

NSK

MEGATORQUE[®] MOTOR SYSTEM User's Manual

**ESB Driver Unit System
Compatible
With
CC-Link**

M-E099SB0C2-132

NSK Ltd.

Document Number: C20132-02

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Introduction

○ About This Manual

- This manual describes the interface of CC-Link. For the other part of the Megatorque Motor System, please refer to the user's manual of Megatorque Motor System (ESB Driver Unit System [Document Number: C20118-01]).

○ Notice for Your Safety

- Please read this manual thoroughly and take necessary precaution for your safety.

○ Restriction on Function of the Driver Unit

- The following functions are not available for the Driver Unit compatible with the CC-Link.
 - ◇ Velocity control mode and torque control mode
 - ◇ Pulse train positioning command
 - ◇ Positioning with acceleration profiling

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1.3. Signal Specifications of Control Input and Output

Table 1-2

Input Signal	Control input	CN2	<ul style="list-style-type: none"> In case of CC-Link operation mode; Emergency stop, Home limit switch, Over travel limit switch (CW, CCW) In case of maintenance operation mode; Emergency stop, Servo on, Home Return start, Clear, Integrator OFF/Lower gain, Clamp Cancel^{*1}, Home limit switch, Over travel limit switch (CW, CCW)
		CC-Link (CN5)	<ul style="list-style-type: none"> In case of CC-Link operation mode; Emergency stop, Servo-on, Programmable Indexer start, Home Return start, Clear, Integrator OFF/Lower gain, Clamp Cancel^{*1}, Jog, Direction select, Internal program channel select, Velocity override, Stop <p>*Emergency stop is logical sum of CN2 and CN5.</p> <p>When operation is in the maintenance mode, all inputs of CC-Link are invalid.</p>
Output signal	Position feed back signal		Refer to “Specification of Motor resolver resolution in ESB Megatorque Motor System Specification Sheet.”
	Control output	CN2	Driver Unit ready, In-position, Brake/Brake control ^{*1}
		CC-Link (CN5)	<ul style="list-style-type: none"> In case of CC-Link operation mode; Driver Unit ready, In-position, Processing internal pulses, Home position defined, Warning, Brake/Brake control^{*1}, Target proximity/ In target A, Target proximity/In target B, Selected channel number, Monitor velocity, Home Return completed/Home position detected In case of maintenance operation mode; Driver Unit ready, In-position, Processing internal pulses, Home position defined, Warning, Brake/Brake control^{*1}, Target proximity/ In target A, Target proximity/In target B, Monitor velocity, Home Return completed/Home position detected

*1: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

- You may switch the operation mode by a mode switch command (CP) through the Handy Terminal. Refer to the description of CP command for more details.
- CC-Link mode is to operate the Drive Unit by control input signal through CC-Link.
- Maintenance mode is to operate the Driver Unit temporarily when CC-Link is not available for some reason.
- CC-Link mode is set as the initial setting right after the power of the Driver Unit is turned on.

1.4. Setup of I/O by Operation Mode

Switching the operation mode changes the validity of I/O signals of CC-Link and CN2 connector.
 [Switching command of operation mode (CP) switches the operation mode.]

1.4.1. I/O Setup for CC-Link or Maintenance Mode

Table 1-3

Input/ Output	Signal name	CC-Link mode		Maintenance mode	
		CC-Link	CN2	CC-Link	CN2
Input	EMST	Valid	Valid	Invalid	Valid
	SVON	Valid	Invalid	Invalid	Valid
	RUN	Valid	–	Invalid	–
	HOS	Valid	Invalid	Invalid	Valid
	CLR	Valid	Invalid	Invalid	Valid
	IOFF /CLCN* ¹	Valid	Invalid	Invalid	Valid
	JOG	Valid	–	Invalid	–
	DIR	Valid	–	Invalid	–
	PRG0	Valid	–	Invalid	–
	PRG1	Valid	–	Invalid	–
	PRG2	Valid	–	Invalid	–
	PRG3	Valid	–	Invalid	–
	PRG4	Valid	–	Invalid	–
	PRG5	Valid	–	Invalid	–
	ORD	Valid	–	Invalid	–
	HLS	–	Valid	–	Valid
	OTM	–	Valid	–	Valid
	OTP	–	Valid	–	Valid
STP	Valid	–	Invalid	–	
Output	DRDY	Valid	Valid	Valid	Valid
	IPOS	Valid	Valid	Valid	Valid
	BUSY	Valid	–	Valid	–
	HCMP	Valid	–	Valid	–
	OVER	Valid	–	Valid	–
	BRK/BRKC* ¹	Valid	Valid	Valid	Valid
	NEARA	Valid	–	Valid	–
	NEARB	Valid	–	Valid	–
	ACK_PRG0	Valid	–	Invalid	–
	ACK_PRG1	Valid	–	Invalid	–
	ACK_PRG2	Valid	–	Invalid	–
	ACK_PRG3	Valid	–	Invalid	–
	ACK_PRG4	Valid	–	Invalid	–
	ACK_PRG5	Valid	–	Invalid	–
	SPD	Valid	–	Valid	–
HOME	Valid	–	Valid	–	

*1: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

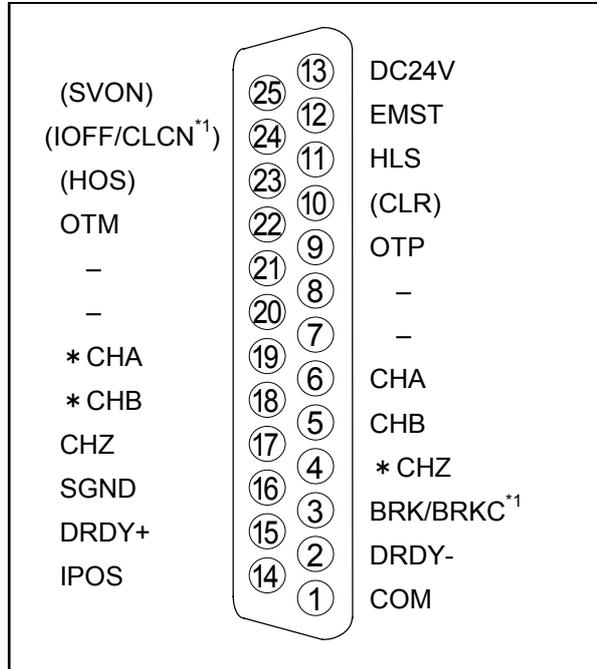
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2. Specifications of External Interface

2.1. CN2 Connector

2.1.1. CN2 Pin-Out

Figure 2-1



- Signals SVON, CLR, IOFF/CLCN*¹ and HOS, which are put in parentheses, are not valid in CC-Link mode.

*1: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

2.1.2. CN2 Signal Name and Function

Table 2-1

Pin No.	Signal name	I/O	Function
1	COM	O	Output COMMON
2	DRDY-	O	Driver Unit ready (-)
3	BRK/BRKC ^{*1}	O	Brake /Brake control signal (normally close)
4	*CHZ ^{*1}	O	Position feedback signal *øZ/Digital position data *MSB ^{*1}
5	CHB	O	Position feedback signal øB
6	CHA	O	Position feedback signal øA
7	-	I	Do not connect.
8	-	I	Do not connect.
9	OTP	I	+ direction over travel limit switch (CW direction)
10	(CLR) ^{*2}	I	Clear input
11	HLS	I	Home limit switch
12	EMST	I	Emergency stop
13	DC24	I	DC 24V external power supply
14	IPOS	O	In-position
15	DRDY+	O	Driver Unit ready (+)
16	SGND	-	Signal ground
17	CHZ ^{*1}	O	Feedback position signal øZ/Digital position signal MSB ^{*1}
18	*CHB	O	Position feedback signal *øB
19	*CHA	O	Position feedback signal *øA
20	-	I	Do not connect.
21	-	I	Do not connect.
22	OTM	I	- direction over travel limit switch (CCW direction)
23	(HOS) ^{*2}	I	Home Return start
24	(IOFF/CLCN ^{*3}) ^{*2}	I	Integrator OFF /Clamp cancel
25	(SVON) ^{*2}	I	Servo on

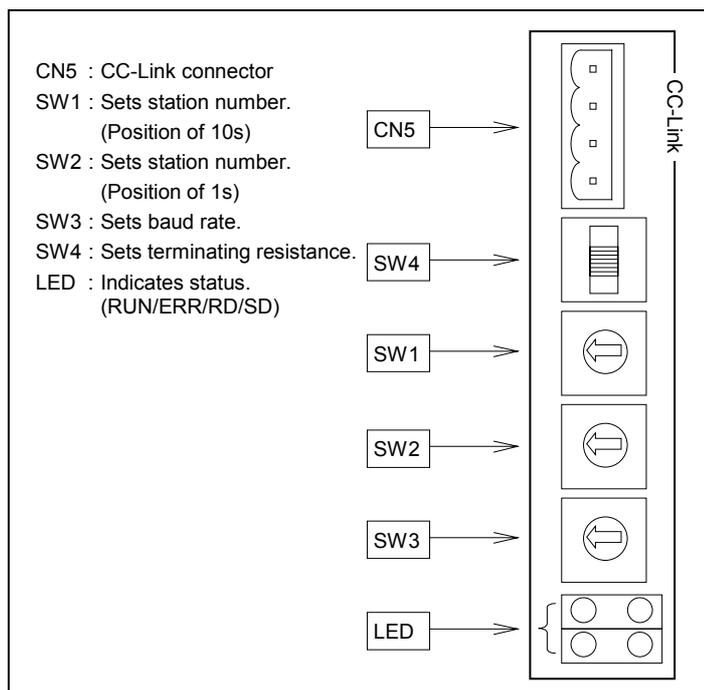
*1: FZ parameter (RS-232C communication) is used to set the function either position feedback signal øZ/ or digital position signal MSB.

*2: Signals SVON, CLR, IOFF and HOS, which are put in the parentheses, are not valid in CC-Link mode.

*3: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

2.2. Specifications for CC-Link

Figure 2-2



2.2.1. CN5 (CC-Link) Connector

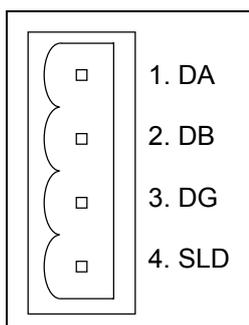
Table 2-2

Driver Unit Connector	Phoenix Contact	MSTBA2,5/4-G-5,08AU
Mating connector type (User device side)		MSTB2,5/4-ST-5,08AU

* These connectors will be provided with the Driver Unit.

2.2.2. CN5 (CC-Link) Pin-Out

Figure 2-3



2.2.3. CN5 Signal Name and Function

Table 2-3

Pin	Signal	I/O	Function
1	DA	I/O	Data A
2	DB	I/O	Data B
3	DG	–	Data ground
4	SLD	–	Shield

2.2.4. Setting of SW1 and SW2 (Set Station Number.)

- Station number = (Setting of SW1; position of 10s) + (Setting of SW2; position of 1s)
- * Do not set station number to 0 or 65 and over.

Table 2-4

SW1 setting	SW2 setting	Station number
0	1	01
0	2	02
0	3	03
0	4	04
•	•	•
•	•	•
•	•	•
1	0	10
1	1	11
•	•	•
•	•	•
•	•	•
6	4	64

2.2.5. Setting of SW3 (Setting Baud Rate)

Table 2-5

SW3 setting	Baud rate
0	156Kbps
1	625Kbps
2	2.5Mbps
3	5Mbps
4	10Mbps
5 ~ 9	Do not set.

2.2.6. Setting of SW4 (Terminating Resistance)

Figure 2-4

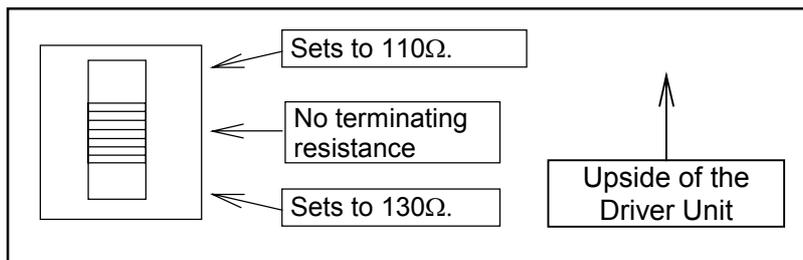


Table 2-6

SW4 setting	Function of terminating resistance
Top	Sets to 110Ω.
Center	Sets no terminating resistance.
Bottom	Sets to 130Ω.

2.2.7. Indication of LED

Figure 2-5

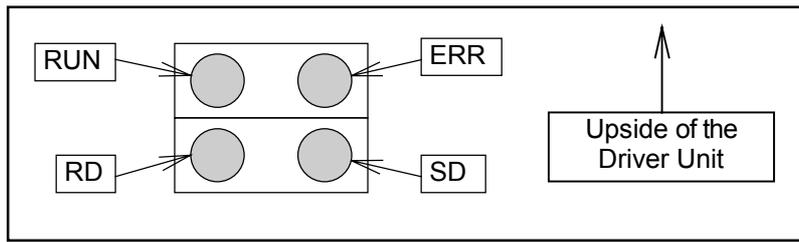


Table 2-7

Name of LED	Status
RUN	ON: Receiving refresh and polling normally after joining the network, or normal communication of refresh. OFF: (1) Before joining the network. (2) NG on detecting the carrier on the channel 1 and 2. (3) Time over. (4) Resetting hardware.
ERR	ON: (1) CRC error. (2) Abnormal SW setting of station number. (3) Abnormal SW setting of baud rate OFF: (1) Communication is normal. (2) Resetting hardware. Blinking: Settings of SW1 and SW2 have changed after the power was turned on.
SD	ON: Transmitting data. OFF: (1) In a state other than transmitting data. (2) Resetting hardware.
RD	ON: Detecting a carrier of channel 1 or channel 2. OFF: (1) Detection of carrier of both channel 1 and channel 2 are not successful. (2) In the middle of resetting hardware.

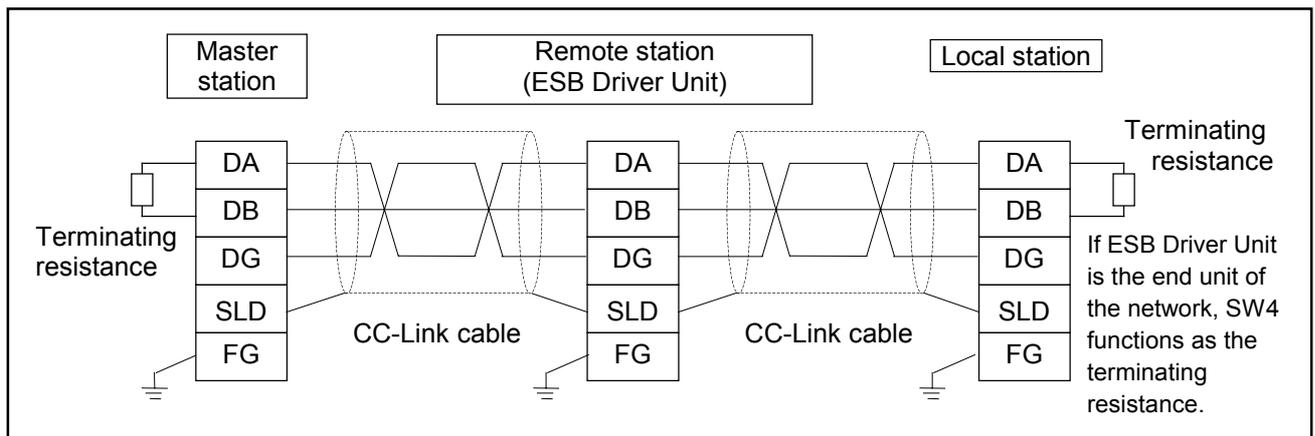
Table 2-8

RUN	ERR	SD	RD	Status
On	Off	Blink	On	Normal communication
On	Blink	Blink	On	CRC error occurs occasionally even in normal communication.
On	Blink*	Blink	On	Baud rate and station number setting have changed from those settings at the moment of power on. *Blinking cycle of ERR is 0.4s.
On	Blink	Off	On	ESB Driver Unit cannot respond because the receiving data becomes CRC error.
On	Off	Off	On	The data does not reach to the Driver Unit.
Off	Blink	Blink	On	Responding to polling, however receiving refresh is CRC error.
On	Blink	Off	On	CRC error occurs on the data to the Diver Unit.
Off	Off	Blink	On	The link is not started.
Off	Off	Off	On	There is no data to the Driver Unit, or it is not ready for receiving the data.
Off	Off	Off	Off	Impossible to receive the data. The power is turned off or resetting the hardware.
Off	On	Off	On/Off	Incorrect setting of Baud rate or station number.

- Blinking cycle of SD is so fast that the LED may seem to be ON.

2.2.8. Example of External Wiring

Figure 2-6



- Use the cables unique to CC-Link for connecting cables.
- Order of the station number does not need to match the order of installation to the network.
- Connect the terminating resistance to “DA – DB” units on the both ends of the network. (The terminating resistor can be set by SW4 of the ESB Driver Unit.)
- There is not “FG” terminal for CN5 connector of ESB Driver Unit. Be sure to ground “FGND” terminal of the Terminal TB.

2.2.9. Cable Length and Specification of Communication

Table 2-9: Specification of cable unique use of CC-Link (Characteristic impedance 110 Ω)

Version	CC-Link Ver.1.10	
Baud rate	Cable length between stations	Maximum overall length of cable
	*1, *2, *3	
156 Kbps	0.2 m or over	1200 m
625 Kbps		900 m
2.5 Mbps		400 m
5 Mbps		160 m
10 Mbps		100m
Terminating resistance	110 Ω (between DA – DB)	
Remarks	May be mixed with the cable compatible with CC-Link Ver.1.10.	

Figure 2-7: System only consists of remote I/O station and remote device station

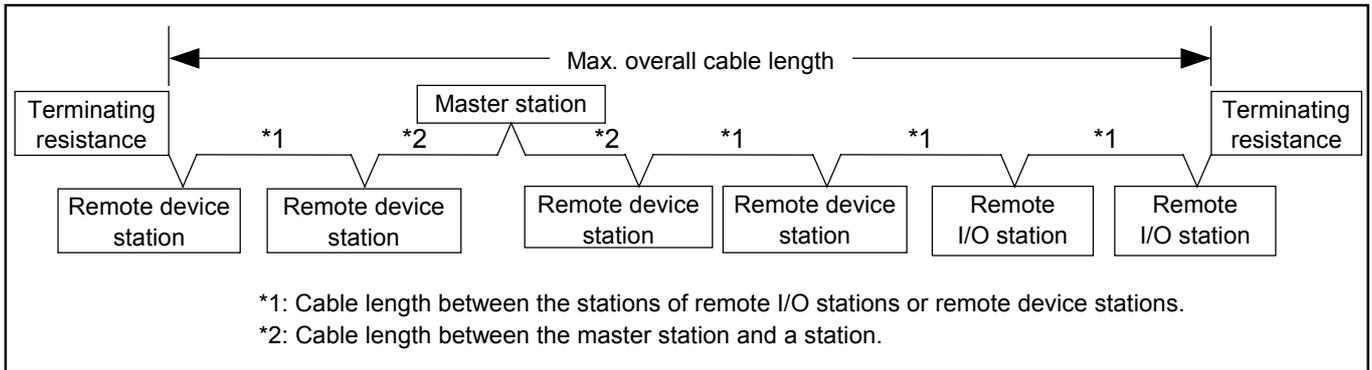
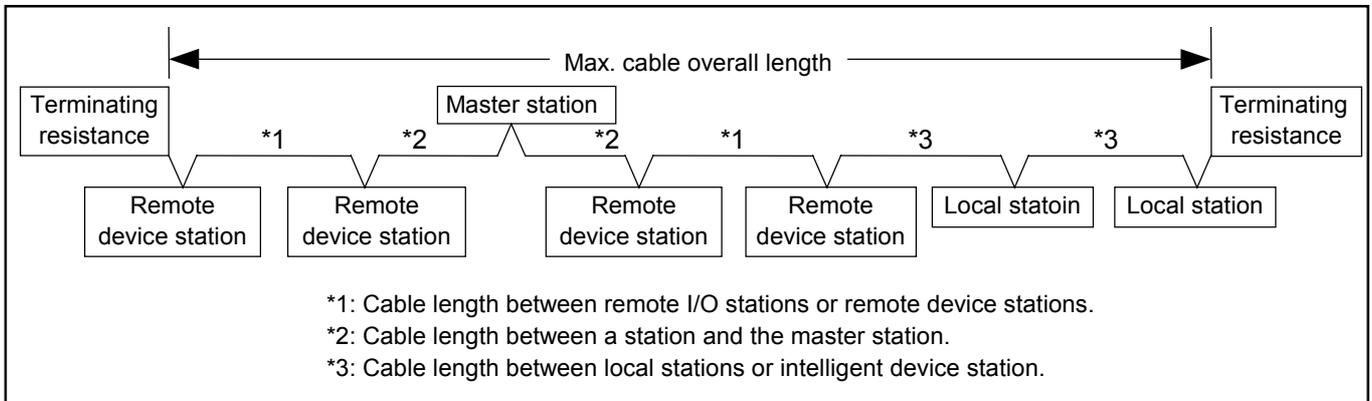


Figure 2-8: System includes local stations or intelligent device station



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3. Layout of Remote I/O and Remote Register

3.1. Remote I/O

Table 3-1

Remote → Master		Master → Remote	
Device No.	Signal name	Device No.	Signal Name
RXm0	DRDY (Driver Unit ready)	RYm0	EMST (Input, Emergency stop)
RXm1	IPOS (In position)	RYm1	SVON (Input, Servo on)
RXm2	BUSY (Processing internal pulse)	RYm2	RUN (Programmable Indexer start)
RXm3	HCMP (Home position defined)	RYm3	HOS (Start Home Return)
RXm4	OVER (Status of warning.)	RYm4	CLR (Input, Clear)
RXm5	BRK/BRKC ^{*3} (Brake /Brake control signal)	RYm5	IOFF/CLCN ^{*3} (Integrator OFF/Lower gain, Clamp cancel)
RXm6	NEARA (Target proximity/In-target A)	RYm6	JOG (Jog)
RXm7	NEARB (Target proximity/In-target B)	RYm7	DIR (Jog direction select)
RXm8	ACK_PRG0 (Selected channel number)	RYm8	PRG0 (Internal program channel select)
RXm9	ACK_PRG1 (Selected channel number)	RYm9	PRG1 (Internal program channel select)
RXmA	ACK_PRG2 (Selected channel number)	RYmA	PRG2 (Internal program channel select)
RXmB	ACK_PRG3 (Selected channel number)	RYmB	PRG3 (Internal program channel select)
RXmC	ACK_PRG4 (Selected channel number)	RYmC	PRG4 (Internal program channel select)
RXmD	ACK_PRG5 (Selected channel number)	RYmD	PRG5 (Internal program channel select)
RXmE	STD (Monitor velocity)	RYmE	ORD (Velocity override)
RXmF	HOME (Home Return completed/Home position detected)	RYmF	STP (Stop)
RX (m+1) 0	System area	RY (m+1) 0	System area
RX (m+1) 1		RY (m+1) 1	
RX (m+1) 2	Reserved (Specify the area of each machine)	RY (m+1) 2	Reserved (Specify the area of each machine)
RX (m+1) 3		RY (m+1) 3	
RX (m+1) 4		RY (m+1) 4	
RX (m+1) 5		RY (m+1) 5	
RX (m+1) 6		RY (m+1) 6	
RX (m+1) 7		RY (m+1) 7	
RX (m+1) 8		Flag to request initial processing ^{*1}	
RX (m+1) 9	Flag for completion of initial setting ^{*1}	RY (m+1) 9	Flag to request initial setting ^{*1}
RX (m+1) A	Error status flag ^{*1}	RY (m+1) A	Flag to request error reset. ^{*1}
RX (m+1) B	Remote station ready ^{*2}	RY (m+1) B	Reserved.
RX (m+1) C	Reserved	RY (m+1) C	Reserved.
RX (m+1) D	Reserved	RY (m+1) D	Reserved
RX (m+1) E	Reserved	RY (m+1) E	Reserved
RX (m+1) F	Reserved	RY (m+1) F	Reserved

m: It indicates a register number led by the first station number.

*1 : Not used.

*2 : Ready is outputted after the power is turned on.

*3 : When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

3.2. Remote Register

Table3-2

Master → Remote	
Address	Description
RWwm+0	Reserved (For future extension)
RWwm+1	Reserved (For future extension)
RWwm+2	Reserved (For future extension)
RWwm+3	Reserved (For future extension)

Table 3-3

Remote → Master	
Address	Description
RWrm+0	Reserved (For future extension)
RWrm+1	Reserved (For future extension)
RWrm+2	Reserved (For future extension)
RWrm+3	Reserved (For future extension)

4. Description of Remote Input/Output

4.1. Input Signal (Master Unit to Remote Station)

4.1.1. Emergency Stop Input (EMST)

- The Driver Unit detects the signal level of the input.
- When EMST input is set to 1, the Driver Unit terminates the function of position loop control and the system stops in servo-lock state in the position loop control.
- EMST input of CN2 connector is valid in the CC-Link mode.

Table 4-1

EMST	Function
0	Clears EMST input.
1	Emergency stop is on.

4.1.2. Servo ON Input (SVON)

- This input is to put the Motor in Servo-on state.
- The Driver Unit detects the signal level of the input.
- After the power is turned on and DRDY output changes to 1, the Motor gets in servo ON state when the SVON input is set to 1.

Table 4-2

SVON	Function
0	Servo OFF
1	Servo ON

4.1.3. Programmable Indexer Start Input (RUN)

- This input starts positioning of internal program of the channel specified by PRG0 ~ PRG5 inputs.
- The Driver Unit detects the rising edge(0→1) of the input.

4.1.4. Home Return Start Input (HOS)

- This input starts Home Return operation.
- The Driver Unit detects the rising edge(0→1) of the input.

4.1.5. Clear Input for Position Error Counter and Alarm (CLR)

- The Driver Unit detects the rising edge(0→1) of the input.
- Setting CLR input to 1 clears the position error counter. However, the system does not clear the position error counter in the middle of following operations.
 - ◇ Operation by the positioning command.
 - ◇ Programmed operation
 - ◇ Home Return
 - ◇ Jog
- When an alarm for excessive position error occurs, setting the CLR signal to 1 will clear the position error counter and call off the alarm.
- Alarms for software thermal, program error, RS-232C communication error and auto-tuning error will be cleared by inputting 1 of the CLR signal as well.

4.1.6. Input for Integrator OFF / Lower Gain (IOFF) *When brake sequence function is invalid

- The Driver Unit detects the signal level of the input.
- Integration control (VI) is invalidated when IOFF input is set to 1. Proportional gain of velocity loop (VG) is lowered to a value multiplied by the parameter LG (lowering ratio of velocity loop proportional gain).
- When IOFF input is set to 1, parameter IM (selecting IOFF function) sets the input to function only for disabling integration OFF function or only for lowering velocity loop proportional gain.
- This input is to control torque generation when the Motor equipped with brake is in holding position state.

Table 4-3

IOFF	Function
0	Integration ON · Lower gain not valid.
1	IM0: Integration OFF and Lower gain (shipping set) IM1: Integration OFF IM2: Lower gain

4.1.7. Clamp cancel Input (CLCN) *When brake sequence function is valid

- Select brake clamp function valid or invalid.
- If CLCN input is 1, brake will be released, and no further brake clamp will be performed. However, if an alarm (which will make motor condition servo-off) occurs, brake will clamp.
- If CLCN input is 0, brake will clamp/unclamp depending on the motor motion command.

Table 4-4

CLCN	Function
0	Brake clamp function valid
1	Clamp cancel

4.1.8. Jog Input (JOG)

- This signal starts and stops the jog operation.
- The Driver Unit detects the rising edge of the input.

Table 4-5

JOG	Function
↑ (0 → 1)	Starts JOG (Starts acceleration)
↓ (1 → 0)	Stops JOG (Decelerates and stops)

4.1.9. Direction Select Input (DIR)

- This input controls the direction of operation.
- When the input is changed in the middle of jog operation the Motor decelerates and stops.

Table 4-6

DIR	Function
0	Direction in CW
1	Direction in CCW

4.1.10. Input for Internal Program Channel Select (PRGx: x=0 to 5)

- This input specifies a channel number of internal program whose operation starts by the RUN input.
- The 6 bit binary codes of PRG0 to PRG5 specify a channel number.

Table 4-7

CH No.	PRG5	PRG4	PRG3	PRG2	PRG4	PRG0
0	0	0	0	0	0	0
1	0	0	0	0	0	1
2	0	0	0	0	1	0
3	0	0	0	0	1	1
•	•	•	•	•	•	•
61	1	1	1	1	0	1
62	1	1	1	1	1	0
63	1	1	1	1	1	1

4.1.11. Velocity Override Input (ORD)

- The Driver Unit detects the signal level of the input.
- The Motor operates at the velocity that is obtained by the application of velocity change rate OV to the velocity setting (MV, HV, CV and JV) when the ORD input is set to 1.
- Velocity is normal when the ORD input is 0. (Each positioning operates under velocity setting of MV, HV, CV and JV respectively.)
- Input of ORD in the middle of positioning operation is invalid.

Table 4-8

ORD	Function
0	Velocity override OFF
1	Velocity override ON

4.1.12. Stop Input (STP)

- The Driver Unit detects the signal level of the input.
- When the STP input is set to 1, the Motor stops operation and does not accept any start command. Parameter MD (Deceleration rate for STP input) sets the deceleration for the STP input.

Table 4-9

STP	Function
0	Start command valid
1	Stop operation, Start command invalid

4.2. Output Signal (Remote Station to Master Unit)

4.2.1. Output for Driver Unit Ready (DRDY) / Warning (OVER)

- The DRDY output turns to 1 when the Motor is ready for operation.
- The table below shows the output of DRDY /OVER when an alarm occurs.

Table 4-10

Alarm	Setting	7-seg LED	DRDY output	OVER output	BRK output	Motor state	Readout by TA command
Memory error	—	E0	0	0	0	Servo OFF	E0>Memory Error
EEPROM error	—	E2	0	0	0	Servo OFF	E2>EEPROM Error
System error	—	E7	—	—	—	Servo OFF	E7>System Error
Interface error	—	E8	0	0	0	Servo OFF	E8>I/F Error
Brake-on position error	—	F0	0	0	0	Servo lock	F0>Clamp Position Error
Excess position error	EP1	F1	0	0	1	Servo lock	F1>Excess Position Error
	EP2		1	1			
	EP3		0	1			
Software over travel limit over	TO1	F2	0	0	1	Servo lock	F2>Software Over Travel
	TO2		1	1			
Hardware over travel limit over	HT0	F3	1	0	1	Servo lock	F3>Hardware Over Travel
	HT1		0	0			
	HT2		1	1			
Emergency stop	—	F4	1	0	0	Servo lock	F4>Emergency Stop
Program error	PE0	F5	1	0	1	Servo lock	F5>Program Error
	PE1		1	1			
Automatic tuning error	AE0	F8	1	0	1	Normal state	F8>AT Error
	AE2		1	1			
RS-232C error	SE0	C2	1	0	1	Normal state	C2>RS232C Error
	SE1		0	0		Servo lock	
	SE2		1	1		Normal state	
CPU error	—	C3	0	0	0	Servo OFF	Cannot identify
CC-Link error	—	C4	0	0	0	Servo OFF	C4>Field bus Error
CC-Link SW error	—	C5	1	1	1	Normal state	C5>CC-Link SW Error
Resolver circuit error	—	A0	0	0	0	Servo OFF	A0>Resolver Circuit Error
Absolute position error	—	A1	0	0	0	Servo OFF	A1>Absolute Position Error
Software thermal sensor	—	A3	0	0	0	Servo OFF	A3>Overload
Velocity abnormal (serious)	—	A4	0	1	0	Servo OFF	A4>Velocity Abnormal
Velocity abnormal (minor)			1	1	1	Servo lock	
Home position undefined	OU0	A5	1	0	1	Normal state	A5>Origin Undefined
	OU2		1	1			
Brake error	—	A8	1	1	0	Servo lock	A8>Brake Error
Heat sink overheat	—	P0	0	0	0	Servo OFF	P0>Over Heat
Abnormal main AC line voltage	—	P1	0	0	0	Servo OFF	P1>Main AC Line Trouble
Over current	—	P2	0	0	0	Servo OFF	P2>Over Current
Abnormal AC line under voltage	—	P3	0	0	0	Servo OFF	P3>Control AC Line Under Voltage

4.2.2. In-position Output (IPOS)

- Conditions for completing positioning (In-position) are determined by the following parameter settings.

FW: Outputting time for IPOS (Output mode)

IN: Set value for In-position signal detection

IS: In-position stability timer

4.2.3. Output for Processing Internal Pulse (BUSY)

- This signal outputs to notify that the system is processing the internal pulse train command. BUSY output is set to 1 in the middle of the following operation.
 - ◇ Operation by positioning command
 - ◇ Programmed operation
 - ◇ Home Return
 - ◇ Jog
- BUSY signal outputs 1 when operating command (DC) is other than 0 in velocity control mode and torque control mode.
- This output signal does not change in overshooting and undershooting.

Table 4-11

BUSY	Function
0	No internal pulse generation
1	Processing internal pulse

4.2.4. Home Position Defined (HCMP)

- This output reports the current status for defining Home position.

Table 4-12

HOME	Function
0	Home position is not defined.
1	Home position defined.

4.2.5. Brake Output (BRK) *When brake sequence function is invalid

- BRK output is 0 in the following state.
 - ◇ SVON input is OFF.
 - ◇ Under an alarm state that creates Servo OFF state.
 - ◇ Under an initialization of system right after the power is turned on.
 - ◇ EMST input is ON.

4.2.6. Brake Control Output (BRKC) *When brake sequence function is valid

- Brake control signal to control brake clamp / un-clamp by the driver unit.
If BRKC output is 0, brake will clam. IF BRKC output is 1, brake will un-clamp.

4.2.7. Output of Target Proximity / In Target (NEARA and NEARB)

- This output reports that the Motor is approaching the target position or gets in the target zone.
- The following parameters select the reporting mode.
- Refer to “7.1.14. Target Proximity / In Target)” on the User’s Manual for ESB Driver Unit System for more details.

Figure 4-1: Parameters related to NEAR outputs

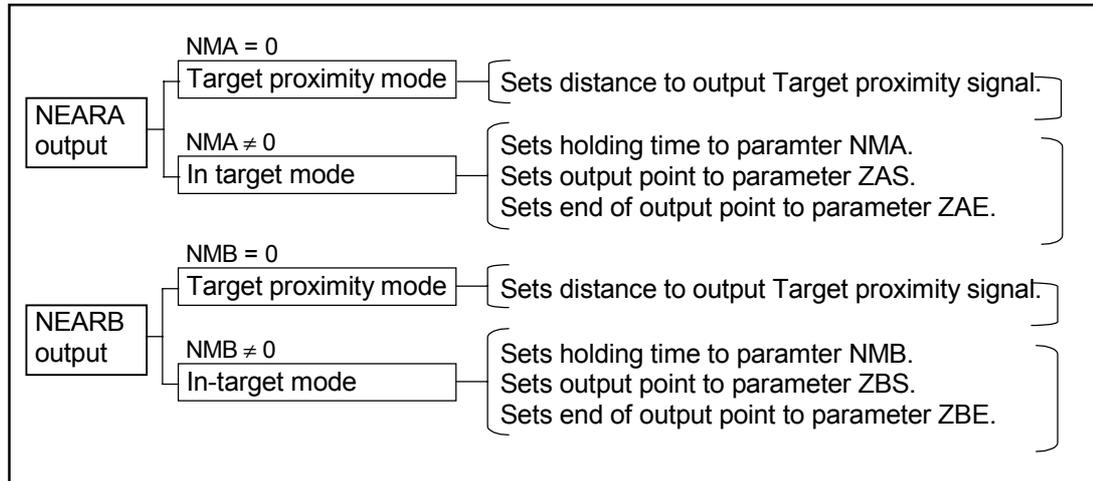


Table 4-13: NEARx · (Target proximity) (NMx = 0)

NEARx	Function
0	Not approaching the target position.
1	Approaching the target position.

Table 4-14: NEARx · · (In target) (NMx ≠ 0)

NEARx	Function
0	Not in target zone.
1	In target zone.

4.2.8. Output of Selected Channel Number (ACK_PRGx: x= 0 to 5)

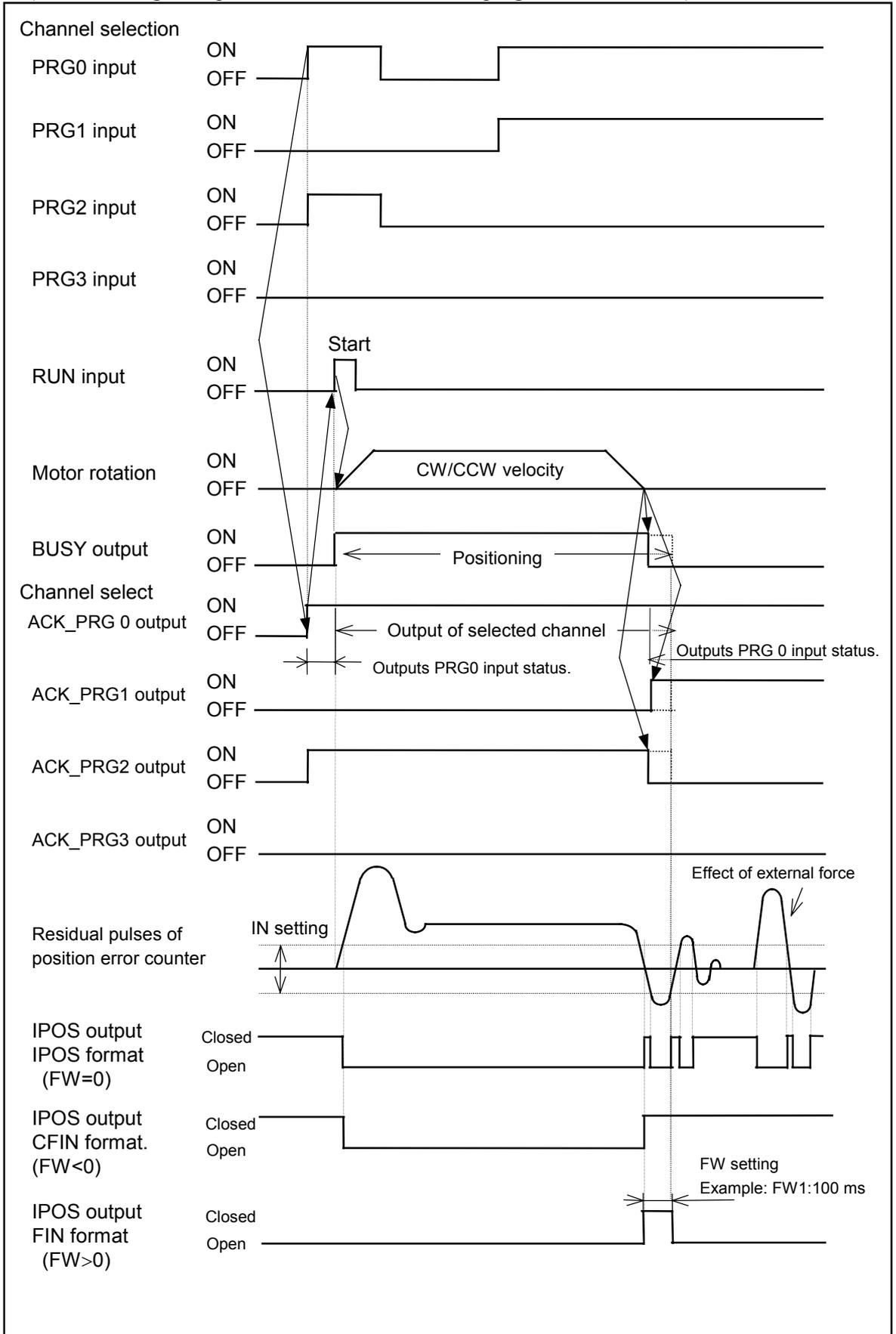
- This output reports input status of channel number for programmable move channel switching.
- However, the system keeps outputting the number for the input of Programmable Indexer start.
- It removes holding state when positioning completes and outputs the status of selected channel switching of internal program.
- Channel numbers are outputted by the 6 bit binary codes of ACK_PRG0 to PRG5.

Table 4-15

CH No.	ACK_PRG5	ACK_PRG4	ACK_PRG3	ACK_PRG2	ACK_PRG1	ACK_PRG0
0	0	0	0	0	0	0
1	0	0	0	0	0	1
2	0	0	0	0	1	0
3	0	0	0	0	1	1
•	•	•	•	•	•	•
61	1	1	1	1	0	1
62	1	1	1	1	1	0
63	1	1	1	1	1	1

Figure 4-2: Timing of programmed operation

(The following example shows a case to execute a program in Channel 5.)



4.2.9. Velocity Monitor Output (SPD)

- This output is for reporting velocity.
- The following parameters set the reporting mode and the velocity status.

Table 4-16: Parameters related to SPD output

Parameter	Function
SO	Selects velocity monitor mode.
SB	Sets to report velocity value.
ST	Sets velocity stability timer.

Table 4-17: Reports “zero speed” SPD (SO0)

SPD	Function
0	Over the velocity threshold
1	Under the velocity threshold.

Table 4-18: Reports over speed SPD (SO1)

SPD	Function
0	Under the velocity threshold.
1	Over the velocity threshold.

4.2.10. Output of Home Return Completed / Home Position Detected (HOME)

- This is to report completion of Home Return or the Motor is on the Home position.
- The following set the reporting mode.

Figure 4-3: Parameters related to HOME output

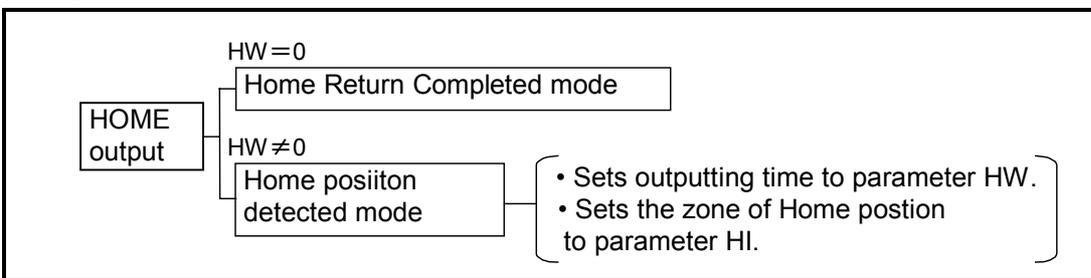


Table 4-19: Home Return Completed Mode (HOME) (HW=0)

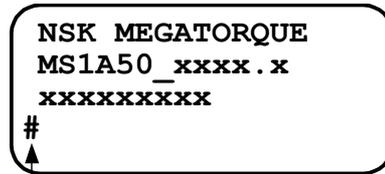
HOME	Function
0	Home Return not completed or the Motor moves from the Home position after completion of Home Return.
1	Home Return has completed and the Home position is secured.

Table 4-20: Home position detecting mode (HOME) (HW≠0)

HOME	Function
0	Home position not detected.
1	Home position detected

5. Turning on Power

- After the power is turned on, the Driver Unit gets in the mode to be able to accept the instructions of CC-Link as soon as it completes initialization of internal network modules.
- Check the following before you start to communicate via the CC-Link.
 - ◇ 7 segments LED
It does not report alarm of C4, E0, E7 or E8.
 - ◇ Handy Terminal (when it is in use)
Prompt (#) is on the screen of the Handy Terminal.

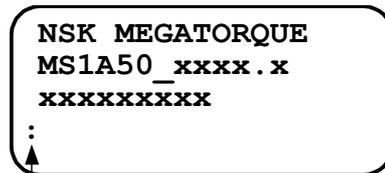


The screenshot shows a terminal window with the following text:
NSK MEGATORQUE
MS1A50_XXXX.X
XXXXXXXXXX

An upward-pointing arrow is positioned below the '#' character.

Indicates the operation mode is CC-Link.

- If the Driver Unit could not complete the initialization of the internal network modules for some reason, the 7 segments LED and the Handy Terminal indicate the error as shown below.
 - ◇ 7 segments LED
It indicates one of C4, E0, E7 or E8 alarm.
 - ◇ Handy Terminal (when it is connected)
A prompt (:) appears on the screen.



The screenshot shows a terminal window with the following text:
NSK MEGATORQUE
MS1A50_XXXX.X
XXXXXXXXXX
:
An upward-pointing arrow is positioned below the ':' character.

Indicates the mode is maintenance mode.

5.1. Operation Mode

- The Driver Unit provides two operation modes as follows.
 - ◇ CC-Link mode
 - ◇ Maintenance mode
- The default operation mode after the power is turned on is the CC-Link mode.

5.1.1. CC-Link Mode

- The Driver Unit operates the system following the instructions of the CC-Link.
- The screen of the Handy Terminal, when it is connected, indicates a prompt (#).

```
NSK MEGATORQUE
MS1A50_XXXX.X
XXXXXXXXXX
#
▲
```

Indicates the operation mode is CC-Link.

5.1.2. Maintenance Mode

- The Driver Units operates the system following the instructions of the Handy Terminal (RS-232C communication).
- The screen of Handy Terminal indicates the prompt (:).
- The maintenance mode is to control the Driver Unit temporarily through the Handy Terminal when the CC-Link is not available for some reason.
- In the maintenance mode, some of input signals of CN2 connector will become effective. Meanwhile, all inputs and a part of outputs of the CC-Link will be invalidated.
- Refer to “1.3. Setup of I/O by Operation Mode” for further details.

```
NSK MEGATORQUE
MS1A50_XXXX.X
XXXXXXXXXX
:
▲
```

Indicates the mode is maintenance mode.

5.1.3. Switching Operation Mode

- Communication device that the Driver Unit can control is always only one. Input switching operation mode command (CP) through the Handy Terminal to change the operation mode. When the Motor is in motion by the internal pulse train command at this moment, it decelerates and stops automatically.

5.1.3.1. Switch to Maintenance Mode from CC-link Mode

- 1) Be sure to check the prompt (#, for CC-Link mode) is on the screen.
- 2) Input the password.

```
#  
#  
#/NSK ON  
#
```

- 3) Execute command CP0.

- If the Motor is running under the internal pulse train command, it will decelerate and stops.

- 4) The prompt changes to (:, for maintenance mode) from (#).

```
#  
#/NSK ON  
#CP0  
:
```

5.1.3.2. Switch to CC-Link from Maintenance Mode

- 1) Check that the prompt “: (maintenance mode)” is on the screen.
- 2) Input the password.

```
:  
:  
:/NSK ON  
:
```

- 3) Input command CP1.

- If the Motor is in motion by the internal pulse train command, it will decelerate and stop.

- 4) The prompt changes to “# (CC-Link mode)” from (:).

```
:  
:/NSK ON  
:CP1  
#
```

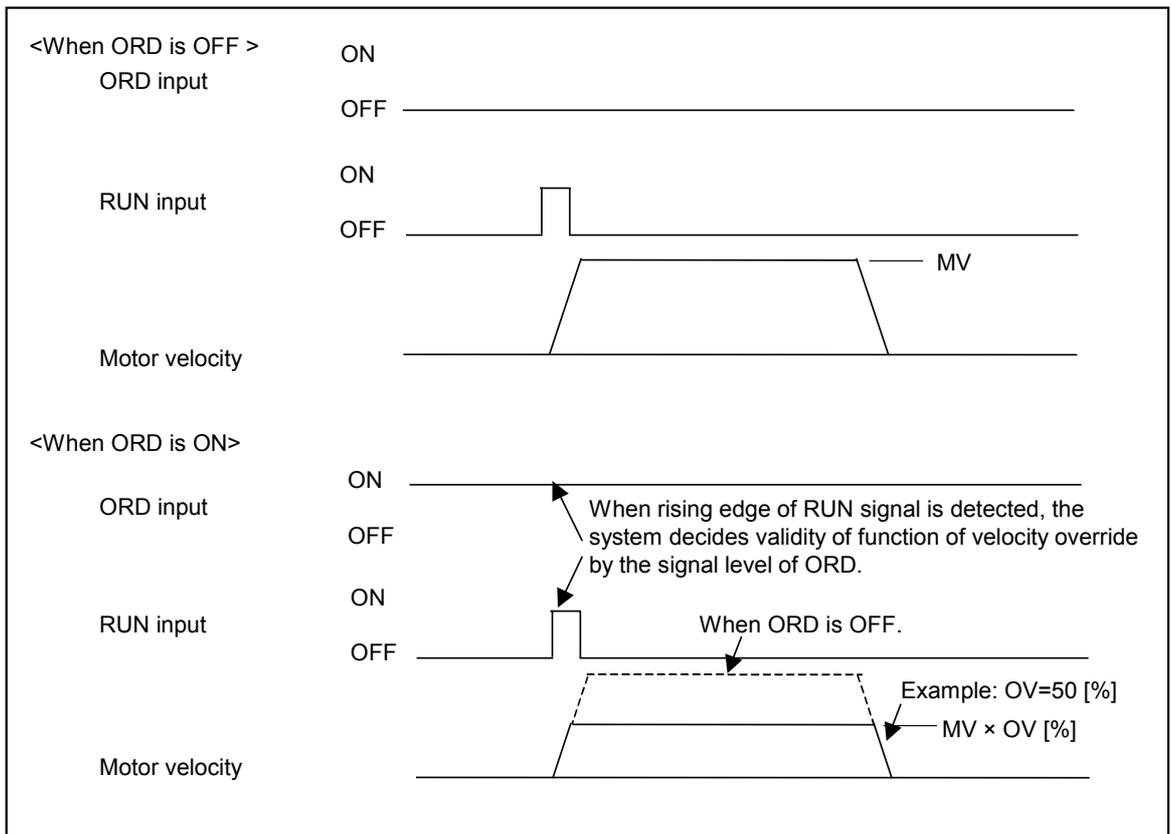
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6. Additional Functions

6.1. Velocity Override

- When control input signal ORD through the CC-Link is ON, this function changes rotational speed of the Motor according to a rate that is set beforehand by a parameter OV.
- The Driver Unit detects input of ORD by its signal level.
- When the input ORD is ON, the Motor will rotate with a velocity that is obtained by application of the velocity change rate (%) of the parameter OV to velocity parameters (MV, HV, CV and JV), which are set to the positioning operations of RS-232C communication, Home Return, Programmable Indexer, and JOG respectively.
- If the input ORD is OFF, the system is in normal state. (Respective positioning operations shall be operated by the velocity parameter MV, HV, CV or JV.)
- The velocity change rate can be set to 0 to 200 % by the parameter OV.
- Input signal ORD is invalid when the Motor is in motion of a positioning operation.
- Actual velocity will be clipped to the maximum rotational speed of the Motor when the velocity obtained by the parameter OV exceeds it.
- The Motor does not rotate when you set the velocity change rate to 0 % and you activate the input ORD.

Figure 6-1: Example of positioning activated by RUN input signal



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7. Additional Commands for RS-232C Communication

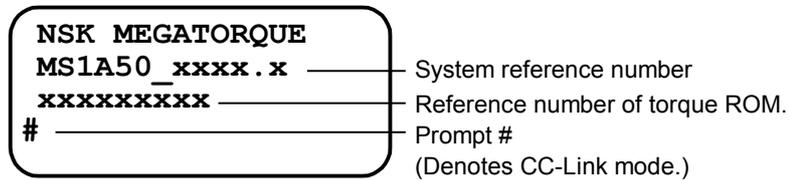
- This section describes new commands and functions that are added to the RS-232C communication.
- You should input the password [/NSK ON] for a command that is marked with ★.

★ **CP : Switching Mode CC-Link / Maintenance**

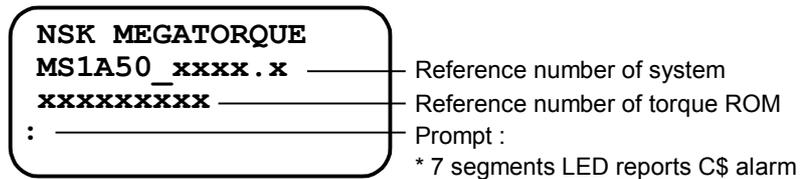
Format : CP data
 Data : data=0 : Maintenance mode
 : data=1 : CC-Link mode
 Default : 0

- This command is to select operation mode of the Driver Unit from CC-Link and Maintenance mode.
- This command is for maintenance, and the contents set for the maintenance mode won't be backed up.
- ?CP command reports the current setting.
- The operation mode at starting of the system is depending on the state of initialization of CC-Link communication that is to be conducted after the power is turned on.
 CC-Link Link mode : When initialization of CC-Link LSI was successful at the moment of starting the Driver Unit [Prompt (#) is indicated on the screen.]
 Maintenance mode : When initialization of CC-Link LSI is not successful at the moment of starting Driver Unit [Prompt (:):appears on the screen.]
 [Error at the initialization involves SW setting error of station number, out-of-range setting of baud rate and faulty setting for initialization.]

Indication of normal state:



Indication of abnormal state:



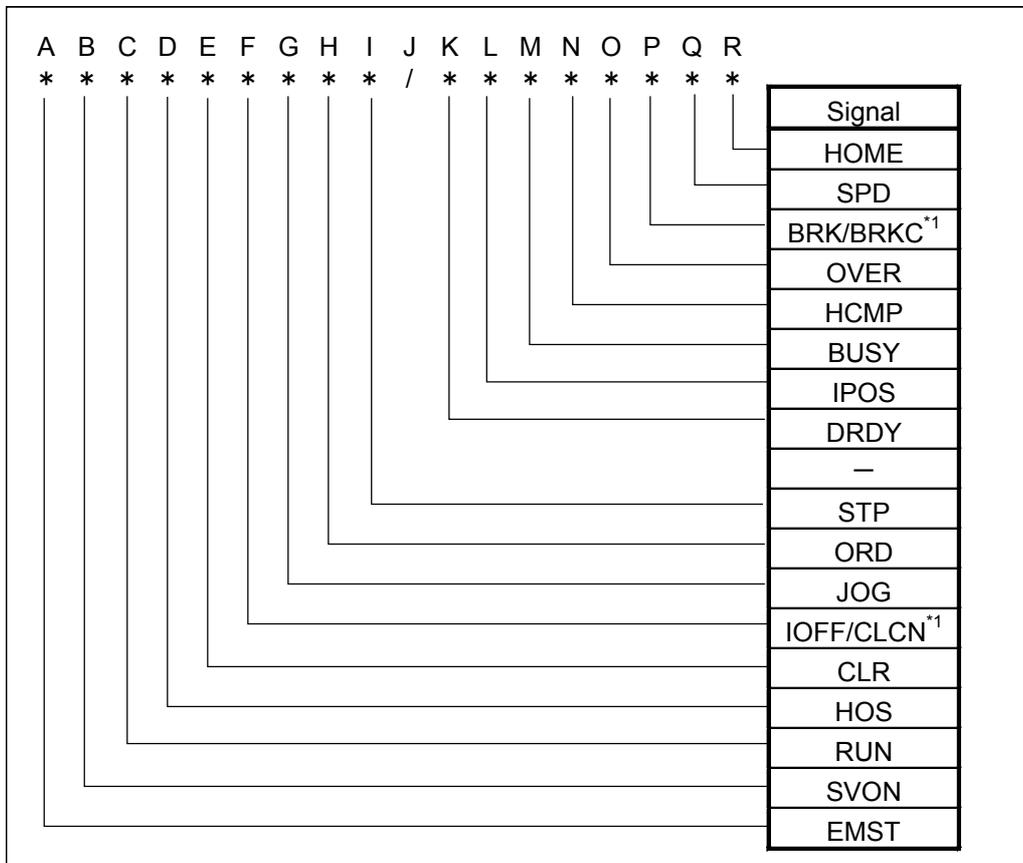
 **Caution:** *The Motor may start suddenly depending on a command of master controller because control input/output signals (CN2 and CN5) are also changed when the mode is switched. When switching operation mode, be sure to confirm a command of the master controller, and take a great care for the operation.*

IO : Input /Output Monitor

Format	: IO data opt	
Data	: data= default, 0	---Monitors General I/O.
	data=1	---Monitors general I/O. (Reverse video for a normally closed contact [B contact])
	data=2	---Monitors I/O related to programmed operation
	data=3	---Monitors I/O related all positioning.
	data=4	---Monitors I/O status related to CC-Link.
	data=5	---Monitors I/O related to programmed operation of CC-Link.
	data=6	---Monitors I/O data of CC-Link. (Area to be defined by the user.)
Optional code	: opt=default	---Monitors only once.
	opt=/RP	---Monitors repeatedly.

- Zeros (0) and ones (1) indicate status of control Input and Output of CN2 and CN5 connectors (ON/OFF or open/close).
1: Input [ON] ; Output [Closed]
0: Input [OFF]; Output [Open]
- Press the **[BS]** key to terminate repeated monitoring of IO/RP.

Figure 7-1: In case of IO4



*1: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

Figure 7-2: In case of IO5

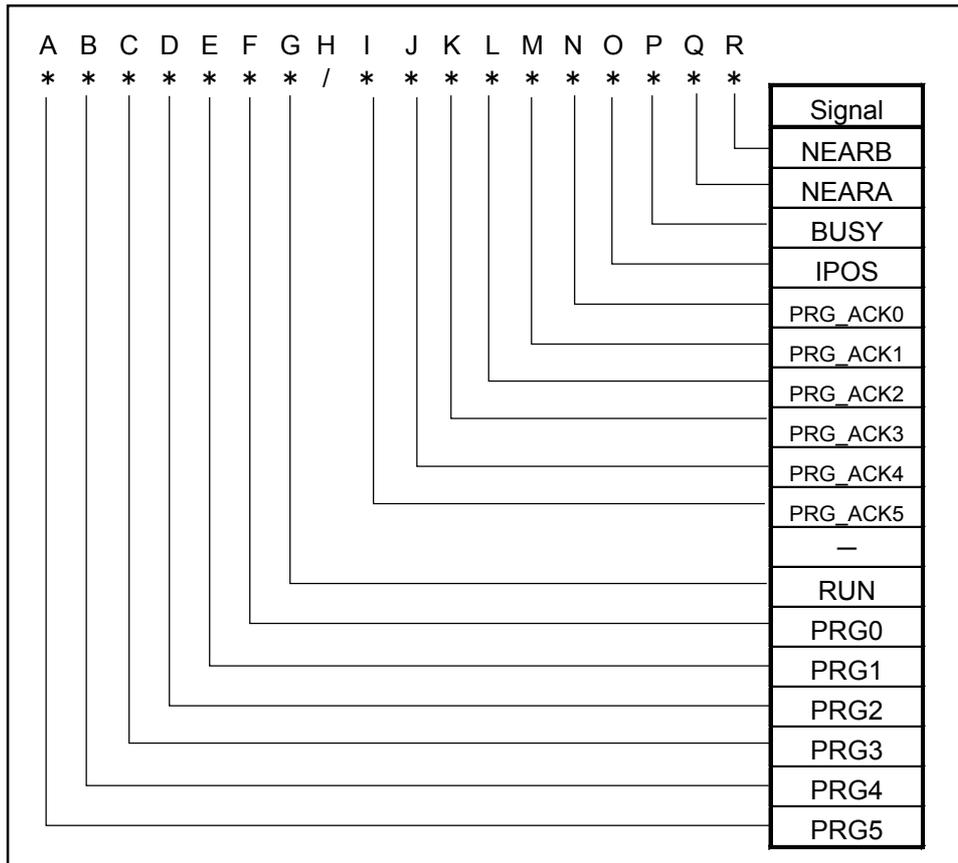


Figure 7-3: In case of IO6

Name of Input signal		Name of output signal	
I ₀	EMST	O ₀	DRDY
I ₁	SVON	O ₁	IPOS
I ₂	RUN	O ₂	BUSY
I ₃	HOS	O ₃	HCMP
I ₄	CLR	O ₄	WRN
I ₅	IOFF/CLCN* ¹	O ₅	BRK/BRKC* ¹
I ₆	JOG	O ₆	OUT1
I ₇	DIR	O ₇	OUT2
I ₈	PRG0	O ₈	ACK_PRG0
I ₉	PRG1	O ₉	ACK_PRG1
I _A	PRG2	O _A	ACK_PRG2
I _B	PRG3	O _B	ACK_PRG3
I _C	PRG4	O _C	ACK_PRG4
I _D	PRG5	O _D	ACK_PRG5
I _E	ORD	O _E	SPD
I _F	STP	O _F	HOME

*1: When using motor with brake combined with brake sequence function(BF1), signals Integrator off / Low gain will be used as Clamp cancel input, Brake output will be used as Brake control output.

OV : Override

Format : OV data
Data : 0 to 200 [%]
Shipping set : 100
Default : 0

- This is to set the rate of velocity override when the ORD input of CC-Link is ON.
- The unit of data is 1 [%].
- When the [ORD] input is ON, and if the data is set to 0, the Motor does not rotate for any motion command.
- When the changed velocity exceeds the maximum velocity of the Motor, it will be clipped at the Motor maximum velocity.
- Refer to “Velocity Override” for more details.
- TS or ?OV command will report the current setting.

7.1. List of Additional Parameter

- This section is provided to record the current setting of the additional parameter for backup when replacing the Driver Unit or unexpected shut down of the System.

Table 7-1

Parameter	Name of parameter	Password	Shipping set	Data	User's setting
OV	Override	Not required	100	0 to 200	

8. Alarms Related to CC-Link

8.1. CC-Link Error

- This alarm denotes that an error is detected in the CC-Link interface.
- The error cannot be identified by the CC-Link communication.
- 7 segments LED and the RS-232C communication report occurrence of the error.

Table 8-1

DRDY output	Open (Alarm)
Motor condition	Servo off
7 segments LED	C4
Readout by TA command	C4>Field bus Error
To clear	Turn on the power again.

- When this alarm arises, confirm alarm sub-code by issuing TA/HI command through RS-232C communication.
- The table below shows cause and remedy of the alarms.

Table 8-2

Alarm history	Alarm detected	Cause	Remedy
C4-1	Error at setting	Defective interface PCB.	Replace the Driver Unit.
C4-2	Setting error of station number	SW1 or SW2 sets a station number that is out of 1 to 64 range.	Turn off the power, set SW1 or 2 for station number within the range of 1 ~ 64, and then turn on power again.
C4-3	Setting error of baud rata.	SW3 for the baud rate setting is set to a number other than 0 to 4.	Turn off the power, set SW3 for baud rate setting to 0 to 4, and then turn on power again.

8.2. CC-Link Setting Switch Error

- It indicates that an error is detected on setting switch of CC-Link interface.
- This error cannot be identified through the CC-Link communication.
- Occurrence of error will be reported through 7 segments LED and RS-232C.

Table 8-3

DRDY output	Close (Warning)
Motor condition	Normal
7 segments LED	C5
Readout by TA command.	C5>Field-bus SW Alarm
To clear	The warning will be lifted by resetting of switch on CC Lin IF (station number and baud rate) to the original setting at the moment of tuning on the power.

- When this alarm arises, confirm an alarm sub-code issuing TA/HI command through RS-232C communication.
- The table below shows cause and remedy of the alarms.

Table 8-4

Alarm history	Detected error	Cause	Rmedy
C5-1	Changes on SW setting of station number	SW setting has changed from the initial setting.	Reset to the same setting right after the initialization.
C5-2	Changes on SW setting of baud rate	SW setting has changed from the initial setting.	Reset to the same setting right after the initialization.

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