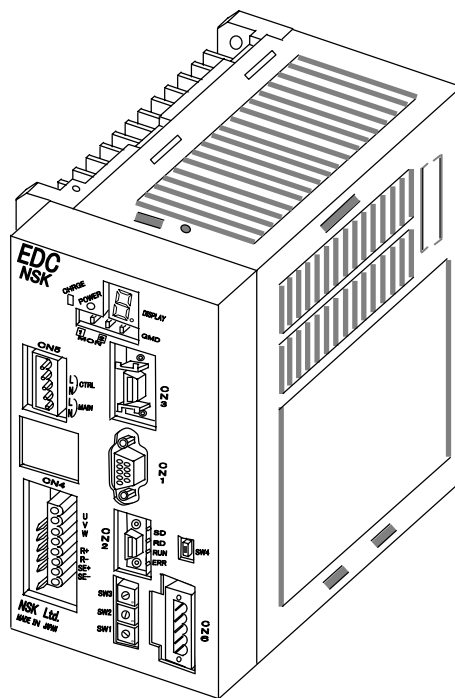# NSK

MEGATORQUE® MOTOR SYSTEM
User's Manual
(EDC Driver Unit CC-Link Option)

M-E099DC0C2-157

NSK Ltd.

Document Number: C20157-02

Limited Warranty

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Contents

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1. Introduction

● This manual describes an option of the Megatorque Motor System that consists of the EDC Driver Unit CC-Link option. Please refer to the user's manual of the Megatorque Motor System (EDC Driver Unit System) for other details.

● Connection of the optional EDC Driver Unit to the CC-Link network will make you utilize its control Input/Output functions through the master station.

● For your safety, please be sure to read the user's manual thoroughly before operating the Megatorque Motor System.

1.1. Notes for Users

1.1.1. Notes for Safety

● For your safety, you should read this manual thoroughly and understand the contents before operating the Megatorque Motor System.

● The following notices are added to give particular emphasis on the safety precautions in this manual.

⚠ *Danger   : A matter that might cause serious injuries.*

⚠ *Warning : A matter that might result in injuries.*

⚠ *Caution : A matter that might result in the breakdown of equipment into which the Motor is installed or the break down of the mechanism surrounding the Motor.*

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2. Specifications

2.1. General Specifications

Table 2-1: General specifications

Item	Description	
Protocol	CC–Link Ver.1.10	
Number of slave stations (Type of station)	2	Remote device stations
Number of addressable remote input ports	17	16 ports are available for any function assignment
Number of addressable remote output ports	8	7 ports are available for any function assignment
Remote register output	2 words	Enables to configure the contents of output

2.2. Specifications of Hardware Interface

2.2.1. External Dimensions

Fig. 2-1: EDC Driver Unit compatible with CC-Link Network

(Motor type: PS1006, PS1012, PS1018, PS3015 and PS3030)

Fig. 2-2: EDC Driver Unit compatible with CC-Link Network
(Motor type: PS3060 and PS3090)
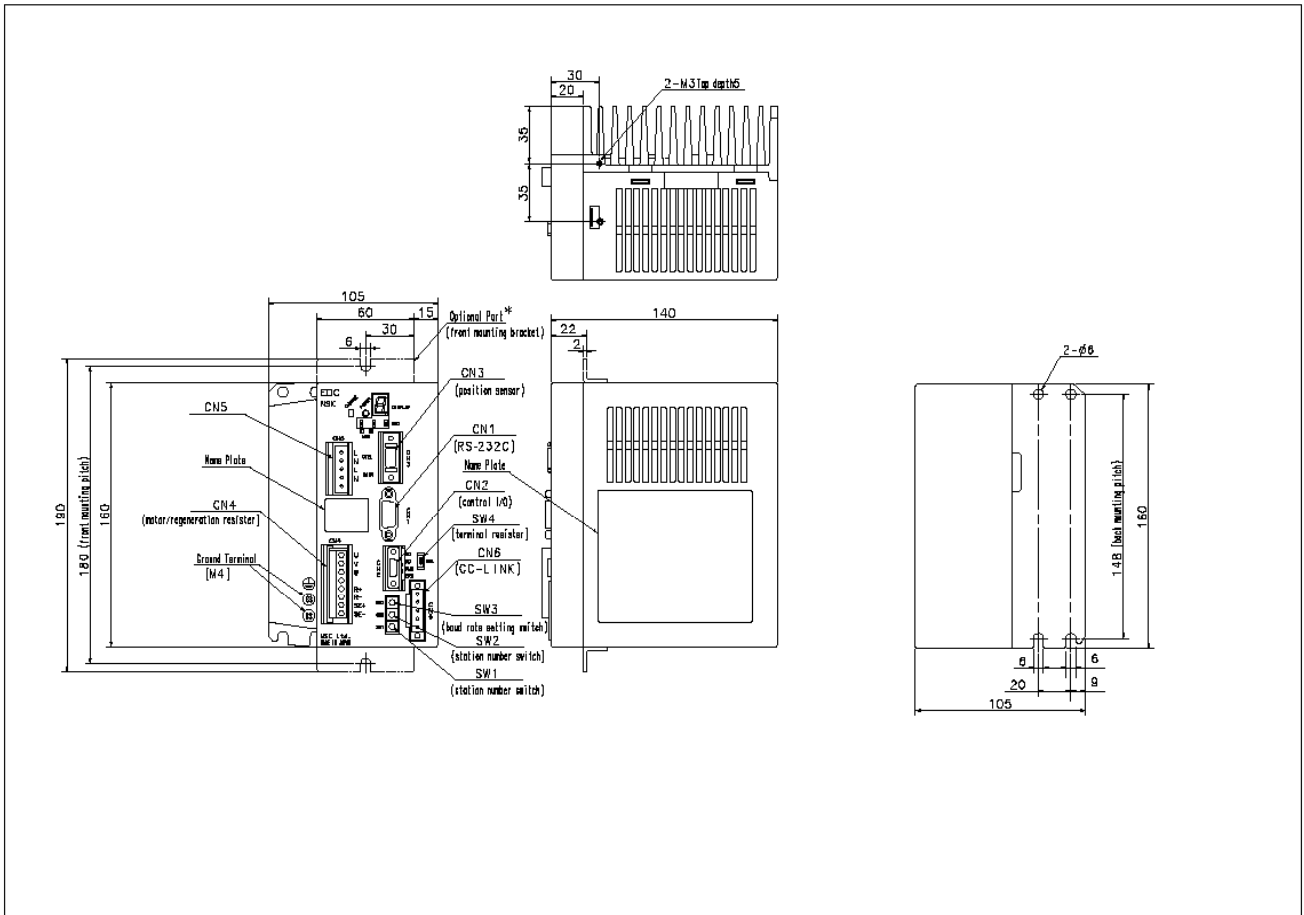
2.2.2. CN2: Control Input/Output Signal Connector

● The table below shows the connectors for CN2.

Table 2-2: Connector list

Connector of Driver Unit	DDK Ltd.	DHF-RAA10-233NB-FA or equivalent
Mating connector	DDK Ltd	DHF-PDA10-3-A01-FA or equivalent

◊ An optional cable set (M-E011DCCN1-001) with the mating connector to the CN2 I/O connector of the Driver Unit is available (Sold separately).

● The followings are wiring precautions for the connector CN2.

1) Use a shielded cable for wiring of the CN2 connector.

2) These cables should be laid separately from the main power line.

3) Connect the one end of the shielded cable to the frame ground.

⚠ *Caution : Check for a wiring mistake in the polarity of external power supply, and a shorting between connector pins.*

⚠ *Caution : Never connect the idle pins that are insntructed as "Do not connect." Do not make them idle at the master controller (PLC, etc) side, after you have connected all pins at the CN2 connector side.*

• Connection of an idle pin that is instructed not to connect may make the Driver Unit easily affected by external noise, and thus likely causing its malfunction or breakdown.

2.2.2.1. CN2 Pin-Out

- Figure 2-3 below shows the shipping set of the pin-out arrangement of the CN2 connector.

- You may change the function assignment of each signal port.
  (Except some ports that are dedicated to a certain function)

  ◊ Change to an extended capability port.

  ◊ Transfer an assigned function to other port.

  ◊ Mask the function of unused port.

- The each port of the CN2 connector is assigned to the same port name as the remote Input/Output of the CN6 interface connector, and the ports of both connectors are corresponsing each other.

⚠ *Caution : A change of function assignment of a port of the CN2 connector forces the function change to the remote Output/Input of the corresponding port.*

Fig. 2.3: CN2 pin-out
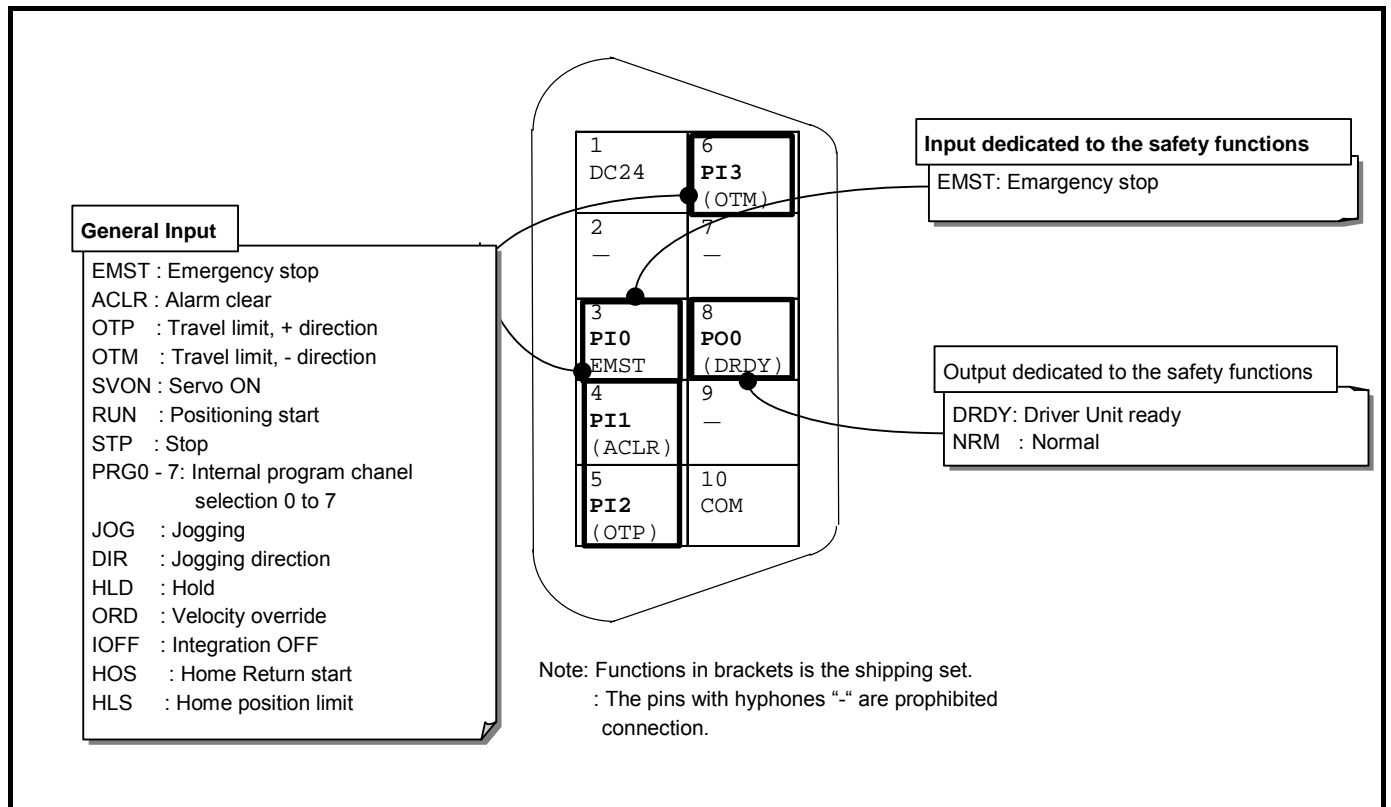
- PI0 and PO0 ports are dedicated to the safety function Input and Output. They have following restrictions respectively.

  ◊ You cannot change the function of the port PI0 (Pin number 3: Input EMST (Emergency stop)). You may only set the input port and the stability timer to it.

  ◊ You can only exchange the function of the PO0(Pin number 8: Output DRDY (Drive Unit ready) with the function Output NRM (Normal). You cannot set the output logic and the stability timer to it.

2.2.2.2. CN2 Signal List

Table 2-3: Signal name and function (shipping set)

Pin No.	Port code	Signal code	Contact logic	Signal function	Function
1	-	DC24	--	24 VDC external power supply	External power supply for input signal
2	-	-	-	Do not connect	-
3	PI0	EMST	Normaly closed	Emergency stop	Interrupts the positioning and stops with the dynamic brake
4	PI1	ACLR	Normaly open	Alarm clear	Clears warning
5	PI2	OTP	Normaly closed	Travel limit, + direction	If OTP input goes active, the Motor servo is locked in the CW only
6	PI3	OTM	Normaly closed	Travel limit, - direction	If OTM input goes active, the Motor servo is locked in the CCW only
7	-	-	-	Do not connect	-
8	PO0	DRDY	Positive	Driver Unit ready	Reports that the Motor is ready to rotate (Those pins open when Motor is not ready, or an alarm occurs)
9	-	-	-	Do not connect	-
10	-	COM	-	Output signal COMMON	Common for output signal

⚠ *Caution : Be sure to follow the operation manual when your Megatorque Motor System is a custom-made version and the function of Input/Output signals are specially arranged.*

⚠ *Caution : Never connect the pins indicated as "Do not connect" Be sure to connect these pins of the master controller (PLC, etc) side after you have connected all pins of the CN2 connector. Otherwise, it may result in a malfunction or breakdown of the system.*

2.2.3. CN6: Interface Connector

● The CN6 connector interfaces with the CC－Link network.

● The followings are the reference for the connectors that are used for the CN6 connector.

Table 2-4: CN6 mating connectors

Connector, Driver Unit side	Phoenix Contact Gmbh, & Co.	MSTB2,5/5-GF-5,08AU or equivalent
Mating connector	Phoenix Contact Gmbh, & Co.	MSTB2,5/5-STF-5,08AU or equivalent

● Table 2-5 below shows the reference data for the mating connectors.

Table 2-5: Reference data of the mating connector
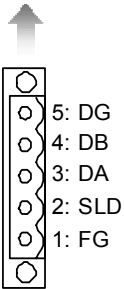
Item	Specification
Cable to be used (single connection)	0.2 to 2.5 [mm^2] (twisted) (AWG24 to 12）
Cable to be used (double connection)	0.2 to 1.5 [mm^2] (twisted)
Removed coat length	7 [mm]
Machine screws to be used	M3
Tightning torque	0.5 to 0.6 [N·m]

2.2.3.1. CN6 Pin-Out

Table 2-6: CN6 pin-out

	Pin No.	Signal code	Function	Description
Top of the Driver Unit / 5: DG / 4: DB / 3: DA / 2: SLD / 1: FG	1	FG	Frame ground	Connect the frame ground
	2	SLD	Shield	Connect the shielded cable (Frame ground cable)
	3	DA	Data A	Connect the data A cable
	4	DB	Data B	Connect the data B cable
	5	DG	Data ground	Connect the data ground cable
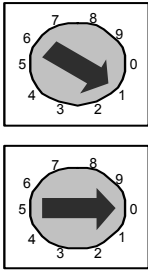
2.2.4. SW1•SW2: Station Number Switch

● These rotary switches set the station number from 1 to 64.
The SW1sets the tens place of the number, while the SW2 switch sets the ones place.
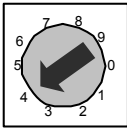
Table 2-7: Station number switch

Driver Unit's upper side	SW1	SW2	Station number
	0	0	(Never set)
SW 2: ×1	0	1	1 (Shipping set)
SW 1: ×10	⋮	⋮	⋮
	6	4	64

2.2.5. SW3: Baud Rate Setting Switch

● The switch sets the baud rate.
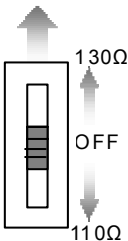
Table 2-8: Baud rate setting switch

Driver Unit's upper side	SW3	Baud rate [bps]
	0	156k
	1	625k
	2	2.5M
	3	5M
	4	10M (Shipping set)
	5 - 9	Never set

2.2.6. SW4: Terminal Resistor Switch

● Set the terminal resistor when connecting the Driver Unit to the end of the network.

◊ Select the resistor value in accordance with the characteristic impedance of the cable.

● Be sure to turn off the power of the Driver Unit when setting the terminal resistor.

Table 2-9: Terminal resistor setting switch

Driver Unit's upper side	SW4	Terminating resistance	Description
130Ω / OFF / 110Ω	Up	130 [Ω]	• The terminal resistor is on (When the characteristic impedance of the cable is 130 [Ω])
	Neutral	None	• The terminal resistor is off (Shipping set)
	Down	110 [Ω]	• The terminal resistor is on (When the characteristic impedance of the cable is 110 [Ω])

2.2.7. LED Status Monitor (SD, RD, RUN and ERR)

- The monitor indicates the status of conection and communicatoin with the network.

- When the communication status is nomal, the indicators RUN, RD and SD are on, and that of ERR is off (In some baud rate, the RD and SD indicators seem like blinking).

Table 2-10: LED status monitor

	Indicator	Color	Description
Driver Unit's upper side ↑ ☐ SD ☐ RD ☐ RUN ☐ ERR	SD	Green	On: In the middle of tarnsmitting data
	RD	Green	On: In the middle of receiving data
	RUN		On: Executing the data link. The unit is normal Off: Not linked to the network. Caririer detection NG, Time-Over, Resetting
	ERR	Red	On : CRC error, SW1and 2 (Station number) setting error, or SW3 (Baud rate) setting error Off: Communicating normally or Resetting hardware Blinking: The switch setting (SW1, 2 and 3) is altered

Table 2-11: Monitoring pattern

SD	RD	RUN	ERR	Status
✳	●	●	○	Communicating normally
✳	●	●	✳	Communicating normaly, with occasional CRC error
✳	●	●	✳*	Baud rate and/or station number setting are alterd at the time of power on. * LED flickers at intervals of every 0.4 [s]
○	●	●	✳	Transferred data become "CRC Error" and thus unable to responsd
○	●	●	○	No data transmission to the Driver Unit
✳	●	○	✳	Though the polling is responding, the refresh receiving has a CRC error
○	●	○	✳	Cannnot respond as the data to the Driver Unit has a CRC error
✳	●	○	○	The communication link is not active
○	●	○	○	No data sent to the Driver Unit, or impossible to receive the data
○	○	○	○	Impossible to receive the data. Power shutdown, or the hardware is in the middle of resetting
○	●／○	○	●	Setting error on the baud rate or station number

●: On   ✳: Blinking   ○: Off

- The SD monitor is blinking quickly, and thus it occasionally seemes like as if it is on depending on the communication state.

2.2.8. Wiring Example

● Refer to "Figure 2-4: Wiring example" below for wiring the Drive Unit to the CC-Link.

　◊ Be sure to use a cable dedicated to the CC-Link.

　◊ The wiring order is not necessarily the same order of station numbers.

Fig. 2-4: Wiring example
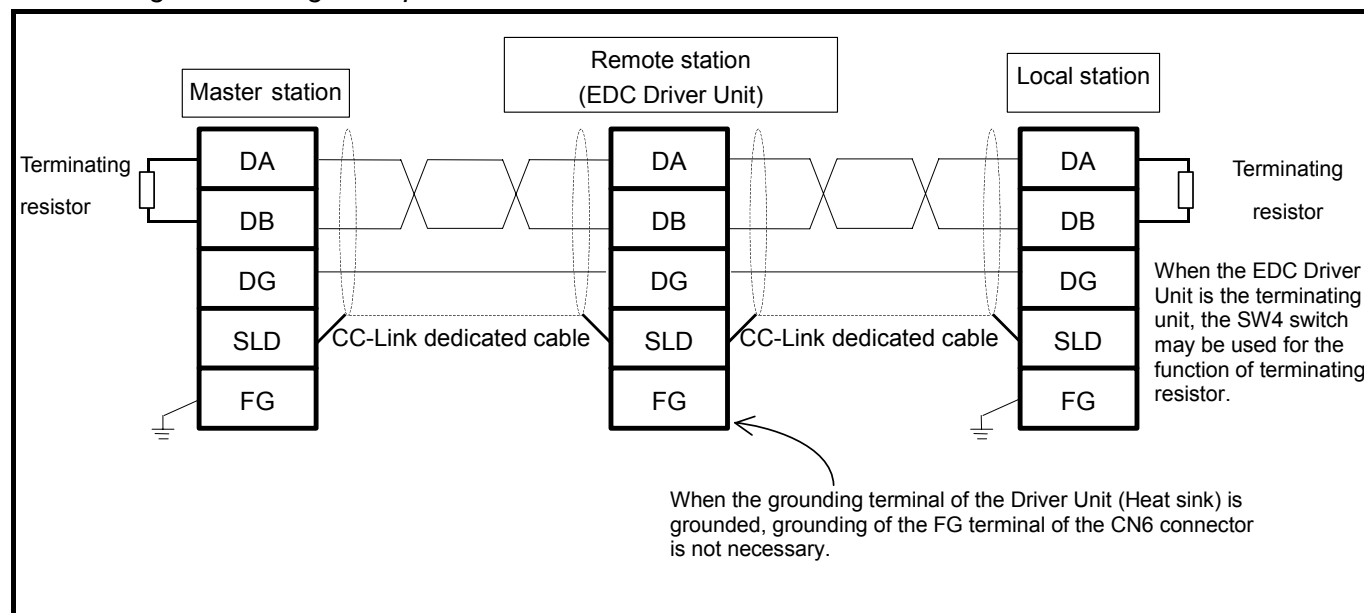
● Connect the shielded wire of the CC-Link dedicated cable to the SLD terminal of CN6 connector. The SLD terminal is connected to the housing of the Driver Unit through the FG terminal and thus, the shielded wire is grounded through the gorunding terminal of the Driver Unit (Heatsink).

● Connect the terminating resistor between the DA and DB terminal of the both end units of the network .

　◊ The SW4 switch sets the terminating resistor for the EDC Driver Unit.

2.3. Software Interface Specification

2.3.1. Remote Input/Output

● Table 2-12 "Remote Input/Output" on the next page shows the function of Input/Output of the CN6 interface connector (Shipping set).

● Excluding some ports, you may change the function assignment to the remote Input/Outpu ports. Please refer to "3.5 Function Assignment of Control Input/Output" for the details of Input/Output signal logic and the function that can be assigned to each Input/Output port.

◊ Replaces an assigned function with an extended function.

◊ A previously assigned function may be set to other port.

◊ Masks a unused port.

● The same port name of the CN2 control I/O connector is assigned to the corresponding port of the remote I/O connector and the I/O function of each port is also corresponding each other.

⚠ *Caution : Pay special attention when changing the function assignment of Remote Input/Output port because that of the corresponding port of the CN2 signal connector changes its function also.*

Table 2-12: Remote Input/Output *(m: A register number derived from the top station number)*

Output	Port code	Signal code	Function	Input	Port code	Signal code	Function
RXm0	PO0	DRDY	Reports that the Motor is ready for the operation	RYm0	PI0	EMST	Interrupts the positioning and stops with the dynamic brake
RXm1	PO1	WRN	Alerts warning.	RYm1	PI1	ACLR	Clears warning
RXm2	PO2	OTPA	Over travel limit (+) (Soft and hard ware limit switch)	RYm2	PI2	—	Reserved [1]
RXm3	PO3	OTMA	Over travel limit (-) (Soft and hard ware limit switch)	RYm3	PI3	—	Reserved [1]
RXm4	PO4	SVST	Reports the state of the servo	RYm4	PI4	SVON	Turns the servo on
RXm5	PO5	BUSY	Reports the operation state	RYm5	PI5	RUN	Starts the program operation specified by the PRG input
RXm6	PO6	IPOS	Reports the conditions in position error and positioning	RYm6	PI6	STP	Stops positioning operation
RXm7	PO7	NEARA	Reports that the Motor is approaching the target position	RYm7	PI7	PRG0	
RXm8	—	—	(Reserved)	RYm8	PI8	PRG1	
RXm9	—	—	(Reserved)	RYm9	PI9	PRG2	
RXmA	—	—	(Reserved)	RYmA	PI10	PRG3	A combination of 1 and 0 (ON/OFF) of the"Internal program channel selection" selects a channel to be executed (Channel 0 -255)
RXmB	—	—	(Reserved)	RYmB	PI11	PRG4	
RXmC	—	—	(Reserved)	RYmC	PI12	PRG5	
RXmD	—	—	(Reserved)	RYmD	PI13	PRG6	
RXmE	—	—	(Reserved)	RYmE	PI14	PRG7	
RXmF	—	—	(Reserved)	RYmF	PI15	JOG	Starts and stops a jog operation
RX(m+1)0	—	—	(Reserved)	RY(m+1)0	PI16	DIR	Specifies the direction of a jog operation
RX(m+1)1 to RX(m+2)F	—	—	(Reserved)	RY(m+1)1 to RY(m+2)F	—	—	(Reserved)
RX(m+3)0 to RX(m+3)7	—	—	(Reserved)	RY(m+3)0 to RY(m+3)7	—	—	(Reserved)
RX(m+3)8	—		Flag for processsing an initial data (Not used)	RY(m+3)8	—		Flag for completion of initial data processing. (Not used)
RX(m+3)9	—		Flag for "End of initial data setting" (Not used)	RY(m+3)9	—		Flag for initial data setting (Not used)
RX(m+3)A	—		Flag for positioning state (Not used)	RY(m+3)A	—		Flag for requesting error reset (Not used)
RX(m+3)B	—		The remote station is ready	RY(m+3)B	—	—	(Reserved)
RX(m+3)C to RX(m+3)F	—	—	(Reserved)	RY(m+3)C to RY(m+3)F	—	—	(Resrved)

[1]: The shipping set of PI2 and PI3 ports is assigned to signals of OTP and OTM respectively. These are the dedicated input signals from the CN2: control I/O connector. An input from the CC-Link to these OTP and OTM function ports shall become invalid.

● The PI0 and PO0 are dedicated ports for the signals fundamental to the safety function. There are following restrictions respectively.

◊ You cannot change the function EMST(Emaergency stop) assigned to the Port PI0 (RYm0).

◊ The Output DRDY (Driver Unit Ready) assigned to the Port PO0 (RXm0) is only interchangeable with the function of NRM(Normal).

● Refer to "3.5 Function Assignment of Control Input/Output" for the logic of each function.

2.3.2. Remote Register

- Table 2-13 "Remoto Register" shows the functon of remote register of the CN6 : interface connector.

- Remote register outputs data monitoring, such as a coordinate data, using two words of remote register RWr.

  ◊ The data consists of 32 bit integer with the sign.

Table 2-13: Remote Register

m: A register number derived from the top station number

Output	Function	Input	Function
RWrm+0	Monitor data set by the POD parameter (LSW)	RWwm+0	
RWrm+1	to (MSW)	RWwm+1	
RWrm+2		RWwm+2	
RWrm+3		RWwm+3	(Reserved)
RWrm+4		RWwm+4	
RWrm+5	(Reserved)	RWwm+5	
RWrm+6		RWwm+6	
RWrm+7		RWwm+7	

- The output is set by the parameter POD (Polling data).

  ◊ The parameter POD must accompany the name of monitor that is outputting data.

Table 2-14: Parameter related to the remote register output

Parameter	Function	Default	Domain
POD	Polling data	TP	Set POD + Monitor name

● The following show an example to output the data of current velocity to the CC-Link.

1) Monitor TV (Current velocity readout) reports the current velocity of the Motor.
   Set "Monitor TV" to the parameter POD (Polling data) to output to the CC-Link.

| P | O | D | T | V | ENT |

```
#PODTV
#_
```

2) Monitor TV reports the current velocity in units of a thousandth of [s^{-1}] as described in the "Megatorque Motor System User's Manual (EDC Driver Unit System)".

◊ The current velocity is given in the units of a thusandth as −5.000 when the Motor is rotating to the minus direction at the velocity of 5 [S^{-1}].

Fig. 2-5: Description of "Monitor TV" (Megatorque Motor System User's Manual [EDC Driver Unit System])

TV: Tell Velocity

● Reads out the current velocity.

◊ Refer to "7.3. RS-232C Monitor" for details.

Command	Monitor
Format	**TV**
Data range	0.000 to ± 10.000 [s^{-1}] (The data range is an approximate value.)

3) The decimal point is abbreviated when outputting to the CC-Link.
   When the Motor is rotating at −5.000, -5000 (FFFF EC78h in hexadecimal number) will be outputted.   Table 2-15 below shows an example of the relation between the register address and the contents of an output.

Table 2-15: Output example of the remote register (When outputting -5000)

m: A register number derived from the top station number

Output	Function	Input	Function
RWrm+0	**EC78h**	RWwm+0	
RWrm+1	**FFFFh**	RWwm+1	
RWrm+2		RWwm+2	
RWrm+3		RWwm+3	
RWrm+4		RWwm+4	(Reserved)
RWrm+5	(Reserved)	RWwm+5	
RWrm+6		RWwm+6	
RWrm+7		RWwm+7	

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3. Operation

3.1. Operation Mode and Input/Output

● There are two ways to input signals to the Driver Unit CN2: control Input/Output connector and remote input by the CN6: interface connector. There are two operation modes to receive those inputs exclusively.
  ◊ Fieldbus mode: The prompt of the Handy Terminal is "**#**".
  ◊ Maintenance mode: The prompt of the Handy Terminal is "**:**".
● The operation mode and format of Inpt/Output are shown in the Table 3-1 "Operation mode and composition of Input/Output" (The function assignment is the shipping set).

  ◊ The operative Inputs/Outputs of each operation mode are shown in the bold line boxes below.

Table 3-1: Operation mode and composition of Inputs/Outputs

m: A register number derived from the top station number

Input/Output		Fieldbus mode		Maintenance mode	
Port code	Signal code	Remote Input/Output	CN2 Pin No.	Remote Input/Output	CN2 Pin No.
PI0	EMST	RYm0	3	RYm0	3
PI1	ACLR	RYm1	4	RYm1	4
PI2	OTP	RYm2	5	RYm2	5
PI3	OTM	RYm3	6	RYm3	6
PI4	SVON	RYm4	–	RYm4	–
PI5	RUN	RYm5	–	RYm5	–
PI6	STP	RYm6	–	RYm6	–
PI7	PRG0	RYm7	–	RYm7	–
PI8	PRG1	RYm8	–	RYm8	–
PI9	PRG2	RYm9	–	RYm9	–
PI10	PRG3	RYmA		RYmA	–
PI11	PRG4	RYmB	–	RYmB	–
PI12	PRG5	RYmC		RYmC	–
PI13	PRG6	RYmD	–	RYmD	–
PI14	PRG7	RYmE		RYmE	–
PI15	JOG	RYmF	–	RYmF	–
PI16	DIR	RY(m+1)0	–	RY(m+1)0	–
PO0	DRDY	RXm0	8	RXm0	8
PO1	WRN	RXm1	–	RXm1	–
PO2	OTPA	RXm2	–	RXm2	–
PO3	OTMA	RXm3	–	RXm3	–
PO4	SVST	RXm4	–	RXm4	–
PO5	BUSY	RXm5	–	RXm5	–
PO6	IPOS	RXm6	–	RXm6	–
PO7	NEARA	RXm7	–	RXm7	–

● In case of the fieldbus mode, take the input signals from the CN6 connector. For the maintenance mode, take them through the CN2 connector. However, there are following two exceptions.

  ◊ The port assigned to the Input EMST (Emergency stop) regards the Input of both CN2 and CN6 connectors as the "Emergency stop" signal. This means that the system gets in the emergency stop state by either one of the inputs.

◊ The ports assigned to the function of OTP/OTM (Over travel limit switch position) and HLS (Home position limit switch) only take the input from the CN2 connector regardless the operation mode.

● The output signals go to the both CN2 and CN6 connecotrs regardless the operation mode.

3.2. Change of Operation Mode

● The system starts with the fieldbus mode right after the power is turned on.

◊ When the system detects any abnormality related to the CC-Link, it starts up with the maintenance mode.

● The command CP (Control mode priority) changes the operation mode.

Fig. 3-1: Switching the operation mode

```
 NSK MEGATORQUE
 DC1A80_0009.0
 XSYS1006.2,XOP1
 #
 #CP0                    ●── Fieldbus mode right after the power is turned on
 :                       ●── Changes to the maintenance mode by the input of CP0
 :CP1                    ●── Maintenance mode
 #                       ●── Changes to the field-bus mode by CP1
                         ●── Field-bus mode
```
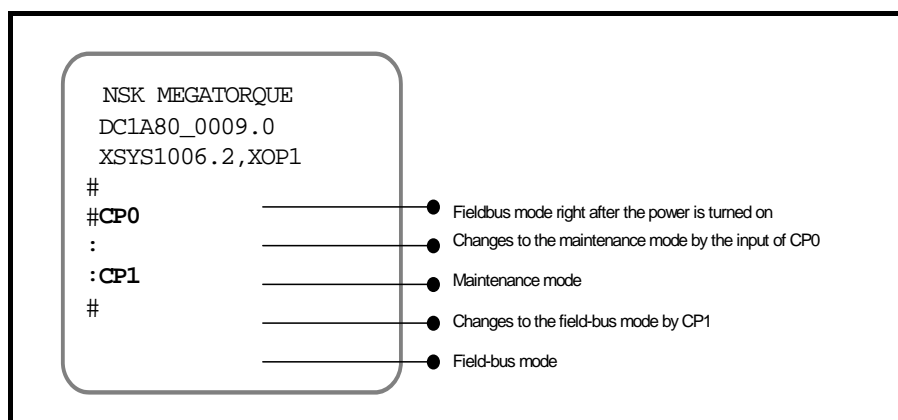
3.3. Servo-on in the Maintenance Mode

● It needs to activate the Input SVON (Servo on) to make the Motor servo on. This means the Input SVON of the CN6 : Interface connector must be set to 1.

● The CC-Link network would not be ready yet while the total system is in the middle of starting-up. In such a case, the Motor can be in the Servo-on state immediately by switching to the maintenance mode from the operation mode to set the polarity of the Input SVON to a normally closed conntact.

◊ The change to the maitenance mode makes the inputs of the CN2 connector effective. While no port is assigned to the Input SVON for the CN2 connector, the SVON input is regarded always as OFF. However, the reverse of the port polarity forcibly turns ON the Input SVON.

● The following describe how to make the Motor SVON effective by the forcible activation of the Input SVON.

⚠ *Danger : Be sure to wire the Input EMST (Emergency stop) so that immediate deactivation of the servo is possible.*

1) Input the command MO (Motor off) to deactivate the Motor servo.

| M | O | ENT |

```
#MO
#_
```

2) Set the parameter CP (Control priority) to the CP0 (Maintenace mode).

| C | P | 0? | ENT |

```
#CP0
:_
```

3) Specify the port number to which the Input SVON (Servo on) is assigned by the command PI (Edit input port) to readout the parameter FN (Port function).

   (The SVON is assigned to the PI4 as the shipping set)

| P | I | 4> | ENT |
| SP | SP |

```
:PI4
 FNSVON;
 AB0;
 NW0.2
```

For every input of the SP key, the parameters AB (Input polarity) and the NW (Anti-chattering timer) are displayed.

4) Input the parameter AB1 to change the input port to a nomally closed port.

| A | B | 1# | ENT |

```
 AB0;
 NW0.2
?AB1
?_
```

5) While the prompt is "?", input "?" for the confirmation of the change of port polarity.

| ? | ENT |
| SP | SP |

```
??
 FNSVON;
 AB1;
 NW0.2
```

Every one input of the SP key reads out the parameters FN, AB, and NW in seaquence.
Confirm that the paremeter AB is changed to AB1.

6) Input the ENT key to terminate the editing while the prompt "?" is on the display.

| ENT |

```
 NW0.2
?
:_
```

7) Input the command SV (Servo on) to make the Motor possible to get into "Servo on".

| S | V | ENT |

```
:SV
:_
```

3.4. Monitoring Control Input/Output

● The Monitor IO (Input/Output monitor) monitors the state of remote inputs and outputs of the CN6 interface connector.

● Figure 3-2 "Monitor of the control Input/Output functions and their state" below shows the relation between the function of control inputs and outputs of the Driver Unit and the Monitor IO. You can monitor the state of each part using Monitor IO0 to IO4 accordingly.

◊ This section describes the IO4, the monitor of Input/Output of the CC-Link and the BS, the monitor of status of interface. Refer to "Appendix 1: Check of the Input/Output Signal" for other monitors.

● Besides the above way of monitoring, "ON and OFF" of each function can be monitored by inputting F + Control I/O Function .

Fig. 3-2: Monitor of the control I/O functions and their state
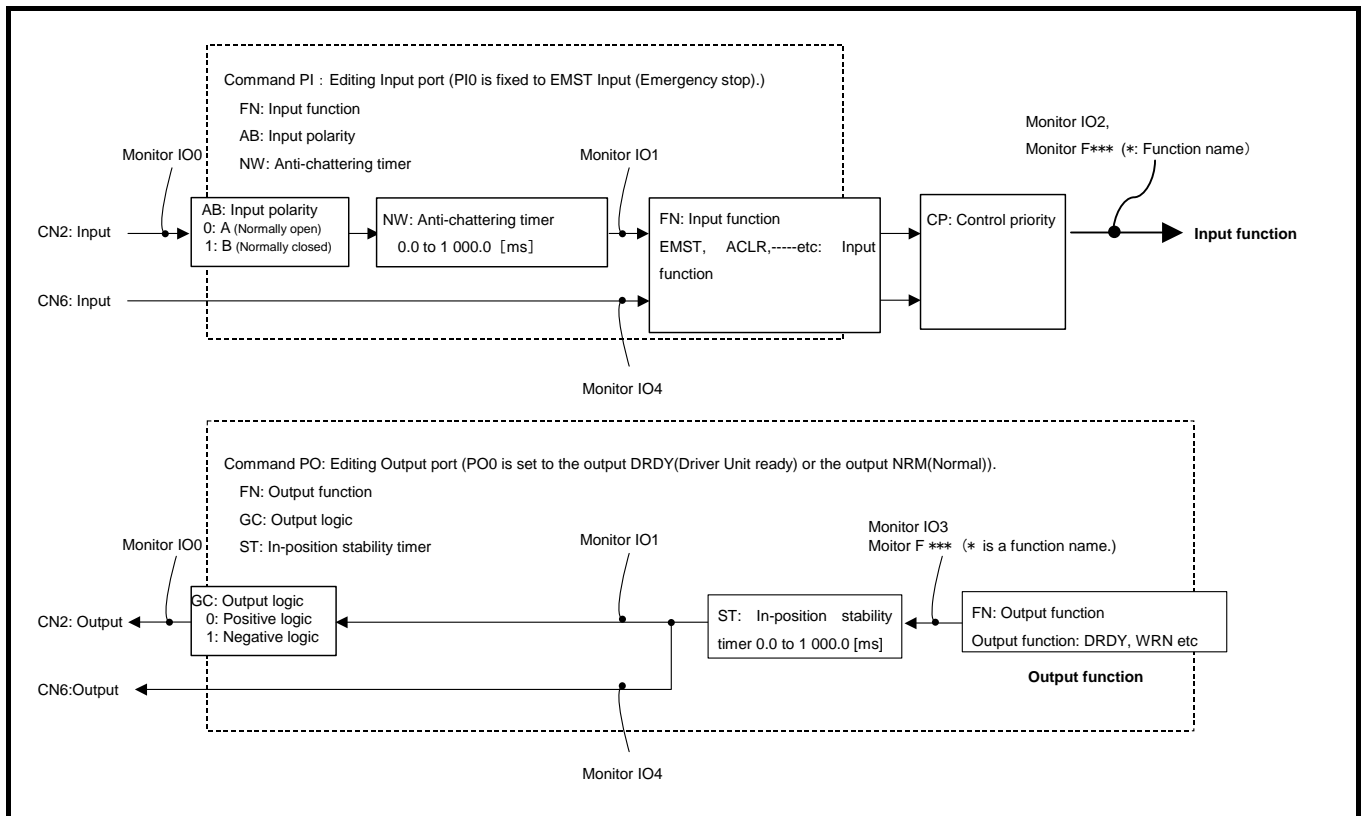
3.4.1. Monitoring the State of Remote Inputs/Outputs: Monitor IO4

● The monitor reports the current state of remote Inputs and Outputs of the CN6 Interface connector.

◊ Input as "IO4/RP".

Input the [BS] key to stop real-time readout.

Fig. 3-3: Readout Example of Monitor IO4

```
IO4
GFEDCBA9876543210        Guide
00000000000000000        Input state   0: OFF
00000000000000000                      1: ON
                         Output state  0: Open
                                       1: Closed
```
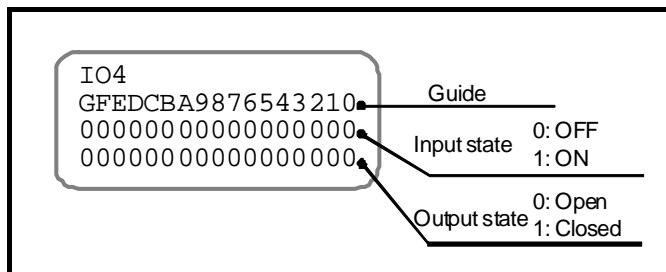
Table 3-2: Readout format of Monitor IO4

m: A register number derived from the top station number

Guide	G	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Name of remote I/O	RY (m+1) 0	RY m15	RY m14	RY m13	RY m12	RY m11	RY m10	RY m9	RY m8	RY m7	RY m6	RY m5	RY m4	RY m3	RY m2	RY m1	RY m0
Port code (Shipping set)	PI16 (DIR)	PI15 (JOG)	PI14 (PRG7)	PI13 (PRG6)	PI12 (PRG5)	PI11 (PRG4)	PI10 (PRG3)	PI09 (PRG2)	PI08 (PRG1)	PI07 (PRG0)	PI06 (STP)	PI05 (RUN)	PI04 (SVON)	PI03 (Reserved)	PI02 (Reserved)	PI01 (ACLR)	PI00 (EMST)
Name of remote I/O	–	–	–	–	–	–	–	–	–	RX m7	RX m6	RX m5	RX m4	RX m3	RX m2	RX m1	RX m0
Port code (Shipping set)	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	PO07 (NEARA)	PO06 (IPOS)	PO05 (BUSY)	PO04 (SVST)	PO03 (OTMA)	PO02 (OTPA)	PO01 (WRN)	PO00 (DRDY)

3.4.2. Monitoring State of the CC-Link Interface: Monitor BS

● Monitor BS reports the current state of the CC-Link Interface.

◊ Input as "BS/RP".

Input the [BS] key to stop real-time readout.

Fig. 3-4: Readout example of Monitor BS

```
#BS/RP
 BS
 FEDCBA9876543210                    Guide
 0000000000000000_                                0: OFF
                        State of the bus         1: ON
```
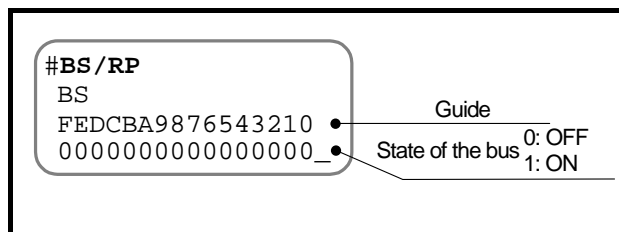
Table 3-3: Readout of the Monitor BS

Guide	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Monitoring Item	Error in change of setting station number	Error in change of Baud rate switicing error	Error in checking of error occurrence	Baud rate SW error	Error on interface cheking	Error in CPU	CPU STOP error	Error in number of RY data	Error in time over setting.	Error in time over	Error in maker code	Error in setting of machine code + version setting	Busy communicating	Error in number of slave station	Error in baud rate setting	Error in station number setting

3.5. Function Assignment to Control Inputs/Outputs

● You may change the function assignment to the ports of CN6 (Interface connector) and CN2 (Control I/O connector). (Excludes certain port.)

◊ Counter change to an expanded function

◊ Transfer a previously assigned function to other port.

◊ Mask the function of an unused port.

● This makes you to be able to assign a required fucntion with the desired arrangement.

◊ In addition to the function assignment, the input signals from the CN2 connector can change the contacts of every port, and can insert filters.

● The PI0 and PO0 are dedicated ports for the signals fundamental to the safety function. There are following restrictions respectively.

◊ You cannot change the function setting of Input EMST (Emaergency stop) of the Port PI0 (RYm0).

◊ The Output NRM (Normal) is the only function that can replace the setting of the Output DRDY "Driver Unit ready" of the Port PO0 (RXm0).

● The input signals can be gotton from either one of the CN6 or the CN2 connector in accordance with the operation mode (Fieldbus mode or Maintenance mode).
However, there are following exceptions.

◊ The port assigned to the Input EMST (Emergency stop) regards an input of both CN2 and CN6 connectors as "Emergency stop". This means that the system gets in the emergency stop state by either one of them.

◊ The port assigned to Input OTP/OTM (Over travel limit switch position) or Input HLS (Home position limit switch) function accepts only the input from the CN2 connector regardless the operation mode.

3.5.1. Function of Conrol Inputs

● You may assign a function to each control input port. This feature, for example, permits you to change a function preset to an input port to other function, or to switch to one of expanded functions.

◊ In addition to assigning functions to the input signals of the CN2 connector, you may change the port polarity or insert the filter to each control input port.

◊ When the same function is assigned to different ports, the logical sum of each input will be the input to the Driver Unit (When the one of the ports becomes effective, the function becomes effective).

◊ If you require a function not included in the shipping set, you may switch a preset fucntion to the required one. If the program does not use 256 channels, you may assign the fucntion to an idle input port of PRG0 to 7.

Table 3-4: Remote Input ports and assigned function

m: A register number derived from the top station number

Input	Port code	Signal code	Signal name	Function	Logic in the CN6 (shipping set)
RYm0	PI0	EMST	Emergency stop	Terminates a positioning and stops the Motor by the dynamic brake	0 : Normal 1 : Emergency stop
RYm1	PI1	ACLR	Alarm clear	Clears warning	0: Clears warning
RYm2	PI2	–	（Reserved） [1]	–	–
Ym3	PI3	–	（Reserved） [1]	–	–
RYm4	PI4	SVON	Servo ON	Activates the Motor servo	0: Servo OFF 1: Servo ON
RYm5	PI5	RUN	Program start	Startst the program specified by the PRG input	$0 \rightarrow 1$ Starts program
RYm6	PI6	STP	Stop	Stops an operation and exits out the program	0: Operation permitted 1: Starts slowing down, Operation prohibited
RYm7	PI7	PRG0	Internal program channel selection 0		
RYm8	PI8	PRG1	Internal program channel selection 1		
RYm9	PI9	PRG2	Internal program channel selection 2		
RYmA	PI10	PRG3	Internal program channel selection 3	Select a channel to be executed (0 to 255) by a combination of ON and OFF of the internal program channel selection (0 to 7).	
RYmB	PI11	PRG4	Internal program channel selection 4		
RYmC	PI12	PRG5	Internal program channel selection 5		
RYmD	PI13	PRG6	Internal program channel selection 6		
RYmE	PI14	PRG7	Internal program channel selection 7		
RYmF	PI15	JOG	Jogging	Start and stop of jogging	0: Start deceleration 1: Start accelleration
RY(m+1)F	PI16	DIR	Jogging direction	Specifies jogging diretion	0 : + direction 1 : - direction

* The shipping set assigns the function codes of OTP and OTM to the port numbers of PI2 and PI3 respectively. They are the dedicated input signals from the CN2 : control I/O connector and, thus, the input from the CC-Link to the port assigned to the OTP or OTM function is invalid.

⚠ *Caution: Please follow the instruction manual for custum made products with special Input/Output signals.*

• The table above shows the shipping set.

Table 3-5: Extended input function

Input	Port code	Signal code	Signal name	Function	Logic in the CN6
–	–	HLD	Hold	Holds an operation and program execution	0: Normal 1 : Hold
–	–	ORD	Velocity override	Changes the operation velocity accordingly to the setting of ORD	0 : Normal 1 : Over ride
–	–	IOFF	Integration OFF	Integration OFF	0 : Normal 1 : Integration OFF
–	–	HOS	Home Return start	Starts the Home Return	0 →1: Start the Home Return
–	–	HLS*	Home position limit	The motor is in the proximity of the home position	–

*HLS: The port assigned to the HLS function becomes the dedicated input signal from the CN2: control Input/Output connector and, thus, the input from the CC-Link to the HLS port is invalid.

3.5.2. Function of Control Outputs

● You can set the function of control outputs and the In-position stability timer. You may change the preset input port function to other function , or to switch to one of expanded functions.

◊ You may assign the same fucntion to multiple ports.

◊ If you require a function other than the shipping set, you may switch a preset function to a required one. For example, you may increase the number of idle ports by combining the Output DRDY and WRN into the Output NRM, or the Output OTPA and OTMA into the Output OTXA, to increase the number of idle ports.

Table 3-6: Remote output ports and assigned function

m: A register number derived from the top station number

Output	Port code	Signal code	Signal name	Function	Logic in the CN6
RXm0	PO0	DRDY	Driver Unit ready	Reports that the Motor is ready to rotate (Those pins are open when the Motor is not ready, or an alarm occurs)	0: Alarm 1: Normal
RXm1	PO1	WRN	Warning	Reports abnormality in the system	0: Normal 1: Warning
RXm2	PO2	OTPA	Over travel limit (+ direction) detected	Reports detection of over travel (software and hardware) in the plus direction	0: Normal 1: Over travel limit detected (+ direction)
RXm3	PO3	OTMA	Over travel limit (- directoin) detected	Reports detection of over travel (software and hardware) in the minus direction	0: Normal 1: Over travel limit detected (- direction)
RXm4	PO4	SVST	Servo state	Reports the state of servo	0: Servo OFF 1: Servo ON
RXm5	PO5	BUSY	In-operation	Reports the state of positioning operation	0: Idle 1: In operation
RXm6	PO6	IPOS	In-position	Reports the condition of positioning error and the positioning opeation	0: Imperfect positioning or Loss of the targetpositon 1: In-position and holding the target position
RXm7	PO7	NEARA	Target proximity A	Reports that the Motor is approaching to the destination	0: Not ditected 1: Proximity to the target position

⚠ *Caution: Please follow the instruction manual for custum made products with special Inputs/Outputs signals.*

• The table above shows the shipping set.

Table 3-7: Function of extended output

Output	Port code	Signal code	Signal name	Function	Logic in the CN6
–	–	NEARB	Target proximity B	Reports that the Motor is approaching to the destination	0: Not in the proximity 1: The Motor is nearing to the target position
–	–	ZONEA	Zone A	Reports the Motor has entered in a preset zone	0: Not active 1: The limit is activated
–	–	ZONEB	Zone B		
–	–	ZONEC	Zone C		
–	–	TEU	Position error, under	Reports the position error	0: Not active 1: The error is equal or under the threshold
–	–	TEO	Position error, over		0: Not active 1: The error is equal or under the thereshold
–	–	TVU	Velocity error, under	Reports the velocity error	0: Out of the limit 1: The error is equal or under the threshold
–	–	TVO	Velocity error, over		0: Out of the limit 1: The error is equal or under the threshold
–	–	TTU	Torque command, under	Reports the state of torque output command	0: Out of the limit 1: The command is equal or under the threshold
–	–	TTO	Torque command, over		0: Out of the limit 1: The command is equal or over the threshold
–	–	TJU	Thermal loading, under	Reports the state of thermal loading	0: Out of the limit. 1: The thermal loading is equal or under the threshold
–	–	TJO	Thermal loading, over		0: Out of the limit. 1: The thermal loading is equal or over the threshold
–	–	OTXA	Travel limit switch, ± direction	Reports the detection of limit switch (software and hardware) in + or – direction	0: Out of the limit 1: The limit activated
–	–	NRM	Normal	Reports the detection of alarm or warning	0: Alarm or warning 1: Normal
–	–	HOME	Home Return completed	Reports that the Motor has completed the Home Return and is on the Home position	0: Home Return is not completed, or the commanded position is not the Home position 1: Home Return is completed and the commanded position is the Home position
–	–	HCMP	Home position defined	Reports that the Home position has been defined	0: The home position is not defined 1: The Home position is defined

3.5.3. Editing Coptrol Inputs/Outputs

3.5.3.1. Editing Control Inputs

● The command PI (Edit input port) edits the function setting to the control input ports.

● When the editing mode of control input is established by the command PI, the setting of the parameters FN (Port function) and NW (Anti-chattering timer) become effective.

◊ You must deactivate the Motor servo for these settings.

◊ The settings by the command PI become immediately effective and thus, the reboot of the power is not necessary.

◊ You may set the parameter AB (Input port polarity) or NW (Anti-chattering timer) to a port. However, they are only effective for the connector CN2 : control I/O connector but not for the remote inputs of the CN6 : interface connector.

● The control input port PI0 is dedicated to the safety function input. For this reason, the parameter FN (Port function) fixes the Input EMST (Emergency stop) to the port.

◊ You may set the pameter AB or NW to the port. However, the function is only effective for the CN2 connector.

● The Monitor IO (Input/Output monitor) monitors the input state of each function. Refer to "3.4. Monitoring of Control Input/Output" for details.

Table 3-8: Editing command for control input port

Category	Edit code		Function	Default	Data range	Unit
Editing Command		PI	Edits control input function	–	0 to 16	Port
	★	PI/RS	Resets a designated input port. (Example: PI1/RS)	–	0 to 16	Port
	★	PI/CL	Resets all control input ports.	–	Resets all control input ports to the shipping set	–
Parameter in the port		FN	Inputs a port function	– *1	FN + Function sets the function.	–
		AB *2	Inputs port polarity	– *1	0: Normaly open 1: Normaly closed	–
		NW *2	Anti-chattering timer	0.2	0.0 to 1 000.0	ms
Monitor		TPI	Reads out an edited input port function.	–	0 to 16	Port
		TPI/AL	Reads out all input functions.	–	Reads out all settings of control input port	–

★: Requires to input a password.

*1: The default differs by the port number.

*2: The setting is only effective for the CN2 connector.

Setting function by direct input

● Refer to the following, for an example, how to change the function of the input port PI14 to the "Input HLD (Hold)" from the "Input PRG7 (Internal program channel selection 7)".

1) Turn the Motor servo off by the command MO (Motor off).

| M | O | ENT |

```
#MO
#_
```

2) An inputof the port number by the command PI (Port number: PI14) reads out the parameter FN.
("PRG7" is assigned to the Input port PI14 as the shipping set)

| P | I | 1# | 4> | ENT |
| SP | SP |

```
#PI14
 FNPRG7;
 AB0;
 NW0.2
```

Input the SP key to read out the parameters AB and NW.

3) Change the function to the Input HLD.

| F | N | H | L | D | ENT |

```
 AB0;
 NW0.2
?FNHLD
?_
```

Set parameters AB and NW in a similar manner above.

4) For the confirmation of the setting, input "?" in the state of prompt "?".

| ? | ENT |
| SP | SP |

```
??
 FNHLD;
 AB0;
 NW0.2
```

Input the SP key to read out the parameters FN, AB and NW.

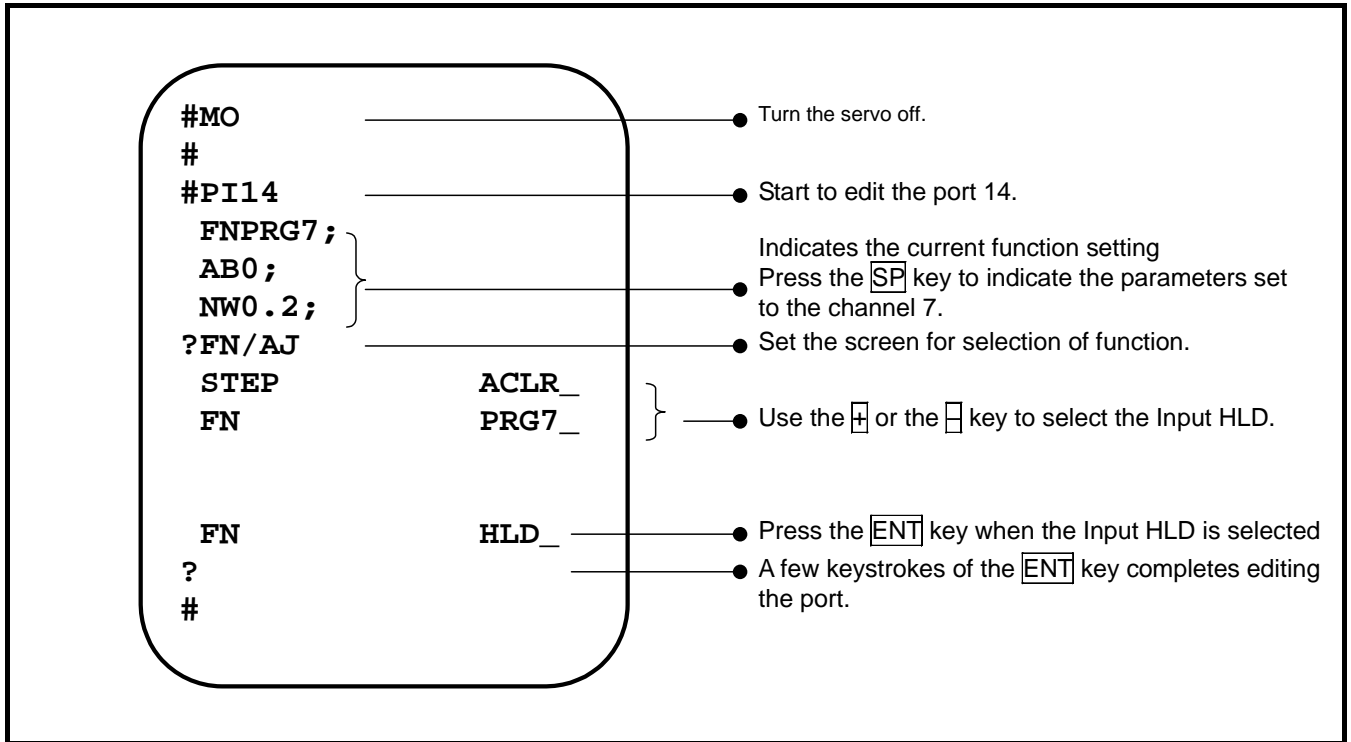5) Input the ENT key to terminate editing while the prompt "?" is on the screen.

| ENT |

```
 NW0.2
?
#_
```

6) Input the command SV (Servo on) to make the Motor ready for the input of SVON.

| S | V | ENT |

```
#SV
#_
```

Selection and setting of function

● Select and set the control input function by **"/AJ "** option.
The procedure shown on "Fig. 3-5: Seletion and setting of control input" changes the function of input
port PI14 to the "Input HLD (Hold)" from the "Input PRG7 (Internal program chanel selection 7)".

Fig. 3-5: Selection and setting of control input

```
#MO                              ●  Turn the servo off.
#
#PI14                            ●  Start to edit the port 14.
 FNPRG7;                            Indicates the current function setting
 AB0;                            ●  Press the SP key to indicate the parameters set
 NW0.2;                             to the channel 7.
?FN/AJ                           ●  Set the screen for selection of function.
 STEP        ACLR_
 FN          PRG7_              ●  Use the + or the – key to select the Input HLD.


 FN          HLD_              ●  Press the ENT key when the Input HLD is selected
?                             ●  A few keystrokes of the ENT key completes editing
#                                the port.
```

— 3-14 —

3.5.3.2. Editing Control Output

● The command PO (Edit output port) edits the function setting to the control output ports.

● When the editing mode of control output is established by the command PO, the setting of the parameters FN (Port function) and ST (Anti-chattering timer) become effective.

◊ The setting by the command PO will be immediately effective, thus making the reboot of power unnecessary.

◊ You may be set the parameter GC (Output logic) to a function. However, it is not effective to the remote Inputs and Outputs of the CN6 : interface connector.

● The control output port PO0 is dedicated to the safety function output. For this reason, the parameter FN (Port function) must be set to either one of the output port of Output DRDY (Driver Unit ready) or Output NOR (Normal).

◊ You cannot change the function of the port of parameters GC and ST.

● The Monitor IO (Input/Output monitor) reports the input condition of each funcction. Refer to "3.4. Monitoring Control Iinput/Output" for details.

● The command OP (Forcible output) forcibly changes the settign of control output ports. Refer to "3.5.3.4. Forcible Change in Setting Output Port Function".

Table 3-9: Editing command of control ouput port

Category		Edit code	Function	Default	Data range	Unit
Editing Command		PO	Edit control output function	–	0 to 7	port
	★	PO/RS	Reset a designated output port (Example: PO1/RS)	–	0 to 7	port
	★	PO/CL	Reset all control output ports.	–	Resets all control output ports to the shipping set	–
Parameter in the port		FN	Output port function	–[1]	$\boxed{\text{FN}}$ + $\boxed{\text{Function}}$ sets the function	–
		GC [2]	Output port polarity	–	0: Normaly open 1: Normaly closed	
		ST	Anti-chattring timer	–	0.0 to 1 000.0	ms
Monitor		TPO	Reads out an edited output port function	0.0	0 to 7	port
		TPO/AL	Reads out all output functions	–	Reads out all settings of control output port	–

★: Requires to input a password.

[1]: The default differs by the port number.

[2]: The setting is only effective for the CN2 connector
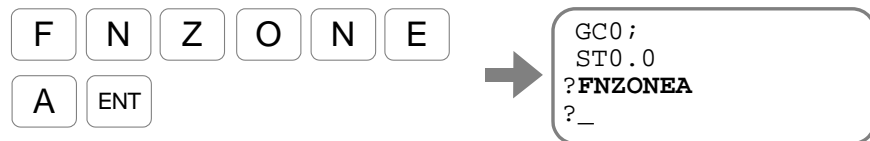
Function setting by direct input

● Refer to the following, for an example, how to change the function of the output port PO7 to "Output ZONEA (Zone A)" from "Output NEARA (Near position A)".

1) Specify the output port number by the command PO to read out the setting of parameter FN. (The function of "NEARA" is specified to the output port as the shipping set)

| P | O | 7 | ENT |

| SP | SP |

➡

```
#PO7
 FNNEARA;
 GC0;
 ST0.0
```

Input the SP key to scroll down to the parameters GC and ST.

2) Change the function to the output "ZONEA".

| F | N | Z | O | N | E |

| A | ENT |

➡

```
 GC0;
 ST0.0
?FNZONEA
?_
```

Set the parameters GC and ST as the same manner above.

3) Input "?" while the prompt is "?" to confirm the settings.

| ? | ENT |

| SP | SP |

➡

```
??
 FNZONEA;
 GC0;
 ST0.0
```

Input the SP key to scroll down to the parameters FN, GC and ST.

4) Input the ENT key to terminate the editing.

| ENT |

➡

```
 ST0.0
?
#_
```

Selection and setting of output function

- Select and set the control input function by **"/AJ "** (option).
  The procedure shown on "Fig. 3-6: Selection and setting of output function" change the function of the
  port PI14 to "Output ZONE A (Zone A)" from "Output NEARA (Near position A)".

Fig. 3-6: Selection and setting of output function

```
#PO7                              ● Start to edit the port 7.
 FNNEARA;
 GC0;                             The screen displays the current setting to the port 7.
 ST0.0;                           ● Press the SP key to indicate the parameters
                                    set to the port.
?FN/AJ                            ● Start the screen for selection of function.
 STEP          WRN_
 FN            NEARA_             ● Select the Output ZONEA using the + or the – key.


 FN            ZONEA_            ● Press the ENT key when the Output ZONEA is selected.
?                                ● A few keystrokes of the ENT key completes editing the
#                                  port.
```

― 3-17 ―
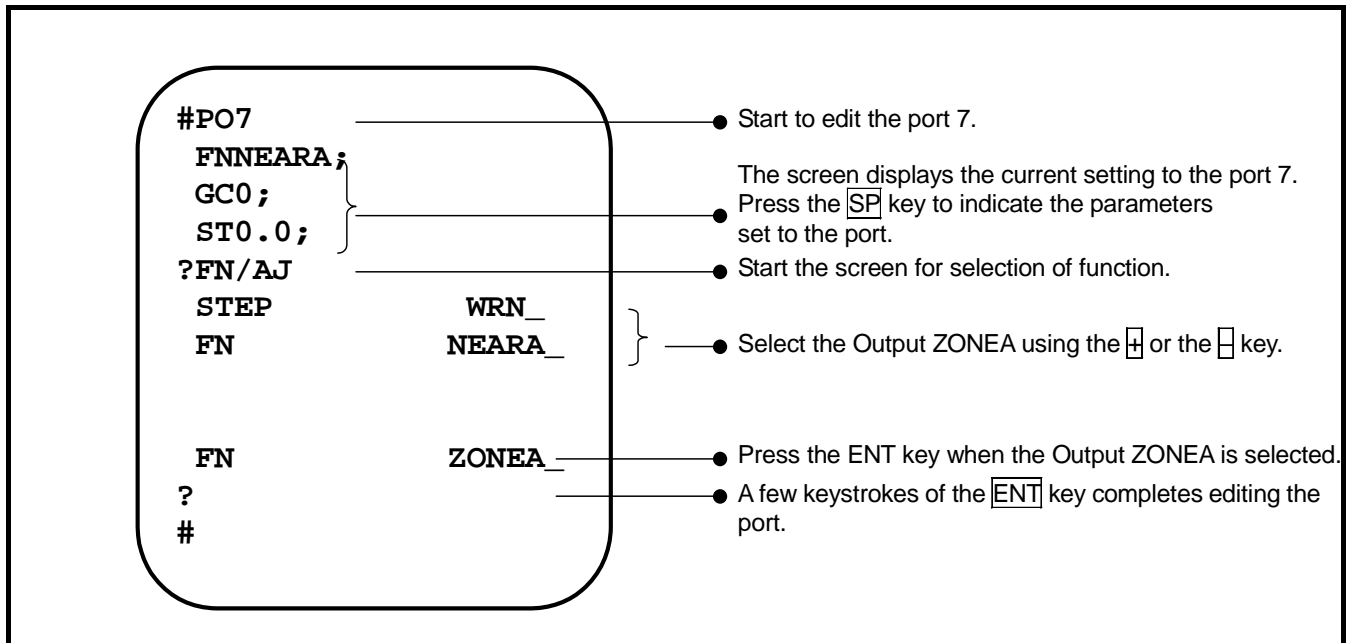
3.5.3.3. Masking the Function of Control Inputs/Outputs

● Refer to the following , for an example, how to change the function of input port P16 from "Input STP (Stop)" to "NONE (No function: Masked)".

1) Input the command "MO (Motor off)" to put the Motor in the state of "Servo off".

| M | O | ENT |

```
#MO
#_
```

2) Specify an input port number by the command PI (Edit control input) to read out the parameter FN (Input function) .

| P | I | 7 | ENT |
| SP | SP |

```
#PI6
 FNSTP;
 AB0;
 NW0.2_
```

Input the SP key to scroll down to the parameter NW (Anti-cahttering timer).

3) Input as below to change the function to "NONE (No function: Msasked)".

| F | N | N | O | N | E |
| ENT |

```
 AB0;
 NW0.2
?FNNONE
?_
```
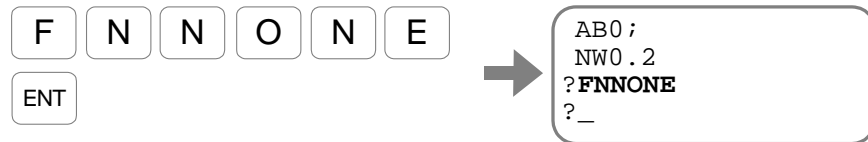
4) For the confirmation, input "?" while the promptb is "?".

| ? | ENT |
| SP | SP |

```
??
 FNNONE;
 AB0;
 NW0.2_
```

Input the SP key to scroll down to the parameter NW, through the palameters FN and AB.

5) Input the ENT key to terminate the editing while the prompt "?" is on the line.

| ENT |

```
 NW0.2
?
#_
```

6) Input the command SV (Servo ON) to make the Motor ready for "Servo on".

| S | V | ENT |

```
#SV
#_
```

3.5.3.4. Forcible Change in Setting Control Output Port Function

● The command OP (Compulsive output) forcibly changes the state of the output ports PO0 to PO7 of the connector CN2 : control Input/Output connector and the remote outputs of the connector CN6 : intrface connector.

● This feature is useful for checking the interface with the master controller.

● And now for an example, forcibly change the output port PO0 to 0 (open in case of the connector CN2). The function of the PO0 is "Output DRDY (Driver Unit ready)" and if its output is 0 (zero), this output port is open to report occurrence of an alarm. This feature can be used for checking if the master controller could detect the abnormal.

1) According to "Table 3-6: Remote output ports and assigned function," the port name of the remote output RXm0 is PO0.

2) Input the password as "**/NSK ON**".

| / | N | S | K | SP |
| O | N | ENT |

```
#/NSK ON
 NSK ON
#_
```
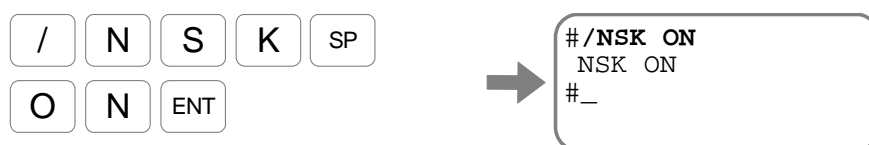
3) Forcibly make the PO0 to 0 and if leaving others unchanged, input as "**OPXXXXXXX0**".

| O | P | X | X | X | X |
| X | X | X | 0# | ENT |

```
#/NSK ON
 NSK ON
#OPXXXXXXX0
 TO ABORT,PUSH[BS]_
```
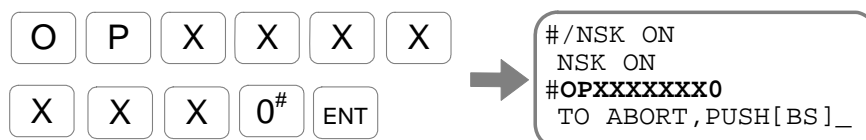
The port PO0 is forced to change to 0.

Input the [BS] key to cancel "Forcible change".

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4. Alarm and Warning

4.1. Cause and Remedy of Alarm and Warning

4.1.1. C4: Fieldbus Error

- The Driver Unit gives the alarm if an error in the built-in CC-Link interface unit occurred and disabled continuous communication.

  ◊ The alarm does not report an abnormality of the whole fieldbus.

Table 4-1: Status when an error in the fieldbus is detected

7 seg LED	Command TA: Tell Alarm Status	Warning/Alarm	Motor state	DRDY output	WRN output	OTPA OTMA output	History	Clear
C4	`C4>Fieldbus Error`	Fieldbus error	Servo off	0	—	—	○	×

- The table below shows the history of alarm occurence read out by the command TA/HI (Tell alarm history) and their remedy.

Table 4-2: Cause and remedy of fieldbus error

Alarm history	Cause	Remedy
C4-0	Two slave stations are not connected	• The Driver Unit may be defective if the alarm occurs again after the reboot of the system. Follow the "Appendix 4: Procedure manual for replacing the EDC Driver Unit Raplacing" of the instruction manual.
C4-1	Error in verifying the manufacturer code	
C4-2	Error in verifying machine code and/or software version	
C4-3	Busy for writing the data	
C4-4	Time over agaisnt the setting	

4.1.2. C5: Fieldbus Warning

● This warning reports an error in the fieldbus that is recoverable.

◊ The warning reports the error in setting of station number or the baud rate, and the line breakage of the fieldbus board.

Table 4-3: Status when the fieldbus warning

7 seg LED	Command TA: Tell Alarm Status	Warning/Alarm	Motor state	DRDY output	WRN output	OTPA OTMA output	History	Clear
C5	`C5>Fieldbus warning`	Fieldbus warning	Cycle stop[*1]	-	1	-	○	○

*1: If the motor is rotating when the warning is reported, it stops after the executing cycle is completed.

● The table below shows the history of alarm occurence read out by the command TA/HI (Tell alarm history) and their remedy.

Table 4-4: Cause and remedy of fieldbus warning

Alarm history	Cause	Remedy
C5－0	Station number setting error May be caused an error in station number setting or a defective station number setting switch.	• Set the station number (1 to 64) collectry and remake the power. • If the above remedy does not work, the Driver Unit is defective. Follow the "Appendix 4: Procedure Manual to replace the EDC Driver Unit".
C5－1	May be caused by •Baud rate setting error, • Setting error in transmission speed, or	• Reset the (0 to 4) collectly and turn the power on. • The Driver Unit may be defective if the alarm occurs again after the reboot of the system. Follow the "Appendix 4: Procedure manual for replacing the EDC Driver Unit Raplacing".
C5－2	• A defective transmission speed setting switch.	
C5－3	Time over errror The communication between the master controller is disconnected.	• Please check if the connector is droped off, or the communication cable is broken.

(1) Input of ACLR(Alarm clear), or Command CL (Alarm clear) clears the warning .

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