CKD

SMF-2008-A

Instruction Manual

ABSODEX

AX Series

XS Type

CC-Link specification

- Before using this product, be sure to read this Instruction Manual.
- In particular, read the descriptions on safety carefully.
- Store this Instruction Manual so that it can be taken out and read quickly as necessary.

CKD Corporation

Contents

ABSODEX

AX series [XS type CC-Link specification]

Instruction Manual No. SMF-2008-A

Created on June 1, 2016

Introduction

Thank you for choosing our ABSODEX.

ABSODEX is a direct-drive index unit developed to drive intermittently operated turntables or the likes of general industrial assembling machines, inspection machines, etc. flexibly at a superior precision.

This Instruction Manual is dedicated to the ABSODEX AX series XS type driver CC-Link specification.

It is not applied to other types.

For the operation method, precautions on operation, maintenance and inspection items and so on, refer to "Instruction Manual for AX Series TS/TH/XS type" (SMF-2006) contained in the attached CD-ROM.

The descriptions, specifications and appearances written in this Instruction Manual may be changed without notice in the future.

1. Specifications

1.1. Product Configuration

Name			Quantity
1	Driver unit		1
2	Accessories	CN5 motor power connector: PC4/3-ST-7.62 (Phoenix Contact)	1
		CN4 power supply connector: PC4/5-ST-7.62 (Phoenix Contact)	1
		CN3 communication connector (CC-Link): BLZ5.08/FAU (Weidmüller)	1

1.2. General Specifications of Driver

Item		AX9000XS-U2 (CC-Link specification)
Power	Main	Single-phase or three-phase: 200V AC ± 10% to 230V AC ± 10% (standard) 1-100V AC - 10% to 115V AC + 10% (J1:option)
	Control	1-200V AC - 10% to 230V AC + 10% (standard) 1-100V AC - 10% to 115V AC + 10% (J1:option)
Frequency		50/60 Hz
Rated input current		1.8 A
Input: Phase number		Single-phase or three-phase
Output voltage		0~230 V
Output frequency		0~50 Hz
Rated output current		1.9 A
Output: Phase number		Three-phase
Power system		TN, TT, IT
Mass		About 1.6 kg
Outside diameter size		W75 * H220 * D160
Configuration		Open modular type (driver, and controller)
Operating Ambient Temperature Range		0 to 50°C
Operating Relative Humidity Range		20 to 90%RH (No condensation allowed)
Storage Ambient Temperature Range		-20~65ºC
Storage Relative Humidity Range		20 to 90%RH (No condensation allowed)
Atmosphere		Free from corrosive gases, and dust
Anti-noise		1,000V (P-P), pulse width 1μsec, startup 1nsec
Anti-vibration		$4.9m/s^2$
Altitude		Altitude: 1,000 m or less
Protection		IP2X (CN4 and CN5 are excluded)

1.3. Performance Specifications of Driver

Item	Description
Number of Controlled Axes	1 axis, 4,194,304 pulses/rotation
Angle Setting Unit	° (degree), pulse, and number of indexes
Angle Setting Minimum Unit	0.001°, 1 pulse (= about 0.31 sec [0.000086 deg.])
Speed Setting Unit	sec, rpm
Speed Setting Range	0.01 to 100 sec/0.11 to 240 rpm
Number of Indexes	1 to 255
Maximum Instruction Value	8 digit input ±99,999,999
Timer	0.01 to 99.99sec
Programming Language	NC language
Programming Method	Data setting through RS-232C port using PC
Operation Mode	Auto, single block, MDI, jog, servo OFF Pulse string input, network operation mode
Coordinate	Absolute and incremental
Acceleration Curve	<Five types> Modified sine (MS), Modified constant velocity (MC, MC2) Modified trapezoid (MT), Trapecloid (TR)
Status Display	LED power lamp display
Motion Display	7-segment LED (2 digits)
Communication Interface	Meets RS-232C specification
CC-Link Communication Function (Ver. 1.10, 2 stations occupied, remote device station)	<Input> Home positioning instruction, reset, start, stop, continuous rotation stop, emergency stop, answer, position deviation counter clear, program number selection, brake release, servo ON, program number setting, ready return
	<Output> Alarm 1 and 2, positioning completion, in-position, standby for start input, M code 8 points, output during indexing 1/2, home position output, M code strobe, segment position strobe, servo status, ready output
Program Capacity	<NC program> About 6,000 characters (256 pcs.)
	<Point table> 64 points
Electronic Thermal	Protects the actuator from being overheated.

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2. Wiring

2.1. Panel Description

A terminal strip and connectors, etc. are located on the front panel of the driver.

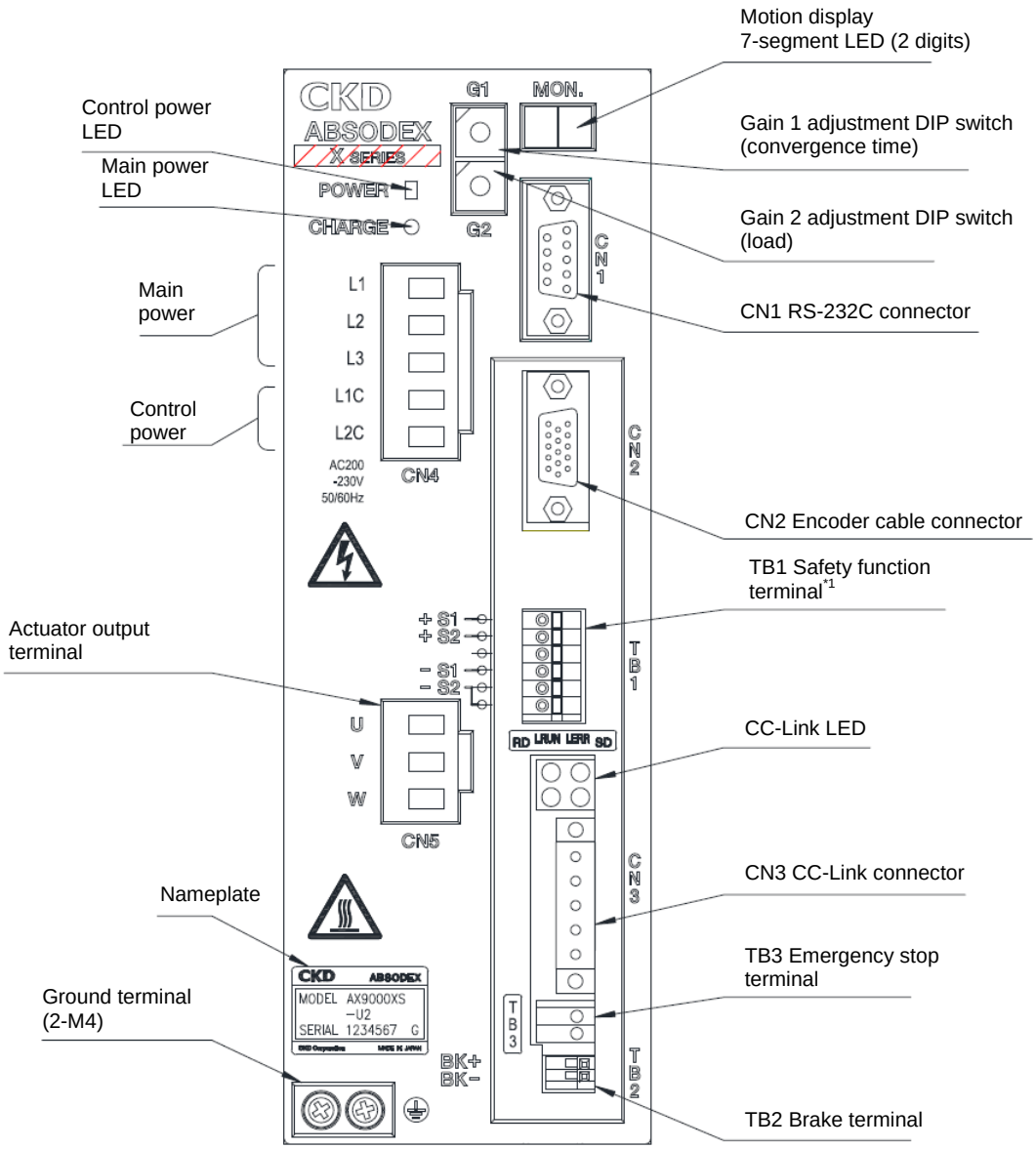


Fig. 2.1 XS type CC-link specification, Driver panel

Note *1: The safety function (TB1) of this product does not correspond to the accreditation of the safety standards.

2.2. Communication Connector

The pin layout of CC-Link communication connector CN3 is shown below.

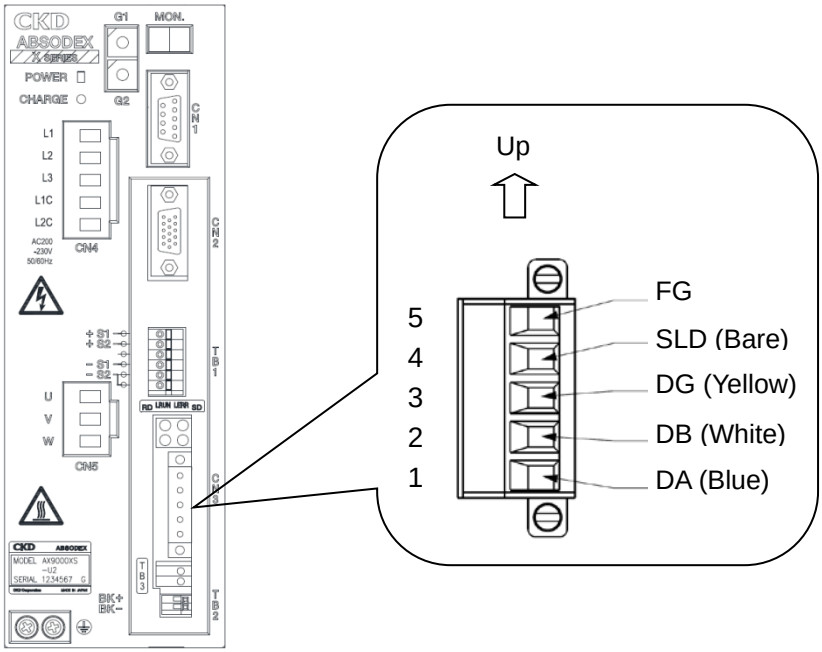


Fig. 2.2 Communication connector, Pin layout

Table 2.1 Pin layout of CN3

Pin	Signal name	Function	Description
1	DA	Data A	Connect the data A cable.
2	DB	Data B	Connect the data B cable.
3	DG	Data ground	Connect the data ground cable.
4	SLD	Shield	Connect the shielding cable. *1
5	FG	Frame ground	Connect the frame ground cable. *1 *2

*1 The SLD and FG terminals are connected inside.

*2 Be sure to connect the grounding terminal (heat sink section) of the driver to operate.
Do not tie the frame ground cable together with the protective ground cable, power cable or the like.
(Otherwise noise will intrude, possibly making communications unstable.)
For details, refer to the CC-Link Laying Manual and so on.

Connect a terminator across terminals "DA" and "DB" if the module is connected at the end of the network.

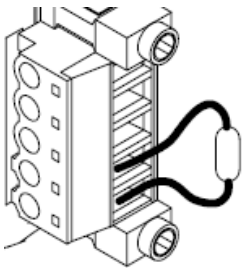


Fig. 2.3 Terminator, Connection example

2.3. Connecting the Communication Cable

Follow the procedure below to connect the special CC-Link cable to the module.

(1) Peel the sheath of the cable off without causing a broken wire (length of peeled cable sheath: 7mm). Do not solder the bare cable. Otherwise poor continuity may be caused. The solderless terminals specified below are recommended. Note that the peeling size of the cable sheath varies according to the type of the solderless terminal (see the figures below).

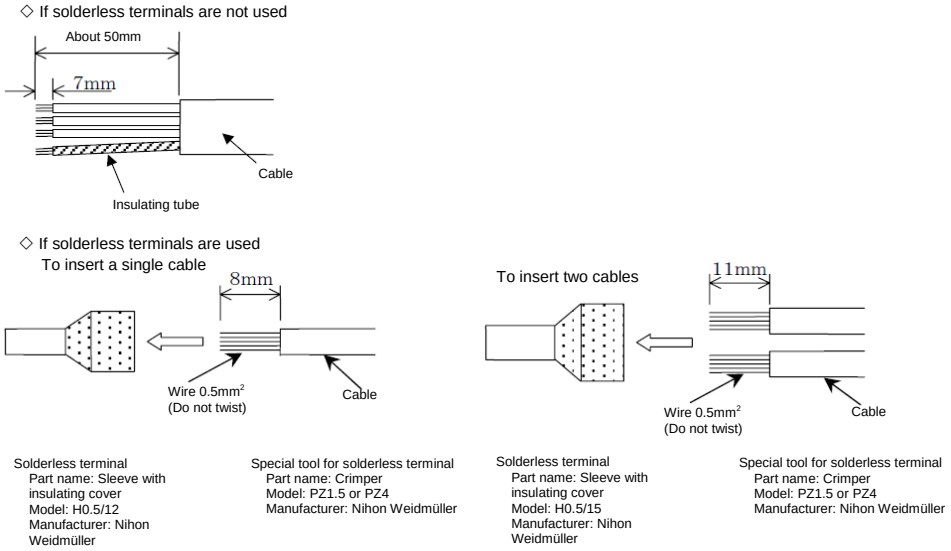


Fig. 2.4 Peeling size of communication cable

(2) Insert the DA (blue), DB (white), DG (yellow) and SLD (bare) cables of the CC-Link cable into the corresponding holes while taking care of the orientation of the accessory connection connector (BLZ5.08/5FAU) (see the figure below), and tighten the cable fixing screw. The recommended connector is BLZ5.08/FAU manufactured by Weidmüller.

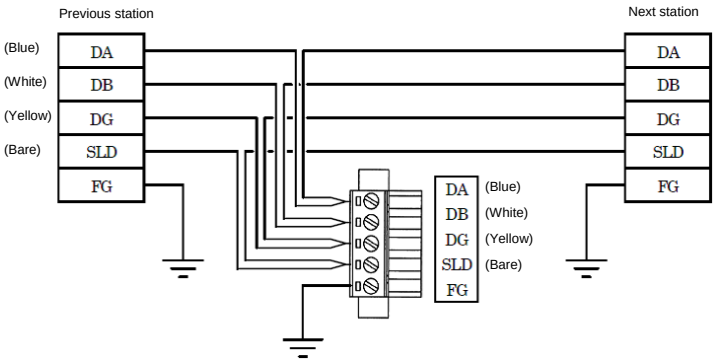


Fig. 2.5 Connection example of communication cable

(3) After checking that the cable name is the same as the one indicated on the module, insert the connection connector into the module and securely tighten the connector fixing screw to a tightening torque of 0.3N·m.

CAUTION

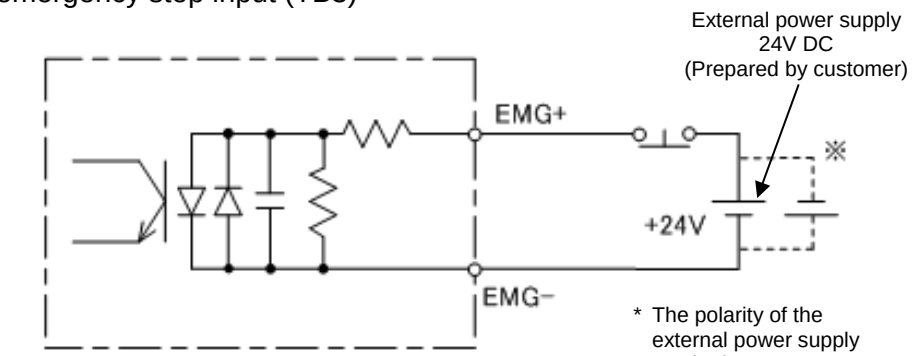
- Be sure to use special signal cables complying with the CC-Link specifications.
- Before inserting the cable into the connector, loosen the cable fixing screw sufficiently to avoid the cable entering the back side of the connector instead of the connector tightening side.
- For the shield wires for CC-Link special cables, connect to “SLD” of each unit via “FG” and ground with class D (level III grounding resistance of 100 Ω or lower) SLD and FG are connected inside the unit.
- For those provided with a connector fixing screw, securely tighten the connector fixing screw when inserting the connector. Otherwise the connector may be dislocated and cause malfunction. For those not provided with a connector fixing screw, check that the catch of the connector snaps in position.
- Loosen the two fixing screws before removing the connector. The connector may be damaged if excess force is applied to the connector without the two screws loosened.
- Do not bend the communication cable forcibly. Assure a sufficient bending radius.
- Remove the connector vertically to avoid excess force from being applied to the connector.
- Reserve a sufficient distance between the communication cable and power cable (motor cable).
- If the communication cable is routed near the power cable or if they are tied, noise will enter to make communication unstable, possibly causing frequent communication errors and/or communication retries.

For details of the laying of the communication cable, refer to the CC-Link Laying Manual, etc.

2.4. IO interface

Connect "emergency stop input (TB3)" in the following way.

2.4.1. Wiring of emergency stop input (TB3)



Rated voltage 24V ±10%, rated current within 5mA

Fig. 2.6 Connection example of emergency stop input (TB3)

- The emergency stop input will be effective as default setting. Refer to the “AX Series TS, TH, XS Type manual” (SMF-2006) for setting instructions.
- Emergency stop is a “b” contact input. Thus it will take effect when emergency stop input (TB3) becomes open. (Emergency stop using CC-Link will be effective when the input data is OFF)

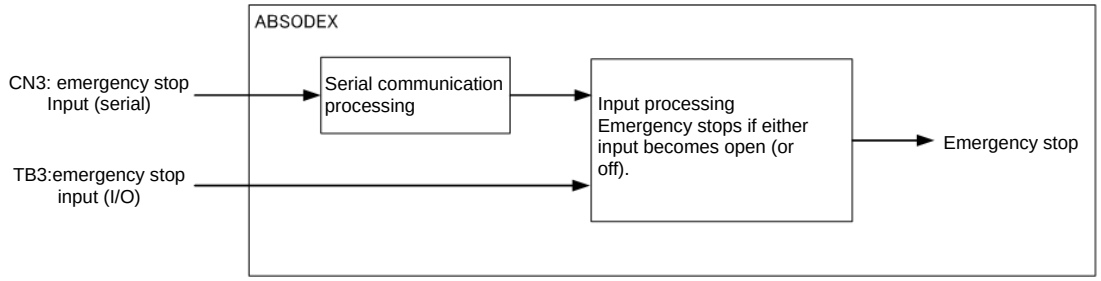


Fig. 2.7 Specification of emergency stop input

- Emergency stop can be inputted by TB3’s input terminal or CN3’s DeviceNet communications and if one of the inputs becomes open (or off), it will be recognized as emergency stop.
  → Input to TB3 is necessary to release the emergency stop.

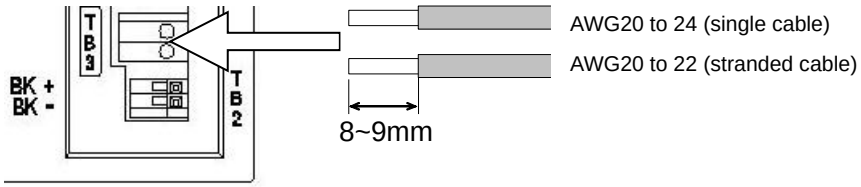


Fig. 2.8 Applicable cable to TB3 and peeling size

- The cable sheath peeling length should be 8 or 9mm.
- The applicable cable is AWG20 to 24 (single cable) or AWG20 to 22 (stranded cable).

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3. CC-Link Communication Function

3.1. Communication Specifications

Table 3.1. Communication specifications

Item	Specification
Power supply	Supply 5V DC from the servo amplifier.
CC-Link version	Ver.1.10
Number of stations occupied (station type)	2 (remote device station)
Number of remote input points	48
Number of remote output points	48
Remote register I/O	8 input words, 8 output words
Communication speed	10M/5M/2.5M/625k/156kbps (Selected with a parameter setting)
Communication method	Broadcast polling
Synchronization method	Frame synchronization method
Coding method	NRZI
Transmission path type	Bus type (compliant with EIA RS-485)
Error control method	CRC ($X^{16}+X^{12}+X^{6}+1$)
Connection cable	Cable compatible with CC-Link Ver. 1.10 (3-conductor twisted pair cable with shield)
Transmission format	Compliant with HDLC
Remote station number	1 to 63 (parameter setting)
Number of connected modules	Max. 32 remote device stations, 2 stations occupied

3.2. I/O Device

2 stations occupied (Ryn/RXn: 48 points each. RWrn/RWwn: 8 points each)

Table 3.2. RYn/RXn device list

PLC → AX (RYn)

Device No.	Signal name	Logic	Judgment
RYn0	Program number selection input (bit 0)	Positive	Level
RYn1	Program number selection input (bit 1)	Positive	Level
RYn2	Program number selection input (bit 2)	Positive	Level
RYn3	Program number selection input (bit 3)	Positive	Level
RYn4	Program number selection input (bit 4) / Program number setting input, second digit	Positive	Level / Edge
RYn5	Program number setting input, first digit / Program number selection input (bit 5)	Positive	Level / Edge
RYn6	Reset input	Positive	Edge
RYn7	Home return command input	Positive	Edge
RYn8	Start input	Positive	Edge
RYn9	Servo-on input / Program stop input	Positive	Level / Edge
RYnA	Ready return input / Continuous rotation stop input	Positive	Edge
RYnB	Answer input / Position deviation counter reset	Positive	Edge
RYnC	Emergency stop input	Negative	Level
RYnD	Brake release input	Positive	Level
RYnE	Jog operation input (CW direction) *1	Positive	Edge
RYnF	Jog operation input (CCW direction) *1	Positive	Edge
RY(n+1)0	Reserved *2 / Movement unit selection input (bit 0) *3	Positive	Level
RY(n+1)1	Reserved *2 / Movement unit selection input (bit 1) *3	Positive	Level
RYn+1)2	Reserved *2 / Movement speed unit selection input *3	Positive	Level
RY(n+1)3	Table operation, data input operation Switching input	Positive	Level
RY(n+1)4 to RY(n+1)F	Reserved	-	-
RY(n+2)0	Monitor output execution request	Positive	Level
RY(n+2)1	Command code execution request	Positive	Edge
RY(n+2)2 to RY(n+2)F	Reserved	-	-
RY(n+3)0 to RY(n+3)F	Reserved	-	-

AX → PLC (RXn)

Device No.	Signal name	Logic
RXn0	M code output (bit 0)	Positive
RXn1	M code output (bit 1)	Positive
RXn2	M code output (bit 2)	Positive
RXn3	M code output (bit 3)	Positive
RXn4	M code output (bit 4)	Positive
RXn5	M code output (bit 5)	Positive
RXn6	M code output (bit 6)	Positive
RXn7	M code output (bit 7)	Positive
RXn8	In-position output	Positive
RXn9	Positioning completion output	Positive
RXnA	Start input wait output	Positive
RXnB	Alarm output 1	Negative
RXnC	Alarm output 2	Negative
RXnD	Indexing-in-progress output 1 / Home position output	Positive
RXnE	Indexing-in-progress output 2 / Servo state output	Positive
RXnF	Ready state output	Positive
RX(n+1)0	Segment position strobe output	Positive
RX(n+1)1	M code strobe output	Positive
RX(n+1)2 to RX(n+1)F	Reserved	-
RX(n+2)0	Monitoring	Positive
RX(n+2)1	Command code execution complete	Positive
RX(n+2)2 to RX(n+2)F	Reserved	-
RX(n+3)0 to RX(n+3)A	Reserved	-
RX(n+3)B	Remote ready	Positive
RX(n+3)C to RX(n+3)F	Reserved	-

Note *1: Only the network operation mode can be used.
*2: Selected in the case of a table operation (RY (n+1) 3 = OFF).
*3: Selected in the case of a data input operation (RY (n+1) 3 = ON).

Table 3.3. RWrn/RWwn device list

PLC → AX (RWwn)

Address No.	Signal name
RWwn	Monitor 1
RWwn+1	Monitor 2
RWwn+2	Command code
RWwn+3	Writing data, lower 16 bits *1 / A code or P code, lower 16 bits *2
RWwn+4	Writing data, upper 16 bits *1 / A code or P code, upper 16 bits *2
RWwn+5	Data designation *1 / F code *2
RWwn+6	Reserved
RWwn+7	Reserved

AX → PLC (RWrn)

Address No.	Signal name
RWrn	Monitor 1 data, lower 16 bits
RWrn+1	Monitor 1 data, upper 16 bits
RWrn+2	Response code
RWrn+3	Loaded data, lower 16 bits
RWrn+4	Loaded data, upper 16 bits
RWrn+5	Monitor 2 data, lower 16 bits
RWrn+6	Monitor 2 data, upper 16 bits
RWrn+7	Reserved

Note *1: Selected in the case of a table operation (RY (n+1) 3 = OFF).
*2: Selected in the case of a data input operation (RY (n+1) 3 = ON).

Table 3.4. Monitor code (RWwn, RWwn+1) list

Code No.	Monitored item	Data length	Unit	Range
0001h	Current position in full rotation (deg.)	32bit	×1000 [deg.]	0 to 359,999
0003h	Current position in full rotation (pulse)	32bit	[pulse]	0 to 4,194,303
0005h	Position deviation amount	32bit	[pulse]	-2,147,483,648 to 2,147,483,647
0007h	Program number	16bit	[No.]	0 to 999
0008h	Electronic thermal relay	16bit	×100 [°C]	0 to 65,535
0009h	Rotation speed	16bit	[rpm]	-32,768 to 32,767
000Ah	Point table number	16bit	[No.]	0 to 63

Table 3.5. Response code (RWrn+2) list *3

Code No.	Description	Details
0	Normal	The command code is executed normally.
1	Code error	A code not listed is executed.
2	Parameter selection error	A parameter number which cannot be read or set is specified.
3	Error in writing range	An excessive value is executed.
4	Timing error	The writing command code is executed during processing of the CN1 communication function.

Note *3: The response code is shared in the monitor, load command and writing command.

Table 3.6. Load command code (RWwn+2) list

Code No.	Item/Function	Loaded data		Loaded data designation RWwn+5
		RWrn+3	RWrn+4	
0010h	Current alarm loading	Lower 8 bits: Alarm loading 1 Upper 8 bits: Alarm loading 2	Lower 8 bits: Alarm loading 3 Upper 8 bits: Alarm loading 4	-
0020h	Operation mode loading	Current operation mode No.	0 (fixed)	-
0025h	Parameter loading	Lower 16 bits of parameter set value	Upper 16 bits of parameter set value	Parameter number

Load current alarm (0010h)

The current alarm number is loaded.

It is set as loaded data. Each byte indicates the type, and up to four alarms are specified.

Alarm indication is consistent to the 7-segment LED indication. The first digit indicates details of the alarm and the second digit indicates the alarm number. Alarms not expressed in 0 to F

Alarm H →"d"

Alarm L →"b"

Alarm P, U and others →"8"

Alarms are set in the order from "F" to "0."

In case of "no alarm," "00" is set.

Operation mode loading (0020h)

The current operation mode is loaded.

The number of the operation mode is set in the loaded data.

Table 3.7. Loadable operation mode list

Operation mode	Loaded data set value
Automatic operation mode	1
Single block mode	2
MDI (manual data input) mode	3
Jog mode	4
Servo OFF mode	5
Pulse string input mode	6
Network operation mode	7

Parameter loading (0025h)

The set value of the parameter designated with the parameter number (RWwn+5) is loaded using an integer value.

A parameter with a decimal value is loaded using a value multiplied by 100 or 10,000.

For details, refer to the “Parameter list” on page 3-6.

Table 3.8. Writing command code (RWwn+2) list

Code No.	Item/Function	Written data		Written data designation RWwn+5
		RWwn+3	RWwn+4	
0021h	Operation mode switching	Automatic operation number	0 (fixed)	-
0029h	Parameter setting	Lower 16 bits of parameter set value	Upper 16 bits of parameter set value	Parameter number
0030h	Point table initialization	Table number initialized	0 (fixed)	-
0031h	Parameter initialization	999	0 (fixed)	-

Operation mode switching (0021h)

The mode is switched to the operation mode designated with written data.
The switchable modes and set values are as shown in the following.

Table 3.9. Switchable operation mode list

Operation mode	Written data Set value
Automatic operation mode	1
Single block mode	2
Servo OFF mode	5
Network operation mode	7

Parameter setting (0029h)

The set value of the parameter designated with the parameter number (RWwn+5) is rewritten to the value of written data.
Written data are integer values only.
As for a parameter with a decimal value, set a value multiplied by 100 or 10,000.
For details, refer to the “Parameter list” on page 3-6.

Point table initialization (0030h)

Point tables designated with written data are initialized.
When the written data are 999, all point tables including shared tables are initialized.
The value after initialization is as shown in the following.

Table 3.10. Point tables after initialization

Type	Instruction	Movement unit	Movement speed unit	A code/P code	F code
Shared table	Absolute	x 1,000 [deg.]	x 1,000 [rpm]	-	-
Table number 0 to 63	Shared table	Shared table	Shared table	0	2,000

Parameter initialization (0031h)

The set values of all parameters are initialized.
Parameter 61 (station number and baud rate setting) is not targeted.

Table 3.11. Parameter list [*1]

PRM number	Name	Set range	Initial value	Unit
1	Cam curve	1~5	1	-
2	Acceleration/Deceleration time of MC2 curve	1~5,000	100	x 100 [sec]
3	Home position offset amount	-2,097,152~2,097,151	0	[Pulse]
4	Home positioning direction	1~3	1	-
5	Home positioning speed	100~2,000	200	x 100 [rpm]
6	Acceleration/Deceleration time of home positioning	10~200	100	x 100 [sec]
7	Home positioning stop	1, 2	2	-
8	Soft limit, Coordinate A (+ direction)	-99,999,998~99,999,999	99,999,999	[Pulse]
9	Soft limit, Coordinate B (− direction)	-99,999,999~99,999,998	-99,999,999	[Pulse]
10	Effective/Ineffective of soft limit	1, 2	2	-
11	No answer time	1 to 100, 999	999	[sec]
12	Necessity/Unnecessity of M answer	1, 2	2	-
13	Answer input at time of positioning and home positioning completion	1, 2	2	-
14	Jog speed	1~10,000	200	x 100 [rpm]
15	Jog acceleration/deceleration time	10~200	100	x 100 [sec]
16	In-position range	1~80,000	15,000	[Pulse]
17	Number of times of in-position sampling	1~2,000	1	[Times]
18	Position deviation amount	Cannot be set	-	[Pulse]
19	Upper limit value of position deviation amount	1~4,194,304	30,000	[Pulse]
20	Speed over limit	1~37,749	37,749	[rpm]
21	Deceleration rate during emergency stop	1 to 1,396, 9,999	9,999	[Pulse/2 msec^2]
22	Delay time of emergency stop servo OFF	0~2,000	1,000	[msec]
23	Emergency stop input	1~3	3	-
24	Actuator temperature increase	Cannot be set	-	x 100 [°C]
25	Upper limit value of actuator temperature	Cannot be set	7,000	x 100 [°C]
27	Delay time after brake output	0~1,000	100	[msec]
28	Initial state of brake	1, 2	2	-
29	Mode when power is turned ON	1, 2, 6, 7	1	-
33	Indexing-in-progress output 1	0~99	0	[%]
34	Indexing-in-progress output 2	0~99	0	[%]
36	Switching of I/O program number selection method	1~5	1	-
37	Segment position range width of designation of indexes	1~2,097,152	10,000	[Pulse]
38	Rotation direction at time of designation of indexes	1~4	3	-
39	Torque limitation	1~100	100	[%]
45	Coordinate recognition range when power is turned ON	0~4,194,303	2,097,151	[Pulse]
46	Home position output range	0~80,000	15,000	[Pulse]
47	Positioning completion output time	0~1,000	100	[msec]
48	Alarm deceleration stop	1, 2	2	-
51	In-position signal output mode	0, 1	0	-
52	I/O input signal, Function selection of CN3-14 (bit 9)	0, 1	0	-
53	I/O input signal, Function selection of CN3-15 (bit 10)	0, 1	0	-
54	I/O input signal, Function selection of CN3-16 (bit 11)	0, 1	0	-
56	I/O output signal, Function selection of CN3-46 (bit 13)	0, 1	0	-
57	I/O output signal, Function selection of CN3-47 (bit 14)	0, 1	0	-
62	Cut OFF frequency of low-pass filter 1	1,000~100,000	20,000	x 100 [Hz]
63	Cut OFF frequency of low-pass filter 2	1,000~100,000	50,000	x 100 [Hz]
64	Cut OFF frequency of notch filter 1	1,000~100,000	50,000	x 100 [Hz]
65	Cut OFF frequency of notch filter 2	1,000~100,000	50,000	x 100 [Hz]
66	Filter switch	0~15	1	-
67	Integration limiter	1~4,194,304	770,000	[Pulse]
70	Value Q for notch filter 1	10~990	100	x 100 [–]
71	Value Q for notch filter 2	10~990	100	x 100 [–]
72	Integration gain magnification	10~1,000	100	x 100 [–]
80	Integration gain	0~320,000	0	x 10,000 [–]
81	Proportion gain	0~5,120,000	0	x 10,000 [–]
82	Differentiation gain	0~20,480,000	0	x 10,000 [–]
83	Auto tuning command	1~32	0	-
87	Auto tuning torque	0~8,192	1,000	-
88	Auto tuning measurement start speed	0~8,000	800	[Pulse/msec]
89	Auto tuning measurement completion speed	0~8,000	5,500	[Pulse/msec]

Note *1: Refer to the “AX Series TS, TH, XS Type manual” (SMF-2006) for the function of each parameter.

3.3. Data Communication Timing Chart

3.3.1. Monitor code

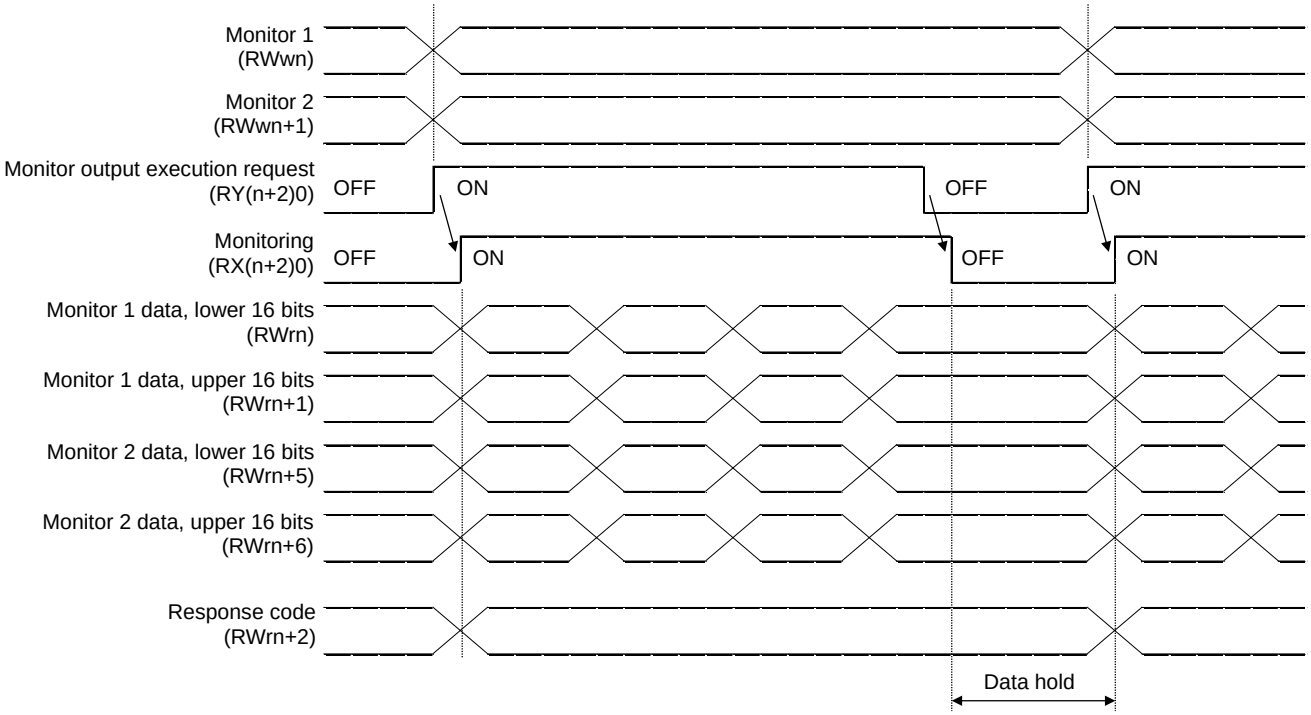


Fig. 3.1. Timing chart for monitor code execution

Enter monitor 1 (RWwn) and monitor 2 (RWwn+1) as monitor codes and turn the monitor output execution request (RY (n+2) 0) on.
Obtained 32-bit data pieces are divided into the upper 16 bits and lower 16 bits when they are stored in remote registers.
All data is in hexadecimals. At the time, the monitoring signal (RX (n+2) 0) is turned on simultaneously.

Monitor data 1, lower 16 bits (RWrn): Lower 16 bits of data requested with monitor 1 (RWwn)
Monitor data 1, upper 16 bits (RWrn+1): Upper 16 bits of data requested with monitor 1 (RWwn)
Monitor data 2, lower 16 bits (RWrn+5): Lower 16 bits of data requested with monitor 2 (RWwn+1)
Monitor data 2, upper 16 bits (RWrn+6): Upper 16 bits of data requested with monitor 2 (RWwn+1)

If there is no data at RWrn+1 and RWrn+6, the sign is acquired.
The sign is "0000" in case of "+" while it is "FFFF" in case of "-."
The monitor data acquired in remote registers are always updated while the monitoring signal (RS (n+2) 0) remains turned on.
If the monitoring signal (RX (n+2) 0) is turned off, monitor data RWrn, RWrn+1, RWrn+5 and RWrn+6 is held.
If a monitor code not included in specifications is either monitor 1 (RWwn) or monitor 2 (RWwn+1), an error code (□□□1) is set in the response code.

3.3.2. Command code

i) Load command code (0000h to 0010h)

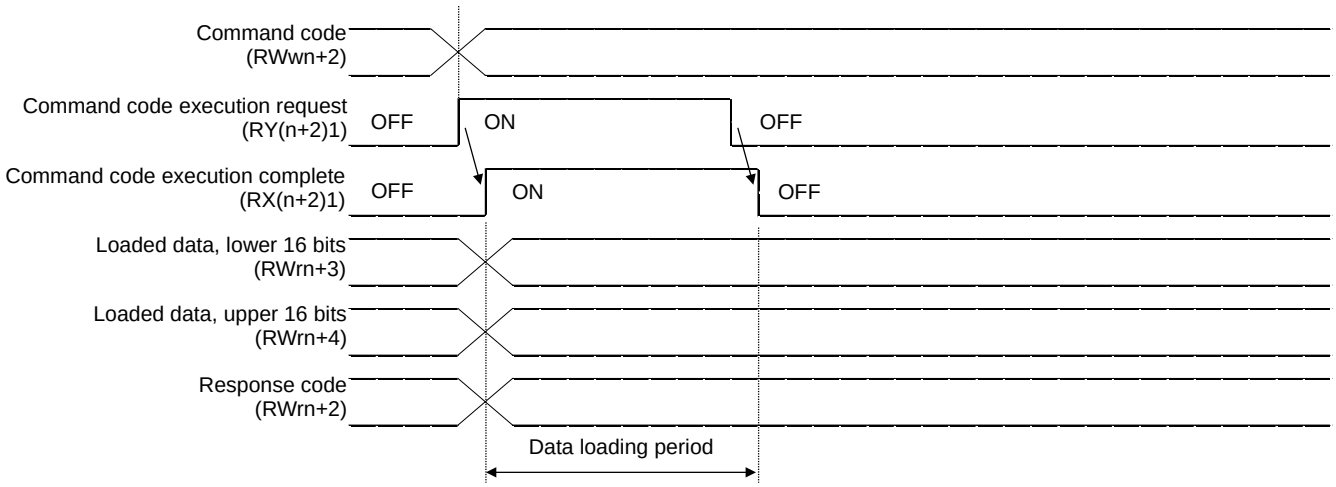


Fig. 3.2. Timing chart for load command code execution

Enter the load command code as command code (RWwn+2), enter the parameter number as necessary and turn the command code execution request (RY (n+2) 1) on to acquire the data corresponding to the specified loading code in load data (RWrn+3, RWrn+4).
Obtained 32-bit data pieces are divided into the upper 16 bits and lower 16 bits when they are stored in remote registers.
All data is in hexadecimals. At the time, command code execution completion (RX (n+2) 1) is turned on simultaneously. Load data from (RWrn+3, RWrn+4) while the command code execution request (RN (n+2) 1) remains turned on. The data is held until the next load command code is entered and the command code execution request (RY (n+2) 1) is turned on.
If a command code not included in specifications is set as a command code (RWwn+2), an error code (□□1□) is set in the response code. If a parameter that cannot be used is loaded, an error (□□2□) is set.
Turn the command code execution request (RY (n+2) 1) off after data loading is finished.

ii) Writing command code

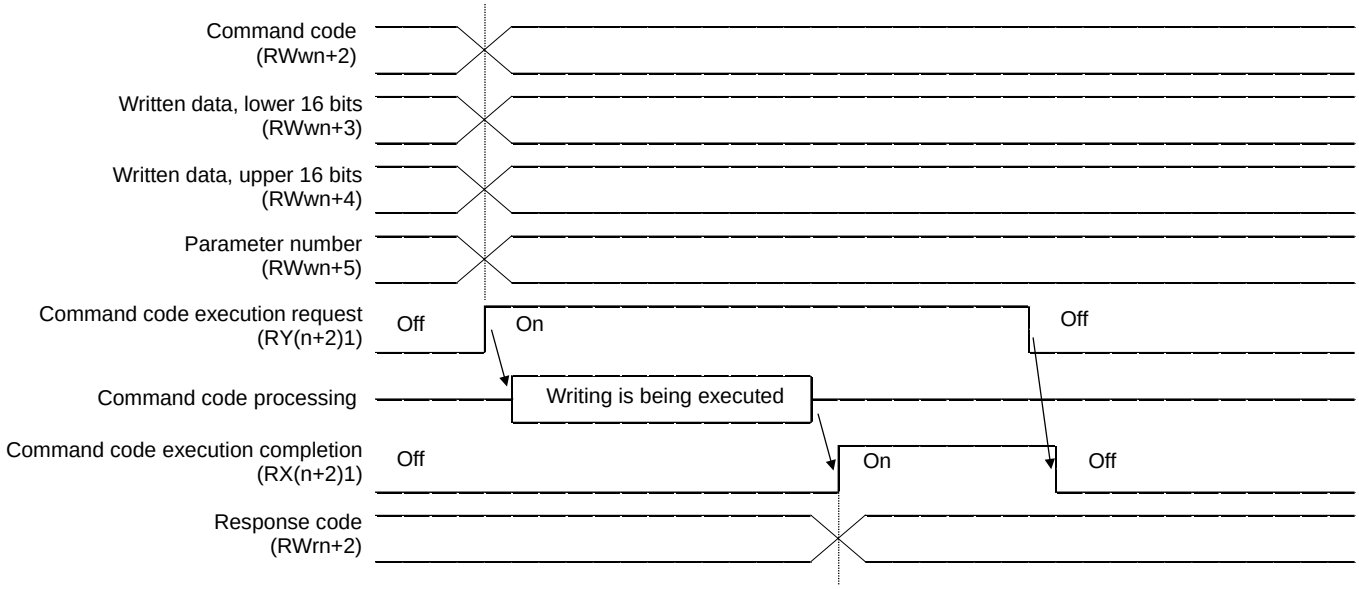


Fig. 3.3. Timing chart for writing command code execution

Set the writing command code as a command code (RWwn+2) and set the written data as written data (RWwn+3 and RWwn+4) and, as necessary, a parameter number (RWwn+5).
Turn on the command code execution request (RY (n+2) 1) and write into data designated with the command code.
Written 32-bit data pieces are divided into the upper 16 bits and lower 16 bits when they are stored in remote registers.
All data is in hexadecimals. At this time, after writing, the command code execution completion (RX (n+2) 1) is turned on.
If a command code not included in specifications is set as a command code (RWwn+2), an error code (□□1□) is set in the response code. If a user tries to write into a parameter that cannot be set by parameter setting, an error code (□□2□) is set. If a user tries to write an excessive value, an error code (□□3□) is set.
If the writing command code is executed during the processing of the communication command input into CN1, an error code (□□4□) is set.
Turn the command code execution request (RY (n+2) 1) off after the command code execution completion (RX (n+2) 1) is turned on.

3.3.3. Response code

If the monitor code or command code specified in the remote register is out of the allowable setting range, an error code is specified as a response code (RWrn+2). If they are normal, "0000" is set.

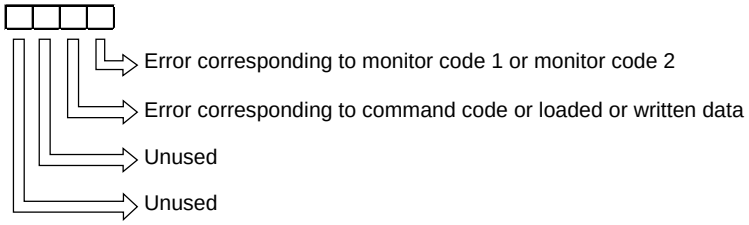


Fig. 3.4. Description of error of response code

3.4. Defining the CC-Link Register

Enter the station number and baud rate using AX Tools Ver 2.10 or later.
The default station number is 1 and the default baud rate is 4 (10 Mbps).

i) CC-Link setting screen
Select "Setting" - "CC-Link" from the menu of the AX Tools to open the "CC-Link Setting Register" screen.

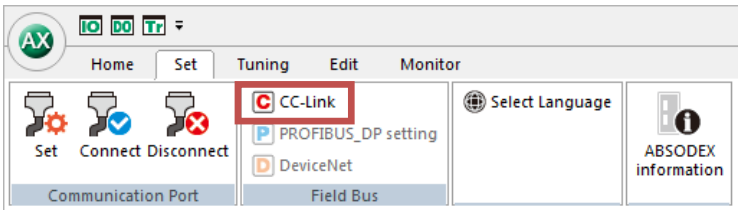


Fig. 3.5. Setting menu of AX Tools

ii) CC-Link setting register
Check that a value is displayed on the CC-Link register setting and select “Setting (ABSODEX)”.

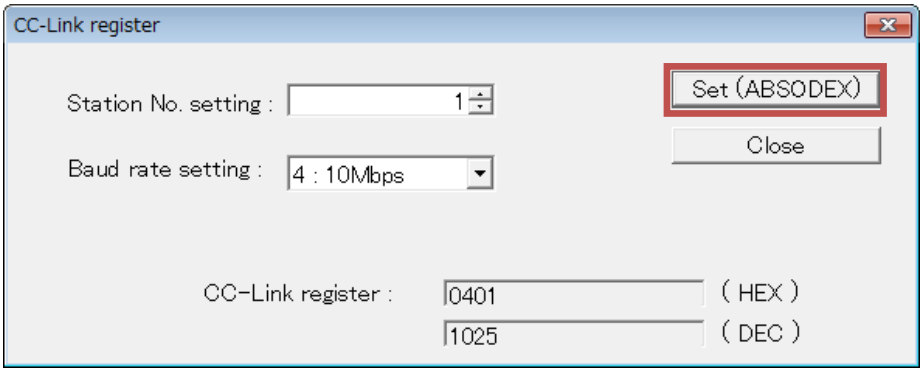


Fig. 3.6. Setting screen of CC-Link register

<Station number setting>
The current station number setting is displayed. The current station number setting is displayed.

<Baud rate setting>
The current baud rate setting is displayed.
Select the desired one among 0 (156kbps), 1 (625kbps), 2 (2.5Mbps), 3 (5Mbps) and 4 (10Mbps).

<CC-Link register setting>
The specified values of the station number and baud rate registers are displayed.

<Setting (ABSODEX)>
Click on this button to transfer new data to the register of ABSODEX.

<Close>
Click on this button to close the screen.

iii) End of setting
After the settings are normally entered, a completion screen is displayed.
Shutdown and restart the power after finishing configuration.
Settings for station No. and baud rate will take effect after the power has been restarted.

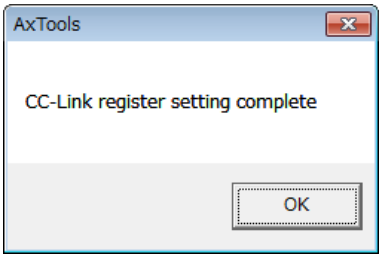


Fig. 3.7. Screen for end of setting

iv) Error in setting
The following screen is displayed if there is an error in the station number setting.

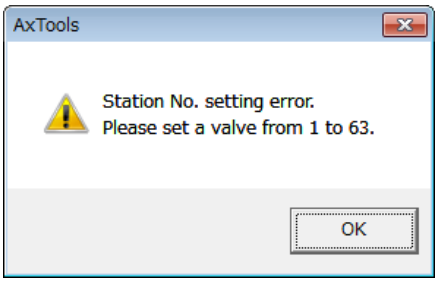


Fig. 3.8. Warning screen at time of error setting of station number

If the system is initialized, CC-Link register settings will return to default settings. Set the CC-Link register setting again after initializing the system.

3.5. Connection with CC-Link Unit

The connection method in the PLC setting software manufactured by the Mitsubishi Electric Corporation is explained.
The ABSODEX driver is based on the premise that the station number is 1.

i) Display of network parameter CC-Link

After a new project is created, a project tree on the navigation window is displayed.
Select “Parameter” - “Network parameter” - “CC Link”.

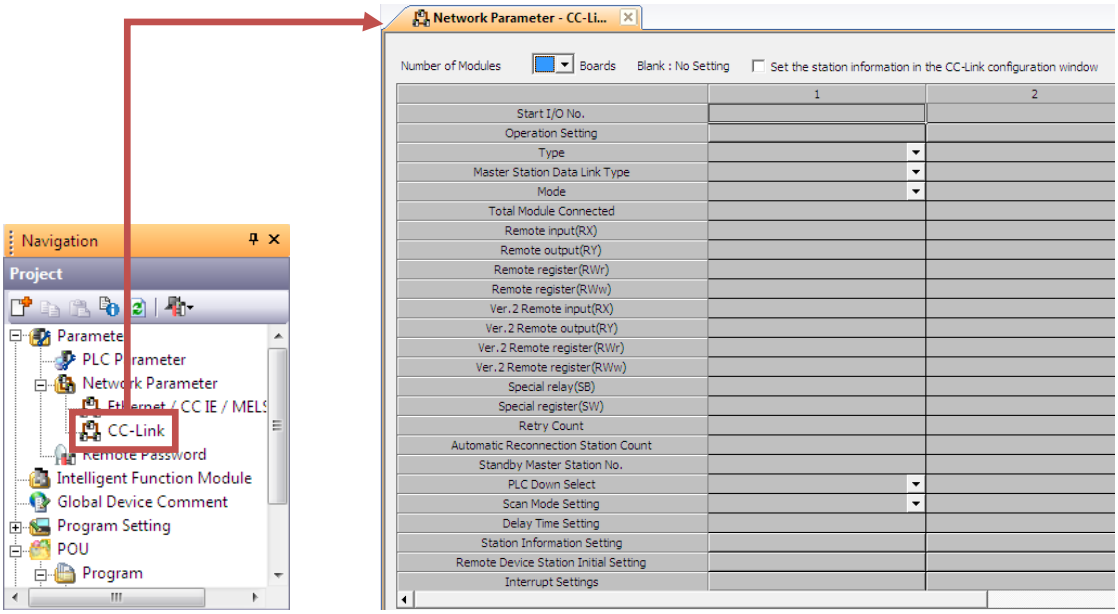
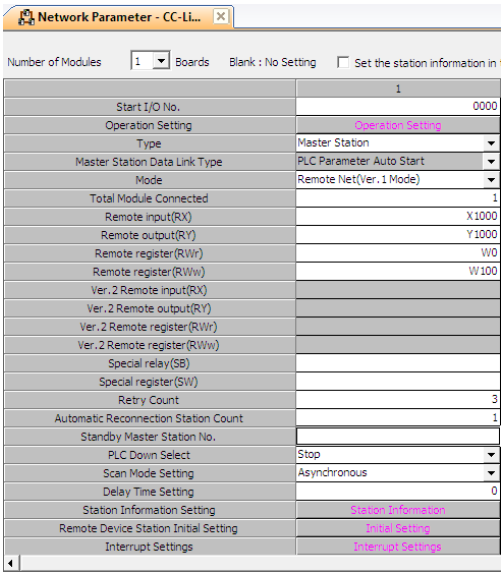


Fig. 3.9. Screen for network parameter

ii) Setting example of network parameter CC-Link

The following shows a network parameter setting example.



- Mode setting
  “Remote net-Ver. 1 mode”
- Remote input (RX)
  “X1000”
- Remote output (RY)
  “Y1000”
- Remote register (RWr)
  “W0”
- Remote register (RWw)
  “W100”

Initial value or arbitrary value in other cases

Fig. 3.10. Setting example of network parameter

iii) Setting of CC-Link station information

ABSODEX: Remote device station, 2 stations occupied.
At this time, if the station number is not 1, the corresponding station number should be the similar setting.

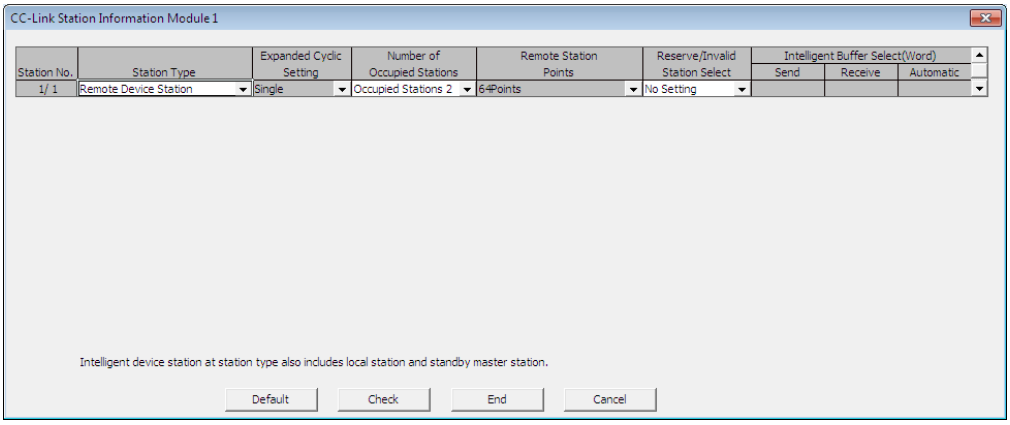


Fig. 3.11. Setting of remote device station

iv) Check of device

If the remote input (RX) is set as “X1000”, ABSODEX is station number 1, so RXn0: M code output (bit 0) corresponds to X1000.
Remaining output signals correspond in order for example, RXn1 = X1001, RXn2 = X1002, ...

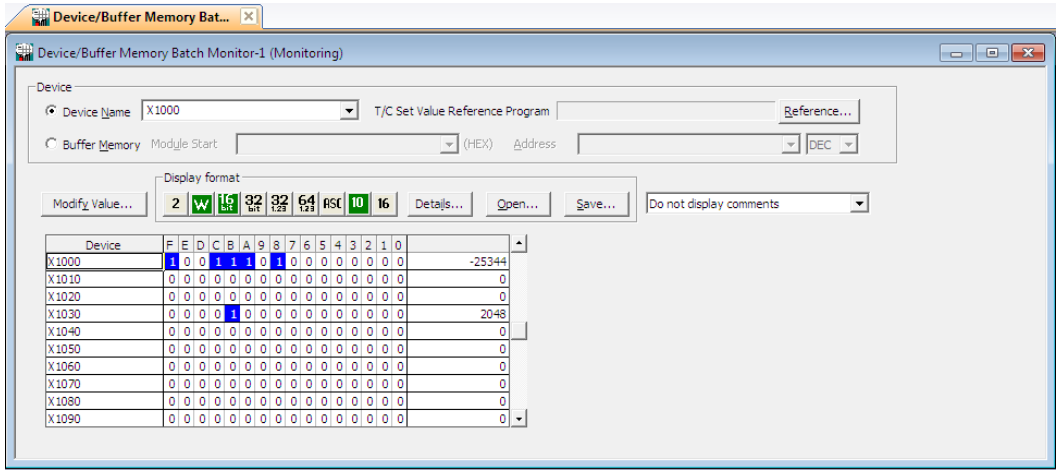


Fig. 3.12 Screen example of device monitor

Other devices are as shown in the following.

- Remote output (RY) Y1000 is RYn0: Program number selection input (bit 0)
- Remote register (RWr) W0 is RWrn: Monitor 1 data, lower 16 bits
- Remote register (RWw) W100 is RWwn: Monitor 1

In the case of Remote input (RX): X1000, Station number of ABSODEX: 2 and Number of stations occupied of station number 1: 1, X1010 corresponds to RXn0. In other words,

Set address of unit + Number of stations occupied before ABSODEX x 16

This value is the beginning address of ABSODEX.

v) Check of network connection

Whether the communication is normal can be checked using the following method.
If there is no error in “Diagnosis” - “CC-Link/CC-Link/LT diagnosis” in the menu, “Diagnosis result | System is normal” is displayed.

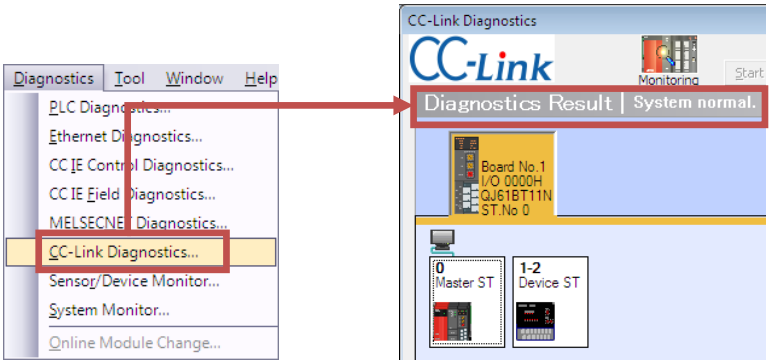


Fig. 3.13. Network diagnosis (normal)

If there is an error, “Diagnosis result | × error * cases” is displayed.

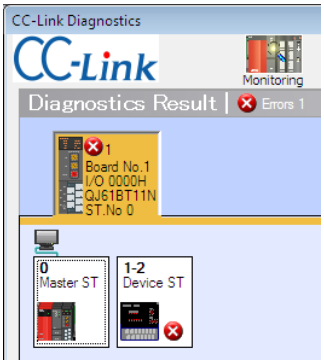


Fig. 3.14. Network diagnosis (abnormal)

3.6. Monitoring the CC-Link Communication State

The communication state can be monitored using AX Tools Ver 2.10 or later.

i) I/O view

Select “Monitor” - “I/O signal state indication” from the menu of the AX Tools to display the screen for “I/O indication”.

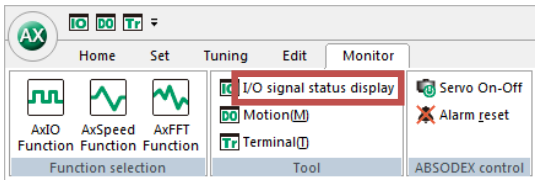


Fig. 3.15. AX Tools monitor menu

ii) Check of I/O

The I/O state by CC-Link communication can be monitored.

“*” shows negative logic, thus, the I/O indication will indicate ON when it is open.

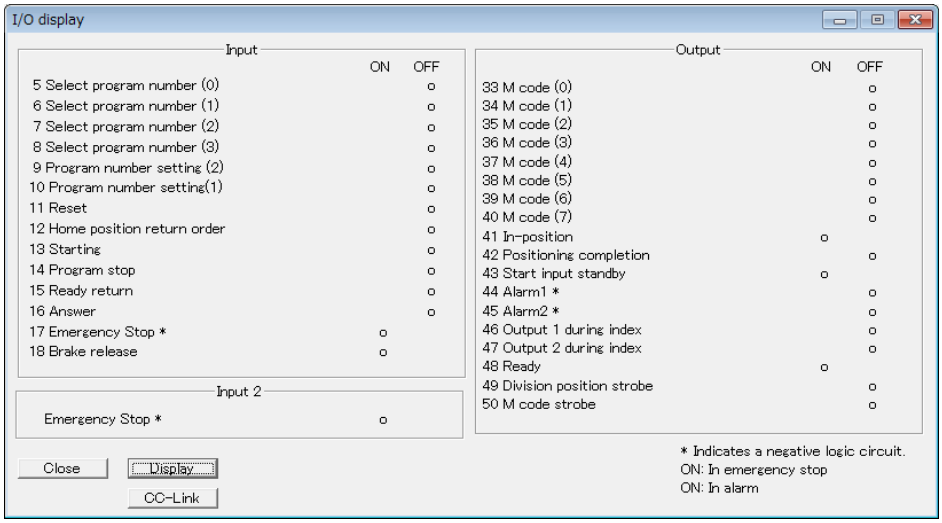


Fig. 3.16. Screen example of I/O indication

iii) CC-Link monitor

Communication error information can be checked by selecting “CC-Link” at the lower part of “I/O indication”.

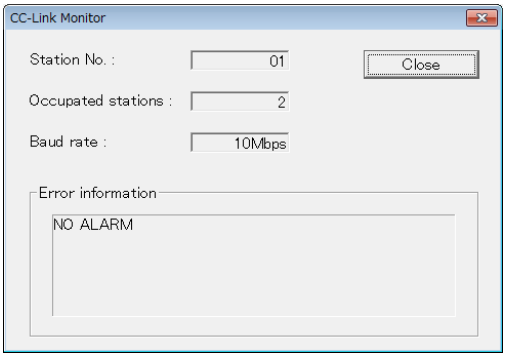


Fig. 3.17. Screen example of CC-Link monitor

3.7. LED Indication

The state of the module and that of the network can be displayed. See the description in the following table for the LED indication.

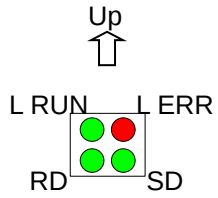


Fig. 3.18. Name of LED

Table 3.12. LED specification list

Name of LED	Color	Description of indication
SD	Green	Lit during data transmission.
RD		Lit during data reception.
L RUN		Lit when the slave station is receiving normal data from the master station.
		Unlit upon time-over.
L ERR	Red	Unlit during normal communication. (L RUN is lit.)
		Lit upon a transmission error (CRC error). Lit upon an error in the station number setting or transmission speed setting.
		ERR blinks when the station number setting or transmission speed setting is changed in the middle.
		Unlit upon time-over.

Table 3.13. LED state list

LRUN	LERR	SD	RD	Operation
○	◎	◎	○	CRC errors are sometimes caused in spite of normal updates.
○	0.4s◎	◎	○	The baud rate or station number setting is changed from the power-on setting.
○	◎	●	○	Cannot respond due to a CRC error in the reception data.
○	●	◎	○	Normal communication
○	●	●	○	No data arrives at the own station.
●	◎	◎	○	Response to polling is made though the refreshment reception is in a CRC error.
●	◎	●	○	CRC error in data destined to own station
●	●	◎	○	Link start is not made.
●	●	●	○	There is no data destined to the own station or reception is disabled.
●	●	●	●	Data reception is disabled. In shutdown or H/W resetting.
●	○	○	○/●	Incorrect baud rate or station number setting

○: Lit, ●: Unlit, ◎: Blink

The blinking rate of SD is too quick that you may feel that the LED is continuously lit in the communication state.

3.8. 7-segment LED Indication

A station number is indicated on the 7-segment LED. The flow after the power is turned on is as shown in the following.

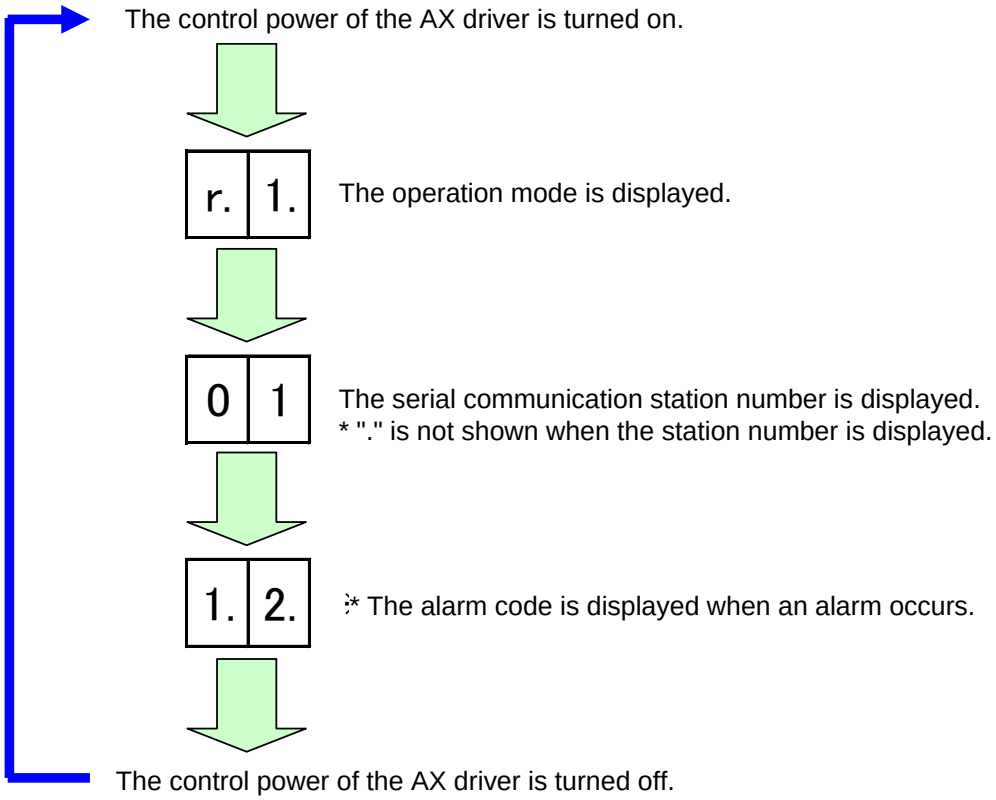


Fig. 3.19. 7-segment LED indication specifications

--- MEMO ---

4. Network Operation Mode

The network operation mode is an operation mode which can be used for wiring saving specification-U2 (CC-Link).

4.1. Point Table Operation

The point table operation use point table data in the ABSODEX driver to operate.
As for point table data, point table data can be referred to and set from the PLC.

4.1.1. Operation method

i) Set a point table.
Set it using AX Tools Ver 2.10 or later or a command code.
A command code can be used only in the network operation mode.

ii) Operation mode switching
Switch the operation mode to the “network operation mode”.
The switching method can be performed by any of the following.
- Send communication command “M7”.
- Set PRM29 (mode when power is turned on) = 7 and restart the control power.
- Switch using a command code (0021h).

iii) Switch to a table operation.
Turn off the table operation and data input operation switching input (RY (n+1) 3).
OFF : Table operation
ON : Data input operation

iv) Selection of point table
For selection, use a program number selection input (RYn0 to RYn5).
The selection method is a method set in PRM36 (switching of I/O program number selection method). The selection range of a point table is 0 to 63.

v) Start of point table
Execute the point table being selected by turning on the start input.

4.1.2. Point table data

In the point tables, there are data of shared tables and tables 0 to 63.
Respective data can load and write values with communication codes and command codes from the PLC as with parameters.

Table 4.1. Point table data list (1/2)

Table number	Corresponding PRM number	Description	Set range	Initial value
-	197	Instruction of shared table	1~6	1
		1: Absolute dimension (G90) 2: Full rotation absolute dimension (G90.1) 3: CW direction rotation absolute dimension (G90.2) 4: CCW direction rotation absolute dimension (G90.3) 5: Incremental dimension (G91) 6: Full rotation incremental dimension (G91.1)		
-	198	Movement unit of shared table	1~3	1
		1: Angle unit (G105) 2: Pulse unit (G104) 3: Index unit (G106)		
-	199	Movement speed unit of shared table	1~2	1
		1: Rotation speed (G10) 2: Time (G11)		
0	200	Instruction	0~11	0
		0: Instruction set to shared table 1: Absolute dimension (G90) 2: Full rotation absolute dimension (G90.1) 3: CW direction rotation absolute dimension (G90.2) 4: CCW direction rotation absolute dimension (G90.3) 5: Incremental dimension (G91) 6: Full rotation incremental dimension (G91.1) 7: Home positioning (G28) 8: Designation of number of segments (G101) 9: Change of magnification of gain (G12) 10: Brake activation (M68) 11: Brake release (M69)		
	201	Movement unit	0~3	0
		0: Movement unit set to shared table 1: Angle unit (G105) 2: Pulse unit (G104) 3: Index unit (G106)		
	202	Movement speed unit	0~2	0
		0: Movement speed unit set to shared table 1: Rotation speed (G10) 2: Time (G11)		

Table 4.1. Point table data list (2/2)

Table number	Corresponding PRM number	Description	Set range	Initial value
0	203	A code/P code	-4,194,304~ 4,194,304	0
		Set the set values (values equivalent to A code and P code of NC program) such as the angle depending on the descriptions of the instruction and movement unit within the following range. In case of angle :-360,000~360,000 x 1,000 [deg.] In case of pulse :-4,194,304~4,194,304 [Pulse] In case of number of indexes and segments :1~255 [Number of indexes and segments] In case of gain magnification : 0, 50 to 200 [%]		
	204	F code *1	10~240,000	2,000
		Set the set values (values equivalent to F code of NC program) such as the rotation speed depending on the descriptions of the instruction and movement speed unit within the following range. In case of rotation speed :110~240,000 x 1,000 [rpm] In case of time :10~100,000 x 1,000 [sec]		
n (1~63)	200 + 5 x n	Instruction	0~11	0
		Refer to the explanation of the instruction of table 0.		
	201 + 5 x n	Movement unit	0~3	0
		Refer to the explanation of the movement unit of table 0.		
	202 + 5 x n	Movement speed unit	0~2	0
		Refer to the explanation of the movement speed unit of table 0.		
	203 + 5 x n	A code/P code	-4,194,304 ~4,194,304	0
		Refer to the explanation of the A code/P code of table 0.		
	204 + 5 x n	F code	10~240,000	2,000
		Refer to the explanation of the F code of table 0.		

Note *1: In the NC program, the initial value of the movement speed unit is the movement time [sec]. In the point table, the initial value is the rotation speed [rpm].

One table consists of five items, “Instruction”, “Movement unit”, “Movement speed unit”, “A code/P code” and “F code”. Required items vary depending on the description of the instruction.

Table 4.2. Network operation mode instruction combination list

Instruction	Movement unit	Movement speed unit	A code /P code	F code
Absolute (G90)	○	○	○	○
Full rotation absolute (G90.1)	○	○	○	○
CW direction absolute (G90.2)	○	○	○	○
CCW direction absolute (G90.3)	○	○	○	○
Incremental (G91)	○	○	○	○
Full rotation incremental (G91.1)	○	○	○	○
Home positioning (G28)	×	×	×	×
Designation of number of segments (G101)	×	×	○	×
Change of magnification of gain (G12)	×	×	○	×
Brake activation (M68)	×	×	×	×
Brake release (M69)	×	×	×	×

4.1.3 Point table setting example

- Turning operation using shared table

Table 4.3. NC program, Operation instruction equivalent to G90G105G11A90F3

Table	Description	Set value	Operation
Shared table	Instruction	1	Absolute dimension
	Movement unit	1	Angle unit
	Movement speed unit	2	Time
n	Instruction	0	Moves to 90 degrees of the absolute coordinate in 3 sec (the absolute, angle unit and speed unit set to the shared table are used).
	Movement unit	0	
	Movement speed unit	0	
	A code /P code	90,000	
	F code	3,000	

When the set values of the instruction, movement unit and movement speed unit of tables 0 to 63 are 0 (initial value), the setting set to the shared table is used. In this case, the operation descriptions of tables 0 to 63 can be changed only by changing the set values of the shared table.
If you want to execute an operation different from the shared table, set the set values of the instruction, movement unit and movement speed unit of tables 0 to 63 to values other than 0.

- Operation not using shared table

Table 4.4. NC program, Operation instruction equivalent to G91G104G11A-50,000F1

Table	Description	Set value	Operation
Shared table	Instruction	1	Absolute dimension
	Movement unit	1	Angle unit
	Movement speed unit	1	Rotation speed
n	Instruction	5	Moves to the position of −50,000 pulses from the current position in 1 sec (the instruction, movement unit and speed unit different from the shared table are used).
	Movement unit	2	
	Movement speed unit	2	
	A code /P code	-50,000	
	F code	1,000	

- Home positioning

Table 4.5. NC program, Operation instruction equivalent to G28

Table	Description	Set value	Operation
n	Instruction	7	Home positioning
	Movement unit	-	Set values are ignored. Hereinafter written as “-“.
	Movement speed unit	-	
	A code /P code	-	
	F code	-	

- Designation of number of segments

Table 4.6. NC program, Operation instruction equivalent to G101A4

Table	Description	Set value	Operation
n	Instruction	8	Designation of number of segments
	Movement unit	-	-
	Movement speed unit	-	
	A code /P code	4	Number of segments 4
	F code	-	-

- Change of magnification of gain

Table 4.7. NC program, Operation instruction equivalent to G12P0

Table	Description	Set value	Operation
n	Instruction	9	Change of magnification of gain
	Movement unit	-	-
	Movement speed unit	-	
	A code /P code	0	0%
	F code	-	-

- Brake activation

Table 4.8. NC program, Operation instruction equivalent to M68

Table	Description	Set value	Operation
n	Instruction	10	Brake activation
	Movement unit	-	-
	Movement speed unit	-	
	A code /P code	-	
	F code	-	

- Brake release

Table 4.9. NC program, Operation instruction equivalent to M69

Table	Description	Set value	Operation
n	Instruction	11	Brake release
	Movement unit	-	-
	Movement speed unit	-	
	A code /P code	-	
	F code	-	

4.2. Data Input Operation

In a data input operation, ABSODEX is operated using reception data from the PLC. Consequently, the operation description of ABSODEX can be changed only by changing the communication data from the PLC.

4.2.1. Operation method

i) Switch the operation mode.
Switch the operation mode to the “network operation mode”.
The switching method can be performed by any of the following.
- Send communication command “M7”.
- Set PRM29 (mode when power is turned on) = 7 and restart the control power.
- Switch using a command code (0021h).

ii) Switch to a table operation.
Turn on the table operation and data input operation switching input (RY (n+1) 3).
OFF : Table operation
ON : Data input operation

iii) Setting of operation description
Set the instruction, movement unit and movement speed unit.
Then send values equivalent to the A code/P code and F code.

iv) Start by data input operation
The operation description set in iii) is executed by turning on the start input.

4.2.2. Input data

Table 4.10. Instruction list

Set value				Description
RYn3	RYn2	RYn1	RYn0	
0	0	0	0	Absolute dimension (G90)
0	0	0	1	Full rotation absolute dimension (G90.1)
0	0	1	0	CW direction rotation absolute dimension (G90.2)
0	0	1	1	CCW direction rotation absolute dimension (G90.3)
0	1	0	0	Incremental dimension (G91)
0	1	0	1	Full rotation incremental dimension (G91.1)
0	1	1	0	Home positioning (G28)
0	1	1	1	Designation of number of segments (G101)
1	0	0	0	Change of magnification of gain (G12)
1	0	0	1	Brake activation (M68)
1	0	1	0	Brake release (M69)

Table 4.11. Movement unit list

Set value		Description
RY(n+1)1	RY(n+1)0	
0	0	Angle unit (G105)
0	1	Pulse unit (G104)
1	0	Index unit (G106)

Table 4.12. Movement speed unit

Set value	Description
RY(n+1)2	
0	Rotation speed (G10)
1	Time (G11)

Table 4.13. A code/P code list

Set value		Description
RWwn+4	RWwn+3	
Upper 16 bits	Lower 16 bits	In case of angle :-360,000~360,000 x 1,000 [deg.] In case of pulse :-4,194,304~4,194,304[Pulse] In case of number of indexes and segments :1~255 [Number of indexes and segments] In case of gain magnification : 0, 50 to 200 [%]

Table 4.14. F code list

Set value RWwn+5	Description	
16bit	In case of rotation speed	11~24,000 x 100 [rpm]
	In case of time	10~30,000 x 1,000 [sec]

In input data used for a data input operation, there are five items, “Instruction”, “Movement unit”, “Movement speed unit”, “A code/P code” and “F code”.
Required input data items vary depending on the description of the instruction. For details, refer to “Network Operation Mode, Instruction Combination List” on page 4-4.

4.2.3. Input data setting examples

- Moves 90 degrees from the current position in the CW direction in 1 sec.

Table 4.15. NC program, Operation instruction equivalent to G91.1G105G11A90F1

Device No. /Address No.	Set value	Description
RYn0	1	Full rotation incremental dimension (G91.1)
RYn1	0	
RYn2	1	
RYn3	0	
RY(n+1)0	0	Angle unit (G105)
RY(n+1)1	0	
RY(n+1)2	1	Time (G11)
RWwn+3	5F90h	0001 5F90h = 90,000 (unit: x 1,000 [deg.]) = 90 degrees
RWwn+4	0001h	
RWwn+5	03E8h	03E8h = 1,000 (unit: x 1,000 [sec]) = 1 sec

- Change the gain magnification to 100.

Table 4.16. NC program, Operation instruction equivalent to G12P100

Device No. /Address No.	Set value	Description
RYn0	0	Change of magnification of gain (G12)
RYn1	0	
RYn2	0	
RYn3	1	
RY(n+1)0	-	-
RY(n+1)1	-	
RY(n+1)2	-	
RWwn+3	0064h	0000 0064h = 100%
RWwn+4	0000h	
RWwn+5	-	-

--- MEMO ---