CC-Link based controller

IB-C02B-UL

Controller

〈 User Manual 〉

Read this manual before use

Thank you for purchasing IB-C02B-UL (hereinafter referred to as "This product")

Applicable MDR models

- ・FE series ··· PM486FE / PM500FE / PM570FE / PM605FE
- ・FP series … PM486FE / PM500FE /

10PIN JST connector option for the above motor roller needs option code of "Z□□□" *
*3 digit numbers are shown at □□□

Before using this product, carefully read this user manual and fully understand the content.
Keep this document readily accessible for future reference.

For more details of FE series and FP series, please download the user manual from our web page.

ITOH DENKI 🔍 Home > Download/Support > User Manual
https://itohdenki.co.jp/english/support/manual.html

ITOH DENKI

Controller
No.603

Introduction

-Disclaimer-

- This product is designed as a general industrial device. Do not use for other applications. We do not take any responsibility for any damage that may result from the disregarding of these warnings.

- In the event that an accident results from the use of this product, we do not compensate for any damage, including abnormalities of equipment, connection devices, and/or software, any damage resulting from malfunctions, and/or any other secondary damage.

- Caution : Installation, operation and usage of ITOH DENKI MDRs in combination with a control card designed by a third party could result in fatal phenomena such as fire, electric shock, injuries etc which are out of the responsibility of ITOH DENKI.

-Notes on industrial property rights-

There are some examples of parts that need to be prepared by customers, as explained within this manual. However, this does not provide any guarantee against the existence of any rights, such as our industrial property rights, or those of other companies.

-Notes on technical support-

We respond to technical inquiries based on the contents described within this manual, and on this product within the range of general items for this product unit.

There are some descriptions in this manual, about parts, equipment, and wiring arranged by customers, as well as the controls and operation under such circumstances. However, these are not included in the guaranteed operating range and/or support.

When in use, please check and perform the aforementioned based on your responsibility according to operation.

-About the performance level (PL) for this system-

This product is based on the performance level "C" [*2] ISO-13849-1 [*1] .

＊1：International Organization for Standardization
＊2：This indicates that even though events that would result in serious injury occur infrequently under
     assumed risk environment, there is a high probability to avoid danger if you observe the safety
       contents described in this manual.

-About installation environment-

This product is not equipped with special dust proof/waterproof countermeasures, and is intended to be used in environments of "Pollution Degree 2" *2, as defined in IEC60664 -1 *1.

＊1： Insulation coordination for equipment within low-voltage supply systems - Part 1 of the International
      Standard
＊2：Non-conductive pollution will occur, but it is assumed that condensation will happen to generate
      conductive property temporarily.

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Standard Accessories

● IB-C02 (Main body)

● PCB mounting screws, nuts

    Cross recessed head screws：M4×15

    Hexagonal nuts   : M4

Options

● Power connector for motor drive (CN1) P/N WAGO231-302/026-000

● Power connector for control (CN5）   P/N WAGO734-102

● CC-Link standard connector   P/N：35505-6000-B0M GF   Manufacturer: 3M

● Terminal resistor connector   P/N：35T05-6M00-B0M GF   Manufacturer: 3M

● Divider connector H shaped   P/N：35720-L200-B00 AK   Manufacturer: 3M

● Sensor connector   P/N：37104-3122-000 FL   Manufacturer: 3M

    Suggested cable for the sensor connector: $0.14\sim0.3m\ m^2$ (AWG26～24)

    Consult us if other cable is used.

1.　Safety Considerations

－General description－

● Switch off the power before wiring, performing maintenance, or removing the unit from
the conveyor, to avoid the risk of electrical shock or injury.

● Follow the local/national electrical codes and regulations
(labor, safety, sanitary, electrical, etc.) where the product is installed.

● Operate this product within its intended design parameters and operating specifications
to avoid the risk of electrical shock, injury, or fire.

● Do not disassemble, repair, or modify this product to avoid the risk of electrical shock or injury,
damage to the product, and voiding the warranty.

● Use an external control device/circuit when connecting to this product's input or
output signals for important connections or control.　In the event of a product failure,
the inputs or outputs may remain active and need to be bypassed.

● Do not wire a connector while it is attached to the product.　Make sure all the wires are
properly seated within the connector.

● Be careful not to drop the product or expose it to impact or pressure as damage may result.

● Make sure the surface to which the product is mounted is properly grounded.

●Make sure this product and conveyor flame are connected to grounding terminal in a power
distribution panel.

● Be careful not to have switching devices (relays, contactors, etc.), which may generate or
induce noise, within close proximity of this product, its power line, or its signal lines.

● Any of electronic brake function is only operational while the product is powered.

● Make sure shut off power for motor power first and then shut off power for control.
Data may not be saved properly.

● Do not remove any connections to the product while it is in operation.
This may damage the product or shorten its lifetime.

● Do not shut off power while the motor is in operation. This may damage the product or shorten its lifetime.

● Do not stand on conveyor while power is ON to avoid the risk of product failure, electrical shock, or injury.

● Do not physically force the MDR to rotate. This may damage the product or shorten its lifetime.

2.　Power

● Switching power supply　CN1: Motor drive（DC24V・≧10A　when 2 motors run）

　　　　　　　　　　　　　　CN5：Control　1.3W per PC board required (without counting sensor current)

● Use separate power supply for CN1 (motor) and CN5 (control)

* For motor power, use stable power supply (24VDC ≧10A) that will not be affected by varying load.

　The power supply also need to be the one that will not activate protection for 20A peak current for 1msec.

3.　Before Operation

3-1　Installation

1) Make mounting holes for controller and ground wire connection to the conveyor flame or plate where controller is attached.

　(See Dimensions in Chapter 8. for mounting holes dimensions)

　The product's back place should be affixed to metallic plate to ensure heat dissipation.

　Care must be paid to prevent metallic debris entry to the product.

2) Fix product tightly to the conveyor frame with supplied mounting screws and nuts with recommended fasten tightly torque 0.58Nm.

3) Refer to "Cable Wiring Manual" provided by CC-Link Partner Association (CLPA) for network.

3-2　Wiring

・Wiring should be done while product is not powered.

・Wiring to the connectors should be done before it is inserted to the product.
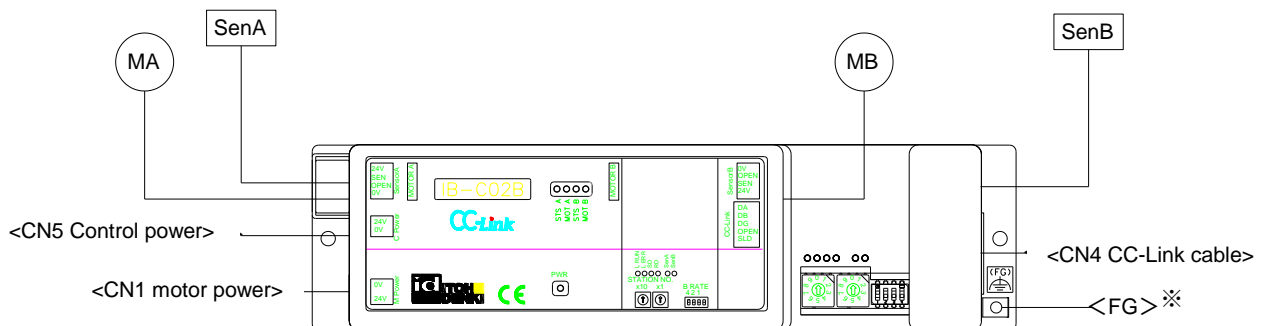
※　Be sure to connect 2mm^2 size grounding wire.

① Wire 24VDC and 0V to the motor power connector<CN1(2 poles)>
【Applicable wire size : 2.0~2.5mm^2 (AWG 14~12)】

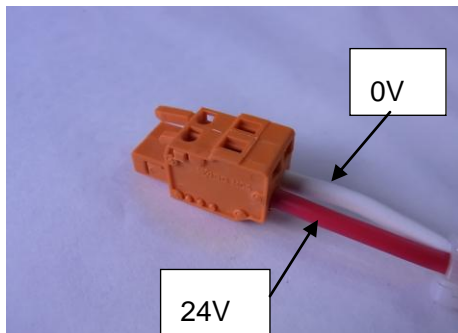* Daisy chain wiring not accepted, as it may cause electrical shock, short-circuit or damage for exceeding 16A connector capacity.
* Wire membrane needs to be removed for 7mm long from the edge.
* Wire 24V and 0V correctly.
* Do not wire while connector is inserted.

② Wire 24VDC and 0V to the control power connector<CN5(2 poles)>。
【Applicable wire size : 0.08~0.5mm^2 (AWG 28~20)】
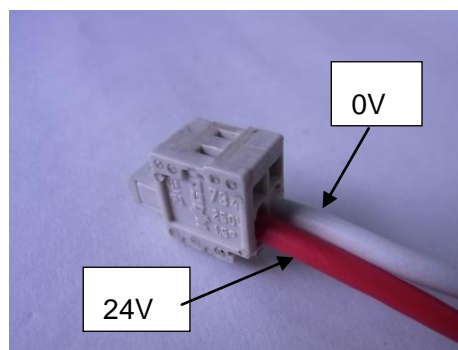
* Daisy chain wiring not accepted as it may cause electrical shock, short-circuit or damage for exceeding 16A connector capacity.
* Wire membrane needs to be removed for 7mm long from the edge.
* Wire 24V and 0V correctly.
* Do not wire while connector is inserted.

③ Wire 24VDC and 0V to the sensor connector <CN2,CN3(4 poles)>
【Applicable wire size : 0.14~0.3mm^2 (AWG 26~24)】
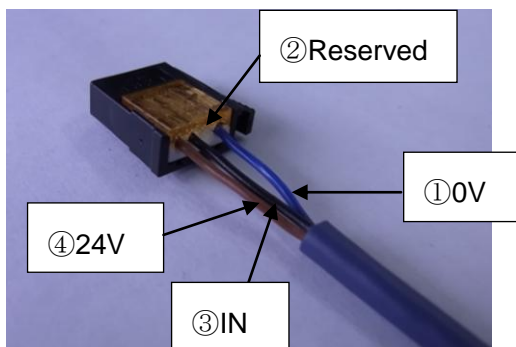
* Wiring order is 24VDC, input, reserved, 0V viewed from the left.

④ Wire SLD,DG,DB and DA to the CC-Link connector <CN4 (5 poles)>

* Wire SLD, Reserved, DG, DB, DA in order.
* Use specific CC-Link cable for wiring.

◆About daisy chain wiring for CC-Link connector <CN4 (5pin)>

Divider connector H Shaped

・There is no distinguish between upper (upstream) side and lower (downstream) side for a socket for CN4.
・Use a Divider connector H Shaped to wire for CN4.
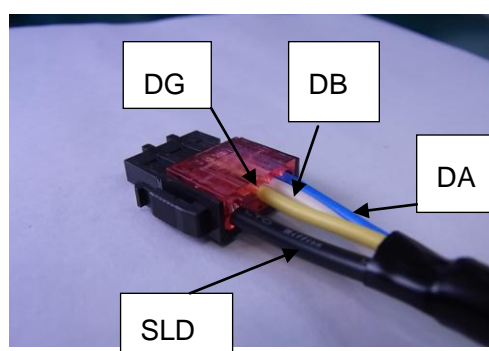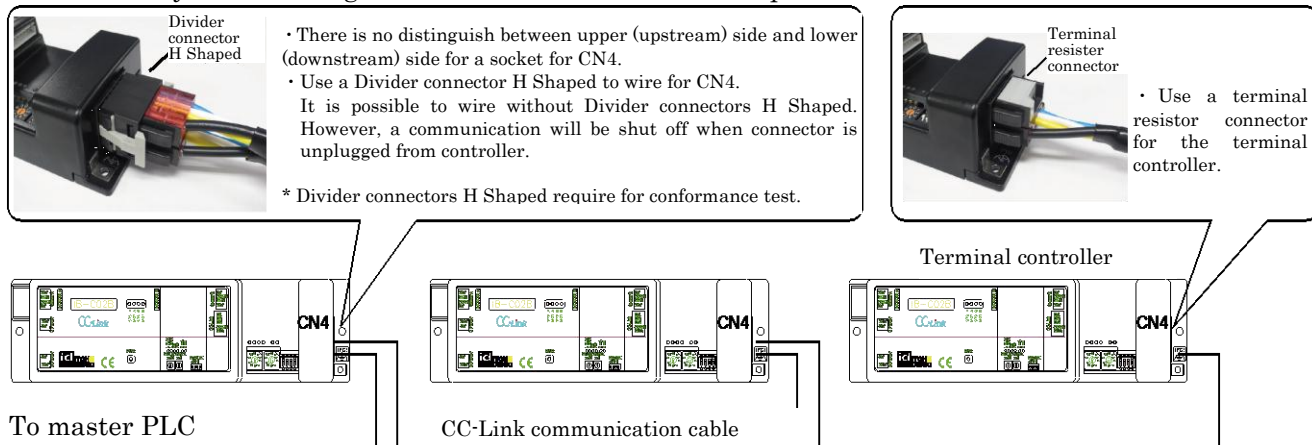 It is possible to wire without Divider connectors H Shaped. However, a communication will be shut off when connector is unplugged from controller.

* Divider connectors H Shaped require for conformance test.

Terminal resister connector

・Use a terminal resistor connector for the terminal controller.

Terminal controller

To master PLC

CC-Link communication cable

4.　Functions

Motor A   Motor B

<CN2>   <CN3>
<CN5>   <CN4>
<CN1>

SW1 Baud rate setting

SW1 / Baud rate	1	2	3
156kbps	OFF	OFF	OFF
625kbps	OFF	OFF	O N
2.5Mbps	OFF	O N	OFF
5Mbps	OFF	O N	O N
10Mbps	O N	OFF	OFF

* SW1-4 is not used.　Switching SW-4 won't change anything.

SW2, SW3 are for setting station number
　・SW2 = ones place
　・SW3 = tens place

(example)

SW3	SW2	Station No
0	3	3
2	7	27

* Station number needs to be set between 1 and 64.
* Station number needs to be set between 1 and 42 in case structure is made only with remote device stations. In case of mixed structure, station number can be up to 64 maximum.
* Setting statioin number to 0 or beyond 64 is recognized as error and L ERR. LED illuminates.

Initialization

Because this unit does not require initialization, flag to require initialization data process, flag to complete initialization data process, flag to complete initialization data setting, and flag to require initialization data setting are invalid.　Remote station Ready becomes ON after power is injected.

PLC
・We recommend the use of Mitsubishi PLC.
・In case Mitsubishi ladder programming software (GX Works2, etc) is not used, CSP data may not
be used.
・In case CSP data cannot be used, parameter settings need to be done by ladder programming.

4-1　Command chart

Command

	Command	Sub command	Function
■	0x01	0x01	CW acceleration
■	0x02	0x01	CCW acceleration
■	0x03	0x01	CW deceleration
■	0x04	0x01	CCW deceleration
■	0x05	0x01	Stall time
■	0x06	0x01	Motor CPU Ver
■	0x07	0x01	Servo lock brake boost value
■	0x08	0x01	Current limit value
■	0x09	0x01	Thermal error detection
■		0x02	Thermal error reset
	0x0A	0x01	Motor port output
■	0x0B	0x01	Motor drive mode
■	0x0C	0x01	Brake mode selection
■	0x0D	0x01	Error - Manual/Automatic reset
■	0x0E	0x01	Servo lock brake upper current lir
	0x0F	0x01	Status reasing
	0x11	0x01	Status clear
	0x14	0x01	Motor LED forcible cotrol
	0x15	0x01	MSM measured data 1
		0x02	MSM measured data 2
		0x03	MSM measured data 3
		0x04	MSM measured data 4
		0x05	MSM measured data 5
		0x06	MSM mode
	0x16	0x01	Acceleration setting
		0x02	Deceleration setting
	0x17	0x01	Calculated life value reading
	0x20	0x01	Speed 1
		0x02	Speed 2
		0x03	Speed 3
		0x04	Speed 4
■	0x21	0x01	Sensor noise elimination time
	0x22	0x01	PC board Version
■	0x23	0x01	Model selection

* ▢ marked are validated only when power is injected.
* Parameter set values are reflected (validated) when power is re-injected after power is once
switched off.
* Set parameters on parameter setting display in GX Works2, and write the values in the
PCboard.
* Stall time is fixed and cannot be changed.
* Acceleration/deceleration setting is automatically set in accordance with the motor turning
direction and speed setting.

4.2 Writing Data

Bit control

		Motor A							
		7	6	5	4	3	2	1	0
R Y 0		Speed4	Speed3	Speed2	Speed1	Error clear	Reset	CCW RUN	CW RUN
R Y 1		System area							
		Motor B							
		F	E	D	C	B	A	9	8
R Y 0		Speed4	Speed3	Speed2	Speed1	Error clear	senD/L	CCW RUN	CW RUN
R Y 1		System area						Initial reque	

* Functions are assigned by bit to Motor A and Motor B respectively as the above table.
* If more than 2 poitns are set to 1, speed 1 has highest priority: Speed > speed 2 > speed 3 > speed 4
* To change the motor turning direction, first change the bit from 1 to 0, then set 1 to RUN on reversing direction.

Command	Content
CW RUN	MDR turns for CW directi
CCW RUN	MDR turns for CCW direc
Reset	IB-C02 board is reset
senD/L	Selection of dark or ligh
Error clear	Clear the error when aris
Speed1-4	Selection of motor speed

Set to "1" for the item to use in case of bit control.

* If particular speed is not set, speed 1 applies.

System area

Command	Content
Initialization request	Flag to set for setting initial data

Word control

	F - 8	7 - 0	Axis
R W w 0	Sub command No	Command No	A
R W w 1	Data 2	Data 1	A
R W w 2	Sub command No	Command No	B
R W w 3	Data 2	Data 1	B

* See command chart for command and sub command number to write.

＜example＞

In case Motor A current limit value is changed
Enter RWw0 = 0x0108 RWw1 = 0x0003 and value in the PC board is changed.
However, in case the same command is repeatedly written, change the sub command number
to the one that is not found in the command chart.

* Set command and data in case of Word control.

4-3　Reading Data

Bit control

	Motor A							
	7	6	5	4	3	2	1	0
R X 0						Error	Motor info	Sensor
R X 1	System area							
	Motor B							
	F	E	D	C	B	A	9	8
R X 0						Error	Motor info	Sensor
R X 1	System area			Remo Read		Initial compl		

* Motor A and B performs the functions as assigned by Bit in the above table.

Command	Content
Sensor	Sensor status for ea 1 means sensor ON
Motor info	Motor status of each 1: Motor runs 0: Motor stops
Error	Error status of each 1: Error exists 0: normal

* Bit changes to follow the changes on PC board.

 "1" stands for On status on bit control.

System area

Command	Content
Initial setting	Flag to complete the sett
Remo Ready	Flag allowing operation

Word control

	F - 8	7 - 0	Axis
R W r 0	Sub command	Command No	No A
R W r 1	Data 2	Data 1	
R W r 2	Sub command	Command No	No B
R W r 3	Data 2	Data 1	

* Word control allows the retrieval of command number and data to read.

<example>

To retrieve the version number of motor CPU of Motor B:

Enter RWw2 = 0x1106　RWw3 = 0x0000　Then, CPU returns value

RWr2 = 0x1106　RWr3 = 0x0011　is retrieved

However, in case the same command is repeatedly written, change the sub command to the number that does not exist in command chart.

Bit and Word assignment for each station are visually obtained by ⚪ marked icon.
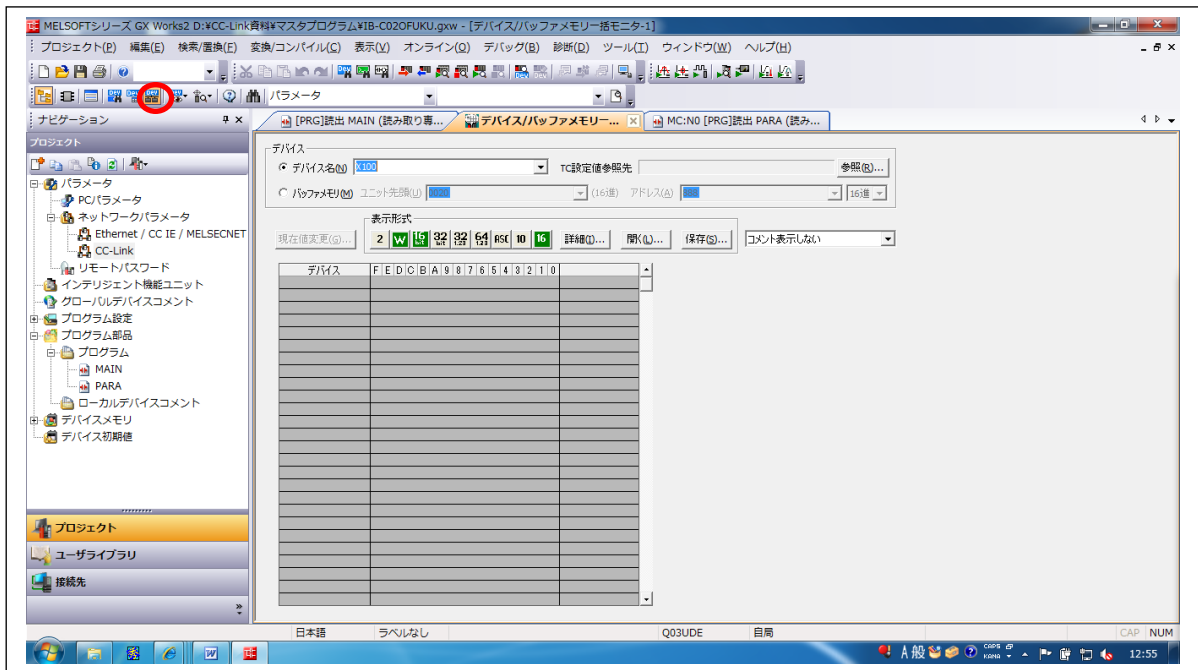
Device assignment box display comes up. Choose the top I/O Number and assigned device number and content shows up. Confirm them while ladder program is made.

4-4 Parameter setting

In case, GX Works 2 is used:

Profile register the CSP file of ITOH DENKI P/N IB-C02.

Registration can be done through "Tool" ⇒ "Profile registration"
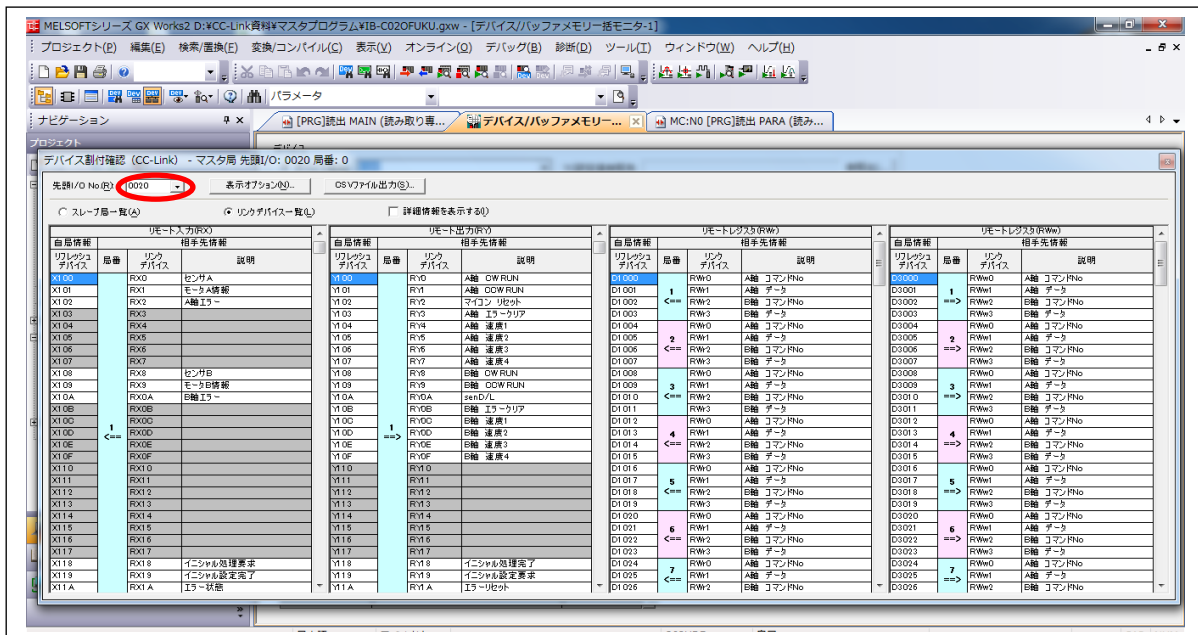
Choose CC-Link structure setting from the network parameters.
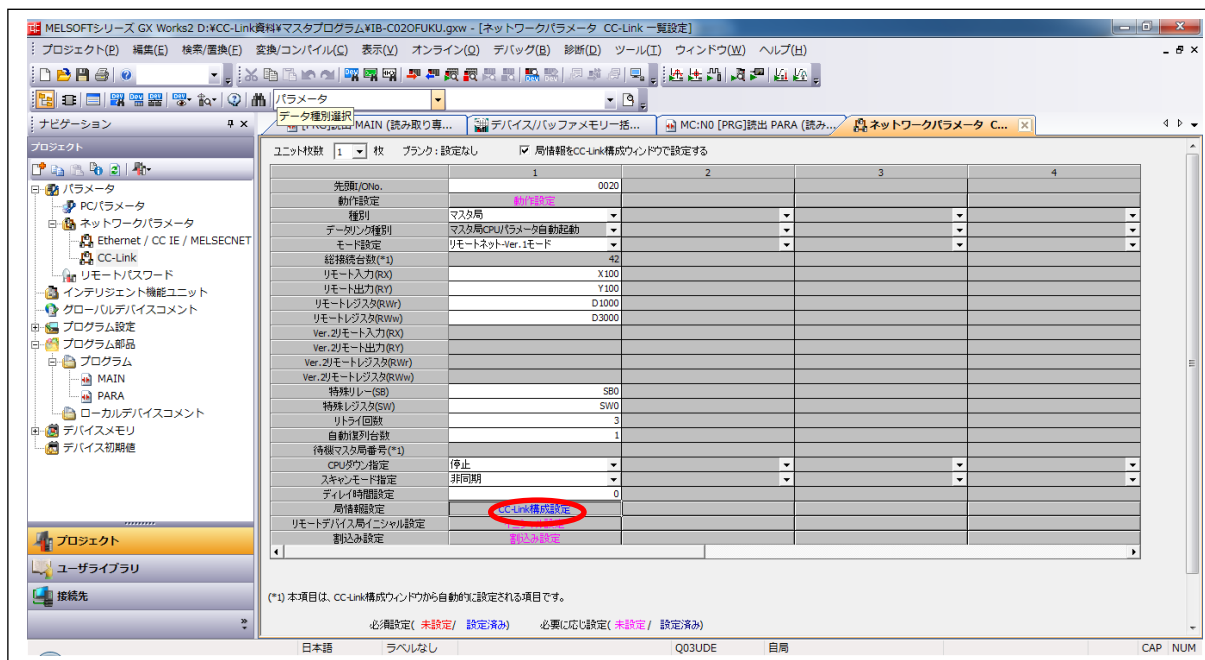
・Choose the unit to be set.　Right click and choose online, then choose "parameter process of the slave station"

・Parameter process in the slave station show up. Set parameter writing.

・Choose command to set and enter writing value.
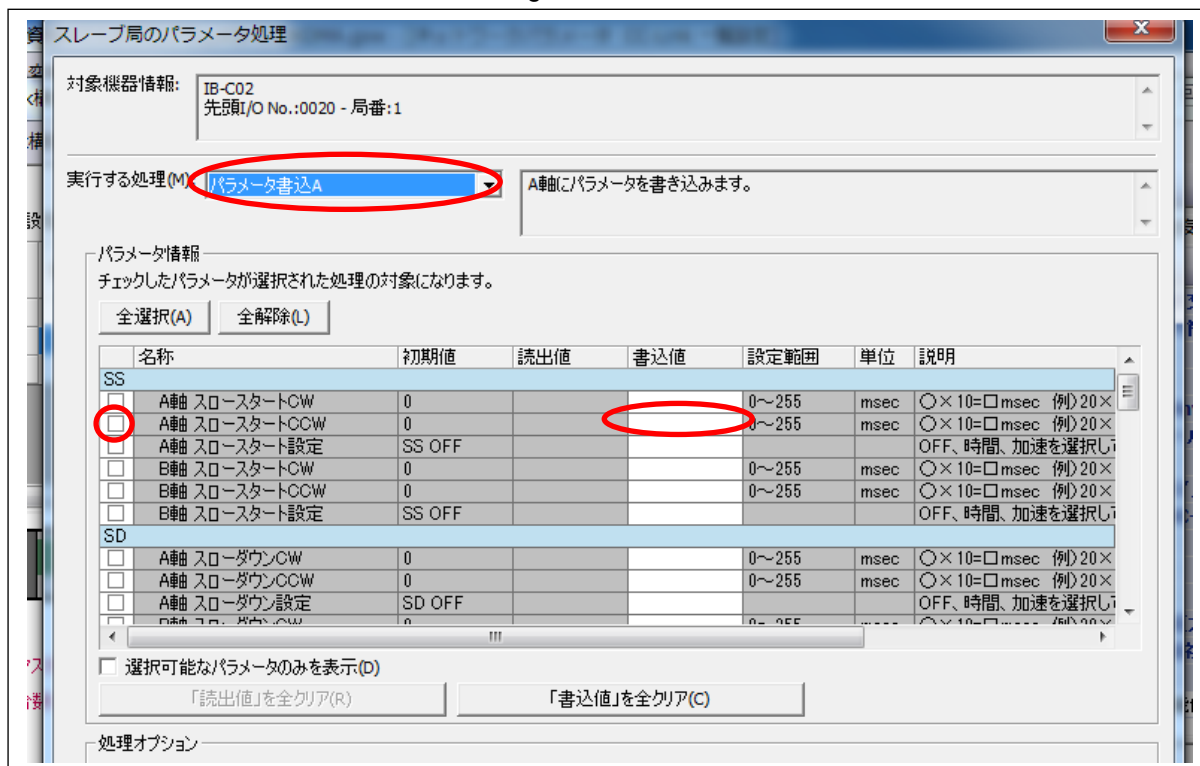
・Click the left end check box(es) of the parameter to send.

・Press "Execution" button and the value is written in the PC board.

Cautions:

* Before execution, check mark must be left in the check box to retrieve parameter.
* Some items may not be divided for Motor A and B. In case there's no division, write and read at Motor A side.
* While in Motor A writing setting, choosing and writing parameters on Motor B won't be reflected to Motor B indeed. Write only to the selected motor.
* Parameter reading and writing cannot be done while error exists. Remove the cause of error to reset, then restart.
* To write parameters, make sure the connected CPU is in STOP mode.

・In case the same settings are applied to other station(s)

① **Date storage**

* Press "Export"to store data after all the settings are completed.
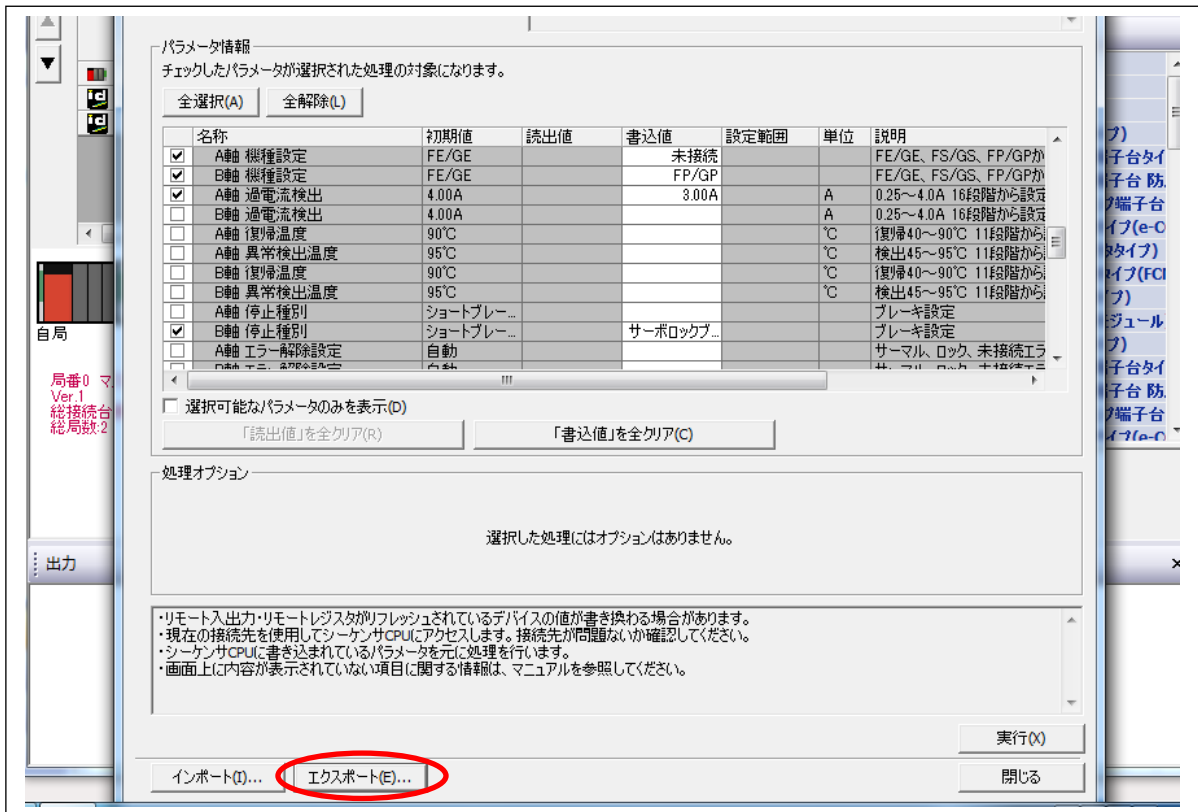
② **Data retrieval**

* Choose the station to write data, and press "Import" to choose the stored data to retrieve.
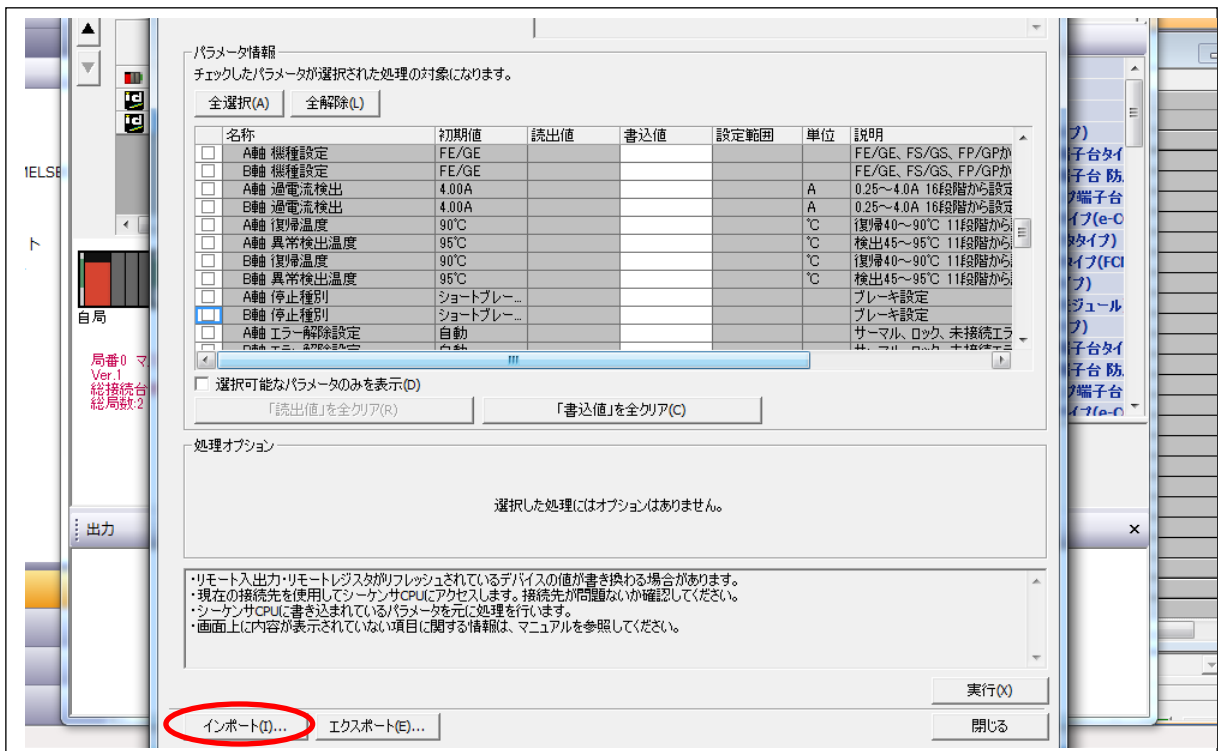
* Sored data show up in writing value column. Set them Motor A and B individually.

4-5　Parameter setting by ladder programming

* Command settings can also be done through ladder programming.

* In case parameters are written in ladder, follow the timing as illustrated below:

```
RYs9  ____|‾‾‾‾‾‾‾‾‾‾‾‾‾|_____

RXs9  _____|‾‾‾|_____     Operate RYs9

            |← Initial data setting →|

RXsB  ____|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾|_____
```
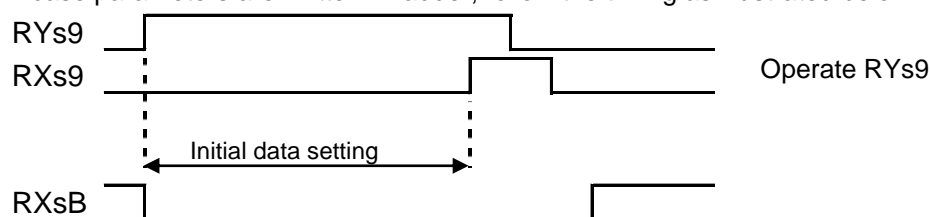
*Available commands during master PLC RUN condition are shown below.

　　0x0A: Master port output

　　0x0F: Status reading

　　0x11: Status clear

　　0x14: Forcible control motor LED

　The above commands can be written and read (only for 0x0F) without BIT operation at RYs9.

<Example>

　　Set command number, sub command number and setting value and register using MOV command, and they will be written in the PC board.

　　See Chapter 4-1 for command and sub command.
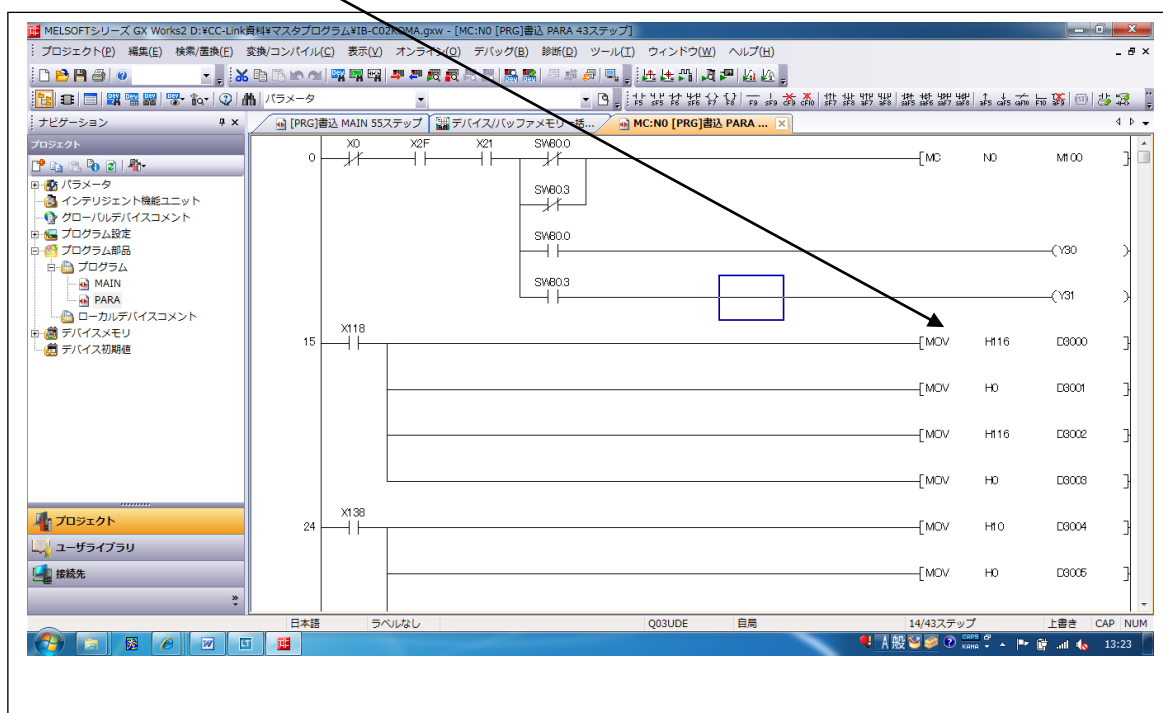
*　Switch the power off once all the parameter settings are completed, then switch the power on to validate the settings.

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5　Operations

<div style="border:1px solid black;">

Check the followings before operation

・Is the MDR properly mounted following the users manual? Is the MDR shaft held

　stationary with the standard mounting bracket supplied.

・Are all the connectors properly wired and connected?

・Is the controller installed properly and used in appropriate environment?

・Is the capacity of the power supply sufficient?

　* Use stabilized power supply (24VDC, ≧12A) so as not to be affected by varied load.

　　Power supply should not react with 20A peak current for 1msec or less for protection.

</div>

① Complete the wiring before supply 24V DC power to control and motor drive.

　Power LED and LED for L RUN SD, RD illuminate once the controller is powered.

② Start up PLC in Master station. MOT A/B LED illuminates.

　* Motor start signal needs to be entered through ladder program.

③ To start up motor, CW RUN or CCW RUN in each station needs to be switch on through ladder

　program.

④ In case the parameters are entered by ladder program, set the data value as described in each

　items.

⑤ For setting speed　　　　　　　　　　　　　　See Chapter 5-1.

⑥ To change the motor turning direction　　　　　See Chapter 5-2

⑦ To change acceleration/deceleration time　　　See Chapter 5-3.

⑧ To change the motor model　　　　　　　　　　See Chapter 5-4.

⑨ To change the current limit value　　　　　　　See Chapter 5-5

⑩ To change thermal protection settings　　　　　See Chapter 5-6

⑪ To change the type of brake　　　　　　　　　　See Chapter 5-7

⑫ To change the error reset mode　　　　　　　　See Chapter 5-8

⑬ To change motor drive mode　　　　　　　　　See Chapter 5-9

⑭ To change sensor noise elimination time　　　　See Chapter 5-10

⑮ To change the servo lock brake force　　　　　See Chapter 5-11 or 5-12

⑯ To change the motor port　　　　　　　　　　　See Chapter 5-13

5-1 Speed setting

4 different MDR speeds can be set in Speed 1 to 4 as in parameter 0X20.

Choose the speed (rpm) by selecting the speeds used in writing data bit 4 to 7.

Setting value needs to be motor speed (rpm)

Speed setting　Command 0x20　(When PM486FE is in use)

Speed rpm	MDR Speed (m/min)			Speed rpm	MDR Speed (m/min)		
	17	60	90		17	60	90
620	2.1	7.5	12.6	2,897	9.8	35.0	59.0
723	2.5	8.7	14.7	3,000	10.2	36.2	61.1
827	2.8	10.0	16.8	3,104	10.5	37.5	63.2
930	3.2	11.2	18.9	3,207	10.9	38.7	65.3
1,034	3.5	12.5	21.0	3,310	11.2	40.0	67.4
1,137	3.9	13.7	23.1	3,414	11.6	41.2	69.5
1,241	4.2	15.0	25.3	3,517	12.0	42.5	71.6
1,344	4.6	16.2	27.4	3,621	12.3	43.7	73.7
1,448	4.9	17.5	29.5	3,724	12.7	45.0	75.8
1,551	5.3	18.7	31.6	3,828	13.0	46.2	77.9
1,655	5.6	20.0	33.7	3,931	13.4	47.5	80.0
1,758	6.0	21.2	35.8	4,035	13.7	48.7	82.1
1,862	6.3	22.5	37.9	4,138	14.1	50.0	84.2
1,965	6.7	23.7	40.0	4,242	14.4	51.2	86.4
2,069	7.0	25.0	42.1	4,345	14.8	52.5	88.5
2,172	7.4	26.2	44.2	4,449	15.1	53.7	90.6
2,276	7.7	27.5	46.3	4,552	15.5	55.0	92.7
2,379	8.1	28.7	48.4	4,656	15.8	56.2	94.8
2,483	8.4	30.0	50.5	4,759	16.2	57.5	96.9
2,586	8.8	31.2	52.6	4,863	16.5	58.7	99.0
2,690	9.1	32.5	54.8	4,967	16.9	60.0	101.1

Default is set as per the table below:

MDR Speed (m/min)	Speed 1	Speed 2	Speed 3	Speed 4
17	16.9	8.4	4.2	2.1
60	60.0	30.0	15.0	7.5
90	101.1	50.5	25.3	12.6

Speed should be set in a manner younger the number, faster the speed: speed 1＞speed 2＞speed 3＞speed 4.　Wrong setting may cause malfunction.

5-2 Motor direction

Motor direction can be changed by writing data bit 0 or 1 as the table below:

Direction	bit 1	bit 0
STOP	0	0
CW RUN	0	1
CCW RUN	1	0
CW RUN	1	1

*　MDR direction is defined by viewing from the cable side. CW = right ward CCW = left ward.

5-3 Acceleration and deceleration

Command No 0x01(CW), 0x02(CCW) is assigned for acceleration and 0x03(CW), 0x04(CCW) is for deceleration.

Set the acceleration/deceleration time (second) used for the speed 1 referring to the table below:

Time (s)	Data	Time (s)	Data
0.2	0 - 29	1.4	140 - 149
0.3	30 - 39	1.5	150 - 159
0.3	40 - 49	1.6	160 - 169
0.5	50 - 59	1.7	170 - 179
0.6	60 - 69	1.8	180 - 189
0.7	70 - 79	1.9	190 - 199
0.8	80 - 89	2.0	200 - 209
0.9	90 - 99	2.1	210 - 219
1	100 - 109	2.2	220 - 229
1.1	110 - 119	2.3	230 - 239
1.2	120 - 129	2.4	240 - 249
1.3	130 - 139	2.5	250 - 255

Time or acceleration/deceleration can be selected.

Time setting: Set time is applied to the speed 1. Same time is applied for speed 2, 3 and 4.

Acceleration/deceleration: Set acceleration/deceleration is applied to speed 1. Acceleration/deceleration for speed 2, 3 and 4 is automatically assigned by calculating the value to have same curve depending on speed (rpm) and set time.

OFF setting: OFF setting makes that start and stop in 0.1 second.

* Speed setting should be done in a manner the speed 1 fastest: Speed 1＞Speed 2＞Speed 3＞Speed 4
    Wrong speed setting may cause malfunction.

* Acceleration/deceleration is not reflected unless speed is set.

5-4 Model selection

Set the right MDR model to use with.

 FE: PM486FE,PM500FE,PM570FE,PM605FE

 FS: PM486FS,PM500FS

 FP: PM486FP,PM500FP

 Unconnected: If any of the two motors is not used, Unconnected mode should be set. Doing this will avoid the troubles like continued LED flashing or Error signal discharge.

Command No 0x23

Data	Content
0x00	FE
0x01	FS
0x02	FP
0x03	Unconnect

Default is set with FE series MDR.

5-5　Current limit (Over current detection value setting

Current limit value can be adjusted between 0.25A and 4.0A.

Command No 0x08

Data	Current	Data	Current	Data	Current
0x01	0.25A	0x07	1.75A	0x0D	3.25A
0x02	0.5A	0x08	2.0A	0x0E	3.5A
0x03	0.75A	0x09	2.25A	0x0F	3.75A
0x04	1.0A	0x0A	2.5A	0x10	4.0A
0x05	1.25A	0x0B	2.75A		
0x06	1.5A	0x0C	3.0A		

* Default is set to 4.0A

5-6　Thermal error detection/reset

Temperature to detect PC board abnormality and temperature to allow recovery can be set.

7	6	5	4	3	2	1	0
Recovery				Detection			

Command No 0x09

Data	Recovery	Detection
0	40℃	45℃
1	45℃	50℃
2	50℃	55℃
3	55℃	60℃
4	60℃	65℃
5	65℃	70℃
6	70℃	75℃
7	75℃	80℃
8	80℃	85℃
9	85℃	90℃
A	90℃	95℃

* Default is set to 95℃for detecting abnormality and 90℃to allow recovery.

5-7　Brake mode selection

Brake mode can be selected while the MDR stops.

・Dynamic brake (short circuit brake): Electric brake is applied with no holding effect.

・Coast: MDR stops only by inertia with no external brake.

・Servo brake: Stops the MDR in the set memorized stop position with holding effect.

・Mechanical brake: Combination of dynamic brake and electro-magnetic brake with strongest holding

　effect.

Command No 0x0C

Data	Content
0x00	Dynamic brake
0x01	Coast
0x02	Servo lock brake
0x04	Dynamic and echanical brake

Default is set with dynamic brake.

5-8　Error – Manual/Automatic recovery

In case of MDR unplugged or stall, thermal error, the recovery can be elected from automatic or manual mode.　In case of other errors, recovery can only be done manually.

Mode selection can not be done individually.

Command No 0x0D

Data	Content
0x00	Automatic
0x07	Manual

Default is set with automatic recovery mode.

5-9　Motor drive mode selection

Motor drive mode can be selected.

Command No 0x0B

Data	Content
0x00	Square wave
0x10	Com. PWM

Square wave, or

Complementary PWM

Default is set with square wave for driving motor.

5-10　Sensor noise elimination time

Time to eliminate sensor noise (noise cancelling time) can be set between 0 and 255msec.

Command No　0x21

Default value is set to 10.

5-11　Brake force boost for servo lock brake

Brake force for servo lock brake is boosted with hall effect sensor 1 count increment. Boost increment value can be changed. Entering large number makes small number of pulses as maximum.　Current can not be higher than 1A.

Command No 0x07　Data entry 0x00～0xC8(0～200)

Default value is set to 0x00

5-12.   Servo lock brake upper current limit

Current drawn for the servo lock brake can be set up to 1A maximum.

Command No 0x0E

Data	Current	Data	Current	Data	Current
0x01	0.1A	0x05	0.5A	0x09	0.9A
0x02	0.2A	0x06	0.6A	0x0A	1A
0x03	0.3A	0x07	0.7A		
0x04	0.4A	0x08	0.8A		

Default is set to 1A.

5-13   Motor port output

Selection is motor or remote output. Bit 2 to 0 is validated only when remote output is selected.

7	6	5	4	3	2	1	0
SW set	Not used				W	V	U

Command No 0x0A

bit	Name	Content
7	SW set	0：Motor／1：Remote
2～0	U V W	0：OFF／1：ON

Default is set with motor.

Setting is done by ladder programming.

5-14   Motor stall time

Motor stall time is fixed to 1 second.

5-15   LED forcible control

LEDs on STS_A/STS_B can forcibly controlled from Master device.

Priority order is: 0,1 > 4,5 > PC board error display > 3 > 2

	Content	Data 1
5	Red LED blinks at 1Hz	0xA0
4	Green LED blinks at 1Hz	0x90
3	Alternative LED blinks at 1Hz	0x88
2	Alternative LED blinks at 7Hz	0x84
1	Green LED illumintaes	0x82
0	Red LED illuminates	0x81

* Enter "0x80" in case LEDs need to be extinguished.   Data 1 values are either to illuminate or to flash
    LEDs.

6. Error

6-1 Error output

If error arises with PC board, "1" appears in the reading data bit 2（in case of Motor A）

Error detection stops the motor. Accordingly, control needs also be programmed to stop the motor with the error signal, otherwise, motor may start all of sudden when recovered.

6-2 Error classifications

To identify the type of error if happens, set the parameter 0x0F (status output) with Word input of writing data, and type of the current ongoing error is transmitted to the reading data from the PC board:

Reading data（Data1）

7	6	5	4	3	2	1	0
FUS	DPWR	MDC	LOCK	TFLT	TFLT2	RECUR	HV

	Content
FUS	Fuse blow
DPWR	Motor Drive power error
MDC	Motor unplugged
LOCK	Motor stalled
TFLT	PCB thermal error
TFLT2	Motor thermal error
RECUR	Back EMF error
HV	Low voltage error

Relation between error and LED display is summarized in 6-3 LED display.

Actions to reset the error differ according to the error recovery setting mode.

Manual recovery   Set "1" to bit 3 (Motor A) writing data (Yxxx) or to bit B(Motor B), and the error is reset. However, unless the conditions to recover from error is satisfied, error continues. After "1" is set, set the value back to "0" after the reset.

Automatic recovery   Applicable for unplugged, thermal and stall error.   Automatically recovers if al conditions to recover is satisfied.

- Unplugged error: Plugging MDR to the IB C02 resets the error.

- Thermal error: Cooling down the temperature to the recovery level resets the error.

- Stall error: Entry of 8 motor pulses or more resets the error.

6-3　LED display

LEDs	LED behavior Green	LED behavior Red	Content
L RUN	Blinks	-	Good reception of refrech & polling or polling after entering network.
L RUN	Extinguished	-	1. Before entering network 2. Channle carrier detection NG 3. Time over 4. Hardware reset
L ERR	-	Illuminates	1. CRC error 2. Station switch setting error after reset 　(0 or 65 or over including occupied station) 3. Baud rate switch setting error after reset 　(Buad rate switch setting 5 or over)
L ERR	-	Extinguished	1. Normal communicaiton 2. Hardware being reset
L ERR	-	Blinks	Switch setting changed from the setting after reset. 　(flashes for 0.4s)
SD	Illuminates	-	During and after transmission ＋0.41ms×2(n-1) time　n=1～8
SD	Extinguished	-	Hardware being reset
RD	Blinks	-	Carrier being detected in the channel
RD	Extinguished	-	1. Channel's carrier detection error 2. Hardware being reset
Sen A/B LED	Blinks	-	Sensor input identified
Sen A/B LED	Extinguished	-	No sensor input
MOT A/B LED	Illuminates	-	Motor selected
MOT A/B LED	Extinguished	-	Remote selected
STS A/B LED	Extinguished		Motor stop (without error)
STS A/B LED	Illuminates	Extinguished	1. Direction (CW/CCW) 2. Motor port output *
STS A/B LED	Extinguished	Blinks (6Hz)	Fuse blow error
STS A/B LED	Extinguished	Blinks (1Hz)	Motor unplugged error
STS A/B LED	Illuminates	Blinks (1Hz)	Stall error
STS A/B LED	Extinguished	Illuminates	Motor pcb thermal error
STS A/B LED	Illuminates	Blinks (1.7s cycle twice at 6Hz)	Back EMF error

　* When motor port is used, green LED illuminates if any of U, V, W is discharged.

7. Servo Lock Brake

Torque and current when servo lock brake is validated

Max holding torque	Max. current
2.0N・m	1(A)

* Holding torque is with PM486□□-60

What is the Servo lock brake?…

・It stops MDR in motion and holds the stop position.

・MDR roller returns to the memorized stop position even if it is externally rotated.

・Suitable for applications in incline/decline line where external force (gravity) may present.

8. Dimensions
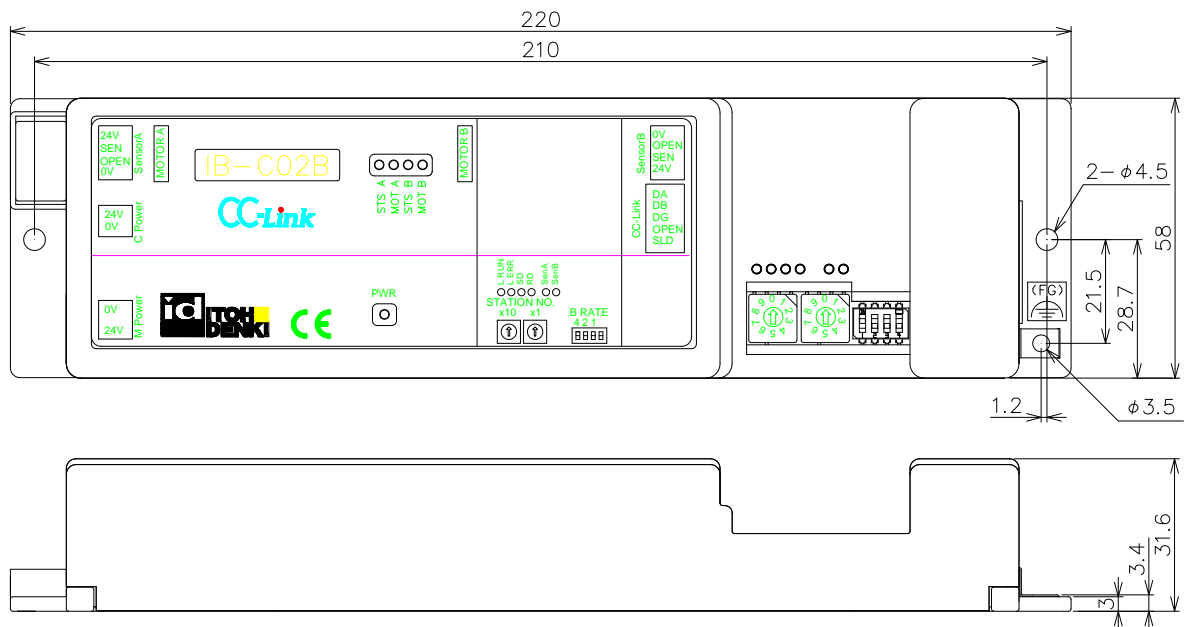
9. Specifications

9-1 PC board specifications

<table>
<tr><td rowspan="4">Motor power</td><td>Nominal voltage</td><td>24V DC</td></tr>
<tr><td>Static current</td><td>0.05A</td></tr>
<tr><td>Peak current</td><td>20A ≦1msec</td></tr>
<tr><td>Starting current</td><td>4.0A per motor</td></tr>
<tr><td rowspan="2">Control power</td><td>Nominal voltage</td><td>24V DC</td></tr>
<tr><td>Current</td><td>0.05A</td></tr>
<tr><td>LED indication</td><td colspan="2">Power (Motor power)
STS_A/B (Motor status)
MOT_A/B (Motor or output)
L RUN/L ERR/SD/RD (Communication)
SEN A/B (Sensor status)</td></tr>
<tr><td>Protections</td><td colspan="2">Integral 7A fuse (+ side)
Integral diode against wrong polarity</td></tr>
<tr><td>Thermal protection</td><td colspan="2">95℃ at motor driver
105℃ at motor</td></tr>
</table>

<table>
<tr><td colspan="2">Brake selection</td><td>Electric (dynamic) brake, or Servo lock brake</td></tr>
<tr><td rowspan="2">Motor connector</td><td>PCB side</td><td>WAGO231-532/001-000</td></tr>
<tr><td>Wiring side</td><td>WAGO231-302/026-000 ※2</td></tr>
<tr><td rowspan="2">Control connector</td><td>PCB side</td><td>WAGO734-162</td></tr>
<tr><td>Wiring side</td><td>WAGO734-102 ※2</td></tr>
<tr><td rowspan="2">Sensor connector</td><td>PCB side</td><td>37204-1BE0-004 PL</td></tr>
<tr><td>Wiring side</td><td>37104-3122-000 FL ※1,※2</td></tr>
<tr><td rowspan="2">Com. Connector</td><td>PCB side</td><td>35610-5253-B00 PE</td></tr>
<tr><td>Wiring side</td><td>35505-6000-B0M GF ※2</td></tr>
<tr><td rowspan="4">Environment</td><td>Ambient temp.</td><td>0 to 40℃</td></tr>
<tr><td>Humidity</td><td>≦ 90%RH (no condensation)</td></tr>
<tr><td>Atmosphere</td><td>No corrosive gas</td></tr>
<tr><td>Vibration</td><td>≦0.5G</td></tr>
</table>

※1　Suggested cable for the sensor connector: 0.14 to 0.3mm^2 (AWG26〜24)

　　Consult us if other cable is to be used.

※2.　Connector for power side is optional.

9-2 CC-Link specifications

<table>
<tr><td>Version</td><td colspan="2">CC-Link Ver 1.10</td></tr>
<tr><td>No of occupied station</td><td colspan="2">1 station occupied</td></tr>
<tr><td>Communication speed</td><td colspan="2">10M/5M/2.5M/625K/156K (switch selection)</td></tr>
<tr><td>Communication style</td><td colspan="2">Broadcasting polling system</td></tr>
<tr><td>Synchronization</td><td colspan="2">Frame synchronization system</td></tr>
<tr><td>Encoding method</td><td colspan="2">NRZI</td></tr>
<tr><td>Transmission path format</td><td colspan="2">Bus format（EIA RS485 comformance）</td></tr>
<tr><td>Transmission format</td><td colspan="2">HDLC conformance</td></tr>
<tr><td>Error control system</td><td colspan="2">CRC(X 16+X12+X6+1)</td></tr>
<tr><td>Max number of units connected</td><td colspan="2">(1×a)+(2×b)+(3×c)+(4×d)≦64 stations
a) link points for device occupying 1 station, b) link points for device occupying 2 stations, c) link points for device occupying 3 stations, d) link points for device occupying 4 stations

16 × A + 54 × B + 88 × C ≦ 2304
A: Remotel/O station・・・・・・・・・・・・・・・・・・・・64 units maximum
B: Remote device station・・・・・・・・・・・・・・・・・ 42 units maximum
C: Local station, intelligent device station・・・・・ 26 units maximum</td></tr>
<tr><td>No of slave station</td><td colspan="2">1 to 64</td></tr>
<tr><td>Connection cable</td><td colspan="2">CC-Link compatible cable (shielded 3 core twisted pair cable)</td></tr>
</table>

Maximum communication distance

Speed	156Kbps	625Kbps	2.5Mbps	5.0,M	10Mbps
Interstation cable length		≧ 0.2m			
Max cable extension length	1200m	900m	400m	160m	100m
Terminal resistor	110Ω（between DA and DB）				

10.　Troubleshooting

10-1　Motor error

Check the followings first without removing the cover or modifying.

Power	・Does Power LED (green) illuminate? ・Does L RUN, SD, RD LED (green) illuminate? ・Doesn't L ERR LED (red) illuminate? ・Is 24VDC properly supplied for power supply. ・Is the wiring (24V and 0V) to CN1 correct? ・Is 24VDC cable correctly wired to the connector.
Error	・Doesn't STS A/B LED（red）illuminate or blink? ⇒See Chapter -2 to reset the error.
MDR	・Is mounting bracket properly fixed to hold MDR stationary？ ・Doesn't MDR endhousing contact inner face of conveyor frame? ・Is the MDR motor connector properly inserted to the controller? ・Isn't the belt tension too strong or isn't number of slave rollers too much, in case MDR slaves free rollers via transmission belts?

（Sympton 2）Speed can't be varied, or does not reach to the expected speed	
MDR	・How much is MDR's nominal speed？ ⇒You can't get the speed faster than nominal speed.
Power	・Is 24VDC properly supplied form power supply?
Ladder	・Is the speed setting correct in the ladder program?

(Sympton 3) MDR can't be revsersed.	
Ladder	・Is the station number correct?　? ・Is the link input number correct?

(Sympton 4) Error arises too often	
STS A/B LED	・Doesn't red LED iilluminate or blink? 　⇒If yes, one of those erros exists; thermal error, stall error, unplugged error, power shortage error, or back EMF error. 　See chapter 6-2 to reset the error. ・Is the capacity of power supply sufficient? 　⇒See chapter 2.
L ERR LED	・Wasn't baud rate setting (SW 1) or station setting (SW 2, SSW 3) done after the power is switch on? 　⇒Switch off the power first, then switch the power on. ・Does the set baud rate or station stay within the specifid range?
Environment	・Does the ambient temperature stay within the specified range? ・Is the controller's back plate affixed to the metallic face ensuring heat dissipation? ・Isn't the MDR stalled in case mechanical stopper is used in the conveyor line?
MDR	・Doesn't MDR contact inner face of conveyor frame? ・Is MDR motor connector properly inserted to the controller? ・Isn't MDR cable injured nor damaged?

10-2 Error messages regarding CC-Link and solutions

Messages	Solutions
Parameter written the sequencer does not match the current structure. Match the parameter and the structure.	Check whether CC-Link communication is established. Update CPU data.
Executed process "Parameter writing A" but got no response from the salve station.	Check whether the PC board in the set station is actually connected. Check whether the communication in the set station is active.
CC Link parameter is the connected sequencer CPU does not have Refresh device setting. Write CC-Link parameter where refresh device is set, then re-execute.	Follow Network parameter => CC Link chart setting, then check whether the mode setting is in "Remote net Ver 1 mode"

Technology for tomorrow

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