

RFID system Z series
Technical Manual for Identification Processor

Type code : **Z4-Q001**
MELSEC-Q series BUS Interface



Thank you very much for purchasing the RFID system Z series of B&PLUS lately.
Before using this Processor, read this manual carefully and operate properly, paying attention to the safety aspects.

Safety Considerations

(Please read this before use)

Before using this Processor, read this manual carefully and operate properly, paying attention to the safety aspects.

Incorrect handling may cause not only malfunction or failure, leading to an accident or injury.

In this manual, the instructions are described in the following two levels.



Caution

The incorrect handling may cause hazardous conditions that lead to death or serious injury.



Attention

The incorrect handling may cause hazardous conditions that lead to injury of human or equipment.

Application

- ◆ This manual applies to processors in Z4-Q001.
- ◆ Carefully read this manual before using the processor and handle the product correctly.
- ◆ Installation and operation should be carried out by trained personnel who has knowledge of electrical equipment.

Design considerations



Caution

- ◆ Even if the abnormality of power supply and this product break down, please design the system so that the whole system acts on the safe side.
 - ◆ About power supply and using conditions, be carefle not to exceed the range of specifications.
 - ◆ About the standard or the rule, to which your equipment should adapt, please do appropriate measures after confirm by yourself.
- It is the responsibility of the operator to ensure that the locally applicable safety regulations are maintained."

Wiring considerations



Attention

- ◆ Wiring should be carried out after the power is turned off.
 - ◆ When wiring the processor, follow the chapters containing the wiring diagrams closely, and wire all connections properly.
- Incorrectly connected wiring may cause malfunction or unexpected problems.

Usage considerations



Attention

- ◆ Unauthorized work and improper use will void the warranty and liability.
- ◆ Please carry out the periodical confirmation of the system including setting environment and the apparatus concerned.
- ◆ The processor must be operated only using approved power supplies. There is a risk of fire or heat generation exceeds the rated voltage power is being supplied.
- ◆ Be sure to turn off the power before cleaning, maintenance and failure treatment. Do not touch the terminals while the electricity is on.
- ◆ Do not disassemble or modify the processor. It may cause failure, malfunction, injury or fire.
- ◆ When disposing of the processor, treat it as industrial waste.

< Note >

- (1) Specifications and contents in this manual are subject to change without notice
- (2) Please let us know if there is any mistake or notice in this manual

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1.1 Description

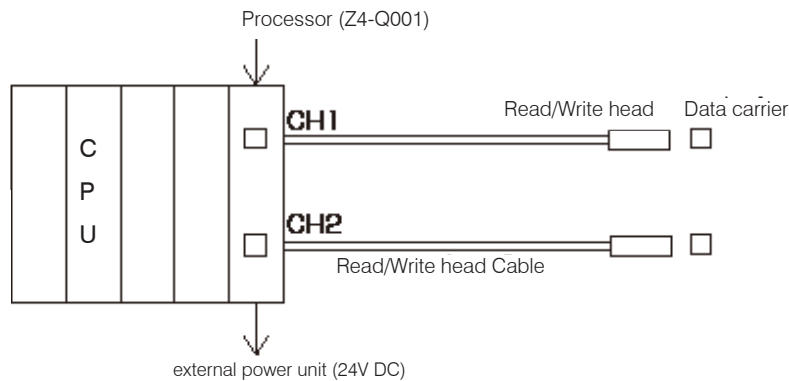
[B&PLUS RFID System Z series] is an RFID System for factory automation which read or writes data wirelessly by inductive coupling principal.

Processor / Z4-Q001 is an interface unit for factory automation systems, which connects directly to Sequencer unit "MELSEC-Q series" by Mitsubishi (2 Read/Write heads are connectable).

There is no need to sequence program when read data from Data carriers or write data to Data carriers. It is possible to read data from data carriers or write data to Data carriers like CPU of a Sequencer reads data or writes data to Buffer memory.

In writing data to data carriers, write data to Buffer memory with [To command] of sequence program, then [ON] output signal. In reading data from Data carriers, [ON] output signal and read data to Buffer memory of data carriers, then read data from Buffer memory [FROM command].

1.2 System configuration



■ Function of each component

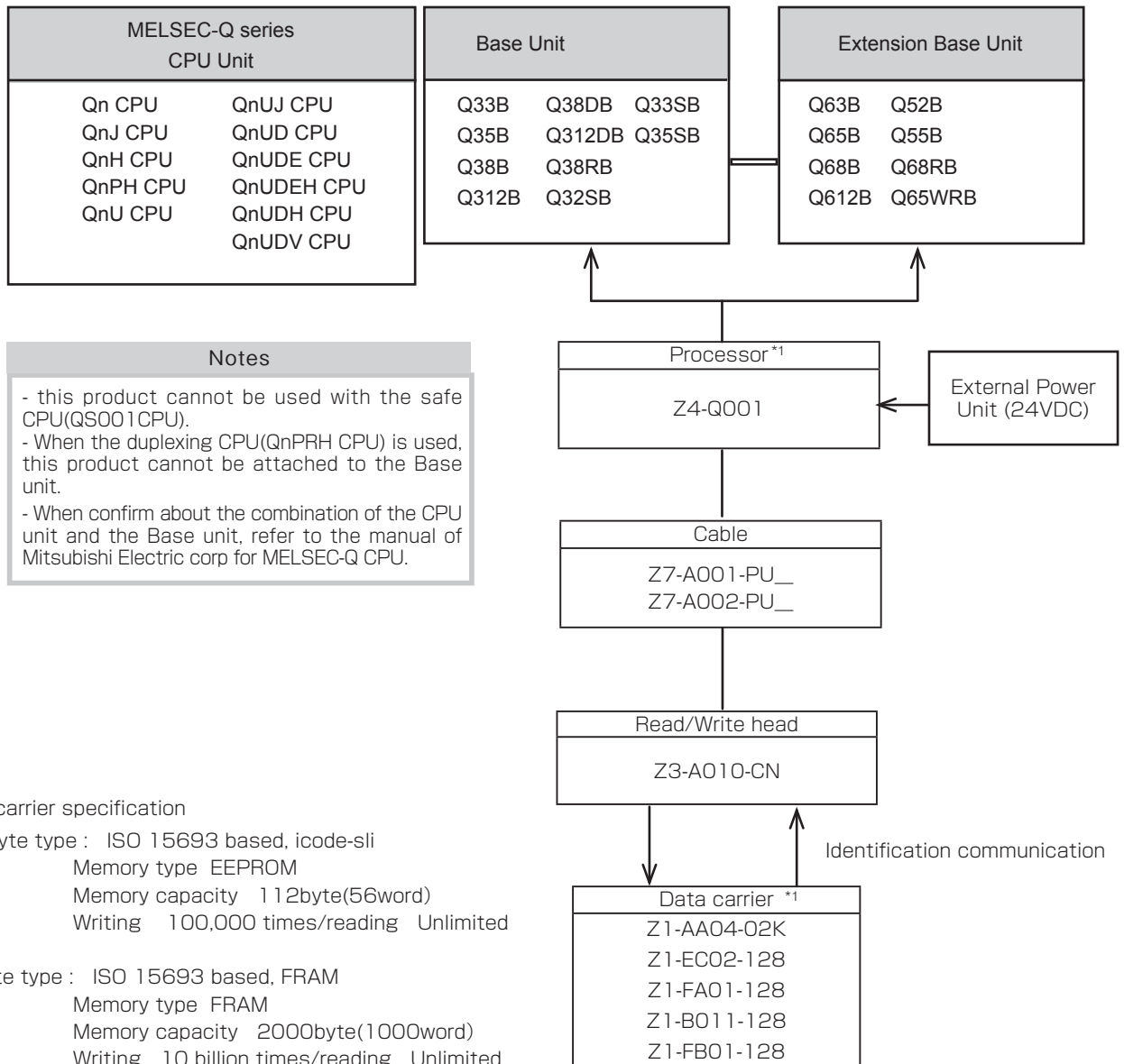
Component	Function
Data carrier	Memorize and save information (data).
Read/Write head	Read and Write information (data) of Data carrier non-contact. Supply power for operating of Data carriers.
Processor	Follow to the command from CPU unit, read data from Data carrier and write data to Data carrier. One or two Read/Write head(s) are connectable.

[Note for System configuration]

- Processor Z4-Q001 is a special unit for MELSEC-Q series which occupies I/O 32 signals.
The maximum number that can be mounted on a MELSEC base unit is different by CPU as follows.
Q00JCPU / Q00UJ : 8 pcs., Q00CPU / Q00UCPU / Q01CPU / Q01UCPU : 24 pcs., Q02UCPU : 36 pcs.,
Q12PRHCPU / Q25PRHCPU : 53 pcs.(It is impossible to install on a basic base unit), Onother CPU : 64 pcs.
When there are other units on the same base unit, the capacity of power may be short, even if there is less number than the above. When the power is not enough, please reconsider the combine of the mount unit.
- The number of Processors which are controlled by a CPU unit should be selected in consideration of the above and the following points.
 - (1) I/O signals and data memory capacity of CPU unit.
 - (2) Number of occupied signals of other units (input/output card) except Processor.
 - (3) Influence of programming (ladder) to processing time or tact time.

1.3 Components and Applicable Unit

Components and applicable unit of MELSEC-Q series including Processor Z4-Q001 is indicated as follows.



*1 : Data carrier specification

112 byte type : ISO 15693 based, icode-sli
Memory type EEPROM
Memory capacity 112byte(56word)
Writing 100,000 times/reading Unlimited

2K byte type : ISO 15693 based, FRAM
Memory type FRAM
Memory capacity 2000byte(1000word)
Writing 10 billion times/reading Unlimited

※ As of July 23, 2015

■ Correspondence RFID chip

Chip	Manufacturer	Capacity
MB89R118	Fujitsu	2000byte(FRAM)
I-CODE SLI,SLIX	NXP	112byte
Tag-it HF-I plus	TI	256byte
my-d(SRF55V02P)	Infineon	224byte
my-d(SRF55V10P)	Infineon	992byte
Tag-it HF-I standard	TI	32byte
Tag-it HF-I pro	TI	32byte

The following are registered trademarks.

I-CODE SLI	NXP semiconductors
SLIX	
FRAM	Cypress Semiconductor
Tag-it	Texas Instruments Incorporated
my-d	Infineon Technologies AG

Lot number 1501JP (first week in 2015) and later of Read/Write head (Z3-A010-CN) corresponds to the ID chip of the left table.

2014 previous product, please note that only correspondence becomes the usable Data carrier.

When using all except for a practicable Data carrier above-mentioned by a product after 2015, please be careful about the following.

To depend on the special quality of the ID chip and the Read/Write head for the communication distance, processing time and the communication quality, when using, please check it.

2. Specification of the System

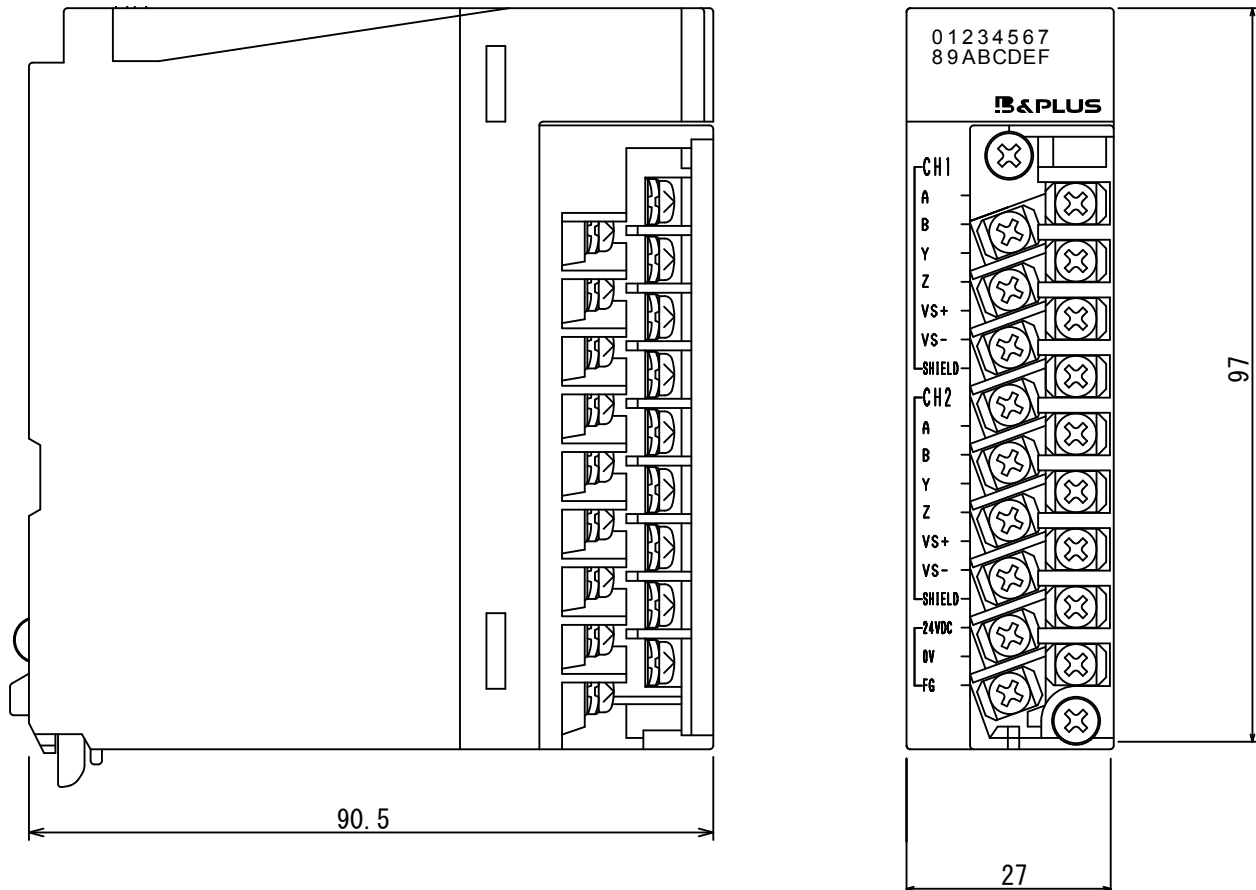
2.1 Specification

Type code	Z4-Q001			
Power supply	24 VDC+/-10 % (External power supply)	5 VDC (Sequencer electric supply source)		
Current consumption	0.75 A (External power supply)	0.5 A (Sequencer electric supply source)		
Occupied I/O signals	32 signals			
Applicable Data carrier	Z1-AA04-02K, Z1-EC02-128, Z1-FA01-128, Z1-B011-128, Z1-FB01-128			
Applicable R/W head	Z3-A010-CN			
Read/Write heads	Connectable up to two Read/Write heads			
Connecting Heads	Terminal connecting			
Cable length R/W heads	5 m standard (max.25 m)			
Operating temperature, humidity	0...+55 degree C, 35...85 % RH (not in dew condensation)			
Storage temperature, humidity	-25...+70 degree C, 35...85 % RH (not in dew condensation)			
Vibration rating	Frequency	Acceleration	Amplitude	Sweepage
	10 - 57 Hz	-	0.075 mm	10 times
	57 - 150 Hz	1 G	-	1 octave/1 min. *
Shock rating	10 G, 3 times each axis to x-y-z			
Noise-proof	Noise voltage for 24 VDC power supply 800 V P-P, amplitude of noise 1 microS, Noise frequency: operating normally with noise simulator 25...60 Hz			
Operating atmosphere	Without corrosive gas and heavy dust			
Weight	approx. 230 g			

(*) 1 octave ... Initial frequency increases to double or decreases to half.

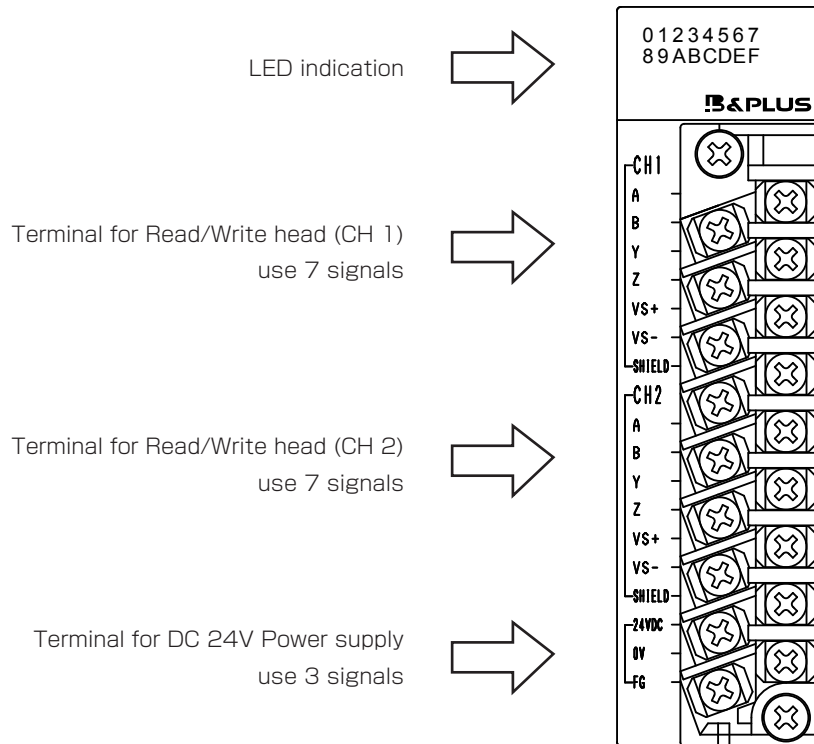
ex. 10 Hz --> 20 Hz, 20 Hz --> 40 Hz, 40 Hz --> 20 Hz, 20 Hz --> 10 Hz / each of these change is called as 1 octave

2.2 Dimension



2. Specification of the System

2.3 LED indication and Connecting Terminal



LED indication

Monitor the operating condition, errors etc. by LED indication.
When error has occurred, error code would be shown

LED No.	LED indication		Error	Descriptions
	Channel	Condition		
0	CH1	Require communication	Error code : bit 4	[Lights on], when Required communication is [ON]
1		Specify Reading page	Error code : bit 3	[Lights on], when reading page command is [ON]
2		Specify Writing address	Error code : bit 2	[Lights on], when writing page command is [ON]
3		Reading/Writing completed	Error code : bit 1	[Lights on], when reading and writing to data carrier is completed
4		Inzone	Error code : bit 0	[Lights on], when data carrier is in [inzone]
5		Head is disconnected		[Lights on], when head is disconnected or cable breakage
6		Error		[Lights on], when error is occurred
7	Ready			[Lights on], when ready condition (in normal operation)
8	CH2	Require communication	Error code : bit 4	Same as CH1
9		Specify Reading page	Error code : bit 3	
A		Specify Writing address	Error code : bit 2	
B		Reading/Writing completed	Error code : bit 1	
C		Inzone	Error code : bit 0	
D		Head is disconnected		
E		Error		
F	Watch dog timer (WDT) error			ON, when watch dog timer (WDT) error is occurred

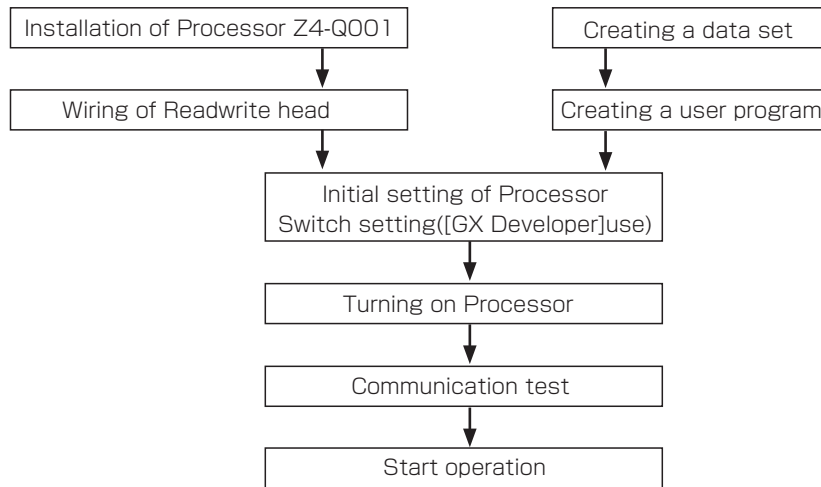
(note) When an error occurs, error code is indicated by using 5 LEDs as above.
<CH 1 error to LED No. 0..4 / CH 2 error LED No. 8..C>

Connecting terminal

- (1) Read/Write head (CH 1) connecting terminal : use 7 terminals
- (2) Read/Write head (CH 2) connecting terminal : use 7 terminals
- (3) External power unit (DC 24V) and earthing terminal : use 3 terminals

Describes the installation environment and Handling Precautions in installation of Processor.

3.1 Procedure of Installation



3.2 Processor Installation

3.2.1 Setting condition

Please install processor avoiding situations where ;

- May be subjected to direct sunlight, such as outdoors.
- Operating temperature exceeds 0..55 degree C.
- Dew condensation caused by severe temperature change.
- Relative humidity exceeds 35...85%RH.
- Processor is exposed to heavy corrosive gas, combustible gas, or dust.
- Shock or vibration directly to processor.
- Water, oil or chemical is sprayed on the processor.

Although this product suits EMC instructions and CE mark is displayed, I am doing the examination in the state of the installation in an operator control panel like the Sequencer.

<Note>

Please install processor in board with particular attention to following points.

- Well ventilated space.
- Processor should not be installed close to devices which generates high heat, such as a heater, transformer or High capacity resistor.
- The surface temperature of processor may become more than 55 deg.C. by self-fever.
Some measure to install a fan or a heat exchanger should be taken so that the board inside keeps under 55 deg.C.
- Please remove the dustproof label, after all wiring is completed.

3.2.2 Processor fixation

This Processor should be installed in a Mitsubishi basic base unit or an additional unit by Mitsubishi. Please refer to "1.3 Components and Applicable Unit" for available base unit.

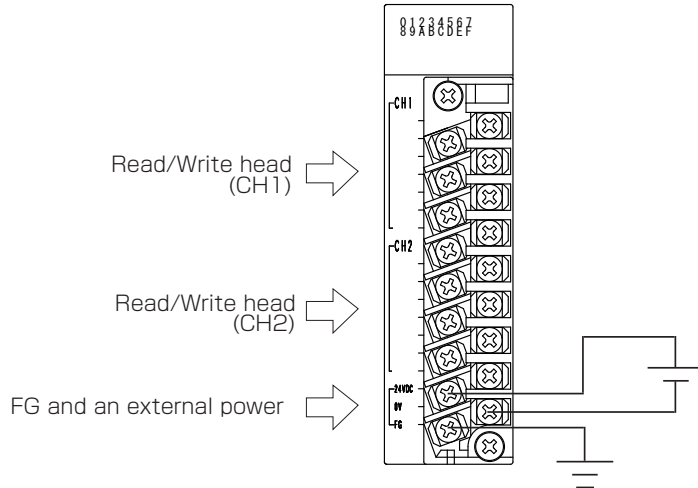
When installing, please take in consideration the current capacity of the power supply, as well as the voltage drop of additional cable. For details, please refer to the Sequencer CPU user manual.

3.3 Wiring

① Wiring of FG and an external power(24VDC)

Install wiring by following the steps below

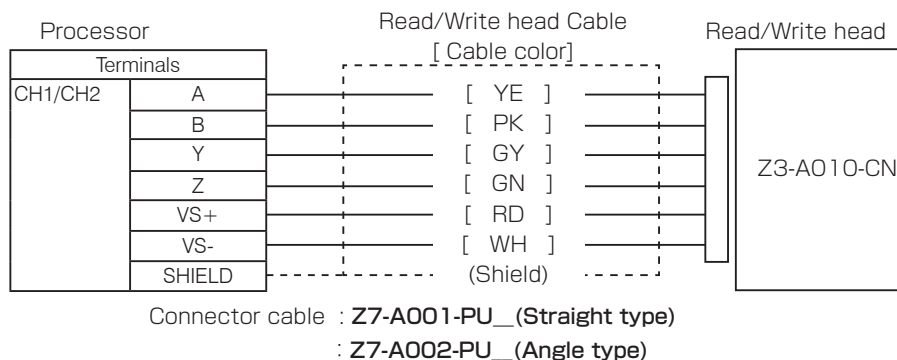
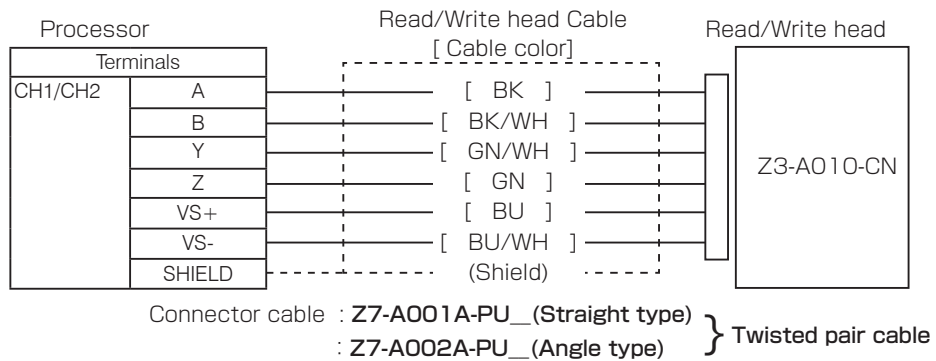
- Connect [+] of 24V DC to terminal indicated [24V DC], [-] to terminal indicated [0V].
- Connect to terminal indicated [FG], and wire to the same point of Frame Ground of Sequencer CPU unit.

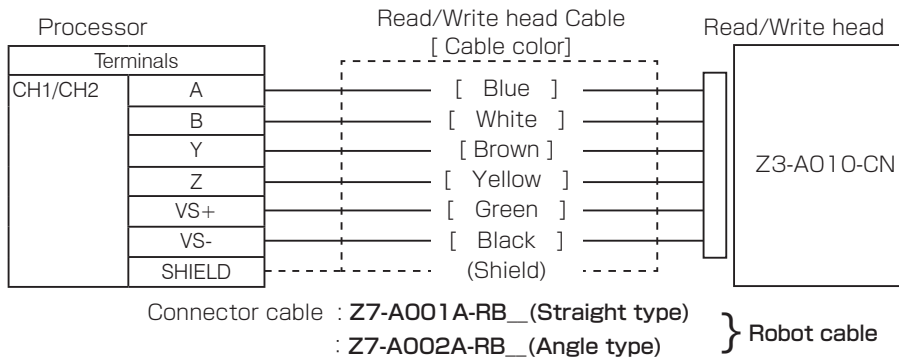


② Read/Write head

Wire Read/Write head to connecting terminal for Read/Write head with reference to [Wiring diagram] below.
To connect 2 Read/Write heads, there are terminals for CH1/CH2 and Read/Write heads are connectable to each terminal.

[Wiring diagram] Wiring of Read/Write head with cable





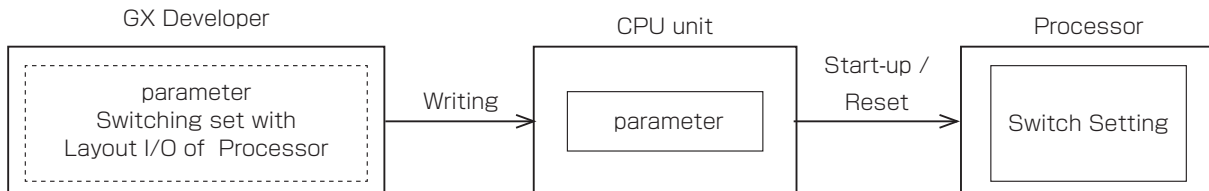
<Note for wiring>

- Read/Write head Cable should be kept apart from power cable or high voltage unit.
 - When Read/Write head is installed on unit which has metal housing, make the unit to D-class grounding.
 - This product is in conformity with EMC directive and indicated CE marking.
- Appropriate measures should be taken to avoid excessive surges when the cable length to the power unit is longer than 10m.

3.4 Setting of Switches ([GX Developer])

Switch settings set the parameters of the processor with [GX Developer].

The switch assignments are written to the processor from CPU unit when the Sequencer of CPU unit is started-up or reset.



!! Refer to user's manual of CPU unit about detail of setting.

3.4.1 Parameter setting switch of CPU

No	Content
Switch 1	Specify data carrier [Pagey size]
Switch 2	Specify R/W head oscillate mode
Switch 3	Specify of write skip function
Switch 4	Specify of buffer memory clear function
Switch 5	Specify of write protect area

※ Set a decimal number by GX Developer

3.4.2 Specify [Page Size] of Data carrier

SW1 defines memory page size.

Configuration Example

The value of the switch1	[page size] of Data carrier
1	32byte
2	64byte

3.4.3 Specifies Oscillation Mode of Read/Write head

It always oscillates when the Processor is ready, so please make sure to set as "OFF".

The value of the switch2	Oscillation mode
0	Always oscillation

3.4.4 Specify of Write Skip Function

[Write Skip Function] is the function that writing data is not carried out when the data already written in data carrier memory is the same as the data to be written. This function can shorten the processing time for writing.

Select whether to use this function or not by setting switch, SW3.

The specified [write skip function] is valid to 2 channels (CH1/CH2).

The value of the switch3	With write skip function
0	With function
1	Without function

3.4.5 Specify Clear Buffer Memory

[Clear Buffer Memory] is a function to clear all data [Reading data], [Writing data], [Data writing at once], and [Life expectancy of Data carrier] in the buffer memory of Processor every time the signal (Y1/Y1 1) is turned [OFF].

In the case of this function is not used, the new data of the address correspond to renewed [Reading Writing data] is changed and other data is remained.

Processor clears all of the data in buffer memory when [Ready] is started.

Select whether to use this function or not via switch setting SW4.

The specified [write skip function] is valid to 2 channels (CH1 / CH2).

The value of the switch4	Buffer Memory
0	Without clear function
1	With clear function

3.4.6 Specify of Write Protect Area

When writing process is carried out to address of data carrier which is protected area specified with set switch, it would be error and data writing is not done.

[Write Protected area] is specified per [page] of data carrier.

Set switch according to the following table.

Value of switch 5	Write protect
0	Non
1	0 page
2	0 to 1 pages
4	0 to 2 pages
8	0 to 3 pages
15	All Pages

<Note>

Processor detects error [Set switch] and outputs the error signal when the set switch is done inappropriate.

Please check the switch setting details before carry out the communication process to data carrier.

4. Communicating Function

4. 1 Communicating Function

Sequencer can process following communication to this Processor.

Function	Processing descriptions
Data Reading	(1) Processing area for data reading is specified per page address or word address of Data carrier from Sequencer to Processor. (2) Processor reads indicated per word or page address of Data carrier and sets Buffer memory area ([reading data] area). (3) Sequencer reads required data by [FROM] command from Buffer memory ([reading data] area) of Processor.
Data Writing	(1) Processing area for data writing is specified per word address of Data carrier from the Sequencer to Processor. (2) Writing data which corresponds to (1) is set by [TO command] from Sequencer to Buffer memory ([writing data] area) of Processor. (3) Processor writes data of Buffer memory ([reading data] area) to word address of Data carrier.
Data Writing at once	This command function is to write [same data] at once indicated all address of Data carrier. It is available to clear all of data of data carrier. ----- (1) Specify processing area of [data writing at once] per [word]address of Data carrier from the Sequencer to Processor. (2) Writing data which corresponds to (1) is set by [TO command] from Sequencer to Buffer memory ([writing data] area) of Processor. (3) Processor writes data of the Buffer memory ([writing data] area) to all specified [word] address of the data carrier.
Error Reading	(1) When an error is detected, Processor sets the error code which corresponds to the error in Buffer memory (error code area). (2) Error code is read [FROM command] from Buffer memory (error code area) of Processor.

4.2 Memory Address of Data carrier

The address per one byte unit (8bits) is given to the memory of Data carrier..

"Page" can be configured per 32 or 64 bytes unit. Page size can be selected by switch setting. (Refer to 3.4.2)

Data communication between Sequencer and Processor is accomplished per "word" unit, but "page" unit is possible in data reading.

Address memory of data carrier configuration

1 page - 32 byte

Page	Word address	
	START	END
0	0	F
1	10	1F
2	20	2F
3	30	3F
4	40	4F
5	50	5F
6	60	6F
7	70	7F
8	80	8F
9	90	9F
10	A0	AF
11	B0	BF
12	C0	CF
13	D0	DF
14	E0	EF
15	F0	FF
16	100	10F
17	110	11F
18	120	12F
19	130	13F
20	140	14F
<hr/>		
21	150	15F
22	160	16F
23	170	177

The 112-byte data carrier has the memory in 3 pages(0 ... 2). The address range is 0 ... 2F.

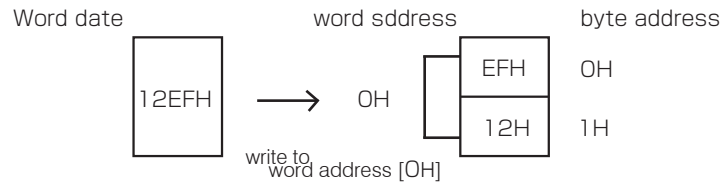
1 page - 64 byte

Page	Word address	
	START	END
0	0	1F
1	20	3F
2	40	5F
3	60	7F
4	80	9F
5	A0	BF
6	C0	DF
7	E0	FF
8	100	11F
9	120	13F
10	140	15F
<hr/>		
29	3A0	3BF
30	3C0	3DF
30	3E0	3E7

The 112-byte data carrier has the memory in 1 page(0). The address range is 0 ... 2F.

4. Communicating Function

Data storage format of data carrier [memory]



4. 3 Input and Output Signals

Input and output signals from the Sequencer to the are shown in the table below.

Device [X] is an input signal from Processor to the Sequencer, device [Y] is an output signal from Sequencer to Processor.

[Device number] of the input output signal in the following table, is indicated when Processor is equipped on slot [O] of basic base unit.

[Note] When the controller is installed in another slot, the [Device number] of input output signals would be changed. (Refer [Sequencer manual] and confirm [Device number]) Input signal (Device [X])

Device No.	Signals	Descriptions
X0	Unit ready	[OFF], when watch dog timer (WDT) error is occurred
X1	CH1	Echo Require Communication
X2		Echo back signal of require communication (Y1)
X3		Inzone
X4		[ON], when Read/Write head detects data carrier
X5		not use
X6		—
X7		Echo specify [Read page]1
X8		Echo back signal of specify [Read page] 1 (Y4)
X9		Echo specify [Read page]2
XA		Echo back signal of specify [Read page] 2 (Y5)
XB		Echo specify [Read address]1
XC		Echo back signal of specify [Read address] 1 (Y6)
XD		Echo specify [Read address]2
XE		Echo back signal of specify [Read address] 2 (Y7)
XF	Echo specify [Write add.]1	
X10	Echo back signal of specify [Write address] 1 (Y8)	
X11	Echo specify [Write add.]2	
X12	Echo back signal of specify [Write address] 2 (Y9)	
X13	Echo specify [write add. at once]	
X14	Echo badk signal of specify [write address at same time] (YA)	
X15	not use	
X16	—	
X17	not use	
X18	—	
X19	Complete reading / writing	
X1A	(1)[ON] when read data is set from data carrier to buffer memory	
X1B	(2)[ON] when write data is written data carrier which is set in buffer memory.	
X1C	(3)[OFF] when require communication (Y1) is OFF.	
X1D	Head disconnected	
X1E	[ON] Read/Write head is disconnected or cable breakage	
X1F	Error	
X1G	[ON] when error is detected.	
X1H	—	
X1I	CH2	Echo Require Communication
X1J		Echo back signal of require communication (Y11)
X1K		Inzone
X1L		[ON], when Read/Write head detects data carrier.
X1M		not use
X1N		—
X1O		Echo specify [Read page]1
X1P		Echo back signal of specify [Read page] 1 (Y14)
X1Q		Echo specify [Read page]2
X1R		Echo back signal of specify [Read page] 2 (Y15)
X1S		Echo specify [Read address]1
X1T		Echo back signal of specify [Read address] 1 (Y16)
X1U		Echo specify [Read address]2
X1V		Echo back signal of specify [Read address] 2 (Y17)
X1W	Echo specify [Write add]1	
X1X	Echo back signal of specify [Write address] 1 (Y18)	
X1Y	Echo specify [Write add]2	
X1Z	Echo back signal of specify [Write address] 2 (Y19)	
X1AA	Echo specify [write add. at once]	
X1AB	Echo badk signal of specify [write address at same time] (Y1A)	
X1AC	not use	
X1AD	—	
X1AE	not use	
X1AF	—	
X1AG	Complete reading / writing	
X1AH	(1)[ON] when read data is sent from data carrier to buffer memory	
X1AI	(2)[ON] when write data is written to data carrier which is set in buffer memory.	
X1AJ	(3)[OFF] when require communication (Y11) is OFF.	
X1AK	Head disconnected	
X1AL	[ON] Read/Write head is disconnected or cable breakage	
X1AM	Error	
X1AN	[ON] when error is detected	

4. Communicating Function

Output Signal (Device [Y])

Device No.	Signals	Descriptions
Y0	not use	—
Y1	CH1 Require communication	Command for starting identification communication (When the signal is ON, identification communication would be started between Processor and Data carrier.)
Y2	not use	—
Y3	not use	—
Y4	Specify [Read page]1	Specified signal [1] of processing area [reading data] (Read from Data carrier according as processing area of page which set in Buffer memory)
Y5	Specify [Read page]2	Specified signal [2] of processing area [reading data] (Read from Data carrier according as processing area of page which set in Buffer memory)
Y6	Specify [Read address]1	Specified signal [1] of processing area [reading data](per word) (Read from Data carrier according as processing area of word address which set in Buffer memory)
Y7	Specify [Read address]2	Specified signal [2] of processing area [reading data](per word) (Read from Data carrier according as processing area of word address which set in Buffer memory)
Y8	Specify [Write add]1	Specified signal [1] of processing area [writing data] (Write data to Data carrier according as processing area of address which set in Buffer memory)
Y9	Specify [Write add]2	Specified signal [2] of processing area [writing data] (Write data to Data carrier according as processing area of address which set in Buffer memory)
YA	Specify [write add. at once]	Specified signal of processing area [writing data at once]. (Write data to Data carrier according as processing area of address which set in Buffer memory)
YB	not use	—
YC	not use	—
YD	not use	—
YE	not use	—
YF	not use	—
Y10	not use	—
Y11	CH2 Require communication	Command for starting of identification communication (When the signal is ON, identification communication would be started between Processor and Data carrier.)
Y12	not use	—
Y13	not use	—
Y14	Specify [Read page]1	Specified signal [1] of processing area [reading data] (Read from Data carrier according as processing area of page which set in Buffer memory)
Y15	Specify [Read page]2	Specified signal [2] of processing area [reading data] (Read from Data carrier according as processing area of page which set in Buffer memory)
Y16	Specify [Read address]1	Specified signal [1] of processing area [reading data] (per word) Read from Data carrier according as processing area of word address which set in Buffer memory)
Y17	Specify [Read address]2	Specified signal [2] of processing area [reading data] (per word) Read from Data carrier according as processing area of word address which set in Buffer memory)
Y18	Specify [Write add]1	Specified signal [1] of processing area [writing data] (Write data to Data carrier according as processing area of address which set in Buffer memory)
Y19	Specify [Write add]2	Specified signal [2] of processing area [writing data] (Write data to Data carrier according as processing area of address which set in Buffer memory)
Y1A	Specify [write add. at once]	Specified signal of processing area [writing data at once]. (Write data to Data carrier according as processing area of address which set in Buffer memory)
Y1B	not use	—
Y1C	not use	—
Y1D	not use	—
Y1E	not use	—
Y1F	not use	—

4. Communicating Function

4. 4 Buffer memory

Buffer memory is [Memory area] inside of Processor and functions as a relay to access from Sequencer to data carrier.

Processor stores [reading data] from Data carrier to Buffer memory, and writes [writing data] to Data carrier which is set from Sequencer to Buffer memory.

4.4.1 Construction of address (word) of [Buffer memory] is shown below.

(HEX)	(Decimal)		
0000	0	CH1/Specify reading page area[1]	Start page
0001	1		The number of processing pages
0002	2	CH1/Specify reading page area[2]	Start page
0003	3		The number of processing pages
0004	4	CH1/Specify reading address area[1]	Start address
0005	5		The number of processing words
0006	6	CH1/Specify reading address area[2]	Start address
0007	7		The number of processing words
			---> [Unused area]
0010	16	CH2/Specify reading page area[1]	Start page
0011	17		The number of processing pages
0012	18	CH2/Specify reading page area[2]	Start page
0013	19		The number of processing pages
0014	20	CH2/Specify reading address area[1]	Start address
0015	21		The number of processing words
0016	22	CH2/Specify reading address area[2]	Start address
0017	23		The number of processing words
			---> [Unused area]
0020	32	CH1/Specify writing address area[1]	Start address
0021	33		The number of processing word
0022	34	CH1/Specify writing address area[2]	Start address
0023	35		The number of processing word
			---> [Unused area]
0030	48	CH2/Specify writing address area[1]	Start address
0031	49		The number of processing word
0032	50	CH2/Specify writing address area[2]	Start address
0033	51		The number of processing word
			---> [Unused area]
0040	64	CH1/Specify writing address at once area	Start address
0041	65		The number of processing word
0050	80	CH2/Specify writing address at once area	Start address
0051	81		The number of processing word
			---> [Unused area]
1000	4096	CH1/ Store area for [reading data]	
1FFF	8191		
2000	8192	CH1/Store area for [writing data]	
2FFF	12287		
3000	12288	CH2/Store area for [reading data]	
3FFF	16383		
4000	16384	CH2/ Store area for [writing data]	
4FFF	20479		
5000	20480	CH1/ Store area for [writing data at once]	
5001	20481	CH2/ Store area for [writing data at once]	
			---> [Unused area]
6000	24576	Input monitor of Device [Y]	
6001	24577		
6002	24578	Output monitor of Device [X]	
6003	24579		
			---> [Unused area]
6010	24592	CH1/ Store area for error code	
6017	24599		
			---> [Unused area]
6020	24608	CH2/ Store area for error code	
6027	24615		
			---> [Unused area]
6030	24624	Set monitor for switch 1	
6031	24625	Set monitor for switch 2	
6032	24626	Set monitor for switch 3	
6033	24627	Set monitor for switch 4	
6034	24628	Set monitor for switch 5	
			---> [Unused area]
7FFF	32767		

(Note)
Refer to next chapter about
correspondence of this address
and data carrier address.

4.4.2 [Address] of Data carrier and [Store Address] of Buffer Memory

Corresponding of Data carrier [address] and Buffer memory [Stored Address] are indicated as follows.

<Table for corresponded address (address per word)>

Data carrier address	Buffer memory store address (Hex.)			
	Reading data		Writing data	
	CH1	CH2	CH1	CH2
0	1000	3000	2000	4000
1	1001	3001	2001	4001
⋮	⋮	⋮	⋮	⋮
FF	10FF	30FF	20FF	40FF
⋮	⋮	⋮	⋮	⋮
1FF	11FF	31FF	21FF	41FF
⋮	⋮	⋮	⋮	⋮
3F7	13E7	33E7	23E7	43E7

Point [1]

Stored address of Buffer memory has a different address for each channel (CH1 / CH2) which connects Read/Write head for reading data and writing data

Point [2]

[Read data] from data carrier is set to [store address] Buffer memory which corresponds to data carrier [address]

Point [3]

When writing data from the Sequencer to Buffer memory, write the data to the stored address of Buffer memory that corresponds to the data carrier address. (for each specified channel). Processor writes the data of the stored address that corresponds to the specific address of the data carrier.

<Note>

Read/write command can be available up to 1000words (3E8H)

When larger command than memory capacity is given to ID tag of 752bytes (376 words), Processor will accept and execute it.

In that case, read/write function is normally executed within the range of memory, but it shows "reading process error" or "writing process error" when you access the address outside of the range.

For example, "writing process error" is displayed after writing up to 56 words when the command "write to Z1-xxxx-xxx (icode 56 words) from 0 to 1000 words" is executed.

4.5 Data Processing Time

Data processing time for reading and writing is shown below.

<112 byte / Data carrier> (icode-sli EEPROM)

Data Volume		Processing time	
		Reading	Writing
1 word	2 byte	0.1 sec.	0.1 sec.
32 word	64 byte	0.2 sec.	0.3 sec.
56 word	112 byte	0.3 sec.	0.6 sec.

<2000 byte / Data carrier> (FRAM)

Data Volume		Processing time	
		Reading	Writing
1 word	2 byte	0.1 sec.	0.1 sec.
32 word	64 byte	0.2 sec.	0.3 sec.
250 word	500 byte	1.3 sec.	2.0 sec.
500 word	1000 byte	2.4 sec.	3.8 sec.
750 word	1500 byte	3.6 sec.	5.7 sec.
1000 word	2000 byte	4.8 sec.	7.6 sec.

"(Note)

The processing time is time to take till the reading and writing complete signal goes ON after the communication request signal is set ON. It is due to the following conditions."

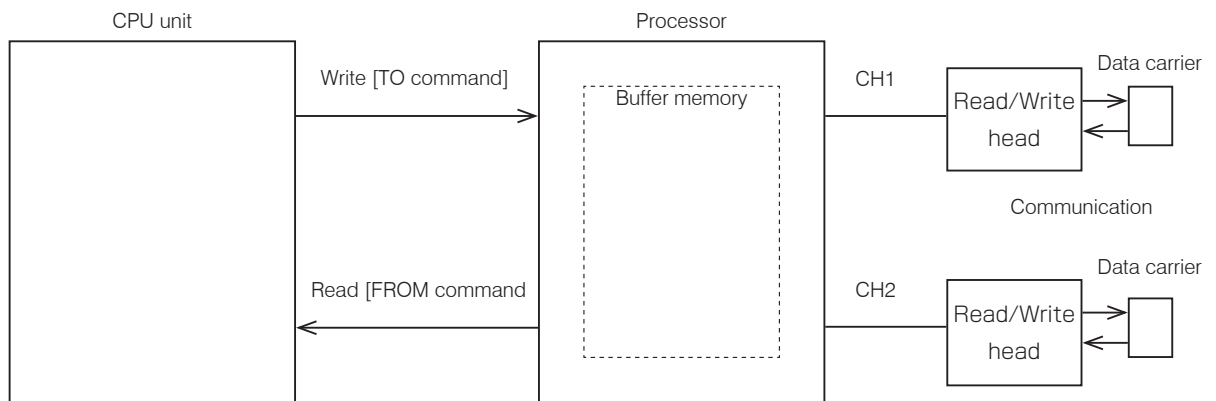
- Processing the data continuously
- Write skip function is ON
- Writing data different from the data of tag

※ If you turn off the lights skip function, you can shorten the processing time.

5. 1 Basic of Communication

This chapter explains communication between [Sequencer] and [Data carrier].

Communication is defined when Processor writes data which sent to Buffer memory of Processor with [TO command] from Sequencer to Data carrier or Sequencer reads data which Processor read from Data carrier with [FROM command] from Buffer memory of Processor.



Point [1]

Processor writes data which is specified by Sequencer directly to Data carrier without converting data to [ASCII]. When converting data to [ASCII] or [JIS code], process the data in Sequencer in advance.

5. 2 Selection of Read/Write head

There are 2 connecting terminals on Processor to connect 2 Read/Write heads for 2 channels (CH1 / CH2). Exclusive signal and data area are assigned to [Input and Output Signal] and [Buffer Memory] for CH1 /CH2. Communication processing with Data carrier can be carried out through Read/Write head which are connected each channel by carrying out command to signal for CH1/CH2 and data area.

Point

Processor can carry out communication processing for CH1/CH2 if other commands are output from Sequencer at the same time
Sequencer can carry out communication processing for CH1/CH2 like a controlling 2 Processors.

5.3 Specify of Processing Area of [Read Write]

Reading and Writing process from Sequencer to Data carrier is carried out according to processing area data of [Buffer memory] which specify with [output signal].

5.3.1 Specify of processing area of [Reading]

Reading per word unit

Channel	Output signal	Buffer memory
CH1	Y6 : Specify reading address [1]	[CH1 / Specify reading address [1]area] address [0000 H] : starting address [0001 H] : number of processing words
	Y7 : Specify reading address [2]	[CH1 / Specify reading address [2]area] address [0002 H] : starting address [0003 H] : number of processing words
CH2	Y16 : Specify reading address [1]	[CH2 / Specify reading address [1]area] address [0010 H] : starting page [0011 H] : number of processing words
	Y17 : Specify reading address [2]	[CH2 / Specify reading address [2]area] address [0012 H] : starting address [0013 H] : number of processing words

Reading per page unit

Channel	Output signal	Buffer memory
CH1	Y4 : Specify reading page [1]	[CH1 / Specify reading page [1]area] address [0000 H] : starting page [0001 H] : number of processing pages
	Y5 : Specify reading page [2]	[CH1 / Specify reading page [2]area] address [0002 H] : starting page [0003 H] : number of processing pages
CH2	Y14 : Specify reading page [1]	[CH2 / Specify reading page [1]area] address [0010 H] : starting page [0011 H] : number of processing pages
	Y15 : Specify reading page [2]	[CH2 / Specify reading page [2]area] address [0012 H] : starting page [0013 H] : number of processing pages

- (1) Two ways of reading process range can be specified for each channel.
- (2) Reading process range can be specified by "word" or "page" unit of tag memory.
- (3) Reading process range is set to predefined Buffer memory by "TO command" from Sequencer.
- (4) Regarding to reading process range, specify word or page address, where reading should be started, and number of words or pages including starting address.

[Example]

< Reading [0H] address only >

Starting address	0	0	0	0
Number of processing words	0	0	0	1

< Reading [5H]...[FH] addresses >

Starting address	0	0	0	5
Number of processing words	0	0	0	B

< Reading [0H] page only >

Starting page	0	0	0	0
Number of processing pages	0	0	0	1

< Reading [5H]...[FH] page >

Starting page	0	0	0	5
Number of processing pages	0	0	0	B

<Note>

When the specified range of processing exceed the memory capacity of the ID tag, reading process is executed within memory and then display "reading process error"(000B H)

5.3.2 Specify of processing data area of [writing]

Channel	Output Signal	Buffer Memory
CH1	Y8 : Specify writing address [1]	[CH1 / Specify writing address [1]area] Address [0020 H] : Starting address [0021 H] : Number of processing word
	Y9 : Specify writing address [2]	[CH1 / Specify writing address [2]area] Address [0022 H] : Starting address [0023 H] : Number of processing word
	YA : Specify writing address at once	[CH1 / Specify writing address at once] Address [0040 H] : Starting address [0041 H] : Number of processing word
CH2	Y18 : Specify writing address [1]	[CH2 / Specify writing address [1]area] Address [0030 H] : Starting address [0031 H] : Number of processing word
	Y19 : Specify writing address [2]	[CH2 / Specify writing address [2]area] Address [0032 H] : Starting address [0033 H] : Number of processing word
	Y1A : Specify writing address at once	[CH2 / Specify writing address at once] Address [0050 H] : Starting address [0051 H] : Number of processing word

- (1) 2 types of process areas of [writing] can be specified for each channel.
Processing area of [data writing at once] can be specified one for each channel.
- (2) Processing area of [writing] is specified by of [memory] of data carrier per [word] address.
- (3) Set the processing area for [writing] with [TO command] from Sequencer to Buffer memory address.
- (4) Processing area of [writing] is specified by how many words (processing words) of data are written including the first address of writing data (starting address).

【Example】

< Write to [OH] address >

Starting address	0	0	0	0
Number of processing words	0	0	0	1

< Writing [5H]...[FH] address >

Starting address	0	0	0	5
Number of processing words	0	0	0	B

<Note>

When the specified range of processing exceed the memory capacity of the Data carrier, writing process is executed within memory range and then display "writing process error"(000A H)

5.4 Data Reading from Data carrier

Reading from Data carrier is defined as; Sequencer reads the data in from Processor via the FROM command. Previous to that the data is read by page and stored in Buffer memory.

5.4.1 Stored area for [Reading data]

Store area of [reading data] is assigned to buffer memory of processor, [1000H...1FFFH] for CH1, [3000H...3FFFH] for CH2. (Refer to "4.4 Buffer Memory")

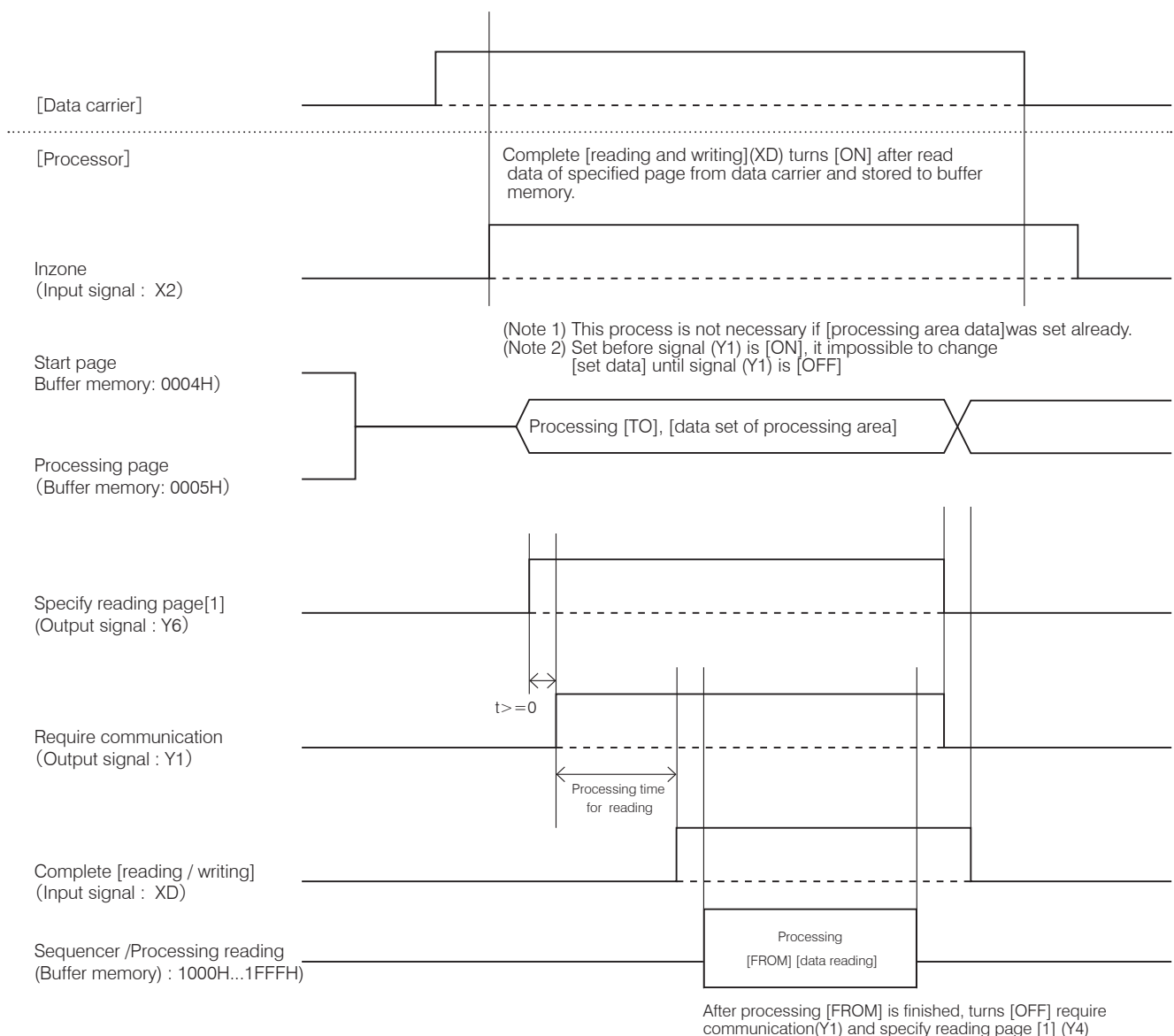
[Reading data] from data carrier is set data of data carrier [address] which correspond to specified processing area per page.

Point

All data is cleared to [0000H] when the signal (Y1 / Y11) is turned [OFF], refer to 3.4.5 Specify Clear Buffer memory (SW4) to select the clear function or not.

Data Reading Procedure

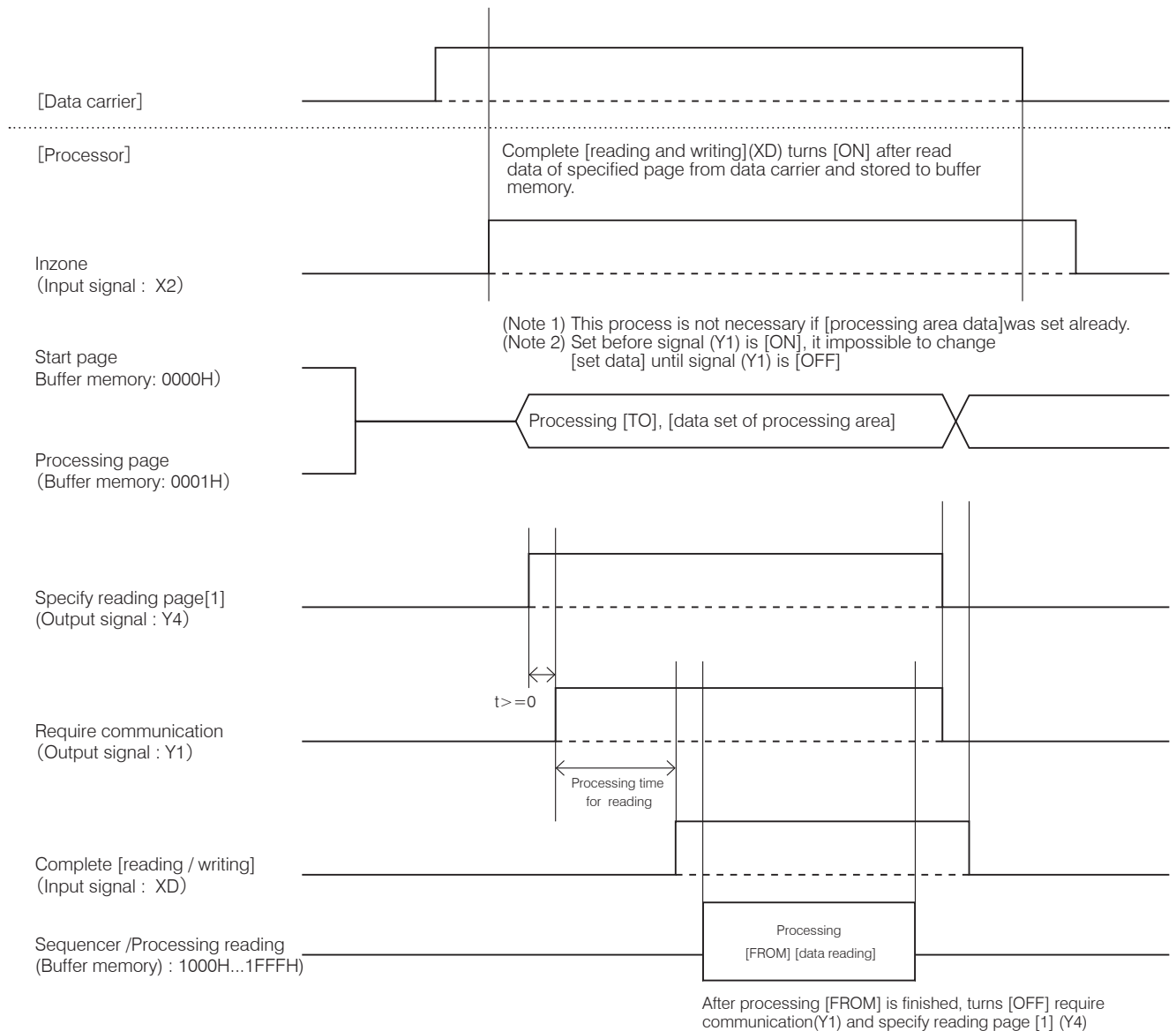
[Example] CH1 / Specify of reading word [1] (Read/Write head: Oscillation mode)



5. Communication with Date carrier

Data Reading Procedure

[Example] CH1 / Specify of reading page [1] (Read/Write head: Oscillation mode)



5. Communication with Data carrier

5.5 Data Writing to Data carrier

[Writing] to data carrier means, Processor writes data which is written to the stored area of Buffer memory [writing data]in Processor from the Sequencer to data carrier.

5.5.1 Stored area for [Writing data]

Stored area for [writing data] is set to Buffer memory of Processor, [2000H...2FFFH] for CH1, [4000H...4FFFH] for CH2. (Refer to "4.4 Buffer memory") [Writing data] from Sequencer is written to data carrier [address] which corresponds to specified processing area per word.

Point[1]

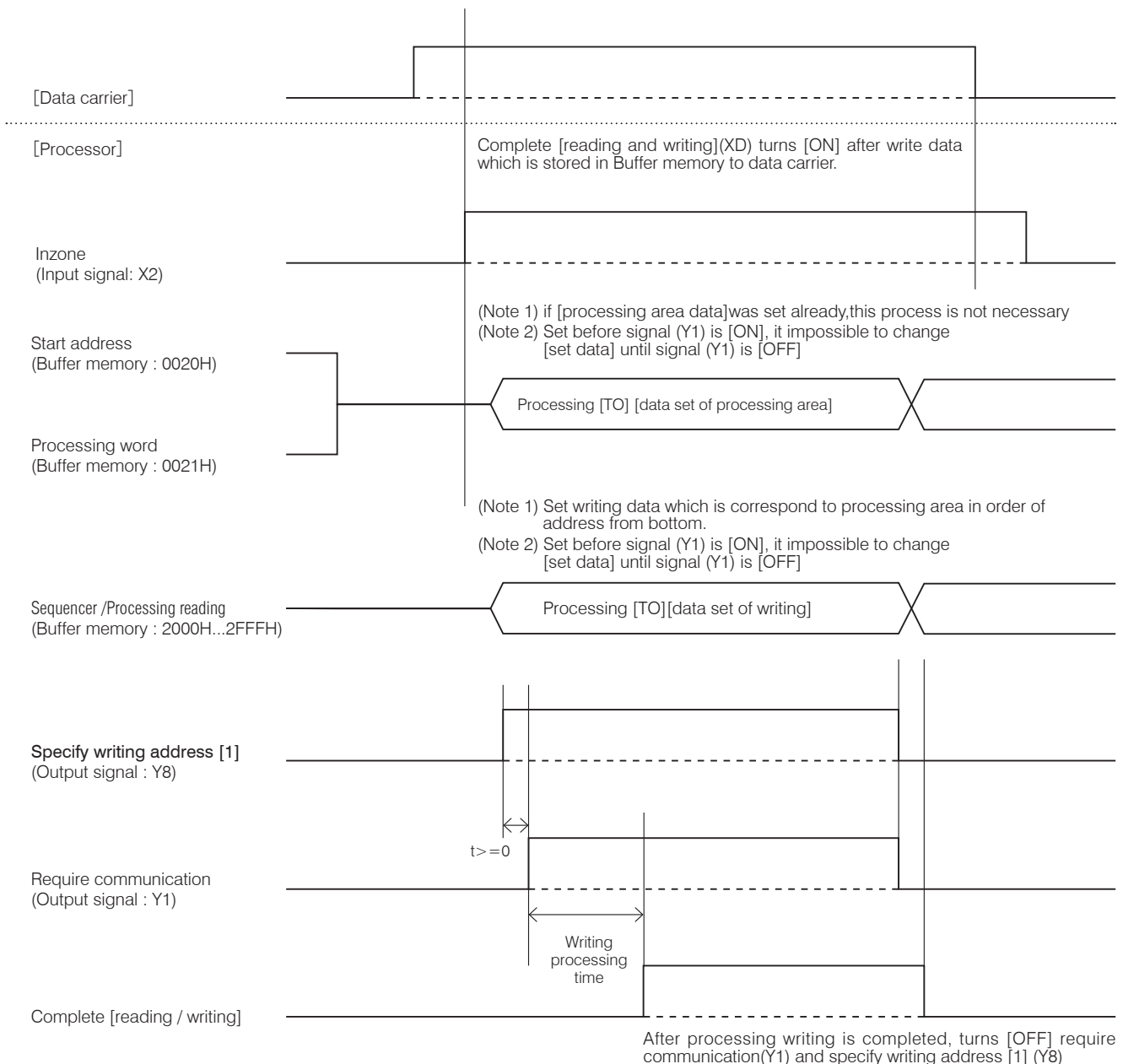
All data in store area for [writing data] is cleared to [0000H] when signal (Y1 / Y11) is turned [OFF], in the condition of [clear of Buffer memory] (refer to 3.4.5 Specify of Clear of Buffer memory) is selected via switch setting.

Point[2]

In setting [writing data], set the data to [store address of writing data] which corresponds to the [address] of data carrier. Processor writes data to data carrier [store address of writing data] which corresponds to area of processing.

5.5.2 Data writing Procedure

Example CH1 / Specify of writing address [1]



5.6 Data Writing to Data carrier at once

[Data writing to Data carrier at once] means Processor writes [1 word data] which is written to the stored area of Buffer memory of Processor by Sequencer to all of the specified address of Data carrier. (Writing process of [the same data])

5.6.1 Stored area for [writing data at once]

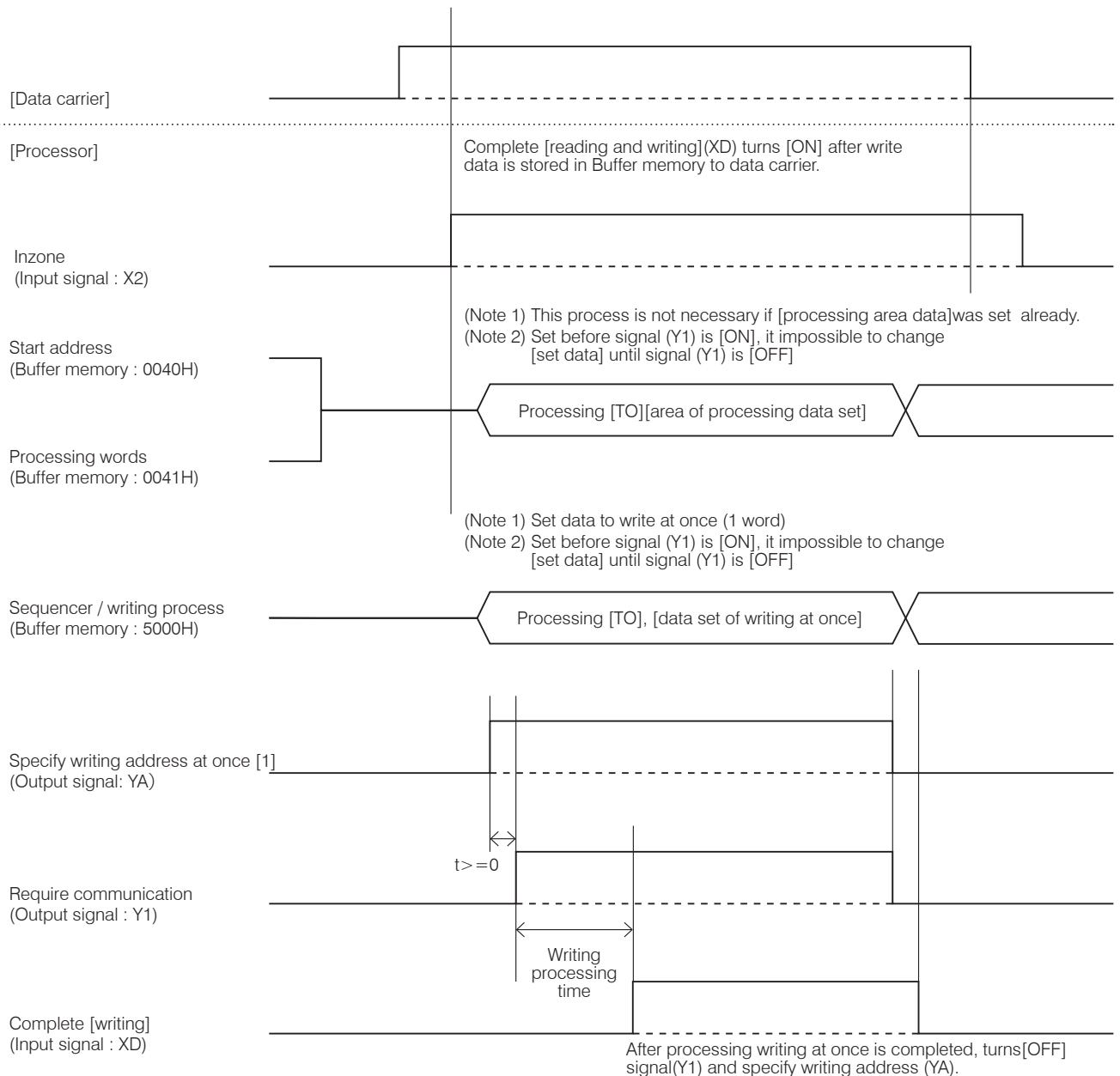
Stored area for [writing data at once] is set [5000H] for CH 1, [5001H] for CH 2 to Buffer memory of Processor. (Refer to 4.4 [Buffer memory]) [Writing data at once] the same data is written to all the addresses of Data carrier.

Point

All data in stored area of [writing data at the same time] is cleared to [0000H] when signal (Y1 / Y1 1) is turned [OFF], when SW4 is set [clear buffer memory] (refer to 3.4.5 Specify Clear Buffer Memory).

5.6.2 Data Writing at once Procedure

[Example] CH1 / Specify of writing address at once (Read/Write head: Oscillation mode)

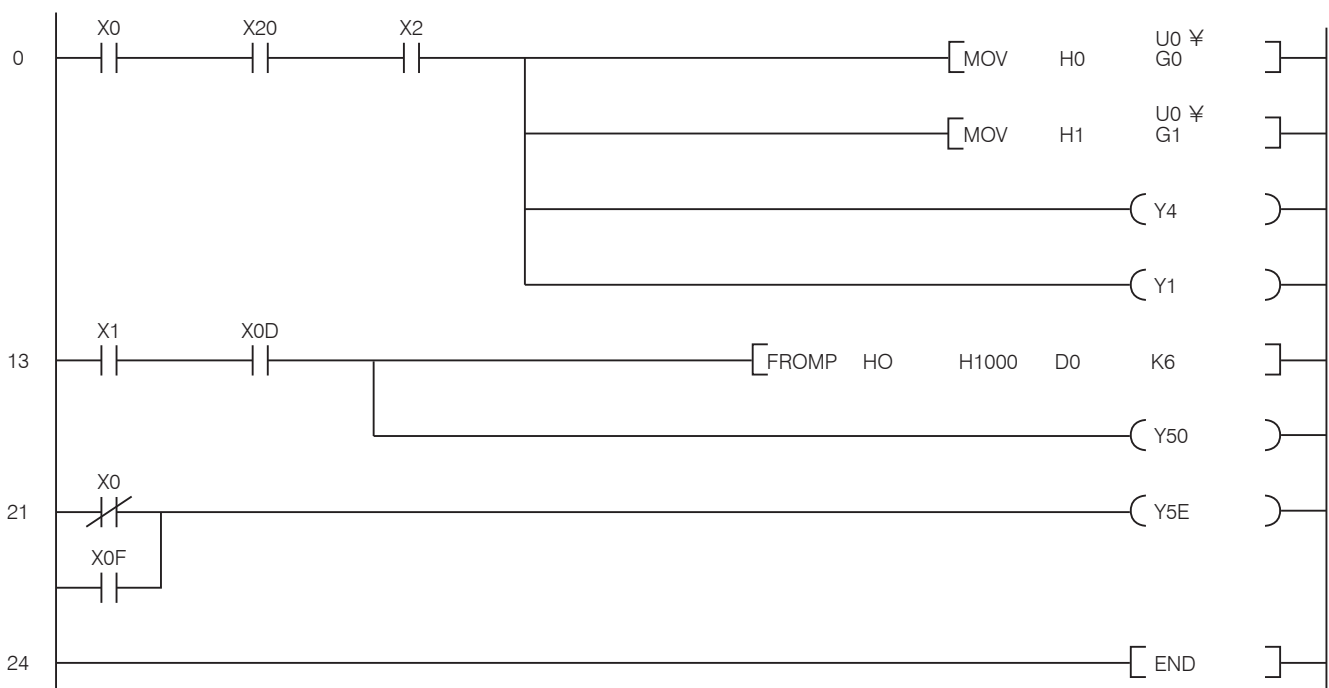


5.7 Programming example

5.7.1 Data Reading

Data Reading / Programming example

- (1) Read/Write head
- (2) Read the Data carrier address 0H...5H (6 words) data by Read/Write head/CH1 and store it register of Sequencer.
- (3) Condition of setting ; 0 slot --> Processor
 - 1 slot --> Input unit (32 signals)
 - 2 slot --> Output unit (32 signals)



[Description]

Step No.	Process
0	When unit ready signal (X0), start-up command from external unit (X20) and inzone signal (X2) turn [ON], 1 - Set [OH] to store area (0) of start page in buffer memory [CH1/ specify of reading page [1] area]. 2 - Set [1H] to store area (1) of process pages in Buffer memory [CH1/specify of reading page [1] area]. 3 - Set [ON] CH 1 / specify reading page signal [1](Y4). 4 - Set [ON] CH 1 / Require communication signal (Y1).
13	After required communication echo signal (X1), [reading and writing] complete signal (XD) turns [ON], read 6 words from (1000H) of Buffer memory [CH1/store area of [reading data]] and set D0...D5 of data register. And, turns [ON] external output signal (Y50) at the same time.
21	Turns [ON] external output signal (Y5E) when unit ready signal (X0) turns [OFF] or error signal (XF) turns [ON].

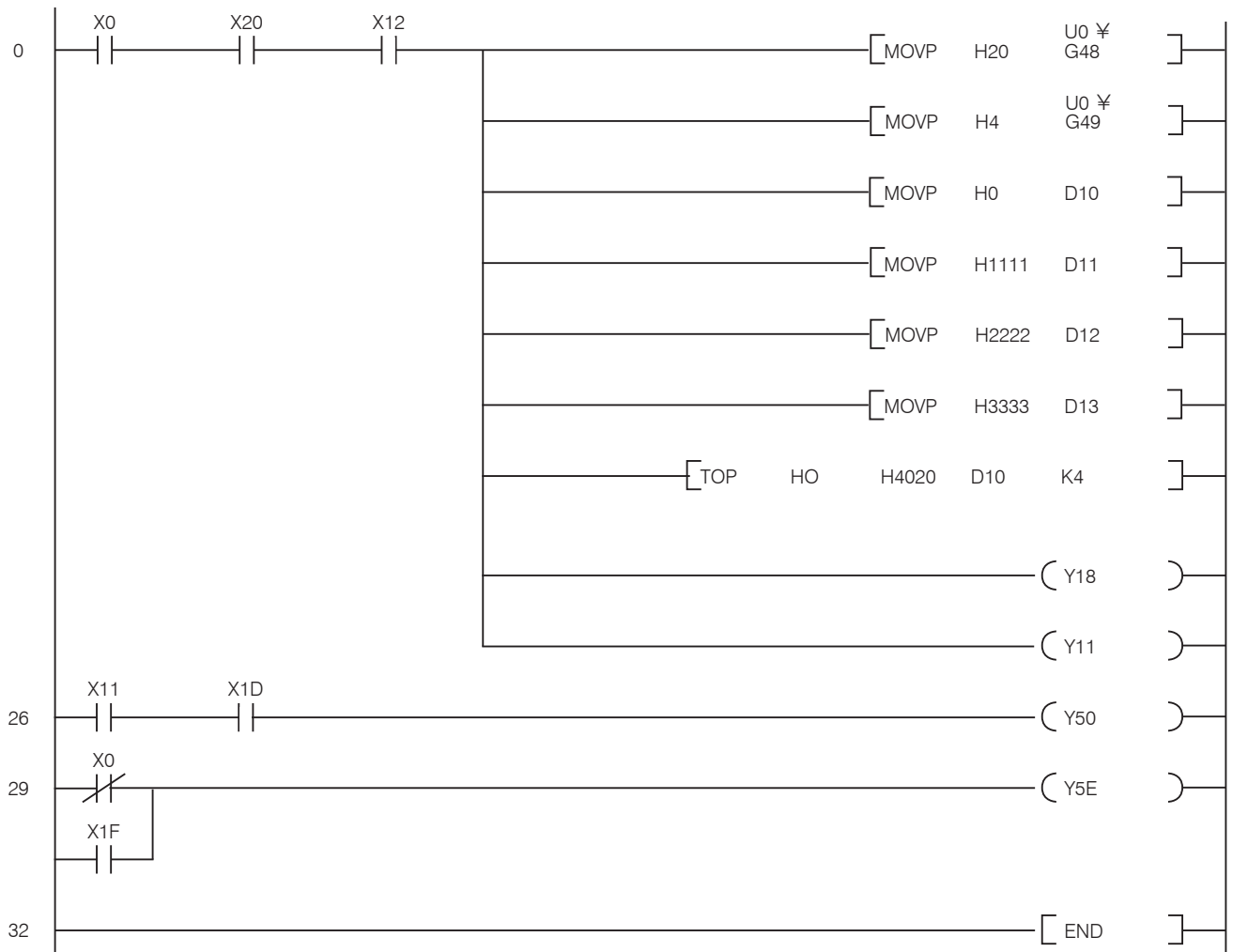
5.7.2 Data Writing

Data Writing / Programming example

- (1) Read/Write head
- (2) Write the following data to Data carrier address 20H...23H (4 words) using Read/Write head / CH 2.

Data carrier address	20H	21H	22H	23H
Writing data	0000H	1111H	2222H	3333H

- (3) Condition of setting ; 0 slot --> Processor
 - 1 slot --> Input unit (32 signals)
 - 2 slot --> Output unit (32 signals)



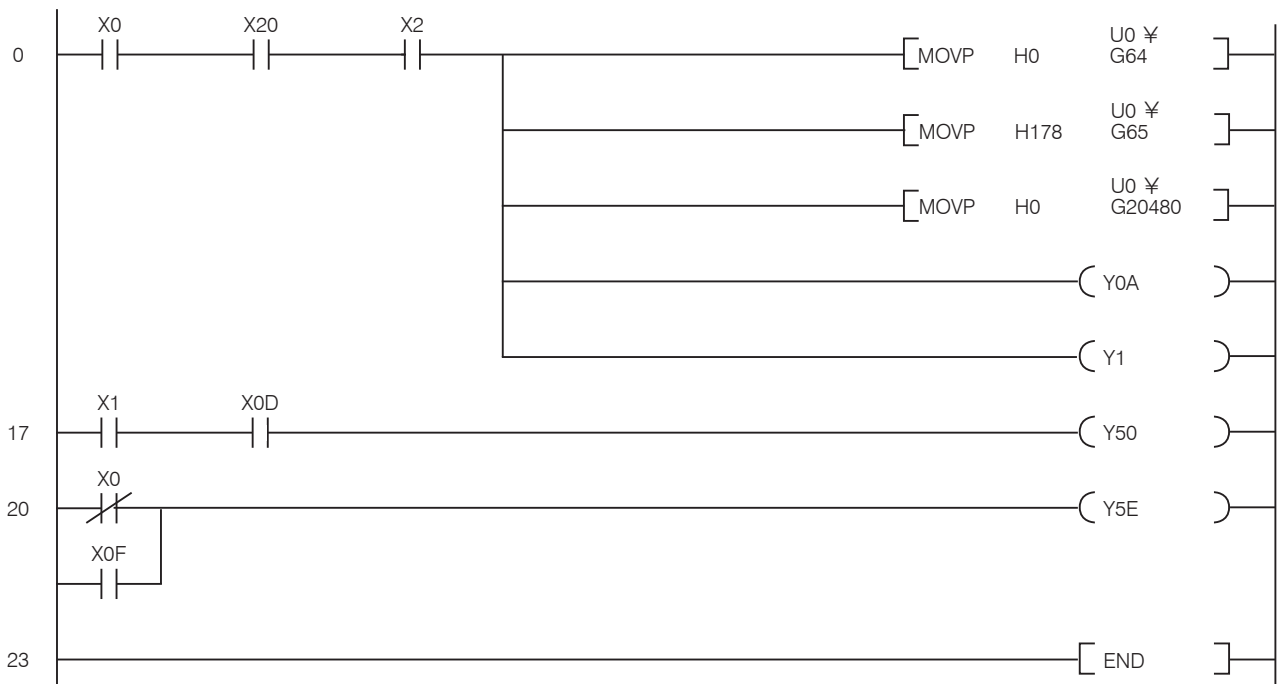
[Description]

Step No.	Process
0	When unit ready signal (X0), starting command from external unit (X20),and inzone signal (X12) turn [ON], 1 - Set [20H] to store area (48) of start address in Buffer memory [CH2/specify of writing address [1] area]. 2 - Set [4H] to store area (49) of process words in Buffer memory [CH2/specify of writing address [1] area]. 3 - Transmits data [0000H, 1111H, 2222H, 3333H] to data register D10...D13. 4 - Set data [0000H, 1111H, 2222H, 3333H] to 4 words from (4020H) of [CH2/store area of writing data] 5 - Set [ON] CH 2 / specify writing address signal [1] (Y18). 6 - Set [ON] CH 2 / Require communication signal (Y11).
26	When required communication echo signal (X11) and finish reading signal (X1D) turn [ON], turns [ON] external output signal (Y50)
29	Turns [ON] external output signal (Y5E) when unit ready signal (X0) turns [OFF] or error signal (X1F) turns [ON].

5.7.3 Data Writing at once

Data writing / Programming example

- (1) Read/Write head
- (2) Write data [0000H] at once to all address of data carrier 0H...3FFH (1k words) using Read/Write head / CH 1.
- (3) Condition of setting ; 0 slot --> Processor
 - 1 slot --> Input unit (32 signals)
 - 2 slot --> Output unit (32 signals)



[Description]

Step No.	Process
0	When unit ready signal (X0), starting command from external unit (X20), inzone signal (X2) turn [ON], 1 - Set [0H] to store area (64) of start address in Buffer memory [CH1/ specify area of writing address at once]. 2 - Set [400H] to store area (65) of process words in Buffer memory [CH1/specify area of writing address at once]. 3 - Set data [0000H] to (20480) of Buffer memory [CH 1 / specify area of writing address at once]. 4 - Set [ON] CH 1 / specify signal of writing address at once (YA). 5 - Set [ON] CH 1 / Require communication signal (Y1).
17	When required communication echo signal (X1) and finish reading signal (XD) turn [ON], turns [ON] external output signal (Y50)
20	Turns [ON] external output signal (Y5E) when unit ready signal (X0) turns [OFF] or error signal (XF) turns [ON].

6 Error information

When Processor detects any error, error signal (CH1:XF/CH2:X1F) turns [ON] and sets error code which indicates error contents to the stored area of [error code] buffer memory.

It is possible to memorize up to 8 error codes and the last error code is set to the bottom last address.

Error codes can be confirmed by [indication LED] of processor. (Refer to 2.3 [LED indication] and [Terminals])

Point

- Error signal (CH1:XF / CH2:X1F) turns [OFF] when require communication (CH1:Y1 / CH2:Y1 1) is turned [ON]. It is not possible to turn [OFF] only Error signal.
- The required communication process starts as soon as the Error signal turns [OFF].

Error code table
(Hex.)

Error code	Error type	Description
0001H	Specified data[processing area] is invalid	There are the following mistakes in the data content that specifies the processing area of [reading and writing]. (Refer to "4.3.2 Specify of [Memory Size] of Data carrier") (1) [Processing page]/[processing word] is [0] (2) [Start page]/[start address] does not exist in [memory] address of Data carrier. (3) Processing area which is specified in [start page & processing page] / [start address & processing word] exceeds [memory size] of Data carrier.
0002H	Specified data change of [Processing area]	In processing [reading and writing] (after require communication turns [ON] and until [OFF]), data contents specified in processing area [reading and writing] has changed.
0003H	[writing] data change	In processing [writing] (after require communication turns [ON] and until [OFF]), contents of [writing data] has changed.
0004H	Specified signal [processing area] is invalid	There are following mistakes in the output signal (Y points) which specify processing area of [reading and writing]. (Refer to "3.3 Input and Output Signals") (1) Undefined output signal (Y points) turns [ON]. (2) Multiple signals of the processing area are [ON] to the same channel. (3) Any signal [processing area] is not [ON]
0005H	Signal change specified [Processing area]	In process [reading and writing] (after require communication turns [ON] and until [OFF]), specified signal of [processing area] has changed.
0006H	Signal missing [Processing area]	In process [reading and writing] (after require communication turns [ON] and until [OFF]), specified signal of [processing area] turns [ON]
0007H	Missing signal [Require communication]	Require communication signal turns [OFF] before finish signal [reading and writing] (XD, X1D) turns [ON].
0008H	Protocol error	Communication to Read/Write head is not carried out properly
0009H	Write protect error	Carry out writing process to a specified write protect area [set switch]. (Refer to "4.3.6 Specify of Write Protect area")
000AH	Writing processing error	Despite writing process to the data carrier, identification communication isn't performed correctly .
000BH	Reading processing error	Despite reading process to the data carrier, identification communication isn't performed correctly .
000CH	Missing data carrier	Data carrier is missing from communication area (inzone) of Read/Write head.
000DH	Read / write Head is disconnected	Detects Read/Write head is disconnected or cable breakage of Read/Write head
000EH	Detection of power supply is disconnected	Detects disconnected 5V power supply supplied from Sequencer bus line. (1) Set error code to both channel of CH1 / CH2 when this error is detected. (2) Error code is set when power is supplied.
000FH	Processor is out of order	Detects [RAM] of processor is out of order. Set error code to both channel of CH1 / CH2 when this error is detected.
0010H	Switching set error	There is mistake in contents of [set switch] by [GX Developer]. (Reffer to "4.3 Setting of Switches ([GX Developer])")
0011H	Sequencer CPU error	Receive [error signal] from Sequencer CPU(Q-CPU). Error code is set to both channel of CH1 / CH2 when detects this error.

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