	 FIRE  BURN
Symbolic indications prohibiting actions	 PROHIBITED	 DISASSEMBLING PROHIBITED
Symbolic indications urging actions	 COMPULSORY	

0.4 Cautions on Safety


DANGER

<p>Do not operate the system in an explosive environment.</p> <p> Otherwise you may be injured or a fire may occur.</p>	<p>For the driver's power supply, use a direct voltage supply where the primary and secondary sides have reinforced insulation.</p> <p> Otherwise you may receive an electric shock.</p>
<p>Do not arrange wires or conduct maintenance work or inspection when the wires are live. Make sure you turn the power off more than 5 minutes in advance.</p> <p> Otherwise you may receive an electric shock.</p>	<p>Ask experts to carry out transporting, installing, wiring, operating, maintaining, and inspecting procedures.</p> <p> Otherwise you may be injured or a fire may occur.</p>













0.SAFETY PRECAUTIONS [Observe these precautions]

DANGER

During operation, never touch rotating parts of the motor.















 Otherwise you may be injured.

CAUTION

<p>Perform wiring by referring to the wiring schematics or the instruction manual.</p> <p> Otherwise a fire may occur.</p>	<p>As for the cable, do not damage it, do not apply unreasonable stress to it, do not place any heavy objects on it, and do not crush it.</p> <p> Otherwise a fire may occur.</p>
<p>Make sure you read the Instruction Manual before installing, operating, maintaining, or inspecting, and follow the instructions detailed in the manual.</p> <p> Otherwise you may be injured or a fire may occur.</p>	<p>Do not use the driver outside their specifications.</p> <p> Otherwise you may be injured or material damage may occur.</p>
<p>Do not use the driver if they are damaged.</p> <p> Otherwise you may be injured or a fire may occur.</p>	<p>Note that the driver and any peripheral devices are heated to high temperatures.</p> <p> Otherwise you may be burnt if you touch them.</p>
<p>Check which side is up before unpacking.</p> <p> Otherwise you may be injured.</p>	<p>Check that what you have received is the same as your order. Installing the incorrect product may result in injury to you or damage to the product.</p> <p> Otherwise you may be injured or damage may occur.</p>
<p>Do not remove the connector while the power is on.</p> <p> Otherwise material damage may occur.</p>	<p>Do not measure insulation resistance and dielectric strength.</p> <p> Otherwise material damage may occur.</p>
<p>Arrange cables in accordance with the Technical Standard for Electric Facilities and the Extension Rules.</p> <p> Otherwise cables may be burnt and fire may occur.</p>	<p>Arrange cables correctly and securely.</p> <p> Otherwise material damage may occur.</p>





0.SAFETY PRECAUTIONS [Observe these precautions]

⚠ CAUTION




<p>Do not shock these units badly.</p> <p> Otherwise damage may be caused.</p>	<p>When any abnormalities occur, stop operating the system at once.</p> <p> Otherwise you may be injured or a fire may occur.</p>
<p>Choose the distances between the driver, the inside surface of the control panel, and other equipment in accordance with the Instruction Manual.</p> <p> Otherwise a fire or damage may be caused.</p>	<p>While power is being supplied, and for a while after power has been turned off, do not touch the driver's radiating fin or the motor etc. because they are heated to high temperatures.</p> <p> Otherwise you may be burnt.</p>
<p>Install them in nonflammable materials such as metal.</p> <p> Otherwise a fire may occur.</p>	<p>Make sure you observe the installation direction.</p> <p> Otherwise damage may be caused.</p>
<p>When an alarm is generated, before driving remove the cause of the alarm after safely securing the machine, and then turn the power supply back on.</p> <p> Otherwise you may be injured.</p>	<p>Never install these units where they are exposed to splashes of water, in corrosive or inflammable gas atmospheres, or near combustibles.</p> <p> Otherwise a fire or damage may be caused.</p>
<p>Never install these units where they are exposed to splashes of water, in corrosive or inflammable gas atmospheres, or near combustibles.</p> <p> Otherwise a fire or damage may be caused.</p>	<p>For a trial run, after the operation check, fix the driver status and separate from the mechanical system, then install to the machine.</p> <p> Otherwise you may be injured.</p>
<p>The operating life expectancy of the electrolytic capacitor inside the driver is 5 years, providing that the yearly ambient temperature is 104°F (40°C). It is recommended to be replaced regularly for preventative maintenance. The operating life expectancy of the fuse is 10 years at the yearly ambient temperature of 104°F (40°C). Regular replacement is recommended.</p> <p> Otherwise damage may be caused.</p>	<p>When the power is restored after a momentary interruption, do not approach the system because it may suddenly start again. (Design the system so that the operator can remain safe even if it does start again.)</p> <p> Otherwise you may be injured.</p>
<p>Check that the power supply specification is normal.</p> <p> Otherwise damage may be caused.</p>	<p>When inspecting and conducting maintenance, note that the driver's radiating fin is heated to a high temperature.</p> <p> Otherwise you may be burnt.</p>

0.SAFETY PRECAUTIONS [Observe these precautions]





⚠ CAUTION

<p>In case of repair, please contact us. If you disassemble these units yourself, they may malfunction.</p> <p> Otherwise damage may be caused.</p>	<p>During transportation be very careful not to drop or turn over these units, or serious dangers may occur.</p> <p> Otherwise you may be injured.</p>
<p>During transportation, do not hold on to the cables or the motor shaft.</p> <p> Otherwise you may be injured or damage may be caused.</p>	<p>Dispose of the driver and the motor as general industrial waste.</p> <p></p>

⊘ PROHIBITED

<p>Do not store these units where they are exposed to water, raindrops, hazardous gas, or liquid.</p> <p> Otherwise damage may be caused.</p>	<p>Do not overhaul the system.</p> <p> Otherwise a fire and electric shock may occur.</p>
<p>Do not remove the nameplate.</p> <p></p>	

⚠ COMPULSORY

<p>Store these units where they are not exposed to direct sunlight and within the specified ranges of temperature and humidity Driver: - 20 to +60 , below 90% R H (no condensation)</p> <p> Otherwise damage may be caused.</p>	<p>When the Driver is stored for a long period (over 3 years as a guide), please contact us. When it is stored for a long time, the capacity of the electrolytic capacitor decreases and a fault may occur.</p> <p> Otherwise damage may be caused.</p>
<p>Install an emergency stop circuit outside the system so that operation can be stopped immediately and the power supply can be shut off.</p> <p> Otherwise there is a danger that it could run out of control, burnout, cause a fire, or cause secondary damage.</p>	<p>Operate the system within the specified ranges of temperature and humidity shown below. Driver temperature: 32°F to 104°F (0°C to +40), Driver humidity: 85% RH or lower (no condensation)</p> <p> Otherwise it may burnout or damage may be caused.</p>

1. BEFORE OPERATION

BEFORE OPERATION

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1. BEFORE OPERATION

Please operate this system taking the contents of the following descriptions into consideration.

1.1 Precaution on Unpacking

When unpacking the driver, do not touch it if your hand is charged with electricity.

1.2 Confirmation of the Product

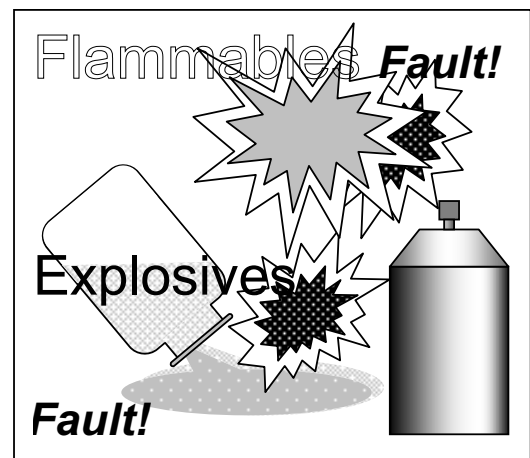
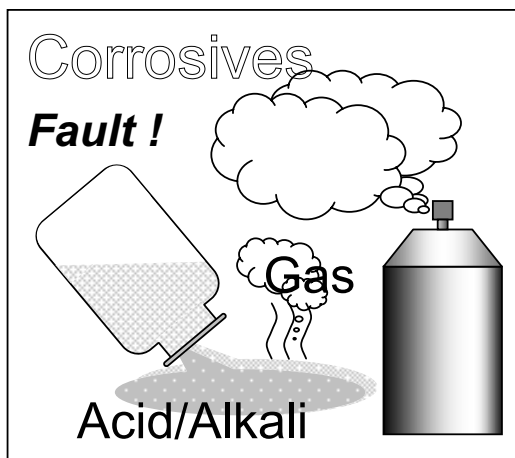
Check the following after receiving the product. Contact us if any abnormality is detected.

- Check if the model numbers of the driver match those of the ones you ordered (the numbers are described after "MODEL" on the main nameplate).
- Check the appearance of the driver to confirm that they are free from any abnormality such as breakage or lack of parts.
- Check that all screws on the driver are tightened properly.

1.3 Precautions on Operation

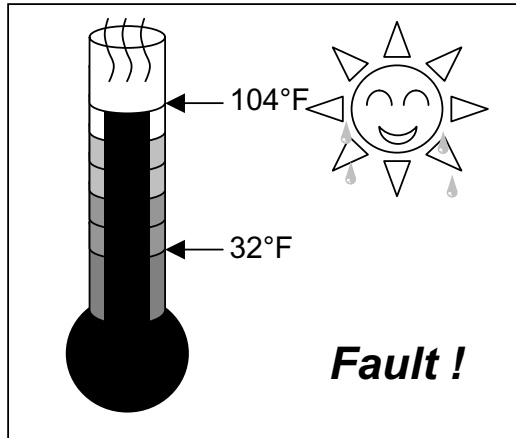
Be careful of the following during operation.

- At installation, do not give shocks to the driver, otherwise they may break.
- **Confirm the model number of the driver and make sure to use a power supply of:**
Main power supply: 24V DC ± 1.0%
For the power supply, use a direct voltage supply where the primary and secondary sides have reinforced insulation.
If a power supply other than the above is used, an accident may occur.
- Turn the power on and off during maintenance and inspection after the safety (such as the situation of the load) has been completely checked. If the power is turned on or off while the load is being applied, an accident or breakage may occur.
- Never use this product where corrosive (acid, alkali, etc.), flammable, or explosive liquid or gas exists to prevent it from deforming or breaking.
- Never use this product where flammable or explosive liquid or gas exists since the liquid or the gas may be ignited, causing great danger.



1. BEFORE OPERATION

- Use this product within the ambient temperature range from 32°F to 104°F and below the relative humidity limit of 85% .
- The driver should be kept away from water, cutting fluid, or rainwater. Otherwise electric leakage or electric shock may occur.

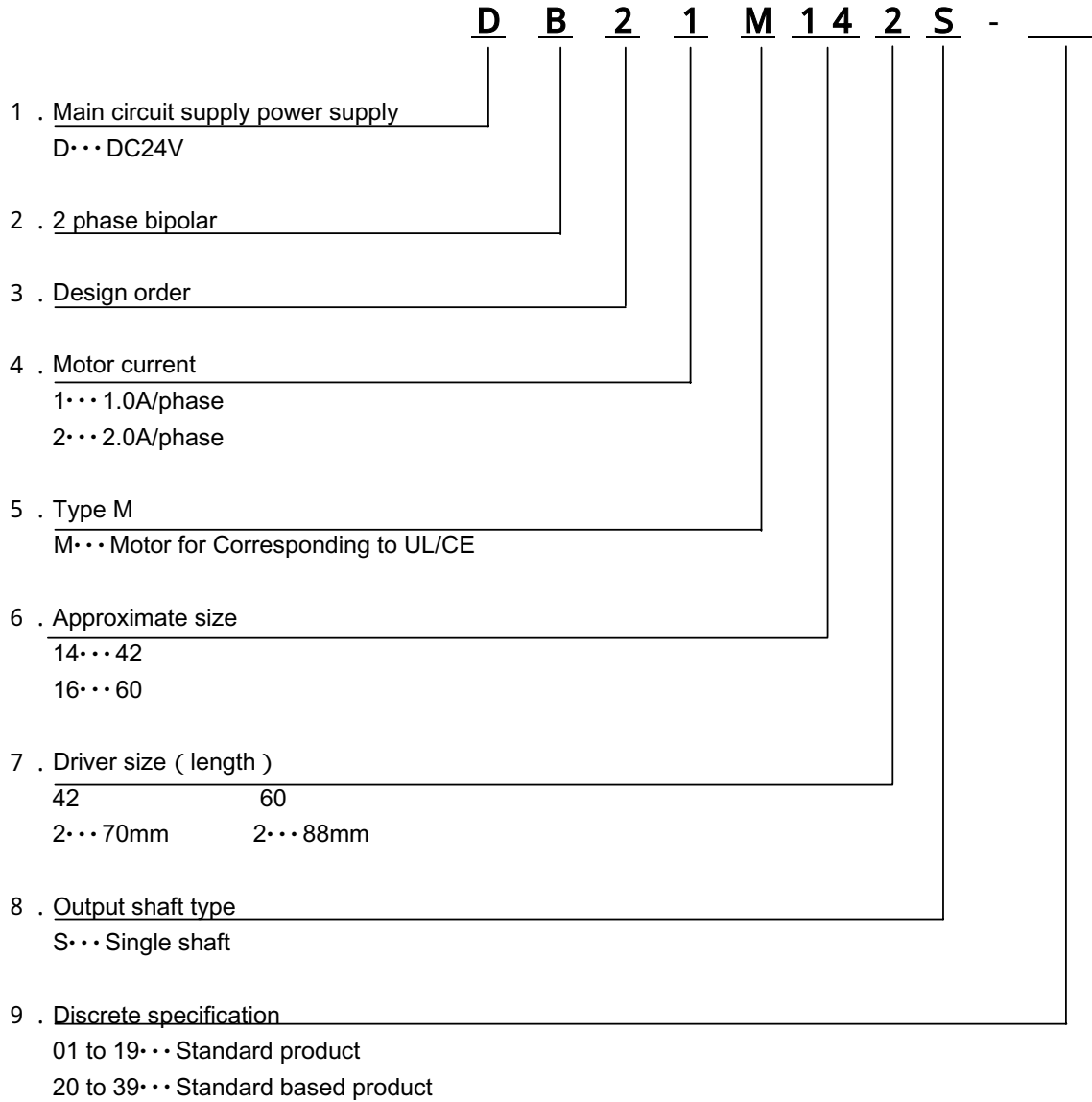


- **Never perform a withstand voltage test or a megger test on the driver.**
- Refer to “4 Wiring” for details on performing correct wiring. Incorrect wiring may cause a fault to occur.
- For safe operation, make sure you install a surge absorber on the relay, electromagnetic contactor, induction motor, and brake solenoid coils.

1. BEFORE OPERATION

1.4 How to Read Model Numbers

1.4.2 Driver Model Number



2. FUNCTIONS AND FEATURES

FUNCTION AND FEATURES

2.1 Built-in Functions.....	2-2
2.2 Features	2-3

2. FUNCTIONS AND FEATURES

2.1 Built-in Functions

This section describes the main built-in functions of the Driver.

- **3 kinds of interface modes**

As well as the usual pulse stream driving mode there is also a parallel signal input program operation mode, and a serial communication operation mode.

- **Program operation**

Positioning operations, return to origin operations, and so on, can be executed using programs that were previously set in the driver's memory.

However, it cannot be used in pulse stream operation mode.

- **Low vibration drive**

Low vibration and smooth driving is possible even for the pulse stream equivalents to the FULL and HALF steps.

- **Micro step function**

16 kinds of resolutions from 1/1 to 1/250 are possible for the micro step drive.

- **Current switching function**

The motor current during operation and stop can each be set from a rated value to 25%.

2. FUNCTIONS AND FEATURES

2.2 Features

This section explains the characteristics of the Driver.

- **Low vibration mode**

Low vibration operation is enabled even with the driving pulse equivalent to full/half steps.

- **Micro step function**

The basic step angle of the Motor can be divided up to 1/250 without reduction gear. This enables smooth and vibration free operation at low speed.

- **Wire-saving**

Wire-saving and space-saving can be achieved by integrating the driver with the motor.

3. SYSTEM CONFIGURATION

SYSTEM CONFIGURATION

3.1	Names of Driver Parts	3-2
3.2	Accessories	3-4

3. SYSTEM CONFIGURATION

3.1 Names of Driver Parts

DB21M14 -

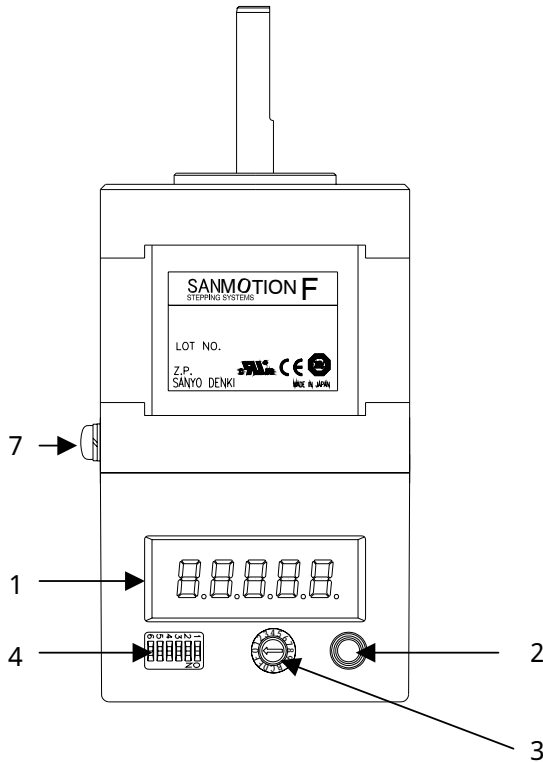


Fig 3-1 Top View of Drive

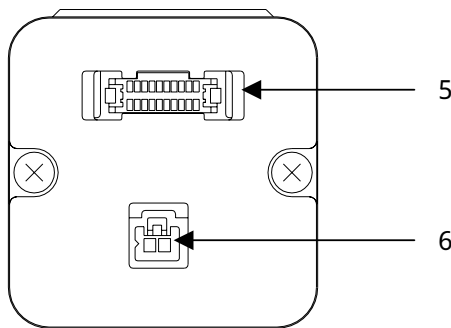


Fig 3-2 Back View of Drive

- 1 5 digit LED display
Indicates driver status.
- 2 Mode setting switch (MODE)
A switch that changes mode.
- 3 Function select switch (RSW)
When step angle selection (S.S), driving current selection (RUN), and stopping current selection (STP) is set.
Use this to set the slave station addresses, except for pulse stream I/F mode.
- 4 Function select switch (F/R,LV,PD,EORG,I.SEL,S.SEL)
Various functions in pulse stream I/F mode and the driving mode of the driver can be selected.
Use this to set the communication speed, except for pulse stream I/F mode.
- 5 Input/Output signal and serial communications connector (CN2)
Connector of the I/O signal and serial communications connected.
- 6 Power supply connector (CN1)
Connect the DC24V power supply.
- 7 Earth connecting terminal
Connect the earth of the power supply.

3. SYSTEM CONFIGURATION

DB 2 2 M 1 6 -

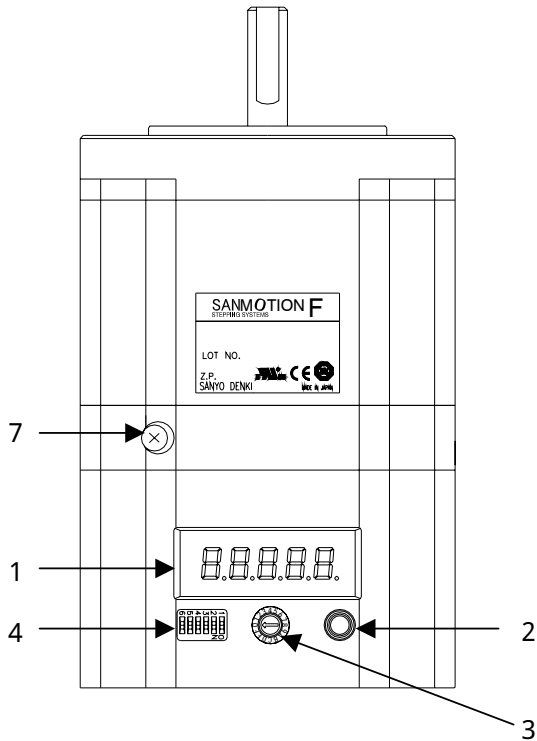


Fig 3-1 Top View of Drive

- 1 5 digit LED display
Indicates driver status.
- 2 Mode setting switch (MODE)
A switch that changes mode.
- 3 Function select switch (RSW)
When step angle selection (S.S), driving current selection (RUN), and stopping current selection (STP) is set.
Use this to set the slave station addresses, except for pulse stream I/F mode.
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Various functions in pulse stream I/F mode and the driving mode of the driver can be selected.
Use this to set the communication speed, except for pulse stream I/F mode.
- 5 Input/Output signal and serial communications connector (CN2)
Connector of the I/O signal and serial communications connected.
- 6 Power supply connector (CN1)
Connect the DC24V power supply.
- 7 Earth connecting terminal
Connect the earth of the power supply.

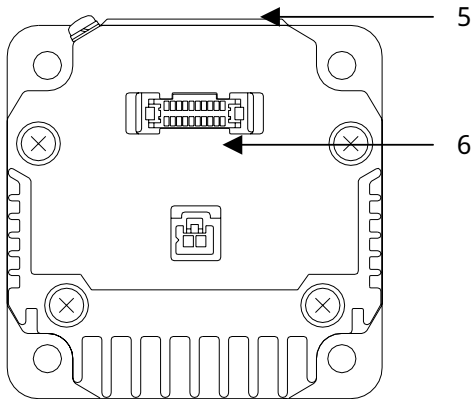


Fig 3-2 Back View of Drive

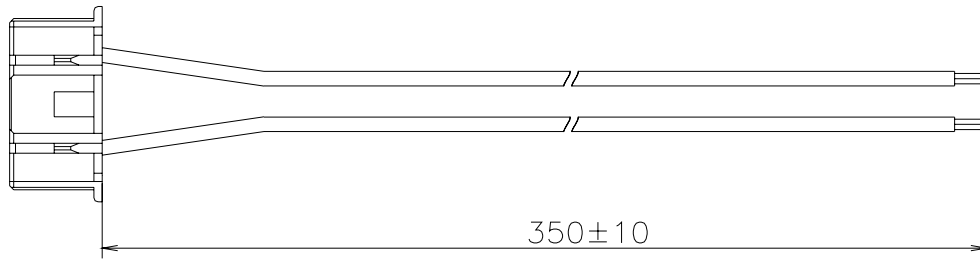
3. SYSTEM CONFIGURATION

3.2 Accessories

The following accessories are added to F series "DB2".

3.2.1 Accessories

Cable for DC Power Supply

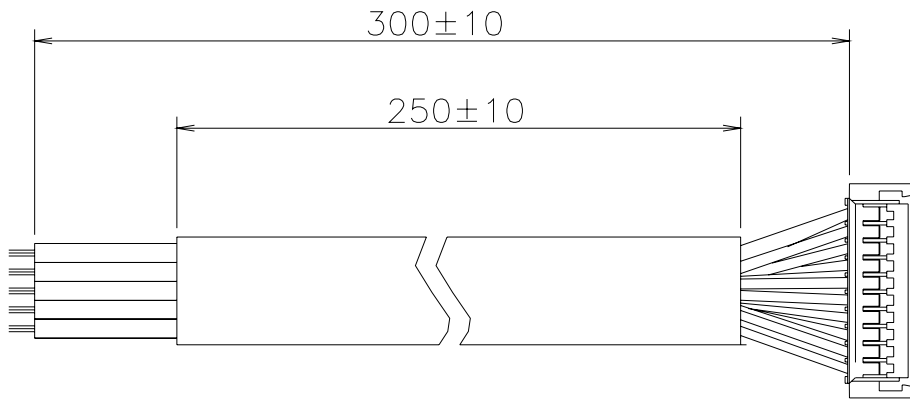


Pin	Color
1	Red
2	Black

Cable	U L 1 4 3 0 A W G 2 4 3 0 0 V , 1 0 5
Housing	P A P - 0 2 V - S (J . S . T . M F G . C O . , L T D)
Contact	S P H D - 0 0 2 T - P 0 . 5 (J . S . T . M F G . C O . , L T D)

3. SYSTEM CONFIGURATION

Cable for I/O signal and communication



Pin	Color
1	White
2	Black
3	Red
4	Orange
5	Yellow
6	Blue
7	Brown
8	Green
9	Gray
10	Purple
11	White (*1)
12	Black (*1)
13	Red (*1)
14	Orange (*1)
15	Yellow (*1)
16	NC (*2)
17	NC (*2)
18	NC (*2)
19	NC (*2)
20	Blue (*1)

Cable	UL 1685 AWG 30 30V, 105
Housing	SSHLD P - 20V - S - 1 (J.S.T.MFG.CO.,LTD)
Contact	SSL - 003GC 1 - 1 (J.S.T.MFG.CO.,LTD)

(*1) There is a marking in a leader of a lead wire.

(*2) Please do not connect #16~19 pin.

4. WIRING

WIRING


4.1	Applicable Wire Sizes.....	4-2
4.2	Applicable Connector and Conformable Housing/ Contact	4-3
4.2.1	Connector for DC Power Supply (CN1).....	4-3
4.2.2	Connector for Input/Output Signals (CN2).....	4-3
4.3	External Wiring Diagram.....	4-4
4.4	Specification Summary of Input/Output Signals	4-5
4.5	Wiring Procedure.....	4-12
4.6	Precautions on Wiring	4-13

4. WIRING

4.1 Applicable Wire Sizes

- The table below shows typical sizes of external terminals and wires used for the Driver.
- Select the wire to use and its size based on the wiring distance, operation environment and current capacity.
- Table 4-1 assumes that the rated current flows with 2m or shorter input/output signal line and 10m or shorter Motor power cable at an ambient temperature of 104°F (40°C).

Table 4-1 Applicable Wire Size

External terminal name	Terminal code	Example of applicable wire size
Power supply input terminal (CN1)	-	AWG#22 ~ 26
Connector for I/O signal and communication (CN2)	-	AWG#28 ~ 30
Earth terminal		AWG#18以上



- 1 For bundling wires or putting them in a duct, take the allowable current reduction ratio of the wires into consideration.
- 2 When the ambient temperature is high, the life will be shortened due to thermal degradation. In this case, use a heat-resistant vinyl cable (HIV).

4. WIRING

4.2 Applicable Connector and Conformable Housing/ Contact

4.2.1 Connector for DC Power Supply (CN1)

For the Driver	Conformable Housing	Conformable Contact	Manufacturer
S02B-PASK-2(LF)(SN)	PAP-02V-S	SPHD-001T-P0.5	J. S. T. MFG. , CO

4.2.2 Connector for I/O signal and communication (CN2)

For the Driver	Conformable Housing	Conformable Contact	Manufacturer
S20B-SHLDS-GW-TF(LF)(SN)	SSHLDP-20V-S-1	SSHL-003GC1-P0.2	J. S. T. MFG. , CO

4. WIRING

4.3 External Wiring Diagrams

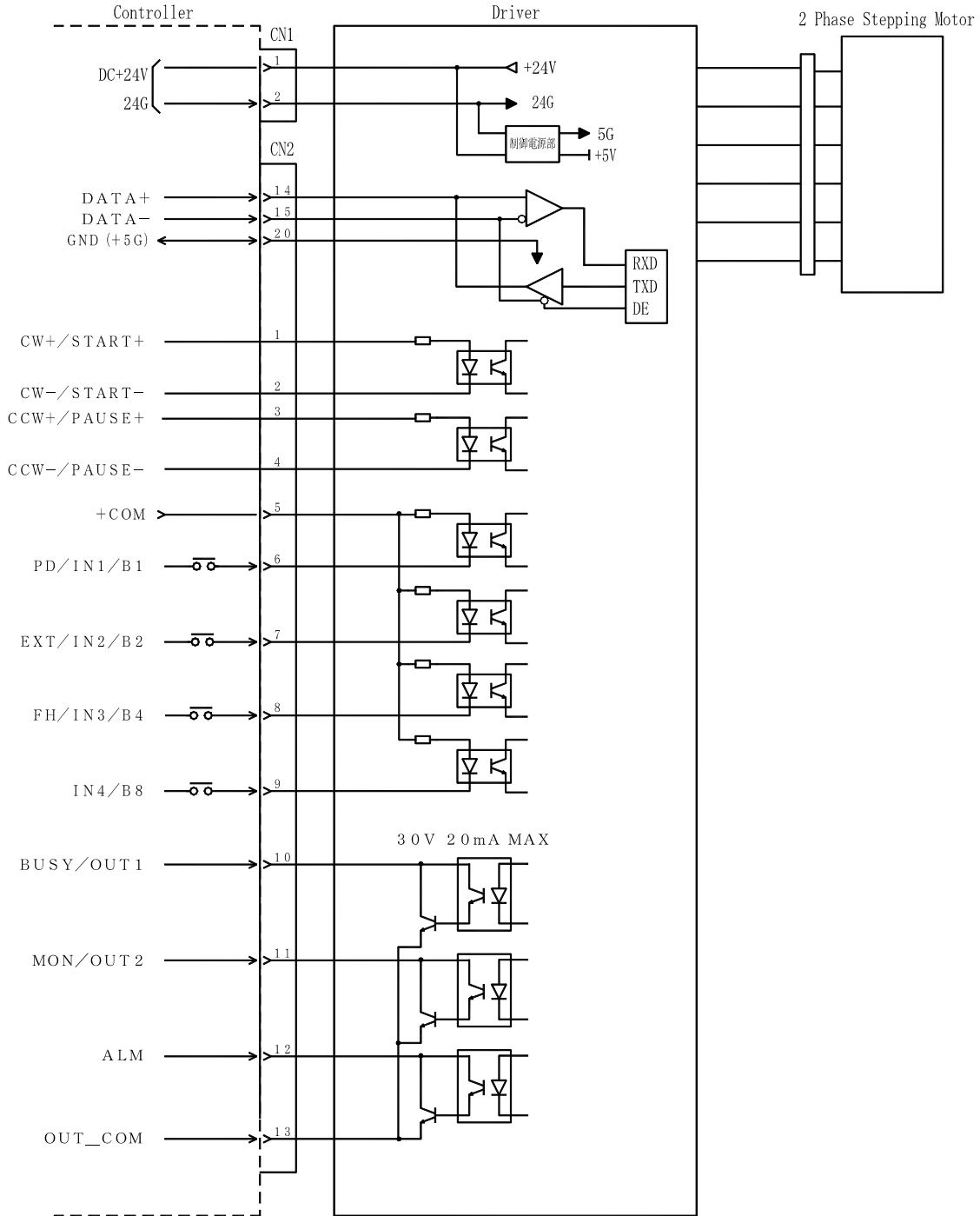


Fig.4-1 External Wiring Diagram

4. WIRING

4.4 Specification Summary of Input/Output Signals

Table 4-2 Specification Summary of CN3 I/O Signal (Pulse train I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
CW pulse input (Standard)	C W +	1	When "2 input mode", Input drive pulse rotating CW direction.
	C W -	2	
Pulse train input	C K +	1	When "1 input mode", Input drive pulse train for motor rotation.
	C K -	2	
CCW pulse input (Standard)	C C W +	3	When "2 input mode", Input drive pulse rotating CCW direction.
	C C W -	4	
Rotational direction input	U / D +	3	When "1 input mode", Input motor rotational direction signal. Internal photo coupler ON ... CW direction Internal photo coupler OFF ... CCW direction
	U / D -	4	
General-purpose input common	+ C O M	6	Input signal common of the 6 to 9 pins D C 5 V is input.
Power down input	P D	6	Inputting PD signal will cut off (power off) the current flowing to the Motor (With dip switch select, change to the Power low function is possible). PD input signal on (internal photo coupler on) ... PD function is valid. PD input signal off (internal photo coupler off) ... PD function is invalid.
Step angle select input	E X T	7	FULL/HALF select input will become valid by inputting EXT signal. EXT input signal on (internal photo coupler on) ... External input signal F/H is valid EXT input signal off (internal photo coupler off) ... Main body rotary switch S.S is valid
FULL / HALF select input	F / H	8	When EXT input signal on (internal photo coupler on), F/H input signal on (internal photo coupler on) ... HALF step F/H input signal off (internal photo coupler off) ... FULL step
		9	Reserved
During motor operation	B U S Y	1 0	The operation status of the motor is output. Internal photo coupler on...During motor operation Internal photo coupler off...During motor stop
Phase origin monitor output	M O N	1 1	When the excitation phase is at the origin (in power on) it turns on. When FULL step, ON once for 4 pulses, when HALF step, ON once for 8 pulses.

4. WIRING

Alarm output	A L M	1 2	When alarm circuits actuated inside the Driver, outputs signals to outside. Then the Stepping motor becomes unexcited status.
Output signal common	O U T _ _ C O M	1 3	It is for the output signal common.



- 1 . Refer to “9. Specification” for Input/Output signal specification.
- 2 .As for the Motor rotational direction, CW direction is regard as the clockwise revolution by viewing the Motor from output shaft side.

Table 4-3 Specification Summary of CN3 I/O Signal (Parallel I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
Program drive Start/Stop	S T A R T + S T A R T -	1 2	Commands the start and stop of program driving. Internal photo coupler on...Program driving start Internal photo coupler off...Program driving stop
Program pause	P A U S E + P A U S E -	3 4	When START signal on, a pause in program driving is commanded. Internal photo coupler on...Program driving pause Internal photo coupler off...Program driving pause release
General-purpose input common	+ C O M	6	Input signal common of the 6 to 9 pins D C 5 V is input.
Alarm clear signal (standard)	A L M C	6	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
General-purpose input 1	I N 1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 1 on Internal photo coupler off ... General purpose input 1 off
Program number selection bit 1	B 1	6	The program number is selected along with other bits. (Subordinate bit) Internal photo coupler on...Corresponding bit 1 Internal photo coupler off... Corresponding bit 0
Emergency stop input	E M G	6	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
Origin signal	O R G	6	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off

4. WIRING

+ direction overtravel signal	+ O T	7	An overtravel signal in the + direction is input. Internal photo coupler on ...+ direction overtravel not arrived Internal photo coupler off ...+ direction overtravel arrived
General-purpose input 2	I N 2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 2 on Internal photo coupler off ... General purpose input 2 off
Program number selection bit 2	B 2	7	The program number is selected along with other bits. (The second bit from the subordinate) Internal photo coupler on...Corresponding bit 1 Internal photo coupler off... Corresponding bit 0
Emergency stop input	E M G	7	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off... Emergency stop
Origin signal	O R G	7	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	7	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
- direction overtravel signal	- O T	8	An overtravel signal in the - direction is input. Internal photo coupler on ...- direction overtravel not arrived Internal photo coupler off ...- direction overtravel arrived
General-purpose input 3	I N 3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 3 on Internal photo coupler off ... General purpose input 3 off
Program number selection bit 4	B 4	8	The program number is selected along with other bits. (The third bit from the subordinate) Internal photo coupler on...Corresponding bit 1 Internal photo coupler off... Corresponding bit 0
Emergency stop input	E M G	8	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off... Emergency stop
Origin signal	O R G	8	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	8	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear

4. WIRING

Emergency stop signal	E M G	9	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
General-purpose input 4	I N 4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 4 on Internal photo coupler off ... General purpose input 4 off
Program number selection bit 8	B 8	9	The program number is selected along with other bits. (The fourth bit from the subordinate) Internal photo coupler on ... Corresponding bit 1 Internal photo coupler off ... Corresponding bit 0
Origin signal	O R G	9	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	9	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
During motor operation	B U S Y	1 0	The operation status of the motor is output. Internal photo coupler on...During motor operation Internal photo coupler off...During motor stop
During program execution	P E N D	1 0	The execution status of the program is output. Internal photo coupler on...During program execution Internal photo coupler off...Program execution complete
Zone signal	Z O N E	1 0	Turns on when the current position is inside the coordinates that were set beforehand.
During program execution	P E N D	1 1	The execution status of the program is output. Internal photo coupler on...During program execution Internal photo coupler off...Program execution complete
During motor operation	B U S Y	1 1	The operation status of the motor is output. Internal photo coupler on...During motor operation Internal photo coupler off...During motor stop
Zone signal	Z O N E	1 1	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	A L M	1 2	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	O U T _ C O M	1 3	It is for the output signal common.
DATA +	D A T A +	1 4	It is for the serial signal.
DATA -	D A T A -	1 5	It is for the serial signal.

4. WIRING

Table 4-4 Specification Summary of CN3 I/O Signal (Serial I/F mode)

Signal	Reference Designation	Pin Number	Function Summary
General-purpose input common	+ C O M	6	Input signal common of the 6 to 9 pins D C 5 V is input.
Alarm clear signal (standard)	A L M C	6	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
General-purpose input 1	I N 1	6	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 1 on Internal photo coupler off ... General purpose input 1 off
Emergency stop input	E M G	6	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
Origin signal	O R G	6	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
+ direction overtravel signal	+ O T	7	An overtravel signal in the + direction is input. Internal photo coupler on ...+ direction overtravel not arrived Internal photo coupler off ...+ direction overtravel arrived
General-purpose input 2	I N 2	7	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 2 on Internal photo coupler off ... General purpose input 2 off
Emergency stop input	E M G	7	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
Origin signal	O R G	7	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	7	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear

4. WIRING

- direction overtravel signal	- O T	8	An overtravel signal in the - direction is input. Internal photo coupler on ...- direction overtravel not arrived Internal photo coupler off ...- direction overtravel arrived
General-purpose input 3	I N 3	8	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 3 on Internal photo coupler off ... General purpose input 3 off
Emergency stop input	E M G	8	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
Origin signal	O R G	8	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	8	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
Emergency stop signal	E M G	9	The emergency stop signal is input. Internal photo coupler on...No emergency stop Internal photo coupler off...Emergency stop
General-purpose input 4	I N 4	9	This is a general-purpose input signal that can be used by program driving. Internal photo coupler on...General purpose input 4 on Internal photo coupler off ... General purpose input 4 off
Origin signal	O R G	9	The origin signal used for the return to origin operation is input. Internal photo coupler on...Origin signal on Internal photo coupler off ... Origin signal off
Alarm clear signal	A L M C	9	Recoverable alarms are cleared. Internal photo coupler off→on...Alarm clear
During motor operation	B U S Y	1 0	The operation status of the motor is output. Internal photo coupler on...During motor operation Internal photo coupler off...During motor stop
During program execution	P E N D	1 0	The execution status of the program is output. Internal photo coupler on...During program execution Internal photo coupler off...Program execution complete
Zone signal	Z O N E	1 0	Turns on when the current position is inside the coordinates that were set beforehand.

4. WIRING

During program execution	P E N D	1 1	The execution status of the program is output. Internal photo coupler on...During program execution Internal photo coupler off...Program execution complete
During motor operation	B U S Y	1 1	The operation status of the motor is output. Internal photo coupler on...During motor operation Internal photo coupler off...During motor stop
Zone signal	Z O N E	1 1	Turns on when the current position is inside the coordinates that were set beforehand.
Alarm output	A L M	1 2	When various alarm circuits operate in the driver, an external signal is output. At this time, the stepping motor becomes non excited status.
Output signal common	O U T _ C O M	1 3	It is for the output signal common.
DATA +	D A T A +	1 4	It is for the serial signal.
DATA -	D A T A -	1 5	It is for the serial signal.

4. WIRING

4.5 Wiring Procedure

The Driver is control unit to process signals of several mV or less. Therefore, perform wiring observing the following items.



1 Input/output signal line

For the input/output signal line, use twisted wires or multi-conductor twisted lump shielded wires. Wire them by taking the following precautions into account.

- Wire them in the shortest distance.
- The input/output signal line should be 2m or less.
- Separate the main circuit line from the signal circuit line.
- Do not wire the main circuit line on the side of the Driver or near another Driver.
- We recommend to use an "insulation sleeve-equipped bar terminal" if a certain insulation distance is required to be secured between main circuit wires or between main and signal circuit wires.

2 Earth cable

- Earth the wire with the diameter of AWG18 or grater at one point.
- Perform class 3 earth (earth resistance value: 100 Ω max.).
- Be sure to connect the frame of the Stepping motor (the grounding terminal) to the earth terminal of the Driver.

3 Measures against malfunction due to noise

Note the following to prevent malfunction due to noise.

- Arrange the noise filter, the Driver, and the upper controller as near as possible.
- Be sure to install a surge absorbing circuit on the coils for the relay, the magnetic contactor, the induction motor and the brake solenoid.
- Don't pass main circuit line and signal line in the same duct or overlap them.
- When a large noise source such as an electric welding machine or an electric discharge machine exists nearby, insert a noise filter into the power supply and the input circuit.
- Don't bind the noise filter primary and secondary side wires together.
- Don't make the earth cable longer.

4 Measure against radio interference

Since the Driver is an industrial piece of equipment, no measure against radio interference has been taken to it. If the interference causes some problem, insert a line filter to the power line input.

4. WIRING

4.6 Precautions on Wiring

Perform wiring observing the following completely.



1 . 1 Noise processing

The main circuit of the Driver uses FET under PWM control. If the wiring processing is not earthed properly, switching noise may occur by di/dt and dv/dt generated when FET is switched. Because the Driver incorporates electronic circuits such as the CPU, it is necessary to perform wiring and processing so as to prevent external noise from invading to the utmost.

To prevent trouble due to this noise in advance, perform wiring and grounding securely.

The power noise resistance (normal, common noise) of the Driver is within 30 minutes at 200V, 1 μ sec. Do not conduct a noise test for more than 30 minutes.

2 Motor frame earth

When the machine is grounded through the frame, $C_f \times dv / dt$ current flows from the PWM power unit of the Driver through the motor floating capacity (C_f).

To prevent any adverse effect due to this current, be sure to connect the motor terminal (motor frame) to the PE (protective earth) terminal of the Driver.

Also, be sure to ground it directly.

3 Wire grounding

When a driver is wired to a metal conduit or box, be sure to ground the metal. In this case, perform one-point grounding.

4 Faulty wiring

Since faulty wiring in the Driver and the Stepping Motor may damage equipment, be sure to check that wiring has been performed properly.

5 Power line protection

Take the following cautions into account for power line wiring

- Input overcurrent protection, Leakage current

Protect the power line by using circuit breaker and fuse without fail for Driver input.

Even after the motor frame is grounded as specified, leakage current flows in the input power line. When selecting a leak detection-type breaker, make sure that no oversensitive operation is caused by high-frequency leakage current.

- Power supply surge

When a surge voltage occurs in the power supply, connect a surge absorber between the powers to absorb the voltage before operation.

6 Lightening surge

When there is a possibility that a lightning surge over 2kV may be applied to the Driver, take countermeasures against the surge at the control panel inlet.

5. INSTALLATION

INSTALLATION

- 5.1 Driver Installation..... 5-2
 - 5.1.1 Installation Place 5-2
 - 5.1.2 Installation Procedure..... 5-2
- 5.2 Lead Wire Installation..... 5-4

5. INSTALLATION

5.1 Driver Installation

The Stepping motor is designed to be installed indoors.
Note the following precautions on the position and method of installation.

5.1.1 Installation Place

Install the Stepping motor at an indoor site by referring to the following.

- Ambient temperature : 0 to 40°C (32 ° F to 104 ° F)
- Storage temperature : -20 to 60°C (-4 ° F to 140 ° F)
- Ambient humidity : Less than 85% :Under 35°C
Less than 35% :Under 60°C(without dew condition)
- Storage humidity : 5 to 90% (without dew condition)
- Well-ventilated places without corrosive or explosive gas
- Places free from dust or foreign materials
- Places easy to check and clean
- Always keep away from oil, water or cut liquid.

5.1.2 Installation Procedure

Installation Direction

- The Stepping motor can be installed horizontally or on/under the end of a shaft.
- When setting vertically, provide a cable trap to prevent oily water from going to the motor.

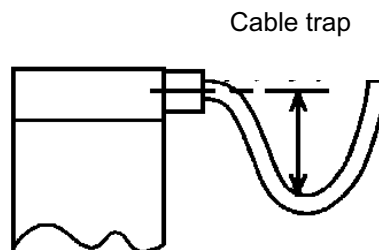


Fig. 5-1

Prevention against Water

The motor, as a single unit, satisfies the IEC standard. Since the standard, however, is intended to check performance over a short period of time, the following measures against wetting are required for actual usage. Handle the system carefully, or the connector sheathes may be hit or damaged, deteriorating waterproof function.

5. INSTALLATION

Connection to Opposite Machine

- Perform centering accurately between the motor shaft and the opposite machine. Note that when a rigid coupling is used, especially, a slight offset will lead to damage of the output shaft.
- When installing the motor to the machine, make an installing hole precisely so that the motor joint can be smoothly connected. Also, make the installing surface as flat as possible, or the shaft or the bearing may be damaged.
- When installing the gear, the pulley, the coupling, etc, avoid giving shocks to them.

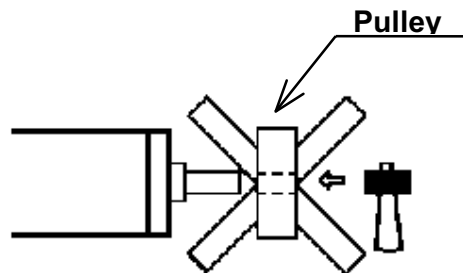


Fig. 5-2

- When removing the gear, the pulley, etc, use a dedicated extracting tool.

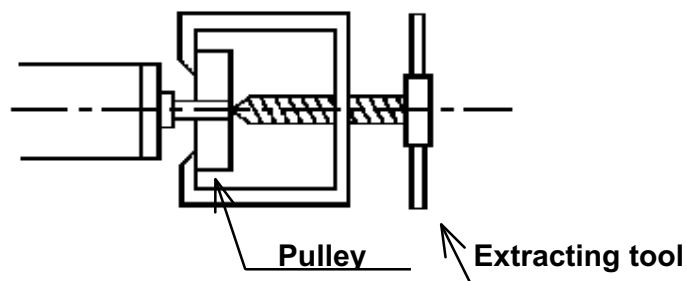


Fig. 5-3

- When performing belt driving, check that the shaft-converted value of the belt tension does not exceed the allowable value shown in Table 5-1.

5. INSTALLATION

Allowable Load of Bearing

Table 5-1 shows the load the Stepping motor can endure. Do not apply an excessive thrust or radial load. The thrust or radial load in the table indicates the value when it is independently applied to the shaft.

Table 5-1 Motor Allowable Radial and Thrust Load

Approximate size	Model Number	Radial Load (N)	Thrust Load (N)
4 2	D B 2 1 M 1 4 2 S - 0 1	2 4	1 0
6 0	D B 2 2 M 1 6 2 S - 0 1	6 5	1 5



The radial load that can be allowed is a permissible capacity at rated load center distance that can be added from the output axis to the output axis point. (Refer to the figure below)

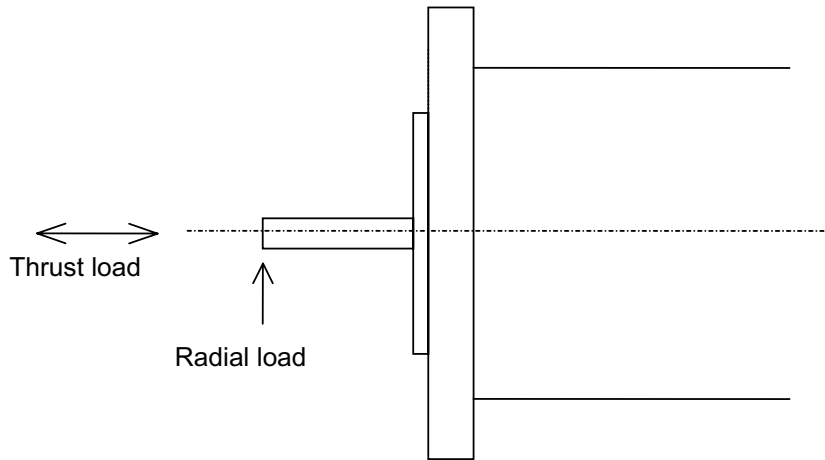


Fig. 5-4 Radial Loaded Position

5.2 Lead Wire Installation

- Be careful not to apply any stress or damage to the lead wires.

6. OPERATION

OPERATION

- 6.1 Operation Sequence 6-2
 - 6.1.1 Pulse Stream I/F Mode Driving Sequence 6-2
 - 6.1.2 Parallel I/F Mode Driving Sequence..... 6-4
 - 6.1.3 Serial I/F Mode Driving Sequence..... 6-5
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 - 6.2.2 Alarm Display 6-16

6. OPERATION

6.1 Operation Sequence

There is the case that overheat protection alarm of a driver functions (Alarm 02h), because temperature of the driver inside rises by a setting drive pattern, the moving current and stop current. In this case, please be careful because forced cooling and a change of a driving condition are need.

Using in less than driving duty 50% and in less than stop current 50% is recommended. When it is set driving duty and electric current more than recommended values, please evaluate it in a true operation condition whether there is not outbreak of above alarm (Alarm 02h).

6.1.1 Pulse Stream I/F Mode Driving Sequence

6.1.1.1 Power ON Sequence

The frequency of power ON/OFF should be 5 times/H or less, and 30 times/day or less.

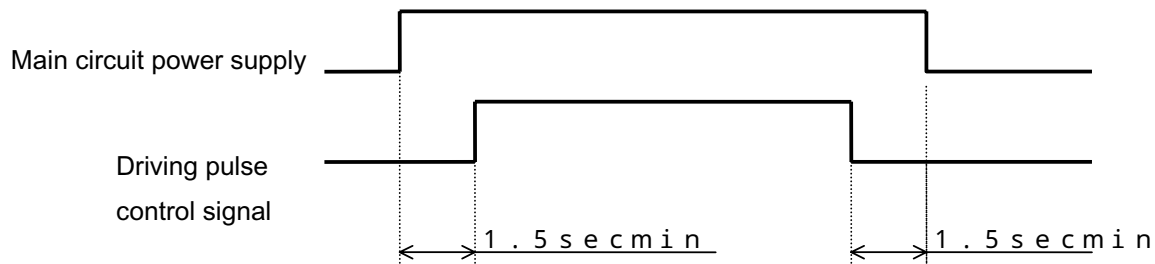


Fig. 6-1 Power ON Sequence

6.1.1.2 Power Down Command

When the power down signal becomes excitation OFF, it keeps being excited between 60ms. It doesn't operate annulling the instruction pulse between 300ms after the excitation turning on is done.

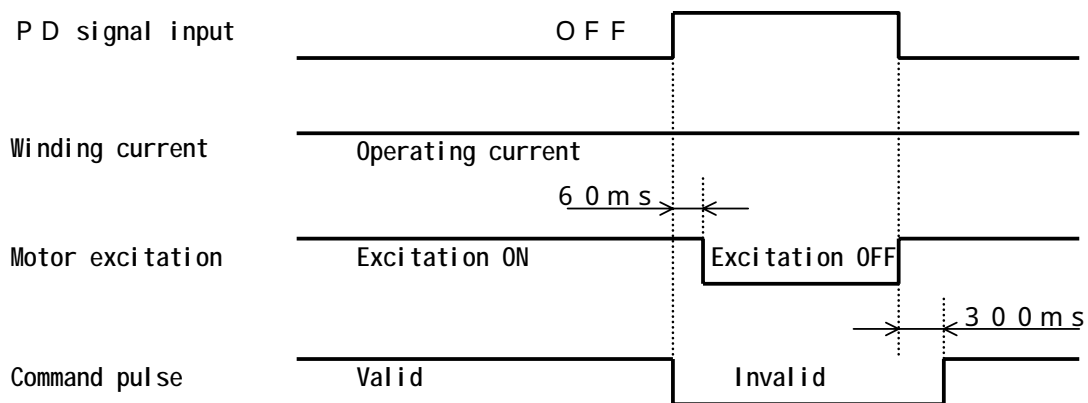


Fig. 6-2 Power Down Operation

6. OPERATION

6.1.1.3 Low Power Command

When the power down signal is input, it changes to the stopping current and is reflected immediately. The low power command does not effect the motor excitation, or the command pulse.

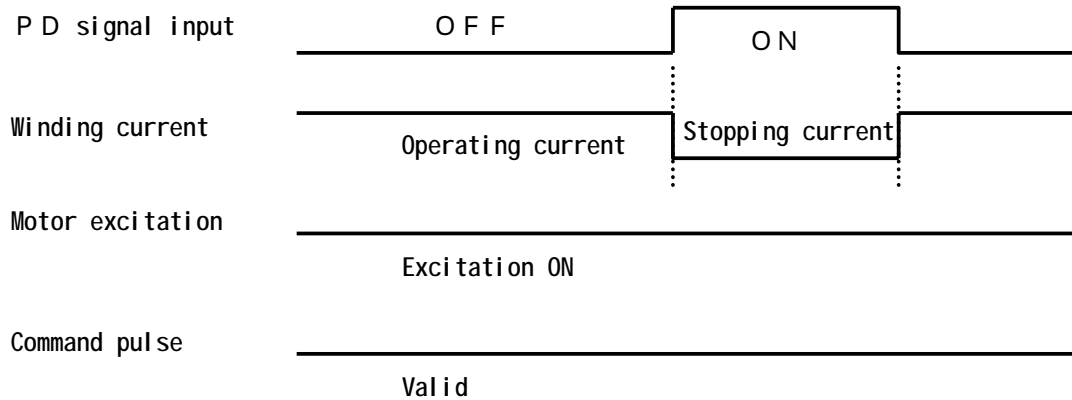


Fig. 6-3 Power Down Operation

6.1.1.4 Operation When Alarm

When the alarm is generated, excitation is turned off at once. Refer to "Table 6-2 Alarm Status Display" for details on the alarm.

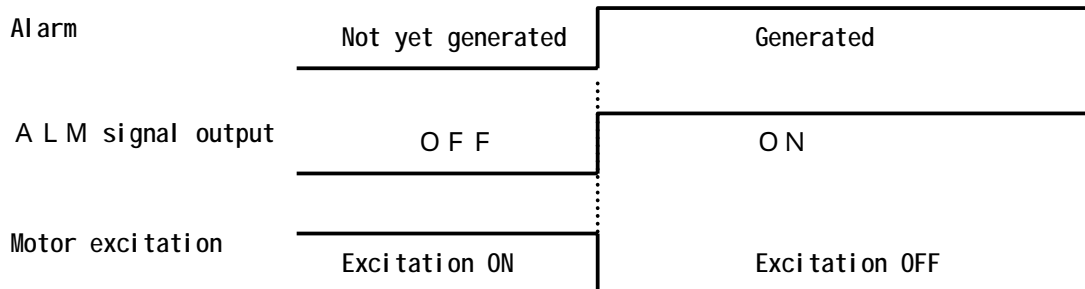


Fig. 6-4 Alarm When Excitation OFF

6. OPERATION

6.1.2 Parallel I/F Mode Driving Sequence

6.1.2.1 Power ON Sequence

The PEND signal is turned OFF during CPU initialization.

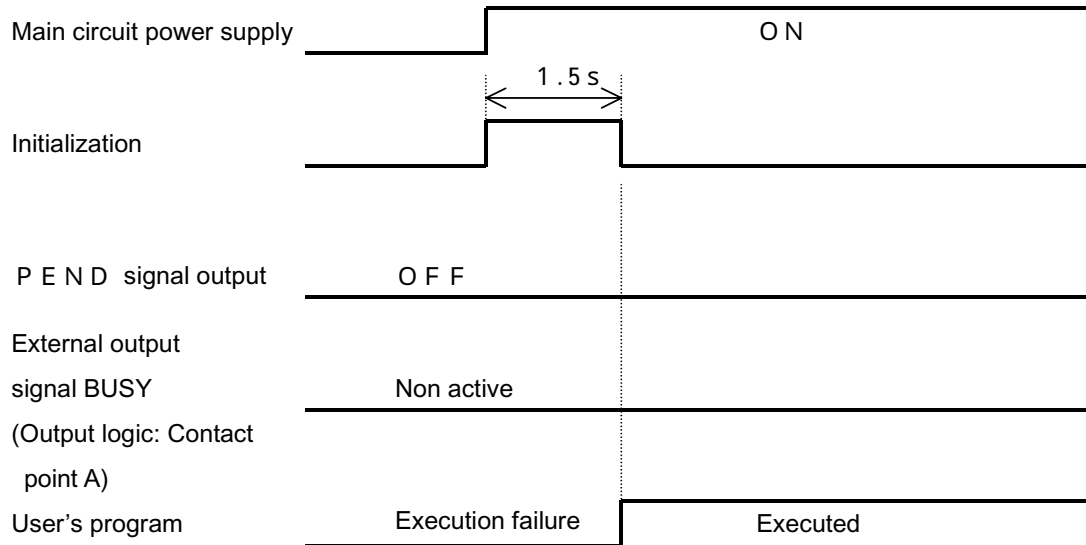


Fig. 6-5 Power ON Sequence

Refer to "11.1 Specification" for the operation sequence of program driving.

6. OPERATION

6.1.3 Serial I/F Mode Driving Sequence

6.1.3.1 Return to Origin Operation

The figure shows the external output signal and status relationship when return to origin operation (Homing Type:10h).

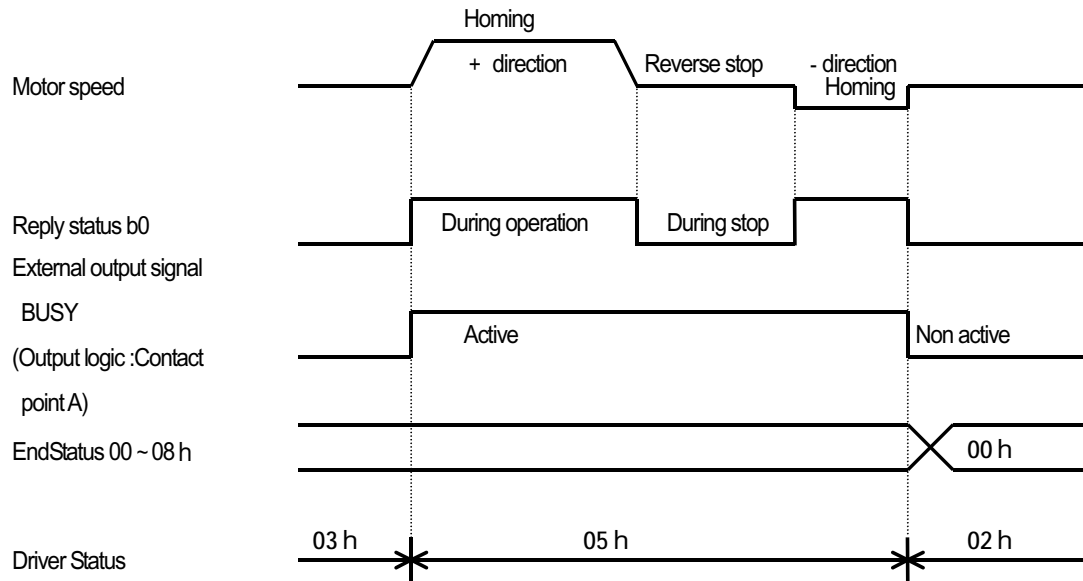


Fig. 6-6 Return to Origin Operation

Operation contents

End Status : Updated when the return to origin is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status : 02h when the motor stops, 05h during return to origin operation are returned.

6. OPERATION

6.1.3.2 Positioning Operation

The figure shows the external output signal and status relationship when positioning operation (Incremental Pulse: 11h, Target Position).

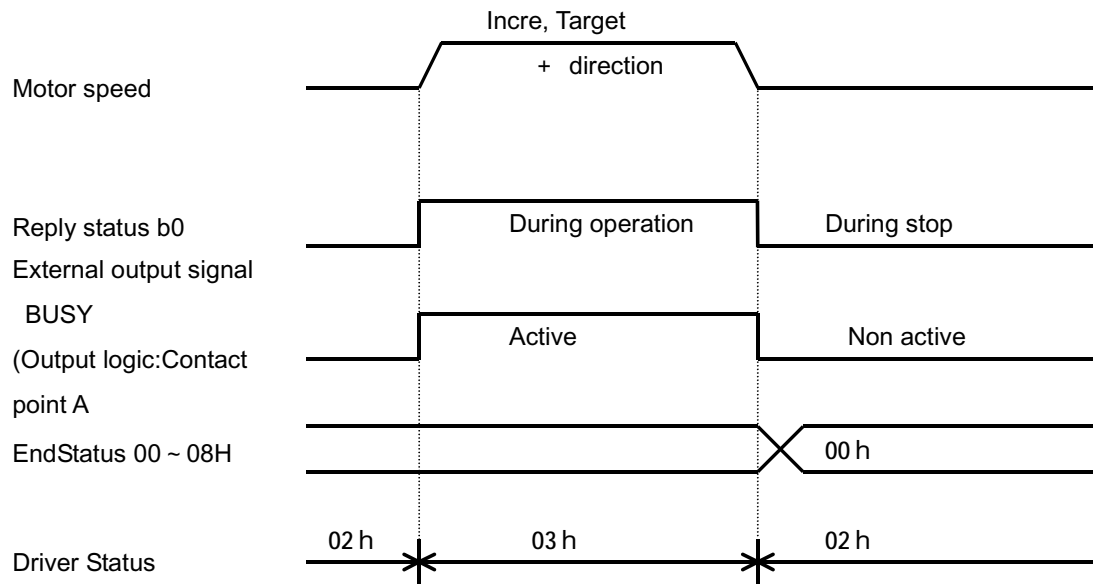


Fig. 6-7 Positioning Operation

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status: 02h when the motor stops, 03h during positioning operation are returned.

6. OPERATION

6.1.3.3 Signal Search Operation

Before starting the signal search operation set the type of signal status, the complex condition (Search Signal Select:2Bh), and the logic of the signal (Search Signal Logic:2Ch).

The example is a stop by the detection of general-purpose input signal 1 during a signal search operation.

The figure shows the external output signal of signal search operation (Signal Search Direction: 14h) and the status relationship.

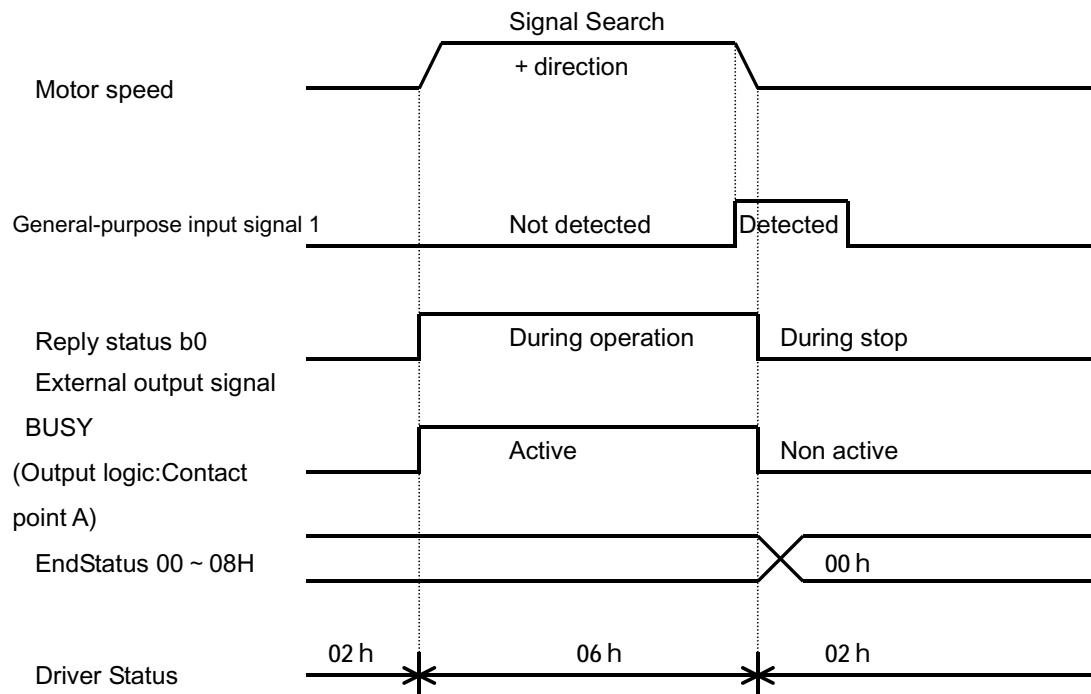


Fig 6-8 Signal Search Operation

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status : 02h when the motor stops, 06h during signal search are returned.

When stopping by an overtravel signal, select "Nothing is done" by setting Hard Limit Action (41h). If you do not select "Nothing is done", setting Action command is given priority, and an alarm is generated. Also, the soft limit and the emergency stop signal have the same specifications.

6. OPERATION

6.1.3.4 Operation When Overtravel Signal Input

Hard Limit Action (41h) is set, and a \pm overtravel signal is detected during operation, it becomes a recoverable alarm. After the alarm is cleared, and when it moves in the opposite direction to the \pm overtravel signal, it does not become an alarm. Operations when the overtravel signal is detected can be specified by setting Hard Limit Action (41h).

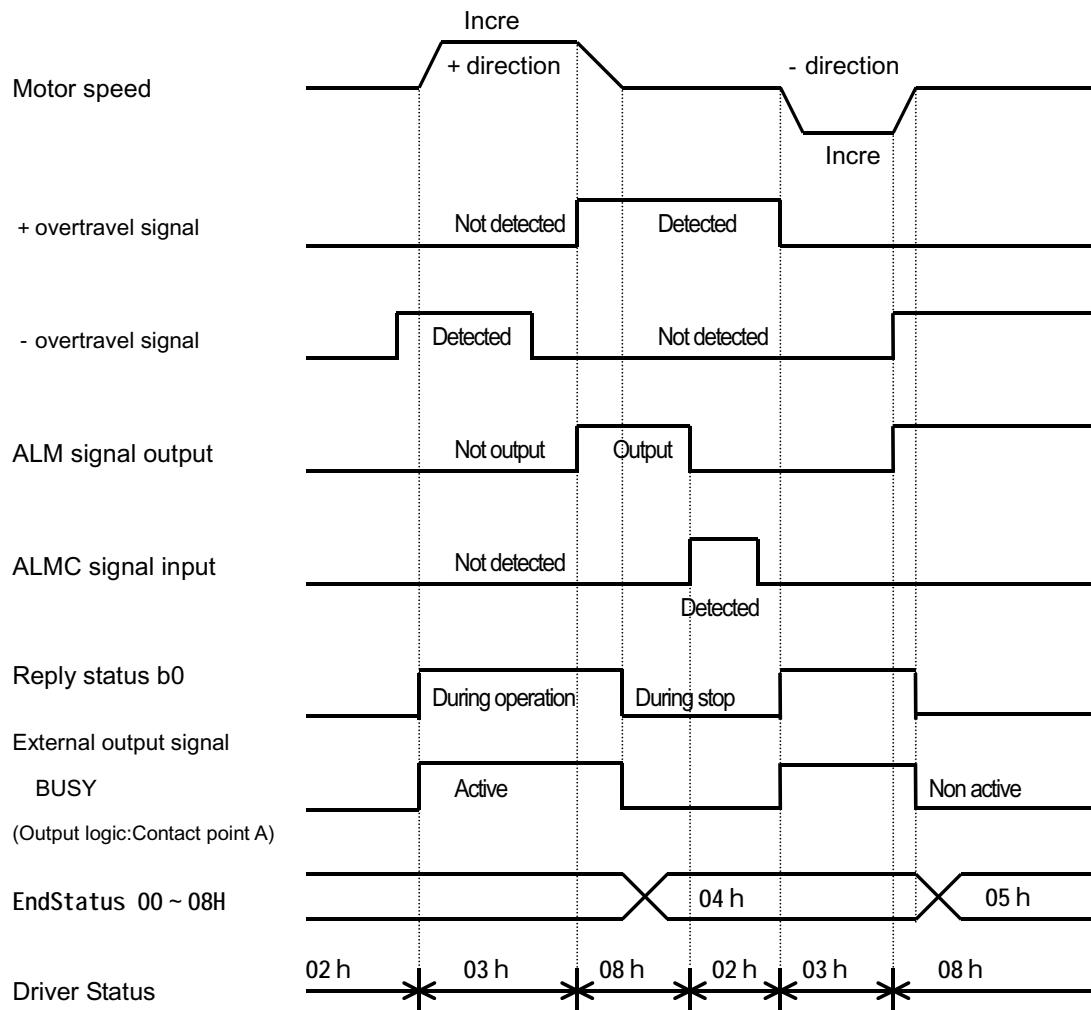


Fig. 6-9 Overtravel Signal

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. 04h: stop by + direction overtravel signal, 05h: stop by – direction overtravel signal.

Driver Status : 02h when the motor stops, 03h during positioning operation, and 08h during alarm are returned.

6. OPERATION

6.1.3.5 Operation When Zone Signal Output

The zone signal is output when it reaches coordinates within the range set by Positive Zone Signal Limit Position (46h) and Negative Zone Signal Limit Position (47h).

Either the command position or the actual position (F/B position) can be specified by the Zone Signal Condition (4B) for a comparison with the output range of zone signal.

The figure shows the operation when the zone signal is output, the external output signal, and the status relationship.

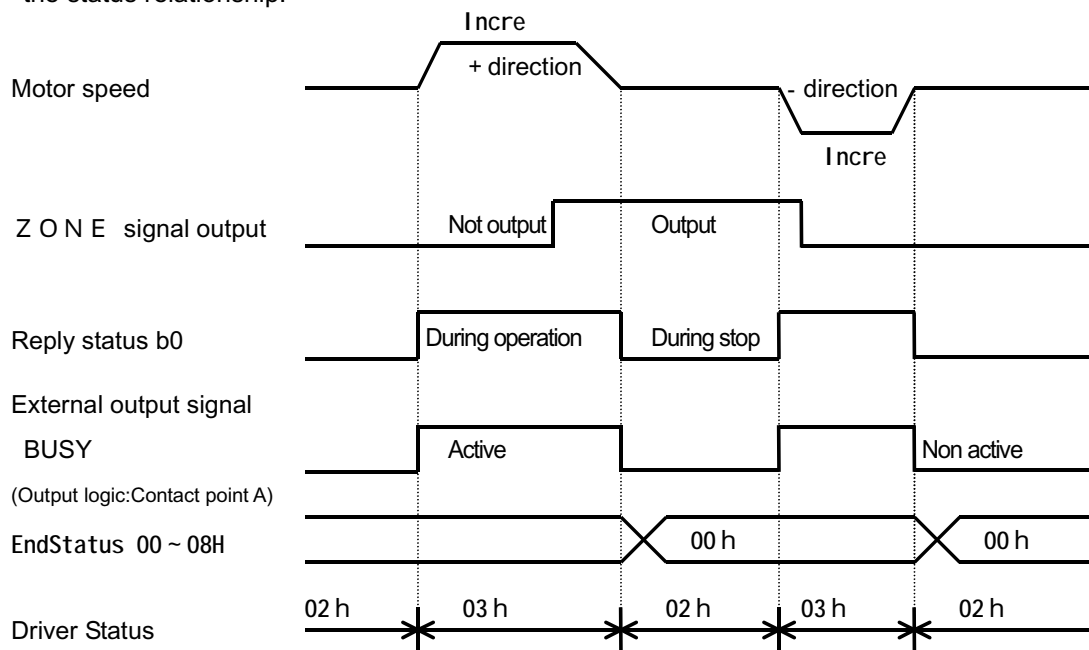


Fig. 6-10 ZONE Signal

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status : 02h when the motor stops, 03h during positioning operation, and 08h during alarm are returned.

6. OPERATION

6.1.3.6 Operation When Emergency Stop Signal Input

If External Stop Action (40h) is set and the emergency stop signal (EMG signal) is detected during operation, it becomes a recoverable alarm. The alarm cannot be cleared during EMG signal detection.

The figure shows the operation when the EMG signal is detected, the external output signal, and the status relationship.

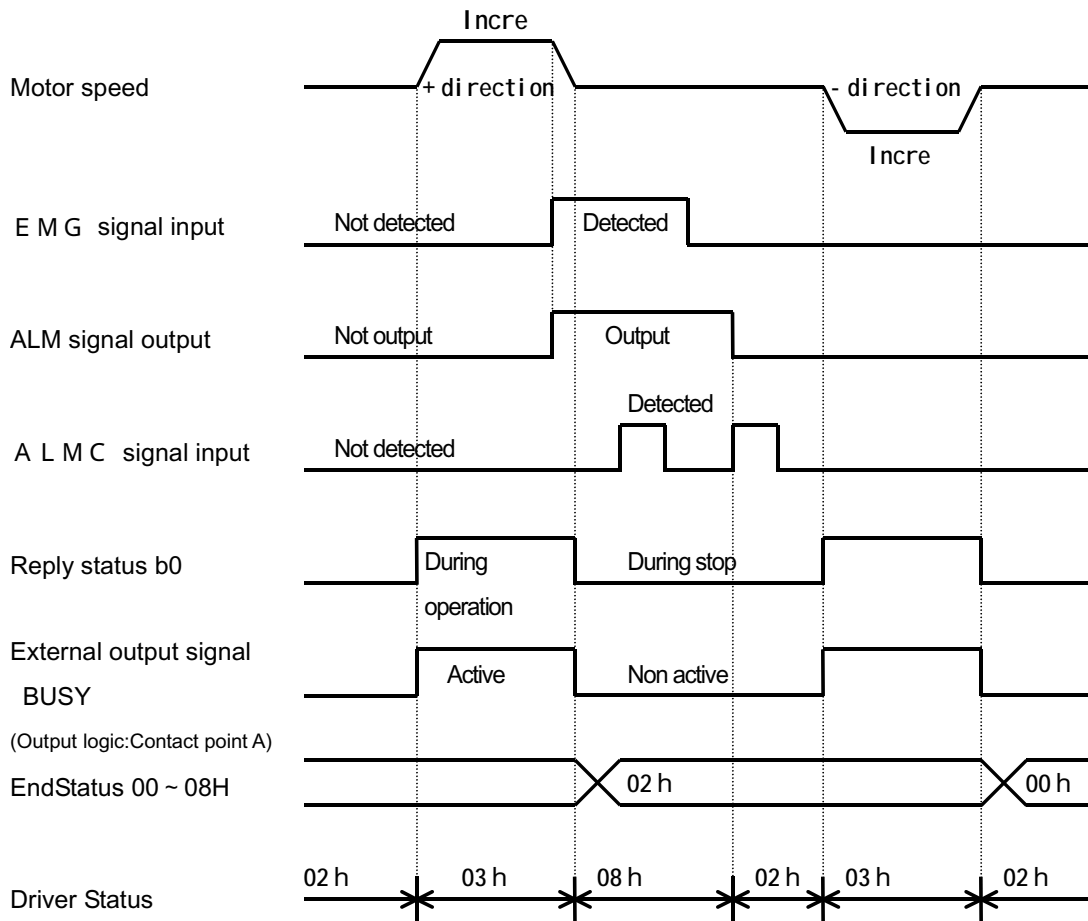


Fig. 6-11 Operation When EMG Signal is Detected

Operation contents

End Status : Updated when the operation is complete, and the previous state is retained until after the next operation ends. 02h: Stop by EMG signal, 00h: Normal end.
 Driver Status : 02h when the motor stops, 03h during positioning operation, and 08h during alarm are returned.

6. OPERATION

6.1.3.7 Midway Velocity Change During Motor Operation

During motor operation (Incremental Pulse: 11h, Target Position: 12h, Jog Direction: 13h, Signal Search Direction: 14h), the velocity can be changed midway by entering Target Velocity (20h) to Target Velocity (20h) in Set. The velocity can be changed during acceleration, constant velocity, and deceleration. However, when Set is done during deceleration stop, it is reflected from the next operation.

The figure shows the midway velocity change, the external output signal, and the status relationship during motor operation.

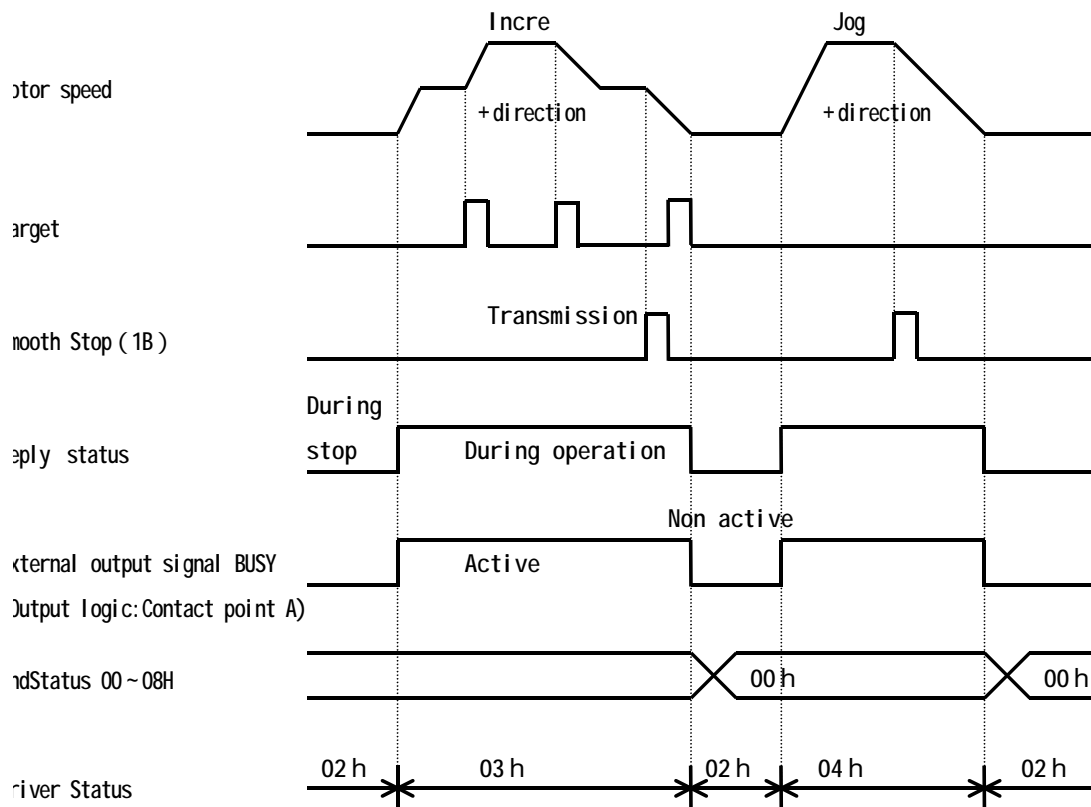


Fig. 6-12 Midway Velocity Change During Motor Operation

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status : 02h when the motor stops, 03h during positioning operation, and 04h during continuous operation are returned.

6. OPERATION

6.1.3.8 Midway Acceleration and Deceleration Change During Motor Operation

During motor operation (IncrementalPulse:11h,TargetPosition:12h,Jog Direction:13h,Signal Search Direction:14h) Acceleration(23h) the acceleration and deceleration can be changed midway by entering Acceleration (23h) and Deceleration (24h) in Set. However, when Set is done during deceleration stop, it is reflected from the next operation.

The figure shows the midway acceleration change, the external output signal, and the status relationship during motor operation.

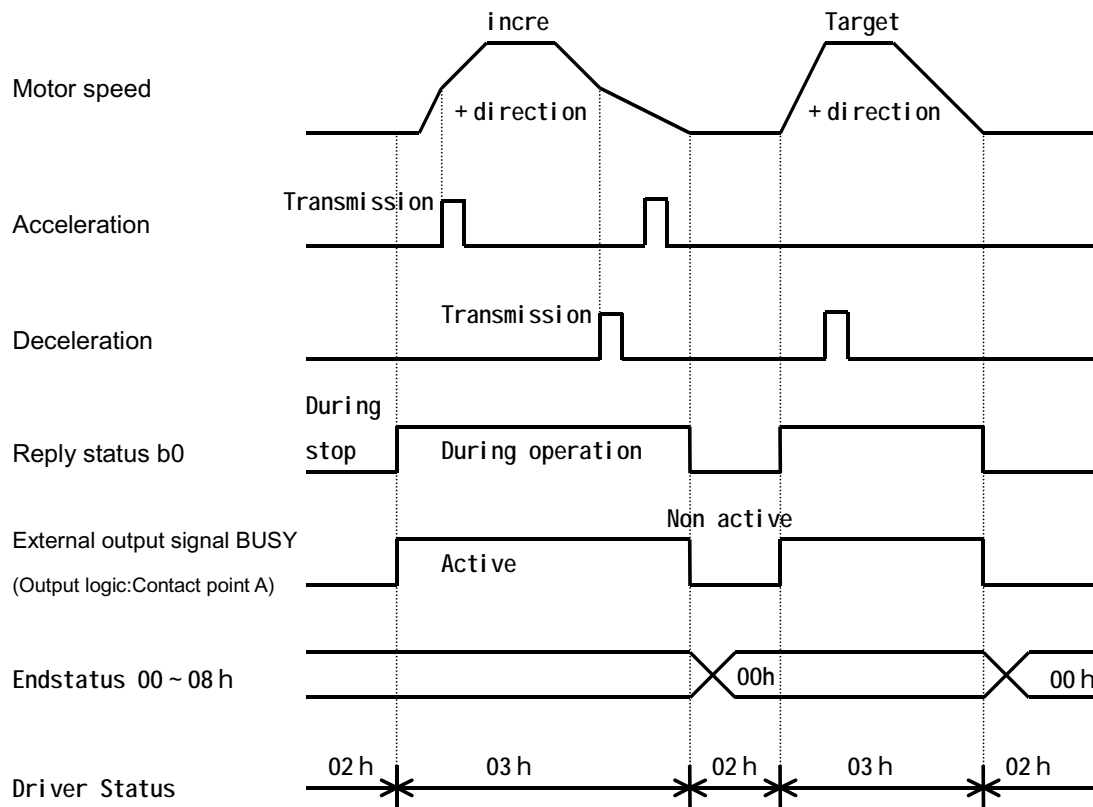


Fig. 6-13 Midway Acceleration and Deceleration Change During Motor Operation

Operation contents

End Status: Updated when the operation is complete, and the previous state is retained until after the next operation ends. (00h: Normal end)

Driver Status : 02h when the motor stops and 03h during positioning operation are returned.

6. OPERATION

6.1.3.9 Rapid Stop

When stopping rapidly, either Deceleration (24h) or Rapid Stop Deceleration(25h) are used to decelerate. However, when there is not enough time for deceleration, it may stop at a velocity faster than the stop velocity.

The figure shows the rapid stop condition, the external output signal, and the status relationship during operation.

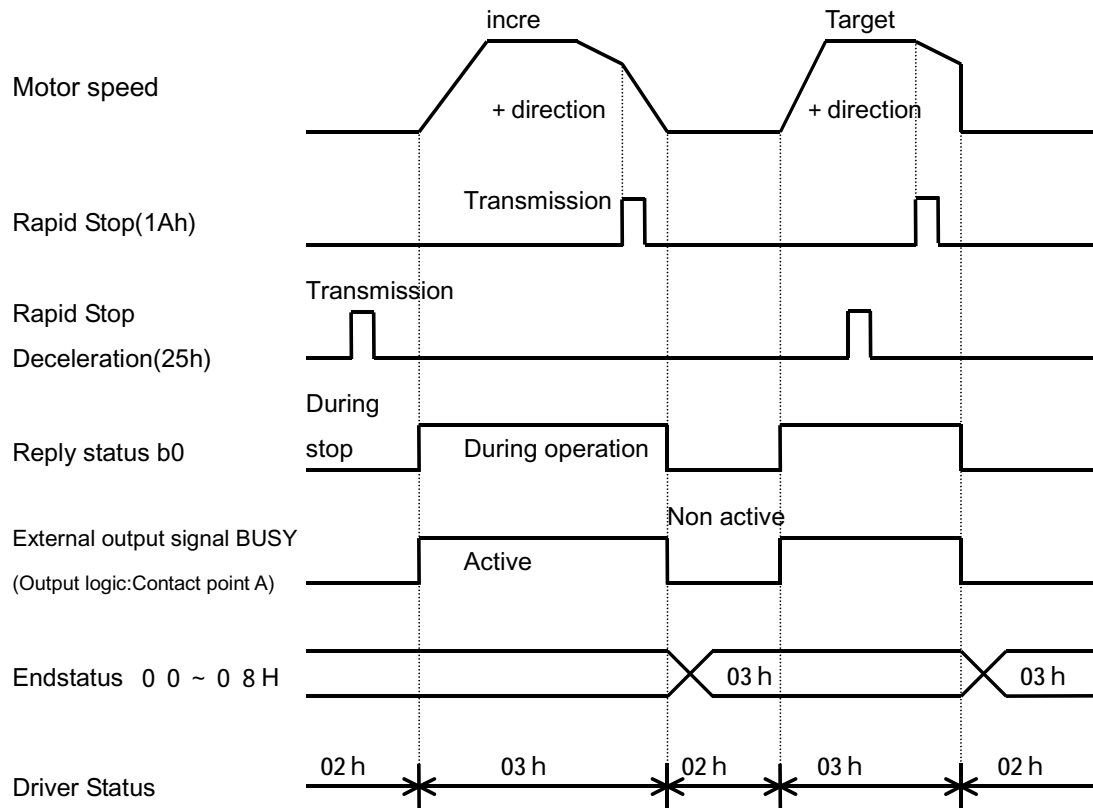


Fig. 6-14 Rapid Stop

Operation contents

End Status : Updated when the rapid stop operation is complete, and the previous state is retained until after the next operation ends. (03h: Stop by stop command)

Driver Status : 02h when the motor stops and 03h during positioning operation are returned.

6. OPERATION

6.1.3.10 Operation When Alarm

When an alarm is generated during motor operation, the motor stops rapidly or immediately. Alarm includes recoverable alarms by an alarm clear signal, and recovery failure alarms that need the power supply to be turned off and on again.

The figure shows the alarm status, the external output signal, and the status relationship during operation

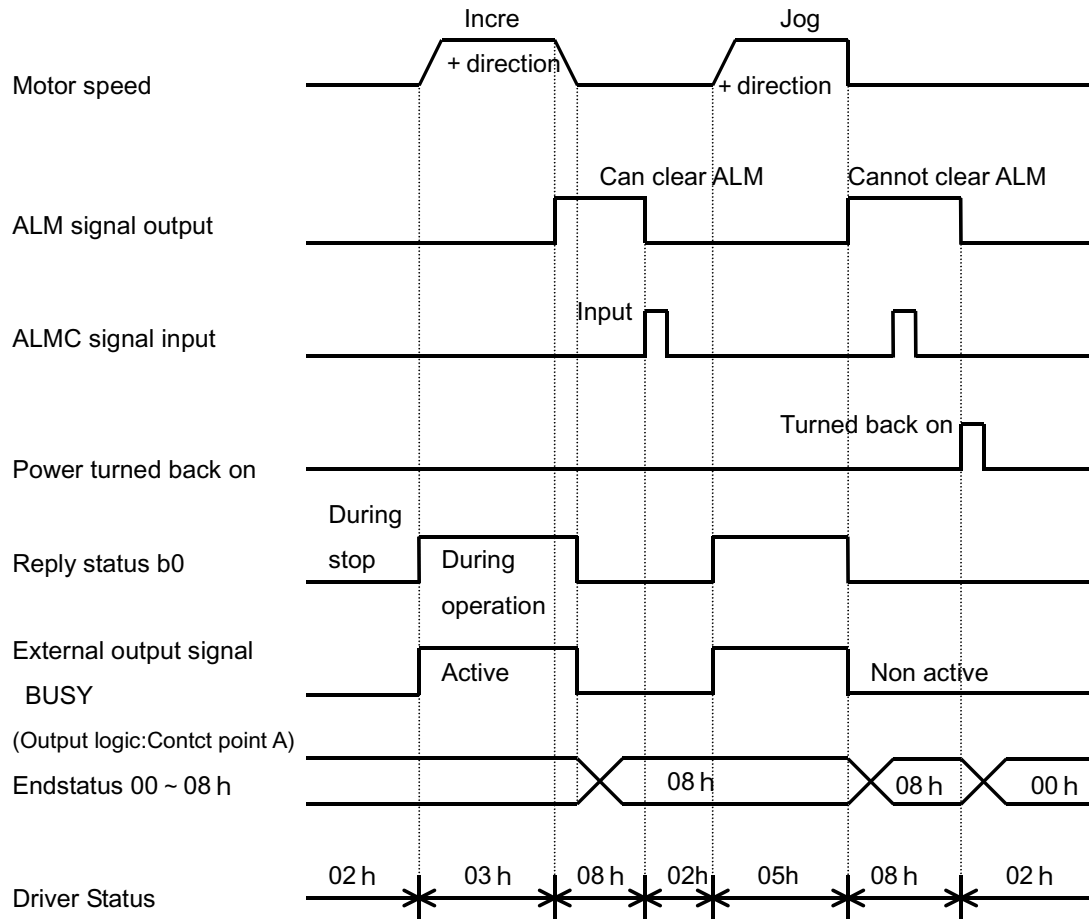


Fig. 6-15 Operation When Alarm

Operation Contents

End Status : Updated when the rapid stop operation is complete, and the previous state is retained until after the next operation ends. (08h: Stop by the alarm)

Driver Status : 02h when the motor stops, 03h during positioning operation, 04h during continuous rotation operation, and 08h during alarm are returned.

Refer to "Table 6-2 Alarm Status Display" for details on excitation OFF/brake retention etc. after the motor stops.

6. OPERATION

6.2 Display

The Driver status and alarms are displayed by a 7-segment LED.

6.2.1 Status Display

Table 6-1 Status Display

Display	Explanation of status
Rotates in the form of a figure 8 	It is an operation possible status when a rotating figure 8 is displayed.
3 center lines decrease 	During excitation off by the power down signal input (when power off is set), decreasing 3 center lines is displayed. Motor does not operate even if a pulse is input.
D.P in the second subordinate position bit is on. 	Excitation phase is at origin (power ON status). ON once per 4 pulse when FULL step (0.9 ° /step) ON once per 8 pulse when HALF step (0.45 ° /step)
D.P in the first subordinate position bit is on. 	Command pulse is input. Turn ON for approx. 100ms per 1 pulse input.

6. OPERATION

6.2.2 Alarm Display

Table 6-2 Alarm Status Display

Display	Explanation of status
02	Overheat protection alarm circuit of inside element is operated. This alarm occurs when the temperature inside the Driver including ambient temperature becomes at 85 (185°F) or more. After a rapid stop, excitation is turned OFF and the brake is retained. The alarm can be cleared by turning the power supply off and then back on. (Using in less than driving duty 50% and in less than stop current 50% is recommended. In the case that this alarm occurred, please be careful because forced cooling and a change of a driving condition are need.)
05	Hardware abnormality. The alarm code displays information for our company to analyze. After a rapid stop, excitation is turned OFF and the brake is retained. The alarm can be cleared by turning the power supply off and then back on.
06	
07	
08	
09	Abnormality in non-volatile memory data. When data read from non-volatile memory exceeds the parameter setting range, an alarm is generated. After a rapid stop, excitation is turned OFF and the brake is retained. The alarm can be cleared when the memory data abnormality is removed.
20	Overtravel. If an overtravel signal in a positive or negative direction is input, it is generated. Generation conditions and operations when generated etc. can be changed by the parameter.
21	Software limit attained. When the motor reaches the software limit that is set beforehand, an alarm is generated. Generation conditions and operations when generated etc. can be changed by the parameter.
22	Return to origin pulse limit attained. During the return to origin operation when movements exceed the pulse number set beforehand, an alarm is generated.
24	Emergency stop signal detected. When the emergency stop signal (EMG) is input, it is generated. Generation conditions and operations when generated etc. can be changed by the parameter. The alarm can be cleared with the emergency stop signal status ends.
25	Excitation off during operation. Except for pulse stream I/F mode, when the excitation off command is input during motor operation, it is generated. After a rapid stop, excitation is turned OFF and the brake is retained.

6. OPERATION

Display	Explanation of status
31	Program command code abnormality. When a mistake is found in the program code when the program is executed, it is generated.
32	Program command data abnormality. When there is a contradiction when the program is executed, such as the parameter referred to ahead does not exist, it is generated.
33	Program execution impossible. When an execution start command is commanded when a program cannot be executed, such as during motor operation or writing to nonvolatile memory etc., it is generated.
34	Program time-out. When a program command that is subject to a time-out is executed, and a time-out is done, an alarm is generated.
35	Program subroutine nest abnormality. When a subroutine with a hierarchy greater than 16 levels is called during a program, it is generated.



By each alarm operation with the LED lit, output signal from alarm output terminal (AL) of I/O signal connector (CN2) to the external, the motor stops rapidly or immediately. Once an alarm is generated the status is retained until an alarm clear is commanded. When an alarm is generated, make sure you remove the cause of the alarm before clearing the alarm. When an alarm is generated, the operation and recovery method differ for each alarm. Refer to "8.1 Troubleshooting" for details.

7. SET UP

SET UP

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7. SET UP

7.1 Overview

Various setting according to the specification is possible with rotary and dip switch in the upper part of Driver.

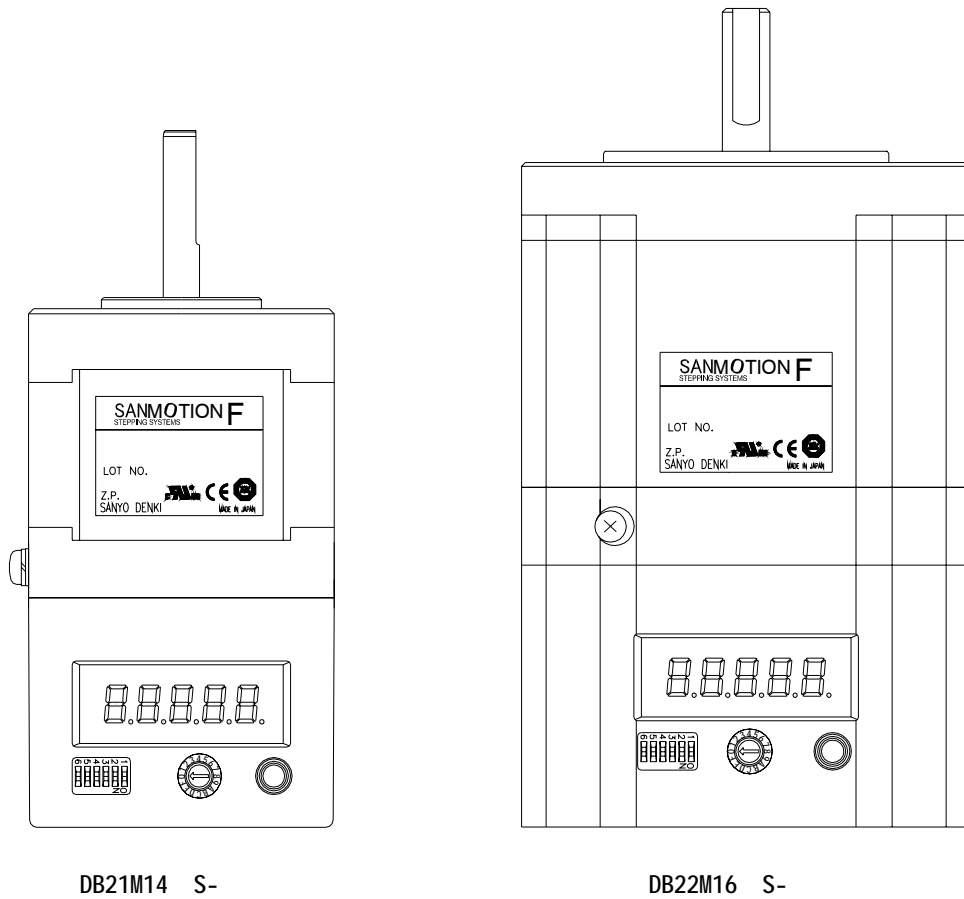


Fig. 7-1 Top View

7. SET UP

7.2 Switch Explanation

7.2.1 Function Select Dip Switch

The functions according to the specification can be selected with this Dip switch.

Confirm the ex-factory setting as follows.

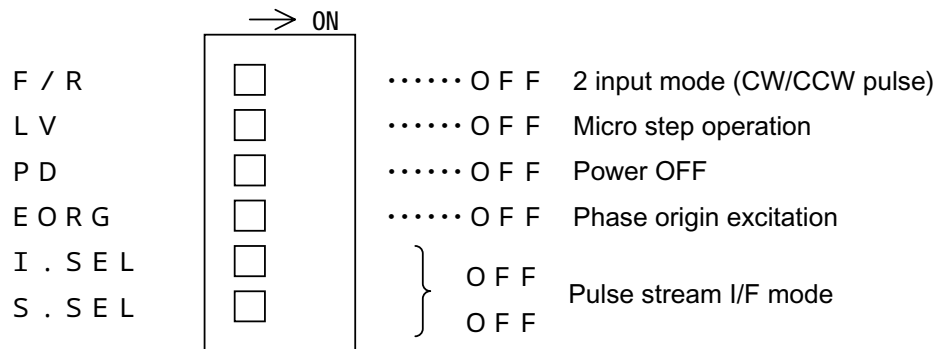


Fig. 7-2 Ex- factory Setting

- For pulse stream I/F mode

Input mode select (F / R)

Input pulse mode selection

This switch setting is only effective in pulse stream I/F mode.

F / R	Input pulse mode
ON	1 input mode (C K , U / D)
OFF	2 input mode (C W , C C W)

Low vibration mode select (L V)

Low vibration and smooth operation is enabled even by the rough resolution setting (e.g. 1 division, 2 division).

This switch setting is only effective in pulse stream I/F mode.

For parallel I/F mode and serial I/F mode, this is usually a low vibration operation.

L V	Operation
ON	Low vibration operation
OFF	Micro step operation



When LV select is ON (low vibration mode), operational process of driving pulse will be carried out inside the Driver. Therefore, the Motor movement delays for the time of 3.2ms pulse per input pulse. Note that depending upon the combined Motor, load, driving profile and etc, it may take a while until the shaft is adjusted when the Motor stops. (In parallel I/F mode and serial I/F mode there is no delay)

7. SET UP

Power down select (P D)

Select the Motor winding current value when inputting the power down signal.

This switch setting is only effective in pulse stream I/F mode.

P D	Motor winding current
O N	Current value by rotary switch STP (Power Low)
O F F	0 A (Power OFF)



PD function (the setting selected by PD of the function select dip switch) is enabled by PD input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2). Power down signal input is prior to all the other current settings except for alarms. The operational status may not be maintained such as power swing due to output torque drop or lower operation due to Motor current OFF (unexcited Motor). Pay extra attention to the input timing of the power down signal in addition that the security device should be installed to the machine.

Switch4 (Reserved)



Switch4 is fixed in OFF.

, Operation mode selection (I.SEL, S.SEL)

The operation mode is selected.

I . S E L	S . S E L	Operation mode
O F F	-	Pulse stream I/F mode
O N	O F F	Parallel I/F mode
	O N	Serial I/F mode



Change the operation mode selection switch after cutting off the driver's power supply.

7. SET UP

- For parallel I/F mode or serial I/F mode

The communication speed of serial communication is set.

Switch	Set value	Communication speed(bps)			
		9,600	19,200	38,400	115,200
F / R	OFF				
	ON				
LV	OFF				
	ON				
PD	OFF				
	ON				



The setting change after the power supply is turned on is invalid.
It does not function as a F/R, LV, and PD.



The communication speed of pulse stream I/F mode is fixed at 9600bps.

7. SET UP

7.2.2 Rotary switch(RSW) and the mode change switch(PSW)

- For pulse stream I/F mode

When it selects the step angle, the driving current is selected, and stops the current is selected, set by combining rotary switch (RSW) and mode change switch (PSW).

Refer to “8.2 Changing Method in Enhanced Mode” for details.

1 . Step angle select(S.S)

The divisions of the basic step angle (0.9 ° /step) when micro step driving can be set with this rotary switch.

Gradation	0	1	2	3	4	5	6	7
Partition	1	2	2 . 5	4	5	8	1 0	2 0
Gradation	8	9	A	B	C	D	E	F
Partition	2 5	4 0	5 0	8 0	1 0 0	1 2 5	2 0 0	2 5 0

Ex-factory setting is at 1 (division 2)



The step angle select switch (S.S) and the number of partitions become invalid by EXT input signal ON (built-in photo coupler ON) of Input/Output signal connector (CN2).

2 . Driving current select(RUN)

The Motor operation current value can be selected with this rotary switch.

Gradation	0	1	2	3	4	5	6	7
Motor current (%) (rated)	1 0 0	9 5	9 0	8 5	8 0	7 5	7 0	6 5
Gradation	8	9	A	B	C	D	E	F
Motor current (%)	6 0	5 5	5 0	4 5	4 0	3 5	3 0	2 5

Ex-factory setting is at 0 (rated value).



When there is a sufficient extra motor torque, lowering the operation current value will be effective in the lower vibration. The Motor output torque is almost proportional to the current value. When adjusting the operational torque, confirm the sufficient operation margin and determine the Motor current value.

7. SET UP

3 . Current Select when Stop (STP)

The motor current value when stop and when power down input signal ON (power low function is selected by dip switch) can be selected with this rotary switch.

Gradation	0	1	2	3	4	5	6	7
Motor current(%) (rated)	1 0 0	9 5	9 0	8 5	8 0	7 5	7 0	6 5
Gradation	8	9	A	B	C	D	E	F
Motor current(%)	6 0	5 5	5 0	4 5	4 0	3 5	3 0	2 5

Ex-factory setting is set at A (50%).



The current setting when stop by STP becomes valid when the Motor stops (approximately 200ms after the last pulse input) and when power down input signal ON (power low function is selected). The Motor output torque is almost proportional to the Motor current value. Be aware of the output torque (especially the drop under Z shaft load operation etc.) when the Motor stops. When there is sufficient extra motor torque, it can prevent the Motor and the Driver from rising the temperature to lower the setting value of the operational current select or the current select when stop.

- For parallel I/F mode and serial I/F mode

The slave bureau address of serial communications is set with this rotary switch.

R S W	Slave station address (HEX)
0	0
1	1
:	:
E	E
F	F

Ex-factory setting is set at 0



The slave station address of the pulse stream I/F mode is fixed at 0.

8. MAINTENANCE

MAINTENANCE

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8. MAINTENANCE

8.1 Troubleshooting

When the Motor does not function normally, check each item in the following table before consulting with us.

Table 8-1 Troubleshooting

Troubles	Check Items	Corrective Actions
The Motor can not be excited.	Has the power supply has been turned ON. Check the 7-segment LED light.	After checking the power line connection, turn on the power supply.
	Check the Driver status. Are any alarms displayed?	Check the alarm contents and remove the causes in the power ON status (refer to "6.2.2 Alarm Status")
	Are there any faulty wirings?	Correct the wirings.
	Is the power down signal being input?	Reset the PD input signal.
	Is excitation OFF commanded?	Specify Position Controller Object(02H)-Enable(08H) as 1.
	If the Motor can not be excited after the checks and the corrective actions are taken, the Driver or the Motor may be broken. Confirm that there is no error on the power voltage and connections, and then execute the repairing request.	
The Motor does not rotate.	Is there faulty wiring in the signal line?	Correct the wirings.
	Is the pulse command input within the specification?	Correct the pulse command to within the specified range.
	Is the input signal logic correct in 2 input mode?	Turn off the input signals of the other input terminals that are not inputting pulses (built-in photo coupler OFF).
	Are the CW and CCW signals are input at the same time in 2 input mode?	Correct command input.
	Does the setting by input mode select switch (1 input mode/ 2 input mode) match the pulse input mode?	Set the input mode and the pulse input mode to match.

8. MAINTENANCE

The motor rotation direction is wrong.	Are the CW line and the CCW line reverse connected in 2 input mode?	Correct the connections
	Are there any mistakes in the motor rotation direction logic command in 1 input mode?	Correct the command input
	Is there any faulty wiring in the motor lead line?	Correct the wirings
	Is there a positive direction setting?	Recheck the Position Controller Object(02H)-Reference Direction(2A) set value
Abnormal Motor operation	Are the Motor shaft and lead shaft centered accurately?	Correct the centering of the Motor shaft and the load shaft.
	Is the distance small or large?	Check the step angle (resolution). Check the input pulse numbers.
Motor power swing	Is the load proper?	Review the load.
	Is the pulse command input properly?	Review the command input.
	Are Slow up/Down performed as designated?	Review slow up/ down.
	Are there any stepping motor errors?	Replace the Stepping motor.
7-segment LED turns on. (0 2)	Is the ambient temperature of the Driver within the specified range of 32 to 104°F (0 to 40)?	Adjust the ambient temperature of the Driver to within the specification of 32 to 104°F (0 to 40). In order to secure reliability, use under the ambient temperature of 86°F (30) or lower is recommended.
	Is the body temperature of the Driver including ambient temperature under 176 °F (80)?	
	Is the Driver installed in the sealing control box or under poor ventilation conditions?	Install the Driver under well ventilated conditions, or install a draft fan in the control box.
	Is the Driver installed in the thermal conductive metallic box?	Install the Driver in the metallic box so that the box is not filled with heat, or install a fan to force cooling
	Check the Motor current setting.	If there is extra torque, lower the operational current setting or the current setting when stop with rotary switch RUN and STP.

8. MAINTENANCE

7 segment LED turns on. (0 5 to 0 8)	Abnormality in the driver hardware. Check the alarm code and request service.	
7 segment LED turns on. (0 9)	Is the power supply voltage within the specification?	Set the power supply to within the specification.
	When the power supply is turned off, is there excessive noise?	Take counter measures at the source of the noise origin.
	Check the alarm history, does 08 occur at the same time?	If 08 is generated at the same time, it is likely that hardware is damaged. Request service.
7 segment LED turns on. (2 0)	Does the number of command pulses exceed the maker limit?	Command it so as not to exceed the limit.
	Has it been wired for the positive direction limit sensor and the negative direction limit sensor?	Check if it contradicts the set value of Reference Direction(2A) of Position Controller Object(02H).
	If the over travel signal is not used, while the terminal function of CN2 is \pm OT, has the terminal been opened?	Try executing the following. <ul style="list-style-type: none"> • Connect \pm OT terminal with + COM.(When the terminal function is contact point B) • Adjust the Position Controller Object(02H)-Hard Limit Action(41h) to 0. • Specify I/O Signal Object(06H) of General Input 2 Function Select(05H) and General Input 3 Function Select(06H) functions to specifications other than \pm O T .

8. MAINTENANCE

7 segment LED turns on. (2 1)	Does the number of command pulses exceed the range of the soft limit?	Set commands so as not to exceed the limit, or change the range of the soft limit.
	Are there any settings where the software limit function is not used correctly?	When you do not use a soft limit, try the following. <ul style="list-style-type: none"> • Adjust the Position Controller Object(02H)-Soft Limit Action(42H) to 0. • Set the same value for the Position Controller Object (02H)of Positive Soft Limit Position(43H)and Negative Soft Limit Position(44H).
7 segment LED turns on. (2 2)	Is the width of the return to origin pulse limit appropriate?	Correct the width of the limit.
	Has the origin signal (ORG) been wired correctly?	Check the wiring and the signal logic.
7 segment LED turns on. (2 4)	Is the logic for emergency stop signal (EMG) correct?	Correct the set values for I/O Signal Object(06H)-General Input 4 Function Select(07H).
	Has the signal line for the emergency stop signal (EMG) been disconnected?	Correct the wiring.
	When you do not use the emergency stop signal, while the terminal function of CN3 becomes EMG, is the terminal opened?	Try executing the following. <ul style="list-style-type: none"> • Connect the EMG terminal with + C O M. (When the terminal function is contact point B) • Adjust the set value of Position Controller Object (02H)-External Stop Action(40h) to 0. • Allocate set values for I/O Signal Object(06H)-General Input 4 Function Select(07H) to functions other than EMG.

8. MAINTENANCE

7 segment LED turns on. (2 5)	Is the excitation OFF command transmitted when executing an operation command?	Set Position Controller Object(02H) -Enable(08H) when the motor stops.
7 segment LED turns on. (3 1)	Are there any mistakes in the program code?	Check the part in which the mistake is found with Program Object(05H)-Current Address(02H) and correct the program command.
7 segment LED turns on. (3 2)	Are there any mistakes in the attribute reference for the following program command?	Check the part in which the mistake is found with Program Object(05H)-Current Address(02H) and correct the program command.
7 segment LED turns on. (3 3)	Has a program start command been issued during motor operation?	Command program executions when the motor is stopped.
	Has a program start command been issued while accessing nonvolatile memory?	Command program starts after waiting for 20ms or more after executing Save, Restore, or Write.
7 segment LED turns on. (3 4)	Is the time-out time too short?	Check the program lock out part with Program Object(05H)-Current Address (02H), and correct the time-out time and the decision conditions.
7 segment LED turns on. (3 5)	Is the hierarchy of the subroutine too deep?	Check the subroutine call frequency of the program.

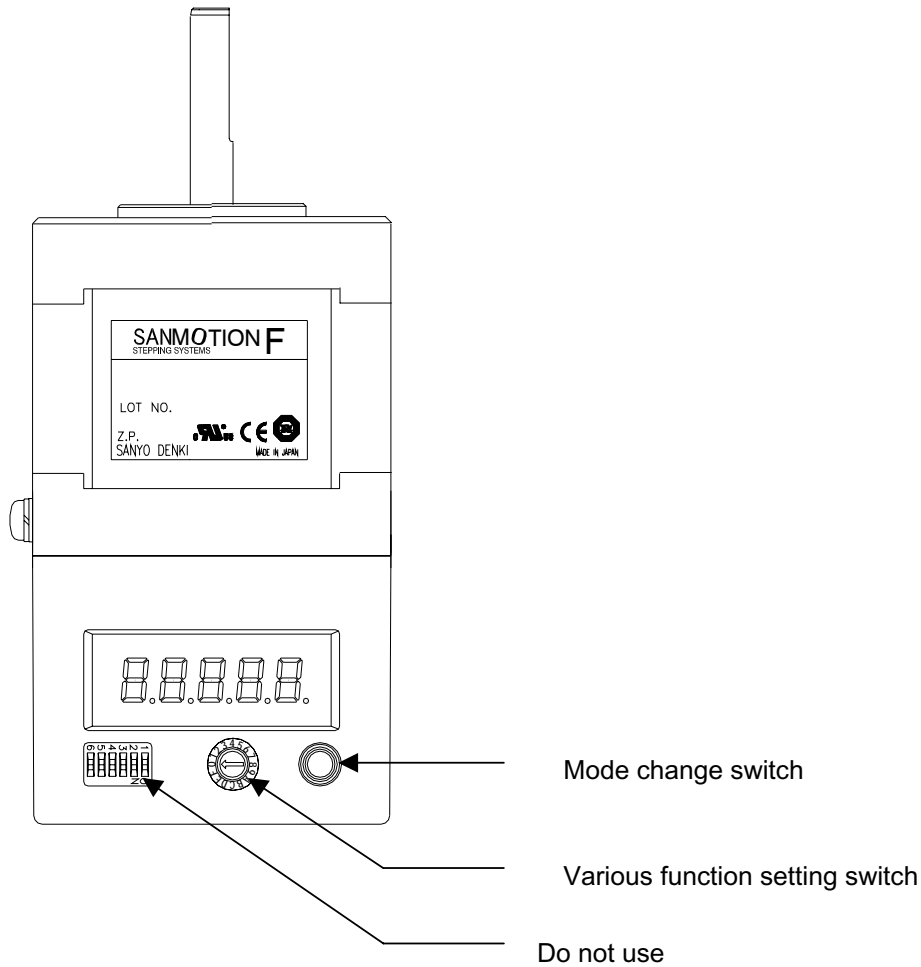
8. MAINTENANCE

8.2 Driver Information Reference

When the switch of the mode on the driver switch is operated, it operates in the enhancing mode for various function setting and maintenance.

In the enhancing mode, driver's inside information can be referred to.

The switch function at various function settings and the enhancing modes is shown below.



	Name	Operation method
	Mode change switch (P S W)	Various functions (current when stopping the step angler and the driving current) are set by pushing. It changes into states other than a usual operation mode one by one by pushing long (one second or more).
	Various function setting switch (R S W)	Select items in each mode. Normal rotation is by CW rotation, reverse rotation is by CCW rotation.

Fig. 8-1 Information Reference Switch

8. MAINTENANCE

8.2.1 Changing Method in Enhanced Mode

The enhancing mode changes in the following order whenever the mode change switch is pushed one second or more longer.

Moreover, whenever the mode change switch is pushed short, various functions (current when stopping the step corner and the driving current) are set.

The mode change switch pushes long and the operation in the enhancing mode is interrupted.

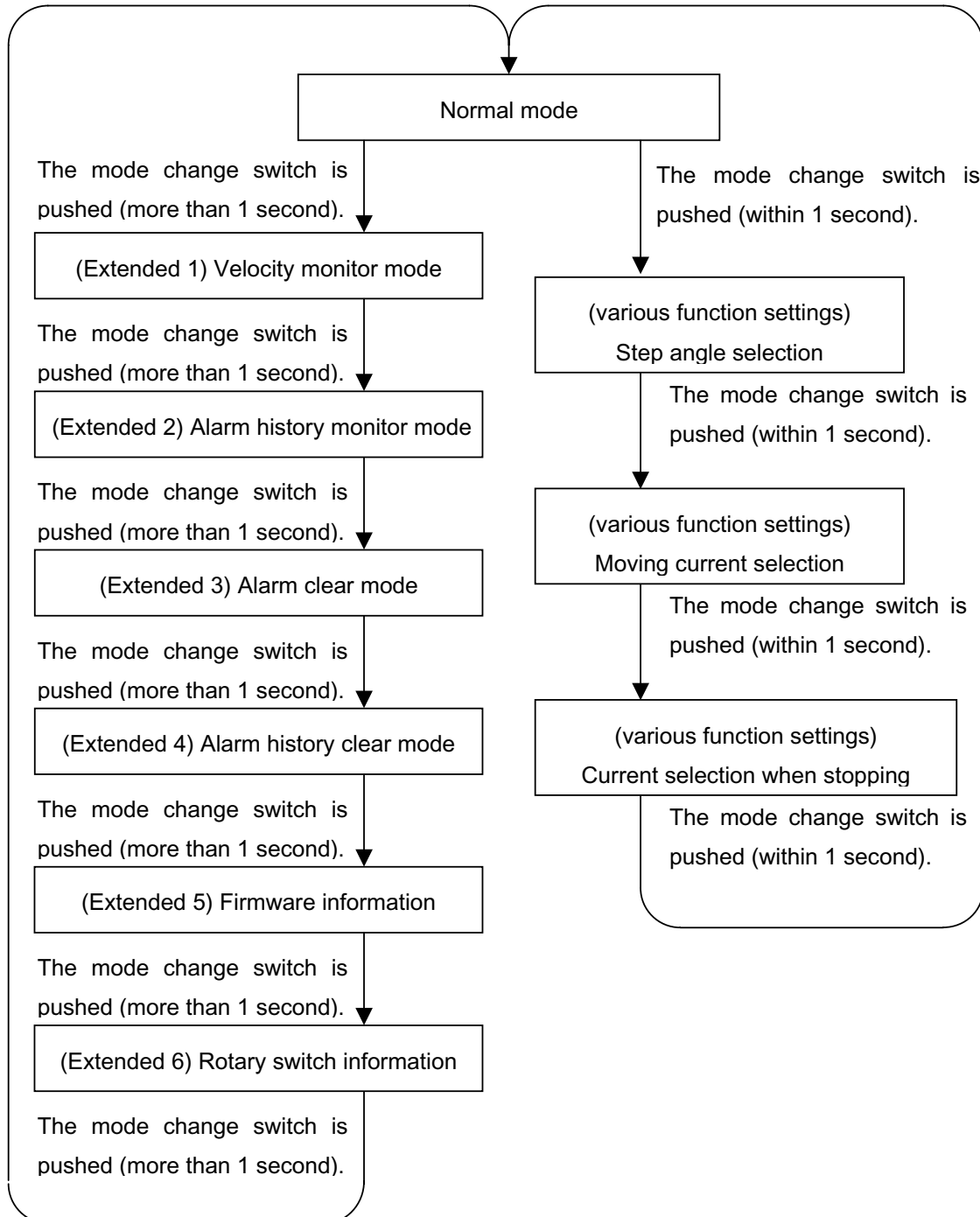


Fig. 8-2 The Change Order and Transition Condition of Each Mode

8. MAINTENANCE

Table 8-2 Mode Status Explanation

Mode	7 segment LED display	Explanation
Normal mode	Displays a figure of 8	Possible to operation according to pulse input during motor excitation.
	3 central lines decrease	Power down signal during excitation OFF. Input pulse is ignored and it does not operate.
	Hexadecimal code turns on	Alarm state. Excitation OFF and input pulses are ignored.
Velocity monitor mode	Displays a figure of 8 And velocity monitor (pulse/sec)	Normal display and driving frequency (pulse/sec) is displayed in right 4 columns.
Alarm history monitor mode	Flashing "A . H . "	Show alarm history. Same excitation state as normal mode, but input pulses are ignored.
Alarm clear mode	Flashing "A . C . "	Clear the latest alarm. Same excitation state as normal mode, but input pulses are ignored.
Alarm history clear mode	Flashing "H , C . "	Clear the alarm history. Same excitation state as normal mode, but input pulses are ignored.
Firmware information mode	Flashing "F A . - - -"	Mode that manages firmware information. Same excitation state as normal mode, but input pulses are ignored.
Rotary switch information mode	Flashing "r S . - - -"	Mode that manages various function settings information. Same excitation state as normal mode, but input pulses are ignored.
Step angle selection	Lighting of "SS---"(--- displays the step angle being set now.)	It moves to the step angle selection when the mode change switch is pushed from the ordinary mode. When the mode change switch is pushed for one second or more after the step angle is selected, the setting is decided.
Moving current selection	Lighting of "rn---"(--- displays the moving current value being set now.)	It moves to the moving current selection when the mode change switch is pushed from the step angle selection once short. When the mode change switch is pushed for one second or more after the driving current is selected, the setting is decided.
Current selection when stopping	Lighting of "SP---"(--- displays the current value when stopping being set now.)	It moves to the current selection when stopping when the mode change switch is pushed from the moving current selection once short. When the mode change switch is pushed for one second or more after the current is selected when stopping, the setting is decided. It moves to the ordinary mode when the mode change switch is pushed from this state short again.

8. MAINTENANCE

8.2.2 Normal Mode

When the dip switch are changed in normal mode, the function after it changes is displayed.

Refer to “7.2 Explanation of Switches” for details on the setting functions.

Table 8-3 Switch Status Displayed in Normal Mode

Switch	Set value	LED display	Meaning of display
F / R	OFF	“ 2 i n . ”	2 input mode (CW/CCW pulse input) is displayed.
	ON	“ 1 i n . ”	1 input mode (CK/UD input) is displayed.
L V	OFF	“ o F F . ”	Low vibration mode is not used is displayed.
	ON	“ o n . ”	Low vibration mode is used is displayed.
P D	OFF	“ P . d . ”	Power off setting is displayed
	ON	“ P . L . ”	Power low setting is displayed.

8.2.3 Velocity Monitor Mode

Driving frequency is displayed in right 4 columns.(pulse/second)

Dip switch setting can be changed same as normal mode.

8.2.4 Alarm History Monitor Mode

In the alarm information mode, the alarm history up to 10 times or less can be referred to.

Table 8-4 Operation of Alarm Information Mode

Item (LED Display)	Operation
Alarm history (“A . H . ”)	<p>Whenever the various function setting switch (RSW) is moved, the alarm generation history since turning on the power supply is displayed.</p> <p>The history of up to 10 times is memorized, and displayed by history number + alarm code. History is numbered 01 to 10, with the largest number being the most recent.</p> <p>[Example] Display of history generated in order of alarm 0b and 03</p> <p>R S W operation to C W “ 0 1 . 0 b ” scroll is displayed</p> <p>R S W operation to C W “ 0 2 . 0 3 ” scroll is displayed</p> <p>R S W operation to C W “ 0 1 . 0 b ” scroll is displayed ...</p>

8. MAINTENANCE

8.2.5 Alarm Clear Mode

In alarm clear mode, the occurring alarm can be cleared.

Table 8-5 Operation of Alarm Clear Mode

Item (LED Display)	Operation
Alarm clear (“A . C . n”)	When the various function setting switch (RSW) is moved to CW, “ A . C . y” is displayed, and it’s moved to CCW, “ A . C . n” displayed. When the mode change switch is pushed (within 1 second) while “ A . C . y” is displayed, the occurring alarm can be cleared and a square is down with LED of right 2 once.

8.2.6 Alarm History Clear Mode

In alarm history clear mode, the alarm history can be cleared.

Table 8-6 Operation of Alarm History Clear Mode

Item (LED Display)	Operation
Alarm history clear (“H . C . n”)	When the various function setting switch (RSW) is moved to CW, “ H . C . y” is displayed, and it’s moved to CCW, “ H . C . n” displayed. When the mode change switch is pushed (within 1 second) while “ H . C . y” is displayed, the alarm history can be cleared and a square is down with LED of right 2 once.

8.2.7 Firmware Information Mode

In firmware information mode, the software version written in the driver’s CPU can be read.

ex] In the case of version 1.01

Flashing “ F A . 1 . 0 1 ”

8. MAINTENANCE

8.2.8 Rotary Switch Information Mode

In rotary switch information mode, the parameter of the step angle, the moving current and the stop current is displayed.

Refer to “7.2 Explanation of Switches” for details on the setting functions.

ex] In the case of the parameter, 「 S . S : 2、 R U N : 1 0 0 %、 S T P : 5 0 % 」

Flashing “ r S . 1 0 A ”



It automatically moves to the ordinary mode when not setting it for 12 seconds or more when various functions are selected.

9. SPECIFICATIONS

SPECIFICATIONS

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9. SPECIFICATIONS

9.1 Driver

9.1.1 Specifications

The following table shows the specifications of the driver. (Input/Output signal's names are in Pulse I/F Mode. Refer to "4.4 Specification Summary of Input/Output Signals" for details on signal's names in each mode.)

Table 9-1 Specifications

Model		DB21M142S	DB22M162S
Input power supply *1		D C 2 4 V ± 1 0 %	
Power supply current (A)		2	3
Basic Specifications	Environment	Protection class	Class I
		Operating environment	Installation category (over voltage category): pollution degree: 2
		Applicable standard	E N 6 1 0 1 0 - 1
		Operating ambient temperature *2	0 to +40
		Storage temperature	-20 to +60
		Operating ambient humidity	35 to 85%RH (no condensation)
		Storage humidity	10 to 90%RH (no condensation)
		Operating altitude	Up to 1,000m above sea level
		Vibration resistance	98m/s when the X, Y, and Z directions were tested for 2 hours in the frequency range 10 to 2000Hz.
		Impact resistance	No error based on the section 3.2.2 "C" of the NDS-C-0110 Standard
		Dielectric strength	No error when applying 500VAC for a minute between power input terminal and metallic case
		Insulation resistance	10M or more when measured with 500VDC meggers between the power input terminal and the metallic case
		Weight (Kg)	
Functions	Protective functions	Driver overheat	
	LED display	Alarm display	
Input/Output signal	Command pulse input signal *3	Photo coupler input mode, input resistance 220 Input signal voltage "H" level: 4.0 to 5.5V, "L" level: 0 to 0.5V	
	Power down input signal	Photo coupler input mode, input resistance 470 Input signal voltage "H" level: 4.0 to 5.5V, "L" level: 0 to 0.5V	
	Step angle select input signal	Photo coupler input mode, input resistance 470 Input signal voltage "H" level: 4.0 to 5.5V, "L" level: 0 to 0.5V	
	FULL/HALF select input signal	Photo coupler input mode, input resistance 470 Input signal voltage "H" level: 4.0 to 5.5V, "L" level: 0 to 0.5V	
	EMG input signal	Photo coupler input mode, input resistance 470 Input signal voltage "H" level: 4.0 to 5.5V, "L" level: 0 to 0.5V	
	BUSY output signal	Open collector output by photo coupler Output signal standard Vce: 30V Ic : 20mA	
	Phase origin monitor output signal	Open collector output by photo coupler Output signal standard Vce: 30V Ic : 20mA	
	Alarm output signal	Open collector output by photo coupler Output signal standard Vce: 30V Ic : 20mA	



- 1 . Note that the power voltage must not exceed 24VDC + 10% (26.4VDC).
- 2 . If the driver is placed in a box, the temperature inside the box must not exceed this specified range.
- 3 . The maximum input frequency is 250k pulse/s.

9. SPECIFICATIONS

9.1.2 Input Interface

Input circuit configuration (CW,CCW)

Fig. 9-1 shows input circuit configuration.

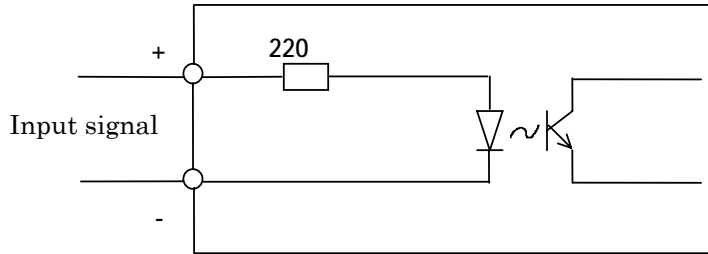


Fig. 9-1 Input Circuit Configuration

Input signal specifications

Fig. 9-2 shows input signal specifications.

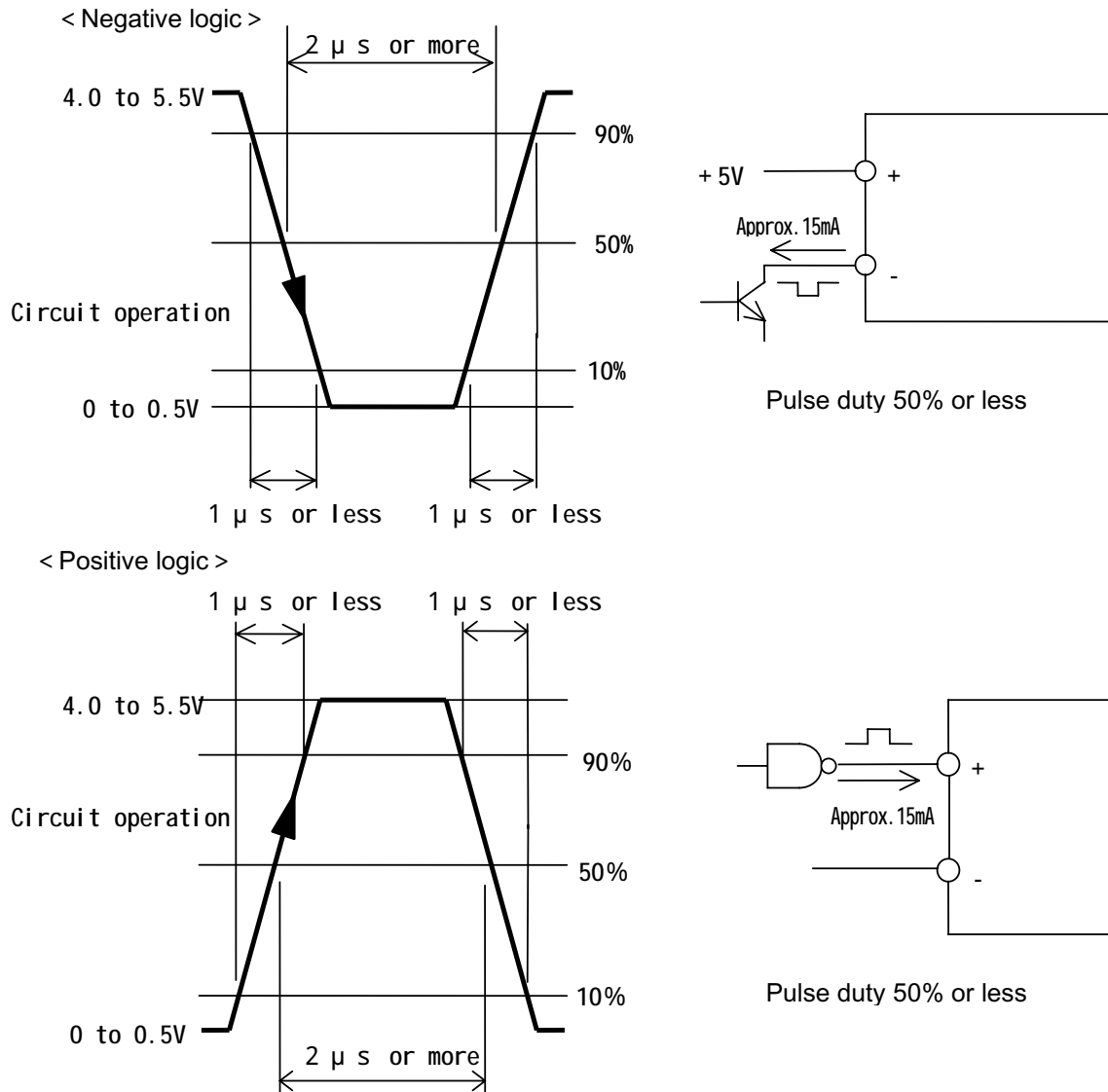


Fig. 9-2 Input Signal Specification

9. SPECIFICATIONS

Command pulse timing

2 input mode (CW pulse, CCW pulse)

Fig. 9-3 shows command pulse timing for “2 input mode”.

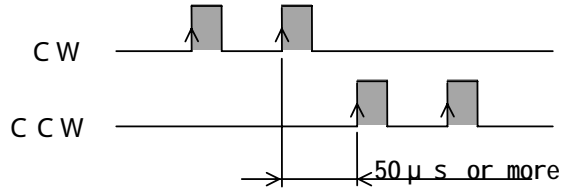


Fig. 9-3 Input Pulse Timing in “2 Input Mode”



1. The built-in photo coupler is turned ON where marked with , and the internal circuit (Motor) is actuated at the rising edge of the photo coupler ON.
2. When applying pulse to CW, turn off the CCW built-in photo coupler.
3. When applying pulse to CCW, turn off the CW built-in photo coupler.

1 input mode(CK, U/D)

Fig. 9-4 shows command pulse timing when “1 input mode”.

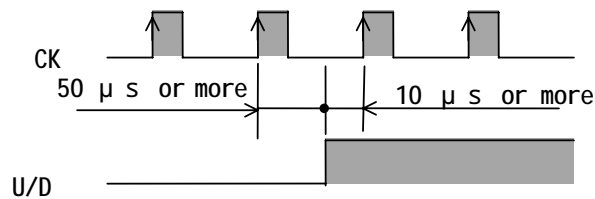


Fig. 9-4 Input Pulse Timing in “1 Input Mode”



1. The built-in photo coupler is turned “ON” where marked with , and the internal circuit (Motor) is actuated at the rising edge of the CK photo coupler “ON”.
2. Switch the U/D input signal when the CK built-in photo coupler is “OFF”.

9. SPECIFICATIONS

Input circuit configuration (PD, EXT, F/H, IN 1 to 4)

Fig. 9-5 shows the input circuit configuration.

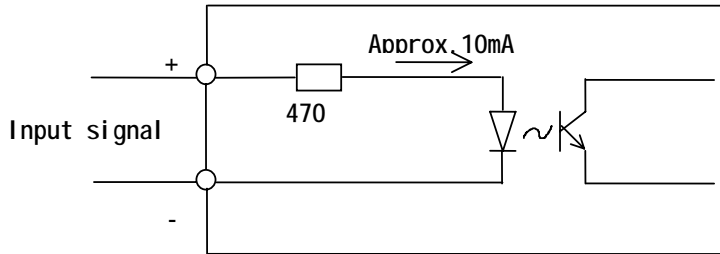


Fig. 9-5 Input Circuit Configuration

Fig. 9-6 shows the timing of FULL/HALF input signal, command pulse, and step angle select, as well as the timing when “EXT input signal” and “F/H input signal” are used.

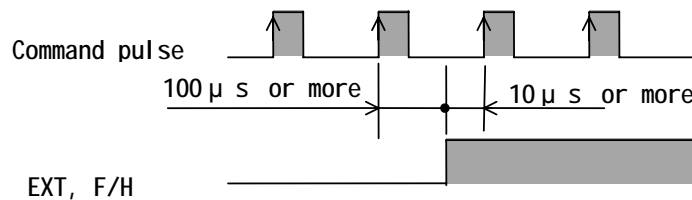


Fig. 9-6 EXT and F/H Input Signal Timing



1. The built-in photo coupler is turned ON where marked with ■.
2. EXT input signal
The functions by external F/H input signal are valid at EXT photo coupler “ON”.
The micro step division setting by rotary switch S.S is valid at EXT photo coupler “OFF”.
3. F/H input signal
HALF step (2 division) operation at F/H photo coupler “ON”.
FULL step (1 division) operation at F/H photo coupler “OFF”.
4. Refer to Fig. 9-6 for switching EXT and F/H input signal.
5. Change the motor division setting(EXT or F/H) when the motor excitation phase is at the phase origin (power ON status), because a right phase change is possible.
Not right phase change becomes the cause that the phase origin LCD may not turn ON and the phase origin monitor output may not output when stop.
Refer to the MON output in the [9.1.3 Output Interface].

9. SPECIFICATIONS

9.1.3 Output Interface

Output circuit configuration (BUSY, MON, AL)

Fig. 9-7 shows the output circuit configuration.

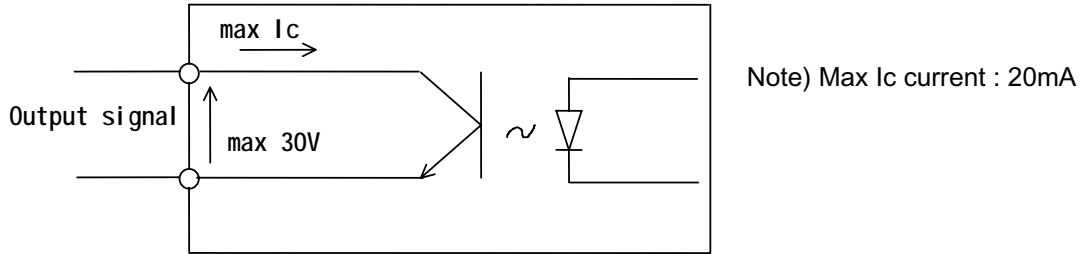


Fig. 9-7 Output Circuit Configuration

MON output

Fig. 9-8 shows the “Command pulse and phase origin output signal” timing.

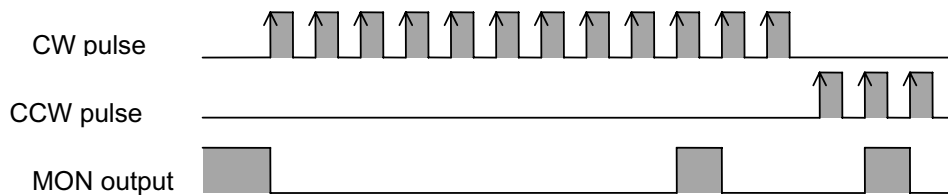


Fig. 9-8 Input Pulse and MON Output Signal Timing (at 1 division setting)



- 1 . When the motor excitation phase is at the phase origin (power ON status), the photo coupler is turned “ON”, and the upper D.P of status LED turns on synchronously.
- 2 . The MON output signal is output per motor output shaft angle of 3.6° from phase origin.

When changing the motor division setting by the external input signal and the rotary switch as shown in the example below, the motor cannot stop where MON output signal can be output. Take this into consideration when using the MON output signal.

[Example] When changing the division setting by F/H input signal.

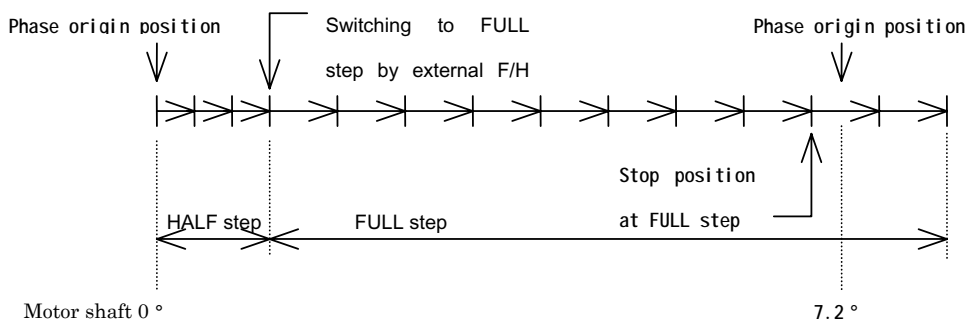
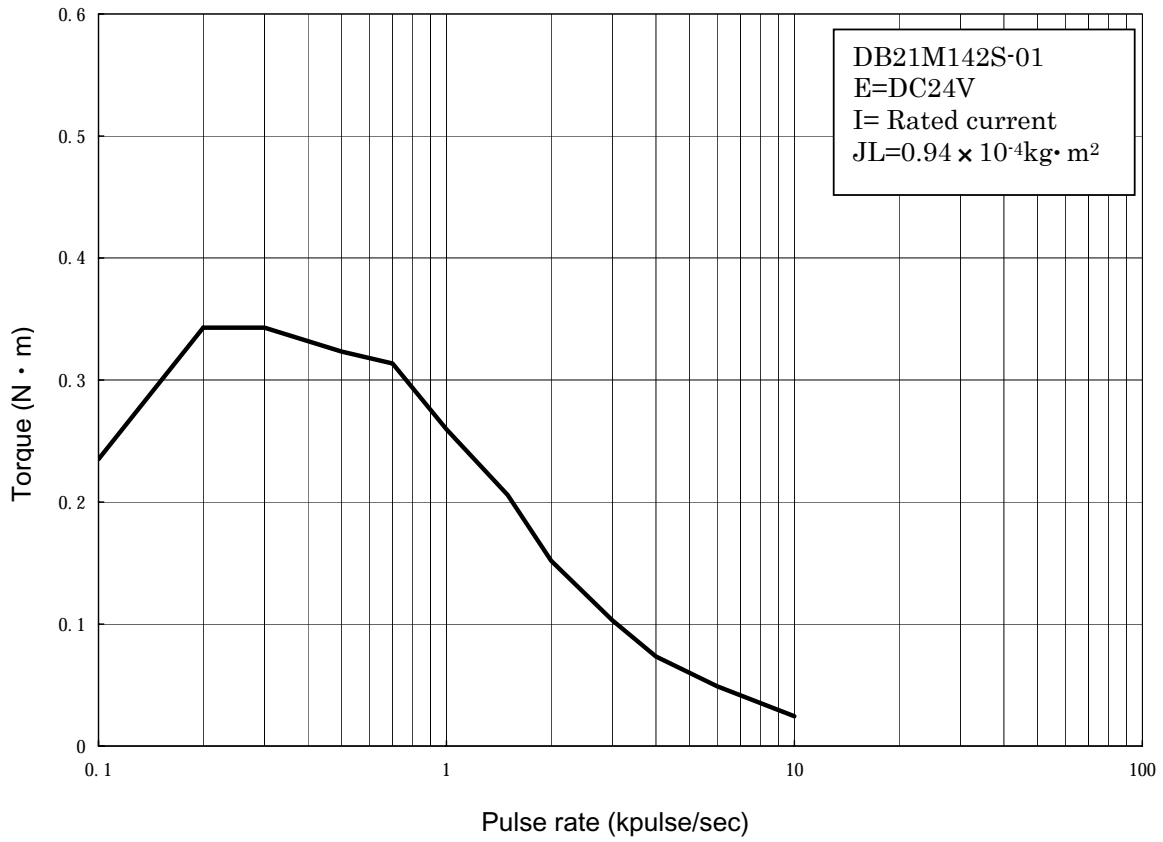


Fig. 9-8 Example for MON Output Signal is not Output When Stop

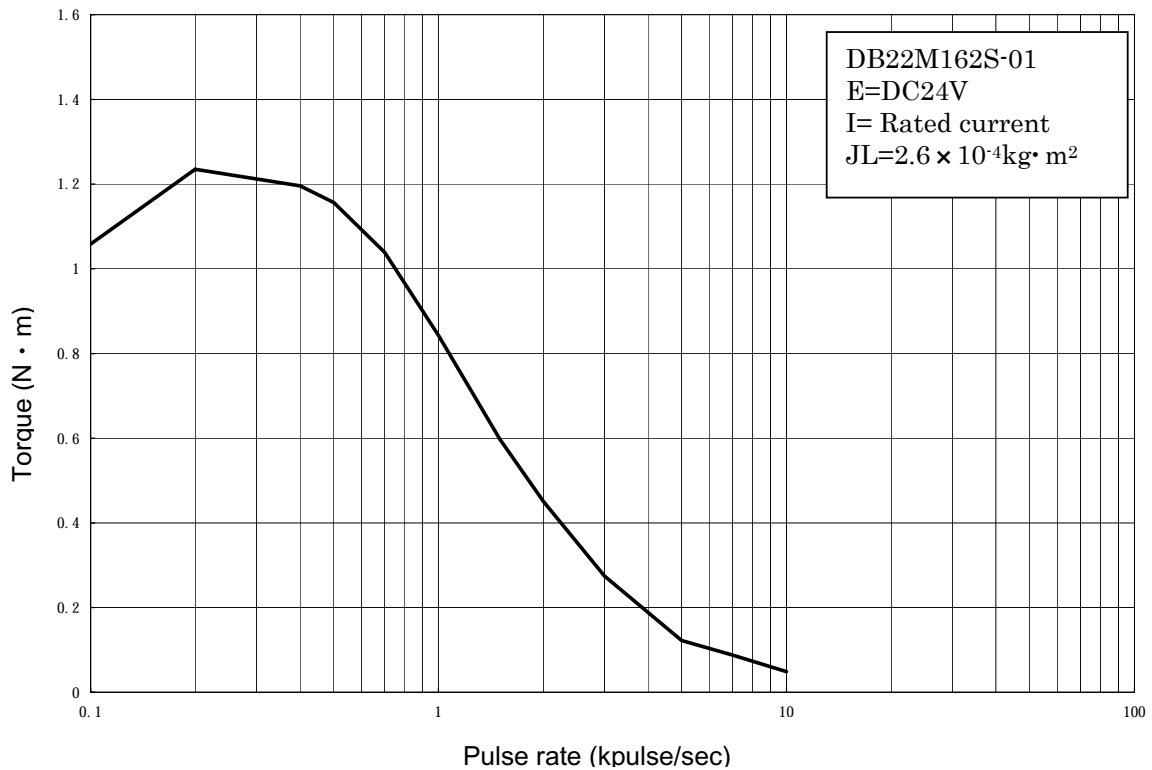
9. SPECIFICATIONS

9.2 Characteristics

Pulse Rate-Torque characteristic (DB21M142S)



Pulse Rate-Torque characteristic (DB22M162S)

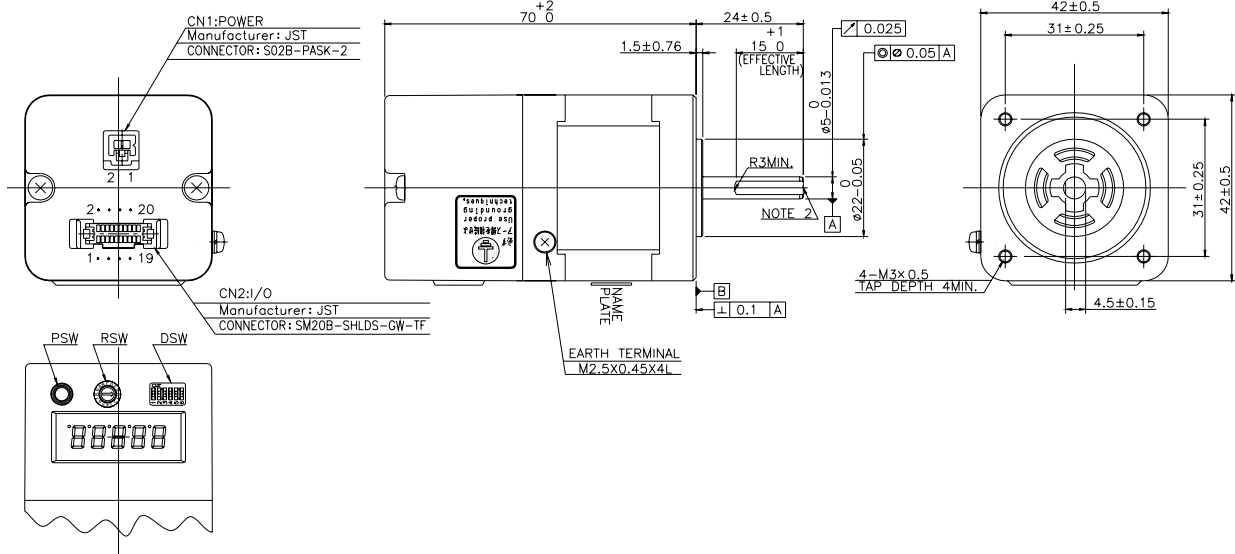


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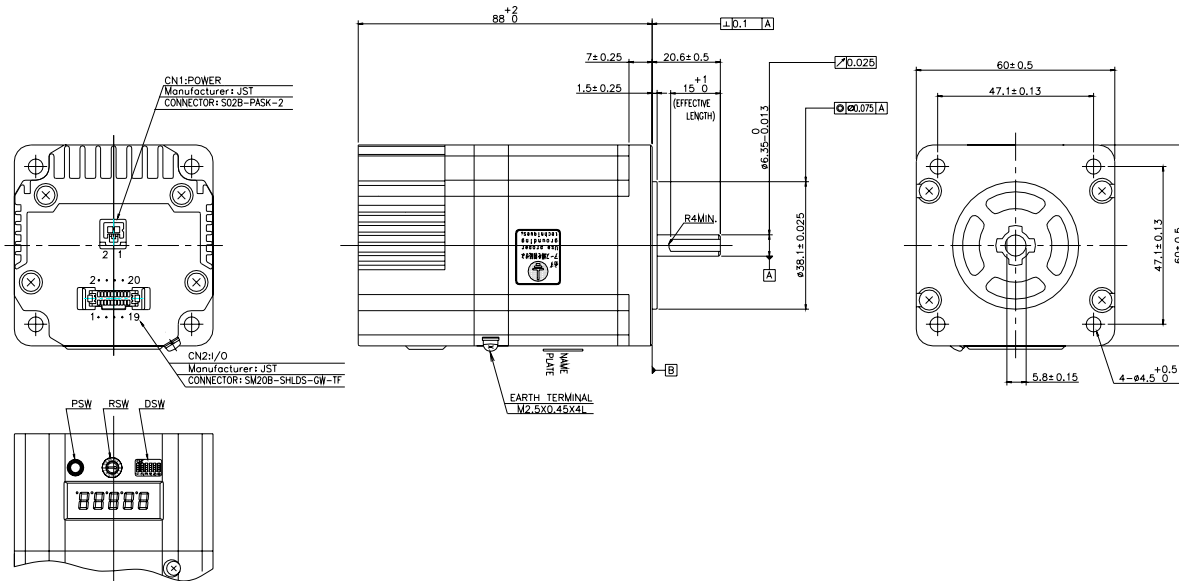
9.3 External Views

9.3.1 External Views of the Driver

DB21M142S-01



DB22M162S-01



Note 1) Machine screw for earth terminal M2.5

Tightening torque 1.18N · m

Note 2) When installing from the rear, make sure that within 8mm of the screw enters into the driver.

10. COMMUNICATION SPECIFICATION

COMMUNICATION SPECIFICATION

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10. COMMUNICATION SPECIFICATION

10.1 Communication Specification

10.1.1 Specification

Communication speed	9600bps, 19200bps, 38400bps
Synchronous system	Asynchronous
Data bit	8 bit
Parity bit	Even numbers
Stop bit	1 bit
Data length	255 bytes maximum

10.1.2 Communication System

Conforming to RS-485
Semi-duplex transmission (master-polling)

10.1.3 Communication Hardware

Transceiver	SN75176B (Manufactured by TI company)
Cable length	50m maximum (total extension)
Slave station number	15 stations

10. COMMUNICATION SPECIFICATION

10.2 Equipment Configuration

A maximum of 15 slaves (drivers) can be connected to 1 master station (controller).
 If the driver is starting up, it is possible to communicate at any time regardless of the operation mode.
 However, for the pulse stream I/F mode, the transmission speed and the slave address are fixed, and it becomes 1 to 1 communication with the master station.

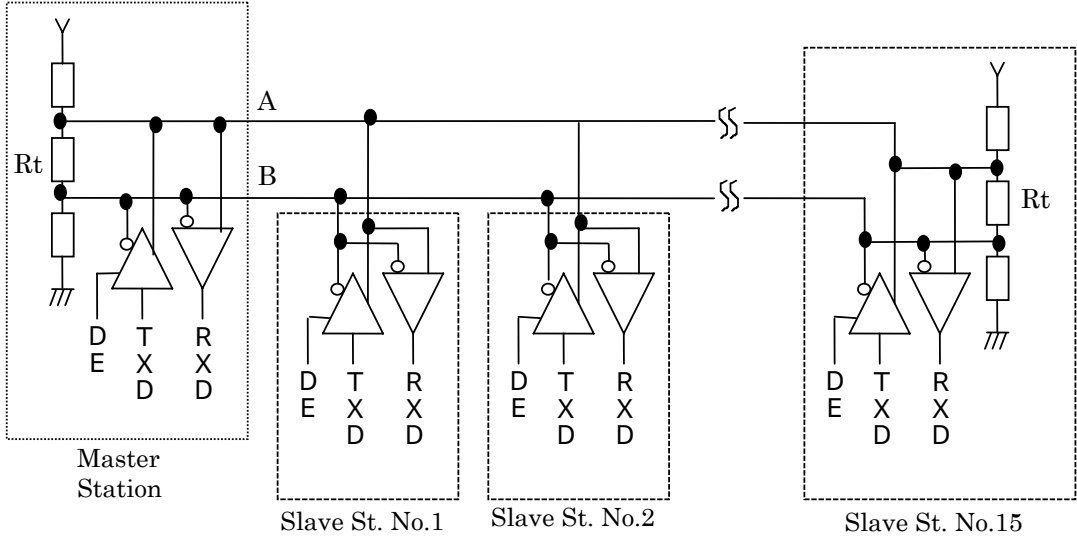


Fig. 10-1 Communication System Configuration

Operation mode	Communication speed	Slave station address
Pulse stream I/F mode	9600bps	00
Parallel I/F mode	Select from 9600bps, 19200bps, or 38400bps by the "DSW" switch.	Select by combining "RSW" switches from 0 - F(HEX)
Serial I/F mode		

10. COMMUNICATION SPECIFICATION

10.3 Communication Format

10.3.1 Data Type

10.3.1.1 Object Model

Parameters handled by this driver are all managed within the functional units of the object.

1 object contains a maximum of 255 parameters (called the attribute). Each object is managed by the number of the object ID, additionally the attribute in the object is managed by the number of the attribute ID.

Therefore, access to a specific attribute is expressed by combining the object ID and the attribute ID.

The object list is shown below.

Table 10-1 Object List

Object ID (Hex)	Object name	Function
1	DB Object	Information specific to this driver, mounting function.
2	Position Controller Object	Functions related to motor operation.
4	Serial Communication Object	Manages serial communications for settings.
5	Program Object	Program registration and operation.
6	I/O Signal Object	Functions and logical settings of external I/O signals.

10.3.1.2 Attribute Data Type

The attribute is shown by the basic data type or the basic data type arrangement.

Table 10-2 Basic Data Type

Name	Data size	Sign
U C H A	8 bit	No sign
U S H O	16 bit	
U L O N	32 bit	
C H A R	8 bit	With sign two' scomplement representation
S H O R	16 bit	
L O N G	32 bit	

10. COMMUNICATION SPECIFICATION

10.3.2 Command Transmission (Master Station → Slave Station)

Packet length (1 byte)	Address (1 byte)	Command (1 byte)	Data (0 ~ 2 5 1 byte)	Checksum (1 byte)
-----------------------------	-----------------------	-----------------------	----------------------------	------------------------

Packet length	...	The length of 1 packet is displayed as a hexadecimal number.
Address	...	The slave address in the command transmission destination (00h – 0Fh), or the group address (F0h – FFh), is displayed as a hexadecimal number. Each slave, other than the slave address set with the rotary switch, has a group address as a parameter, when the transmitted address matches either the slave address or the group address, the command is executed.
Command	...	Consists of the service code (high order 4 bits) + the object ID (subordinate 4 bits).
Data	...	Displayed as attribute ID (1 byte) + attribute value (N byte). The format and the meaning of the attribute value differ depending on the attribute. In addition, there is also a service without data.
Checksum	...	The subordinate 1 byte that is added to each byte other than checksum is added.

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Table 10-3 Service Code and Data Format

Service name (code)	Data	Operation
Initialize(0)	Attribute ID (Can be omitted)	The attribute value is reset to the initial value. When the attribute ID is omitted, all attributes of the object become objects. It cannot be executed during motor operation, during program execution, or during EEPROM access. An error is returned.
Restore(1)	Attribute ID (Can be omitted)	The attribute is rewritten with the value read from EEPROM. If the attribute ID is omitted, all attributes of the object become objects. It cannot be executed during motor operation, during program execution, or during EEPROM access. An error is returned.
Save(2)	Attribute ID (Can be omitted)	The attribute value is written to EEPROM. If the attribute ID is omitted, all attributes of the specified object are written. It cannot be executed during motor operation, during program execution, or during EEPROM access. An error is returned.
Set(4)	Attribute ID, Attribute value	The attribute value is set. The attribute value for the motor operation is also reflected in the current operation.
Preset(5)	Attribute ID, Attribute value	The attribute value is set. The attribute value for the motor operation is reflected from the next operation.
Get(6)	Attribute ID	The attribute value is read.

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Service name (code)	Data	Operation
Write(8)	Attribute ID, Attribute value	The attribute value is written directly to EEPROM. It cannot be executed during motor operation, during program execution, or during EEPROM access. An error is returned.
Read(9)	Attribute ID	The attribute value from EEPROM is read and returned. It cannot be executed during motor operation, during program execution, or during EEPROM access. An error is returned.

The packet... 00h is used as an example.

Transmission example (1) When resetting all attribute ID of DB Object to their initial values.

04 00 01 05

Transmission example (2) Target Velocity(20h) of Position Controller Object : When the value of 5000pps is Set.

09 00 42 20 88 13 00 00 06

Transmission example (3) Target Velocity(20h) of Position Controller Object : When the value of 10000pps is Preset.

09 00 52 20 10 27 00 00 B2

Transmission example (4) When doing Get for the value of the Target Velocity(20h) of Position Controller Object.

05 00 62 20 87

Transmission example (5) When doing Save for the value of the Target Velocity (20h) of Position Controller Object.

05 00 22 20 47

Transmission example (6) When doing Restore for the value of the Target Velocity (20h) of Position Controller Object.

05 00 12 20 37

Transmission example (7) When doing Write for the value [05 00 85 13 04 50 C3 00 00 88 13 00 00 05 64 00 00 00 00 C8] of the Program Data (13h) of Program Object. Refer to "11.3.1 Registering a New Program" for details.

05 00 85 13 04 50 C3 00 00 88 13 00 00 05 64 00 00 00 00 C8

Transmission example (8) When doing Read for the value of the Target Velocity (20h) of Program Object.

05 00 95 13 AD

10. COMMUNICATION SPECIFICATION

10.3.3 Status Response (Slave Station Master Station)

Packet length (1 byte)	Address (1 byte)	Status (1 byte)	Data (0 - 251 bytes)	Checksum (1 byte)
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Packet length	...	The length of 1 packet is displayed as a hexadecimal number.
Address	...	The slave address of the status response origin (00h-3Fh) or the group address is returned as a hexadecimal number.
Status	...	The execution property of the command and the status of the slave station are displayed as a bit stream.
Data	...	The attribute value is returned if necessary.
Checksum	...	The subordinate 1 byte that is added to each byte other than checksum is added.

The packet ... 00h is used as an example.

Response example (1) 04 00 41 45

Status bit: 41h displays during the motor operation and the positive direction rotation.

Response example (2) 04 00 03 07

Status bit: 03h displays during the motor operation, during the program execution, and the negative direction rotation.

Response example (3) 04 00 14 18

Status bit: 14h displays during the driver alarm generation and a driver status error.

10. COMMUNICATION SPECIFICATION

Table 10-4 Status Bit

Bit	Contents	Explanation
b 7	Reserved	0 is returned.
b 6	Rotation direction	The rotation direction is returned. During stop, the previous operation direction is returned. 0 : Negative direction rotation 1 : Positive direction rotation
b 5	Attribute error	Set when a nonexistent attribute ID is specified, or the attribute value exceeds the setting range. 0 : No error (service is executable) 1 : Error (service is not executable)
b 4	Driver status error	Set when a service is not executable when an operation command is received during an alarm etc. 0 : No error (service is executable) 1 : Error (service is not executable)
b 3	During pause	Set during pause by a PAUSE signal etc. 0 : During deceleration by pause or no pause input 1 : During pause
b 2	Driver alarm	Set when an alarm or warning is generated. 0 : No alarm 1 : Alarm or during warning generation
b 1	Executing a program	Set when executing a program. Synchronizes with the PEND signal. 0 : Program execution complete 1 : During program execution
b 0	During operation	Set when executing an operation command. During a return to origin reverse stop and during a pause, operation incomplete is returned. 0 : Operation complete 1 : Operation incomplete

10. COMMUNICATION SPECIFICATION

10.4 Communication Timing

10.4.1 Communication Time

Table 10-5 Time-out Time

Item	Abbreviation	Time [μ s]	Explanation
Possible status reply time	T1	100 ~ 500	The minimum time from receiving a command in the slave station to the possible status reply.
Status reply start time	T2	T1+Tres	The time when the slave station starts a status response
Next command transmission waiting time	T3	100	The waiting time for the next command transmission start after the master station receives a normal status response.
Retransmission waiting time when error	T4	2×Terr	The waiting time until retransmission when the master station detects an abnormality in the packet during transmission and stops.
Status first byte Reception time-out	T5	Terr + Tres	The time limit until the first status byte is received completely after the master station completes command transmission.
Reception time-out between bytes	Terr	1500	When the reception interval between bytes exceeds this value during data reception, the data received by both the master station and the slave station is annulled.
Status response waiting time	Tres	0 ~ 1000000	The waiting time until the slave station begins status response. Set optionally depending on the efficiency of the master station.

10. COMMUNICATION SPECIFICATION

10.4.1.1 Normal Transmission Procedures

Master station

Packet is transmitted.

Returns to □ after the [T3] time passes from the packet reception, and the next packet is transmitted.

Slave station

DE off and standby for reception.

When the address of the received packet matches this station, the command is executed.

Status response starts after [T2] or more passes from the packet reception.

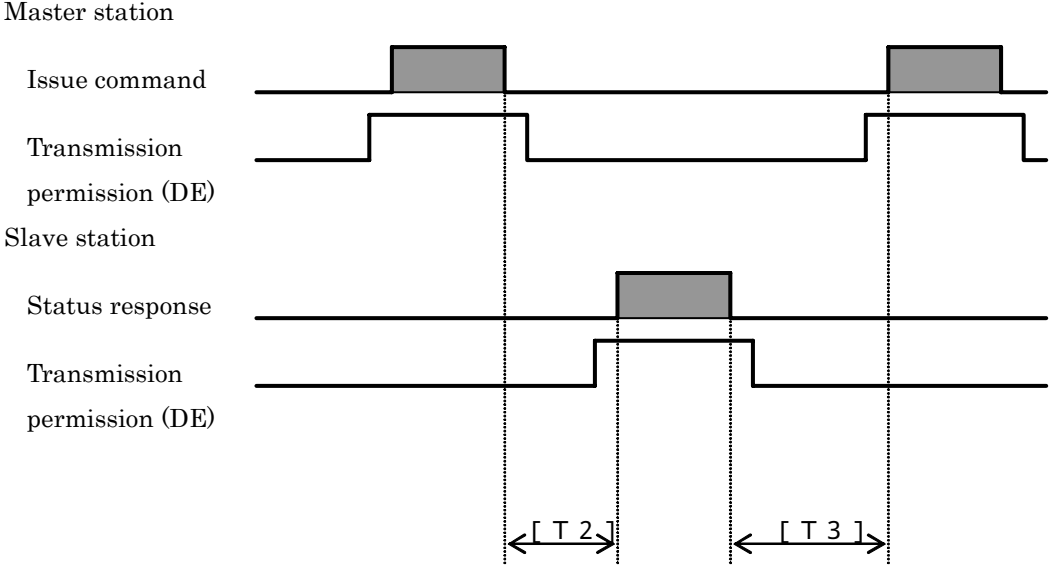


Fig. 10-2 Continuous Transmission Timing

10. COMMUNICATION SPECIFICATION

10.4.1.2 Reception Time-out by Retransmission Process

Master station

Packet is transmitted.

A time-out is judged when the first byte of status is not received from the final byte transmission completion within [T5], and after passing [T3] returns to □ and retransmits the command.

Slave station

DE off and standby for reception.

Cancels received data and returns to the status in □ when an abnormal parity, abnormal checksum, and a time-out between bytes is generated while receiving.

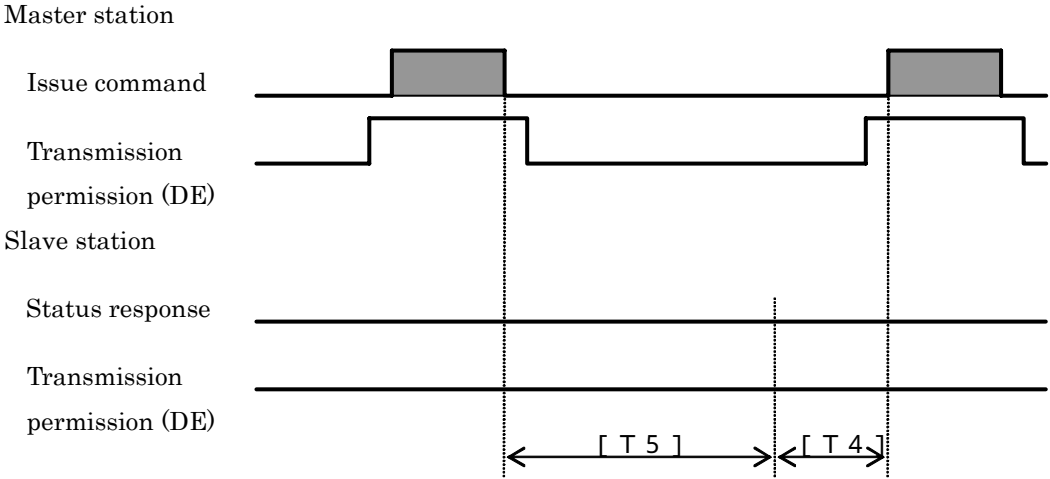


Fig. 10-3 Retransmission timing by Reception Error

10. COMMUNICATION SPECIFICATION

10.5 Attributes

10.5.1 DB Object (01h)

10.5.1.1 Product Code (01h)

The product code is displayed.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h:DB21M142S01
Related attributes	

10.5.1.2 Product Name (02h)

The product name is displayed as an ASCII code character string.

Service	Get
Data type	UCHAR array (variable length)
Initial value	"DB21M142S01"
Data range and meaning	ASCII code "DB21M142S01"
Related attributes	

10.5.1.3 Software Revision (03h)

The product's software version is displayed as an ASCII code character string.

Service	Get
Data type	UCHAR array (5 bytes)
Initial value	-
Data range and meaning	Major revisions and minor revisions are displayed as 2 figures in the form of "**.***".
Related attributes	

10.5.1.4 Interface Mode (05h)

The current operating mode is returned.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Pulse stream I/F mode 01h: Parallel I/F mode 03h: Serial I/F mode
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.1.5 Alarm Code (10h)

The type of alarm that is generated in the driver is displayed as a number. When another alarm is generated during an alarm, it is overwritten by the alarm code generated later.

When an alarm is generated, the same number is also displayed in the 7 segment LED.

When alarm number 00h is Set, the recoverable alarm is cleared. After the clearing process, the alarm number with the highest precedence among those left that were impossible to recover is displayed.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h : No alarm Refer to “6.2.2 Alarm Display” for details on alarm codes.
Related attributes	Alarm History (11h) Alarm Signal Function Select (0Bh)

10.5.1.6 Alarm History (11h)

The previous 10 alarm histories are displayed by alarm codes. When a new alarm is generated and the alarm history is filled by 10 alarm codes, the oldest alarm is cancelled and the order advances.

When Initialize is executed, the current history is cleared. It is also possible to check the alarm history by operation of this machines front. Refer to “8.2.4 Alarm history monitor Mode” for details.

Service	Initialize, Get
Data type	UCHAR array (10 bytes)
Initial value	00h 00h 00h 00h 00h 00h 00h 00h 00h 00h
Data range and meaning	First byte...The oldest alarm code generated Second byte...The second oldest alarm code generated : Tenth byte...The most recent alarm code generated
Related attributes	Alarm Code (10h)

10. COMMUNICATION SPECIFICATION

10.5.1.7 Step Angle (20h)

The motors partition number is specified.

In the pulse stream I/F mode the set value is ignored, if Get is done the resolution specified by the S.S rotary switch is returned.

When a set value is Set by parallel I/F mode and serial I/F mode, Actual Position and Commanded Position are cleared to zero.

Set cannot be done during motor operation.

Change the motor division setting when the motor excitation phase is at the phase origin (power ON status).

Service	Initialize,Restore,Save,Set,Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Full step (400 pulses/1 rotation) 01h: Half step (800 pulses/1 rotation) 02h: 1/2.5 (1000 pulses/1 rotation) 03h: 1/4 (1600 pulses/1 rotation) 04h: 1/5 (2000 pulses/1 rotation) 05h: 1/8 (3200 pulses/1 rotation) 06h: 1/10 (4000 pulses/1 rotation) 07h: 1/20 (8000 pulses/1 rotation) 08h: 1/25 (10000 pulses/1 rotation) 09h: 1/40 (16000 pulses/1 rotation) 0Ah: 1/50 (20000 pulses/1 rotation) 0Bh: 1/80 (32000 pulses/1 rotation) 0Ch: 1/100 (40000 pulses/1 rotation) 0Dh: 1/125 (50000 pulses/1 rotation) 0Eh: 1/200 (80000 pulses/1 rotation) 0Fh: 1/250 (100000 pulses/1 rotation)
Related attributes	Interface Mode (05h)

10. COMMUNICATION SPECIFICATION

10.5.1.8 External Step Angle 1 (21h)

An external step angle command is valid (EXT signal = ON), and specifies the partition number when F/H signal = ON.

The set value is only valid in pulse stream I/F mode.

Note that if the set value is changed during pulse input it causes a positional discrepancy.

When a set value is Set by parallel I/F mode and serial I/F mode, Commanded Position is cleared to zero.

Set cannot be done during motor operation.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Full step (400 pulses/1 rotation) 01h: Half step (800 pulses/1 rotation) 02h: 1/2.5 (1000 pulses/1 rotation) 03h: 1/4 (1600 pulses/1 rotation) 04h: 1/5 (2000 pulses/1 rotation) 05h: 1/8 (3200 pulses/1 rotation) 06h: 1/10 (4000 pulses/1 rotation) 07h: 1/20 (8000 pulses/1 rotation) 08h: 1/25 (10000 pulses/1 rotation) 09h: 1/40 (16000 pulses/1 rotation) 0Ah: 1/50 (20000 pulses/1 rotation) 0Bh: 1/80 (32000 pulses/1 rotation) 0Ch: 1/100 (40000 pulses/1 rotation) 0Dh: 1/125 (50000 pulses/1 rotation) 0Eh: 1/200 (80000 pulses/1 rotation) 0Fh: 1/250 (100000 pulses/1 rotation)
Related attributes	Interface Mode (05h) External Step Angle 2 (22h)

10. COMMUNICATION SPECIFICATION

10.5.1.9 External Step Angle 2 (22h)

An external step angle command is valid (EXT signal = ON), and specifies the partition number when F/H signal = OFF.

The set value is only valid in pulse stream I/F mode.

Note that if the set value is changed during pulse input it causes a positional discrepancy.

When a set value is Set by parallel I/F mode and serial I/F mode, Commanded Position is cleared to zero.

Set cannot be done during motor operation.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial variable	00h
Data range and meaning	00h: Full step (400 pulses/1 rotation) 01h: Half step (800 pulses/1 rotation) 02h: 1/2.5 (1000 pulses/1 rotation) 03h: 1/4 (1600 pulses/1 rotation) 04h: 1/5 (2000 pulses/1 rotation) 05h: 1/8 (3200 pulses/1 rotation) 06h: 1/10 (4000 pulses/1 rotation) 07h: 1/20 (8000 pulses/1 rotation) 08h: 1/25 (10000 pulses/1 rotation) 09h: 1/40 (16000 pulses/1 rotation) 0Ah: 1/50 (20000 pulses/1 rotation) 0Bh: 1/80 (32000 pulses/1 rotation) 0Ch: 1/100 (40000 pulses/1 rotation) 0Dh: 1/125 (50000 pulses/1 rotation) 0Eh: 1/200 (80000 pulses/1 rotation) 0Fh: 1/250 (100000 pulses/1 rotation)
Related attributes	Interface Mode (05h) External Step Angle 1 (21h)

10. COMMUNICATION SPECIFICATION

10.5.1.10 Acceleration Current (23h)

The winding current when accelerating is specified.

In pulse stream I/F mode, the set value is ignored and the status of the RUN of various function settings is returned by Get command.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	64h
Data range and meaning	00h ~ 64h(0 ~ 100) [%] (DB21 Series: 100% = 1A/phase, DB22 Series: 100% = 2A/phase)
Related attributes	Interface Mode (05h) Moving Current (24h) Stop Current (25h) Moving Current Switching Time (26h) Current Down Time (27h)

10.5.1.11 Moving Current (24h)

The constant velocity and the winding current when decelerating are specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	64h
Data range and meaning	00h ~ 64h(0 ~ 100) [%] (DB21 Series: 100% = 1A/phase, DB22 Series: 100% = 2A/phase)
Related attributes	Interface Mode (05h) Acceleration Current (23h) Stop Current (25h) Moving Current Switching Time (26h) Current Down Time (27h)

10. COMMUNICATION SPECIFICATION

10.5.1.12 Stop Current (25h)

The winding current when stopping is specified.

In pulse stream I/F mode, the set value is ignored and the status of the STP of various function settings is returned by Get command.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	32h
Data range and meaning	00h ~ 64h(0 ~ 100) [%] (DB21 Series: 100% = 1A/phase, DB22 Series: 100% = 2A/phase)
Related attributes	Interface Mode (05h) Acceleration Current (23h) Moving Current (24h) Moving Current Switching Time (26h) Current Down Time (27h)

10.5.1.13 Moving Current Switching Time (26h)

When acceleration is complete, the time between switching from the current when accelerating to the current when operating is specified.

This set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Get
Data type	USHORT
Initial value	0000h
Data range and meaning	0000h ~ 07D0h(0 ~ 2000) [ms]
Related attributes	Interface Mode (05h) Acceleration Current (23h) Moving Current (24h) Stop Current (25h) Current Down Time (27h)

10. COMMUNICATION SPECIFICATION

10.5.1.14 Current Down Time (27h)

The time between switching from motor stop to the current when stopping is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	USHORT
Initial value	00C8h
Data range and meaning	0000h ~ 07D0h(0 ~ 2000) [ms]
Related attributes	Interface Mode (05h) Acceleration Current (23h) Moving Current (24h) Stop Current (25h) Moving Current Switching Time (26h)

10. COMMUNICATION SPECIFICATION

10.5.2 Position Controller Object (02h)

10.5.2.1 Driver Status (01h)

The driver's internal status is displayed by the status code. The power down status for pulse stream I/F mode is included during pulse stream I/F operation.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Status during initialization 01h: Power down status 02h: Idle status 03h: During positioning operation 04h: During continuous rotation operation 05h: During return to origin operation 06h: During signal search operation 07h: During pulse stream I/F operation 08h: During alarm
Related attributes	

10.5.2.2 End Status (02h)

The stop cause for the previous operation is displayed. The stop cause for the previous operation is displayed during operation and during a pause by PAUSE.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Normal completion 01h: Stop by return to origin pulse limit 02h: Interruption by EMG signal 03h: Stop by stop command 04h: Stop by + direction over travel signal 05h: Stop by - direction over travel signal 06h: Stop by + direction soft limit 07h: Stop by - direction soft limit 08h: Stop by alarm
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.2.3 Enable (08h)

Excitation ON/OFF is commanded.

This set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Excitation OFF command 01h: Excitation ON command
Related attributes	Driver Status (01h) Feedback Enable (09h)

10.5.2.4 Feedback Enable (09h)

Excitation status is displayed.

Service	Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Excitation OFF status 01h: Excitation ON status
Related attributes	Driver Status (01h) Enable (08h)

10. COMMUNICATION SPECIFICATION

10.5.2.5 Homing Type (10h)

The operation type for the return to origin is displayed.

When Set is successful, the return to origin operation is executed.

During motor operation, Set cannot be done.

In pulse stream I/F mode and parallel I/F mode, the set value is ignored and the operation is not started.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: The return to origin to the origin signal + side edge 01h: The return to origin to the origin signal – side edge 02h: Excitation return to origin
Related attributes	Driver Status (01h) Reference Direction (2Ah) Homing Direction (30h) Homing Fast Velocity (31h) Homing Slow Velocity (32h) Grid Shift Pulse (33h) Homing Pulse Limit (34h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10. COMMUNICATION SPECIFICATION

10.5.2.6 Incremental Pulse (11h)

The amount of relative movement is specified by the pulse.

When Set is successful, the positioning operation starts by relative movement.

During motor operation, Set cannot be done.

Service	Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Driver Status (01h) Target Velocity (20h) Starting Velocity (21h) Stop Velocity (22h) Acceleration (23h) Deceleration (24h) Reference Direction (2Ah)

10. COMMUNICATION SPECIFICATION

10.5.2.7 Target Position (12h)

The target position is specified by the absolute position.

When Set is successful, the absolute positioning operation starts.

Shortcut movement is possible by setting Shortcut Enable.

Service	Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Driver Status (01h) Target Velocity (20h) Starting Velocity (21h) Stop Velocity (22h) Acceleration (23h) Deceleration (24h) Reference Direction (2Ah) Shortcut Enable (2Eh)

10. COMMUNICATION SPECIFICATION

10.5.2.8 Jog Direction (13h)

The operation direction of continuous rotation operation is specified.

During motor operation, Set cannot be done.

Service	Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Negative direction 01h: Positive direction
Related attributes	Driver Status (01h) Target Velocity (20h) Starting Velocity (21h) Stop Velocity (22h) Acceleration (23h) Deceleration (24h) Reference Direction (2Ah)

10. COMMUNICATION SPECIFICATION

10.5.2.9 Signal Search Direction (14h)

The operation direction of the signal search is specified.

When Set is successful, the signal search operation starts.

During motor operation, Set cannot be done.

Service	Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Negative direction 01h: Positive direction
Related attributes	Driver Status (01h) Target Velocity (20h) Starting Velocity (21h) Stop Velocity (22h) Acceleration (23h) Deceleration (24h) Reference Direction (2Ah) Search Signal Select (2Bh) Search Signal Logic (2Ch) Signal Status (2Dh)

10. COMMUNICATION SPECIFICATION

10.5.2.10 Pause (18h)

The motor operation is paused.

When commanded during operation, the motor comes to a rapid stop and the execution of the program is paused. Operation restarts when released.

During pause, an operation incomplete end is returned to the communication status, and the target position is retained.

The set value is ignored in pulse stream I/F mode.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Pause release 01h: During pause command
Related attributes	Rapid Stop Deceleration (25h)

10.5.2.11 Hard Stop (19h)

The motor operation is stopped immediately.

When 01h is set during any operation, the motor is fixed excitation, and the operation is complete.

When the set value is Get, 0 is returned.

The set value is ignored in pulse stream I/F mode.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: No immediate stop execution 01h: Immediate stop execution
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.2.12 Rapid Stop (1Ah)

The motor operation is stopped rapidly.

When 01h is set during any operation, the motor decelerate stops by a rapid stop deceleration, and the operation is complete.

When the set value is Get, 0 is returned.

The set value is ignored in pulse stream I/F mode.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: No rapid stop command 01h: Rapid stop command
Related attributes	Rapid Stop Deceleration (25h)

10.5.2.13 Smooth Stop (1Bh)

The motor operation is stopped by decelerating.

When 01h is Set during any operation, the motor decelerate stops by a normal deceleration, and the operation is complete.

When the set value is Get, 0 is returned.

The set value is ignored in pulse stream I/F mode.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: No deceleration stop command 01h: Deceleration stop command
Related attributes	Deceleration (24h)

10. COMMUNICATION SPECIFICATION

10.5.2.14 Target Velocity (20h)

The velocity of the positioning operation, the continuous rotation operation, and the signal search operation are specified. When it is set lower than the starting velocity, it becomes a constant velocity operation at the specified velocity.

When Set is done during the above operation, they accelerate and decelerate to the newly set velocity.

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000003E8h
Data range and meaning	00000001h ~ 004C4B40h(1 ~ 5000000) [pulse/s] However, actual operation is limited to 0.001 ~ 100rps.
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h)

10.5.2.15 Starting Velocity (21h)

The starting velocity of the positioning operation, the continuous rotation operation, and the signal search operation are specified.

When Set is done, it starts up at the newly set velocity from the next time operation starts (if during PAUSE then when it is released).

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000001F4h
Data range and meaning	00000001h ~ 004C4B40h(1 ~ 5000000) [pulse/s] However, actual operation is limited to 0.001 ~ 100rps.
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h)

10. COMMUNICATION SPECIFICATION

10.5.2.16 Stop Velocity (22h)

The possible stop velocity of the positioning operation, the continuous rotation operation, and the signal search operation are specified.

Positioning deceleration is controlled so that the velocity of the stop point becomes this proximity.

When Set is done during operation, it is controlled so that it can stop at the newly set velocity. However, when there is not enough time for deceleration, it may stop at a velocity more than the set value.

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000001F4h
Data range and meaning	00000001h ~ 004C4B40h(1 ~ 5000000) [pulse/s] However, actual operation is limited to 0.001 ~ 100rps.
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h)

10.5.2.17 Acceleration (23h)

The acceleration of the positioning operation, the continuous rotation operation, and the signal search operation is specified.

When Set is done during operation, it accelerates by the newly set acceleration.

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000003E8h
Data range and meaning	000003E8h ~ 00989680h(1000 ~ 10000000) [pulse/s ²] However, actual operation is limited to 0.1 ~ 1000000rps ² .
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h) Deceleration (24h)

10. COMMUNICATION SPECIFICATION

U10.5.2.18 Deceleration (24h)

The deceleration of the positioning operation, the continuous rotation operation, and the signal search operation is specified.

When Set is done during operation, it decelerates by the newly set deceleration. However, when there is not enough time for the deceleration velocity to change, it may stop at a faster velocity than the stop velocity.

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000003E8h
Data range and meaning	000003E8h ~ 00989680h(1000 ~ 10000000) [pulse/s ²] However, actual operation is limited to 0.1 ~ 1000000rps ² .
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h) Acceleration (23h)

U10.5.2.19 Rapid Stop Deceleration (25h)

Deceleration of rapid stop by the alarm etc. is specified.

When Set is done during rapid stop, it decelerates by the newly set deceleration. However, when there is not enough time for the deceleration velocity to change, it may stop at a faster velocity than the stop velocity.

The set value is ignored in pulse stream I/F mode.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000003E8h
Data range and meaning	000003E8h ~ 00989680h(1000 ~ 10000000) [pulse/s ²] However, actual operation is limited to 0.1 ~ 1000000rps ² .
Related attributes	Pause (18h) Rapid Stop (1Ah)

10. COMMUNICATION SPECIFICATION

10.5.2.21 Commanded Velocity (29h)

The current velocity commanded by the driver is displayed.

Service	Get
Data type	ULONG
Initial value	00000000h
Data range and meaning	00000000h ~ 00989680h(0 ~ 10000000) [pulse/s]
Related attributes	

10.5.2.22 Reference Direction (2Ah)

Defines which rotation, CW or CCW, is the positive direction.

This parameter effects only the count direction of Commanded Position.

During motor operation, Set cannot be done.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: CW rotation is the + direction 01h: CCW rotation is the + direction
Related attributes	Incremental Pulse (11h) Target Position (12h) Jog Direction (13h) Signal Search Direction (14h) Commanded Position (27h) Homing Direction (30h) Direction Sign (02h)

10. COMMUNICATION SPECIFICATION

10.5.2.23 Search Signal Select (2Bh)

The type and complex condition of signals to scan by the signal search operation is specified.

When Set is done during operation, it becomes valid from the next operation.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	0800h
Data range and meaning	<p>The following combination of bit streams</p> <p>b31-b16 Reserved (fixed to 0)</p> <p>b15 CCW hard limit signal (0: not detected 1: detected)</p> <p>b14 CW hard limit signal (0: not detected 1: detected)</p> <p>b13 + direction soft limit (0: not detected 1: detected)</p> <p>b12 - direction soft limit (0: not detected 1: detected)</p> <p>b11 Origin signal (0: not detected 1: detected)</p> <p>b10 Emergency stop signal (0: not detected 1: detected)</p> <p>b9 Zone signal (0: not detected 1: detected)</p> <p>b8 Reserved (fixed to 0)</p> <p>b7 Reserved (fixed to 0)</p> <p>b6 General-purpose input signal 4 (0: not detected 1: detected)</p> <p>b5 General-purpose input signal 3 (0: not detected 1: detected)</p> <p>b4 General-purpose input signal 2 (0: not detected 1: detected)</p> <p>b3 General-purpose input signal 1 (0: not detected 1: detected)</p> <p>b2 Reserved (fixed to 0)</p> <p>b1 Reserved (fixed to 0)</p> <p>b0 Compound condition when two or more signals are specified (0: AND 1: OR)</p>
Related attributes	<p>Signal Search Direction (14h)</p> <p>Search Signal Logic (2Ch)</p> <p>Signal Status (2Dh)</p>

10. COMMUNICATION SPECIFICATION

10.5.2.24 Search Signal Logic (2Ch)

The status of the signal being detected by the signal search command is specified.

When Set is also done during operation, it becomes effective from the next operation.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	0800h
Data range and meaning	<p>The following combination of bit streams</p> <p>b31-b16 Reserved (fixed to 0)</p> <p>b15 CCW hard limit signal (0: non-active 1: active)</p> <p>b14 CW hard limit signal (0: non-active 1: active)</p> <p>b13 + direction soft limit (0: non-active 1: active)</p> <p>b12 - direction soft limit (0: non-active 1: active)</p> <p>b11 Origin signal (0: non-active 1: active)</p> <p>b10 Emergency stop signal (0: non-active 1: active)</p> <p>b9 Zone signal (0: non-active 1: active)</p> <p>b8 Reserved (fixed to 0)</p> <p>b7 Reserved (fixed to 0)</p> <p>b6 General-purpose input signal 4 (0: non-active 1: active)</p> <p>b5 General-purpose input signal 3 (0: non-active 1: active)</p> <p>b4 General-purpose input signal 2 (0: non-active 1: active)</p> <p>b3 General-purpose input signal 1 (0: non-active 1: active)</p> <p>b2 Reserved (fixed to 0)</p> <p>b1 Reserved (fixed to 0)</p> <p>b0 Reserved (fixed to 0)</p>
Related attributes	<p>Signal Search Direction (14h)</p> <p>Search Signal Select (2Bh)</p> <p>Signal Status (2Dh)</p>

10. COMMUNICATION SPECIFICATION

10.5.2.25 Signal Status (2Dh)

The current signal status is brought together and returned.

Service	Get
Data type	ULONG
Initial value	0000h
Data range and meaning	<p>The following combination of bit streams</p> <p>b31-b16 Reserved (fixed to 0)</p> <p>b15 CCW hard limit signal (0: non-active 1: active)</p> <p>b14 CW hard limit signal (0: non-active 1: active)</p> <p>b13 + direction soft limit (0: non-active 1: active)</p> <p>b12 - direction soft limit (0: non-active 1: active)</p> <p>b11 Origin signal (0: non-active 1: active)</p> <p>b10 Emergency stop signal (0: non-active 1: active)</p> <p>b9 Zone signal (0: non-active 1: active)</p> <p>b8 Reserved (fixed to 0)</p> <p>b7 Reserved (fixed to 0)</p> <p>b6 General-purpose input signal 4 (0: non-active 1: active)</p> <p>b5 General-purpose input signal 3 (0: non-active 1: active)</p> <p>b4 General-purpose input signal 2 (0: non-active 1: active)</p> <p>b3 General-purpose input signal 1 (0: non-active 1: active)</p> <p>b2 Reserved (fixed to 0)</p> <p>b1 Reserved (fixed to 0)</p> <p>b0 Reserved (fixed to 0)</p>
Related attributes	<p>Signal Search Direction (14h)</p> <p>Signal Status (2Dh)</p> <p>General Input 1 Function Select (04h)</p> <p>General Input 2 Function Select (05h)</p> <p>General Input 3 Function Select (06h)</p> <p>General Input 4 Function Select (07h)</p>

10. COMMUNICATION SPECIFICATION

10.5.2.26 Shortcut Enable (2Eh)

Command whether or not to control a short cut by the positioning operation of the absolute position command.

During motor operation, Set cannot be done.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: No shortcut control 01h: Shortcut control
Related attributes	Target Position (12h)

10.5.2.27 Constant Velocity Time (2Fh)

In the positioning operation, the lowest value of the constant velocity drive time is specified to prevent a triangular drive.

Because of the relation between the amount of movement and the adjustable velocity, when the constant velocity drive time at the target velocity is expected to shorten more than this value, to secure the constant velocity time, the velocity of the target is corrected.

However, the Target Velocity is not rewritten. And when the commands pause, immediate stop, rapid stop, and deceleration stop are entered, the stop process enters immediately even if the constant velocity time is not passed.

Service	Initialize, Restore, Save, Set, Get
Data type	USHORT
Initial value	0000h
Data range and meaning	0000h ~ 1388h(0 ~ 5000) [ms]
Related attributes	Incremental Pulse (11h) Target Position (12h)

10. COMMUNICATION SPECIFICATION

10.5.2.28 Homing Direction (30h)

The startup direction of return to origin is specified.

Even if Set service is executed during return to origin, the operation is not effected.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Startup in a negative direction 01h: Startup in a positive direction
Related attributes	Homing Type (10h) Reference Direction (2Ah) Homing Fast Velocity (31h) Homing Slow Velocity (32h) Grid Shift Pulse (33h) Homing Pulse Limit (34h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10.5.2.29 Homing Fast Velocity (31h)

The maximum velocity of the return to origin is specified.

When Set is done during operation to the highest velocity, they accelerate and decelerate to become the newly set velocity.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000003E8h
Data range and meaning	00000001h ~ 004C4B40h(1 ~ 5000000) [pulse/s] However, actual operation is limited to 0.001 ~ 100rps
Related attributes	Homing Type (10h) Homing Direction (30h) Homing Slow Velocity (32h) Grid Shift Pulse (33h) Homing Pulse Limit (34h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10. COMMUNICATION SPECIFICATION

10.5.2.30 Homing Slow Velocity (32h)

During return to origin the movement velocity of the low velocity for detecting the signal edge is specified.

The startup velocity for high velocity movement follows this setting.

Even if Set service is executed during return to origin, the operation is not effected.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	000001F4h
Data range and meaning	00000001h ~ 004C4B40h(1 ~ 5000000) [pulse/s] However, actual operation is limited to 0.001 ~ 100rps
Related attributes	Homing Type (10h) Homing Direction (30h) Homing Fast Velocity (31h) Grid Shift Pulse (33h) Homing Pulse Limit (34h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10.5.2.31 Grid Shift Pulse (33h)

The amount of offset that moves after detecting the origin position is specified by the pulse number. The command value is handled as the amount of relative movement from the origin.

Even if Set service is executed during return to origin, the operation is not effected.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Homing Type (10h) Reference Direction (2Ah) Homing Direction (30h) Homing Fast Velocity (31h) Homing Slow Velocity (32h) Homing Pulse Limit (34h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10. COMMUNICATION SPECIFICATION

10.5.2.32 Homing Pulse Limit (34h)

When return to origin the maximum movement pulse number is specified.

If the origin cannot be detected even if Homing Pulse reaches this pulse number, the return to origin is stopped.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	ULONG
Initial value	00000000h
Data range and meaning	00000000h ~ 7FFFFFFFh(0 ~ 2147483647) [pulse] However, when 0 is specified the movement pulse number is not observed.
Related attributes	Homing Type (10h) Homing Direction (30h) Homing Fast Velocity (31h) Homing Slow Velocity (32h) Grid Shift Pulse (33h) Home Position (35h) Homing Complete (36h) Homing Pulse (37h)

10.5.2.33 Home Position (35h)

When a return to origin is completed, the command position and the origin coordinates for overwriting the F/B position are specified.

Service	Initialize, Restore, Save, Set, Preset, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Homing Type (10h) Homing Complete (36h)

10. COMMUNICATION SPECIFICATION

10.5.2.34 Homing Complete (36h)

Whether or not the return to origin is complete is returned.

It is cleared when return to origin execution starts, and is set by the normal end of return to origin.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Return to origin incomplete 01h: Return to origin complete
Related attributes	Homing Type (10h) Home Position (35h)

10.5.2.35 Homing Pulse (37h)

The total movement pulse number during the return to origin is returned.

0 is cleared when return to origin execution starts, and the number of pulses moved regardless of direction is totaled.

Service	Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Homing Type (10h) Homing Pulse Limit (34h) Homing Complete (36h)

10. COMMUNICATION SPECIFICATION

10.5.2.36 External Stop Action (40h)

The operation when an EMG signal is detected is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	The following combination of bit streams b7-b5 Reserved (fixed to 0) b4 Excited status after stop (0: status before stop is retained 1: excitation off) b3-b0 Stop method (0: nothing 1: immediate stop 2: rapid stop 3: deceleration stop)
Related attributes	Signal Status (2Dh) General Input 1 Function Select (04h) General Input 2 Function Select (05h) General Input 3 Function Select (06h) General Input 4 Function Select (07h)

10.5.2.37 Hard Limit Action (41h)

The operation when a \pm over travel signal is detected is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	The following combination bit streams b7-b5 Reserved (fixed to 0) b4 Excited status after stop (0: status before stop is retained 1: excitation off) b3-b0 Stop method (0: nothing 1: immediate stop 2: rapid stop 3: deceleration stop)
Related attributes	Signal Status (2Dh) General Input 2 Function Select (05h) General Input 3 Function Select (06h)

10. COMMUNICATION SPECIFICATION

10.5.2.38 Soft Limit Action (42h)

The operation when a soft limit is detected is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	The following combination of bit streams b7-b5 Reserved (fixed to 0) b4 Excited status after stop (0: status before stop is retained 1: excitation off) b3-b0 Stop method (0: nothing 1: immediate stop 2: rapid stop 3: deceleration stop)
Related attributes	Signal Status (2Dh) Positive Soft Limit Position (43h) Negative Soft Limit Position (44h) Soft Limit Active Condition (45h)

10.5.2.39 Positive Soft Limit Position (43h)

A + direction of soft limit position is specified.

However, when the value of Negative Soft Limit Position or less is specified, a soft limit is not detected.

Service	Initialize, Restore, Save, Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Commanded Position (27h) Signal Status (2Dh) Soft Limit Action (42h) Negative Soft Limit Position (44h) Soft Limit Active Condition (45h)

10. COMMUNICATION SPECIFICATION

10.5.2.40 Negative Soft Limit Position (44h)

A - direction of soft limit position is specified.

However, when a Positive Soft Limit Position above this value is specified, a soft limit is not detected.

Service	Initialize, Restore, Save, Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Commanded Position (27h) Signal Status (2Dh) Soft Limit Action (42h) Positive Soft Limit Position (43h) Soft Limit Active Condition (45h)

10.5.2.41 Soft Limit Active Condition (45h)

The condition in which a soft limit becomes active is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Follows the comparison result with Commanded Position
Related attributes	Commanded Position (27h) Signal Status (2Dh) Soft Limit Action (42h) Positive Soft Limit Position (43h) Negative Soft Limit Position (44h)

10. COMMUNICATION SPECIFICATION

10.5.2.42 Positive Zone Limit Position (46h)

The positive direction output limit position of the zone signal is specified.

However, when the value of Negative Zone Position or less is specified, the Zone signal is not output.

Service	Initialize, Restore, Save, Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Commanded Position (27h) Negative Zone Signal Limit Position (47h) Zone Signal Active Condition (48h) Signal Status (2Dh)

10.5.2.43 Negative Zone Limit Position (47h)

The negative direction output limit position of the zone signal is specified.

However, when the value of Positive Zone Position or more is specified, the Zone signal is not output.

Service	Initialize, Restore, Save, Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	80000000h ~ 7FFFFFFFh(-2147483648 ~ 2147483647) [pulse]
Related attributes	Commanded Position (27h) Signal Status (2Dh) Positive Zone Signal Limit Position (46h) Zone Signal Active Condition (48h)

10. COMMUNICATION SPECIFICATION

10.5.2.44 Zone Signal Active Condition (48h)

The condition in which the zone signal becomes active is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Follows the comparison result with Commanded Position
Related attributes	Commanded Position (27h) Signal Status (2Dh) Positive Zone Signal Limit Position (46h) Negative Zone Signal Limit Position (47h)

10.5.2.45 Position Pre-Scale (49h)

The counter cycle of Commanded Position is specified.

When Set is successful, Commanded Position, and Homing Complete are cleared.

When 0 is set, it is counted in the coordinate space of 32 bit.

During motor operation, Set cannot be done.

Service	Initialize, Restore, Save, Set, Get
Data type	LONG
Initial value	00000000h
Data range and meaning	0 or 00001F4h ~ 7FFFFFFh(0, 500 ~ 2147483647) [pulse] Coordinate range (set value n) n=0:-2147483648 ~ 2147483647 n≠0:0 ~ n-1
Related attributes	Commanded Position (27h) Shortcut Enable (2Eh)

10. COMMUNICATION SPECIFICATION

10.5.3 Serial Communication Object (04h)

10.5.3.1 Baud Rate (01h)

The communication velocity setting is returned.

Service	Get
Data type	ULONG
Initial value	00002580h
Data range and meaning	00002580h:9600bps 00004B00h:19200bps 00009600h:38400bps
Related attributes	

10.5.3.2 Slave Address (02h)

The slave station address setting is returned.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h ~ 0Fh(0 ~ 15)
Related attributes	

10.5.3.3 Group Address (03h)

The group address it belongs to is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	FFh
Data range and meaning	F0h ~ FFh(240 ~ 255)
Related attributes	Slave Address List (04h) Group Response Type (05h)

10. COMMUNICATION SPECIFICATION

10.5.3.4 Slave Address List (04h)

The address list of all slave stations that belong to the same group is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR array (variable length)
Initial value	-
Data range and meaning	Up to a maximum of 16 slave numbers in the same group are stored.
Related attributes	Group Address (03h) Group Response Type (05h)

10.5.3.5 Group Response Type (05h)

The group response method is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: The representative axis of the group responds
Related attributes	Group Address (03h) Slave Address List (04h) Communication Type (06h)

10.5.3.6 Communication Type (06h)

The circuit system is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	01h: Semi-duplex communication circuits
Related attributes	Group Response Type (05h)

10. COMMUNICATION SPECIFICATION

10.5.3.7 Response Time (07h)

The start delay time of a response for the master station is specified.

Service	Initialize, Restore, Save, Set, Get
Data type	USHORT
Initial value	0000h
Data range and meaning	0000h ~ 03E8h(0 ~ 1000) [ms]
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.4 Program Object (05h)

10.5.4.1 Start Number (01h)

The execution start program number is specified.

When Set is successful, the program of the number specified is executed. However, if a program is already being executed, an incomplete execution is returned.

When Get is done in parallel I/F mode, the program number selected by external I/O signal is returned. For serial I/F mode, the previous set value is returned.

Service	Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h ~ 0Fh(0 ~ 15) [Program number]
Related attributes	Current Address (02h) Execute Mode (03h) Program Complete (04h) Vector Number (10h) Vector (11h)

10.5.4.2 Current Address (02h)

The address being executed is returned.

+1 is done for every 1 command execution completion.

During program stop, the address executed previously is returned.

When Set is successful, the program is executed from the address specified.

During program execution, Set cannot be done.

Service	Set, Get
Data type	USHORT
Initial value	0001h
Data range and meaning	0001h ~ 012Ch(1 ~ 300) [Address]
Related attributes	Start Number (01h) Execute Mode (03h) Program Complete (04h)

10. COMMUNICATION SPECIFICATION

10.5.4.3 Program Complete (04h)

Whether or not to execute during the program is returned.

If the program complete bit and the PEND signal of communication status synchronize and 00h is Set, the program is stopped.

Service	Set, Get
Data type	UCHAR
Initial value	01h
Data range and meaning	00h: Program execution complete 01h: During program execution
Related attributes	Start Number (01h) Current Address (02h) Execute Mode (03h) Program Complete (04h) Fault Code (05h)

10. COMMUNICATION SPECIFICATION

10.5.4.4 Fault Code (05h)

The cause of the execution interruption when a problem is generated during program execution is returned.

When a program fault is generated, alarm Fault Code+30h is generated.

The fault code is also cleared at the same time the alarm is cleared.

Service	Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Normal end 01h: Abnormal command code 02h: Abnormal command data 03h: Program cannot be executed status 04h: Time-out 05h: Abnormal sub routine nest
Related attributes	Alarm Code (10h) Program Complete (04h)

10.5.4.5 Vector Number (10h)

The program number editing position in the vector table is specified.

The address can be Set in program numbers 100-180h in the vector table, but execution start cannot be done.

Service	Set, Get
Data type	USHORT
Initial value	0001h
Data range and meaning	0001h ~ 0064h(1 ~ 100) [Program number]
Related attributes	Start Number (01h) Vector (11h)

10.5.4.6 Vector (11h)

The execution start line number of the position where the current Vector Number points is specified.

When Write or Read are successful, Vector Number is done by +1 and points at the next position. It does not advance any further when Vector Number is already in the final position.

Service	Write, Read
Data type	USHORT
Initial value	0000h
Data range and meaning	0000h ~ 012Ch(0 ~ 300) [Address] However, at the points where 0 is specified the programs are not executed.
Related attributes	Start Number (01h) Vector Number (10h)

10. COMMUNICATION SPECIFICATION

10.5.4.7 Edit Address (12h)

The address at which to edit the program is specified.

Service	Set, Get
Data type	USHORT
Initial value	0001h
Data range and meaning	0001h ~ 012Ch(0 ~ 300) [Address]
Related attributes	Program Data (13h)

10.5.4.8 Program Data (13h)

The content of the address shown in Edit Address is specified.

When Write or Read are successful, Edit Address is done by +1 and points at the next line.

It does not advance any further when Edit Address is already in the final position.

The size of the array differs according to the program.

During motor operation, Set cannot be done.

Service	Write, Read
Data type	UCHAR array (16 bytes maximum)
Initial value	00h
Data range and meaning	Depends on program command
Related attributes	Edit Address (12h)

10.5.4.9 Variable Area 1 ~ 64 (80h ~ BFh)

Attributes that can be used freely during the program by specifying with a Variable ID.

Service	Initialize, Restore, Save, Set, Get
Data type	ULONG
Initial value	00000000h
Data range and meaning	00000000h ~ FFFFFFFFh(0 ~ 4294967295)
Related attributes	Mapping Flag 1 ~ 64 (C0h ~ FFh)

10. COMMUNICATION SPECIFICATION

10.5.4.10 Mapping Flag 1 ~ 64 (C0h ~ FFh)

Whether or not Variable Area 1 ~ 64 is handled as data itself or as a short cut to a specific attribute is decided.

When the Mapping Flag set value is 0, the Variable Area of the same number is immediate data; when the set value is 1, it is handled as a shortcut where the value of Variable Area displays as Object ID+Attribute ID.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	00h: Corresponding Variable Area is immediate data 01h: Corresponding Variable Area is indirect reference data for the shortcut
Related attributes	Variable Area 1 ~ 64 (80h ~ BFh)

10. COMMUNICATION SPECIFICATION

10.5.5 I/O Signal Object (06h)

10.5.5.1 General Input 1 Function Select (04h)

The terminal function and the input logic of general-purpose input signal 1 are specified.

In pulse stream I/F mode the set value is ignored.

When functions other than the program selection bit are specified, the applicable bit of the program number becomes 0 (non-active).

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	03h
Data range and meaning	The following combination of bit streams b7 Input logic (0: Contact point A 1: Contact point B) b6-b4 Reserved (0 is set) b3-b0 Terminal function (0: Not used 1: General-purpose input signal IN1 2: Program selection bit B1 (set of b7 is invalid, fixed contact point A) 3: Alarm clear signal ALMC 4: Origin signal ORG 7: Emergency signal EMG)
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.5.2 General Input 2 Function Select (05h)

The terminal function and the input logic of general-purpose input signal 2 are specified.

In pulse stream I/F mode the set value is ignored.

When functions other than the program selection bit are specified, the applicable bit of the program number becomes 0 (non-active).

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	85h
Data range and meaning	<p>The following combination of bit streams</p> <p>b7 Input logic (0: Contact point A 1: Contact point B)</p> <p>b6-b4 Reserved (0 is set)</p> <p>b3-b0 Terminal function</p> <p>(0: Not used</p> <p>1: General-purpose input signal IN2</p> <p>2: Program selection bit B2</p> <p>(set of b7 is invalid, fixed point of contact A)</p> <p>3: Alarm clear signal ALMC</p> <p>4: Origin signal ORG</p> <p>5: + direction over travel signal + OT</p> <p>7: Emergency signal EMG)</p>
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.5.3 General Input 3 Function Select (06h)

The terminal function and the input logic of general-purpose input signal 3 are specified.

In pulse stream I/F mode the set value is ignored.

When functions other than the program selection bit are specified, the applicable bit of the program number becomes 0 (non-active).

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	86h
Data range and meaning	The following combination of bit streams b7 Input logic (0: Contact point A 1: Contact point B) b6-b4 Reserved (0 is set) b3-b0 Terminal function (0: Not used 1: General-purpose input signal IN3 2: Program selection bit B4 (set of b7 is invalid, fixed point of contact A) 3: Alarm clear signal ALMC 4: Origin signal 6: - direction over travel signal - OT 7: Emergency signal EMG)
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.5.4 General Input 4 Function Select (07h)

The terminal function and the input logic of general-purpose input signal 4 are specified.

In pulse stream I/F mode the set value is ignored.

When functions other than the program selection bit are specified, the applicable bit of the program number becomes 0 (non-active).

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	87h
Data range and meaning	The following combination of bit streams b7 Input logic (0: Contact point A 1: Contact point B) b6-b4 Reserved (0 is set) b3-b0 Terminal function (0: Not used 1: General-purpose input signal IN4 2: Program selection bit B8 (set of b7 is invalid, fixed point of contact A) 3: Alarm clear signal ALMC 4: Origin signal ORG 7: Emergency signal EMG)
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.5.5 General Output 1 Function Select (09h)

The function and the output logic of general-purpose output terminal OUT1 are specified.

In pulse stream I/F mode the set value is ignored.

During motor operation, Set cannot be done.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	04h
Data range and meaning	The following combination of bit streams b7 Output logic(0: Contact point A 1: Contact point B) b6-b4 (0 is set) b3-b0 Terminal function (0: Not used 1: Reserved (do not set) 2: During program execution signal PEND 3: Reserved (do not set) 4: During motor operation signal BUSY 5: Zone signal ZONE)
Related attributes	

10.5.6.7 General Output 2 Function Select (0Ah)

The function and the output logic of general-purpose output terminal OUT2 are specified.

In pulse stream I/F mode the set value is ignored.

During motor operation, Set cannot be done.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	02h
Data range and meaning	The following combination of bit streams b7 Output logic (0: Contact point A 1: Contact point B) b6-b4 Reserved (0 is set) b3-b0 Terminal function (0: Not used 1: Reserved (do not set) 2: During program execution signal PEND 3: Reserved (do not set) 4: During motor operation signal BUSY 5: Zone signal ZONE)
Related attributes	

10. COMMUNICATION SPECIFICATION

10.5.5.7 Alarm Signal Function Select (0Bh)

The function and the output logic of the alarm output terminal ALM are specified.

Service	Initialize, Restore, Save, Set, Get
Data type	UCHAR
Initial value	00h
Data range and meaning	The following combination of bit streams b7 Output logic of OUT1 terminal (0: contact point A 1: contact point B) b6-b0 Reserved (0 is set)
Related attributes	Alarm Code (10h)

10. COMMUNICATION SPECIFICATION

10.6 Service Execution List

10.6.1 Execution Property List of Each Object

10.6.1.1 DB Object

Table 10-6-1 DB Object Execution Property List

Attributes		Driver status	During initialization (Note 1)	Power down	Idle	Pulse stream	During motor operation (Note 2)	Alarm	During program execution
All attributes of DB Object	Get		×						
	Rest		×				×	×	×
	Save		×				×	×	×
	Ini		×				×		×
Alarm Code(10h)	Set		×					×	
Step Angle1(20h)	Set		×			×	1	×	
External Step Angle1(21h)	Set		×			×		×	
External Step Angle2(22h)	Set		×			×		×	
Acceleration Current(23h)	Set		×					×	
Moving Current(24h)	Set		×					×	
Stop Current(25h)	Set		×					×	
Moving Current Switching Time (26h)	Set		×					×	
Current Down Time (27h)	Set		×					×	

: Shows the service of the attribute is executable.

Communication status returns a successful response.

Shows the service of the attribute is conditionally executable.

1 : In serial and parallel mode, the set value is updated, but it is not reflected in the operation.

Communication status returns a successful response.

× : Shows the service of the attribute is not executable.

Communication status returns a driver status error.

Note 1) Do not execute an attribute service, because attribute values are updated during initialization.

Note 2) During motor operation means during positioning operation, during continual rotation operation, during return to origin operation, and during signal search operation.

10. COMMUNICATION SPECIFICATION

10.6.1.2 Position Controller Object

Table 10-6-2 Execution Property List of Position Controller Object

Driver status		During initialization (Note 1)	Power down	Idle	Pulse stream	During motor operation (Note 2)	Alarm	During program execution
Attributes								
All attributes of Position Controller Object	Get	×						
	Rest	×				×	×	×
	Save	×				×	×	×
	Ini	×				×		×
Enable (08h)	Set	×			2		×	
Homing Type (10h)	Set	×			2	2	2	×
Incremental Pulse (11h)	Set	×			2	2	2	×
Target Position (12h)	Set	×			2	2	2	×
Jog Direction (13h)	Set	×			2	2	2	×
Signal Search Direction (14h)	Set	×			2	2	2	×
Pause (18h)	Set	×						×
Hard Stop (19h)	Set	×						×
Rapid Stop (1Ah)	Set	×						×
Smooth Stop (1Bh)	Set	×						×
Target Velocity (20h)	Set	×						×
Starting Velocity (21h)	Set	×						×
Stop Velocity (22h)	Set	×						×
Acceleration (23h)	Set	×						×
Deceleration (24h)	Set	×						×
Rapid Stop Deceleration (25h)	Set	×						×
Commanded Position (27h)	Set	×	(Note 3)	(Note 3)	(Note 3)	×	(Note 3)	×
Reference Direction (2Ah)	Set	×				×	1	×
Search Signal Select (2Bh)	Set	×						×
Search Signal Logic (2Ch)	Set	×						×
Shortcut Enable (2Eh)	Set	×						×
Constant Velocity Time (2Fh)	Set	×				×		×
Homing Direction (30h)	Set	×						×

10. COMMUNICATION SPECIFICATION

Driver status		During initialization (Note 1)	Power down	Idle	Pulse stream	During motor operation (Note 2)	Alarm	During program execution
Homing Fast Velocity (31h)	Set	×				×		×
Homing Slow Velocity (32h)	Set	×				×		×
Grid Shift Pulse (33h)	Set	×				×		×
Homing Pulse Limit (34h)	Set	×						×
Home Position (35h)	Set	×						×
External Stop Action (40h)	Set	×						×
Hard Limit Action (41h)	Set	×						×
Soft Limit Action (42h)	Set	×						×
Positive Soft Limit Position (43h)	Set	×						×
Negative Soft Limit Position (44h)	Set	×						×
Soft Limit Active Condition (45h)	Set	×						×
Positive Zone Limit Position (46h)	Set	×						×
Negative Zone Limit Position (47h)	Set	×						×
Zone Signal Active Condition (48h)	Set	×						×
Position Pre-Scale (49h)	Set	×				×	2	×

: Shows the service of the attribute is executable. Communication status returns a successful response.

Shows the service of the attribute is conditionally executable.

1: The set value is updated, but it is not reflected in the operation. Communication status returns a successful response.

2: The set value is updated, but it is not reflected in the operation. Communication status returns a driver status error.

× : Shows the service of the attribute is not executable.

Communication status returns a driver status error.

Note 1) Do not execute an attribute service during initialization.

Note 2) During motor operation means during positioning operation, during continual rotation operation, during return to origin operation, and during signal search operation.

Note 3) When setting by combining the encoder [channel 2, 3] and the partition number [1/1 ~ 2.5 partitions], the data setting range becomes E000000h ~ 1FFFFFFh. A driver status error is returned when anything outside this range is specified.

10. COMMUNICATION SPECIFICATION

10.6.1.3 Serial Communication Object (04h)

Table 10-6-3 Execution Property list of Serial Communication Object

Driver status		During Initializ ation (Note 1)	Power down	Idle	Pulse stream	During motor operat ion (Note 2)	Alarm	During progra m executi on
		Attributes						
All attributes of Serial Communication Object	Get	×						
	PreSet	×				×	×	×
	Save	×				×	×	×
	Ini	×				×		×
Serial Communication Object	-	-	-	-	-	-	-	-
Group Address (03h)	Set	×						×
Slave Address List (04h)	Set	×						×
Group Response Type (05h)	Set	×						×
Communication Type (06h)	Set	×						×
Response Time (07h)	Set	×						×

: Shows the service of the attribute is executable.

Communication status returns a successful response.

× : Shows the service of the attribute is not executable.

Communication status returns a driver status error.

Note 1) Do not execute an attribute service, because attribute values are updated during initialization.

Note 2) During motor operation means during positioning operation, during continual rotation operation, during return to origin operation, and during signal search operation.

10. COMMUNICATION SPECIFICATION

10.6.1.4 Program Object (05h)

Table 10-6-4 Execution Property list of Program Object

Driver status		During initialization (Note 1)	Power down	Idle	Pulse stream	During motor operation (Note 2)	Alarm	During program execution
Attributes								
All attributes of Program Object	Get	x						
	Rest	x				x	x	x
	Save	x				x	x	x
	Ini	x				x		x
Start Number (01h)	Set	x			x	x	x	x
Current Address (02h)	Set	x			x	x	x	x
Execute Mode (03h)	Set	x						x
Program Complete (04h)	Set	x						
Vector Number (10h)	Set	x						x
Vector (11h)	Set	x						x
Edit Address (12h)	Set	x						x
Program Data (13h)	Set	x						x
Variable Area 1 ~ 64 (80h ~ BFh)	Set	x						x
Mapping Flag 1 ~ 64 (C0h ~ FFh)	Set	x						x

: Shows the service of the attribute is executable.

Communication status returns a successful response.

x : Shows the service of the attribute is not executable.

Communication status returns a driver status error.

Note 1) Do not execute an attribute service, because attribute values are updated during initialization.

Note 2) During motor operation means during positioning operation, during continual rotation operation, during return to origin operation, and during signal search operation.

10. COMMUNICATION SPECIFICATION

10.6.1.5 I/O Signal Object (06h)

Table 10-6-2 Execution Property List of I/O Signal Object

Attributes		Driver status	During initialization (Note 1)	Power down	Idle	Pulse stream	During motor operation (Note 2)	Alarm	During program operation
All attributes of I/O Signal Object	Get		×						
	Rest		×				×	×	×
	Save		×				×	×	×
	Ini		×				×		×
General Input 1 Function Select (04h)	Set		×						×
General Input 2 Function Select (05h)	Set		×						×
General Input 3 Function Select (06h)	Set		×						×
General Input 4 Function Select (07h)	Set		×						×
General Output 1 Function Select (09h)	Set		×				×		×
General Output 2 Function Select (0Ah)	Set		×				×		×
Alarm Signal Function Select (0Bh)	Set		×				×		×

: Shows the service of the attribute is executable.

Communication status returns a successful response.

× : Shows the service of the attribute is not executable.

Communication status returns a driver status error.

Note 1) Do not execute an attribute service, because attribute values are updated during initialization.

Note 2) During motor operation means during positioning operation, during continual rotation operation, during return to origin operation, and during signal search operation.

10. COMMUNICATION SPECIFICATION

10.7 Explanation of Return to Origin Pattern

10.7.1 Return to Origin Pattern "00h"

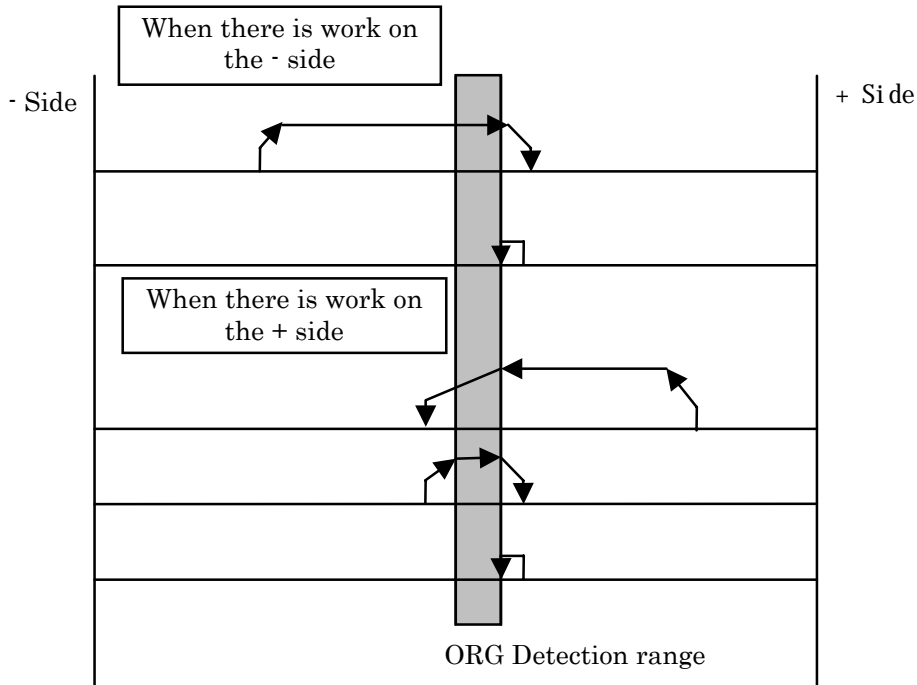


Fig. 10-4 Return to Origin Pattern 00

This return to origin method is the message that designates the + side edge of the ORG sensor as the origin.

- ~ when there is work on the -side
(Homing Direction(30h): 01h starts in a positive direction)
The motor rotates to the + side at the maximum velocity of the return to origin (Homing Fast Velocity(31h)).
Detects the + side edge of the ORG sensor and then decelerates to a stop.
After it stops, it rotates to the - side at the low velocity of the return to origin (Homing Slow Velocity(32h)), detects the + side edge of the ORG sensor and stops.
This point is designated as the origin, and the command position (Commanded Position(27h)) are overwritten by the set value of the Home Position(35h).
When detecting the ORG sensor when the operation starts, it becomes the operation from □.
- ~ when there is work on the + side
(Homing Direction(30h): 00h starts in a negative direction)
The motor rotates to the - side at the maximum velocity of the return to origin (Homing Fast Velocity(31h)).

10. COMMUNICATION SPECIFICATION

Detects the + side edge of the ORG sensor and then decelerates to a stop.
 After it stops, it rotates to the + side at the maximum velocity of the return to origin, detects the + side edge of the ORG sensor and decelerates to a stop.
 After it stops, it rotates to the + side at the low velocity of the return to origin (Homing Slow Velocity(32h)), detects the + side edge of the ORG sensor and stops.
 This point is designated as the origin, and the command position are overwritten by the set value of Home Position(35h).
 When detecting the ORG sensor when the operation starts, it becomes the operation from .

10.7.2 Return to Origin Pattern “01h”

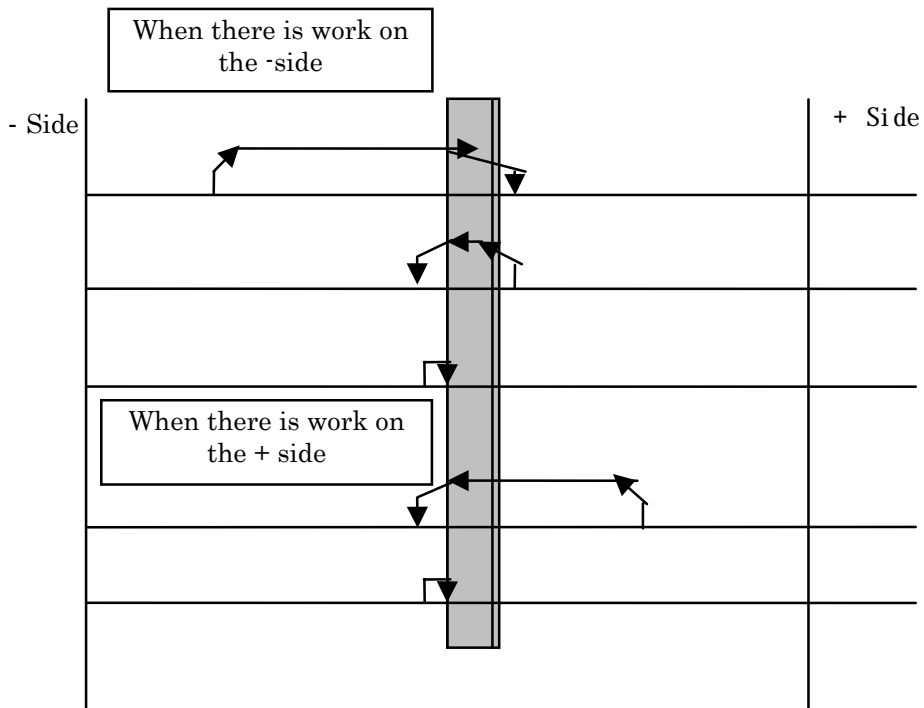


Fig. 10-5 Return to Origin Pattern 01

This return to origin method is the return method that designates the - side edge of the ORG sensor as the origin.

- ~ when there is work on the – side.
 (Homing Direction(30h): 01h starts in a positive direction
 The motor rotates to the + side at the maximum velocity of the return to origin (Homing Fast Velocity(31h)).
 Detects the - side edge of the ORG sensor and decelerates to a stop.
 After it stops, it rotates to the - side at the maximum velocity of the return to origin, detects the - side edge of the ORG sensor and decelerates to a stop.
 After it stops, it rotates to the + side at the low velocity of the return to origin (Homing Slow Velocity(32h)), detects the - side edge of the ORG sensor and stops. This point is designated as the origin, and the command position are overwritten by the set value of Home Position(35h).
 When detecting the ORG sensor when the operation starts, it becomes the operation from .

10. COMMUNICATION SPECIFICATION

- ~ when there is work on the + side
(Homing Direction(30h): 00h starts in a negative direction
The motor rotates to the - side at the maximum velocity of the return to origin (Homing Fast Velocity(31h)).
When it detects the - side edge of the ORG sensor it decelerates to a stop.
After it stops, it rotates to the + side at the low velocity of the return to origin (Homing Slow Velocity(32h)), detects the - side edge of the ORG sensor and stops.
This point is designated as the origin, and the command position are overwritten by the set value of Home Position(35h).
When detecting the ORG sensor when the operation starts, it becomes the operation from .

10.7.3 Return to Origin Pattern “02h”

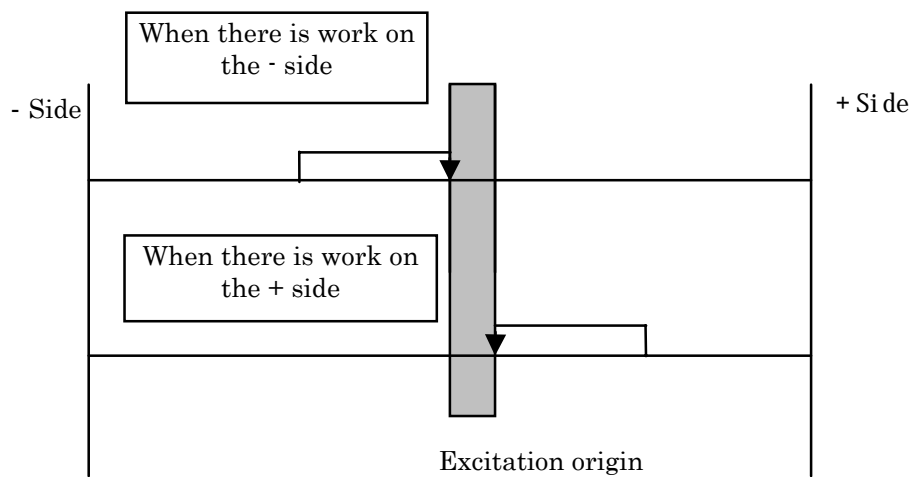


Fig. 10-6 Return to Origin Pattern 02

This return to origin method is the return method that designates excitation origin as the origin.

- When there is work on the – side
(Homing Direction (30h):01h starts in a positive direction
It rotates to the + side at low velocity of the return to origin (Homing Slow Velocity(32h)), detects the excitation origin and stops.
This point is designated as the origin, and the command position overwritten by the set value of the Home Position(35h).
When detecting the excitation origin when the operation starts, it does not operate and that position is designated as the origin.
- When there is work on the + side
(Homing Direction(30h): 00h starts in a negative direction
It rotates to the – side at low velocity of the return to origin (Homing Slow Velocity(32h)), detects the excitation origin and stops. This point is designated as the origin, and the command position are overwritten by the set value of Home Position(35h).
When detecting the excitation origin when the operation starts, it does not operate and that position is designated as the origin.

Program Operation

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11. Program Operation

11.1 Specification

11.1.1 Program Memory

A program can store 1 command of 16 bytes, and a maximum of 300 commands in nonvolatile memory. A vector table describing the starting address of the program and actual program commands are managed separately internally.

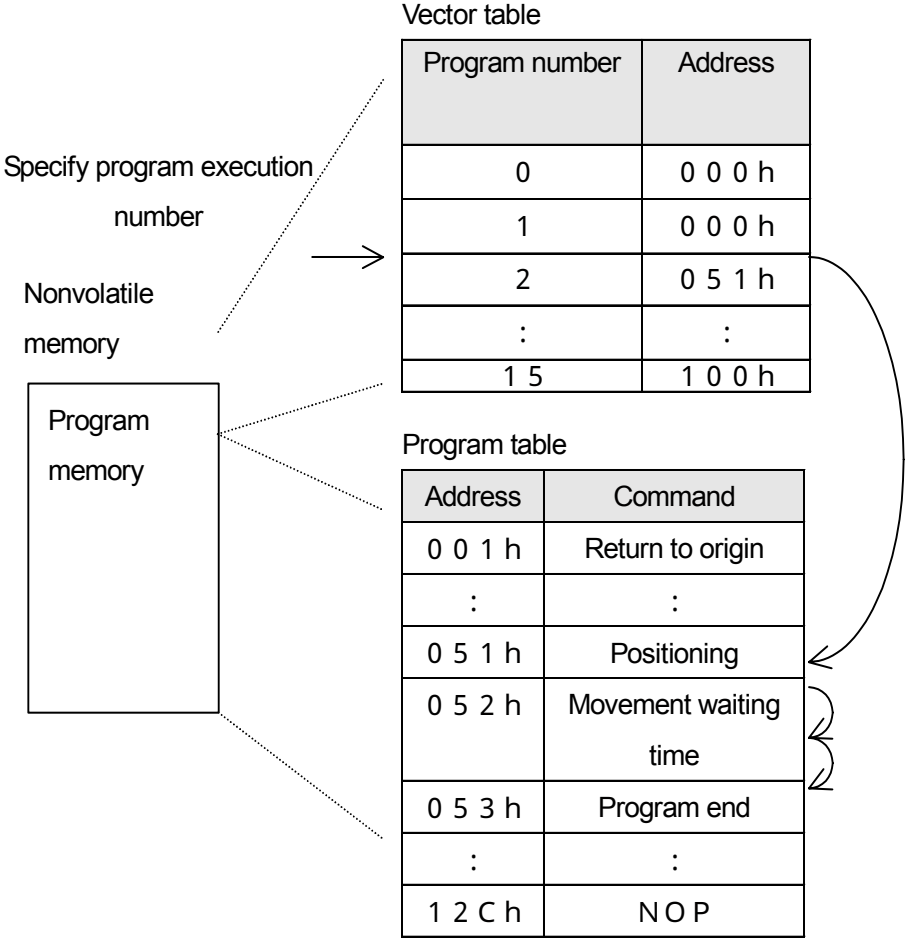


Figure 11-1 Program Management

Start the program by selecting the program number from the controller in the external I/O, and turn the START signal on by switching from OFF to ON.

When the driver receives the start execution command, it refers to the program vector and executes commands in order of the corresponding address. Also, program number 0 is invalid and nothing happens even if the program is commanded.

It continues operating in order while executing +1 address. Stop a program during operation by a stop command from the controller, execution of the end command, the alarm etc.

11. Program Operation

11.1.2 Startup Method

Latch the execution start number of the program by the rising edge of the START signal.
There is a maximum delay of 1ms between the input of the START signal and the execution start of the first program command.
When all programs finish executing normally, output during program execution becomes OFF.

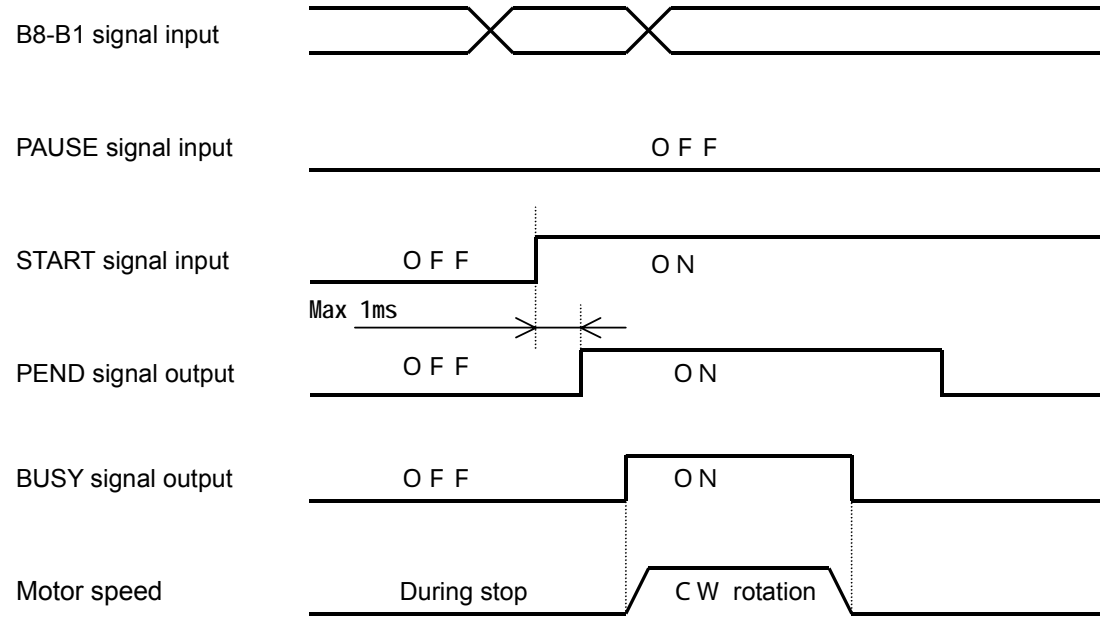


Fig. 11-2 Program Execution Operation

11. Program Operation

11.1.3 Interruption Method

When the START signal falls while the program is executing, the program is interrupted at that point. The output is turned OFF by interruption while executing a program, but the operation being executed is continued.

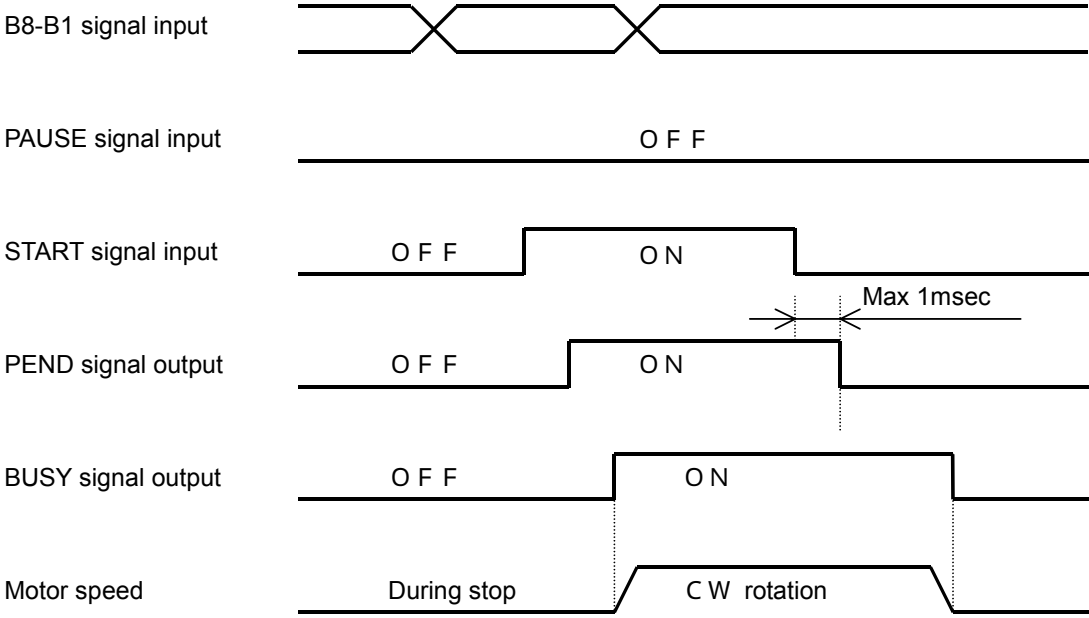


Fig. 11-3 Program Interrupt Command

11. Program Operation

11.1.4 Pause

The motor operation being executed stops rapidly when the PAUSE signal is input, and the program is paused. When the PAUSE signal is released, movement to the target position is restarted.

Also, when the START signal is turned OFF during PAUSE, the program is interrupted.

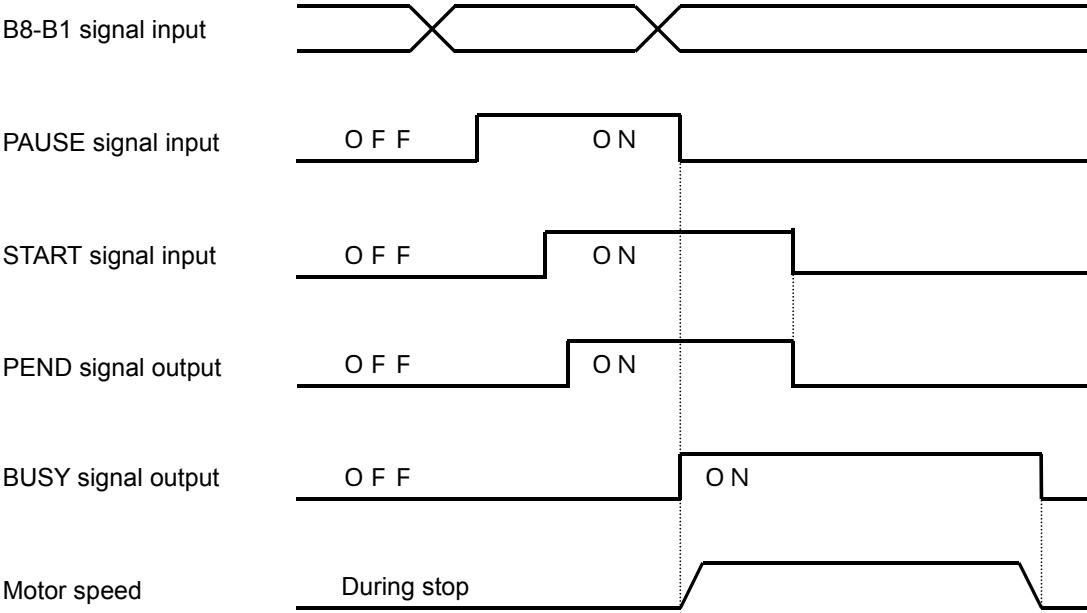


Fig. 11-4-1 Program Pause Operation (before starting operation)

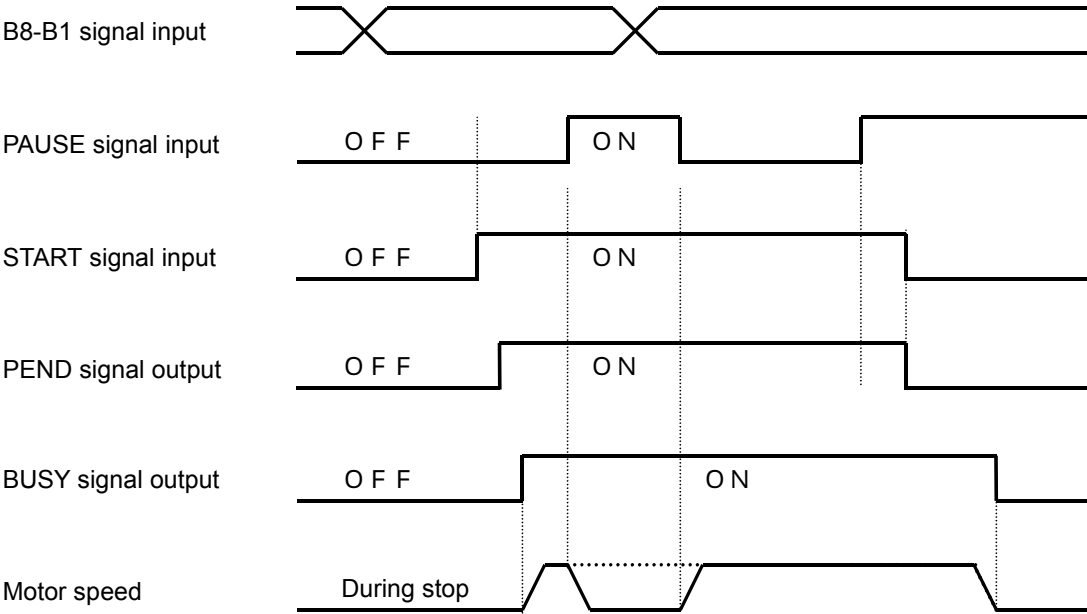


Fig. 11-4-2 Program Pause Operation (in the middle of operation)

11. Program Operation

11.1.5 Interruption by Alarm

When an alarm sounds while the program is executing, the motor stops rapidly or stops immediately.

The program execution is interrupted by the alarm, and the PEND signal becomes non-active. When alarm recovery is possible, recover from the alarm by inputting an alarm clear signal, but the program operation executing previously is not resumed.

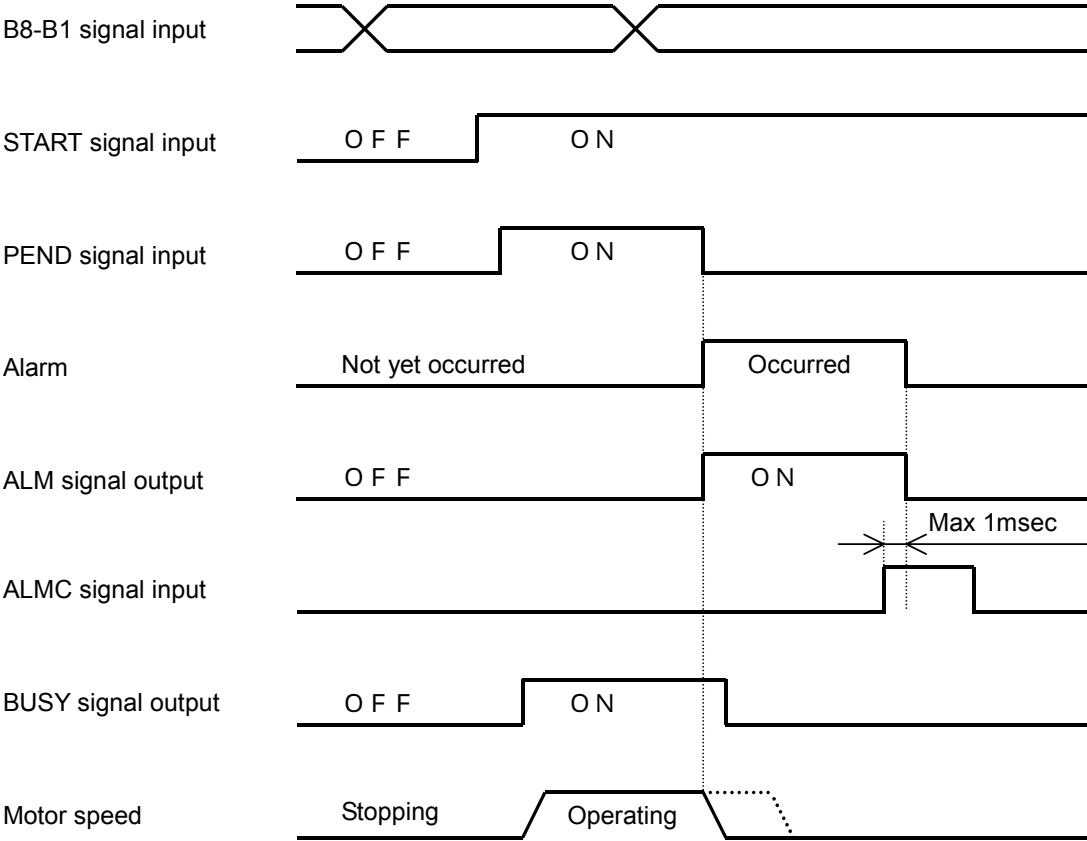


Fig. 11-5 Program Interrupted by Alarm

11. Program Operation

11.2 Program Command

11.2.1 Command

11.2.1.1 NOP (00h)

Does nothing.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	00h

11.2.1.2 Homing (01h)

Start the return to origin operation. No need to wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	01h
2	Homing Type (*1)	UCHAR	The return to origin type is specified by a constant.
3	Homing Direction (*1)	UCHAR	The operation direction is specified by a constant.
4	Homing Fast Velocity (*1)	LONG	Maximum velocity is specified by a constant.
5	Homing Slow Velocity (*1)	LONG	The low speed movement velocity is specified by a constant.
6	Variable ID for Homing Type (*1)(*2)	UCHAR	The return to origin type is specified by a variable number.
7	Variable ID for Homing Direction (*1)(*2)	UCHAR	The operation direction is specified by a variable number.
8	Variable ID for Homing Fast Velocity (*1)(*2)	UCHAR	Maximum velocity is specified by a variable number.
9	Variable ID for Homing Slow Velocity (*1)(*2)	UCHAR	The low speed movement velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11. Program Operation

11.2.1.3 Homing and Wait (02h)

Start the return to origin operation, wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	02h
2	Homing Type (*1)	UCHAR	The return to origin type is specified.
3	Homing Direction (*1)	UCHAR	The operation direction of the return to origin is specified.
4	Homing Fast Velocity (*1)	LONG	The maximum velocity of the return to origin is specified.
5	Homing Slow Velocity (*1)	LONG	The low speed movement velocity of the return to origin is specified.
6	Variable ID for Homing Type (*1)(*2)	UCHAR	The return to origin type is specified by a variable number.
7	Variable ID for Homing Direction (*1)(*2)	UCHAR	The operation direction is specified by a variable number.
8	Variable ID for Homing Fast Velocity (*1)(*2)	UCHAR	The maximum velocity is specified by a variable number.
9	Variable ID for Homing Slow Velocity (*1)(*2)	UCHAR	The low speed movement velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11.2.1.4 Incremental Move (03h)

Start the relative positioning operation. No need to wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	03h
2	Incremental Pulse (*1)	LONG	The movement pulse value is specified by a constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Variable ID for Incremental Pulse (*1)(*2)	UCHAR	The movement pulse value is specified by a variable number.
5	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-3 is used.

11.2.1.5 Incremental Move and Wait (04h)

Start the relative positioning operation, wait for movement completion.

11. Program Operation

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	04h
2	Incremental Pulse (*1)	LONG	The movement pulse value is specified by a constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Loop	UCHAR	Repetition frequency. Set 1-255.
5	Delay	USHORT	The delay after each movement completion is specified in ms units.
6	Variable ID for Incremental Pulse (*1)(*2)	UCHAR	The movement pulse value is specified by a variable number.
7	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.
8	Variable ID for Loop (*2)	UCHAR	The repetition frequency is specified by a variable number.
9	Variable ID for Delay (*2)	UCHAR	The delay after movement completion is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11. Program Operation

11.2.1.6 Absolute Move (05h)

Start the absolute positioning operation. No need to wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	05h
2	Target Position (*1)	LONG	The target position is specified by an absolute coordinate constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Variable ID for Target Position (*1)(*2)	UCHAR	The target position is specified by a variable number.
5	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-3 is used.

11.2.1.7 Absolute Move and Wait (06h)

Start the absolute positioning operation, wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	06h
2	Target Position (*1)	LONG	The target position is specified by an absolute coordinate constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Delay	USHORT	The delay after movement completion is specified in ms units.
5	Variable ID for Target Position (*1)(*2)	UCHAR	The target position is specified by a variable number.
6	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.
7	Variable ID for Delay (*2)	USHORT	The delay after movement completion is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11. Program Operation

11.2.1.8 Jog (07h)

Start the continuous rotation.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	07h
2	Jog Direction (*1)	UCHAR	The rotation direction is specified by a constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Variable ID for Jog Direction (*1)(*2)	UCHAR	The rotation direction is specified by a variable number.
5	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-3 is used.

11.2.1.9 Signal Search (08h)

Start the signal search operation. No need to wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	08h
2	Search Direction (*1)	UCHAR	The rotation direction is specified by a constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Search Signal Select (*1)	USHORT	The signal of the object of the search is specified by a constant.
5	Search Signal Logic (*1)	USHORT	The search signal logic is specified by a constant.
6	Variable ID for Search Direction (*1)(*2)	UCHAR	The rotation direction is specified by a variable number.
7	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.
8	Variable ID for Search Signal Select (*1)(*2)	UCHAR	The signal of the object of the search is specified by a variable number.
9	Variable ID for Search Signal Logic (*1)(*2)	UCHAR	The search signal logic is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11. Program Operation

11.2.1.10 Signal Search and Wait (09h)

Start the signal search operation, wait for movement completion.

When the motor is already operating, program fault (03h) occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	09h
2	Search Direction (*1)	UCHAR	The rotation direction is specified by a constant.
3	Target Velocity (*1)	ULONG	The movement velocity is specified by a constant.
4	Search Signal Select (*1)	USHORT	The signal of the object of the search is specified by a constant.
5	Search Signal Logic (*1)	USHORT	The search signal logic is specified by a constant.
6	Delay	USHORT	The delay after movement completion is specified in ms units.
7	Variable ID for Search Direction (*1)(*2)	UCHAR	The rotation direction is specified by a variable number.
8	Variable ID for Target Velocity (*1)(*2)	UCHAR	The movement velocity is specified by a variable number.
9	Variable ID for Search Signal Select (*1)(*2)	UCHAR	The signal of the object of the search is specified by a variable number.
10	Variable ID for Search Signal Logic (*1)(*2)	UCHAR	The search signal logic is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten.

(*2) When 0 is specified, the constant value specified in data No. 2-5 is used.

11. Program Operation

11.2.1.11 Change Velocity (10h)

Change the target velocity, the starting velocity, and the stop velocity.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	10h
2	Target Velocity (*1)	ULONG	The target velocity is specified by a constant.
3	Starting Velocity (*1)	ULONG	The starting velocity is specified by a constant.
4	Stop Velocity (*1)	ULONG	The stop velocity is specified by a constant.
5	Variable ID for Target Velocity (*1)(*2)	UCHAR	The target velocity is specified by a variable number.
6	Variable ID for Starting Velocity (*1)(*2)	UCHAR	The starting velocity is specified by a variable number.
7	Variable ID for Stop Velocity (*1)(*2)	UCHAR	The stop velocity is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten. However, when 0 is specified it does not change from the current value

(*2) When 0 is specified, the constant value specified in data No. 2-4 is used.

11.2.1.12 Change Acceleration and Deceleration (11h)

Change the acceleration and the deceleration.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	11h
2	Acceleration (*1)	ULONG	The acceleration is specified by a constant.
3	Deceleration (*1)	ULONG	The deceleration is specified by a constant.
4	Rapid Stop Deceleration (*1)	ULONG	The rapid stop deceleration is specified by a constant.
5	Variable ID for Acceleration (*1)(*2)	UCHAR	The acceleration is specified by a variable number.
6	Variable ID for Deceleration (*1)(*2)	UCHAR	The deceleration is specified by a variable number.
7	Variable ID for Rapid Stop Deceleration (*1)(*2)	UCHAR	The rapid stop deceleration is specified by a variable number.

(*1) When the command is executed, the attribute with the same name as Position Controller Object is overwritten. However, when 0 is specified it does not change from the current value

(*2) When 0 is specified, the constant value specified in data No. 2-4 is used.

11. Program Operation

11.2.1.13 Hard Stop (18h)

Fixed excitation of the motor.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	18h
2	Delay	USHORT	The delay after movement completion is specified in ms units.

11.2.1.14 Rapid Stop (19h)

The motor is stopped rapidly.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	19h

11.2.1.15 Rapid Stop and Wait (1Ah)

The motor is stopped rapidly. It does not proceed to the next command until rapid stop is complete.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	1Ah
2	Delay	USHORT	The delay after movement completion is specified in ms units.

11.2.1.16 Smooth Stop (1Bh)

The motor is stopped by deceleration.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	1Bh

11.2.1.17 Smooth Stop and Wait (1Ch)

The motor is stopped by deceleration. It does not proceed to the next command until rapid stop is complete.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	1Ch
2	Delay	USHORT	The delay after movement completion is specified in ms units.

11. Program Operation

11.2.1.18 Timer Wait (20h)

Waits for the specified time.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	20h
2	Delay	USHORT	The delay is specified in ms units.
3	Variable ID for Delay (*1)	UCHAR	The delay is specified by a variable number.

(*1) When 0 is specified, the constant value specified in data No. 2 is used.

11.2.1.20 Jump (22h)

An unconditional branch.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	22h
2	Link	USHORT	The branch address is specified.

11.2.1.22 Go Sub Routine (24h)

Branches off to the sub routine.

The nested structure of the sub routine (the structure to call another sub routine within the sub routine) can have a hierarchy of up to 16 levels. If the call exceeds 16 levels when it is executed, a program fault occurs.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	24h
2	Link	USHORT	The branch address is specified.

11.2.1.24 Return (26h)

Ends the sub routine and returns to the previous branch.

If the sub routine arrives at this command without being called, a program end is executed.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	26h

11.2.1.25 End (27h)

Ends the program.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	27h

11. Program Operation

11.2.1.27 Modify Variable (31h)

Modify the value of a variable or of a specified attribute.

When the variable number of the entered destination is allocated as a shortcut, the attribute of the shortcut destination is changed.

The set value is read at 1ms, and set in each attribute at 2ms. Therefore, the processing time for the command becomes 2ms.

No.	Data name	Data type	Explanation
1	Command Code	UCHAR	31h
2	Target Variable ID (*1)	UCHAR	The modified variable number is specified.
3	Target Object ID (*1)	UCHAR	The modified object number is specified.
4	Target Attribute ID (*1)	UCHAR	The modified attribute number is specified.
5	Modify Value	ULONG	The set value is specified by a constant.
6	Variable ID for Modify Value (*2)	UCHAR	The set value is specified by a variable number.

(*1) When 0 is specified as the Target Variable ID, the Target Object ID and the Target Attribute ID become effective. When anything except 0 is specified, the Target Variable ID becomes effective.

(*2) When 0 is specified, the constant value specified in data No. 5 is substituted.

11. Program Operation

11.3 Operation Method by the Program

11.3.1 Registering a New Program

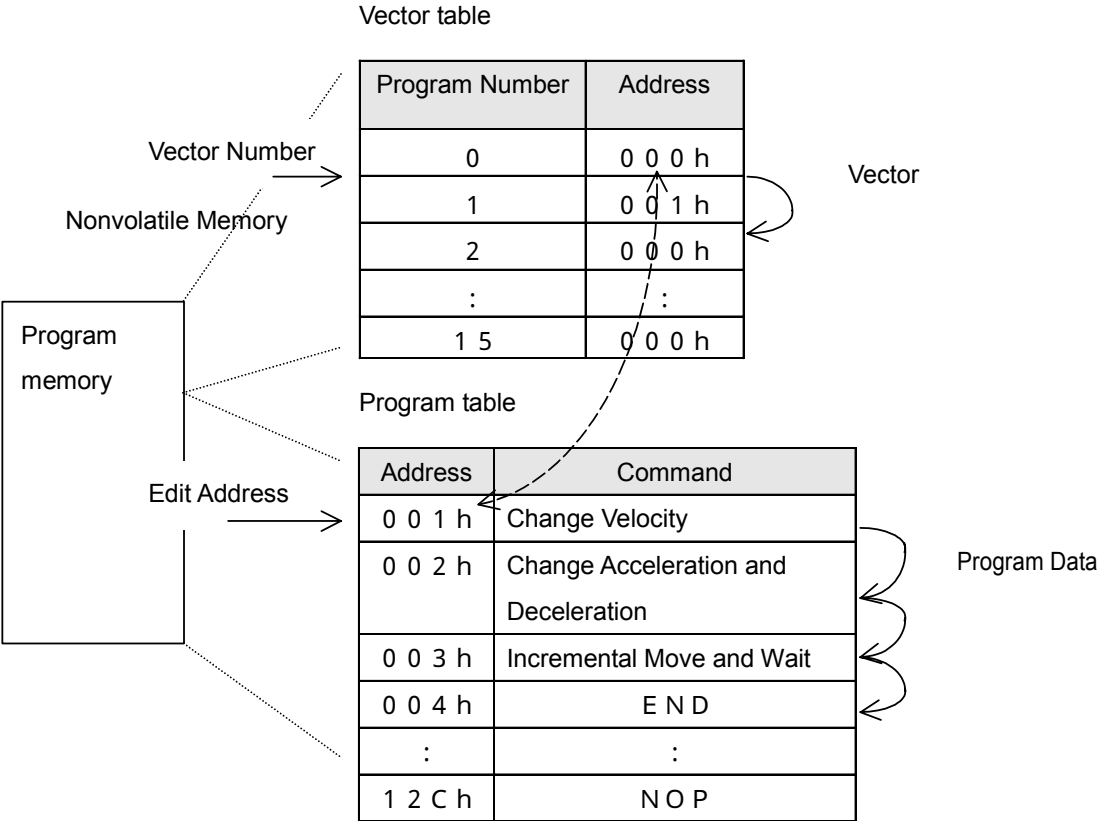


Fig. 11-6 Registering a New Program

The vector table describing the start address and the program table describing the actual program commands themselves are managed separately.

Program driving can be done by registering a series of program commands to the program table, and the execution start address to the vector table respectively.

Registering the vector table

The editable part of the vector table is specified by the program number for the Vector Number(10h) of Program Object(05h).

Example) 07 00 45 10 01 00 5D . . . Program number: 1 is set

The contents of the vector table are updated by setting the address for the program number by Vector(11h). Each time it is updated successfully the Vector Number is +1, the start address can be registered continuously.

Example) 07 00 85 11 01 00 9E . . . Address: 0001h is set

Note) The transmission packet is displayed as a hexadecimal bit string, and the slave address is assumed to be 00h.

11. Program Operation

Registering the program table

In the editable part of the program table specify the address by Edit Address(12h).

Example) 07 00 45 12 01 00 5F . . . Address : 0001h is set

Program commands are registered by Program Data(13h).

Each time it is registered successfully the Edit Address is +1, the program can be registered continuously.

Ex.) 15 00 85 13 10 10 27 00 00 E8 03 00 00 20 03 00 00 00 00 00 02 . . . (1)
15 00 85 13 11 88 13 00 00 88 13 00 00 10 27 00 00 00 00 00 2B . . . (2)
15 00 85 13 04 50 C3 00 00 88 13 00 00 05 64 00 00 00 00 00 C8 . . . (3)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . . (4)

(1) Change Velocity(10h)

Target velocity (Target Velocity(20h)) : 10000pps、

Starting velocity (Starting Velocity(21h)) : 1000pps、

Stop velocity (Stop Velocity(22h)) : 800pps

(2) Change Acceleration and Deceleration(11h)

Acceleration (Acceleration(23h)) : 5000[pulse/s²]、

Deceleration (Deceleration(24h)) : 5000[pulse/s²]、

Deceleration when rapid stop (Rapid Stop Deceleration 25h) : 10000[pulse/s²]

(3) Incremental Move and Wait(04h)

Target velocity Target Velocity(20h) : 10000pps、

Repetition frequency:5 times、 delay time : 100ms、

Movement pulse number (Incremental Pulse 11h) : 50000pulse

(4) End(27h) . . . End of program

This ends registering the program.

Next, the program execution method is explained.

11. Program Operation

11.3.2 Executing a Program

The program execution methods are the method that starts from serial communication and the method that starts from external I/O.

However, the program number is up to 16 when beginning from external I/O.

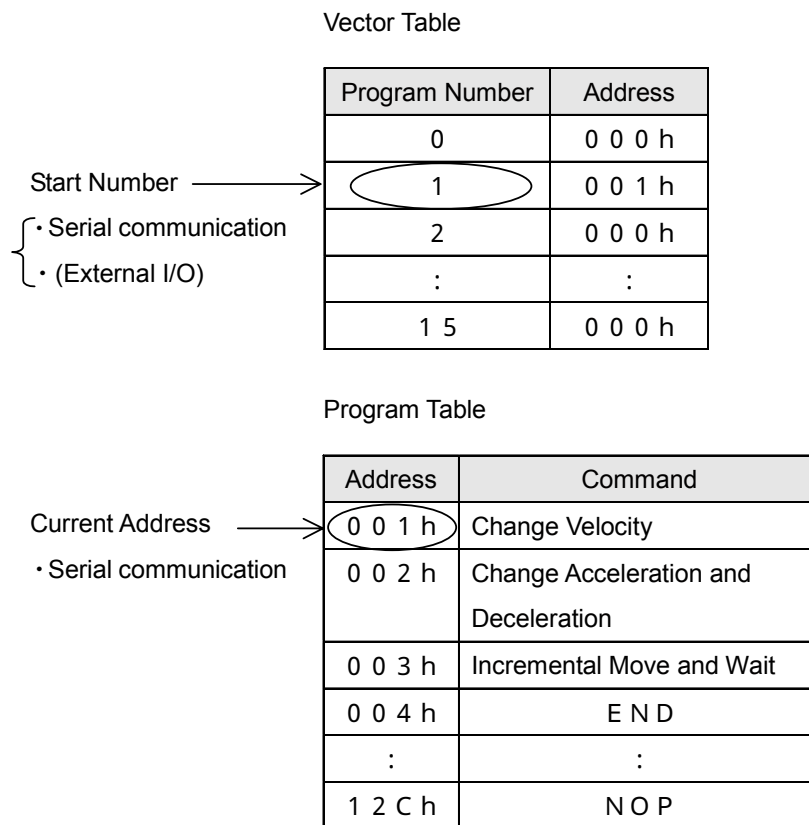


Fig. 11-7 Program Execution Method

11.3.2.1 Executing a Program by Serial Communication

Execute the program by Start Number(01h) or Current Address(02h).

- When executing it by Start Number(01h), select the program number registered to the vector table.

Example) 06 00 45 01 01 4D . . . Program Number: 01h is set

- When using Current Address(02h), the program can be executed by only registering the program table. Program driving starts by specifying the address of the registered program table directly.

Example) 07 00 45 02 02 00 50 . . . Address : Executing the program from 0002h

Executing the program by serial communication can only be done in serial I/F mode.

11. Program Operation

11.3.2.2 Executing a Program by External Input

To execute the program, the program number for the registered vector table as well as Start Number(01h) is selected by the program selection bit (B1-B8) and executed.

Program number	B 8	B 4	B 2	B 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
4	0	1	0	0
~				
15	1	1	1	1

The program selection bit becomes 1 by internal photo coupler ON.
(Refer to “4.5 Specification Summary of Input/Output Signals” for details.)

When the START signal is turned on under the condition that the program number is selected, it is possible to execute the intended program.

(Refer to “11.1.2 - 11.1.4” for details.)

Executing the program from external input can only be done in parallel I/F mode.

11. Program Operation

11.3.3 Interrupting a Program

11.3.3.1 Interrupting a Program by Serial Communication

Program interruption execution by serial communication can be done in parallel or serial I/F mode.

Executing a program interruption is done by setting Program Complete(04h): 00h. When it is necessary to stop motor operation, execute a continuous stop command (Stop, Rapid Stop, Deceleration Stop).

11.3.3.2 Interrupting a Program by External Input

Program interruption execution by external input can be done in parallel I/F mode.

When the START signal falls, the program is interrupted by an interruption execution. When it is necessary to stop motor operation, execute a stop command (Hard Stop, Rapid Stop, Smooth Stop).

(Refer to “11.1.3 Interruption Method” for details.)

11.3.4 Program Step Execution

When debugging the program operation, use the step execution to check the operation line by line. When using together with Current Address(02h) it is possible to do while checking the program number currently executed.

When executed during program stop, you can select step execution or normal execution by setting Execute Mode(03h).

Example) 06 00 45 03 01 4F · · · Execute Mode(03h) : Execute step

11. Program Operation

11.3.5 Program Data Execution Value

Each data for program command is executed by specifying either a constant value or a variable value.

11.3.5.1 Specify a Constant Value

When data for the program commands is specified as a constant, the constant value is substituted as follows. Fill in the place where the variable number is specified as 00h.

Example) 15 00 85 13 01 00 00 88 13 00 00 E8 03 00 00 00 00 00 00 34

Homing Type(10h) : 01h [Origin signal return to origin to – side edge]	} Substitute a constant value
Homing Direction(30h) : 01h [Starts in a positive direction]	
Homing Fast Velocity(31h) : 5000pps	
Homing Slow Velocity(32h) : 1000pps	
Variable ID for Homing Type:00h	} Substitute 0 as the variable value
Variable ID for Homing Direction:00h	
Variable ID for Homing Fast Velocity:00h	
Variable ID for Homing Slow Velocity:00h	

11.3.5.2 Specify a Variable Value

When a set value of the program is specified by a variable, use Variable Area 1-64 (80h-BFh). Also, the variable value becomes available when a value of 01h or more is specified, and the corresponding constant value becomes invalid.

Example) 15 00 85 13 02 01 01 B8 0B 00 00 E8 03 00 00 00 00 01 02 00 62

Homing Type(10h) : 01h [Origin signal return to origin to - side edge]	
Homing Direction(30h) : 01h [Starts in a positive direction]	
Homing Fast Velocity(31h) : 3000pps	} Becomes invalid
Homing Slow Velocity(32h) : 1000pps	
Variable ID for Homing Type:00h	
Variable ID for Homing Direction:00h	
Variable ID for Homing Fast Velocity:01h	} Variable value becomes available
Variable ID for Homing Slow Velocity:02h	

In the above example, Homing Fast Velocity and Homing Slow Velocity are substituted by the variable values of Variable Area 1 and 2 respectively. Whether Variable Area is treated as data itself (immediate data) or as a reference to a specific attribute, depends on the variable value determined by a set value of the Mapping Flag.

11. Program Operation

11.3.6 Sample Program Example

11.3.6.1 NOP (00h)

Any NOP command does nothing, and command time for 1 batch (1ms) is consumed and moves to the next command.

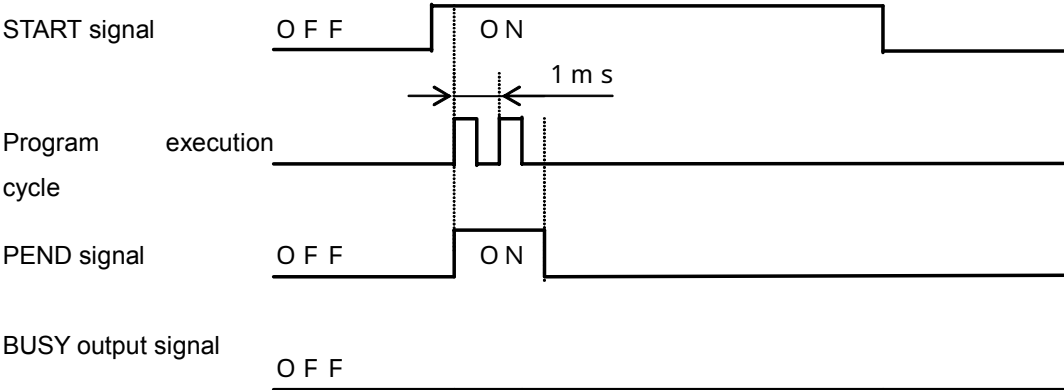


Fig. 11-8 NOP Command Operation Pattern

- Sample program
 - 15 00 85 13 00 00 00 00 00 00 00 00 00 00 00 00 00 00 AD . . . (1)
 - 15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . . (2)

- (1) NOP(00h) [Does nothing]
- (2) End(27h) [Program end command]

11. Program Operation

11.3.6.2 Homing (01h)

The Homing command sets the attributes in the order of Homing Direction, Homing Fast Velocity, Homing Slow Velocity, Homing Type, and starts the return to origin operation.

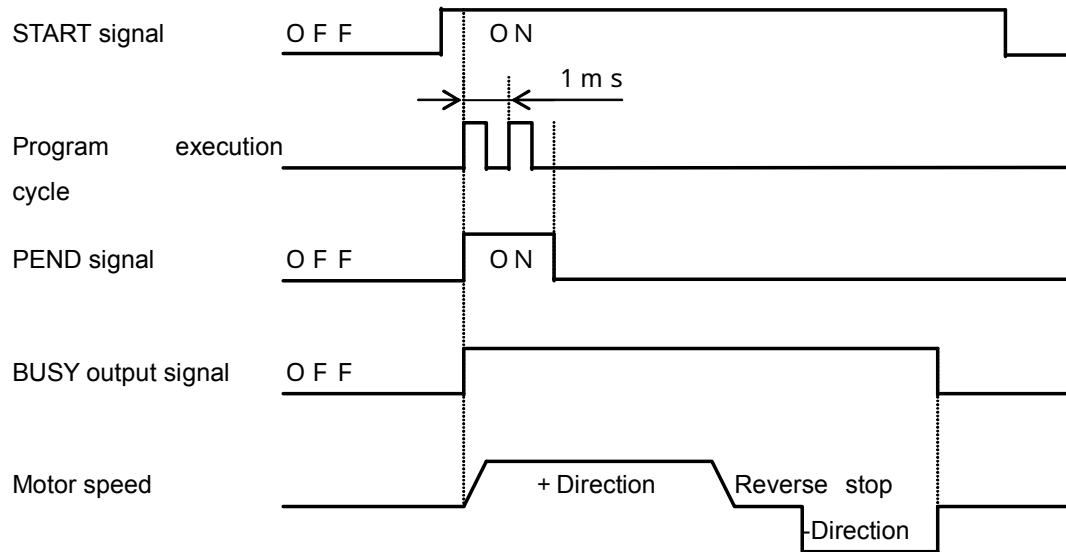


Fig. 11-9 Homing Command Operation Pattern

• Sample program

15 00 85 13 01 00 01 88 13 00 00 E8 03 00 00 00 00 00 00 00 35 · · (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (2)

(1) Homing (01h) [Return to origin command]

Homing Type(10h) : 00h [Origin signal return to origin to + side edge]

Homing Direction(30h) : 01h [Starts in a positive direction]

Homing Fast Velocity(31h) : 5000pps

Homing Slow Velocity(32h) : 1000pps

Variable ID for Homing Type:00h

Variable ID for Homing Direction:00h

Variable ID for Homing Fast Velocity:00h

Variable ID for Homing Slow Velocity:00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.3 Homing and Wait (02h)

The Homing and Wait command sets the attributes in the order of Homing Direction, Homing Fast Velocity, Homing Slow Velocity, Homing Type, and moves to the next command after completing the return to origin operation. There is a maximum delay of 1ms between turning the BUSY signal OFF and moving to the next command.

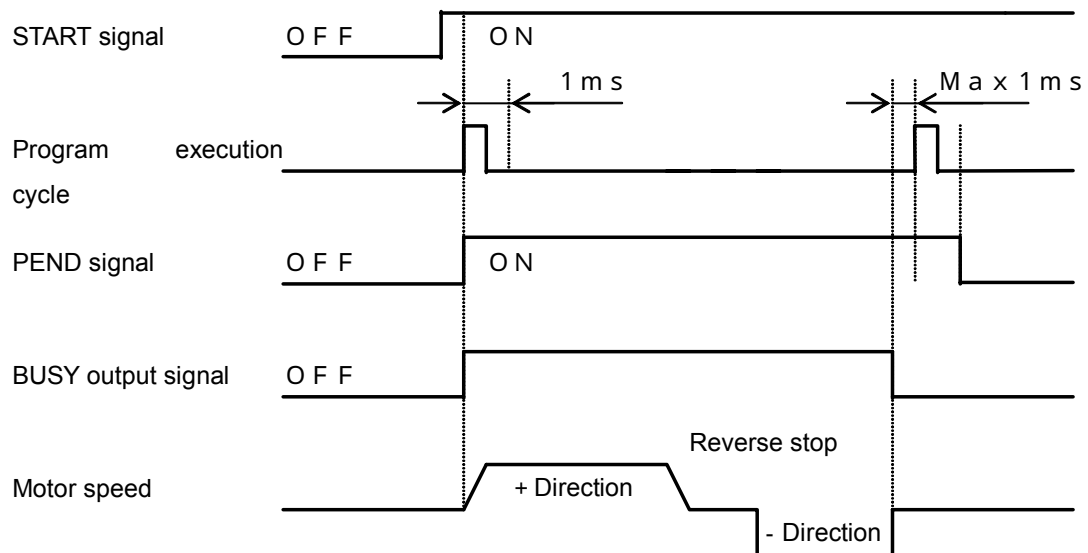


Fig. 11-10 Homing and Wait Command Operation Pattern

• Sample program

15 00 85 13 02 00 01 88 13 00 00 E8 03 00 00 00 00 00 00 00 36 · · (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (2)

(1) Homing and Wait(02h) [Return to origin command]

Homing Type(11h) : 00h [Origin signal return to origin to + side edge]

Homing Direction(30h) : 01h [Starts in a positive direction]

Homing Fast Velocity(31h) : 5000pps

Homing Slow Velocity(32h) : 1000pps

Variable ID for Homing Type:00h

Variable ID for Homing Direction:00h

Variable ID for Homing Fast Velocity:00h

Variable ID for Homing Slow Velocity:00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.4 Incremental Move (03h)

The Incremental Move(03h) command sets the attributes in the order of Target Velocity, Incremental Pulse, and starts the positioning operation.

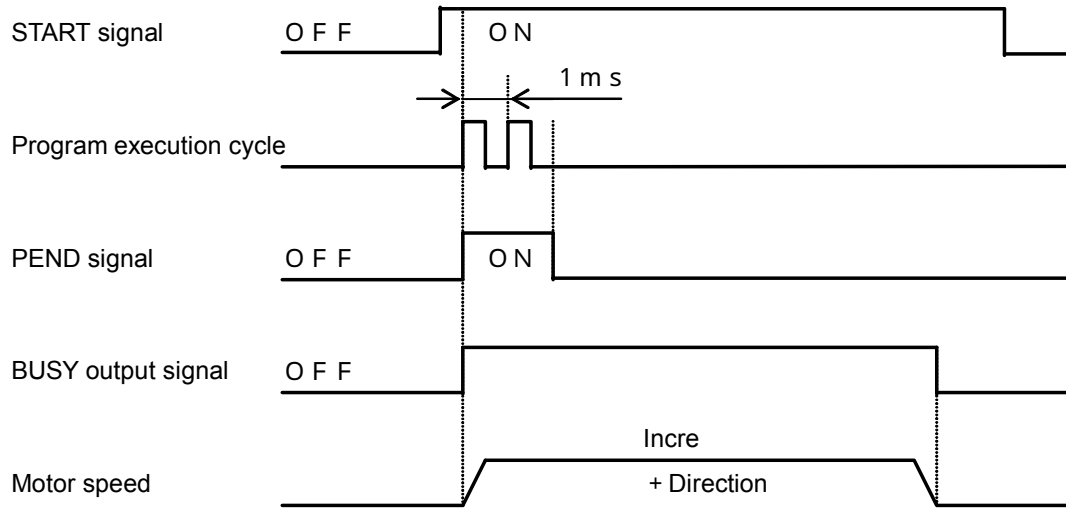


Fig. 11-11 Incremental Move Command Operation Pattern

• Sample program

15 00 85 13 03 10 27 00 00 88 13 00 00 00 00 00 00 00 00 00 82 . . (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (2)

(1) Incremental Move(03h) [Relative positioning operation command]

Incremental Pulse(10h) : 10000pulse

Target Velocity(20h) : 5000pps

Variable ID for Incremental Pulse:00h

Variable ID for Target Velocity:00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.5 Incremental Move and Wait (04h)

The Incremental Move and Wait command sets the attributes in the order of Target Velocity, Incremental Pulse, and moves to the next command after completing the positioning operation.

There is a maximum delay of 1ms between turning off the BUSY signal and entering Delay.

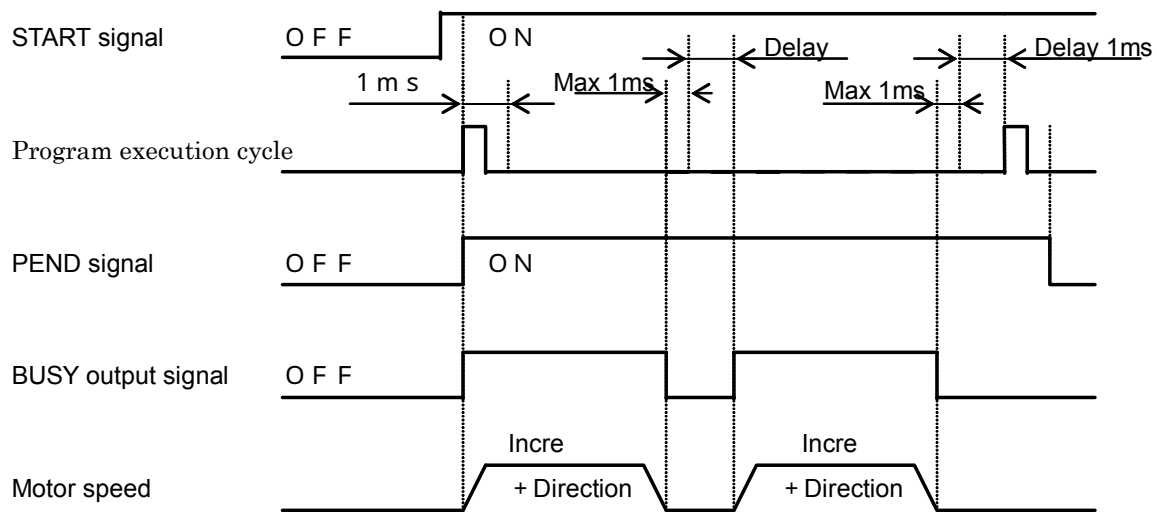


Fig. 11-12 Incremental Move and Wait Command Operation Pattern

• Sample program

15 00 85 13 04 10 27 00 00 88 13 00 00 02 01 00 00 00 00 00 86 · · (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (2)

(1) Incremental Move(04h) [Relative positioning operation command]

Incremental Pulse(10h) : 10000pulse

Target Velocity(20h) : 5000pps

Loop : 2 times [Loop frequency]

Delay : 1ms [Delay time after operation completion]

Variable ID for Incremental Pulse: 00h

Variable ID for Target Velocity: 00h

Variable ID for Loop: 00h

Variable ID for Delay: 00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.6 Absolute Move (05h)

A sample program of the Absolute Move(04h) command is shown below.

The absolute positioning operation command sets the attributes in the order of Target Velocity, Target Position, and starts the positioning operation.

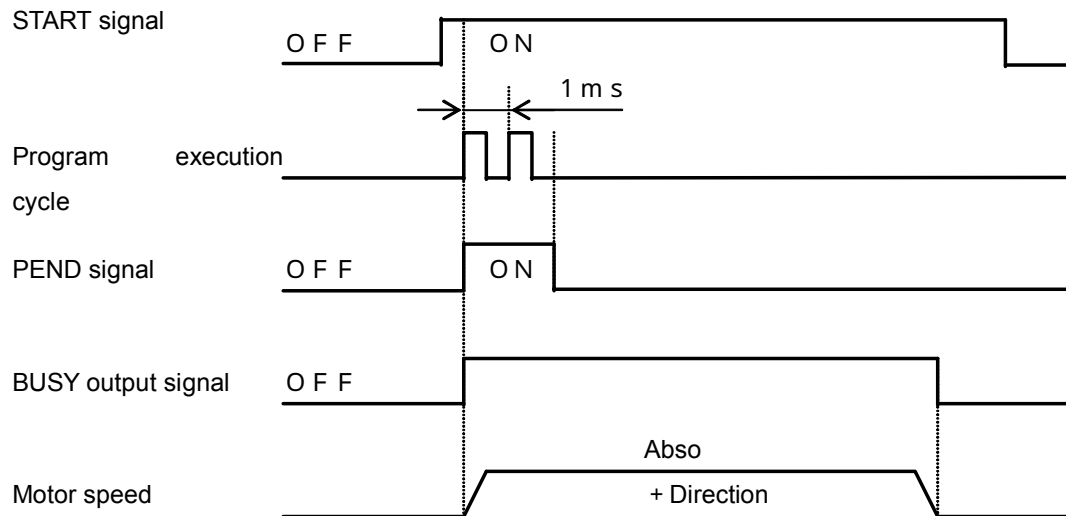


Fig. 11-13 Absolute Move Command Operation Pattern

• Sample program

15 00 85 13 05 10 27 00 00 88 13 00 00 00 00 00 00 00 00 00 84 · · (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (2)

(1) Absolute Move(05h) [Absolute positioning operation command]

Target Position(11h) : 10000pulse

Target Velocity(20h) : 5000pps

Variable ID for Target Position: 00h

Variable ID for Target Velocity: 00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.7 Absolute Move and Wait (06h)

The Absolute Move and Wait command sets the attributes in the order of Target Velocity, Target Position, and moves to the next command after completing the positioning operation. There is a maximum delay of 1ms between turning off the BUSY signal and entering Delay.

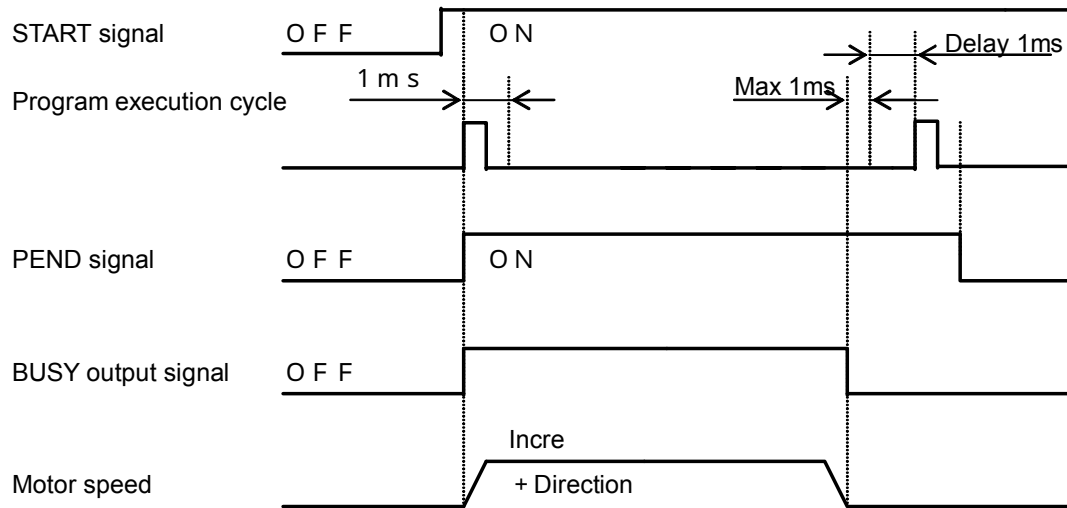


Fig. 11-14 Absolute Move and Wait Command Operation Pattern

• Sample program

15 00 85 13 06 10 27 00 00 88 13 00 00 01 00 00 00 00 00 00 86 · · (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (2)

(1) Absolute Move and Wait(06h) [Absolute positioning operation command]

Target Position(11h) : 10000pulse

Target Velocity(20h) : 5000pps

Delay : 1ms [Delay time after operation completion]

Variable ID for Target Position: 00h

Variable ID for Target Velocity: 00h

Variable ID for Delay: 00h

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.8 Jog (07h)

The Jog command sets the attributes in the order of Target Velocity, Jog Direction, and starts continuous operation.

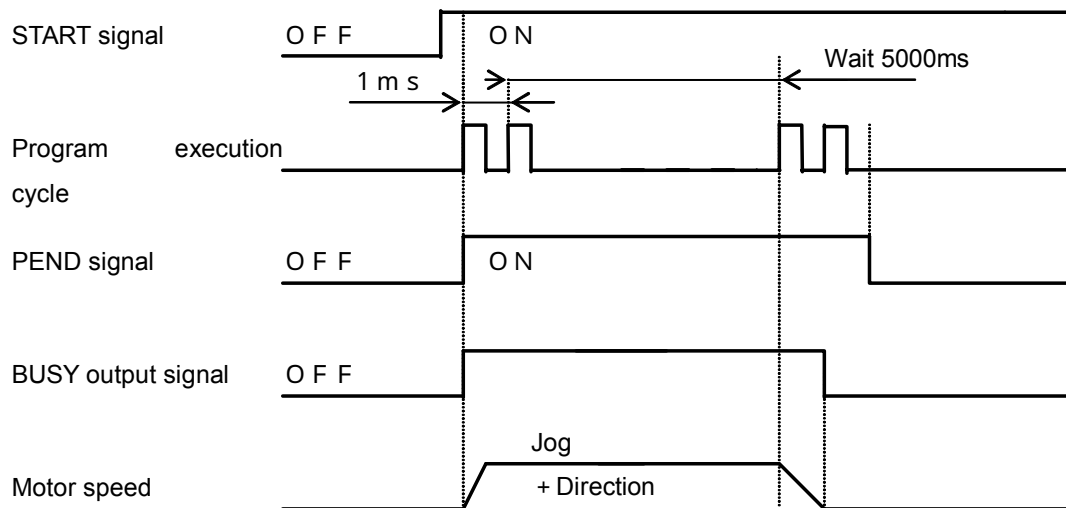


Fig. 11-15 Jog Command Operation Pattern

• Sample program

```
15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 50 · · (1)
15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 · · (2)
15 00 85 13 19 00 00 00 00 00 00 00 00 00 00 00 00 00 C6 · · (3)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (4)
```

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Starts in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction:00h

Variable ID for Target Velocity:00h

(2) Timer Wait(20h) : 5000ms [Standby for the specified time command]

(3) Rapid Stop(19h) [Rapid stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.10 Signal Search and Wait (09h)

The Signal Search and Wait command sets the attributes in the order of Target Velocity, Search Signal Select, Search Signal Logic, Search Direction, and moves to the next command after completing the signal search operation.

There is a maximum delay of 1ms between turning off the BUSY signal and entering Delay.

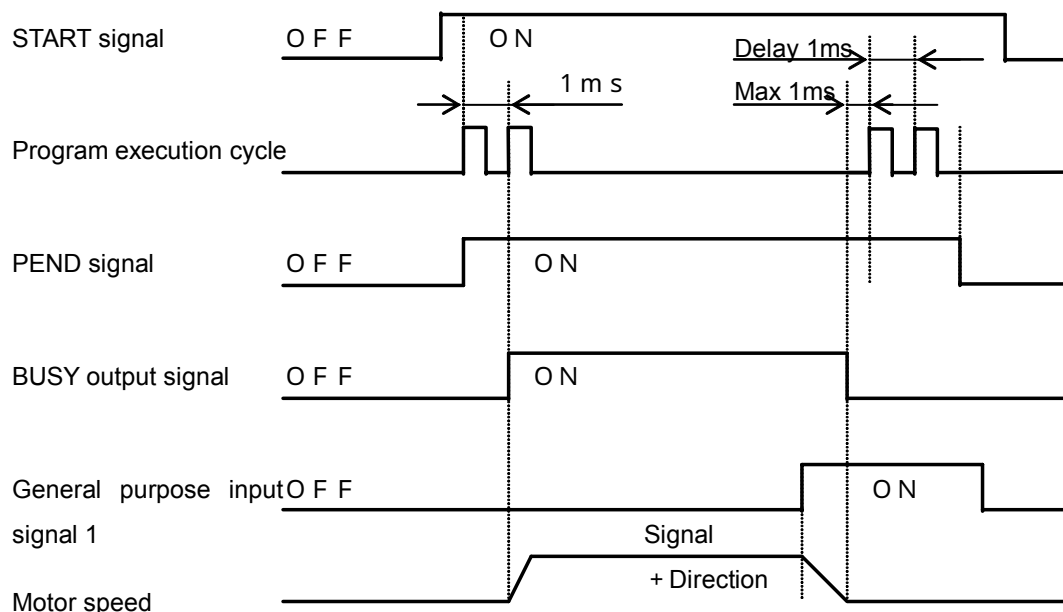


Fig. 11-17 Signal Search and Wait Command Operation Pattern

• Sample program

15 00 85 13 31 00 06 04 01 00 00 00 00 00 00 00 00 00 00 00 E9 · · (1)

15 00 85 13 09 01 88 13 00 00 08 00 08 00 01 00 00 00 00 00 63 · · (2)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (3)

(1) Modify Value : (General Input 1 Function Select(04h):01h[General purpose input signal IN1])

(2) Signal Search(08h) [Signal search operation command]

Search Direction (12h) : : 01h [Starts in a positive direction]

Target Velocity(20h) : 5000pps

Search Signal Select(2Bh) : 0008h [General purpose input signal 1]

Search Signal Logic(2Ch) : 0008h [General purpose input signal 1]

Delay : 1ms [Delay time after operation completion]

Variable ID for Search Direction:00h

Variable ID for Target Velocity:00h

Variable ID for Search Signal Select:00h

Variable ID for Search Signal Logic:00h

(3) End(27h) [Program end command]

11. Program Operation

11.3.6.11 Change Velocity (10h)

The Change Velocity command sets the attributes in the order of Target Velocity, Starting Velocity, Stop Velocity, and moves to the next command.

If the command is executed while the motor is operating, it is reflected the next time the motor operates.

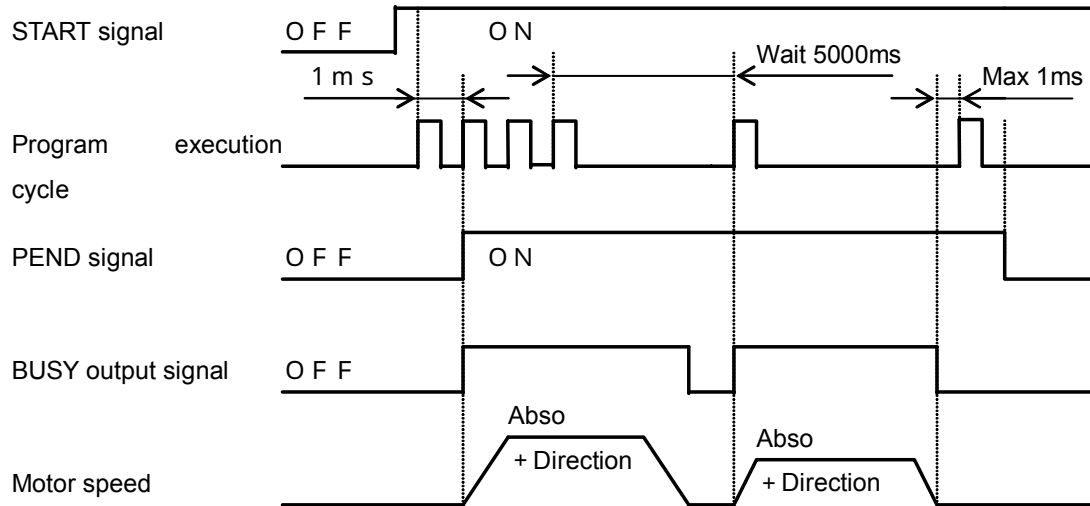


Fig. 11-18 Change Velocity Command Operation Pattern

• Sample program

- 15 00 85 13 10 10 27 00 00 E8 03 00 00 E8 03 00 00 00 00 00 CA · · (1)
- 15 00 85 13 05 10 27 00 00 10 27 00 00 00 00 00 00 00 00 20 · · (2)
- 15 00 85 13 10 88 13 00 00 F4 01 00 00 F4 01 00 00 00 00 00 42 · · (3)
- 15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 00 68 · · (4)
- 15 00 85 13 06 98 3A 00 00 88 13 00 00 00 00 00 00 00 00 00 20 · · (5)
- 15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (6)

- (1) Change Velocity (10h) [Change velocity command]
Target Velocity(20h) : 10000pps, Starting Velocity(21h) : 1000pps
Stop Velocity(22h) : 1000pps
- (2) Absolute Move(05h) [Absolute positioning operation command]
Target Position(11h) : 10000pulse, Target Velocity(20h) : 10000pps
- (3) Change Velocity (10h) [Change velocity command]
Target Velocity(20h) : 5000pps, Starting Velocity(21h) : 500pps
Stop Velocity(22h) : 500pps
- (4) Timer Wait(20h) : 5000ms [Standby for specified time command]
- (5) Absolute Move and Wait(06h) [Absolute positioning operation command]
Target Position(11h) : 15000pulse, Target Velocity(20h) : 5000pps, Delay : 0ms
- (6) End(27h) [Program end command]

11. Program Operation

11.3.6.12 Change Acceleration and Deceleration (11h)

The Change Acceleration command sets the attributes in the order of Acceleration, Deceleration, Rapid Stop Deceleration, and moves to the next command. If the command is executed while the motor is operating, it is reflected the next time the motor operates.

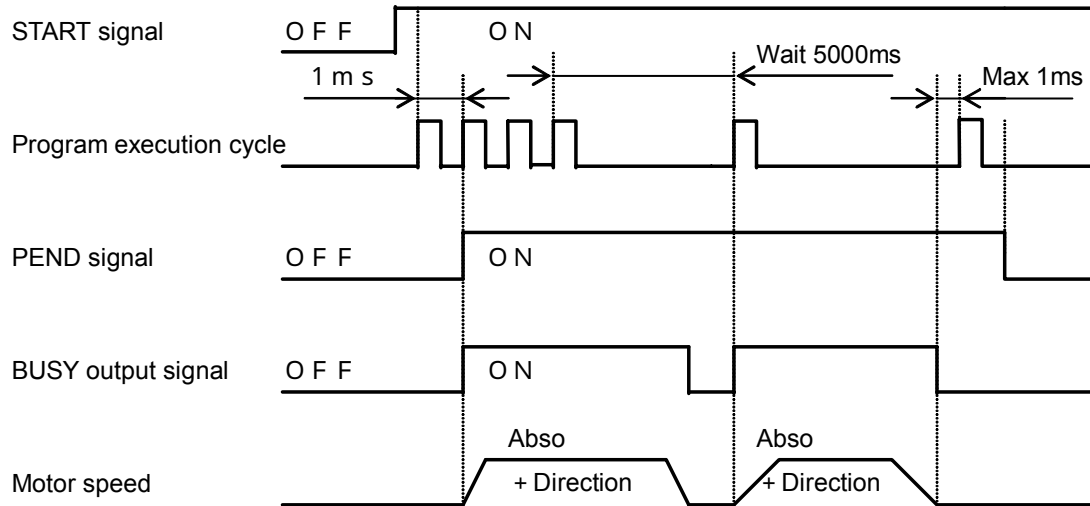


Fig. 11-19 Change Velocity Command Operation Pattern

• Sample program

```

15 00 85 13 11 D0 07 00 00 D0 07 00 00 10 27 00 00 00 00 00 00 A3 . . (1)
15 00 85 13 05 10 27 00 00 10 27 00 00 00 00 00 00 00 00 20 . . (2)
15 00 85 13 11 E8 03 00 00 E8 03 00 00 20 4E 00 00 00 00 00 00 02 . . (3)
15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 00 68 . . (4)
15 00 85 13 06 10 27 00 00 10 27 00 00 00 00 00 00 00 00 21 . . (5)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (6)
  
```

- (1) Change Acceleration(11h) [Change acceleration command]
Acceleration(23h) : 2000pps², Deceleration(24h) : 2000pps²
Rapid Stop Deceleration (25h) : 10000pps²
- (2) Absolute Move(05h) [Absolute positioning operation command]
Target Position(11h) : 10000pulse, Target Velocity(20h) : 10000pps
- (3) Change Acceleration(11h) [Change acceleration command]
Acceleration(23h) : 1000pps², Deceleration(24h) : 1000pps²
Rapid Stop Deceleration (25h) : 20000pps²
- (4) Timer Wait(20h) : 5000ms [Standby for specified time command]
- (5) Absolute Move and Wait(06h) [Absolute positioning operation command]
Target Position(11h) : 10000pulse, Target Velocity(20h) : 10000pps, Delay : 0ms
- (6) End(27h) [Program end command]

11. Program Operation

11.3.6.13 Hard Stop (18h)

The Hard Stop command executes an immediate stop and moves to the next command.

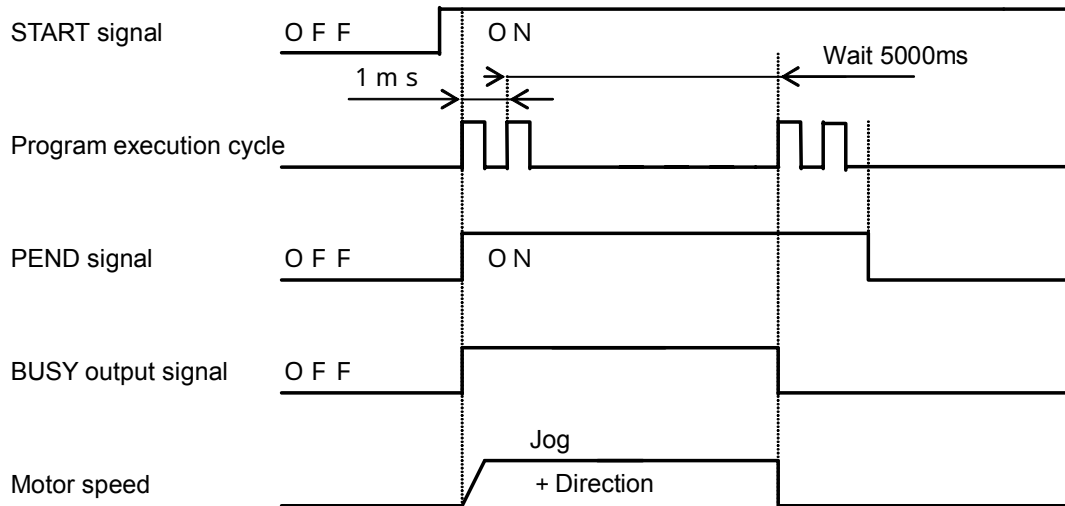


Fig. 11-20 Hard Stop Command Operation Pattern

• Sample program

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 50 . . (1)

15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 . . (2)

15 00 85 13 18 00 00 00 00 00 00 00 00 00 00 00 00 00 C5 . . (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (4)

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Starts in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction:00h

Variable ID for Target Velocity:00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Hard Stop(18h) [Immediate stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.14 Rapid Stop (19h)

The Rapid Stop command executes a rapid stop and moves to the next command.

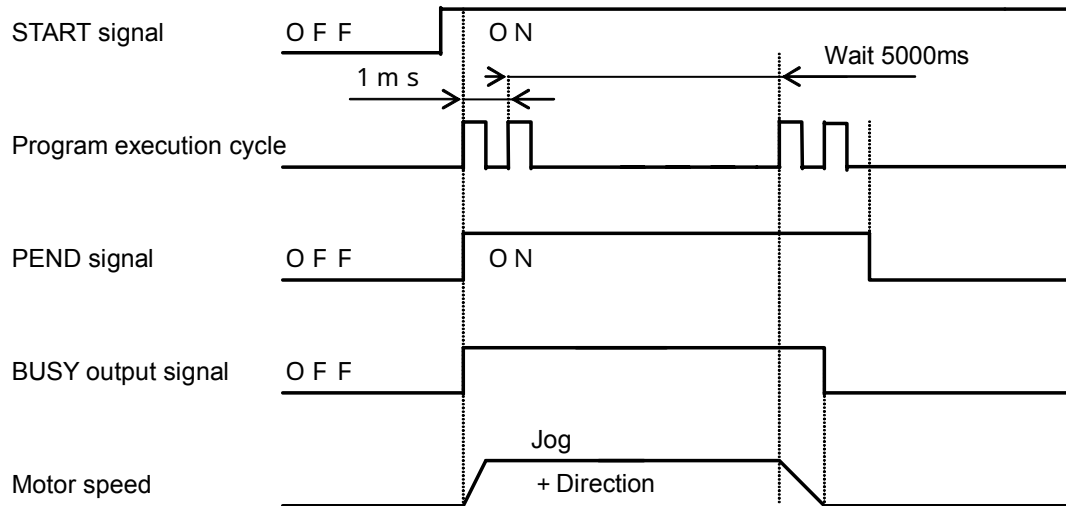


Fig. 11-21 Rapid Stop Command Operation Pattern

• Sample program

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 50 · · (1)

15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 · · (2)

15 00 85 13 19 00 00 00 00 00 00 00 00 00 00 00 00 00 C6 · · (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (4)

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Starts in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction: 00h

Variable ID for Target Velocity: 00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Rapid Stop(19h) [Rapid stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.15 Rapid Stop and Wait (1Ah)

The Rapid Stop and Wait command moves to the next command after completing the rapid stop operation.

There is a maximum delay of 1ms between turning off the BUSY signal and entering Delay.

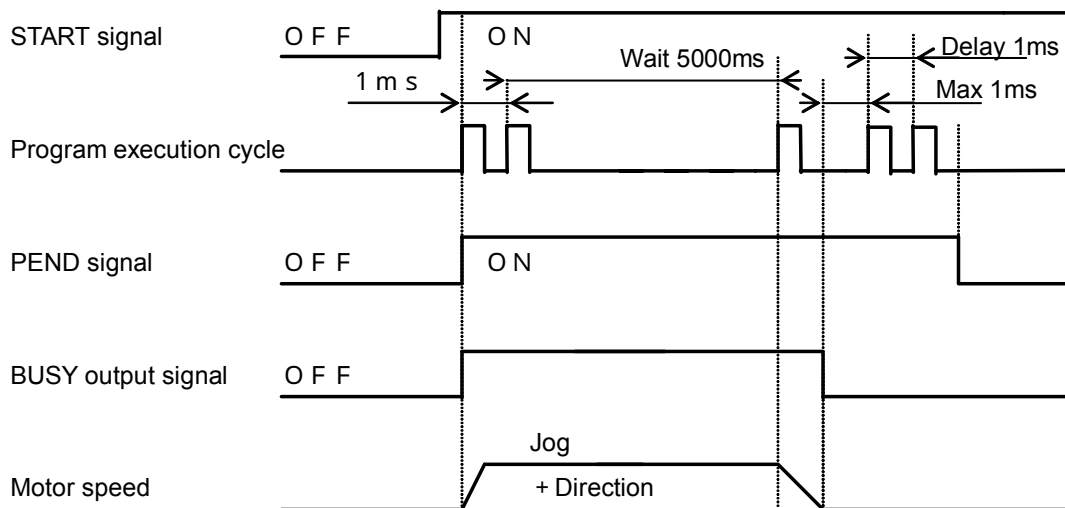


Fig. 11-22 Rapid Stop and Wait Command Operation Pattern

• Sample program

15 00 85 13 07 01 88 00 00 00 00 00 00 00 00 00 00 00 50 . . (1)

15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 . . (2)

15 00 85 13 1A 01 00 00 00 00 00 00 00 00 00 00 00 00 C8 . . (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (4)

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Startup in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction:00h

Variable ID for Target Velocity:00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Rapid Stop and Wait(1Ah) [Rapid stop command]

Delay : 1ms [Delay time after operation completion]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.16 Smooth Stop (1Bh)

The Smooth Stop command executes a deceleration stop and moves to the next command.

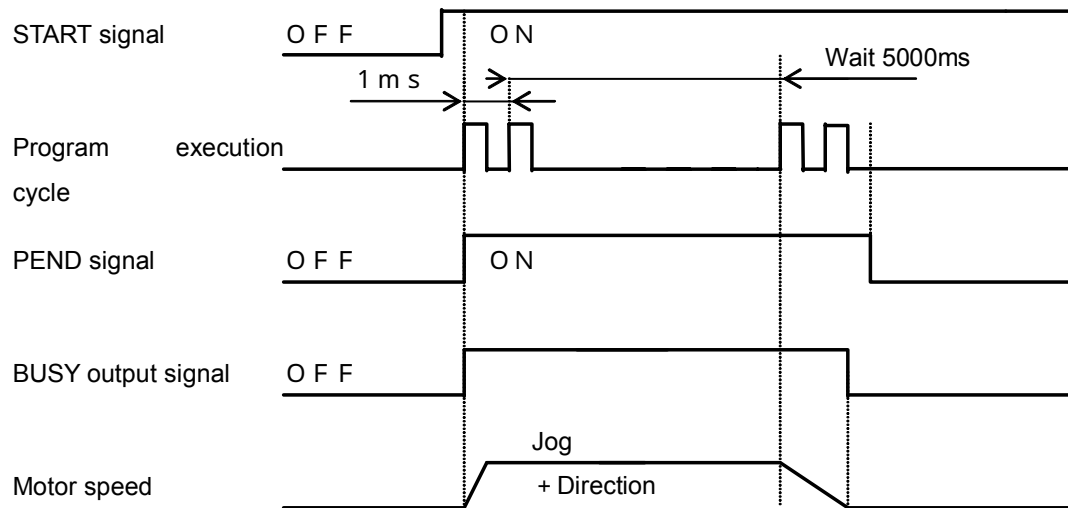


Fig. 11-23 Smooth Stop Command Operation Pattern

• Sample program

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 00 00 50 · · (1)

15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 00 00 68 · · (2)

15 00 85 13 1B 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 C8 · · (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (4)

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Startup in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction:00h

Variable ID for Target Velocity:00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Smooth Stop(1Bh) [Rapid stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.17 Smooth Stop and Wait (1Ch)

The Smooth Stop and Wait command completes the deceleration stop operation and moves to the next command.

There is a maximum delay of 1ms between turning off the BUSY signal and entering Delay.

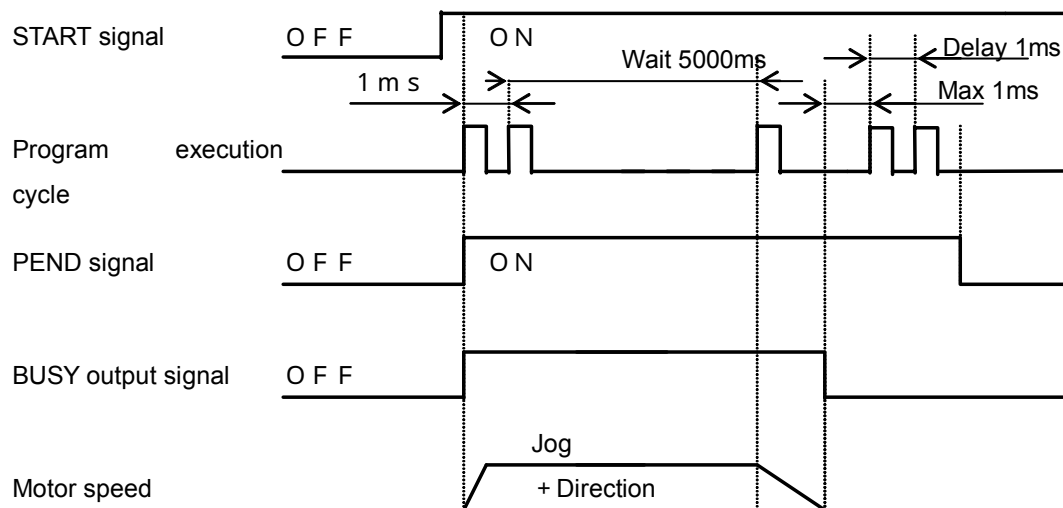


Fig. 11-24 Smooth Stop and Wait Command Operation Pattern

• Sample Program

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 50 . . (1)

15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 . . (2)

15 00 85 13 1C 01 00 00 00 00 00 00 00 00 00 00 00 00 00 C9 . . (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (4)

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Startup in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction: 00h

Variable ID for Target Velocity: 00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Smooth Stop and Wait(1Ch) [Smooth stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.18 Timer Wait (21h)

The Timer Wait command stands by for the specified time and then moves to the next command.

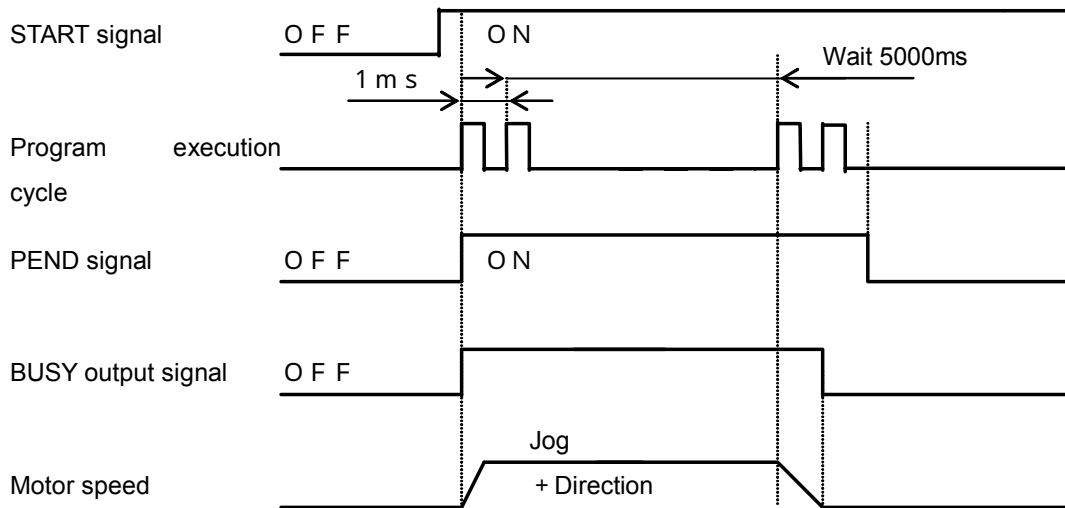


Figure 11-25 Timer Wait Command Operation Pattern

• Sample program

```

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 50 . . (1)
15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 68 . . (2)
15 00 85 13 19 00 00 00 00 00 00 00 00 00 00 00 00 C6 . . (3)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (4)

```

(1) Jog(07h) [Continuous operation command]

Jog Direction(11h) : 01h [Startup in a positive direction]

Target Velocity(20h) : 5000pps

Variable ID for Jog Direction: 00h

Variable ID for Target Velocity: 00h

(2) Timer Wait(20h) : 5000ms [Standby for specified time command]

(3) Rapid Stop(19h) [Rapid stop command]

(4) End(27h) [Program end command]

11. Program Operation

11.3.6.19 Jump (22h)

The Jump command unconditionally branches off from the line currently executing to a specified address.

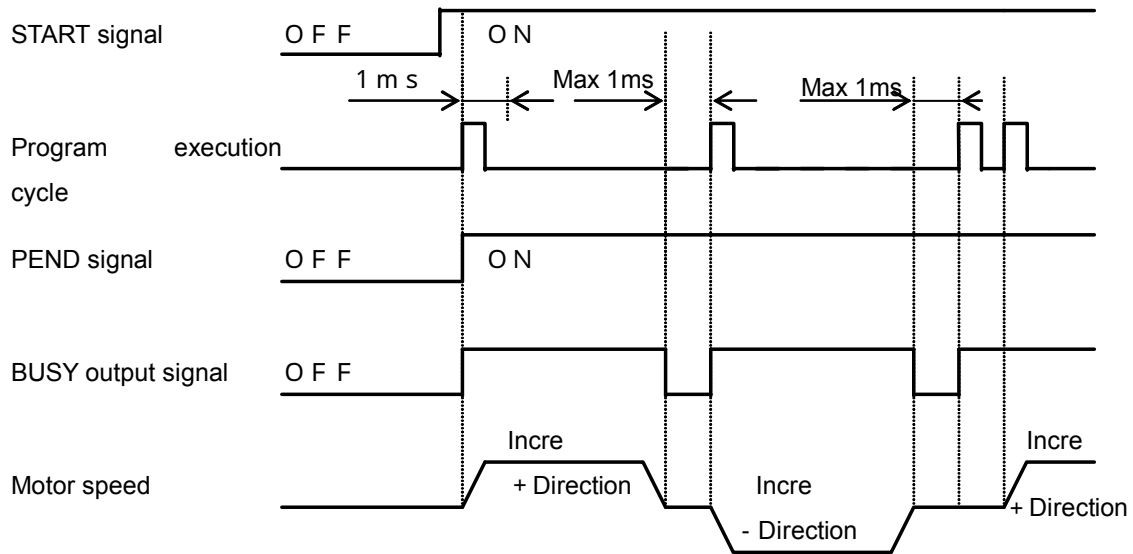


Fig. 11-26 Jump Command Operation Pattern

• Sample program

15 00 85 13 04 10 27 00 00 88 13 00 00 01 00 00 00 00 00 00 84 . . (1)

15 00 85 13 04 F0 D8 FF FF 88 13 00 00 01 00 00 00 00 00 00 13 . . (2)

15 00 85 13 22 01 00 00 00 00 00 00 00 00 00 00 00 00 00 D0 . . (3)

(1) Incremental Move and wait (04h) [Relative positioning operation command]

Incremental Pulse(10h) : 10000pulse , Target Velocity(20h) : 5000pps

Loop : 1 [Loop frequency] , Delay : 0ms [Delay time after operation completion]

(2) Incremental Move and wait (04h) [Relative positioning operation command]

Incremental Pulse(10h) : -10000pulse , Target Velocity(20h) : 5000pps

Loop : 1 [Loop frequency] , Delay : 0ms [Delay time after operation completion]

(3) Jump(22h) : 0001h [Starts from (1)]

11. Program Operation

11.3.6.20 Go Sub Routine (24h)

11.3.6.21 Return (26h)

The Go Sub Routine command branches off to a sub routine, and the Return command ends the sub routine and returns to the previous branch.

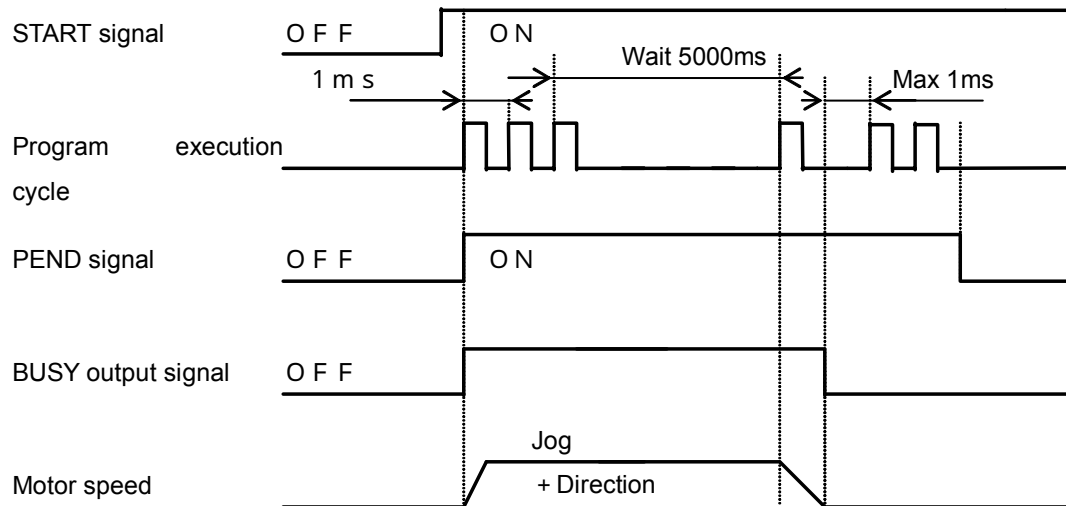


Figure 11-27 Go Sub Routine Command Operation Pattern

• Sample program

```

15 00 85 13 07 01 88 13 00 00 00 00 00 00 00 00 00 00 50 . . (1)
15 00 85 13 24 06 00 00 00 00 00 00 00 00 00 00 00 00 D7 . . (2)
15 00 85 13 1A 00 00 00 00 00 00 00 00 00 00 00 00 00 C7 . . (3)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . (4)
15 00 85 13 00 00 00 00 00 00 00 00 00 00 00 00 00 00 AD . . (5)
15 00 85 13 20 88 13 00 00 00 00 00 00 00 00 00 00 00 68 . . (6)
15 00 85 13 26 00 00 00 00 00 00 00 00 00 00 00 00 00 D3 . . (7)

```

- (1) Jog(07h) [Continuous operation command]
 Jog Direction(11h) : 01h [Startup in a positive direction]
 Target Velocity(20h) : 5000pps
- (2) Go Sub Routine(24h) : 006h [Starts from (6)]
- (3) Rapid Stop and Wait(1Ah) [Waiting stop, after rapid stop command]
- (4) End(27h) [Program end command]
- (5) NOP(00h) [Does nothing]
- (6) Timer Wait(20h) : 5000ms [Standby for specified time command]
- (7) Return(26h) [Advances to the next line of the sub routine]

11. Program Operation

11.3.6.22 End (27h)

The End command ends the program. To end normally this should be placed at the end, except for programs that become an infinite loop.

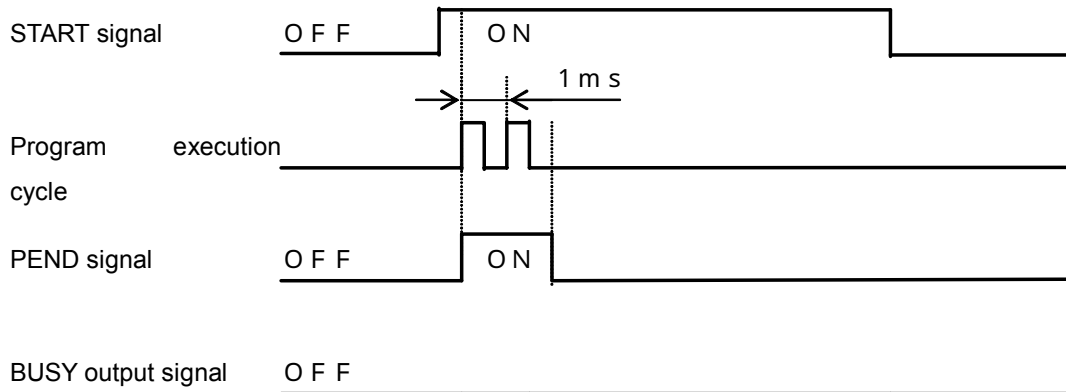


Figure 11-28 End Command Operation Pattern

• Sample program

15 00 85 13 00 00 00 00 00 00 00 00 00 00 00 00 00 00 AD . . . (1)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 . . . (2)

(1) NOP(00h) [Does nothing]

(2) End(27h) [Program end command]

11. Program Operation

11.3.6.23 Modify Variable (31h)

The Modify Variable command changes a variable value or a specified attribute value and moves to the next command.

Sample program 1 updates Target Velocity during positioning operation, and changes velocity on the way.

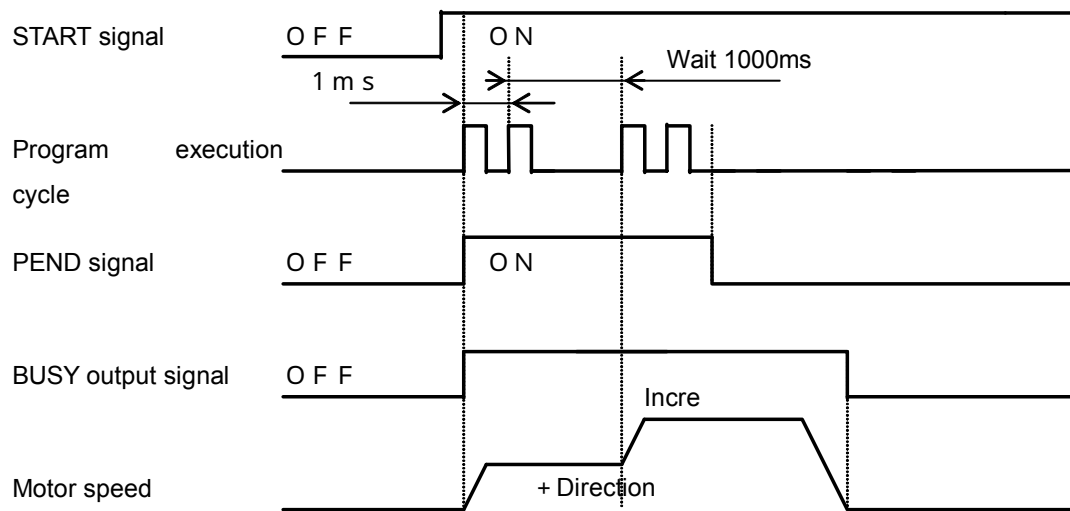


Fig. 11-29 Modify Variable Command Operation Pattern 1

• Sample program 1

15 00 85 13 03 20 4E 00 00 88 13 00 00 00 00 00 00 00 00 00 00 B9 · · (1)

15 00 85 13 20 E8 03 00 00 00 00 00 00 00 00 00 00 00 00 00 00 B8 · · (2)

15 00 85 13 31 00 02 20 10 27 00 00 00 00 00 00 00 00 00 00 00 37 · · (3)

15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (4)

(1) Incremental Move(03h) [Relative positioning operation command]

Incremental Pulse(10h) : 20000pulse , Target Velocity(20h) : 5000pps

(2) Timer Wait(20h) : 1000ms [Standby for specified time command]

(3) Modify Value(31h) : Target Velocity(20h) : 10000pps

(The object number and attribute number are specified directly)

(4) End(27h) [Program end command]

11. Program Operation

Sample program 2 updates Target Velocity using the reference data during positioning operation, and changes velocity on the way.

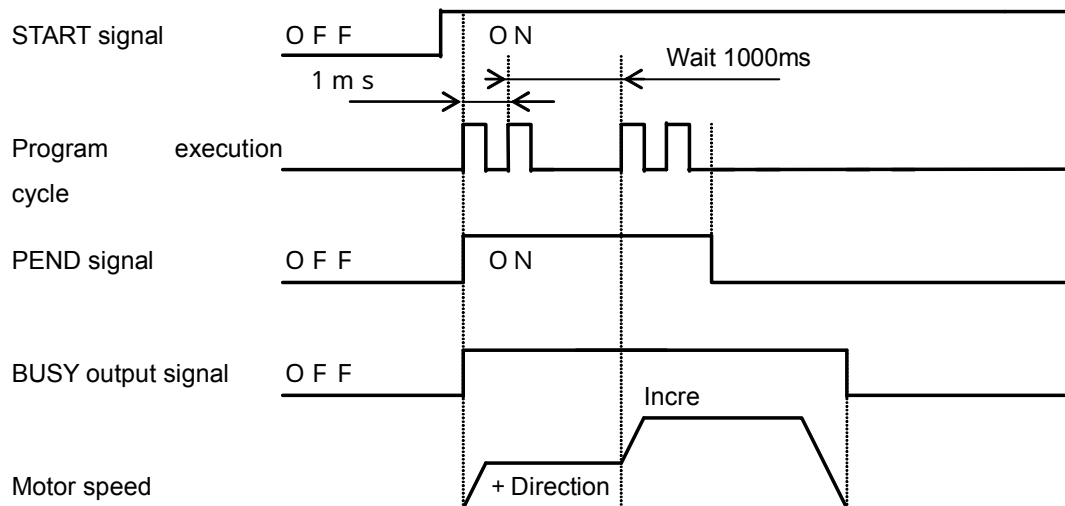


Figure 11-30 Modify Variable Command Operation Pattern 2

• Sample program 2

```
15 00 85 13 03 20 4E 00 00 88 13 00 00 00 00 00 00 00 00 00 00 B9 · · (1)
15 00 85 13 20 E8 03 00 00 00 00 00 00 00 00 00 00 00 00 00 00 B8 · · (2)
15 00 85 13 31 01 00 00 00 00 02 00 00 00 00 00 00 00 00 00 00 E1 · · (3)
15 00 85 13 27 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D4 · · (4)
```

(1) Incremental Move(03h) [Relative positioning operation command]

Incremental Pulse(10h) : 20000pulse , Target Velocity(20h) : 5000pps

(2) Timer Wait(20h) : 1000ms [Standby for specified time command]

(3) Modify Value(31h) : Target Velocity(20h) : 10000pps

(Substitute the value of Variable Area2 to Target Velocity [specified indirectly])

(4) End(27h) [Program end command]

Sample program 2, set the following values before starting.

- Mapping Flag1(C0h) : 01h
- Mapping Flag2(C1h) : 00h
- Variable Area1(80h) : 00000220h
- Variable Area2(81h) : 00002710h

12. SAFETY STANDARD

SAFETY STANDARD

- 12.1 UL Standard 12-2
- 12.2 CE Marking..... 12-2
 - 12.2.1 Low Voltage Directive..... 12-2
 - 12.2.2 EMC Directive..... 12-2
- 12.3 Installation Procedure..... 12-3
- 12.4 Recommended EMC Measure Parts and Installation Procedure 12-5
 - 12.4.1 Power Cable Wirings 12-5
 - 12.4.2 Wiring Between Driver and Controller 12-5
 - 12.4.3 Power supply 12-5

12. SAFETY STANDARD

12.1 UL Standard

The “DB2” complies with the UL (Underwriters Laboratories Inc.) standards.

Standard	File Number
UL Standard	E179775
UL Standard for Canada	

12.2 CE Marking

The conformity tests of Low Voltage Directive and EMC Directive are performed for DB2 as EC directives at the third party of qualified institutions. And CE marking self declaration has been executed.

12.2.1 Low Voltage Directive

Make sure to use the Driver under the installation environment of the following category and pollution level.

Over Voltage Category	
Pollution Level	2
Standard	E N 6 0 0 3 4 - 1
	E N 6 0 0 3 4 - 5
	E N 6 1 0 1 0 - 1

12.2.2 EMC Directive

The conformity tests of EMC Standard compliance were performed for DB2 under the installation environment in figure 10 -1. However, since EMC changes depending upon user’s control board construction incorporated with the Stepping Motor with Driver Unit, layout with the other electric devices or wirings, the conformity tests under the user’s installation environmental conditions can not be performed. Therefore, the final conformity tests of EMC compliance as entire machine and system should be performed by users.

Classification	Test	Standard
Emission	Terminal interference voltage	E N 5 5 0 1 1 - A
	Electromagnetic radiation interference	E N 5 5 0 1 1 - A
Immunity	Electrostatics immunity	E N - 6 1 0 0 0 - 4 - 2
	Radiation field immunity	E N - 6 1 0 0 0 - 4 - 3
	Electric fast transient burst immunity	E N - 6 1 0 0 0 - 4 - 4
	Conductivity immunity	E N - 6 1 0 0 0 - 4 - 6

12. SAFETY STANDARD

12.3 Installation Procedure

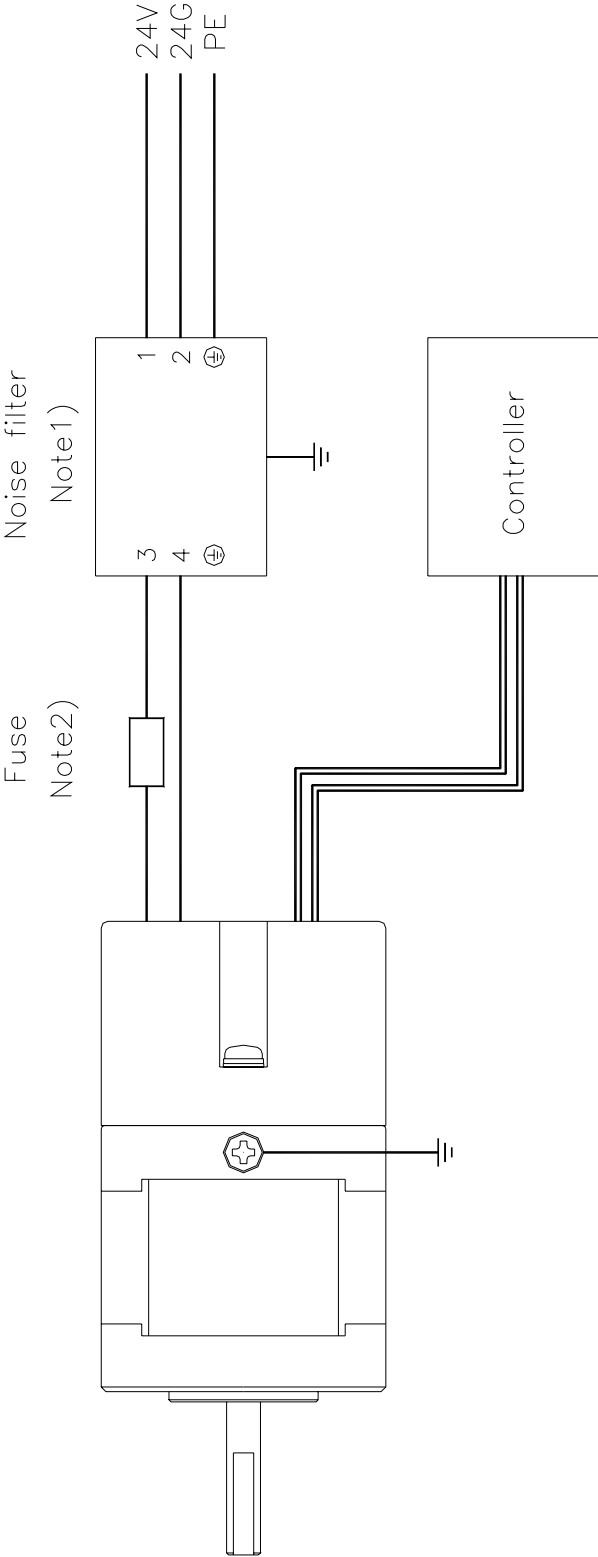


Fig.10-1 DB21M14 S- Installation Procedure for EMC test

12. SAFETY STANDARD

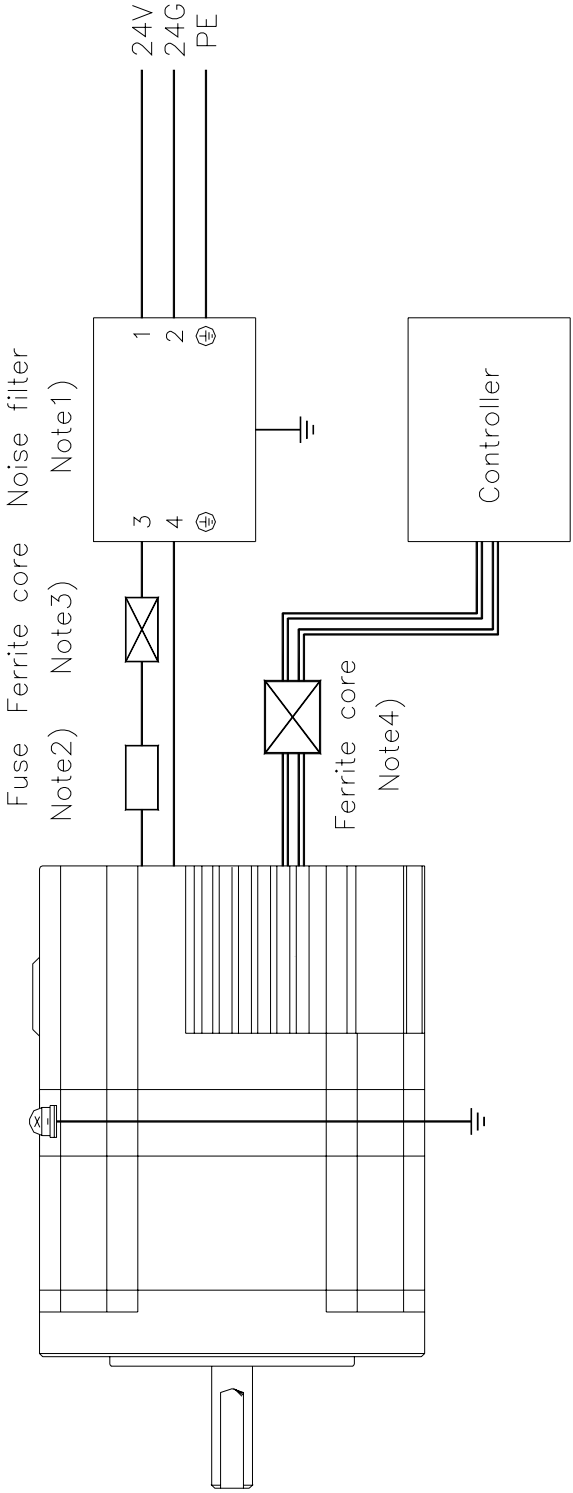


Fig.10-2 DB22M16 S- Installation Procedure for EMC test

12. SAFETY STANDARD

12.4 Recommended EMC Measure Parts and Installation Procedure

12.4.1 Power Cable Wirings

Note 1) Noise filter

Model	Specifications	Maker
SNA-06-223-T	Rated voltage: 50VDC Rated current: 6A	COSEL CO., LTD.

- * Make sure to earth the frame of noise filter.
- * The wiring for the primary and secondary sides of the noise filter should be away as possible.
- * The wiring from noise filter to Driver should be short as possible.
- * Wire the Driver to the secondary side of the noise filter.

Note 2) Fuse

Model	Specifications	Maker
0218.315	Rated voltage: 250VAC Rated current: 3.15A	Littelfuse CO., LTD.

- * Wire the fuse to the primary side of the noise filter.

Note 3) Ferrite core (Only DB22M16 S-)

Model	External diameter of core	Internal diameter of core	Maker
E04ST402715D	42mm	27mm	SEIWA ELECTRIC MFG.CO.,LTD

- * Please roll more than two turns in the ferrite core.

12.4.2 Wirings between Stepping Motor with Driver Unit and Controller

Note 4) Ferrite core (Only DB22M16 S-)

Model	External diameter of core	Internal diameter of core	Maker
ESD-SR-25	28mm	13mm	NEC TOKIN CORPORATION

- * Please roll more than one turn in the ferrite core.
- * Use shielded cable for wiring and make sure to earth the shielding sheath.
- * The shielding sheath of the Driver connector can be earthed by connector shell.
- * The cable should be shorter than 2m.

12.4.3 Power supply

- * The primary and secondary sides must use DC power that reinforced insulation is done for the power supply.

CAUTION

Failure to observe any of the cautions indicated on the right-hand side may cause a light to medium-degree injury or property damage. It may even lead to a serious disaster. Be sure to observe all of the cautions.

- Do not use any of these products for medical or other equipment that may affect human lives.
- Do not use any of these products for equipment that may have a serious impact on society or the public.
- Do not use any of these products in a vehicle, ship, or other environment exposed to vibration.
- Do not remodel or machine any of these products.
- Before using any of these products, be sure to read its operation manual.

* If you have any questions or inquiries regarding the above, contact our Sales Department.

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*Remarks : Specifications Are Subject To Change Without Notice.