FASTECH

Fast, Accurate, Smooth Motion Control

Ezi-MOTIONGATE

IO-Map user's manual

ver.1.05.03.(rev.34) 2013-08-14

(IO-Map 1.5.3)

(Ezi-MOTIONGATE Ver.1.0.8.51)

CC-Link PROFIBUS DeviceNet

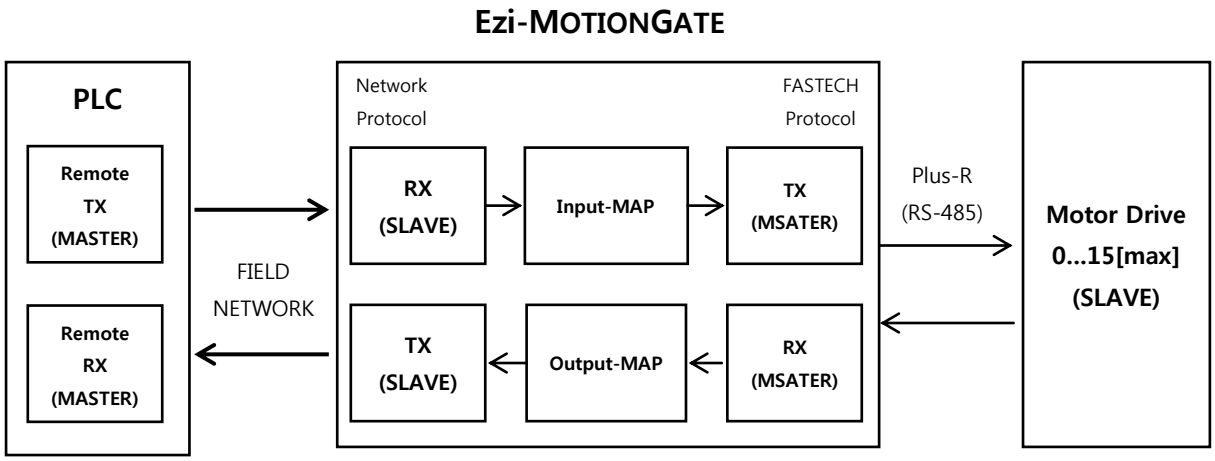
EtherCAT

Table of contents

1 Operation principle of MotionGate

1.1 MotionGate system of industrial network.

MotionGate works as a slave in industrial network. Superior controller (PLC), the master device of industrial network, should be the master system that can access to the transmitting/receiving memory address of industrial network connected to MotionGate.



① Transmit the data from superior controller through industrial network in Bitmap combined format.

② Transmitted data will be received to MotionGate through industrial network.

③ The data received to MotionGate will be analyzed as the defined Input-Map.

④ Corresponding Input-Map command will be transmitted to the motor drive connected to the slave.

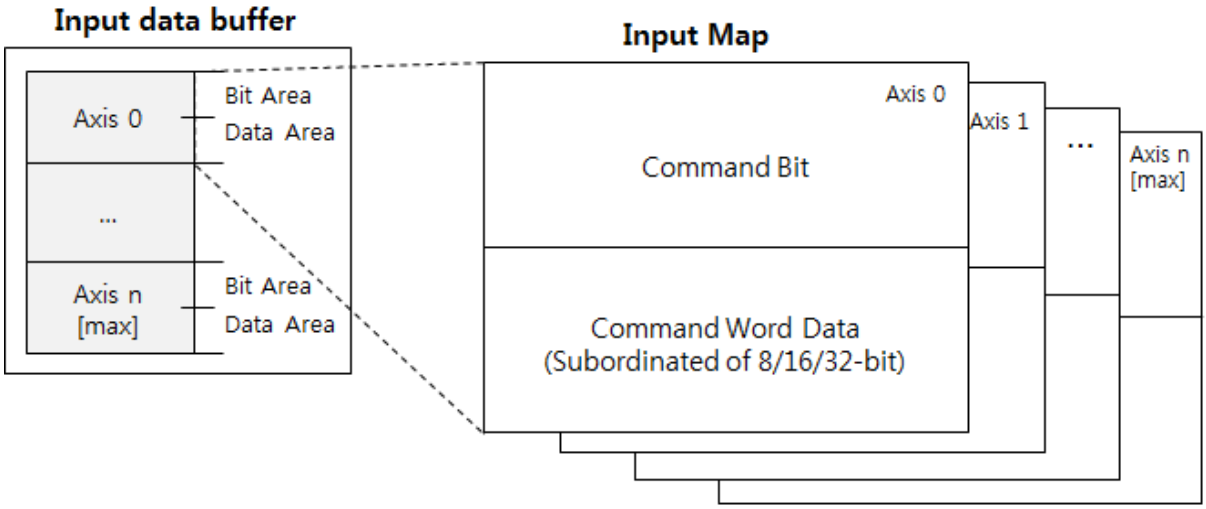
⑤ MotionGate will construct the response information of the motor drive as Output-Map.

⑥ Output-Map data will be transmitted to industrial network.

1.2 IO-Map of MotionGate

Number of motor drives of IO-Map (number of drives that can be connected to the MotionGate) is included in the transmitting/receiving I/O data buffer from superior controller. The IO-Map to control one motor drive is divided into bit [0-3] and data area [4-7], and its total size is 8 bytes.

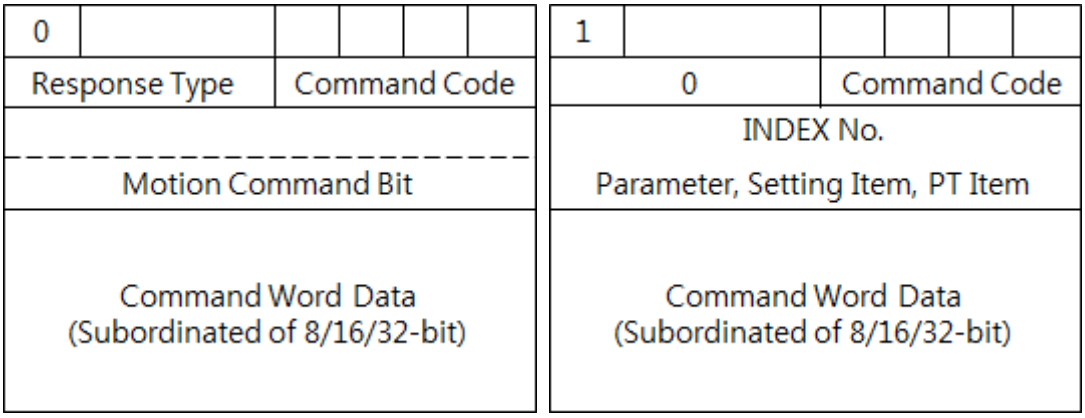
1.2.1 Structure of Input Map



The bit area of Input-Map will be used as the bit command section of motor axis. However, 2-3 byte area will be used as the Index No. when IO-Map is converted to set-up mode. Command word data area will be used as the data information input section of this command when bit command is executed. Command word is 1 DWORD format data consisted of 32 bit data structure.

■ Bit construction of Input Map

Input-Map is the area that commands the control of motor drive. Selection of motion control of motor drive, response information format and the values for the parameters or PT information can be set-up with bit combination of command.



<Construction of Input Map of motion mode>< Construction of Input Map of set-up mode>

NOTE 1: 1 WORD of device memory of superior controller is 16 bit data and the size is 2 byte. Therefore, 00.0~00.7 area of 0h address of device memory occupies 0 Byte area and 00.8~00.15 occupies 1Byte area of IO-Map.

NOTE 2: Device occupied memory of data area is 2WORD. Therefore, DWORD address for the starting address of data area is available to use.

Bit area of Input-Map (Top 4 byte area)

BYTE offset	BIT	Bit name	level	Description
0	0	CONNECT	Rising Edge	The use of corresponding axis will be determined by setting up this bit. If this bit is set as '1', communication between the corresponding axis will be attempted and if the communication to the corresponding axis is not required, this number should be set as '0'. If it is set as '0', the communication with the corresponding axis is excepted and no command will be executed. If many commands to multiple axes are generated simultaneously, the processing sequence will be started from the low to high number of motor drive. If one event for one axis is completed, the process for the next ID axis will be started. If there is no command or event from corresponding axis, MotionGate will receive the data for the status information and response request from corresponding axis. - Status information of corresponding axis (flags FLAG-define) - Command position (signed long 32-bit) - Actual position (signed long 32-bit) - Position error (signed long 32-bit) - Current driving speed (signed long 32-bit) - Current driving PT number **NOTE 1:** MotionGare executes the Fas_GetAllStatus() function command frequently. **NOTE 2:** Motor control delaying time will be twice more than the number of connected axes in case the motor has the same delaying time.
	1	ENABLE / IGNORED	Rising Edge	SERVO Drive: The status of corresponding axis will be converted to the motion available status. 0 : ServoOFF 1 : ServoON STEP Drive: This bit command will be ignored.
	2	nESTOP	Falling Edge	Stop of execution of motion or all commands. (Emergency stop) * 0: Execute the E-Stop Command, 1: Standby of the E-Stop Command

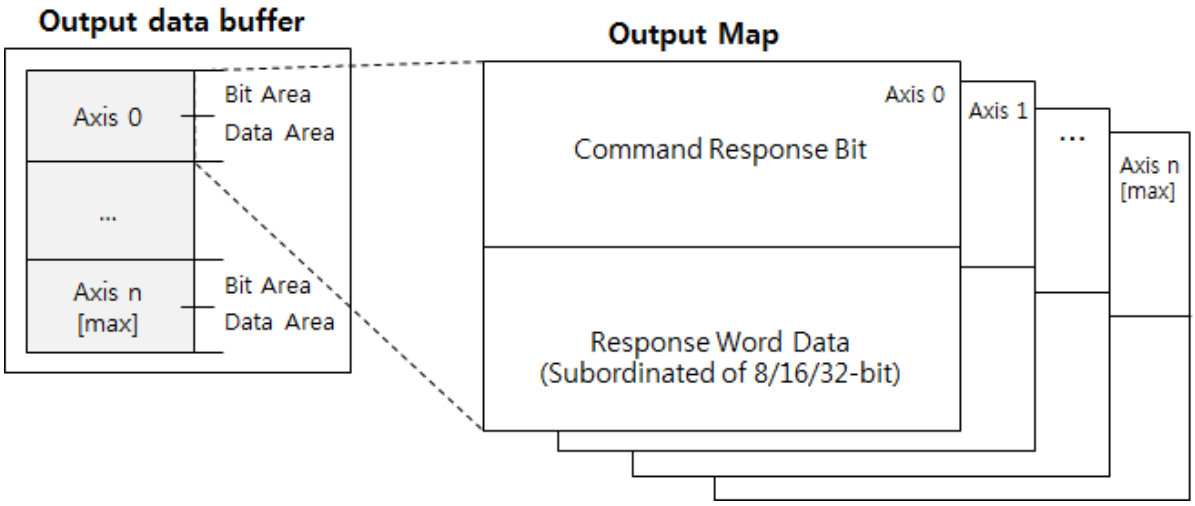
BYTE offset	BIT	Bit name	level	Description
	3	ALARM_RESET / MOTOR_FREE	Rising / Falling Edge	SERVO Drive: This will be used when releasing the generated alarm (positive edge operation) * Motor free status of step drive will be maintained when MOTOR_FREE bit is maintained as '1' and the step motor alarm reset command will be executed in negative edge when it is changed to '0'.
	4	CMD_START	Rising Edge	Executing 'Speed Override' command when ordering 'Jog Run' command. Use when moving the position or execute the PT drive or executing the original point move command.
	5	-	-	-
	6	-	-	-
	7	MOTION /SETTTING	H/L	A bit that selects the MotionGate Map as motion or set-up. 0: Motion control mode 1: Set-up mode
1	0	CMD_CODE0	H/L	**During Motion control mode** 0000(0): General move (Jog, Step, Zero point move) 0001(1): Relative value move [Incremental Move], Absolute value move [Absolute Move] 0100(4): PT Drive (PT Drive, Single PT Drive) 0111(7): Original point move (Origin) **During set-up mode** 0000(0): No command 0101(5): Verifying the version information 1000(8): Parameter request 1001(9): Parameter write 1010(10): Position informaiton change 1100(12): Alarm log request 1101(13): Alarn log delete 1110(14): Parameter save
	1	CMD_CODE1		
	2	CMD_CODE2		
	3	CMD_CODE3		

BYTE offset	BIT	Bit name	level	Description
	4	RESPONSE_TYPE0	H/L	Define the response format of desired response data from RX section of the corresponding axis. 0000(0): Do not request the response data. 0001(1): Command position 0010(2): Actual position 0011(3): Position error 0100(4): Present speed 0101(5): Driving PT number 1000(8): Currently generated alarm number *** Do not use in set-up mode**
	5	RESPONSE_TYPE1		
	6	RESPONSE_TYPE2		
	7	RESPONSE_TYPE3		
2	0	CANCEL	Rising Edge	General stop of motion
	1	HOLD	Falling Edge	Hold during motion
	2	-	-	-
	3	GO_ZERO_POS	Falling Edge	Move to the designated Zero position from corresponding axis driving (position value: 0)
	4	-JOG_MOV	Falling Edge	Reverse direction JOG drive Input value of data area: speed rate, speed value, speed step number.
	5	+JOG_MOV	Falling Edge	Forward direction JOG drive Input value of data area: speed rate, speed value, speed step number.
	6	-STEP_MOV	Falling Edge	Positive/negative move using inside parameter value (such as position and speed) of MotionGate. Input value of data area: Number of position value (0~3) * This can be redefined by user.

BYTE offset	BIT	Bit name	level	Description
	7	+STEP_MOV	Falling Edge	Increase/decrease of move using inside parameter value (such as position and speed) of MotionGate Input value of word area: Number of position value (0~3) * This can be redefined by user.
3	0	INC/ABS	H/L	A bit that selects either relative value move or absolute value move when the controlling method is position move (CMD_CODE:0001). 0: relative value move 1: absolute value move
	1	-	-	-
	2	SPD_MODE	H/L	Use for the Jog move when controlling method is general motion (CMD_CODE: 0000). 0: Jog drive using input ratio or speed step number 1: Jog drive using input speed
	3	-	-	-
	4	SINGLE_PT	H/L	A bit that selects either general PT drive or single PT drive when controlling method is PT drive (CMD_CODE:0100). 0: general PT drive 1: Single PT drive
	5	-	-	-
	6	-	-	-
	7	-	-	-

NOTE 1: Input-Map is the area that MotionGate is receiving the commands from superior controller.
NOTE 2: Above mentioned Input-Map is for the control command area and is for the information of top 4 bytes.
NOTE 3: Last 4 bytes of Input-Map is for the DWORD data input section of control command.

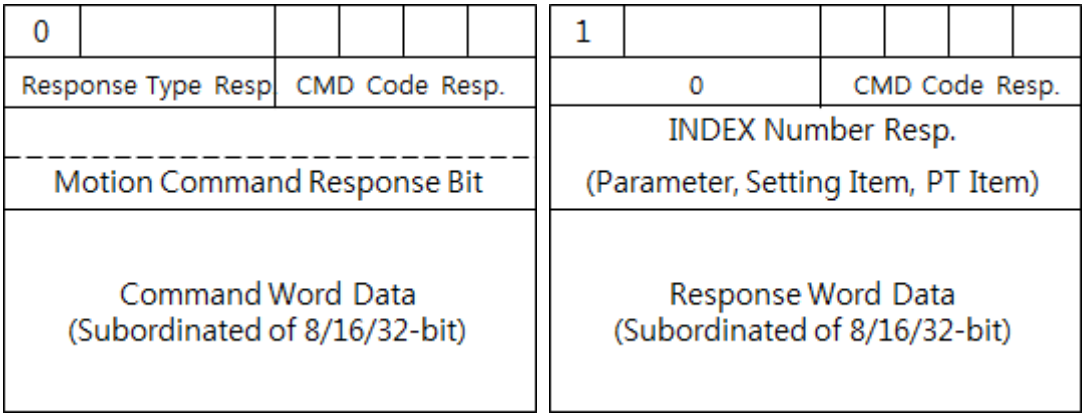
1.2.2 Structure of Output Map



Bit area from Output-Map will be used as the status flag of corresponding axis or response bit for the control command. And the INDEX No. that was used in Input-Map will be the loopback. Response word data area is the storing section of the response data for the commands of Input-Map. This section can respond up to 4 data with 1 byte structure or can respond to 1 data as 1 DWORD.

■ Bit construction of Output Map

Output-Map section includes the loopback bit for the data flag and bit command. As the bit reacts in the same manner as the command event of the corresponding bit, loopback can verify whether the bit input of Input-Map is existed or not. Status flag will be displayed based on the received data information from the corresponding motor drive.



<Construction of Output Map of motion mode>< Construction of Output Map of set-up mode >

NOTE 1: 1 WORD of device memory of superior controller is 16Bit data and its size is 2 bytes. Therefore, 00.0~00.7 area of the 0h address of device memory occupies 0 Byte and 00.8~00.15 occupies 1 Byte of IO-Map.
NOTE 2: Device occupied memory of data area is 2 WORD. Therefore, DWORD address for the starting address of data area is available to use.

Bit area of Output-Map (Top 4 Bytes area)

BYTE offset	BIT	Bit name	level	Description	BYTE offset
0	0	CONNECTED	H	status bit	Set this bit a '1' when connected to the Plus-R of corresponding axis
	1	ENABLED MOTOR_FREE (STEP)	H	status bit	Set as '1' when Servo ON of corresponding axis or Step motor is in Normal status. * This will be the response bit for Motor Free command when in STEP Drive status.
	2	ESTOP_RESP	H	Loopback	Set as '1' if the emergency stop command is executed by Loopback bit of nESTOP bit of Input-Map.
	3	ALARM_ERROR	H	status bit	It will be set as '1' automatically when alarm is generated from the motor drive of the corresponding axis. It will be cleared to '0' when alarm is released.
	4	CMD_RESP	H	Loopback	Loopback bit of CMD_START bit of Input-Map.
	5	OUT_RANGE	H	status bit	Set as '1' if the data area value of Input-Map does not match to the corresponding command value.
	6	READY	H	status bit	It will be set as '1' if the command for the current corresponding axis is in operable status. No command is operable if this bit is '0'. **NOTE 1:** If READY bit is set as '1' from the setting mode, other axes are controllable.
	7	SET_MOV_RESP	H/L	Loopback	It will be set as '1' if the data of current Output-Map is in setting mode, and will be cleared to '0' in motion mode.

BYTE offset	BIT	Bit name	level	Description	BYTE offset
	0	CMD_CODE_RESP0	H/L	Loopback	Respond to the types of move command 0000(0): General move (Jog, Step, Zero position move) 0001(1): Relative value move [Incremental Move], Absolute value move [Absolute Move] 0100(2): PT Drive (PT Drive, Single PT Drive) 0111(3): Original point move (Origin)
	1	CMD_CODE_RESP 1	H/L		
	2	CMD_CODE_RESP 2	H/L		
	3	CMD_CODE_RESP 3	H/L		
	4	RESPONSE_TYPE_RESP0	H/L	Loopback	Respond to the response data allocated in Word area. 0000(0): Do not request the response data. 0001(1): Command position 0010(2): Actual position 0011(3): Position error 0100(4): Present speed 0101(5): Driving PT number 1000(8): Currently generated alarm number
	5	RESPONSE_TYPE_RESP1	H/L		
	6	RESPONSE_TYPE_RESP2	H/L		
	7	RESPONSE_TYPE_RESP3	H/L		
2	0	MOTIONNING	H/L	status bit	Set as '1' when corresponding axis is in motion status.
	1	HOLD_RESP	H/L	status bit	Set as '1' when in hold status by the command of HOLD bit during operation.
	2	-			
	3	GO_ORIGIN_RESP	H	status bit	Set as '1' when executing the return to parameter original point of Plus-R of corresponding axis.
	4	-	-		-
	5	JOG_RESP	H	status bit	When corresponding axis is in Jog drive.
	6	-	-		-
	7	STEP_RESP	H	status bit	When corresponding axis is in Step drive.

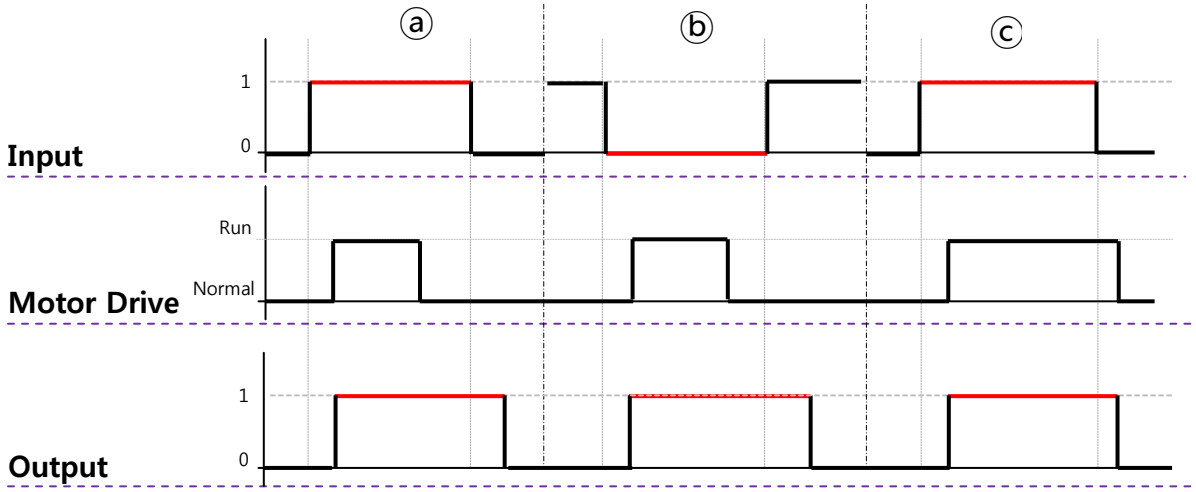
BYTE offset	BIT	Bit name	level	Description	BYTE offset
	0	PT_RUNNING	L/H	status bit	When corresponding axis is in position move.
	1	MOV DIR	L/H	status bit	Displays the rotation direction of motor. 0 : CW(+) 1 : CCW(-) * If FLAG_IN_MOTION bit is set as '1', updated value should be verified. logical operation (FLAG_IN_MOTION &FLAG_nDIR)
	2	INP	L/H	status bit	It will be set as '1' when 'In position' of motor is completed. * This bit is not operable when motor is in STEP status.
	3	ORIGIN_SENSOR	H	status bit	It will be set as '1' when original point sensor is turned ON.
	4	SW_LIMIT_N	H	status bit	It will be set as '1' when '-' direction program limit is exceeded.
	5	SW_LIMIT_P	H	status bit	It will be set as '1' when '+' direction program limit is exceeded.
	6	HW_LIMIT_N	H	status bit	It will be set as '1' when '-' direction limit sensor is turned ON.
	7	HW_LIMIT_P	H	status bit	It will be set as '1' when '+' direction limit sensor is turned ON.

NOTE 1: Output-Map is the area that MotionGate is sending the commands from superior controller.
NOTE 2: Above mentioned Output-Map is for the control command area and is for the information of top 4 bytes.
NOTE 3: Last 4 bytes of Output-Map is for the DWORD data receiving section of response data.

1.3 Operation and data accessing method of IO Map

1.3.1 Bit command method of IO-Map

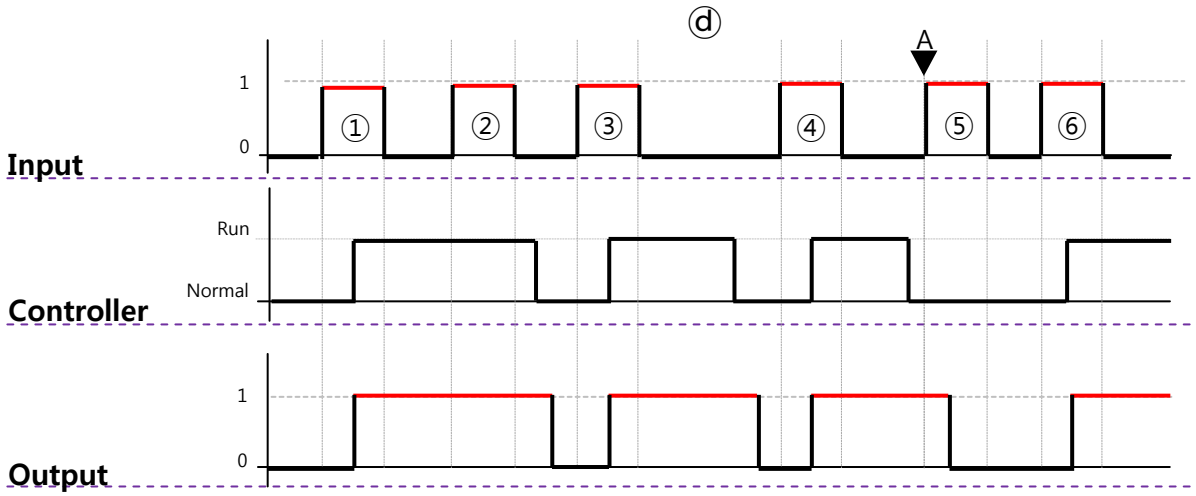
Bit command is classified as Positive edge and Negative edge.



Command start of Positive edge is the Input command changing point from '0' to '1' as section ⓐ. MotionGate will pass the received commands to corresponding axis and respond to the command as Output.

Command start of Negative edge is the Input point of change from '0' to '1' as section ⓑ. MotionGate will pass the commands to corresponding axis using this event and respond to the command as Output when the command is executed.

Bit command of section ⓒ is Positive edge command of Input. This is the command that maintains the continuous command until the Negative edge command is requested when MotionGate is conveying the command of the corresponding axis. The sequence of this command is that once the corresponding axis starts operation as the Positive edge command of Input, it responds to the operation as Output. And, once the operation of the corresponding axis is stopped, it responds to the stop of operation as Output.



ⓓ section is the case for continuous operation of Input command. In this case, command will be started as section ⓐ with command ①. Command ② will not operate when MotionGate is in operation. Also, operation will be executed with the input command ③ when the operation of MotionGate is completed by the command ①.

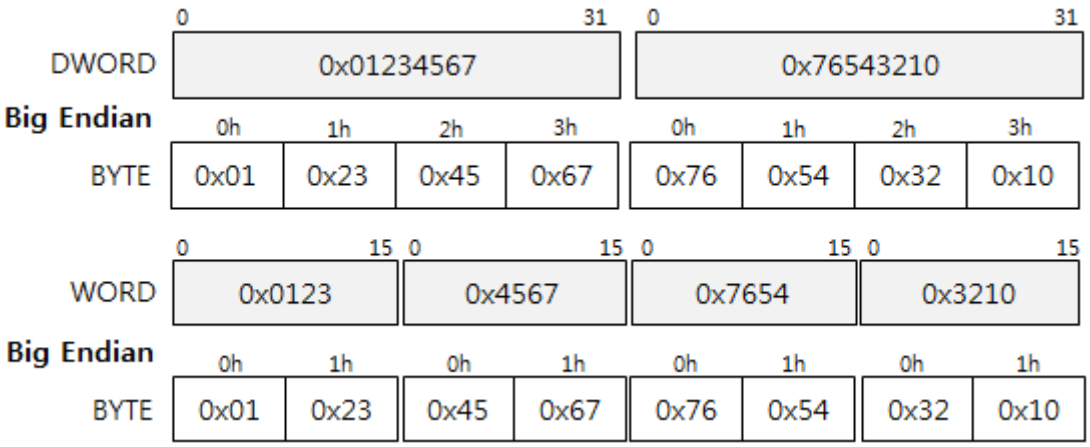
If the command ④ is completed and command ⑤ is entered at point A which is the point prior to the response of Output, this command will be ignored. However, command ⑥ will be executed if it is entered after the Output response. I.e, MotionGate operation will be executed by the Input command and the Input command is effective when the response of output operation is completed.

1.3.2 Data area of IO-Map

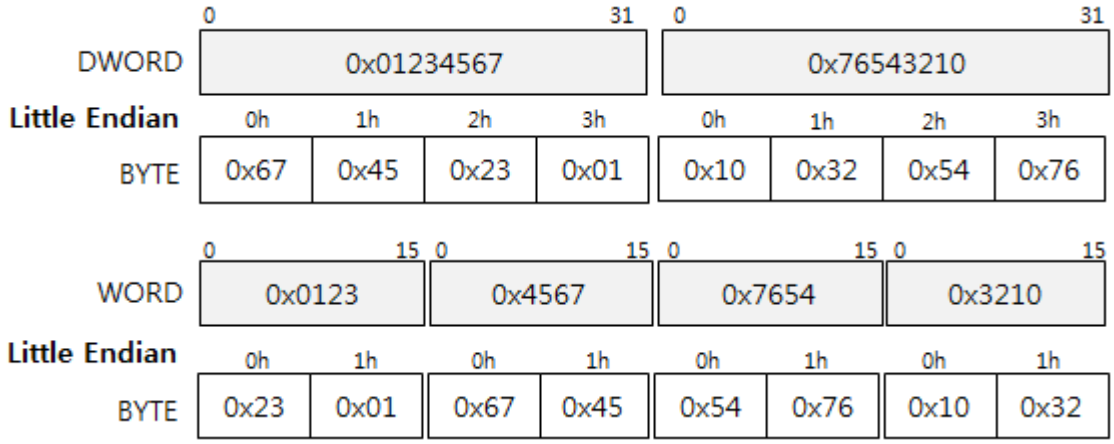
■ Types of data access method

System data will be saved as integer. This will be used by saving in the system memory and will be classified as data saving memory accessing method (Endian) depending on the types of built-in processor (CPU) of controller, and this will be classified as Big-Endian and Little-Endian.

Big-Endian access will save the highest bytes in the highest address. This is the accessing method for the RISC or MOTOROLLA series processors.



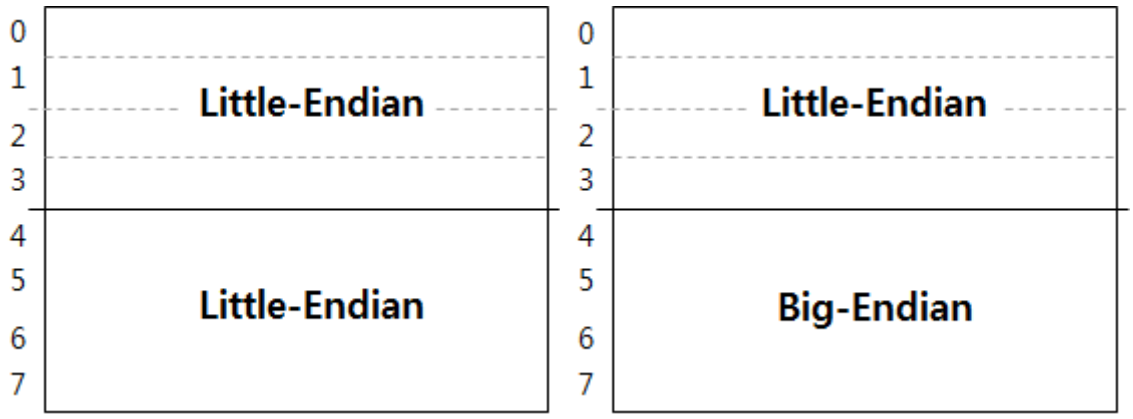
Little-Endian access will save the highest bytes in the lowest address. This is the accessing method for the Intel series processors.



■ Data input method

Data area of MotionGate uses 4-7byte area of IO-Map as 1 DWORD data. Also, in set-up mode, 2-3 bytes area will be used as 1 WORD data. The data address accessing method will be changed depending on the processor of superior controller.

In order to make all of the systems commands of IO-Map be identical, Little-Endian accessing method will be used in MotionGate. However, since 4 BYTE data will be used as 1 DWORD data in data area, data access will be supported in 2 different ways depending on the types of the superior controller system.

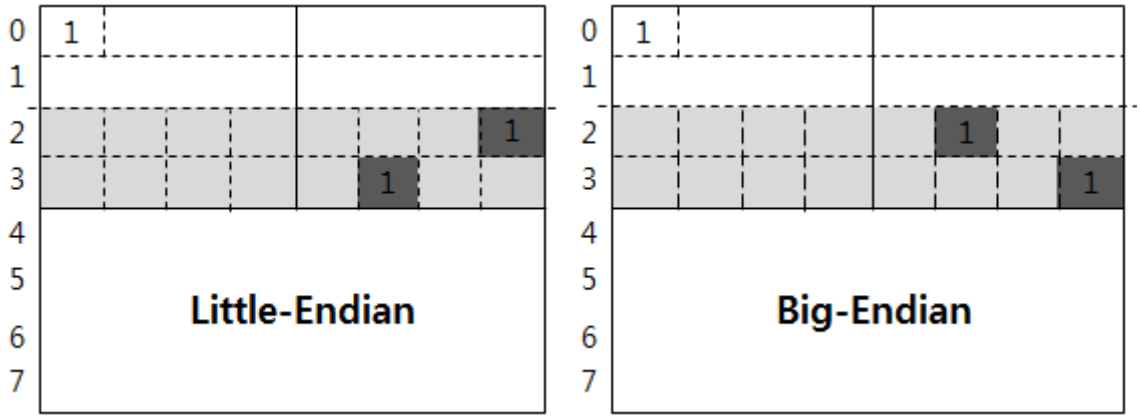


Little-Endian access system　　Big-Endian access system

NOTE: MotionGate will be shipped out by setting up differently depending on the superior system configuration.

For superior controller system that processes the data in Big-Endian method, since 0-3 BYTE of bit area will be processed in byte unit, they can be used as actual value in motion mode of IO-Map of MotionGate. However, 2-3 BYTE area of IO-MAP in set-up mode, in order to be the same as the Index No. marked in this manual, Byte-Swap should be conducted between 2 and 3 BYTEs.

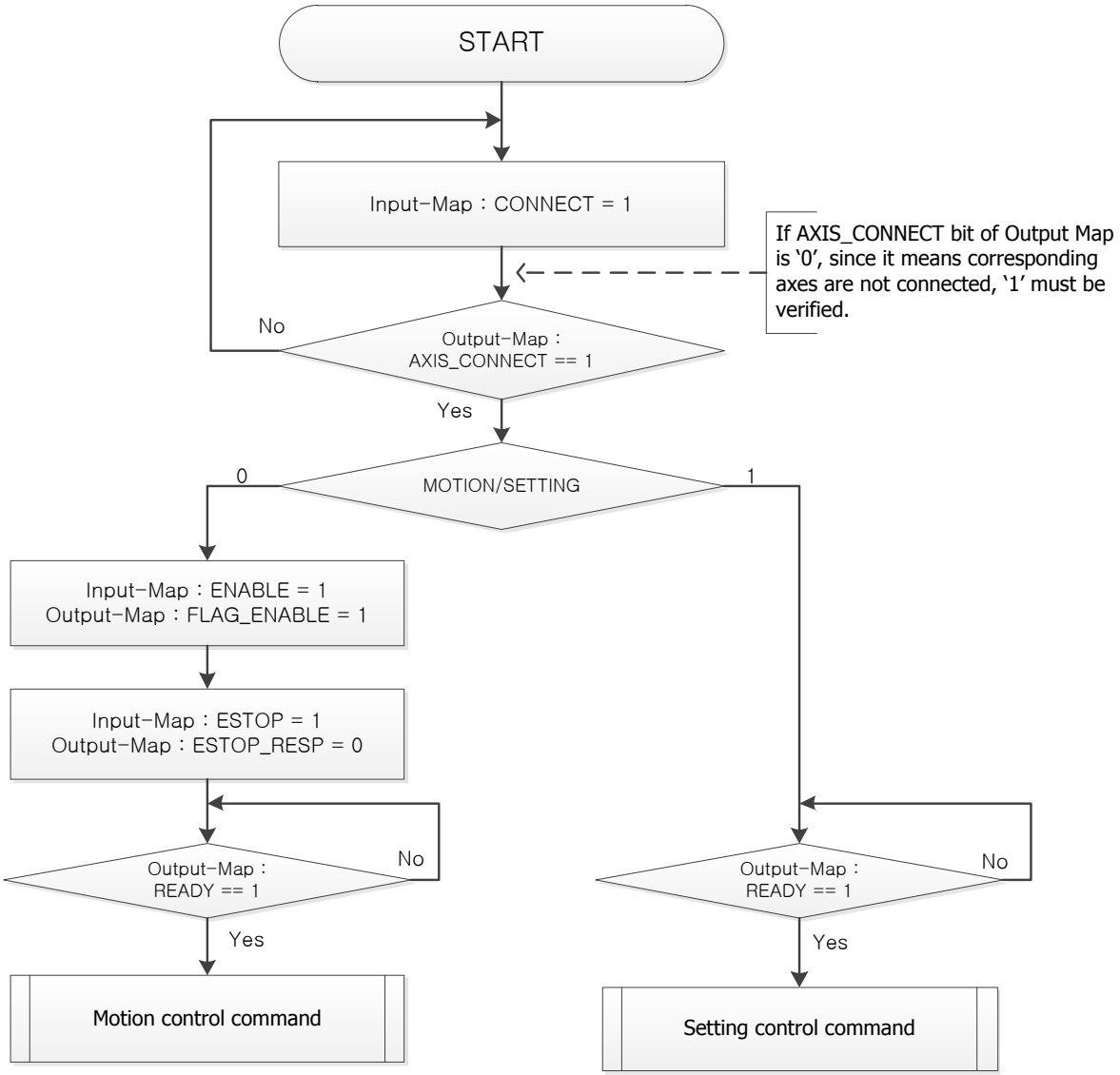
If Index No. data is set-up as #0401, Little-Endian and Big-Endian will be displayed as below.



1.3.3 Sequence of control command preparation of IO-Map

MotionGate will require below sequence when executing the commands.

Flow chart 1. Activation condition of motion and setup command



※ MotionGate Command

① Execute the command by setting the CONNECT bit of Input-Map as '1' <refer to *2.2.1>

- Since CONNECT bit is the selecting bit of corresponding axis, it must be set as '1'.
- Check if the response of AXIS_CONNECT bit of Output-Map is '1'.

② Select the MOTION/SETTING bit of Input-Map <refer to *2.1>

- Select motion control as '0' and setting control as '1'.

③ For motion control case, ENABLE bit and ESTOP motion control of Input-Map should be set as '1' <refer to *2.1.1>

- Check if the FLAG_ENABLE bit of Output-Map is '1'.
- Check if the ESTOP_RESP bit is '0'

④ Check the status of READY bit of Output-Map when executing the command <refer to * 2.7>

- READY bit will be maintained as '0' when other command is being executed.
- READY bit will be maintained as '1' when no motion command is available.
- Setting command should be maintained as '0' until the corresponding command is completed.

⑤ Drive motion control should be executed as the combination of IO-Map for motion command <refer to * 3>

- Set-up the MOTION/SETTING bit of Input-Map as '0'
- For execution of motion control command cases, "CONNECT= 1, ENABLE=1, nESTOP=1" must be set-up without fail.

⑥ Verification and modification of drive and MotionGate set-up value will be executed as the bit combination of IO-Map for setting control <refer to *4, *5, *6, *7>

- Set-up the MOTION/SETTING bit of Input-Map as '1'.
- For command execution of setting control case, "CONNECT= 1" must be set-up without fail.

2 Set-up and operation principle of IO-Map

2.1 Selection bit of Motion/Setting command of IO-Map

2.1.1 Motion control mode

Allocated area will be converted to motion control when MOTION/SETTING bit of Input-Map is 0. 1-3 Byte of data area is the motion control selection bit when using them as the motion control and 4-7 Byte will be used as the motion control value.

Input-Map: MOTION/SETTING [0.7]

Output-Map: MOTION/SETTING [0.7] (Loopback)

- **Types of motion control**

- Jog drive	- Step move	- Position move
- PT drive	- Zero position move	- Original point move

NOTE 1: Data area will be classified as Big-Endian and Little-Endian depending on the accessing method for the data process of superior controller.
NOTE 2: Output-Map is the response information output area of MotionGate for superior controller.

Input Map of SERVO drive

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MOTION/ SETTING	-	-	CMD START	ALARM RESET	nESTOP	ENABLE	CONNECT
Byte 1	RESPONSE_TYPE				Motion CMD_CODE			
Byte 2	+STEP MOV	- STEP MOV	+ Jog MOV	- Jog MOV	GO_ZERO POS	-	HOLD	CANCEL
Byte 3	-	-	-	SINGLE PT	-	SPD MODE	-	INC/ABS
Byte 4-7	Data area							

Input Map of STEP drive

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MOTION/ SETTING	-	-	CMD START	ALM_RST/ MOTOR FREE	nESTOP	IGNORED	CONNECT
Byte 1	RESPONSE_TYPE				Motion CMD_CODE			
Byte 2	+STEP MOV	- STEP MOV	+ Jog MOV	- Jog MOV	GO_ZERO POS	-	HOLD	CANCEL
Byte 3	-	-	-	SINGLE PT	-	SPD MODE	-	INC/ABS
Byte 4-7	Data area							

Output Map of SERVO drive

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MOTION/ SETTING_ RESP	READY	OUT_RANGE	CMD_RESP.	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	AXIS_ CONNECT
Byte 1	RESPONSE TYPE RESP				Motion CMD CODE RESP			
Byte 2	STEP_RESP.	-	JOG_RESP	-	GO_ZERO POS_RESP	-	HOLD_RESP.	MOTIONING
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUNNING
Byte 4-7	Data area							

Output Map of STEP drive

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MOTION/ SETTING_ RESP	READY	OUT_RANGE	CMD_RESP.	ALM/ERROR	ESTOP_ RESP	MOTOR_ FREE	AXIS_ CONNECT
Byte 1	RESPONSE TYPE RESP				Motion CMD CODE RESP			
Byte 2	STEP_RESP.	-	JOG_RESP		GO_ZERO POS_RESP	-	HOLD_RESP.	MOTIONING
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUNNING
Byte 4-7	Data area							

Loopback bit of Input-Map, response bit of motion control command and status flag bit of corresponding axis are included in Output-Map of motion mode.

Motion control response bit

Loopback bit	Command response bit	Status flag bit
ESTOP_RESP	AXIS_CONNECT	FLAG_ENABLE
CMD_RESP.	MOTION_CMD_CODE_RESP	ALARM/ERROR, MOTOR_FREE (Step Drive)
RESPONSE_TYPE_RESP	SETTING_CMD_CODE_RESP	
STEP_RESP.	INDEX_VALUE_RESP	READY
GO_ZERO_POS_RESP	OUT_RANGE	MOTIONING
JOG_RESP		HOLD_RESP.
		PT_RUNNING
		MOV_DIR
		INP
		ORIGIN SENSOR
		S/W -Limit
		S/W +Limit
		H/W -Limit
		H/W +Limit

2.1.2 Setting control mode

Assigned data area will be converted to setting control format when MOTION/SETTING bit of Input-Map is '1'. 1 Byte of corresponding memory area will be used as the command code when it is used as the setting control mode, 2-3 Byte area will be used as parameter number and 4-7 Byte area will be used as the data value for the parameter number.

Input Map of SERVO drive

Input-Map

<table>
<tr><th></th><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>Byte 0</td><td>MOTION/ SETTING</td><td>-</td><td>-</td><td>CMD START</td><td>ALARM RESET</td><td>ESTOP</td><td>ENABLE</td><td>CONNECT</td></tr>
<tr><td>Byte 1</td><td colspan="4">0</td><td colspan="4">SETTING_CMD_CODE</td></tr>
<tr><td>Byte 2</td><td colspan="8" rowspan="2">INDEX_VALUE</td></tr>
<tr><td>Byte 3</td></tr>
<tr><td>Byte 4-7</td><td colspan="8">Data area</td></tr>
</table>

Output Map of STEP drive

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MOTION/ SETTING	-	-	CMD START	ALM/RST MOTOR_ FREE	ESTOP	-	CONNECT
Byte 1	0				SETTING_CMD_CODE			
Byte 2	INDEX_VALUE							
Byte 3								
Byte 4-7	Data area							

Drive connection bit, motor activation bit, emergency stop command bit and alarm reset/ motor free bit in setting control mode will be operated same as the functions of motion control mode.

Output Map of SERVO drive

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	SET_MOV RESP	READY	OUT_ RANGE	CMD_ RESP.	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	AXIS_ CONNECT
Byte 1	0				SETTING_CMD_CODE_RESP			
Byte 2	INDEX_VALUE_RESP							
Byte 3								
Byte 4-7	Data area							

Output Map of SERVO drive

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	SET_MOV RESP	READY	OUT_ RANGE	CMD_ RESP.	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	AXIS_ CONNECT
Byte 1	0				SETTING_CMD_CODE_RESP			
Byte 2	INDEX_VALUE_RESP							
Byte 3								
Byte 4-7	Data area							

Connection command bit, motor activation bit, emergency stop command bit and alarm reset bit in setting control mode will be operated same as the Output-Map of motion control mode. In the meantime, 1~3 Byte is the Loopback area of the command.

2.2 Drive connection and Servo control command

2.2.1 Connection of motor drive

Whether to use of corresponding axis can be set by using FLAG_AXIS_IN_USE bit of Input-Map. This bit can be applied in motion and set-up mode and the command response bit is AXIS_CONNECT bit of Output-Map.

Input-Map: CONNECT [0.0]
Output-Map: CONNECTED [0.0] (Command response bit)

- This can be controlled from motor motion command and setting command mode.
- MotionGate will not receive any of communication command or data from corresponding axis if CONNECT bit is not set as '1'.
- The CONNECTED bit in data receiving section will be set as '1' when the connection of MotionGate to corresponding axis is completed and this will be cleared as '0' if not connected.
- Please check if the devices are connected correctly when CONNECTED bit cannot be set as '1'.

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								CONNECT 0->1
Byte 1..7	...							

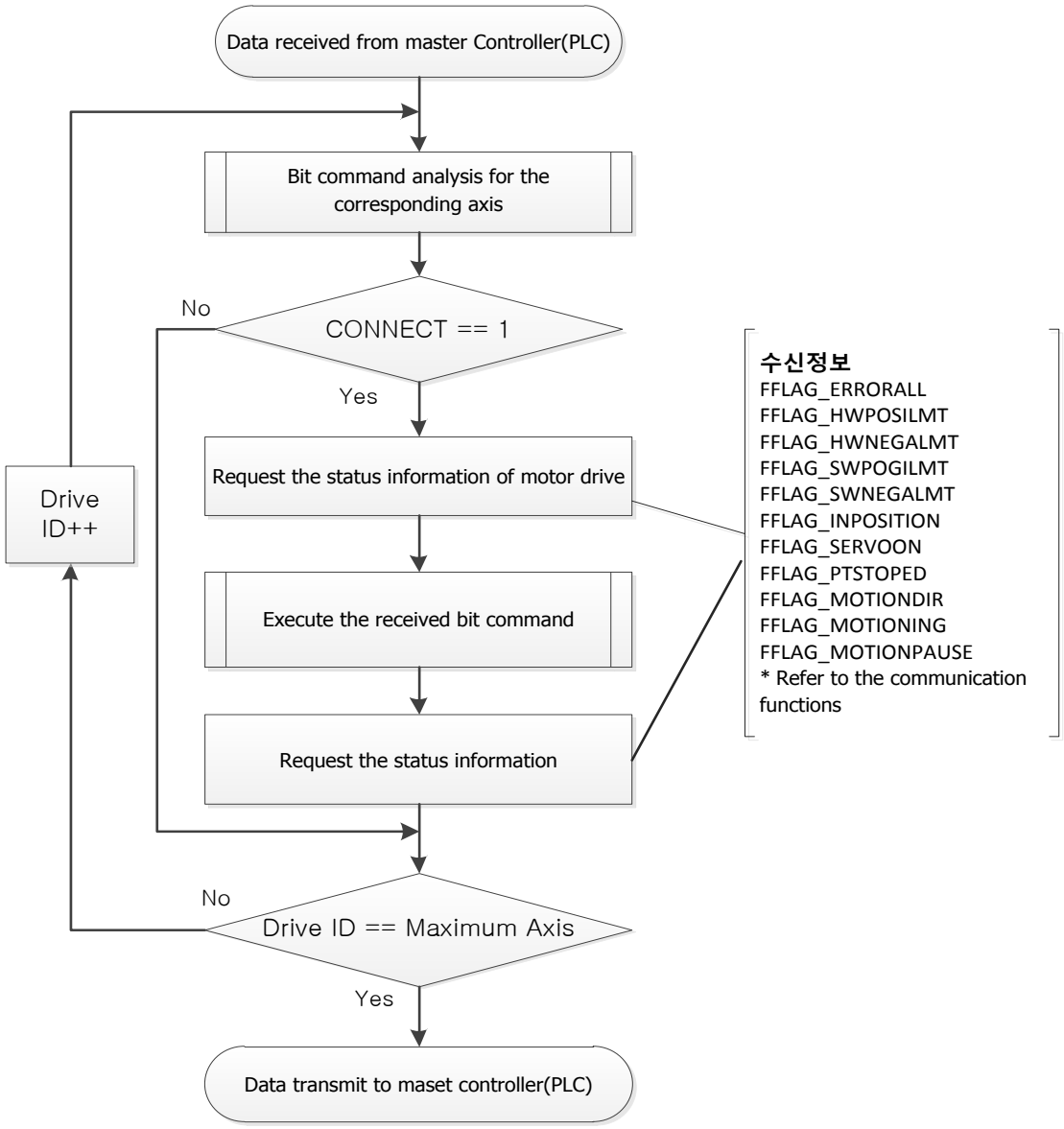
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								CONNECTED 1
Byte 1..7	...							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.

Flow chart 2 is the Process of MotionGate for all MotionGate axes. Whether to execute of bit command for the corresponding axis will be decided by setting the CONNECT bit. Therefore, if CONNECT bit is set as '0', MotionGate will process the bit command of the next motor axis instead of the bit command of the corresponding one. Therefore, the CONNECT bit of Input-Map of the axes not in use can be set as '0' to improve the processing speed of all MotionGate axes.

Flow chart 2. The sequence of MotionGate depending on the set-up of CONNECT bit



2.2.2 Activation of SERVO drive

ENABLE of Input-Map is the bit that can change the motor status of axis consisted of SERVO motors to the motion controllable status. This bit can be used in motion and set-up mode, and the response bit for the command is FLAG_ENABLE bit in data receiving section. FLAG_ENABLE bit can be maintained continuously depending on the status of the corresponding axis.

Input-Map: ENABLE [0.1]
Output-Map: FLAG_ENABLE [0.1]

- This can be controlled in motor motion command and setting command mode.
- If the corresponsing axis is SERVO drive - Servo ON/OFF (1: ON, 0: OFF).
- This bit must be set as '1' for the sake of motion control of motors. If set as '0', since Servo will be maintained in OFF status, motion will not be executed.
- This is not the bit to be used in case corresponding axis is in STEP drive.
- STEP drive cannot be activated using ENABLE bit.

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0							ENABLE 0->1	**1**
Byte 1..7	...							

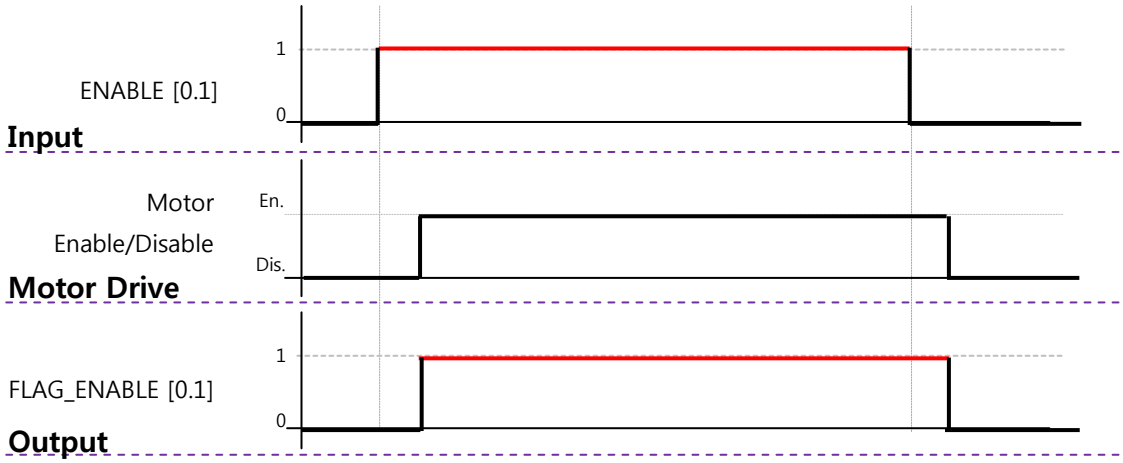
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0							FLAG_ENABLE 0->1	**1**
Byte 1..7								

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.

Motor activation command will be started by Positive edge command as shown in the picture using ENABLE bit command of Input-Map. In this situation, FLAG_ENABLE bit of Output will respond as the motor activated status value. MotionGate will command motor inactivation to the corresponding axis.

Therefore, ENABLE bit must be set as '1' in motor motion command.



2.2.3 Emergency stop command

Emergency stop command of motor drive will be executed by nESTOP bit of Input-Map. This bit will be operated when it is cleared to '0'. The response bit of this operation command will be set as 1 after the emergency stop command is executed using nESTOP bit as the ESTOP_RESP bit of Output-Map and this operation command will be cleared to 0 when ESTOP bit is set as 1.

Input-Map: nESTOP [0.2]
Output-Map: ESTOP_RESP [0.2] (Loopback)

- This can be controlled from motor motion and setting command mode.
- SERVO drive will be changed to Servo OFF when emergency stop command is executed.
- Emergency stop command will be executed when it is set as '0'. Also, motor activation command will not be executed when nESTOP bit is '0'. Motion control command can be executed when ENABLE bit is changed from '0' to '1' after emergency stop command is executed.

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0						nESTOP 1->0	**1**	**1**
Byte 1..7	...							

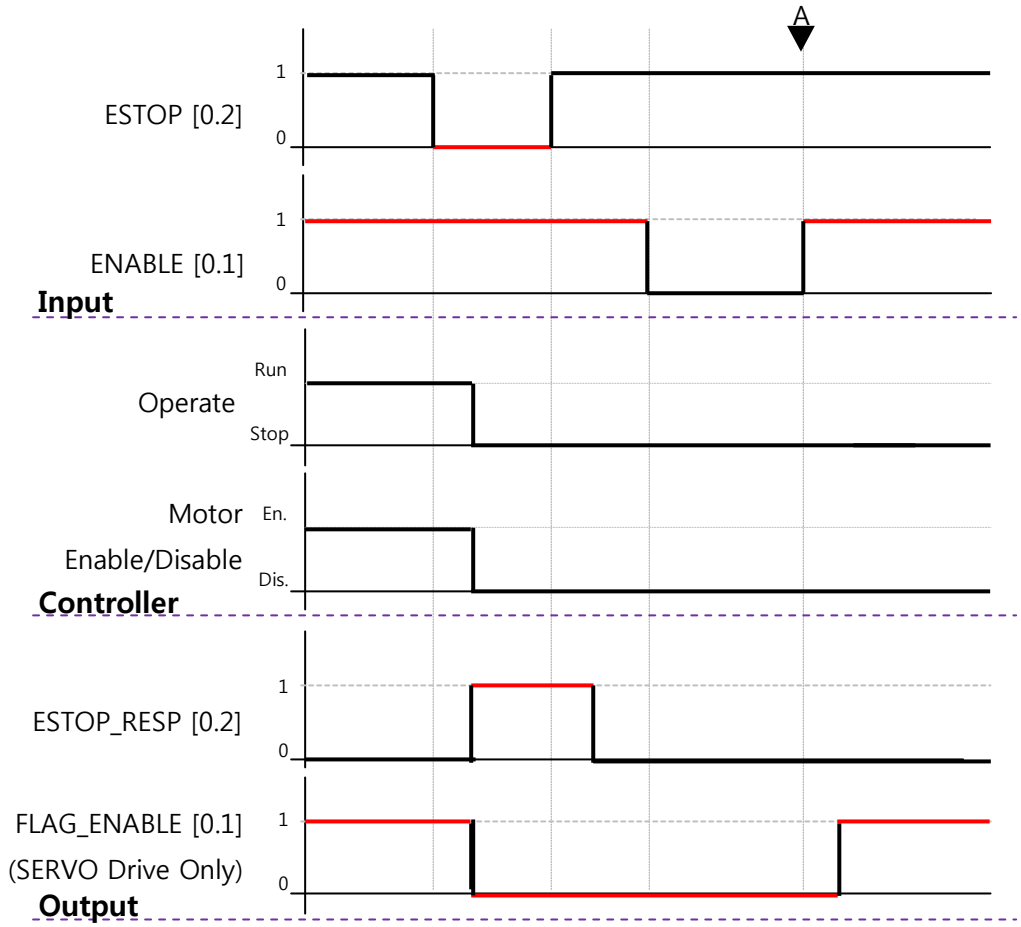
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0						ESTOP_ RESP 0->1	FLAG_ ENABLE 1->0	**1**
Byte 1..7	...							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: Connected motor will be changed to Servo OFF automatically.

Emergency stop command is started as Negative edge command using nESTOP bit of Input-Map as shown below, and the data will be sent using Output-Map for this. Once emergency stop command is executed, ESTOP_RESP bit will be loop-backed and the ENABLE command will be released and the FLAG_ENABLE bit of SERVO Drive will become '0'.

Motors can be activated using ENABLE Positive edge command during emergency stop.



2.2.4 Alarm reset command and STEP Motor Free status

The alarm status of each axis can be identified by the ALARM/ERROR bit status. Generated Alarm Reset command can be executed by setting the ALARM_RESET bit of Input-Map as '1'. Once the generated alarm is reset, ALARM/ERROR bit will become '0'.

Also, this command in STEP Drive can be used as a command to convert the status to Motor-Free. This bit can be used in both of motion and set-up mode.

Input-Map: ALARM_RESET [0.3]
Output-Map: ALARM/ERROR [0.3] (Status flag)

- This can be controlled from motor motion command mode and setting command mode.
- ALARM_ERROR bit of Output-Map will be set as '1' when alarm or error is generated.
- If alarm is reset using ALARM_RESET bit, FLAG_ENABLE and !MOTOR_FREE bit will become 0 by changing the SERVO drive of corresponding axis to Servo OFF and STEP drive to Motor Free.

Input-Map

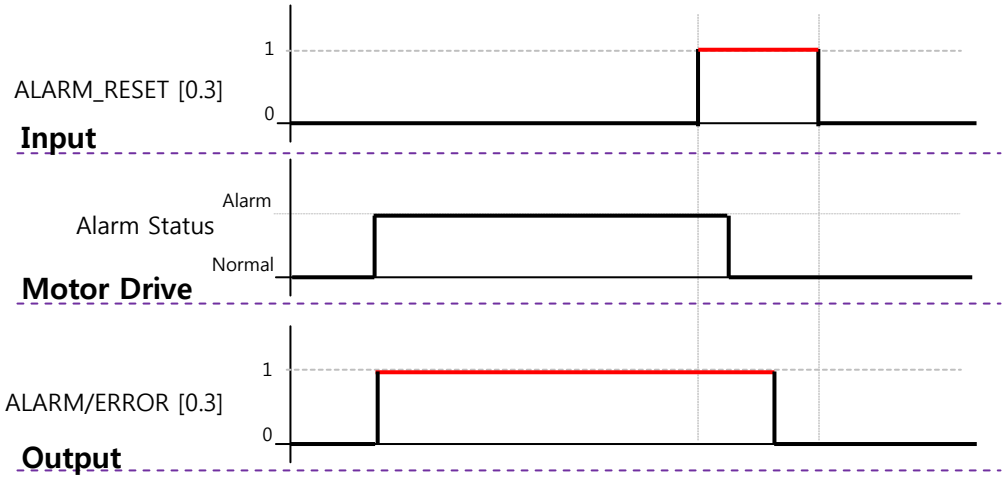
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0					ALARM_RESET MOTOR_FREE 0->1			**1**
Byte 1..7	…							

Output-Map

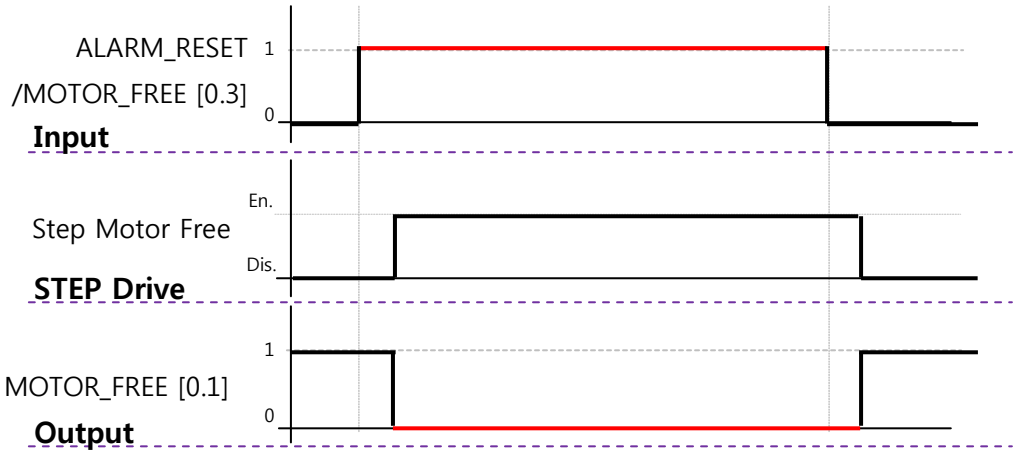
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0					ALARM /ERROR Status Flag		FLAG_ENABLE !MOTOR_FREE 1->0	**1**
Byte 1..7	…							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: Connected motor will be changed to Servo OFF or Motor Free status automatically.

Once alarm is generated from motor drive, ALARM/ERROR of Output-Map bit status will be set as '1' as below picture. Alarm reset command should be maintained as '1' until ALARM/ERROR bit of Output-Map is cleared to '0'



In order to keep the motor of STEP drive in Motor-Free status, MOTOR-FREE bit of Input-Map should be maintained as '1'. Motor of STEP drive will be in Motor-Free status as long as this bit is maintained as '1'.



2.2.5 Stop command (CANCEL)

CANCEL bit of Input-Map is the cancel command of motion or operation of corresponding axis. MOTIONING bit of Output-Map which was set as '1' during the motion of this bit will be changed to '0' by the stop command. Also, release of HOLD and cancel of PT drive will be executed using stop command.

Input-Map: CANCEL [2.0]
Output-Map: MOTIONNIG [2.0] (Status flag)

Input-Map

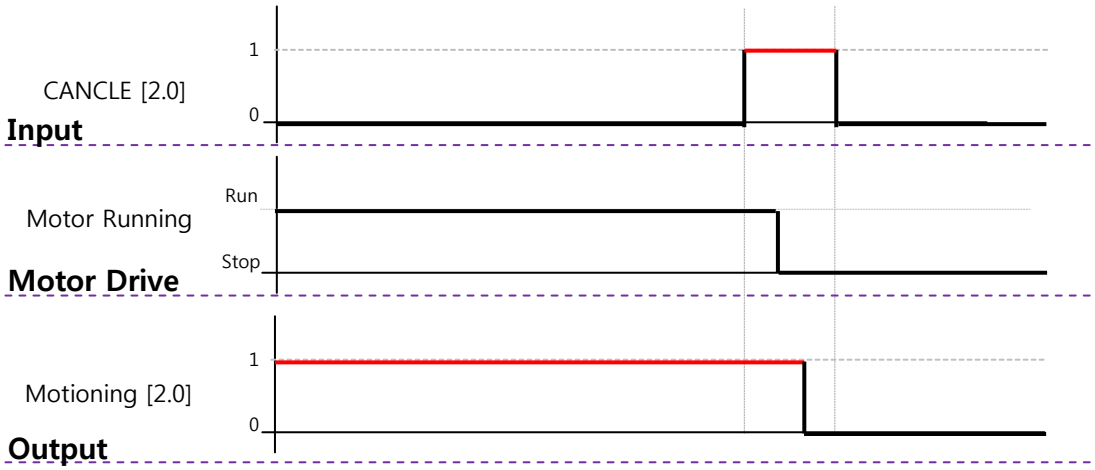
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	0					1	1	1
Byte 1								
Byte 2								CANCEL 0->1
Byte 3								
Byte 4...7	Data area (32bit data)							

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	0						1	1
Byte 1								
Byte 2								MOTIONING 1->0
Byte 3								
Byte 4...7	Data area (32bit data)							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.

In order for motion stop or cancel of MotionGate command, set the CANCEL bit of Input-Map as '1' as shown below. CANCEL bit should be maintained as '1' until the MOTIONNING bit of Output-Map is cleared to '0' for the stop command during the motors are being operated.



2.2.6 Hold command (HOLD)

HOLD bit of Input-Map is the command to pause the corresponding axis. Once the motion is in pause status, HOLD_RESP bit of Output-Map will be set as '1' and this is the flag bit of the HOLD bit corresponding axis.

Input-Map: HOLD [2.1]
Output-Map: HOLD_RESP [2.1] (Status flag)

Input-Map

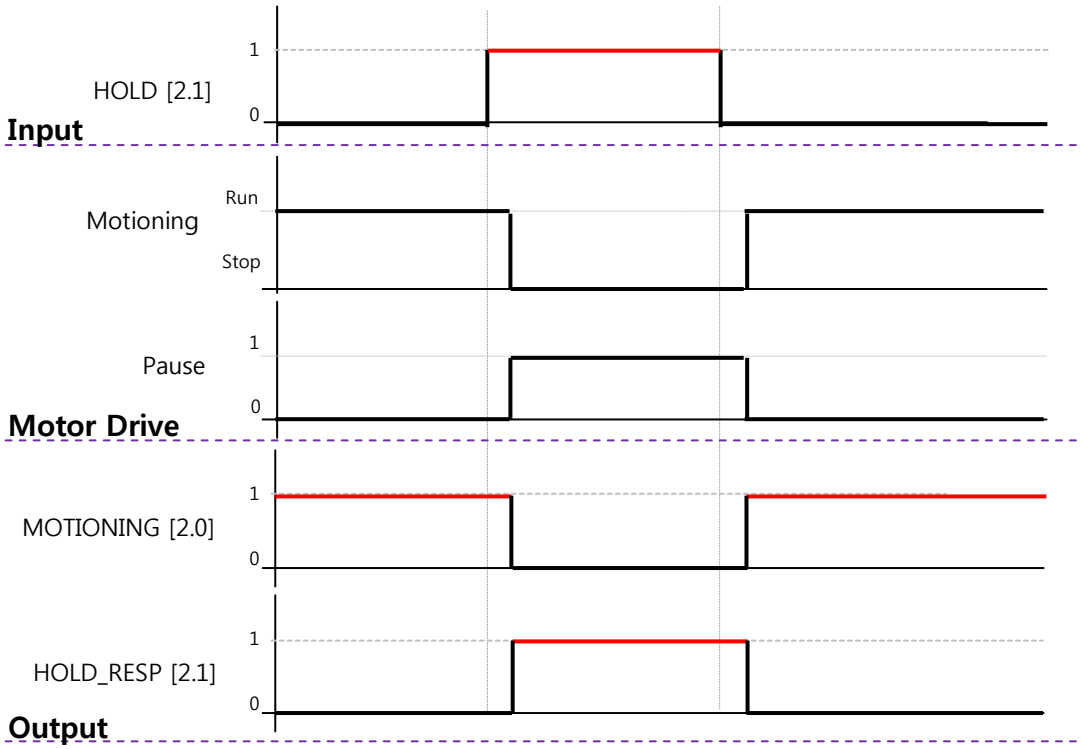
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**					**1**	**1**	**1**
Byte 1								
Byte 2							HOLD 0->1	CANCEL 0->1
Byte 3								
Byte 4...7	Word Data area (32bit data)							

Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**						**1**	**1**
Byte 1								
Byte 2							HOLD_RESP. 0->1	MOTIONING Status Flag
Byte 3								
Byte 4...7	Word Data area (32bit data)							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be changed to '0' from '1' as the motor is paused in driving status.

Motion hold command is controlled by Positive edge command of HOLD bit of Input-Map as shown below. In order to keep the hold of motion, HOLD bit should be maintained as '1' and this hold status will be released at the Negative edge when cleared to '0'.



2.3 Selection of types of motion control (Motion Command Code)

Selection of motion types can be controlled using MOV_CMD_CODE area from motion control mode. Bit command of Input-Map can be loop-backed using MOV_CMD_COD_RESP area of Output-Map.

Input-Map: MOV_CMD_CODE [1.0]-[1.3]
Output-Map: AXIS_ MOV_CMD_CODE_RESP [1.0]-[1.3] (Loopback)

Command code [DEC]	Command code [BIN]	Type	Function
0	0000b	General Motion	Jog drive, Step move, Zero position move
1	0001b	Position Move	Relative position move, Absolute position move
2, 3	0010b-0011b	-	-
4	0100b	PT Drive	General PT Drive, Single PT Drive
5, 6	0101b-0110b	-	-
7	0111b	Original point move	Original point move
8-15	1001b-1111b	-	-

2.4 Selection of set-up command (Setting Command Code)

Selection of set-up command can be selected by CMD_CODE area in set-up mode. Bit command of Input-Map can be loop-backed using CMD_COD_RESP area of Output-Map.

Input-Map: CMD_CODE [1.0]-[1.3]
Output-Map: CMD_CODE_RESP [1.0]-[1.3] (Loopback)

Command code [DEC]	Command code [BIN]	Type	Function
0~4	0000b-0100	-	-
5	0101b	Version information check	Version check
6, 7	0110b-0111b	-	-
8	1000b	Read Parameter	Request of RAM area parameter
9	1001b	Write Parameter	Save the parameter at RAM area
10	1010b	Set Current Position	Designate the current position value
11	1011b		
12	1100b	Read Alarm History	Verify the alarm history
13	1101b	Reset Alarm History	Reset the alarm history
14	1110b	Save Parameters	Save the parameter at RAM area
15	1111b	-	-

2.5 Set-up of response data (Response Type)

Information of corresponding axis is RESPONSE_TYPE of Input-Map and the receiving information to Output-Map can be selected. During the receipt of information, it will be loop-backed to RESPONSE_TYPE_RESP of Output-Map and the data type received to the word area of Output-Map can be identified.

Input-Map: RESPONSE_TYPE [1.4]-[1.7]
Output-Map: RESPONSE_TYPE_RESP [1.4]-[1.7] (Loopback)

- Response data set-up is available only in motion control mode.
- The value of RESPONSE_TYPE in setting mode should be set as '0'.

Command code [DEC]	Command code [BIN]	Type	Function
0	0000b	No Info.	No information is requested
1	0001b	Command Position	Requested Position command (pulse output count).
2	0010b	Actual Position	Request the current position
3	0011b	Position Error	Request the difference between current position and position command
4	0100b	Actual Velocity	Request the actual speed of the currently operating motor
5	0101b	Current PT No.	Request the currently operating PT number
6, 7	0110b-0111b	-	-
8	1000b	Current Alarm No.	Request the currently generated alarm code
9 - 15	1001-1111	-	-

Refer to the alarm types for the requested alarm code. (refer *9.1)

2.6 Selection of set-up command (Setting Command Code)

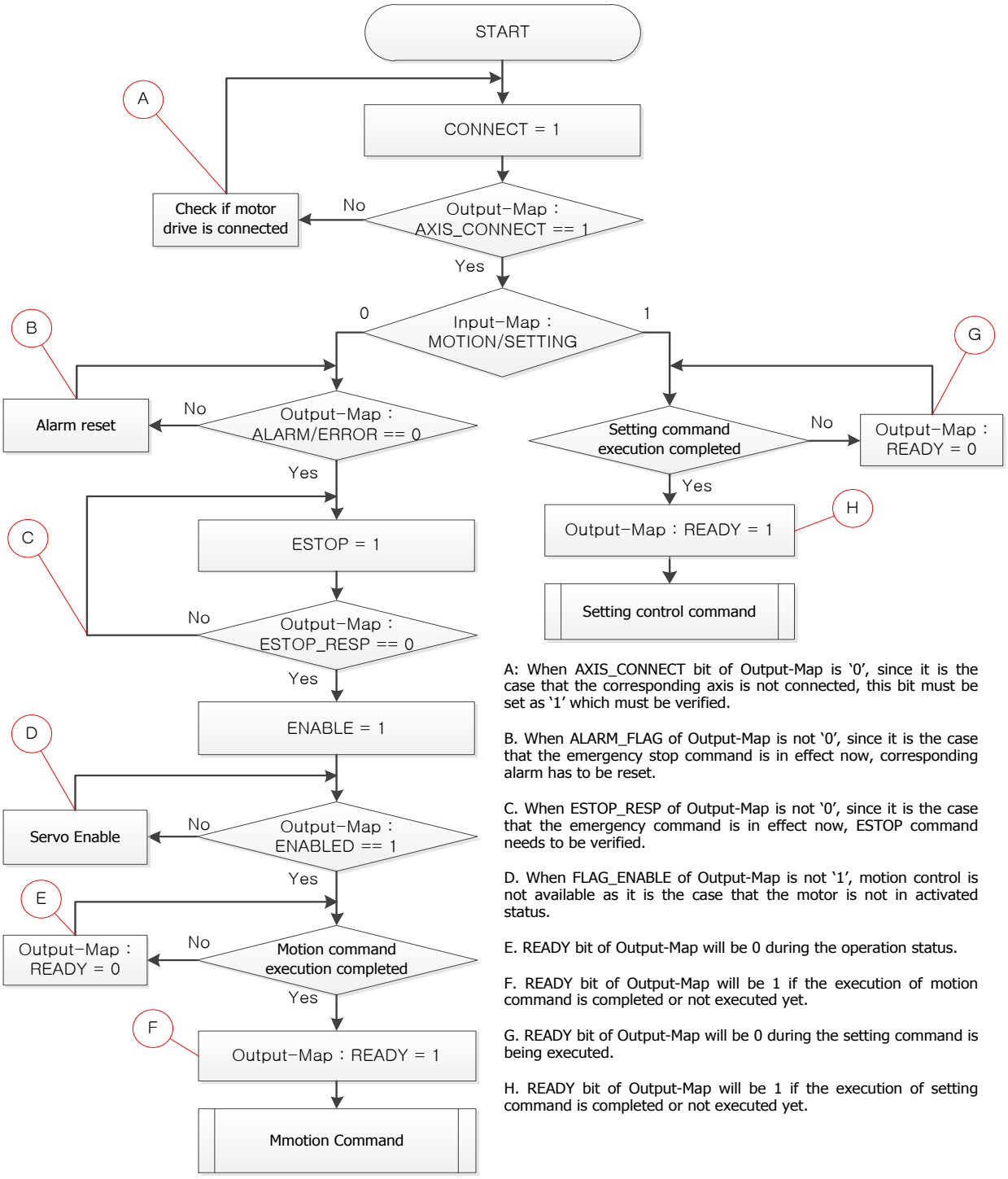
Status flag of motor drive that is connected to each of the axis can be identified using Output-Map of motion control mode status.

Status flag bit name	Status value	Contents
FLAG_ENABLE	1	Motor is in activation mode.
ALARM/ERROR	1	One or more than one error(s) is/are occurred.
READY	1	MotionGate is available for motion or setting control command for the corresponding axis.
MOTIONING	1	Motor is in operation.
HOLD_RESP.	1	Motor is in general stop status.
PT_RUN	1	Position table is in operation status.
MOV_DIR	0, 1	Operation direction of motor (+ direction: 0, - direction: 1)
INP	1	In position operation is in finished status.
ORIGIN SENSOR	1	Original point sensor is in ON status.
S/W -Limit	1	When – direction program limit is exceeded
S/W +Limit	1	When + direction program limit is exceeded
H/W -Limit	1	When – direction limit sensor is turned ON
H/W +Limit	1	When + direction limit sensor is turned ON

2.7 Command status bit (READY)

Motion control command or setting control command will be applied when READY bit of Output-Map is '1'. The condition of READY bit to become '1' would be as follows.

Flow chart 3. Processing sequence of MotionGate depending on the set-up of CONNECT bit.



A: When AXIS_CONNECT bit of Output-Map is '0', since it is the case that the corresponding axis is not connected, this bit must be set as '1' which must be verified.

B. When ALARM_FLAG of Output-Map is not '0', since it is the case that the emergency stop command is in effect now, corresponding alarm has to be reset.

C. When ESTOP_RESP of Output-Map is not '0', since it is the case that the emergency command is in effect now, ESTOP command needs to be verified.

D. When FLAG_ENABLE of Output-Map is not '1', motion control is not available as it is the case that the motor is not in activated status.

E. READY bit of Output-Map will be 0 during the operation status.

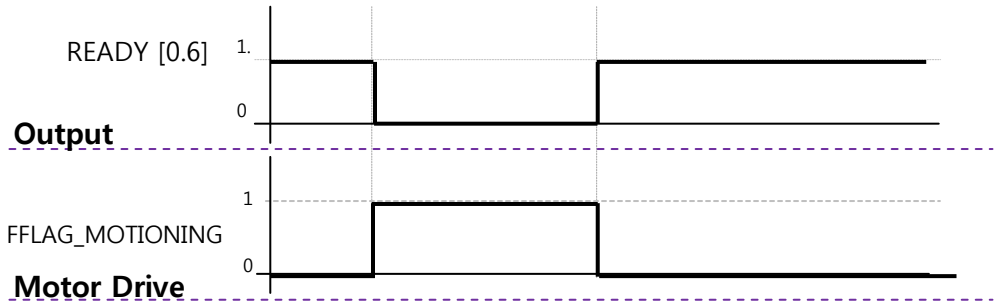
F. READY bit of Output-Map will be 1 if the execution of motion command is completed or not executed yet.

G. READY bit of Output-Map will be 0 during the setting command is being executed.

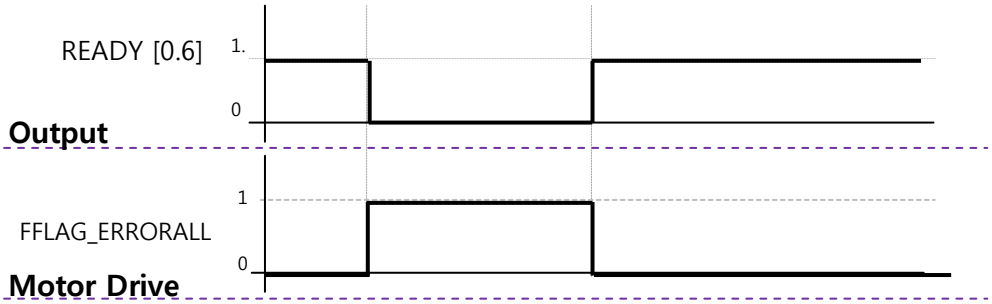
H. READY bit of Output-Map will be 1 if the execution of setting command is completed or not executed yet.

READY bit is converted state depending on the motion state or command processing conditions of MOTIONGATE.

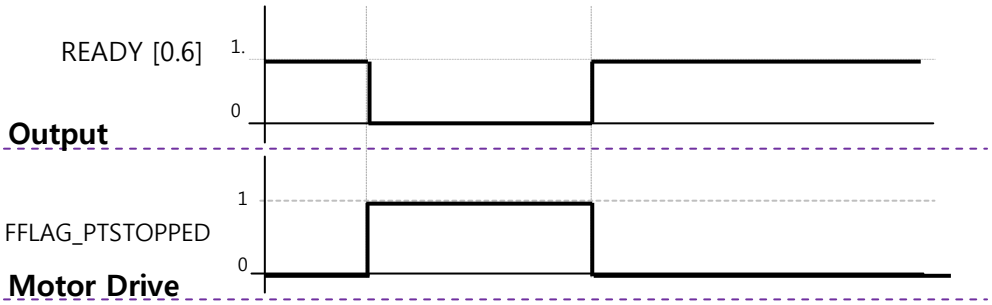
① If the axis is not in motion state



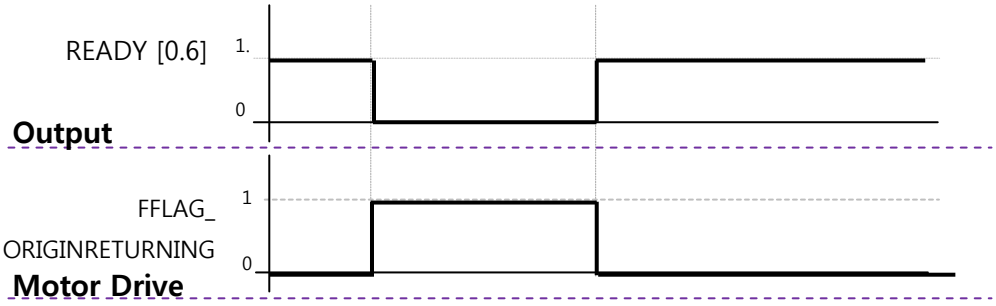
② If the axis is not in error state or Alarm state,



③ If the axis is not in PT RUN state

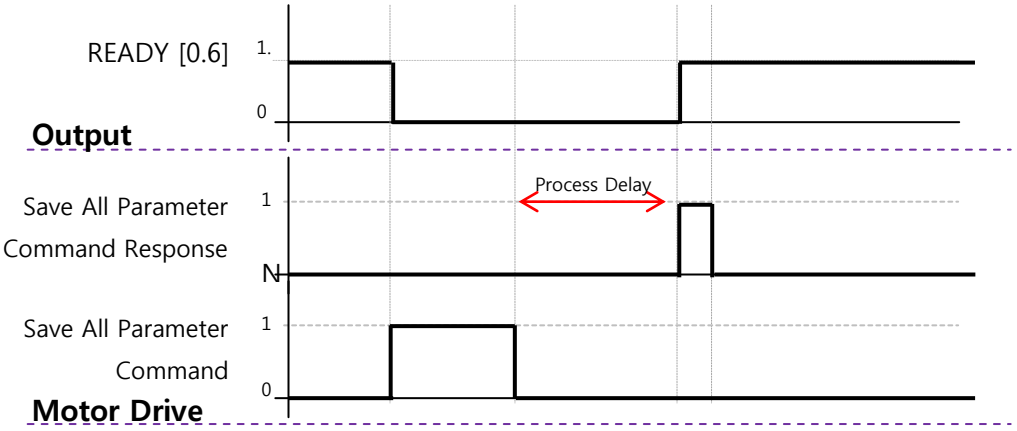


④ If the axis is not in Origin Returning state



⑤ If the axis is not in motion pause state

⑥ If complete the data saving in the EEPROM area by the parameter storage command



NOTE 1: Please refer to the 'Status FLAG' section of "User Manual Communication Function" to find the information of status FLAG of drive..

NOTE 2: READY bit is set to '1' without ENABLE command in the case of Ezi-STEP series. However, if ALARM RESET bit is '1', it becomes MOTOR FREE STATUS so, unable to operate. Therefore READY bit is cleared to '0'

3 . Motion control

3.1 Jog drive (Jog Move)

Jog drive means the drive that the user operates the motor with the given speed by his/her own discretion. This drive uses JOG_MOV bit and can be classified as normal (-JOG_MOV) and reverse direction drive (+JOG_MOV). Jog drive command is loop-backed to JOG_RESP of Output-Map.

Jog drive type can be selected by using SPD_MODE [3.2] of Input-Map during Jog drive. Word data value will be used as the speed value during the Jog drive when SPD_MODE is 1, and the speed value will be decided depending on the parameter set-up value of MotionGate when SPD_MODE is 0.

It is possible to run the 'Speed Override' command without stopping the operation state of jog operation, to apply the new speed value..

Input-Map: -JOG_MOV [2.4], +JOG_MOV [2.5], SPD_MODE [3.2]

Output-Map: JOG_RESP [2.5] (Loopback bit)

- There are 4 speeds in Speed Step mode and they can be selected using 0~3 of word data.
- The speed of Speed Step mode is MotionGate parameter Pn#100~103.
- Speed Step mode will be applied when MotionGate parameter Pn#104 『Use Jog Speed Ratio』 is '0'.
- Speed Rate will be used by entering 1~255 ([%] unit) to word data.
- Standard speed of Speed Rate mode will be MotionGate parameter Pn#105 『Move Speed for Jog Move: Ratio』.
- Speed Ratio mode will be applied when MotionGate parameter Pn#104 『Use Jog Speed Ratio』 is '1'.
- Speed Value mode will be used by entering the actual motor driving speed in word data.
- Out_Range bit of Output-Map will be set as '1' if the data entered in the data area is not suitable for the Jog driving method.

3.1.1 Jog drive parameter

List of Jog drive parameter

Parameter No.	Parameter Name	Setting range	Unit	Shipment value	Contents
MotionGate parameter					
Pn#100	Speed Step 0 for Jog Move	1 to 10,000,000	pps	100	Speed value save
Pn#101	Speed Step 1 for Jog Move	1 to 10,000,000	pps	1,000	
Pn#102	Speed Step 2 for Jog Move	1 to 10,000,000	pps	10,000	
Pn#103	Speed Step 3 for Jog Move	1 to 10,000,000	pps	100,000	
Pn#104	Use Jog Speed Ratio	0, 1		0	0: Use Speed Step 1: Use of speed ratio
Pn#105	Move Speed for Jog Move: Ratio	1 to 10,000,000	pps	100,000	Standard speed value of Jog drive
Motor drive parameter					
Pn#A00	Pulse Per Revolution	0 to 9 0 to 15*)		9 10*)	* Ezi-STEP Plus-R will be applied when outside encoder is existed.
Pn#A01	Axis Max Speed	1 to 500,000	pps	500,000	Driving speed after acceleration
Pn#A02	Axis Start Speed	1 to 35,000	pps	1	Start driving speed before acceleration.
Pn#A03	Axis Acc Time	1 to 9,999	msec	100	Acceleration time
Pn#A04	Axis Dec Time	1 to 9,999	msec	100	Deceleration time
Pn#A05	Speed Override	1 to 500	%	100	Ratio of Motor drive speed
Pn#A07	Jog Start Speed	1 to 35,000	pps	1	Parameter of motor drive
Pn#A08	Jog Acc Dec Time	1 to 9,999	msec	100	Parameter of motor drive
Pn#A1C	Motion Dir	0 , 1		0	Selection of driving direction (CW, CCW)

3.1.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**				**0**	**1**	**1**	**1**
Byte 1					MOV_CMD_CODE **0000b**			
Byte 2			+ Jog MOV 0->1	- Jog MOV 0->1			HOLD	CANCEL
Byte 3						SPD MODE 0->1		
Byte 4...7	**Speed Step No., Speed ratio (1~255) value, Drive speed value (1~500000)**							

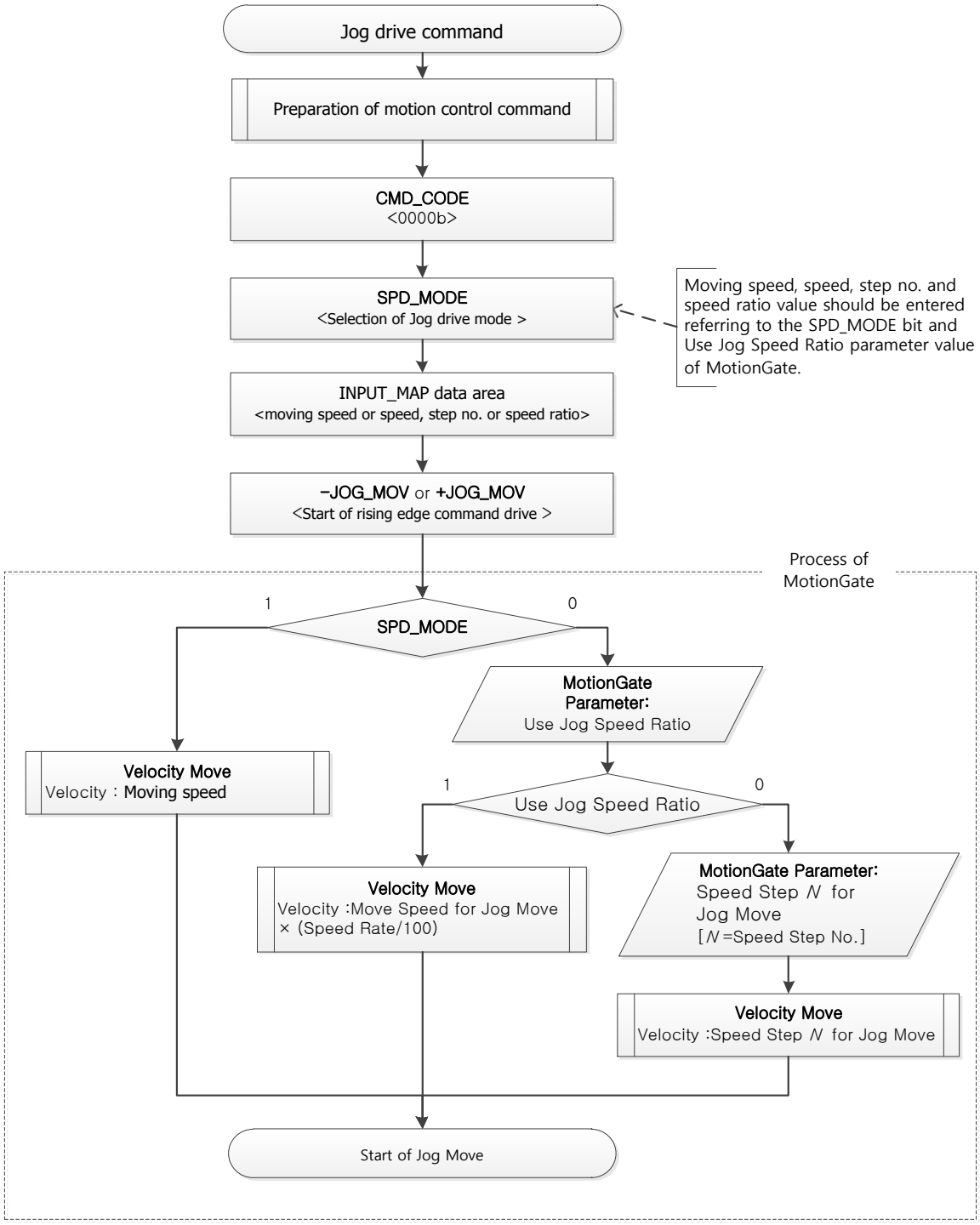
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**						**1**	**1**
Byte 1					MOV_CMD_CODE_RESP **0000b**			
Byte 2			JOG_RESP 0->1					MOTIONING Status Flag
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUN
Byte 4...7	**RESOPNSE Data (32bit data)**							

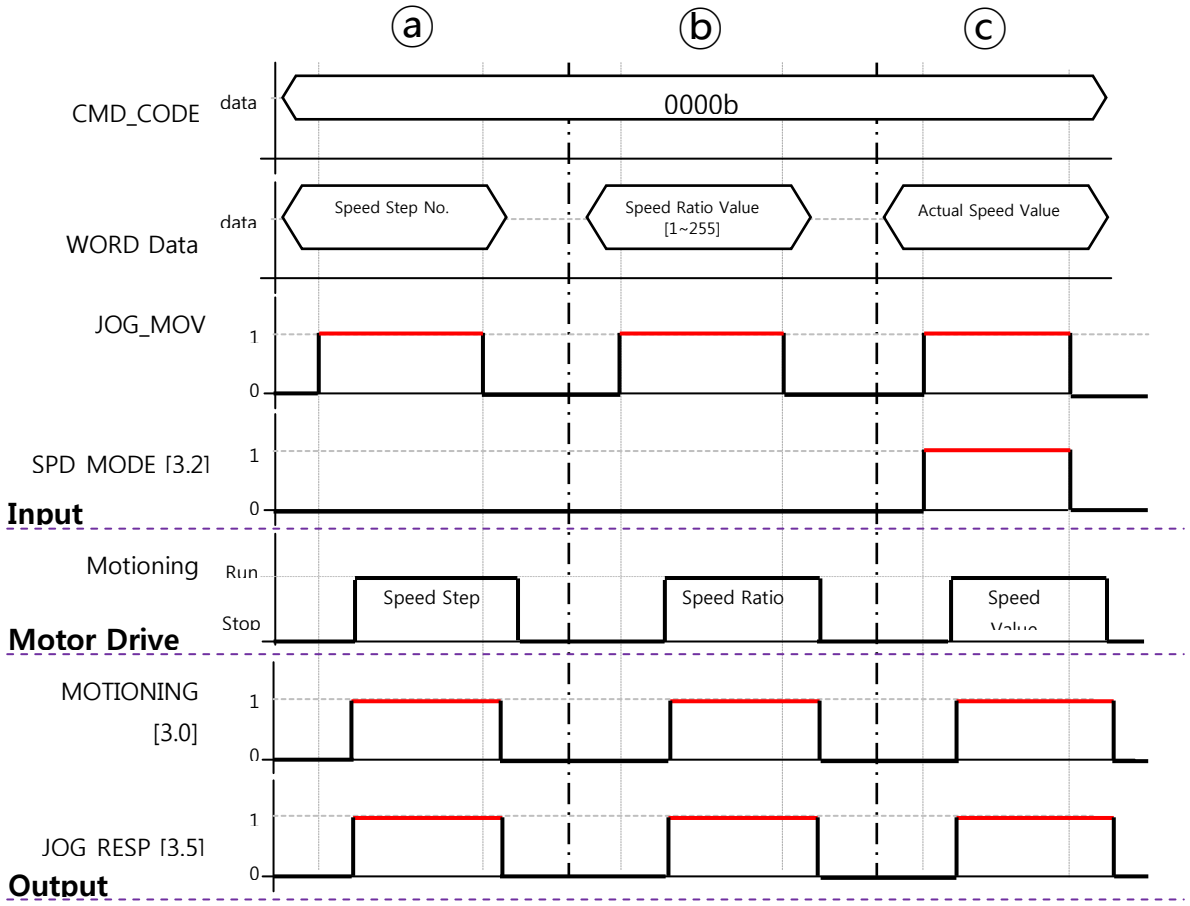
NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.

3.1.3 Command sequence and operation condition

Flow chart 4. Processing sequence for the command execution of Jog drive



3.1.4 Timing chart



Jog drive is the motion that starts at the Positive edge and stops at the Negative edge of JOG_MOV bit. In order to execute this motion, moving speed value will be required.

Section ⓐ is the Jog drive command in the Speed Step mode. The MotionGate parameter speed value which was saved when the SPD_MODE bit of Input-Map is 0 and MotionGate parameter PN#104 『Use Jog Speed Ratio』 is 0 will be used for driving (in case word data area in shipment condition is 0, motor will drive in 100 [pps] of speed when jog drive is executed).

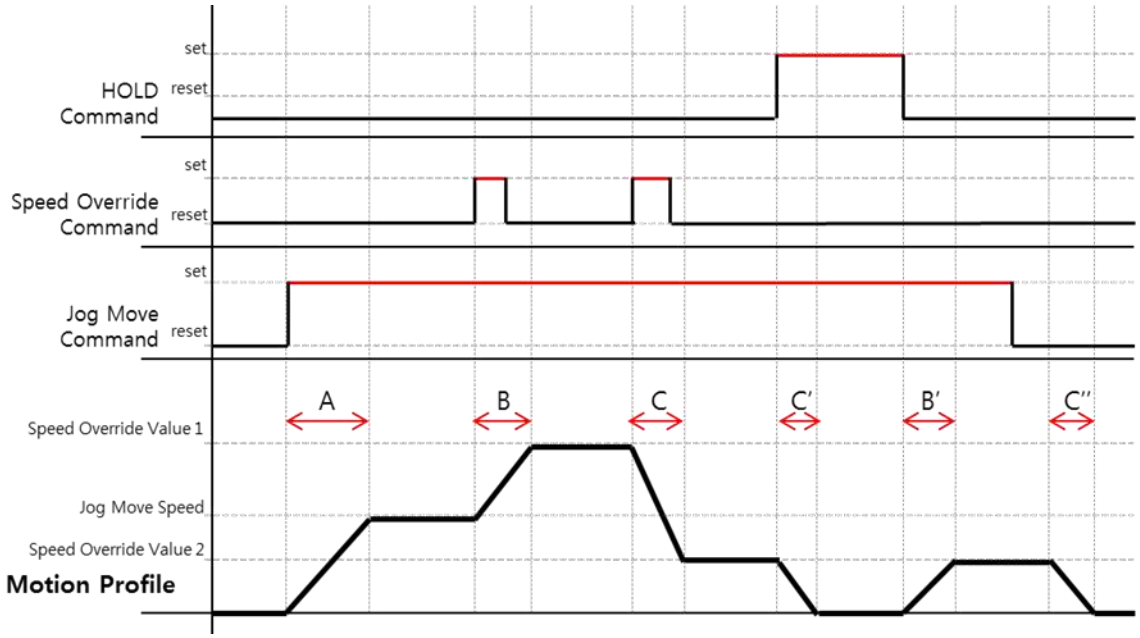
Section ⓑ is the Jog drive command in Speed Rate mode. It will drive in the speed value that the word data area value is displayed as PN#105 『Move Speed for Jog Move: Ratio』 when SPD_MODE bit of Input-Map is 0 and MotionGate parameter PN#104 『Use Jog Speed Ratio』 is 1.

Section ⓒ is the Jog drive command in Speed Value mode. This is the command that drives with the word data as the data speed value when SPD_MODE bit of Input-Map is '1'.

3.1.5 Speed Override

Speed Override command is used to change the value of the jog speed of jog operation. This command is possible to change the value between jog operation modes.

▶ Motion profile for Speed Override Command



A In the 'A' section, operation is started. The value of the parameter 『Pn#A08 Jog Acc Dec Time』 is applied to start operation..

B In the 'B' section, run the 'Speed Override' command by value '1' of Speed Override, so speed will increase. At this time, the value of Pn#A03 『Axis Acc Time』 parameter is applied to the acceleration time..

C In the 'C' section, run the 'Speed Override' command by value '2' of Speed Override, so speed will decrease. At this time, the value of Pn#A04 『Axis Dec Time』 parameter is applied to the acceleration time.

C′ In the C' section, operation is stopped by pause command. The value of Pn#A04 『Axis Dec Time』 parameter is applied to deceleration time..

B′ In the B' section, operation is restarted by 'pause off' command. The value of Pn#A03 『Axis Acc Time』 parameter is applied to acceleration time..

C″ In the C'' section, operation is stopped by Stop command for Jog operation. The value of Pn#A04 『Axis Dec Time』 parameter is applied to deceleration time.

3.2 Step drive (STEP Move)

Step move is the motion that moves to the defined position with one pulse input. MotionGate can save and manage up to 4 step move distances simultaneously. Motion uses STEP_MOV bit, classified regular move (+STEP_MOV) and reverse direction move (-STEP_MOV). Two bit command of Input-Map can be loop-backed to STEP_RESP bit of Output-Map

Input-Map: -STEP_MOV [2.6], +STEP_MOV [2.7]

Output-Map: STEP_RESP [2.7] (Loopback bit)

- 4 position information of Step Distance can be managed by Pn#200~Pn#203『Step Distance n』parameter.
- Step move will be executed by entering the range in Input-Map Data area with 0~3 of n range of『Step Distance n』.
- MotionGate parameter Pn#204『Move Speed for Step Move』value will be applied on the step move speed.
- Out_Range bit of Output-Map will be set as '1' if the data entered into the Data area is not the values fit to the ranger of Step Distance number.

3.2.1 Step drive parameter

List of Step move parameter

Parameter number	Parameter name	Set-up range	Unit	Shipment value	Contents
MotionGate Parameter					
Pn#200	Step Distance 0	0 to 99,999,999	pulse	1	1 Step Moving distance
Pn#201	Step Distance 1	0 to 99,999,999	pulse	10	
Pn#202	Step Distance 2	0 to 99,999,999	pulse	100	
Pn#203	Step Distance 3	0 to 99,999,999	pulse	1000	
Pn#204	Move Speed for Step Move	1 to 10,000,000	pps	10,000	Step moving speed
Motor drive parameter					
Pn#A00	Pulse Per Revolution	0 to 9 0 to 15(*		9 10	*) Ezi-STEP Plus-R will be applied when outside encoder is existed.
Pn#A01	Axis Max Speed	1 to 500,000	pps	500,000	Driving speed after acceleration
Pn#A02	Axis Start Speed	1 to 35,000	pps	1	Start driving speed before acceleration.
Pn#A03	Axis Acc Time	1 to 9,999	msec	100	Acceleration time
Pn#A04	Axis Dec Time	1 to 9,999	msec	100	Deceleration time
Pn#A05	Speed Override	1 to 500	%	100	Ratio of Motor drive speed
Pn#A1C	Motion Dir	0 , 1		0	Selection of driving direction (CW, CCW)

3.2.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD START	**0**	**1**	**1**	**1**
Byte 1	RESPONSE TYPE				MOV_CMD_CODE **0000b**			
Byte 2	+STEP MOV 0->1	- STEP MOV 0->1					HOLD	CANCEL
Byte 3								
Byte 4...7	**STEP Distance No.**							

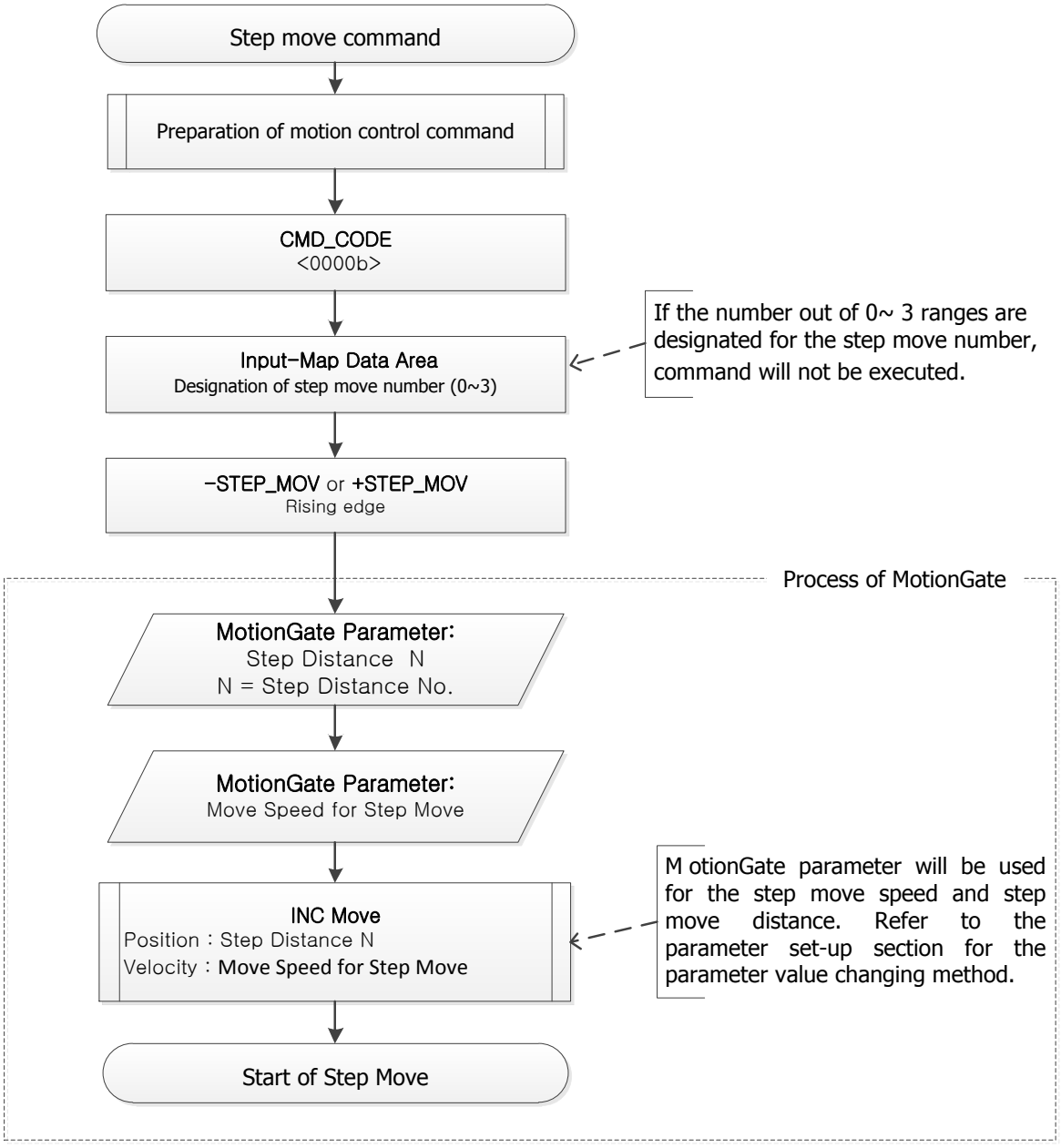
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**						**1**	**1**
Byte 1					MOV_CMD_CODE_RESP **0000b**			
Byte 2	STEP_RESP . 0->1							MOTIONING Status Flag
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUN
Byte 4...7	**RESOPNSE Data (32bit data)**							

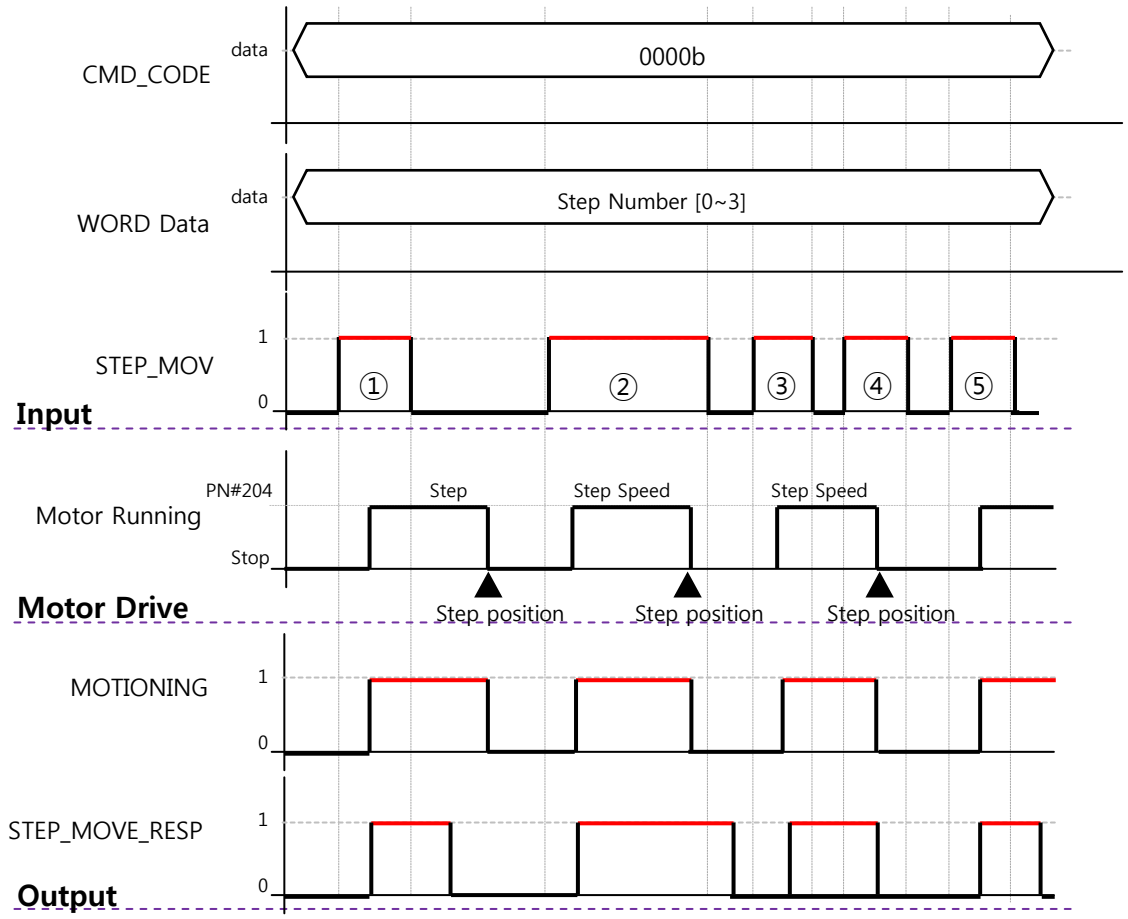
NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.

3.2.3 Command sequence and Operation condition

Flow chart 5. Processing sequence for the command execution of step drive



3.2.4 Timing chart



Execution of step move command will be executed by one command as ① of STEP_MOV bit.

If the command is entered continuously as ②, step move will be executed once and STEP_MOVE_RESP bit will send '1' during this continuous input.

Input command ④ will be ignored while step move is being executed with command ③. Also it will be operated only by the command ⑤ which is the command after the step move is completed and the Loopback bit for the normally operated ③ and ⑤ command will be sent.

3.3 Zero position move (Go Zero Position)

Zero position move is the motion that moves to the absolute position 0 [pulse] of motor drive. This command uses GO_ZERO_POS bit of Input-Map and the moving speed will be decided by the parameter 『Origin Speed』 value of motor drive when moving to the zero position. Once command is executed, response for the zero position move command will be sent using Go_ZERO_POS_RESP bit of Output-Map.

Input-Map: GO_ZERO_POS [2.3]

Output-Map: GO_ZERO_POS_RESP [2.3] (command response bit)

3.3.1 Zero position move parameter

List of Zero position move drive parameter

Parameter number	Parameter name	Set-up range	Unit	Shipment value	Contents
Motor drive parameter					
Pn#A00	Pulse Per Revolution	0 to 9 0 to 15(*		9 10(*	*) STEP drive will be applied when outside encoder is existed..
Pn#A01	Axis Max Speed	1 to 500,000	pps	500,000	Driving speed after acceleration
Pn#A02	Axis Start Speed	1 to 35,000	pps	1	Start driving speed before acceleration.
Pn#A03	Axis Acc Time	1 to 9,999	msec	100	Acceleration time
Pn#A04	Axis Dec Time	1 to 9,999	msec	100	Deceleration time
Pn#A05	Speed Override	1 to 500	%	100	Ratio of Motor drive speed
Pn#A11	Org Speed	1 to 500,000	pps	50,000	Parameter of motor drive
Pn#A1C	Motion Dir	0 , 1		0	Parameter of motor drive

3.3.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**				**0**	**1**	**1**	**1**
Byte 1					MOV_CMD_CODE 0000b			
Byte 2					GO_ZERO POS 0->1		HOLD	CANCEL
Byte 3								
Byte 4...7	**0**							

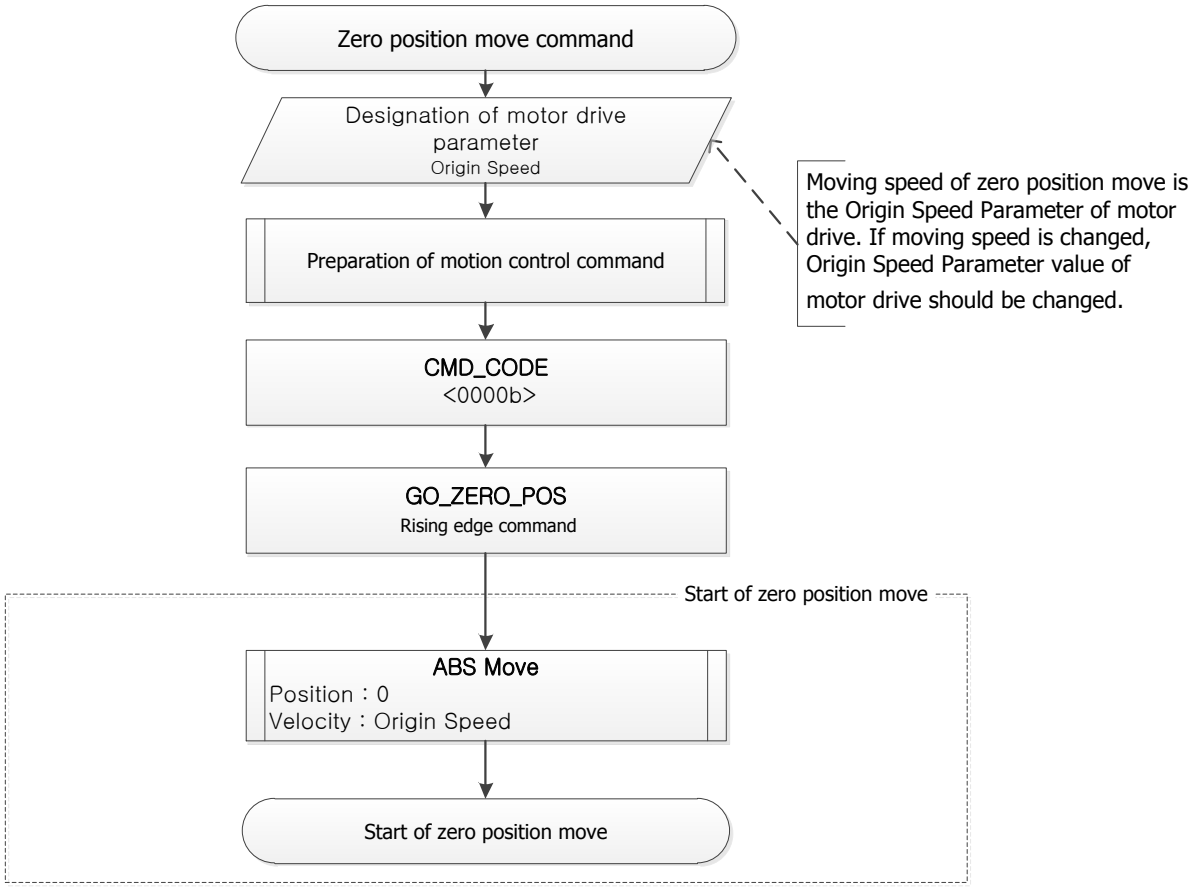
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**						**1**	**1**
Byte 1					MOV_CMD_CODE_RESP 0000b			
Byte 2					GO_ZERO POS_RESP 0->1			MOTIONING Status Flag
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUN
Byte 4...7	**RESOPNSE Data (32bit data)**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.

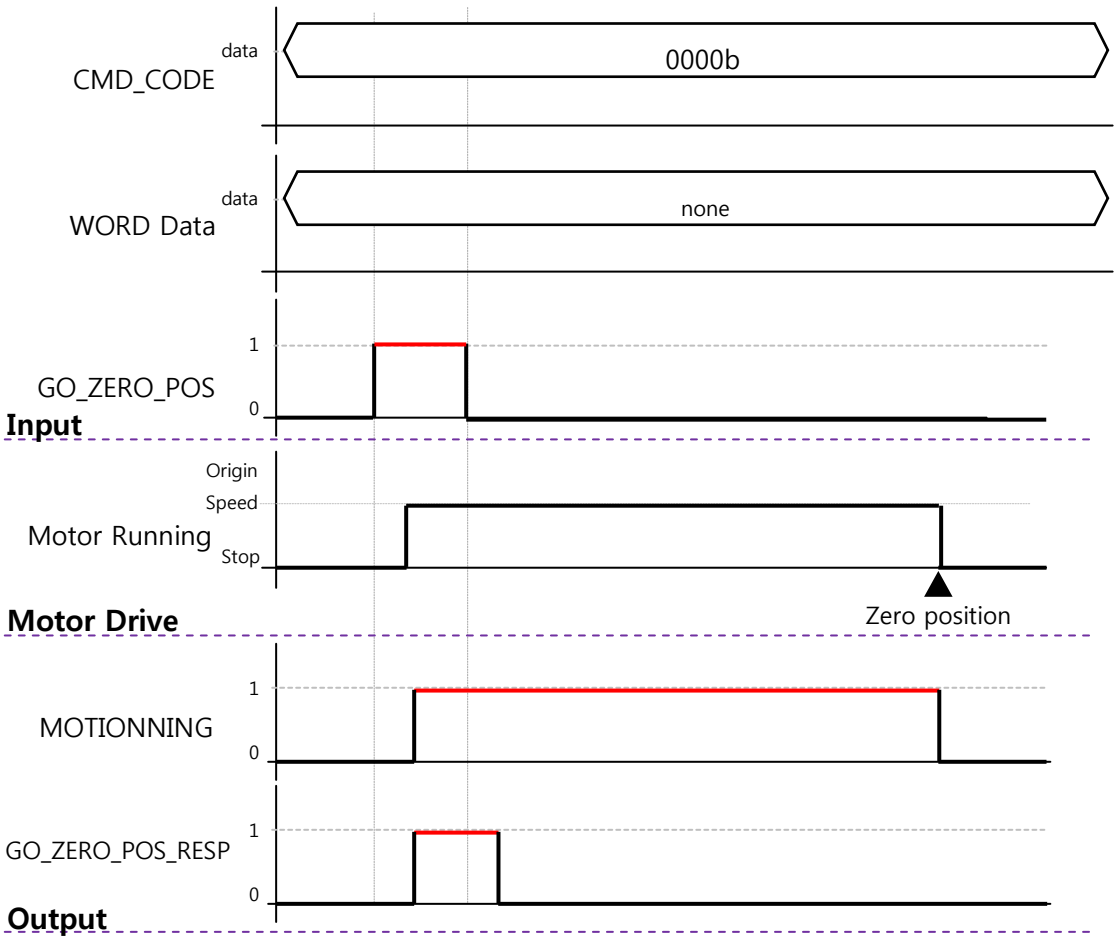
3.3.3 Command sequence and Operation condition

Flow chart 6. Process sequence for the execution of zero position move command



3.3.4 Timing chart

Zero position move is the motion that starts the drive at Positive edge of GO_ZERO_POS bit. The motion started by the command input will move to the absolute value position 0 and the status value of Input-Map GO_ZERO_POS bit will be loop-backed to GO_ZERO_POS of Output-Map.



3.4 Position move (Position Move)

Position move is the motion that moves to the relative position or absolute position by the input value in data area. CMD_CODE value of this command is 0001b. Move can be selected using INC/ABS bit (0 - relative position move, 1 – absolute position move).

Input-Map: INC/ABS[3.0], CMD_CODE [1.0~3] = 0001b

Output-Map: CMD_CODE_RESP [1.0~3] = 0001b (Loopback data)

- Pn#400 『Move Speed for positioning』 will be applied for the moving speed of Motiongate parameter.

3.4.1 Position move parameter

List of the position move parameter

Parameter number	Parameter name	Set-up range	Unit	Shipment value	Contents
MotionGate parameter					
Pn#400	Move Speed for positioning	1 to 10,000,000	pps	10,000	Position move speed
Motor drive parameter					
Pn#A00	Pulse Per Revolution	0 to 9 0 to 15*)		9 10*)	* Ezi-STEP Plus-R will be applied when outside encoder is existed..
Pn#A01	Axis Max Speed	1 to 500,000	pps	500,000	Driving speed after acceleration
Pn#A02	Axis Start Speed	1 to 35,000	pps	1	Start driving speed before acceleration.
Pn#A03	Axis Acc Time	1 to 9,999	msec	100	Acceleration time
Pn#A04	Axis Dec Time	1 to 9,999	msec	100	Deceleration time
Pn#A05	Speed Override	1 to 500	%	100	Ratio of Motor drive speed
Pn#A1C	Motion Dir	0 , 1		0	Parameter of motor drive

3.4.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD START **0->1**	**0**	**1**	**1**	**1**
Byte 1					MOV_CMD_CODE **0001b**			
Byte 2							HOLD	CANCEL
Byte 3								INC/ABS **0 or 1**
Byte 4...7	**Designation of move position value**							

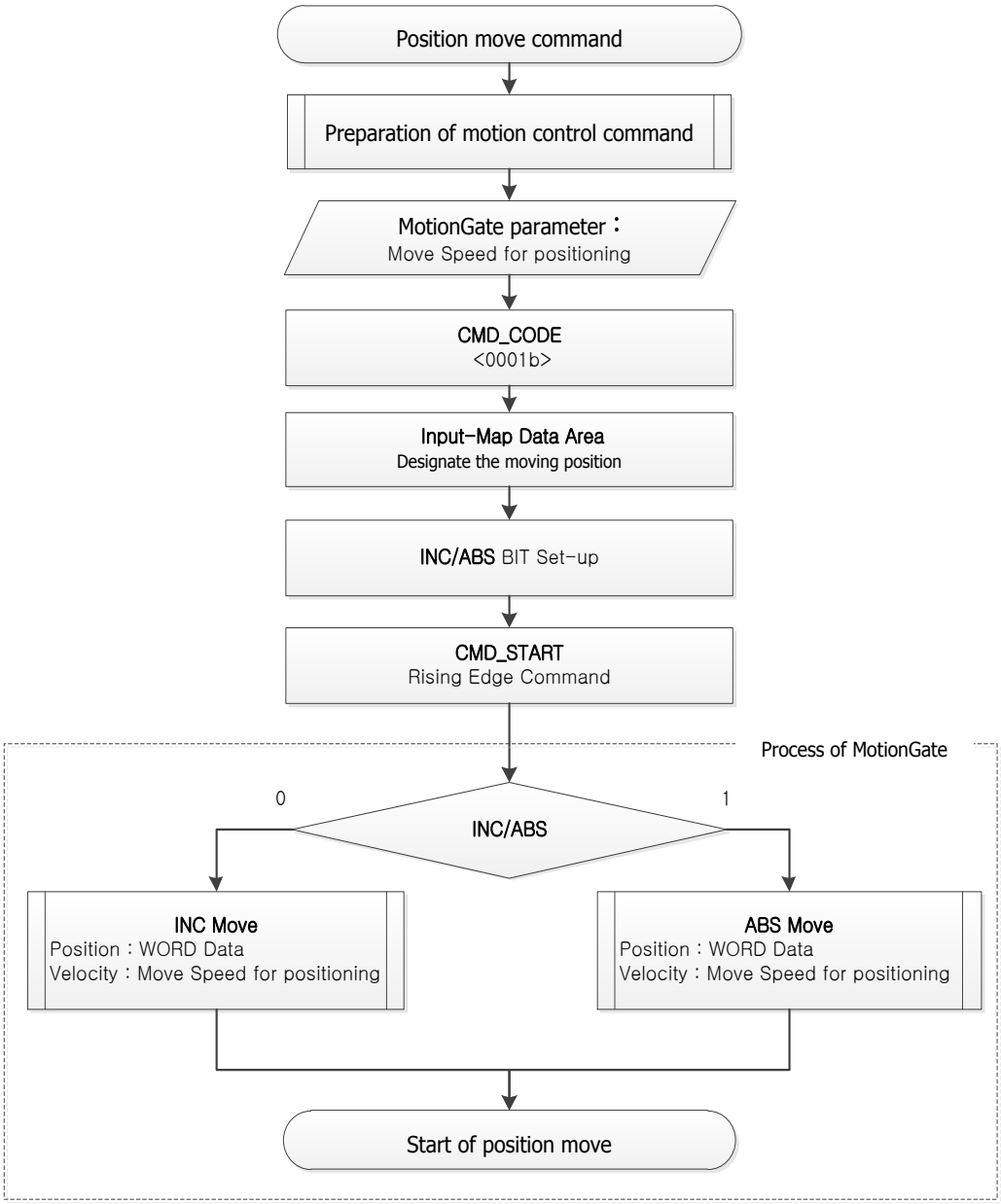
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD_ RESP. **0->1**			**1**	**1**
Byte 1					MOV_CMD_CODE_RESP **0001b**			
Byte 2							HOLD_RESP.	MOTIONING Status Flag
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUN
Byte 4...7	**RESOPNSE Data (32bit data)**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.

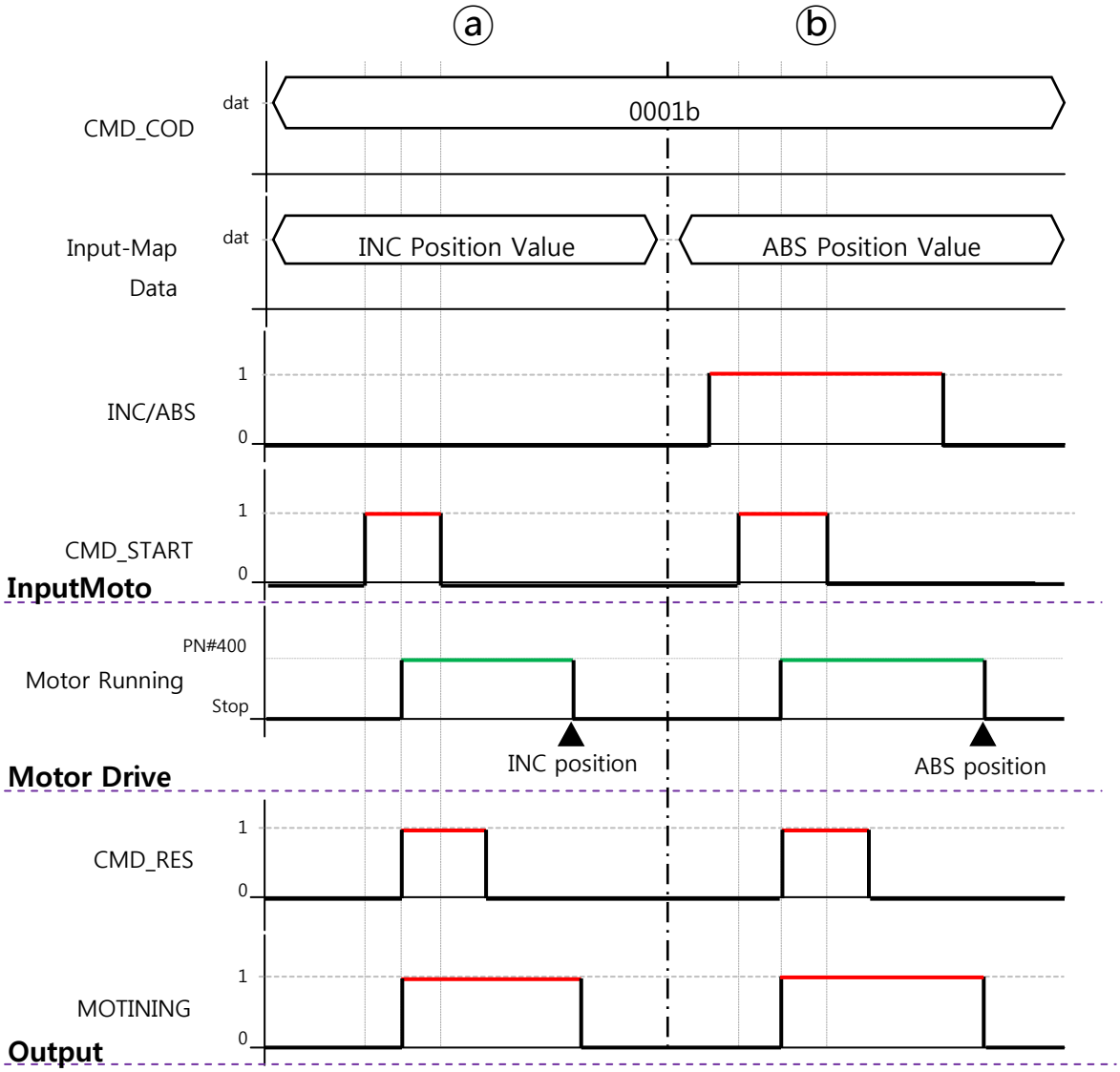
3.4.3 Command sequence and Operation condition

Flow chart 7. Process sequence for the execution of position move command



3.4.4 Timing chart

The motion of Position move can be selected by INC & ABS Move and by setting the CMD_CODE value as 0001b by entering the position value in Input-Map Data area and setting up the INC/ABS bit. Selected motion will be started from the Positive edge command of CMD_START bit.



3.5 PT drive (Position Table Run)

PT Drive includes the general PT drive that runs the PT items saved in motor drive in sequence and the single drive that runs one PT item at a time.

Input-Map: CMD_START[0.4], SINGLE_PT[3.4], CMD_CODE [1.0~3] = 0100b

Output-Map: CMD_CODE_RESP [1.0~3] = 0100b (Loopback data)

- Input-Map Data will be the number of PT items.
- SINGLE_PT bit '0' is for general PT drive and '1' is for single PT drive.
- Set-up value of CMD_CODE is 0100b.
- Positive edge command of CMD_START will be required to start the command.
- Out_Range bit of Output-Map will be set as '1' when the input data of Data area fits to the range of PT number.

3.5.1 PT drive parameter

List of PT drive parameter

Parameter No. [n = PT No.]	Parameter Name [n = PT No.]	Set-up range	Unit
Pn#1000 + n	#n PT Command	0 to 9	
Pn#1200 + n	#n PT Position	-134,217,728 to 134,217,728	Pulse
Pn#1400 + n	#n PT Start Speed	1 to 500,000	pps
Pn#1600 + n	#n PT Move Speed	1 to 2,500,000	pps
Pn#1800 + n	#n PT Accel Time	1 to 9,999	msec
Pn#1A00 + n	#n PT Decel Time	1 to 9,999	msec
Pn#1C00 + n	#n PT Jump Table No.	0 to 255, 10000 to 10255	
Pn#1E00 + n	#n PT Jump PT0	0 to 255, 10000 to 10255	
Pn#2000 + n	#n PT Jump PT1	0 to 255, 10000 to 10255	
Pn#2200 + n	#n PT Jump PT2	0 to 255, 10000 to 10255	
Pn#2400 + n	#n PT Loop Count	0 to 100	
Pn#2600 + n	#n PT Loop Jump Table No.	0 to 255, 10000 to 10255	
Pn#2800 + n	#n PT PT Set	0 to 15	
Pn#2A00 + n	#n PT Loop count Clear	0 to 255	
Pn#2C00 + n	#n PT Wait Time	0 to 1	

3.5.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD START **0->1**	**0**	**1**	**1**	**1**
Byte 1					MOV_CMD_CODE **0100b**			
Byte 2								
Byte 3				SINGLE PT **0 or 1**				
Byte 4...7	**PT No.**							

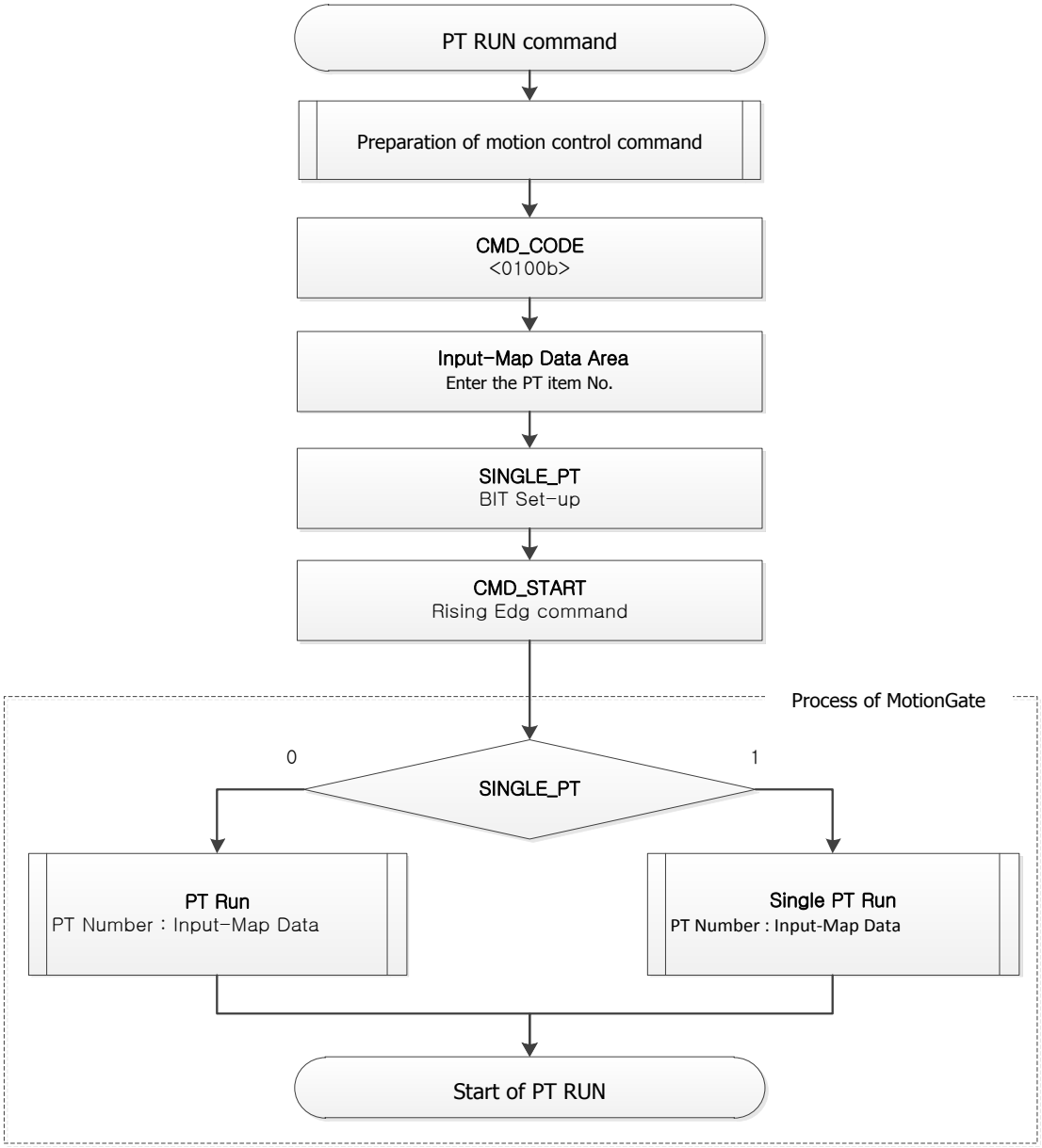
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD_ RESP. **0->1**			**1**	**1**
Byte 1					MOV_CMD_CODE_RESP **0100b**			
Byte 2								MOTIONING **Status Flag**
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR	INP	MOV_DIR	PT_RUN **1**
Byte 4...7	**RESOPNSE Data (32bit data)**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.

3.5.3 Command sequence and Operation condition

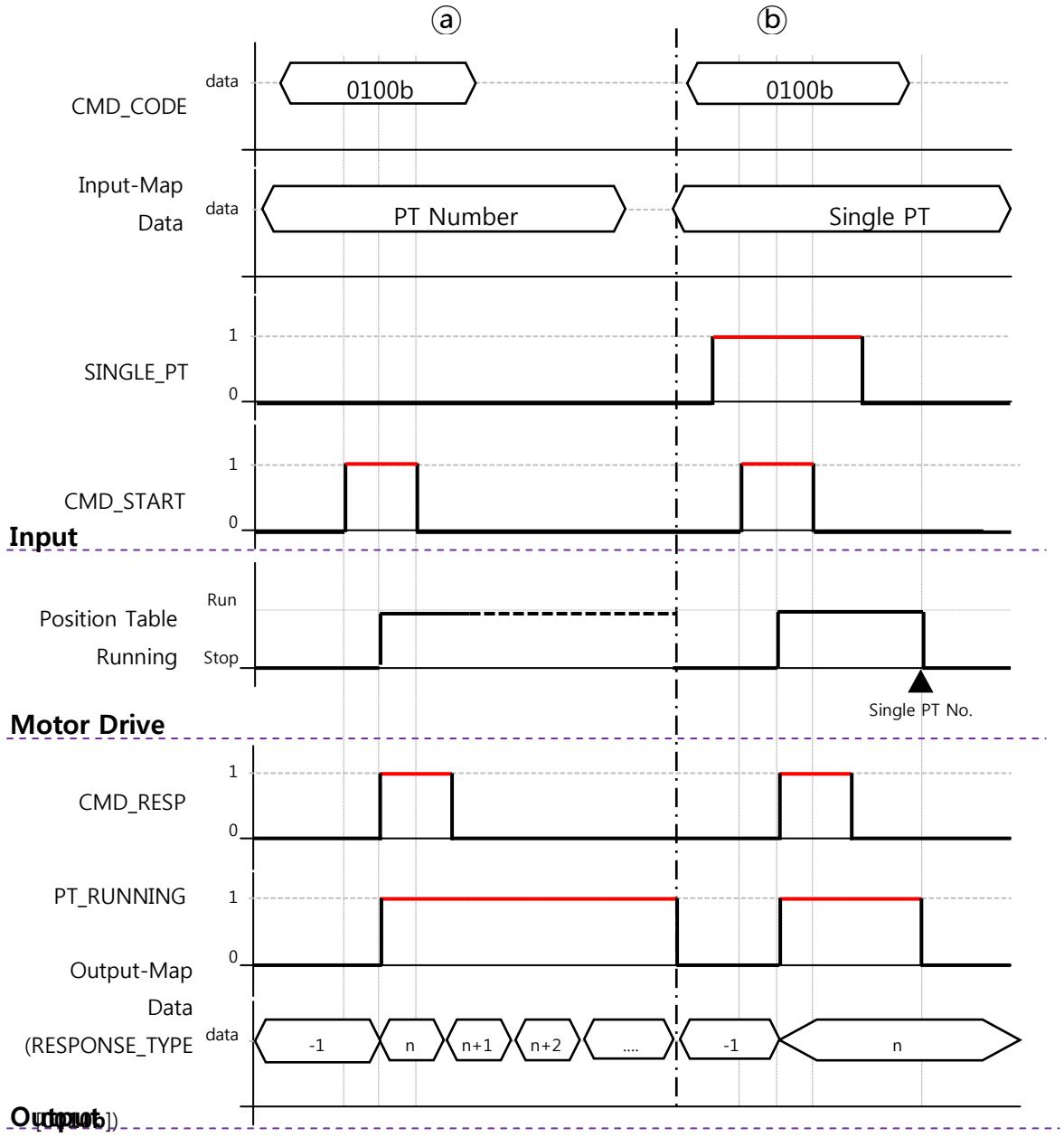
Flow chart 8. Process sequence for the execution of PT drive command



3.5.4 Timing chart

SINGLE_PT bit should be set as '0' as shown in section ⓐ for general PT drive and SINGLE_PT bit should be set as '1' as shown in section ⓑ for single PT drive.

As the response of PT drive command, Output-Map PT_RUN bit will be set as '1'. Also, if RESPONSE_TYPE is set as the PT number request code [0101b], PT number under operation will respond to Output-Map data area.



3.6 Original point move (Origin Searching)

Original point move is the original point return command using the set up parameter value to the motor drive.

Input-Map: CMD_START[0.4], MOTION_CMD_CODE[1.0] = 0111b

Output-Map: MOTION_CMD_CODE_RESP [1.0~3] = 0111b (Loopback data)

- Original point returning method is set as Pn#0A14 『Org Method』 parameter of motor drive (refer to section 7.1 types of parameter or user's manual of corresponding motor drive).
- Data area of Input-Map will be ignored.
- When execute the command, conflicts between devices needs to be verified.

3.6.1 Drive parameter of original point move

List of the original point move parameter

Parameter number	Parameter name	Set-up range	Unit	Shipment value	Contents
Pn#A11	Org Speed	1 to 500,000	Pps	5,000	Drive speed when starting of original point move
Pn#A12	Org Search Speed	1 to 50,000	Pps	1,000	Low drive speed after the original point is detected
Pn#A13	Org Acc Dec Time	1 to 9,999	Msec	50	Allocated time for the acceleration/ deceleration section
Pn#A14	Org Method	0 to 4		0	Selection of original point move method
Pn#A15	Org Dir	0 to 1		0	Selection of driving direction
Pn#A16	Org Offset	-134,217,727 to 134,217,727	pulse	0	After return to the original point, the additional distance of this set-up value should be moved and stopped.
Pn#A17	Org Position Set	-134,217,727 to 134,217,727	pulse	0	'Command Pos' value should be designated after returning to the original point.
Pn#A18	Org Sensor Logic	0 to 1		0	Set up the signal level of original point sensor.
Pn#A1E	Org Torque Ratio	10 to 100[%]	%	50	Set-up the force ratio value required for the stop during Torque Origin

3.6.2 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD START **0**		**1**	**1**	**1**
Byte 1					MOV_CMD_CODE **0111b**			
Byte 2								
Byte 3								
Byte 4...7	**0**							

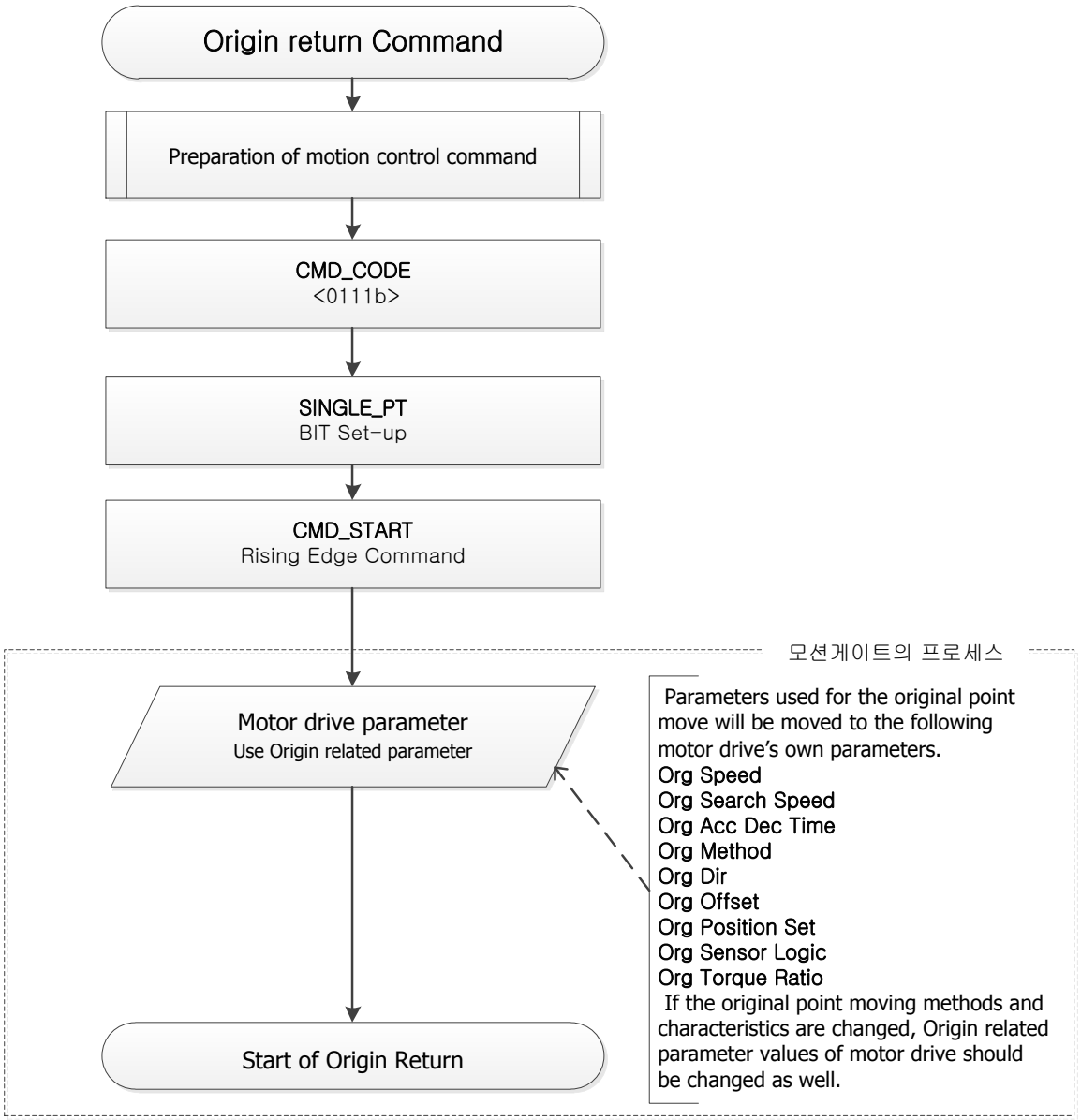
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**0**			CMD_ RESP. **0**			FLAG_ ENABLE 1	AXIS_ CONNECT 1
Byte 1	RESPONSE TYPE RESP				MOV_CMD_CODE_RESP **0100b**			
Byte 2								MOTIONING **Status Flag**
Byte 3	H/W +Limit	H/W -Limit	S/W +Limit	S/W -Limit	ORIGIN SENSOR **Status Flag**	INP	MOV_DIR	PT_RUN
Byte 4...7	**RESOPNSE Data (32bit data)**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: MOTIONING bit will be toggled to '0' and '1' depending on the driving status by the Jog drive command.
NOTE 4: ORIGIN SENSOR bit value can be changed using the original point sensor.

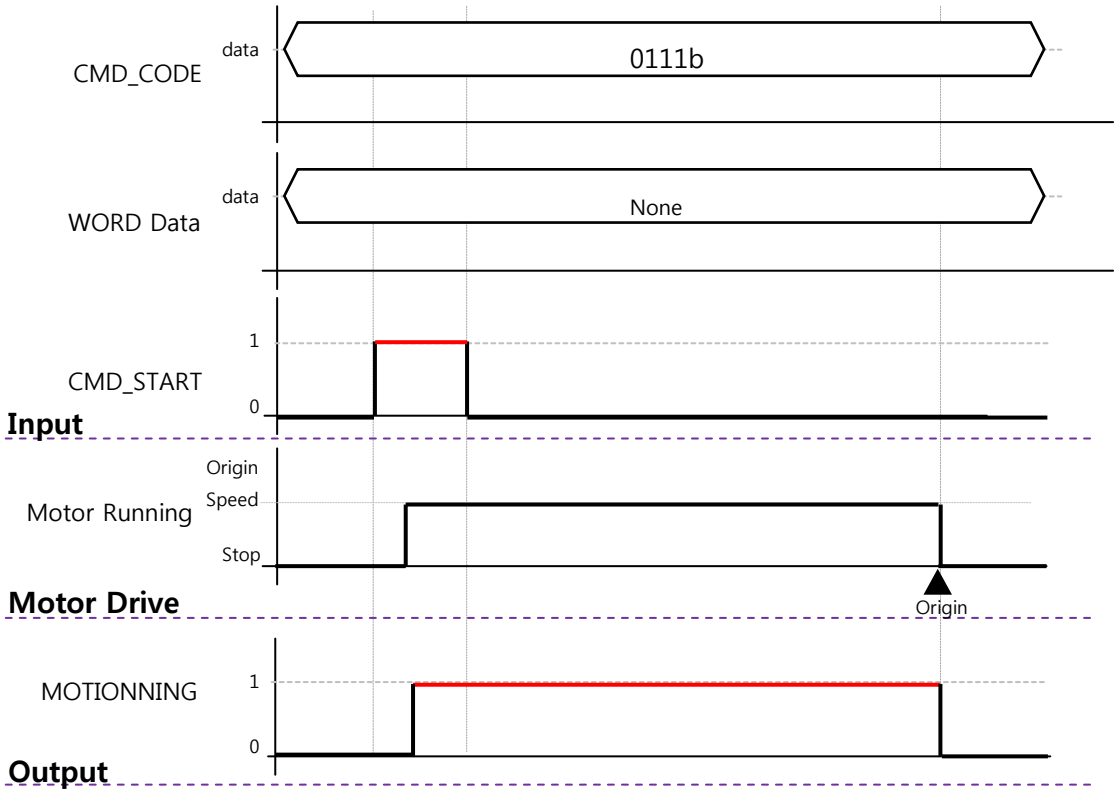
3.6.3 Command sequence and Operation condition

Flow chart 9. Process sequence for the execution of original point move command



3.6.4 Timing chart

CMD_CODE should be set as [0111b] and the move should be executed using Positive edge command of CMD_START.



4 Parameter set-up

4.1 Types of parameter

MotionGate parameters and Motor drive parameters can be set up in IO-Map setting mode and motor drive PT items can be verified in this mode. Types of settable parameters in setting mode are as shown below.

MotionGate parameter

Index No. (HEX)	Parameter No.	Setting range	Unit	Shipment Value
Jog Move Parameters				
Pn#0100	Speed Step 0 for Jog Move	1 to 10,000,000	pps	100
Pn#0101	Speed Step 1 for Jog Move	1 to 10,000,000	pps	1000
Pn#0102	Speed Step 2 for Jog Move	1 to 10,000,000	pps	10000
Pn#0103	Speed Step 3 for Jog Move	1 to 10,000,000	pps	100000
Pn#0104	Use Jog Speed Ratio	0, 1		0
Pn#0105	Move Speed for Jog Move: Ratio	1 to 10,000,000	pps	100000
Step Move Parameters				
Pn#0200	Step Distance 0	0 to 99,999,999	pulse	1
Pn#0201	Step Distance 1	0 to 99,999,999	pulse	10
Pn#0202	Step Distance 2	0 to 99,999,999	pulse	100
Pn#0203	Step Distance 3	0 to 99,999,999	pulse	1000
Pn#0204	Move Speed for Step Move	1 to 10,000,000	pps	10,000
Position Move Parameters				
Pn#0400	Move Speed for positioning	1 to 10,000,000	pps	10,000
Coordination Parameters				
Pn#0900	Motor Lead	1 to 50		1
Pn#0901	Gear Ratio	1 to 50		1
Pn#0902	Decimal place (* 10^n)	0 to 5 (n)		0

List of supportable parameters by drive model

Parameter No.	List of parameters	Ezi-STEP Plus-R (MINI included)	Ezi-SERVOPlus-R (MINI included)	Ezi-SERVO Plus-R ABS	Ezi-SERVO Plus-R BLDC
Pn#0A00	Pulse Per Revolution	O	O	O	-
Pn#0A01	Axis Max Speed	O	O	O	O
Pn#0A02	Axis Start Speed	O	O	O	O
Pn#0A03	Axis Acc Time	O	O	O	O
Pn#0A04	Axis Dec Time	O	O	O	O
Pn#0A05	Speed Override	O	O	O	O
Pn#0A06	Jog Speed	O	O	O	O
Pn#0A07	Jog Start Speed	O	O	O	O
Pn#0A08	Jog Acc Dec Time	O	O	O	O
Pn#0A09	Servo Alarm Logic	O	O	O	O
Pn#0A0A	Servo On Logic	-	O	O	O
Pn#0A0B	Servo Alarm Reset Logic	-	O	O	O
Pn#0A0C	Step Run/Stop Logic	O	-	-	-
Pn#0A0D	Step Alarm Reset Logic	O	-	-	-
Pn#0A0E	S/W Limit Plus Value	O	O	O	O
Pn#0A0F	S/W Limit Minus Value	O	O	O	O
Pn#0A10	S/W Limit Stop Method	O	O	O	O
Pn#0A11	H/W Limit Stop Method	O	O	O	O
Pn#0A12	Limit Sensor Logic	O	O	O	O
Pn#0A13	Org Speed	O	O	O	O
Pn#0A14	Org Search Speed	O	O	O	O
Pn#0A15	Org Acc Dec Time	O	O	O	O
Pn#0A16	Org Method	O	O	O	O
Pn#0A17	Org Dir	O	O	O	O
Pn#0A18	Org OffSet	O	O	O	O
Pn#0A19	Org Position Set	O	O	O	-
Pn#0A1A	Org Sensor Logic	-	O	O	-
Pn#0A1B	Position Loop Gain	-	O	O	O
Pn#0A1C	Stop Current	O	-	-	-
Pn#0A1D	Inpos Value	-	O	O	O
Pn#0A1E	Pos Tracking Limit	-	O	O	O
Pn#0A1F	Motion Dir	O	O	O	O
Pn#0A20	Limit Sensor Dir	O	O	O	O
Pn#0A21	Org Torque Ratio	-	O	O	O
Pn#0A22	Encoder Multiply Value	O	-	-	-
Pn#0A23	Pos. Error Overflow Limit	-	O	O	O

Position Table (PT) Items

Parameter No. [n = PT No.]	Parameter name [n = PT No.]	Set-up range	Unit
Pn#1000 + n	#n PT Command	0 to 9	
Pn#1200 + n	#n PT Position	-134,217,728 to 134,217,728	Pulse
Pn#1400 + n	#n PT Start Speed	1 to 500,000	pps
Pn#1600 + n	#n PT Move Speed	1 to 2,500,000	pps
Pn#1800 + n	#n PT Accel Time	1 to 9,999	msec
Pn#1A00 + n	#n PT Decel Time	1 to 9,999	msec
Pn#1C00 + n	#n PT Jump Table No.	0 to 255, 10000 to 10255	
Pn#1E00 + n	#n PT Jump PT0	0 to 255, 10000 to 10255	
Pn#2000 + n	#n PT Jump PT1	0 to 255, 10000 to 10255	
Pn#2200 + n	#n PT Jump PT2	0 to 255, 10000 to 10255	
Pn#2400 + n	#n PT Loop Count	0 to 100	
Pn#2600 + n	#n PT Loop Jump Table No.	0 to 255, 10000 to 10255	
Pn#2800 + n	#n PT PT Set	0 to 15	
Pn#2A00 + n	#n PT Loop count Clear	0 to 255	
Pn#2C00 + n	#n PT Wait Time	0 to 1	
Pn#2E00 + n	#n PT Check Inposition	0 to 1	
Pn#3000 + n	#n PT Continuous Action	0 to 1	

4.2 Verification of parameter information

Verification of parameter information can be requested by entering the requested parameter No. in the INDEX_VALUE area.

Input-Map: CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1000b

Output-Map: SETTING_CMD_CODE_RESP [1.0~3] = 1000b (Loopback data)

- Enter the requested parameter number in index area.
- Set-up value of SETTING_CMD_CODE is 1000b.
- Positive edge command of CMD_START is required to start the command.
- Requested parameter value will be sent to the Output-Map data area.
- Out_Range bit will be set as '1' if the entered INDEX_VALUE is not the available parameter number.

4.2.1 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**		**1**		**1**
Byte 1	**0**				SETTING_CMD_CODE **1000b**			
Byte 2-3	INDEX_VALUE							
Byte 4...7	**0**							

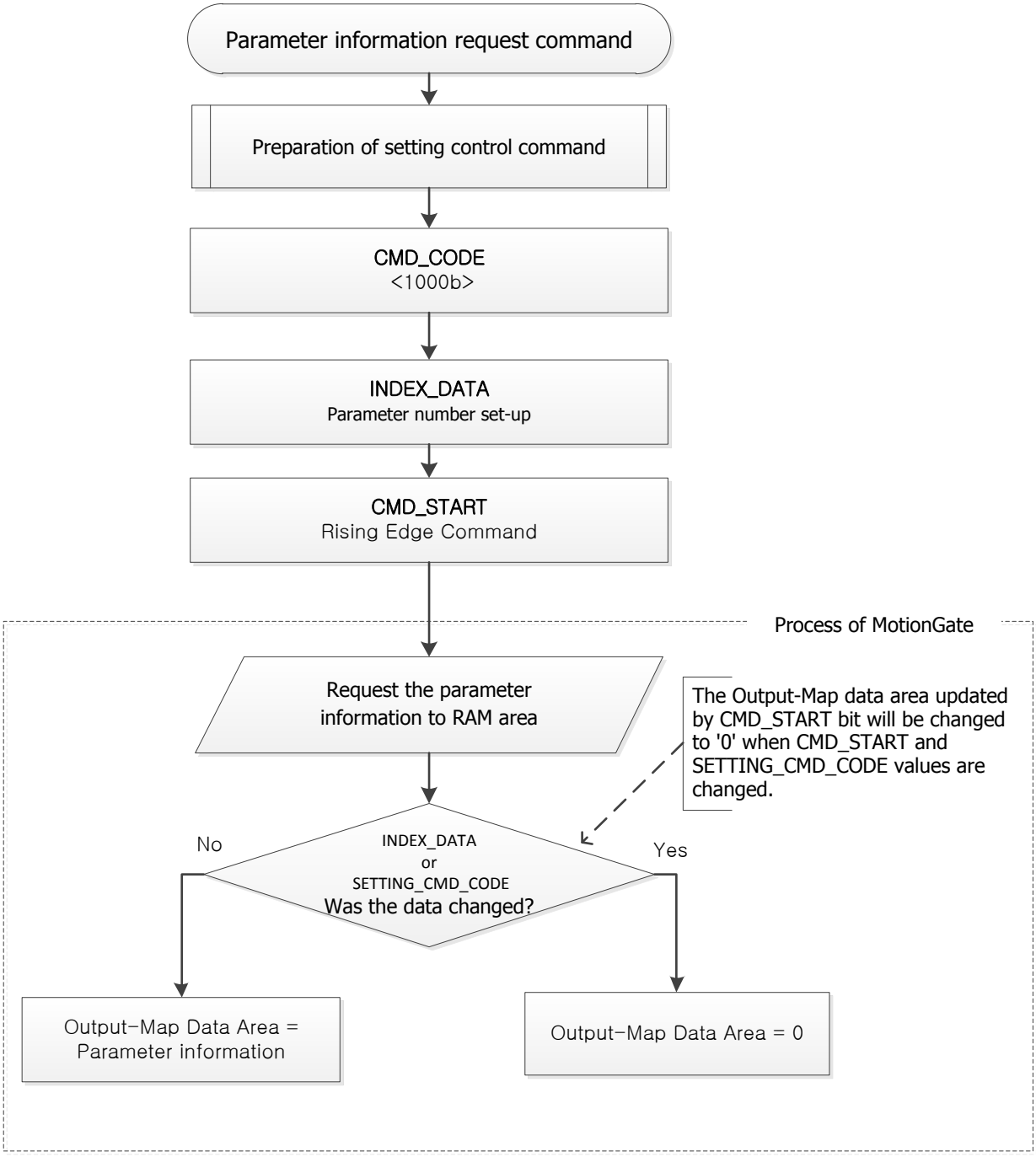
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY **1->0**		CMD_ RESP. **0->1**				**1**
Byte 1	**0**				SETTING_CMD_CODE_RESP **1000b**			
Byte 2-3	INDEX_VALUE_RESP							
Byte 4...7	**Requested parameter data**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: READY bit will be set as '0' when the data is being acquired from the motor drive and '1' when acquired already.

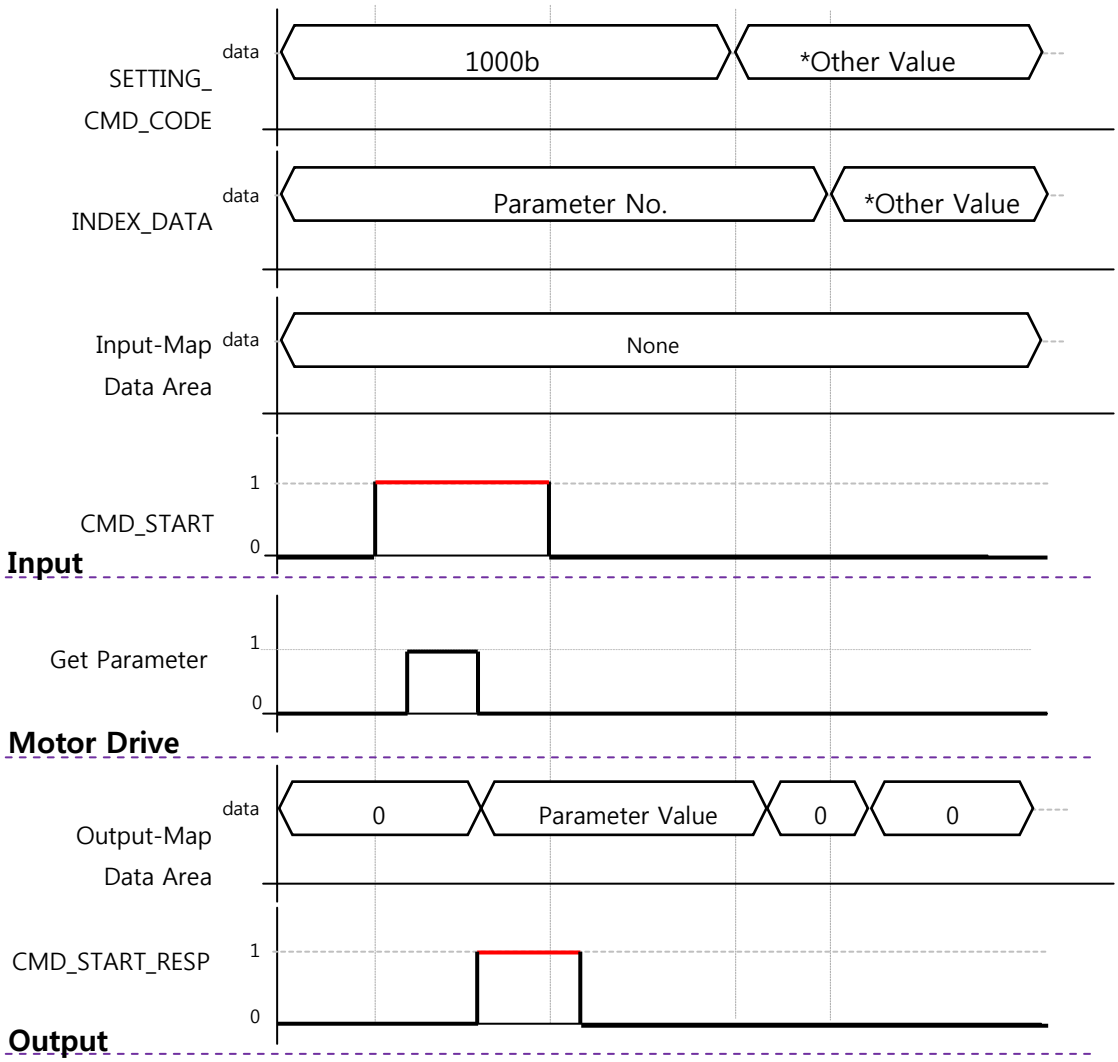
4.2.2 Command sequence and Operation condition

Flow chart 10. Process sequence for the execution of parameter information request command



4.2.3 Timing chart

In order for the parameter information request, SETTING_CMD_CODE should be set as 1000b (Read Parameter code) and the parameter value to be requested should be entered in INDEX_DATA area. Also, requested command will be started using Positive edge command of CMD_START bit. During this process, the requested data by CMD_START bit will be updated and the CMD_START_RESP bit will be set as '1' and this should be maintained as '1' until the requested parameter value is updated.



4.3 Parameter information change

Parameters to be changed should be selected by entering the parameter number in INDEX_VALUE area.

Input-Map: CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1001b

Output-Map: SETTING_CMD_CODE_RESP [1.0~3] = 1001b (Loopback data)

- Enter the parameter number to be changed in index area.
- Set-up value of SETTING_CMD_CODE is 1001b.
- Positive edge command of CMD_START will be required to start the command.
- Changed parameter value will be sent to Output-Map data area.
- Out_Range bit will be set as '1' when the INDEX_VALUE does not exist or data area value does not fit to the range of corresponding parameter value.

4.3.1 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**		**1**		**1**
Byte 1	**0**				SETTING_CMD_CODE **1001b**			
Byte 2-3	INDEX_VALUE							
Byte 4...7	**Parameter data value to be changed**							

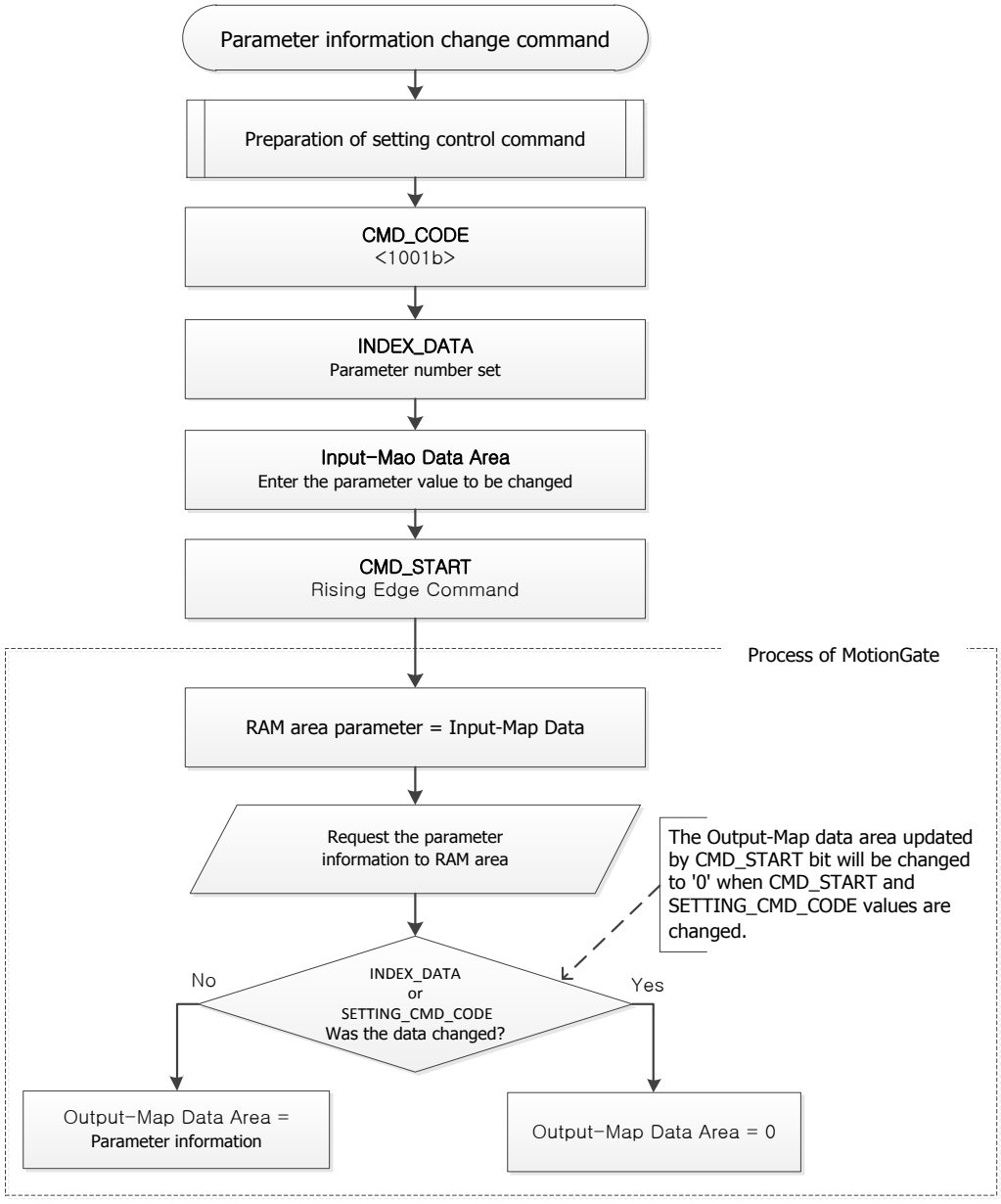
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD_ RESP. **0->1**				**1**
Byte 1	**0**				SETTING_CMD_CODE_RESP **1001b**			
Byte 2-3	INDEX_VALUE_RESP							
Byte 4...7	**Changed Parameter data value**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: READY bit will be set as '0' when the data is being acquired from the motor drive and '1' when acquired already.

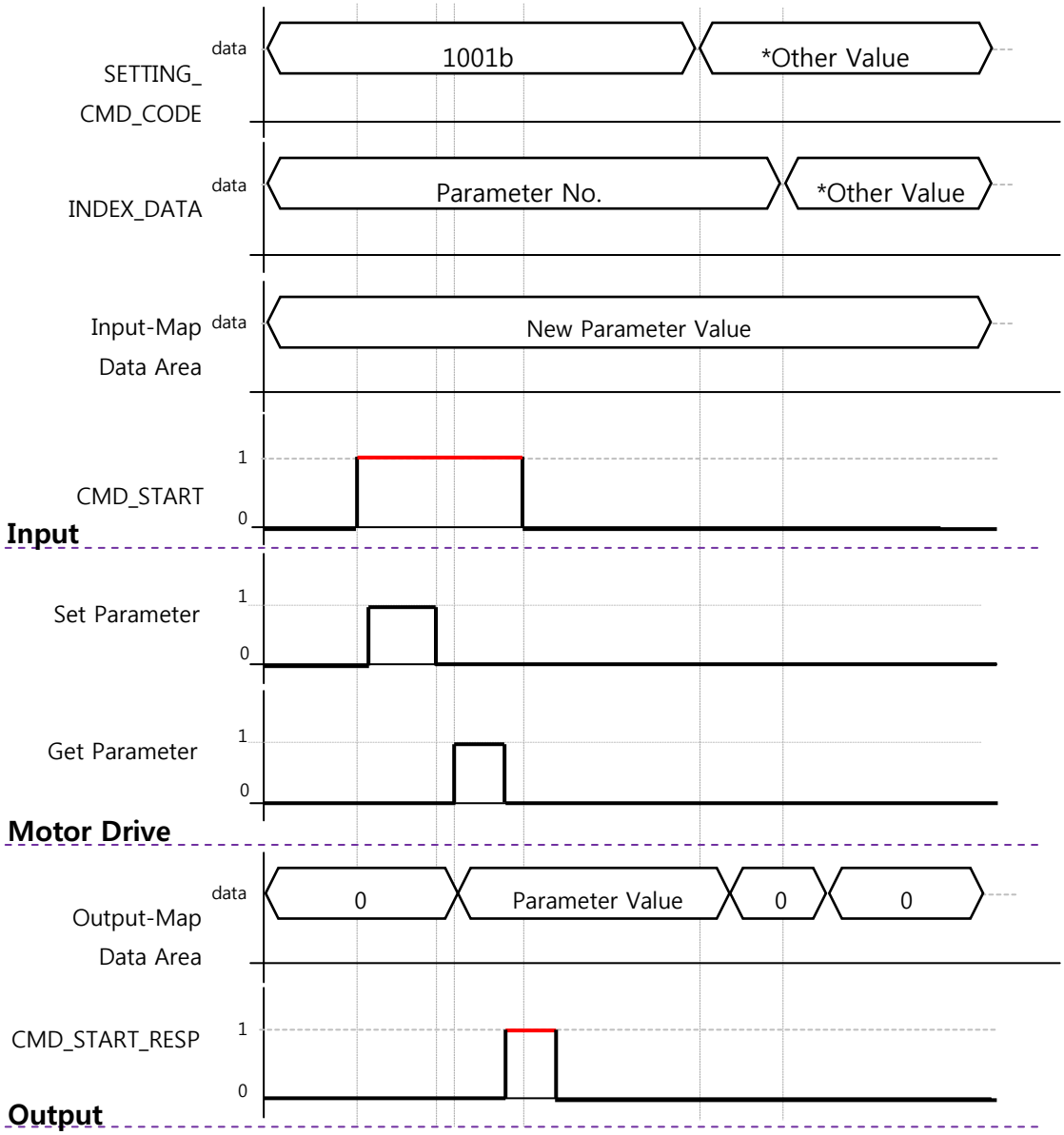
4.3.2 Command sequence and Operation condition

Flow chart 11. Process sequence for the execution of parameter information change command



4.3.3 Timing chart

In order to change the parameter information, SETTING_CMD_CODE should be set as '1001b' (Write Parameter code) and the parameter value to be changed should be entered in INDEX_DATA area, then the change command using Positive edge command of CMD_START bit should be started. During this process, CMD_START bit will be updated with the changed data. The CMD_START_RESP bit will be set as '1' and this should be maintained until the Output-Map data area is updated.



4.4 Parameter save

Parameter save is the command to be used when save the currently set-up parameter information in ROM area.

Input-Map: CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1110b

Output-Map: SETTING_CMD_CODE_RESP [1.0~3] = 1110b (Loopback data)

- Set-up value of SETTING_CMD_CODE is 1110b.
- Parameter save command will be started from the Positive edge command of CMD_START bit.
- Parameter save command needs longer response time comparing to the others and the completion of parameter save is when READY bit is changed to '1'.

4.4.1 Bit area

Input-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**	ALARM RESET	ESTOP	ENABLE	**1**
Byte 1	**0**				SETTING_CMD_CODE **1110b**			
Byte 2-3	0							
Byte 4...7	**0**							

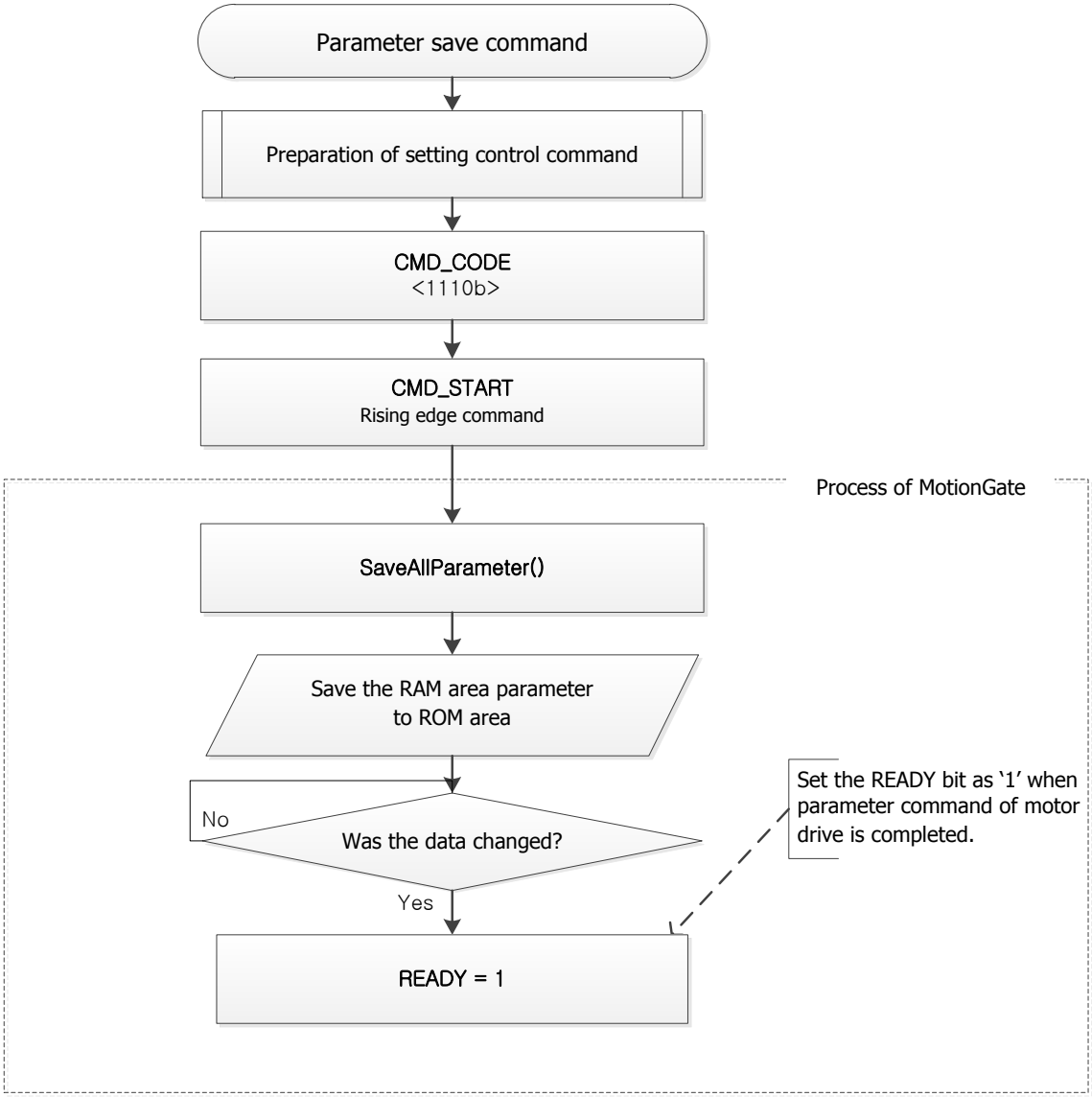
Output-Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY Status	OUT_RANGE	CMD_ RESP. **0->1**	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1	**0**				SETTING_CMD_CODE_RESP **1110b**			
Byte 2-3	0							
Byte 4...7	**0**							

NOTE 1: Gray highlighted bit is the one required for the drive of corresponding motion.
NOTE 2: Yellow highlighted bit is the one to be used in corresponding command.
NOTE 3: READY bit will be set as '0' when the data is being acquired from the motor drive and '1' when acquired already.

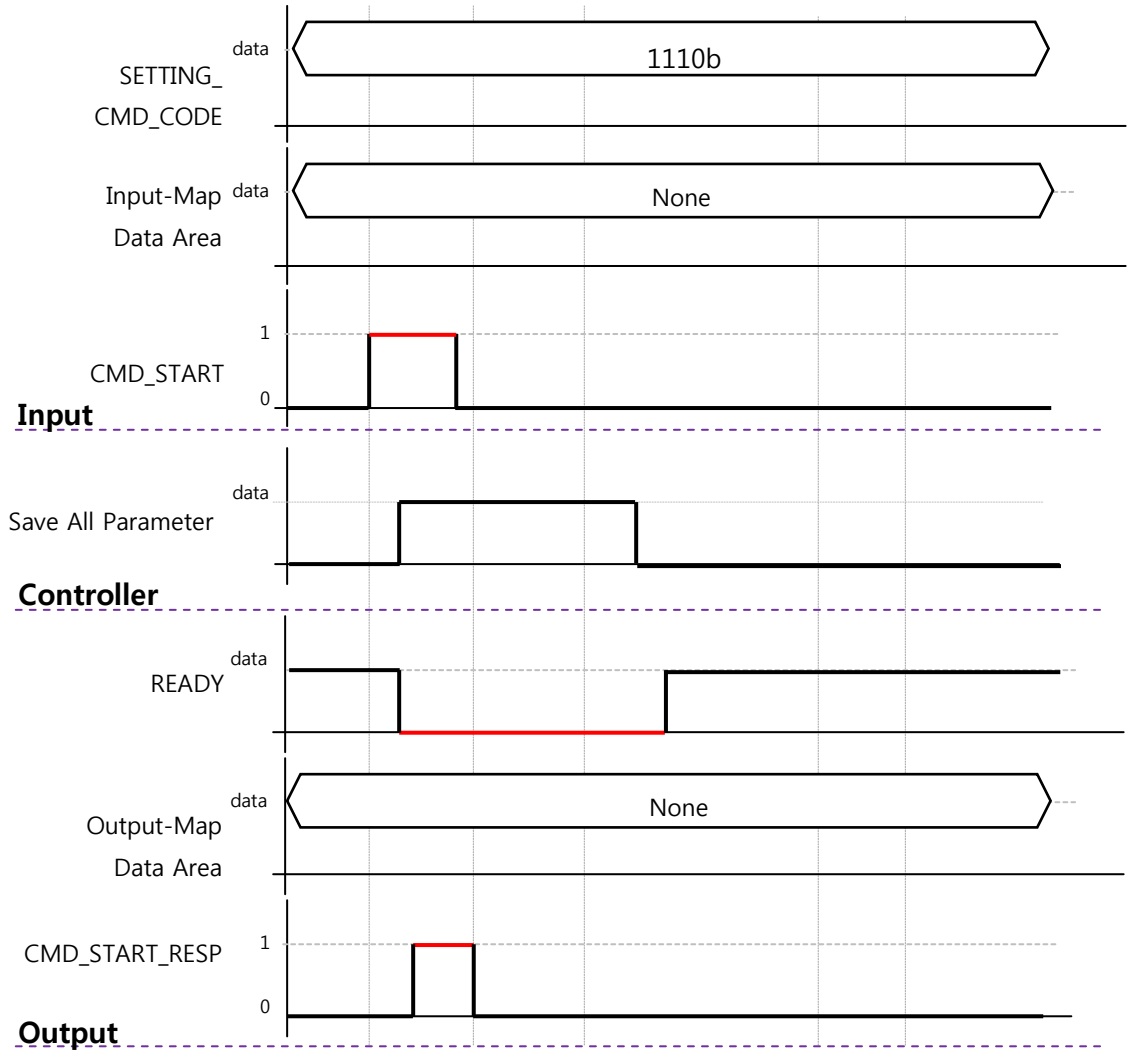
4.4.2 Command sequence and Operation condition

Flow chart 12. Process sequence of the execution of parameter save command



4.4.3 Timing Chart

In order to save parameters, SETTING_CMD_CODE should be set as '1110b' (Save Parameter code) and the change command will be started by the Positive edge command of CMD_START bit. Once the parameter save command is started, READY bit will be changed to '0' and became standby status. The READY bit will be changed to '1' when the parameter save is completed by which the users can recognize that the parameter save command is completed.



5 Set-up of position value (Set Current Position)

Designation of position value is the command that changes the target position value (Command Position) to the designated one. This command changes the target position value only when the connected motor is STEP drive. However, for SERVO drive or STEP drive using outside encoder cases, the current position value (Actual Position) will be changed as the designated value for the target position value.

Input Map : CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1010b

Output Map : SETTING_CMD_CODE_RESP [1.0~3] = 1010b (Loopback data)

- Set-up value of SETTING_CMD_CODE is 1010b.
- Enter the position value to be changed to Input-Map data area.
- CMD_START Positive edge command will be required to start the command.
- The changed position value will be sent to Output-Map Data area.

5.1 Bit area

Input Map

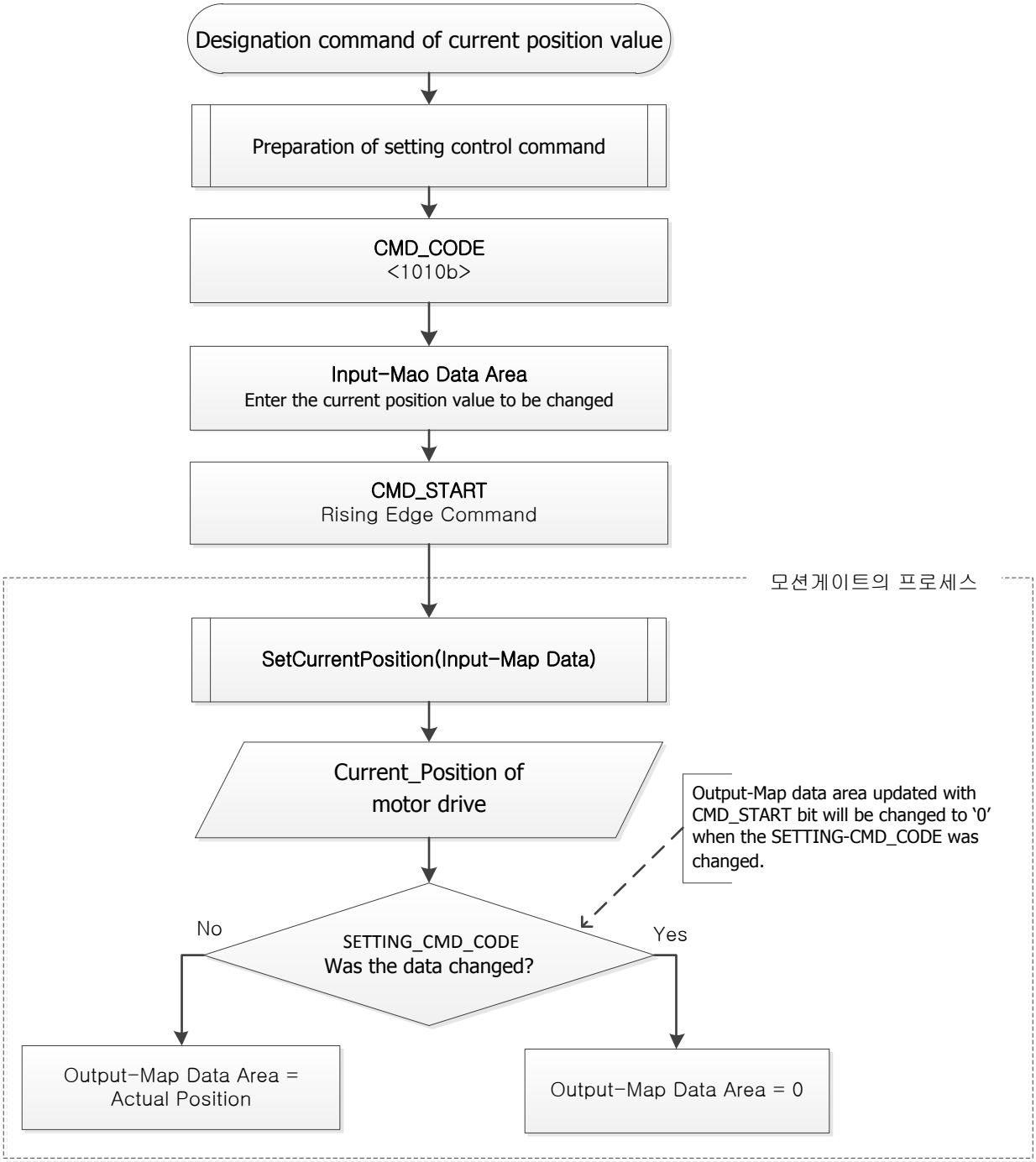
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START 0->1	ALARM RESET	**1**	ENABLE	**1**
Byte 1	**0**				SETTING_CMD_CODE **1010b**			
Byte 2-3	**0**							
Byte 4...7	**Position data**							

Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY	OUT_RANGE	CMD_ RESP. 0->1	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1	**0**				SETTING_CMD_CODE_RESP **1010b**			
Byte 2-3	**0**							
Byte 4...7	**Designated position data**							

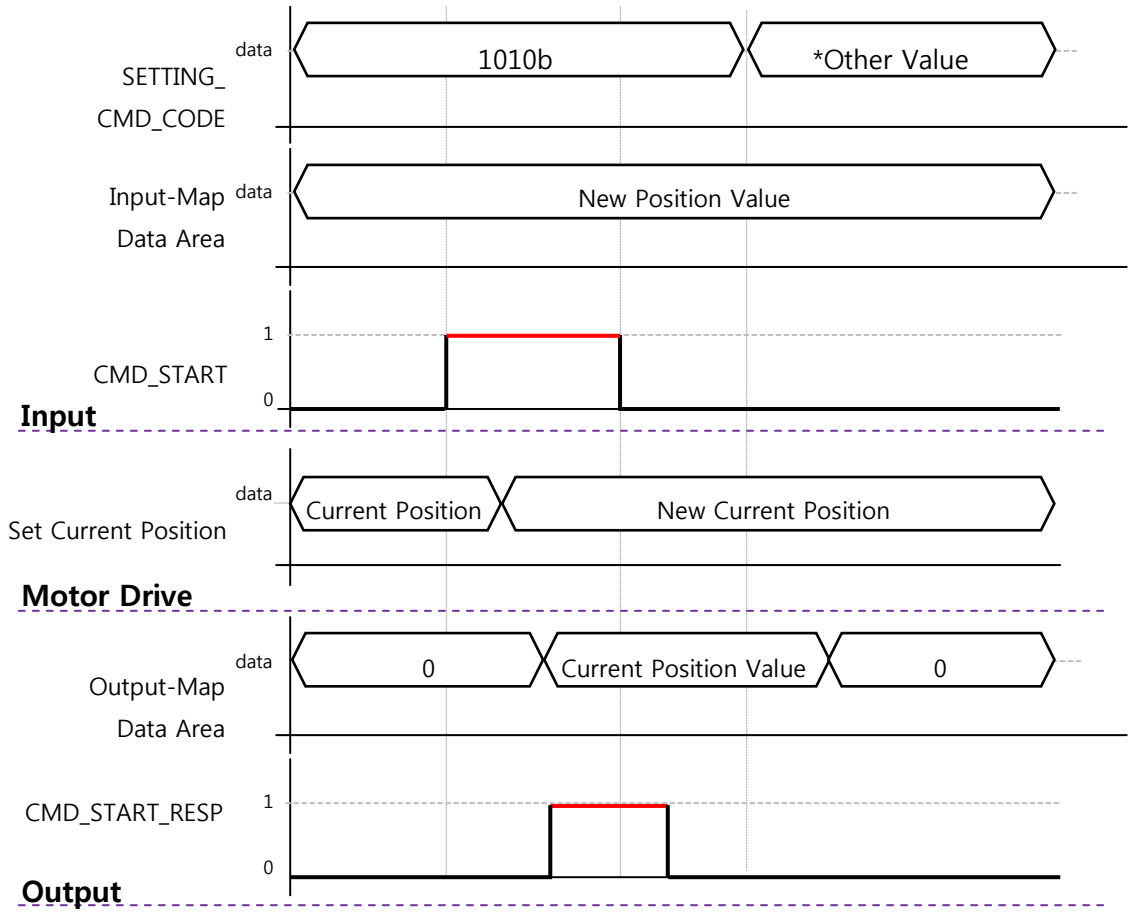
5.2 Command sequence and Operation condition

Flow chart 13. Process sequence of the execution of designation command of current position



5.3 Timing chart

In order to change the command of current position value, SETTING_CMD_CODE should be set as 1010b (Set Current Position code) and the change command using Positive edge command of CMD_START bit should be started. During this process, CMD_START bit will be updated with the actually changed current position value and CMD_START_RESP bit will be set as '1' and the changed parameter data should be maintained with '1' until it is verified that the changed parameter data is updated in Output-Map data area.



6 Alarm History

6.1 Types of alarm

The alarm generated from MotionGate or motor drive can be verified using the data sent to the Output-Map by entering the response code at RESPONSE_TYPE from response data set-up. Also, alarm history can be reviewed using alarm history requesting command.

Types of alarm include the motor drive status alarm and communication alarm between MotionGate and motor dirve.

When drive alarm is generated, red LED (ALARM) of MotionGate will blink on and off which will show that one or more connected drive(s) is/are in alarm status. Status alarms of motor drive have different permissible limit by model, which needs to be checked when corresponding alarm is generated.

Status alarm code of motor drive

Alarm code		Types	Contents
HEX	DEC		
0x00	0	No Alarm	No Alarm
0x01	1	Over Current	Over current on motor driving element
0x02	2	Over Speed	Alarm when motor exceeds 3000 [rpm] of speed
0x03	3	Position Tracking	When motor does not follow the input pulse accordingly.
0x04	4	Over Load	When load that exceeds the max. torque of motor is applied for more than 5 seconds.
0x05	5	Over Temperature	When inside temperature of the drive being operated exceeds the permissible limit. ***1)**
0x06	6	Back EMF	When counter electromotive force of motor exceeds the permissible voltage of motor being operated. ***2)**
0x07	7	Motor Connect	Abnormal connection between drive and motor
0x08	8	Encoder Connect	Abnormal connection between drive and encoder
0x09	9	Motor Power	When motor supplying power is lower than the min. limit of the drive being operated. ***3)**
0x0A	10	Inposition	Position error when the operation is completed
0x0B	11	System Halt	Drive system error (Watch Dog Timer)

Alarm code		Types	Contents
HEX	DEC		
0x0C	12	ROM device	Parameter storing device (ROM) error
0x0E	14	OverInputVoltage	When input voltage exceeds the set-up value of drive being operated. *4)
0x0F	15	PositionOverflow	When position error is bigger than the given limit when the position command is completed.

Permissible threshold value by motor drive

Model name	*1) Inside Temperature	*2) Threshold value of back electromotive force			*3) Lowest limit of the supplied power		*4) Permissible limit of input voltage	
		50V	70V	90V	20V	40V	20V~28V	36V~70V
EzS-NDR-MI-20-□□	55℃	O			O		O	
EzS-NDR-MI-28-□□		O			O		O	
EzS-NDR-MI-42-□□		O			O		O	
EzS-NDR-20-□□			O		O		O	
EzS-NDR-28-□□			O		O		O	
EzS-NDR-42-□□			O		O		O	
EzS-NDR-56-□□			O		O		O	
EzS-NDR-60-□□			O		O		O	
EzS-NDR-86-□□				O		O		O

Communication error will be occurred when transmission/ receipt of data are not smooth or during the status that the response request command cannot be executed. This alarm can be recognized by the red LED 2 (ERROR) of MotionGate.

Transmission/ Receipt communication error between MotionGate and motor drive

Types	Contents
No Alarm	No Alarm
Frame type error	Received Frame type command cannot be recognized
Data error, ROM data read, write error	Received data is outside of the designated range
Receipt frame error	Received Frame does not meet this standard
Drive command failure	New operation is attempted under the following status. 1) During the motor operation 2) During the stop command 3) Servo is in OFF status 4) Z-pulse Origin is attempted without outside encoder
RESET failure	Reset operation is attempted under the following status. 1) Servo is ON status 2) Already in Reset status by the outside input signal
Servo ON failure ①	Servo ON command is attempted under the alarm situation
Servo ON failure ②	Servo ON command is attempted during the emergency stop
Servo ON failure ③	'Servo ON' is set up in outside input signal. Servo ON/OFF can be executed by this command only.
CRC error	CRC error is occurred on the received Frame data by the effects of the surrounding noises. In this case, MotionGate will try to communicate once more.

6.2 Verification of alarm history

MotionGate memorizes up to 4 alarm codes when alarm is generated. 4 alarm codes are memorized in 4 byte structure and up to 4 alarm history will be sent to the Output-Map Data area when alarm history is requested.

Input Map: CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1100b

Output Map: SETTING_CMD_CODE_RESP [1.0~3] = 1100b (Loopback data)

- Set-up value of SETTING_CMD_CODE is 1100b.
- Positive edge command of CMD_START should be requested to start the command.
- Requested alarm history will be sent to Output-Map Data area.
- Alarm history information sent to Output-Map will be verified differently depending on the data access formula of superior controller being operated.
  - For Big-Endian cases, generated alarm history will be saved at the end of the 7th byte area of Output-Map, and the oldest alarm history (4th alarm from the last) will be saved on the 4th byte area.
  - For Little-Endian case, 4th byte area of Output-Map is for the latest alarm history and the 7th byte area is for the oldest alarm history (4th alarm from the last).
- This information will be initialized when alarm reset command is executed or the MotionGate is re-booted.

6.2.1 Bit area

Input Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**	ALARM RESET 0	ESTOP	ENABLE	CONNECT 1
Byte 1					SETTING_CMD_CODE **1100b**			
Byte 2-3	0							
Byte 4...7	0							

Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY		CMD_ RESP. **0->1**	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1					SETTING_CMD_CODE_RESP **1100b**			
Byte 2-3	0							
Byte 4	Last Alarm Code							
Byte 5	2nd Last Alarm Code							
Byte 6	3rd Last Alarm Code							
Byte 7	4th Last Alarm Code							

*** Output-Map during Little-Endian access**

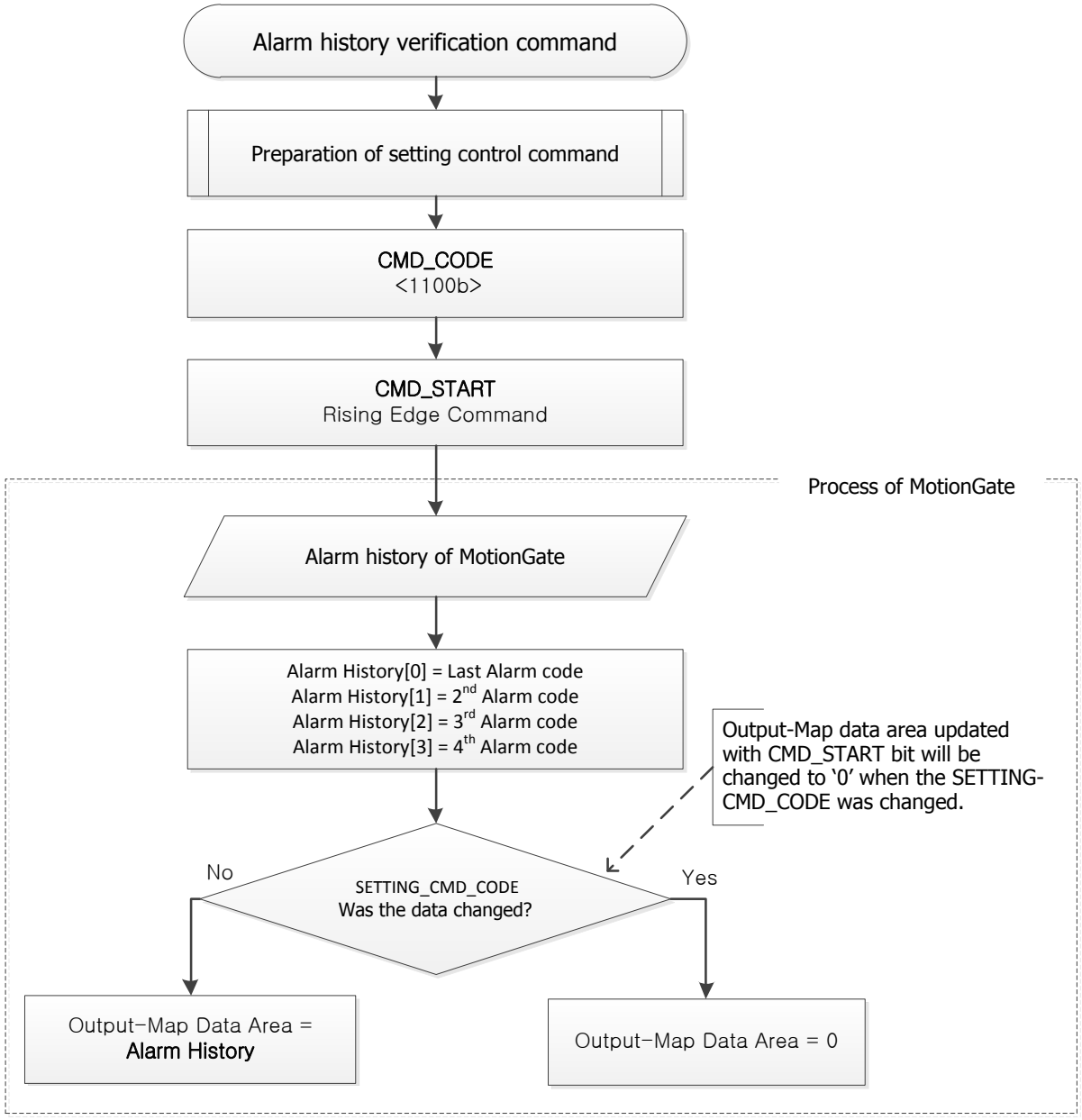
Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY		CMD_ RESP. **0->1**	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1					SETTING_CMD_CODE_RESP **1100b**			
Byte 2-3	0							
Byte 4	4th Last Alarm Code							
Byte 5	3rd Last Alarm Code							
Byte 6	2nd Last Alarm Code							
Byte 7	Last Alarm Code							

*** Output-Map during Big-Endian access**

6.2.2 Command sequence and Operation condition

Flow chart 14. Process sequence of the execution of alarm history verification command



6.3 Initialization of alarm history

Alarm histories saved in MotionGate can be initialized using alarm history initialization command. Initialization command will initialize 4 of the alarm histories to '0x00'.

Input Map : CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 1101b

Output Map : SETTING_CMD_CODE_RESP [1.0~3] = 1101b (Loopback data)

- Set-up value of SETTING_CMD_CODE is 1101b.
- CMD_START Positive edge command will be required to start the command.
- All of the alarm history will be set as '0x00' by initialization command and '0' will sent to the Output-Map Data area.
- Alarm history can be initialized by re-booting the MotionGate.

6.3.1 Bit area

Input Map

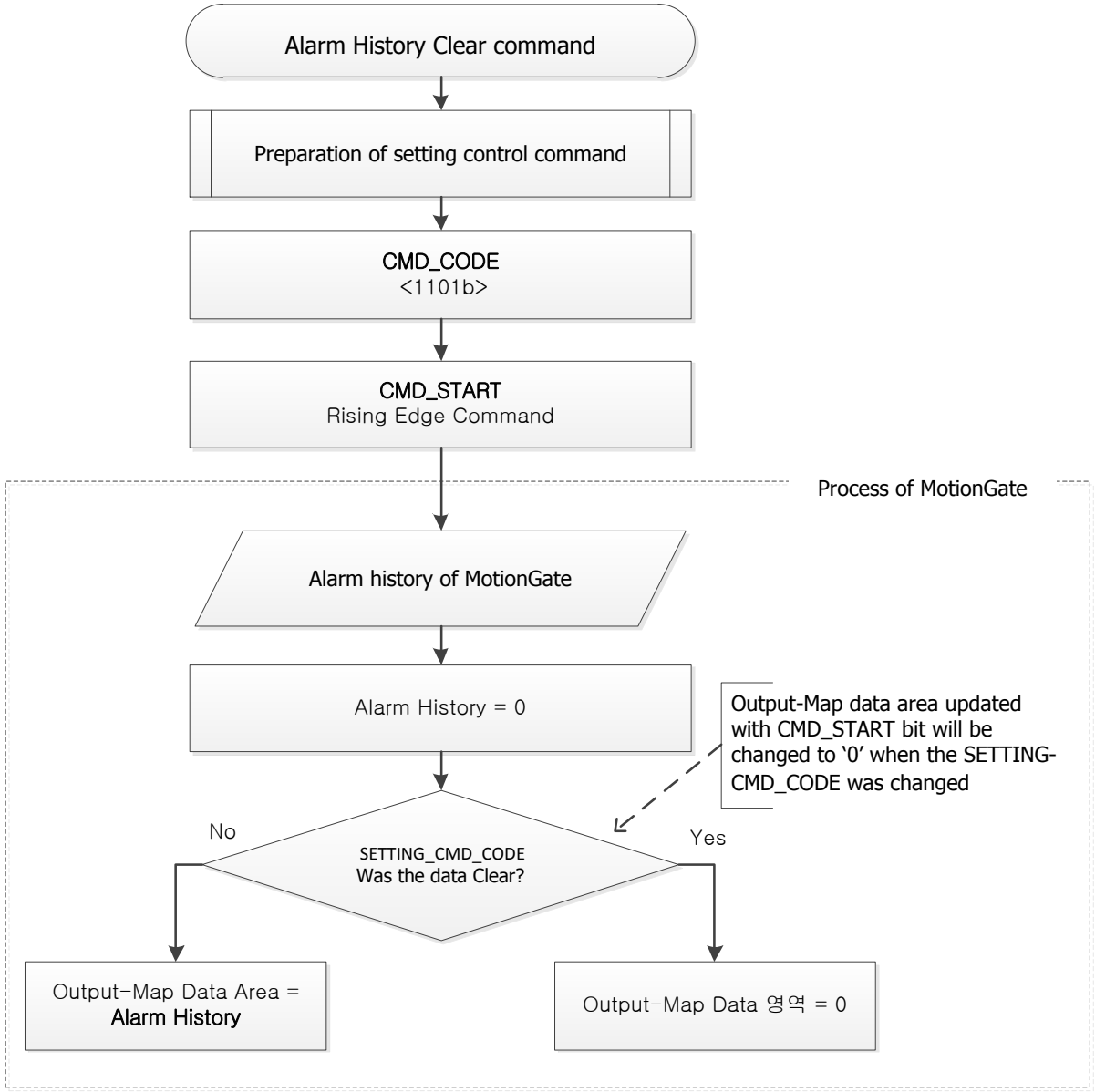
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**		**1**	ENABLE	**1**
Byte 1					SETTING_CMD_CODE **1101b**			
Byte 2-3	0							
Byte 4...7	0							

Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY		CMD_ RESP. **0->1**				**1**
Byte 1					SETTING_CMD_CODE_RESP **1101b**			
Byte 2-3	0							
Byte 4...7	0							

6.3.2 Command sequence and Operation condition

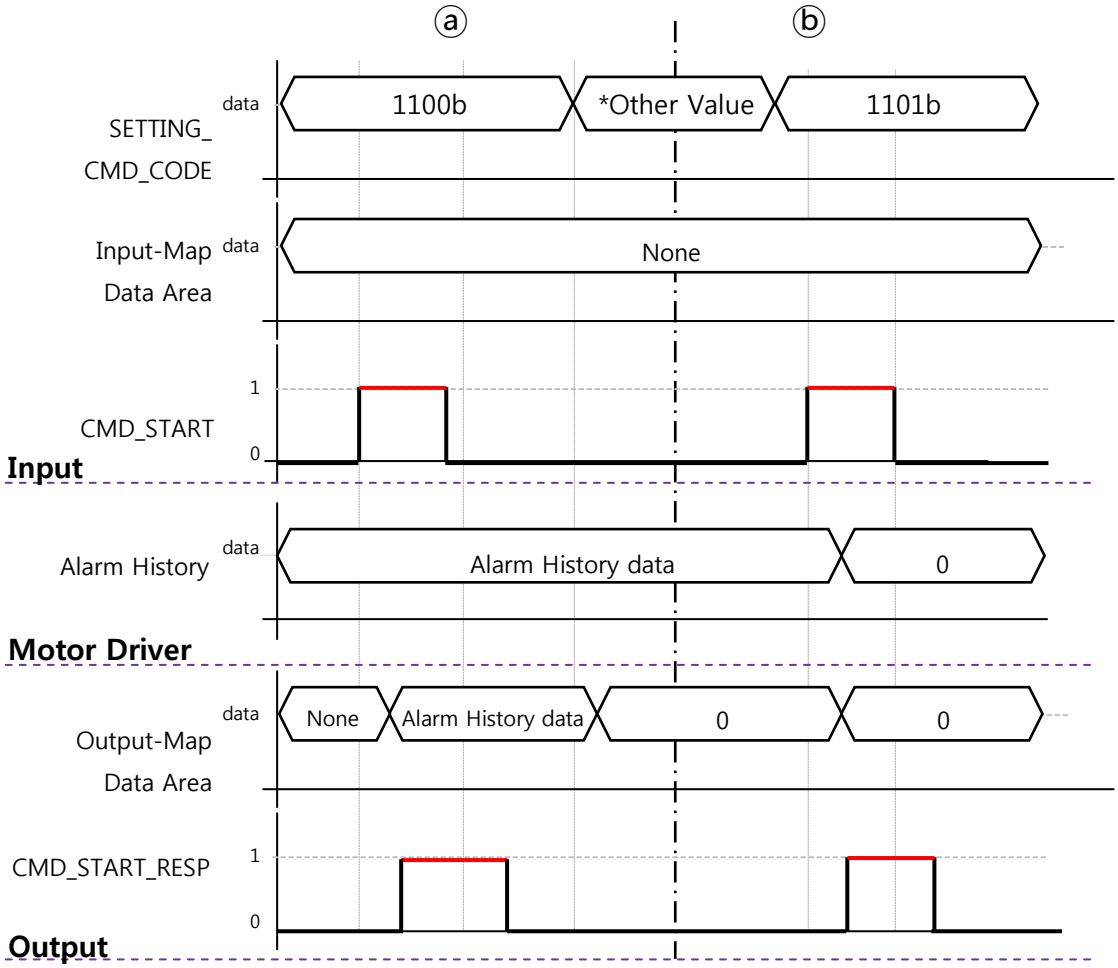
Flow chart 15. Process sequence of the execution of alarm history initialization command



6.4 Timing chart of alarm history verification and initialization command

In order to request the alarm history verification, SETTING_CMD_CODE should be set as 1100b (Read Alarm History code) as section ⓐ and Positive edge command of CMD_START should be executed. Once the command is executed, alarm history will become '0' when SETTING_CMD_CODE data is changed.

Initialization command of alarm history will be executed by Positive edge command of CMD_START bit by setting the SETTING_CMD_CODE as 1101b (Reset Alarm History code) as section ⓑ. Once this command is executed, MotionGate alarm history will be initialized as '0' and the Output-Map Data area will become '0' as well.



7 Special function

7.1 Verification of MotionGate version information

MotionGate has the version verification function. Once version verification command is executed, version information will respond with 4 values by dividing the Output Map Data area in 8 bit.

Input Map : CMD_START[0.4], SETTING_CMD_CODE [1.0~3] = 0101b

Output Map : SETTING_CMD_CODE_RESP [1.0~3] = 0101b (Loopback data)

- Set-up value of SETTING_CMD_CODE is 0101b.
- CMD_START Positive edge command will be required to start the command.
- There are 4 kinds of data received by version verification command. This data has 8 bit structure and respond to decimal number unit. **(*not ASCII code)**
- Example) 1. 0. 2. 3
  - Release No. : 3
  - Bug Fix. : 2
  - Minor Version : 0
  - Major Version : 1

7.1.1 Bit area

Input Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**			CMD START **0->1**	ALARM RESET 0	ESTOP	ENABLE	**1**
Byte 1					SETTING_CMD_CODE **0101b**			
Byte 2-3	0							
Byte 4...7	0							

Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY		CMD_ RESP. **0->1**	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1					SETTING_CMD_CODE_RESP **0101b**			
Byte 2-3	0							
Byte 4	Release No.							
Byte 5	Bug Fix.							
Byte 6	Minor Version							
Byte 7	Major Version							

*** Output-Map during Little-Endian access**

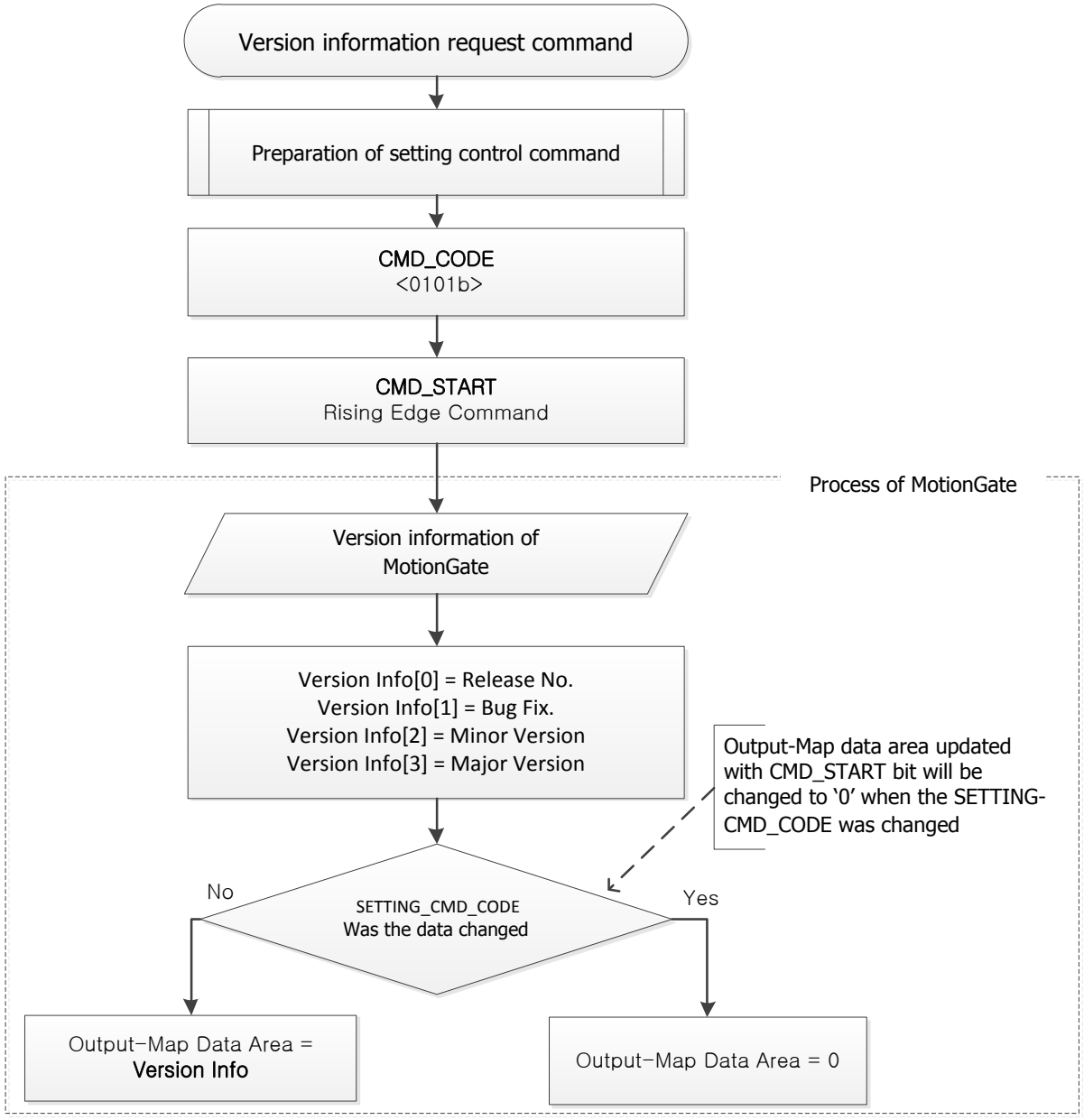
Output Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	**1**	READY		CMD_ RESP. **0->1**	ALARM /ERROR	ESTOP_ RESP	FLAG_ ENABLE	**1**
Byte 1					SETTING_CMD_CODE_RESP **0101b**			
Byte 2-3	0							
Byte 4	Major Version							
Byte 5	Minor Version							
Byte 6	Bug Fix.							
Byte 7	Release No.							

*** Output-Map during Big-Endian access**

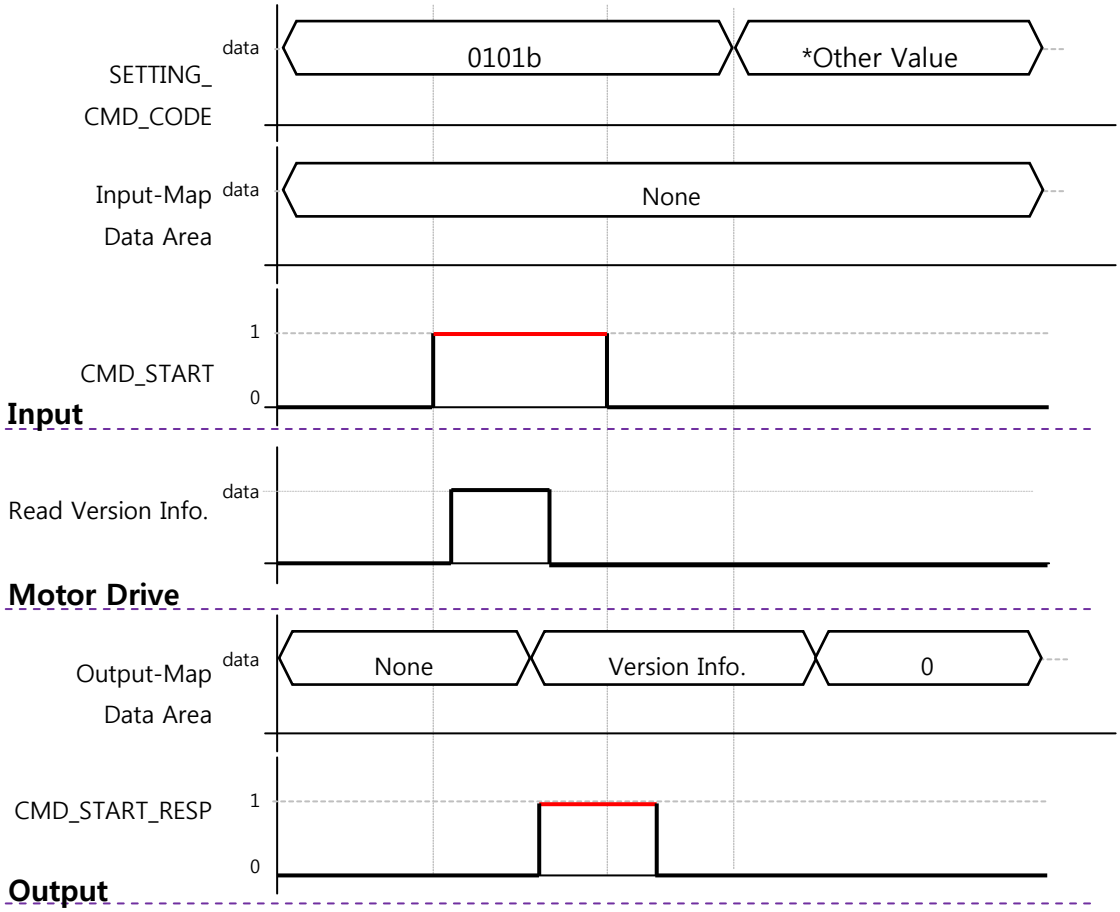
7.1.2 Command sequence and Operation condition

Flow chart 16. Process sequence of the execution of alarm history verification



7.1.3 Timing chart

Version information verification command of MotionGate will be started by the Positive edge command of CMD_START bit by setting the SETTING_CMD_CODE as 0101b (command code of Read Version Information). During this process, CMD_START bit should be maintained as '1' until the MotionGate version information is updated in Output-Map data area.



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