MITSUBISHI ELECTRIC

MDU Breaker
Programming Manual

MELSEC-Q Series Sequencer CC-Link Communication Version

Applicable models

250A Frame	NF250-SEV with MDU、NF250-HEV with MDU
400A Frame	NF400-SEW with MDU、NF400-HEW with MDU
800A Frame*	NF800-SEW with MDU、NF800-HEW with MDU

*The “800A Frame” circuit breaker includes specifications of 630A rating and 800A rating.

● The marks used mean the following.

⚠ Caution	In the event of incorrect handling, a dangerous situation may arise, a possibility of being subject to moderate injury or minor injury, or only physical damage may occur.
❗	Always follow instructions.

Please read the instruction manual for MDU breaker and sequencer for proper use safely before use.

・ MDU Breaker Operation Manual
・ CC-Link System Master / Local Module User's Manual type QJ61BT11
・ CC-Link System Master / Local Module User's Manual type QJ61BT11N

*The version of CC-Link is "CC-Link Ver. 1.10".

KGA120334-C

Introduction

Thank you very much for purchasing our MDU breaker.
Please read this manual before use and fully understand the functions and performance of the MDU breaker (hereinafter referred to as "MDU") for safe and proper operation.

Table of Contents

1. General Description

The MDU breaker (hereinafter referred to as "MDU") supports also the communication via the Control & Communication Link (hereinafter referred to as "CC-Link").
In order to monitor the measurement values and breaker information in the MDU or to configure each setting of the MDU from MELSEC-Q series sequencer (hereinafter referred to as "Q sequencer") with QJ61BT11N type CC-Link system master local unit or QJ61BT11 type CC-Link system master local unit, users need to create a sequence program appropriate for the intended purpose.
This manual explains the communication procedures, commands, and response to commands that are necessary when a user creates a sequence program appropriate for the intended purpose.
This manual is described based on the assumption that SWnD5C-GPPW (n = 4 or more) and GX Developer are used.
Before starting actual programming, please read the following reference manuals in addition to this manual.

Table 1.1 Reference manuals

Manual name	Manual No.
CC-Link System Master/Local Module User's Manual type QJ61BT11	SH-080016 (13JL91)
CC-Link System Master/Local Module User's Manual type QJ61BT11N	SH-080394E (13JR64)
Instruction Manualf for MDU Breaker	Included in the same package with the product

2. Overall configuration of the CC-Link system

The CC-Link system is currently offered in Ver. 2 and available in four modes depending on various systems. Table 2.1 shows the outline of each mode. In consideration of concurrent existence of the CC-Link system master local units of QJ61BT11N type and QJ61BT11 type, this programming manual is described based on the assumption of the use of the CC-Link system master local unit in the "Remote net Ver. 1 mode". The devices of the CC-Link system in the "Remote net Ver. 1 mode" include the remote I/O station, remote device station, local station, and intelligent device station. Up to total of 64 remote I/O stations, remote device stations, and local stations can be connected to one master station.
The MDU is a remote device station and a slave station supporting Ver. 1. (It can be connected also to the master local unit supporting Ver. 2 and used in the remote net Ver. 1 mode, remote net Ver. 2 mode, or remote net add mode).
As the condition for connection in the "Remote net Ver. 1 mode", it is necessary to satisfy the followings.

(1) $\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$
a: Number of units occupying one station (The MDU falls into this category.)
b: Number of units occupying two stations
c: Number of units occupying three stations
d: Number of units occupying four stations

(2) $\{(16 \times A) + (54 \times B) + (8C)\} \leq 2304$
A: Number of remote I/O stations ≤ 64 stations
B: Number of remote device stations (The MDU falls into this category.) ≤ 42 stations
C: Local station, intelligent device station ≤ 26 stations

The diagram below shows the overall system configuration in the "Remote net Ver. 1 mode".

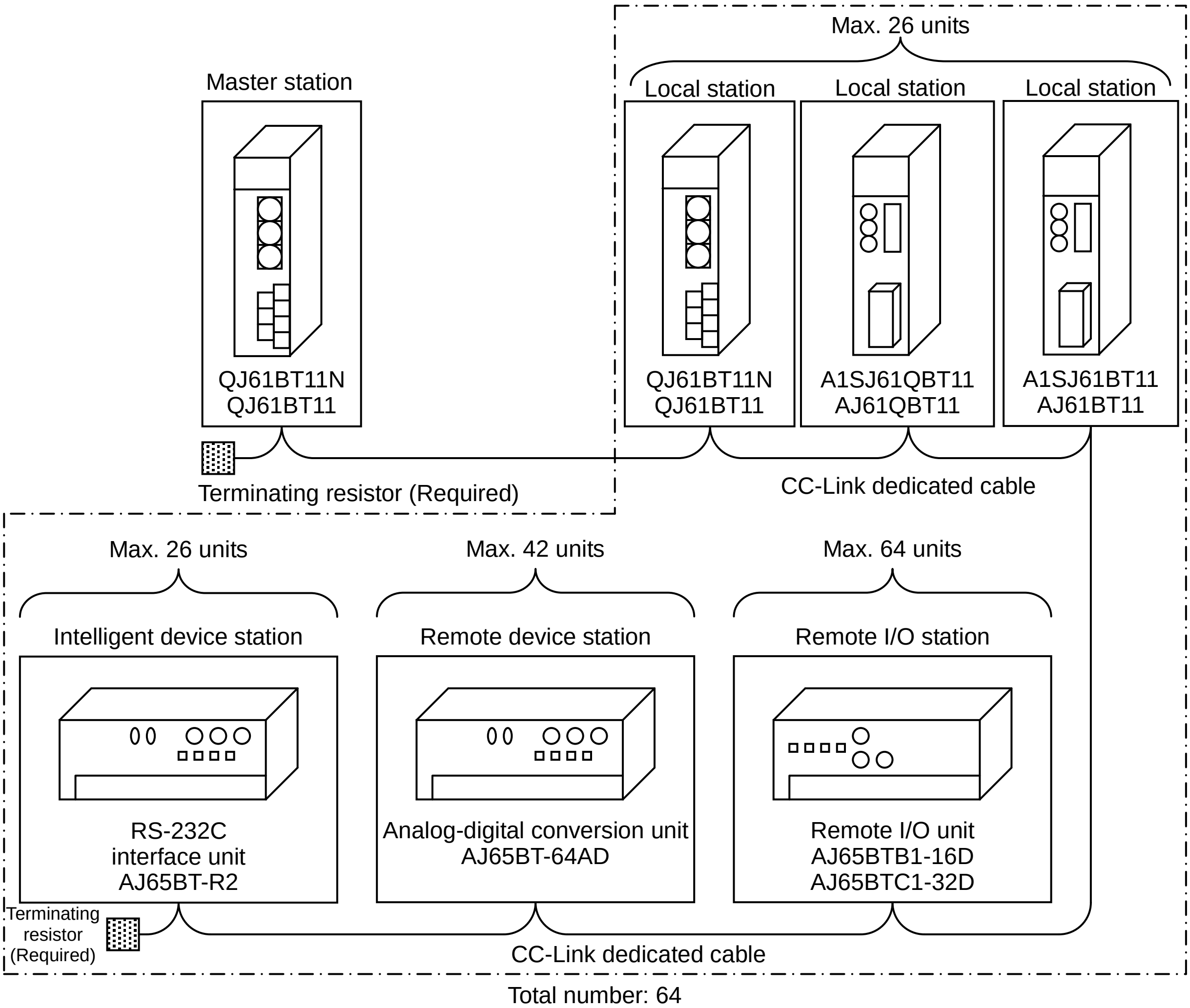


Fig. 2.1 Overall system configuration

Table 2.1 List of modes of CC-Link system

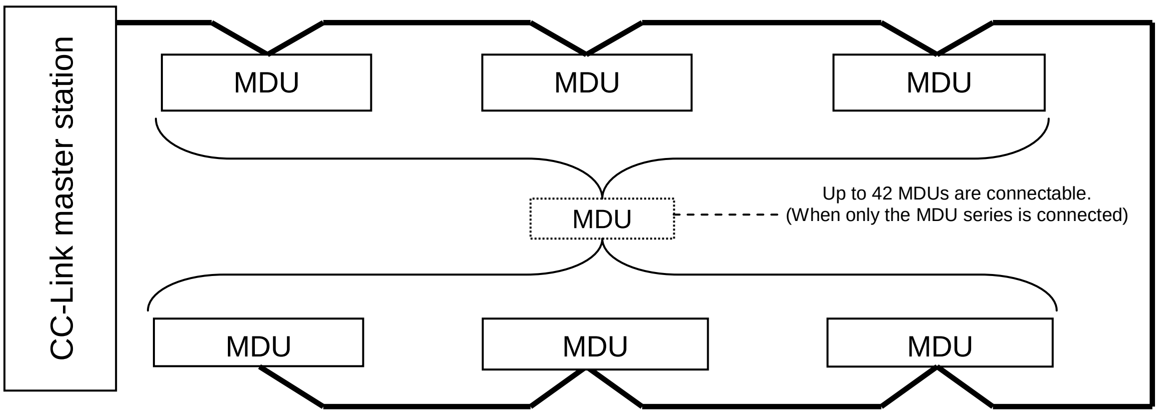
Mode	Connectable station	Overview
Remote net Ver. 1 mode	Remote I/O station Remote device station Intelligent device station Local station Standby master station	Mode fully compatible with the existing unit (QJ61BT11). This mode is selected when there is no need to increase the number of cyclic units or when the existing unit is replaced with QJ61BT11N as a spare unit.
Remote net Ver. 2 mode		This mode is selected when a new system is developed by increasing the number of cyclic units.
Remote net add mode		This mode is selected when a slave station supporting Ver. 2 is added to the existing system and the number of cyclic units is increased.
Remote I/O net mode	Remote I/O station	This mode is selected in the case of the system configuration comprised only of the master station and remote I/O station. The link scan time can be reduced since cyclic transmission is performed at a high speed.

3. CC-Link communication specifications of the MDU

Table 3.1 shows the CC-Link communication specifications of the MDU.

Table 3.1 CC-Link communication specifications of the MDU

Item	Description
Unit type	Remote device station
Number of occupied stations	One station
Number of connectable units	Max. 42 units (When only the remote device station occupying one station is connected)
Transmission speed	Select from 156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, and 10 Mbps.
Number of remote inputs/outputs	32 points each
Number of remote registers	4 points each

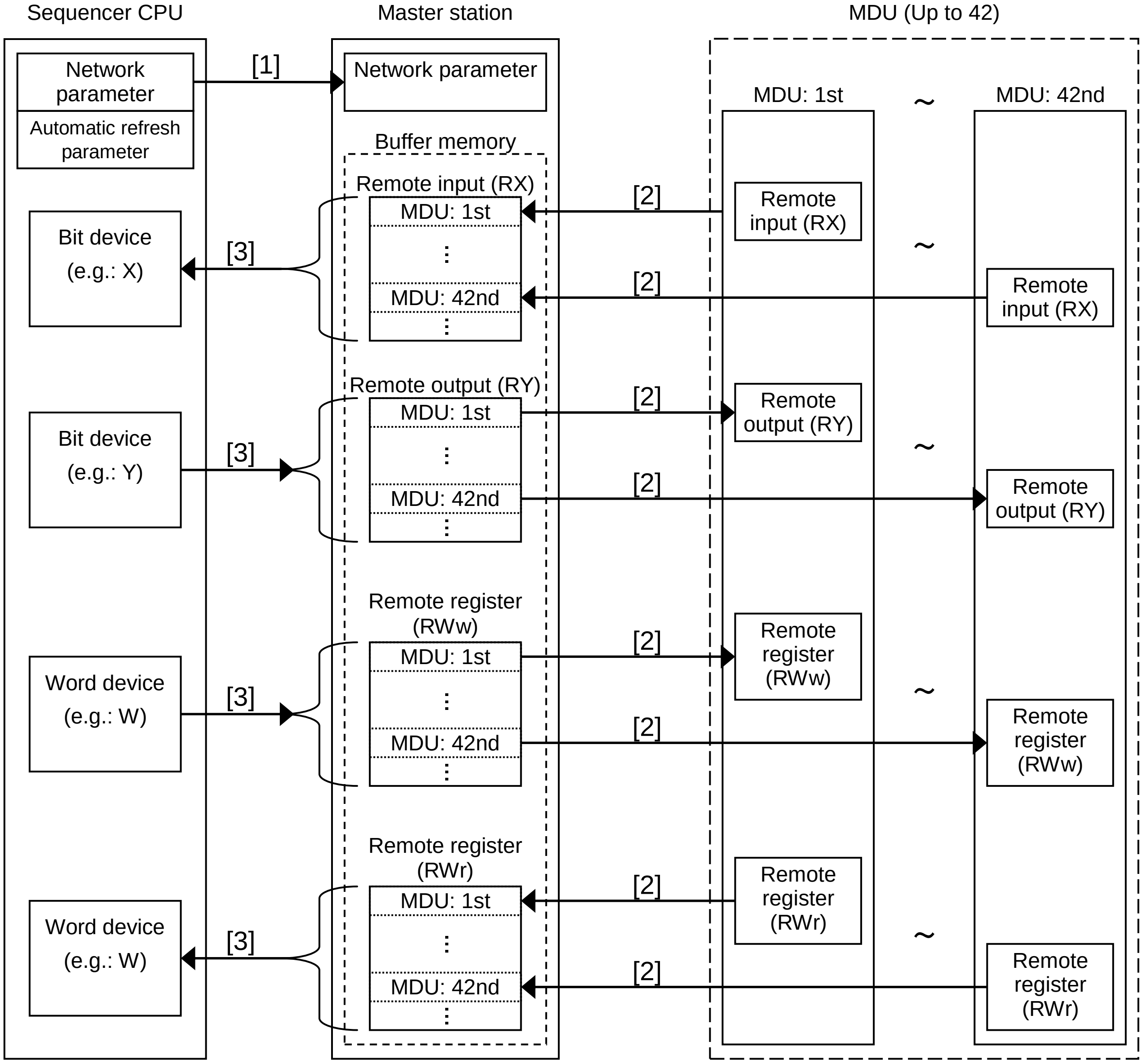


MDU series system configuration example (CC-Link)

4. Establishment of communication between the sequencer CPU and the MDU

4.1 Overview of communication

When using the attached CC-Link system master local unit, set it as the master station. (For the details of the setting, see the manual of the CC-Link system master local unit.)
The sequencer CPU and the MDU communicate with each other via the master station. The overview of establishment of the communication is shown below.



[1] Start of data link : The sequencer CPU transmits a network parameter in the sequencer CPU to the master station and sets the parameter when the power supply is turned on or reset. The master station automatically starts data link with each connected MDU according to the parameter setting and starts up the CC-Link system automatically.

[2] Link scan : The master station automatically and regularly reads the remote input (RX) and remote register (RWr) of each data-linked MDU in succession, stores them in the buffer memory, and write the remote output (RY) and remote register (RWw) stored in the buffer memory to each MDU.

[3] Matic refresh : The sequencer CPU automatically and regularly writes and updates the data of each device of the sequencer CPU in the remote output (RY) and remote register (RWw) in the buffer memory of the master station, reads data from the remote input (RX) and remote register (RWr) in the buffer memory of the master station, stores the data in each device in the sequencer CPU, and updates (= refreshes) the data of the MDU.

4.2 Parameter setting

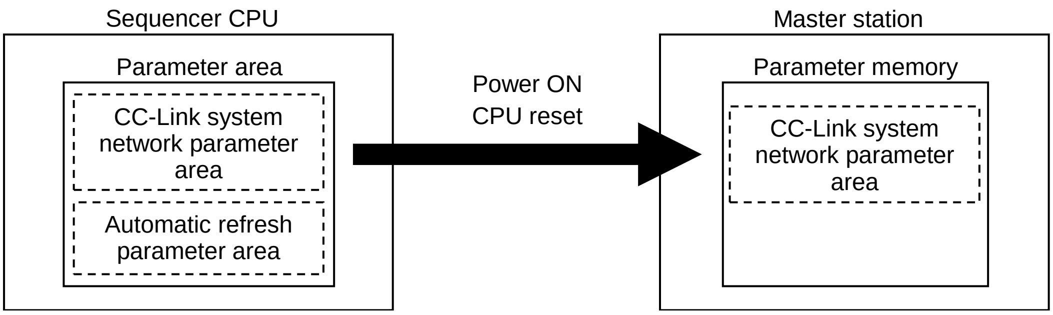
This section explains the parameter setting necessary for the establishment of communication between the sequencer CPU and the MDU.

4.2.1 Parameter storage area

This section explains the relation between the parameter area of the sequencer CPU and the parameter memory of the master station.

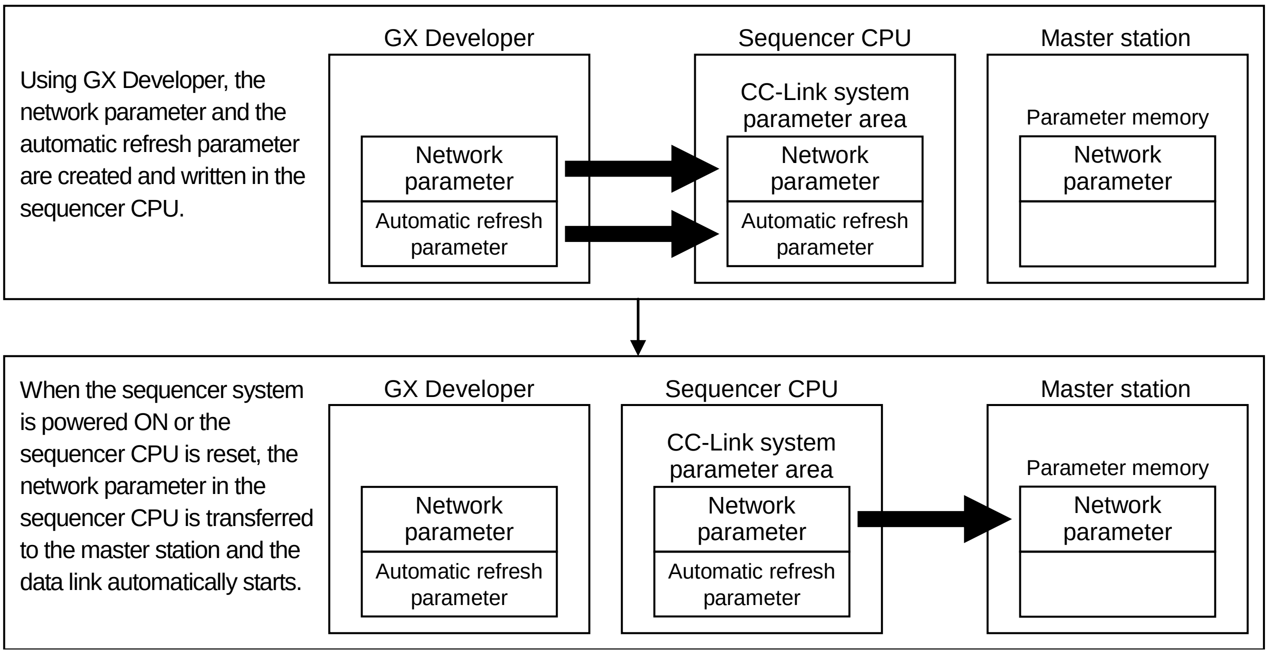
(1) Parameter area of the sequencer CPU
This is an area where the basic values to control the sequencer system is set. The network parameter to control the CC-Link system and the automatic refresh parameter are also set in this area.

(2) Parameter memory of the master station
This is an area where the network parameter of the CC-Link system is stored.
When the power supply of the unit is turned off or the sequencer CPU is reset, the network parameter disappears. However, every time the power supply is turned on or the sequencer CPU is reset, the network parameter is set from the sequencer CPU.



4.2.2 Parameter setting and start of the data link

The setting of the network parameter for starting the data link and the setting of the automatic refresh parameter for executing the automatic refresh are made from GX Developer. The figure below shows the procedure from the parameter setting by GX Developer to the start of the data link.



Note : The parameter setting by GX Developer has the following characteristics.

	Necessity of the program for setting the parameter	Automatic refresh	Number of attachable units	Parameter change while the sequencer CPU is running
Setting by GX Developer	Not necessary	○	4	x

4.2.3 Setting items of the network parameter

The following table lists the items of the network parameter stored in the parameter memory of the master station.

Table 4.2.3

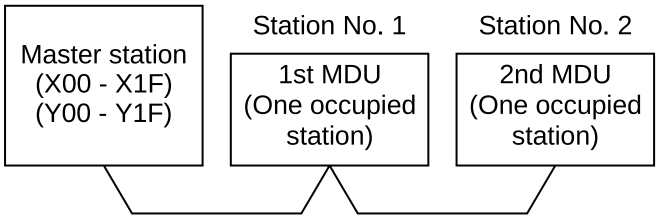
Setting item	Description
Setting of data link error station	Set the input data status from the station having a data link error. Default value : Clear Setting range : Hold, clear
Setting when the CPU is stopped	Select whether to refresh or forcibly clear the slave station when the sequencer CPU is stopped. Default value : Refresh Setting range : Refresh, forcibly clear
Number of connected units	Set the number of remote stations, local stations, intelligent device stations, and standby master stations connected to the master station (including the reserve station). Default value : 64 (stations) Setting range : 1 - 64 (station(s))
Number of retries	Set the number of retries of the communication to the station having an error. Default value : 3 (times) Setting range : 1 - 7 (time(s))
Number of automatically restored units	Set the number of remote stations, local stations, intelligent device stations, and standby master stations that can be restored by one link scan. Default value : 1 (station) Setting range : 1 - 10 (station(s))
Standby master station specification	Specify the station number of the standby master station. Default value : 0 (0 : The standby master station is not specified.) Setting range : 0 - 64 (0 : The standby master station is not specified.)
CPU shut down specification	Specify the data link status when a failure occurs in the master station sequencer CPU. Default value : 0 (Stop) Setting range : 0 (Stop), 1 (Continue)
Scan mode specification	Specify the synchronization or non-synchronization of the link scan for the sequence scan. Default value : 0 (Non-synchronize) Setting range : 0 (Non-synchronize), 1 (Synchronize)
Delay time setting	Specify the interval of the link scan. (Unit: 50 μs) Default value : 0 (0: Not specified) Setting range : 0 - 100 (0: Not specified) * Actual link scan interval = Setting value x 50 μs
Reserve station specification	Specify the reserve station. Default value : 0 (Not specified) Setting range : Turn on the bit corresponding to the station number.
Error invalid station specification	Specify the error invalid station. Default value : 0 (Not specified) Setting range : Turn on the bit corresponding to the station number.
Station information	Set the type of the connected remote station, local station, intelligent device station, and standby master station. Default value : Remote I/O station supporting Ver. 1, one occupied station, station No. 1 - Remote I/O station supporting Ver. 1, one occupied station, station No. 64 Setting range Station type : Remote I/O station, remote device station, and intelligent device station /Ver. 1 and Ver. 2 (Set as 1, 2, 4, and 8 times) Number of occupied stations : One occupied station, two occupied stations, three occupied stations, and four occupied stations Station number : 1 - 64 Note : The MDU is a remote device station occupying one station.

4.3 Parameter setting by GX Developer

This section explains the parameter setting using GX Developer. In the parameter setting using GX Developer, the master station network parameter and automatic refresh parameter are set.

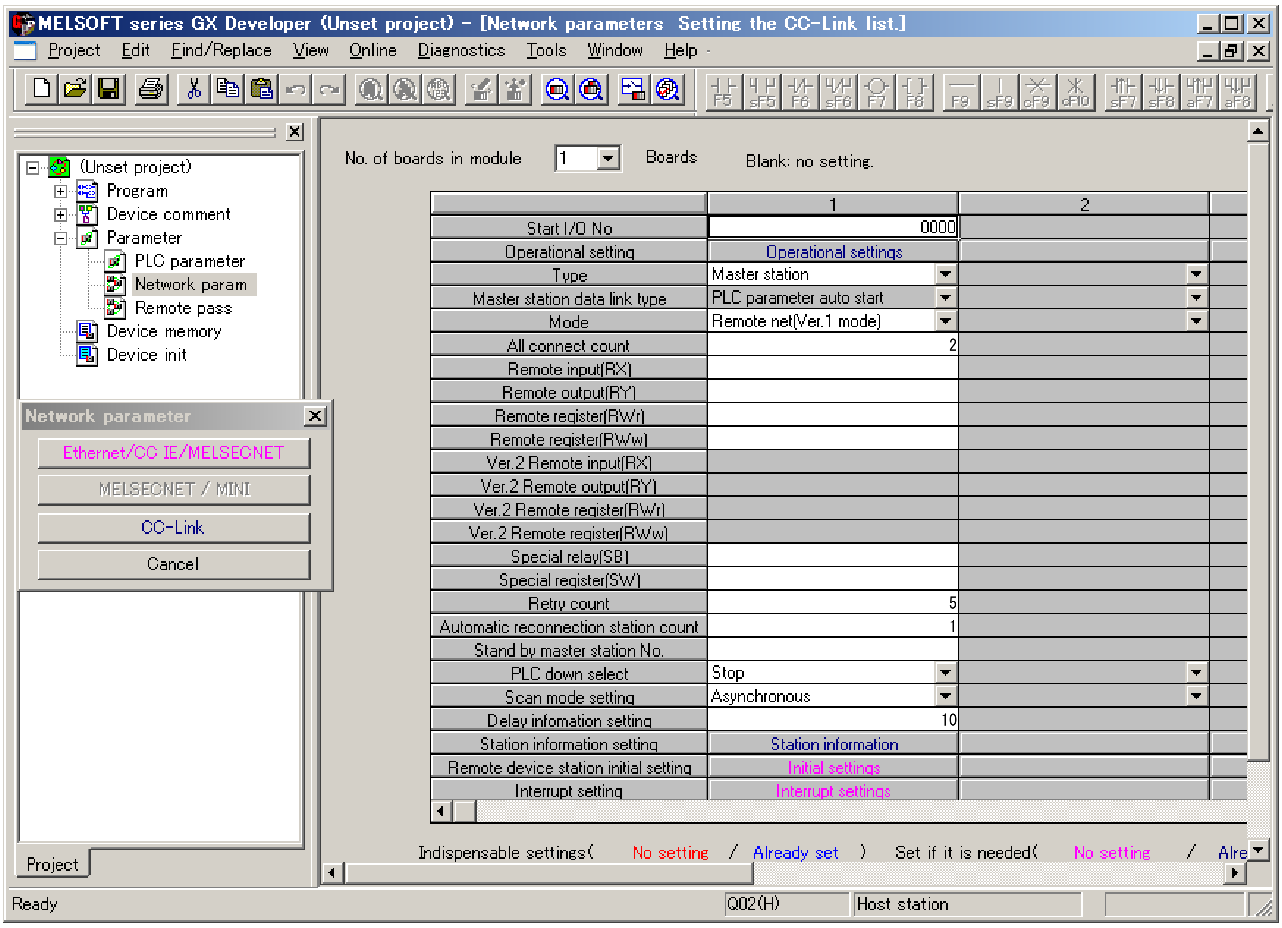
For the detailed information on the operation of GX Developer, see the operating manual of GX Developer.

The following shows a system configuration example.



4.3.1 Setting of the master station network parameter

(1) The following shows an example of the setting. See (2) for the actual setting.



(2) Set the network parameter in the following procedure.

(a) Set the "Number of units" for which the network parameter is set.

Do not include the unit whose parameter is set by the dedicated instruction (RLPASET instruction) in the "Number of units".

Default value: None

Setting range: 0 - 4 (unit(s))

Example Set it to 1 (unit).

(b) Set the "First I/O No." of the master station.

Default value: None

Setting range: 0000 - 0FE0

Example Set it to 0000.

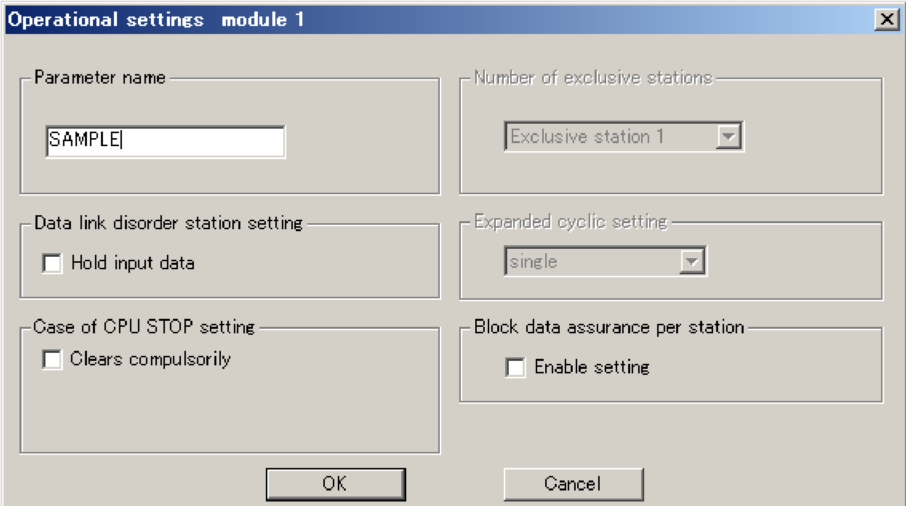
(c) Set the parameter name in the "Operation setting".

Even if the parameter name is not set, it does not affect the operation of the CC-Link system.

Default value: None

Setting range: Single-byte, eight characters or less

Example Set it to "SAMPLE".



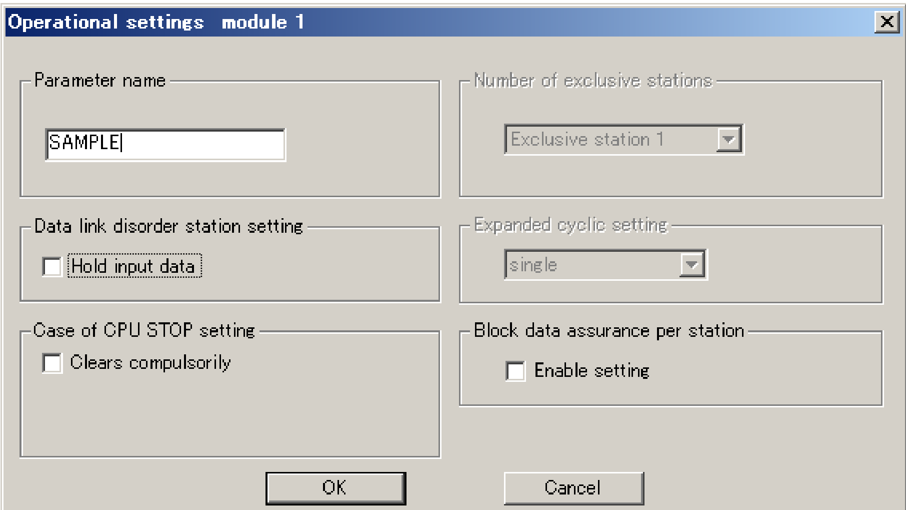
(d) Set the input status of the data link error station in the "Operation setting".

Default value: Clear (No tick mark in "Hold the input data")

Setting range: Hold (Tick mark in "Hold the input data")

Clear (No tick mark in "Hold the input data")

Example Set it to Clear (Put no tick mark in "Hold the input data").



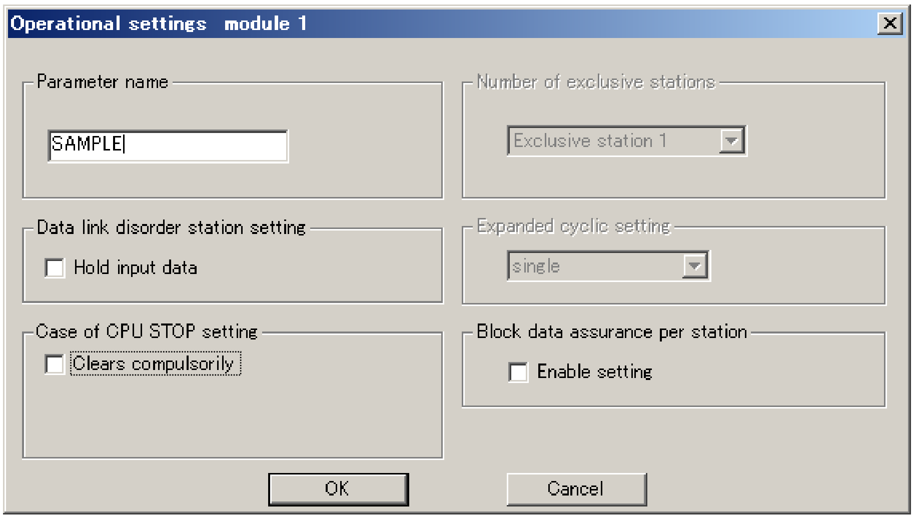
(e) Set whether to refresh or forcibly clear the slave station when the sequencer CPU is stopped in the "Operation setting".

Default value: Refresh (No tick mark in "Forced clear")

Setting range: Refresh (No tick mark in "Forced clear")

Forced clear (Tick mark in "Forced clear")

Example Set it to Refresh (Put no tick mark in "Forced clear").



(f) Set the type of the station in "Type".

Default value: Master station

Setting range: Master station, master station (supporting the duplication function), local station, standby master station

Example Set it to Master station.

(g) Set the mode of CC-Link in the "Mode setting".

Default value: Remote net - Ver. 1 mode

Setting range: Remote net - Ver. 1 mode, remote net - Ver. 2 mode, remote net - add mode, remote I/O net mode, off line

Example Set it to Remote net - Ver. 1 mode.

(h) Set the total number of units connected on the CC-Link system including the reserve station in the "Total number of connected units".

Default value: 64 (units)

Setting range: 1 - 64 (unit (s))

Example Set it to 2 (units).

(i) Set the number of retries in the event of a communication error in the "Number of retries ".

Default value: 3 (times)

Setting range: 1 - 7 (time(s))

Example Set it to 5 (times).

(j) Set the number of units that can be restored by one link scan in the "Number of automatically restored units".

Default value: 1 (unit)

Setting range: 1 - 10 (unit (s))

Example Set it to 1 (units).

(k) Set the station number of the standby master station in the "Standby master station number".

Default value: Blank (Standby master station not specified)

Setting range: Blank, 1 - 64 (Standby master station not specified)

Example Set it to Blank (Standby master station not specified).

(l) Set the data link status when an error occurs in the master station sequencer CPU in the "CPU shutdown specification".

Default value: Stop

Setting range: Stop, continue

Example Set it to Stop.

(m) Set whether or not to synchronize the link scan with the sequence scan in the "Scan mode specification".

Default value: Not synchronize

Setting range: Synchronize, not synchronize

Example Set it to Not synchronize.

(n) Set the link scan interval in the "Delay time setting".

Default value: 0 (Not specified)

Setting range: 0 - 100 (Unit: 50 μs)

Example Set it to 10 (500 μs).

(o) Set the station information in the "Station information setting".

Default value: Remote I/O station, one time setting, one occupied station, 32 points, reserve station/error invalid station not specified

Setting range Station type: Not specified, remote I/O station, remote device station, intelligent device station (including local station and standby master station)

Extended cyclic setting (Not changeable):
One time setting

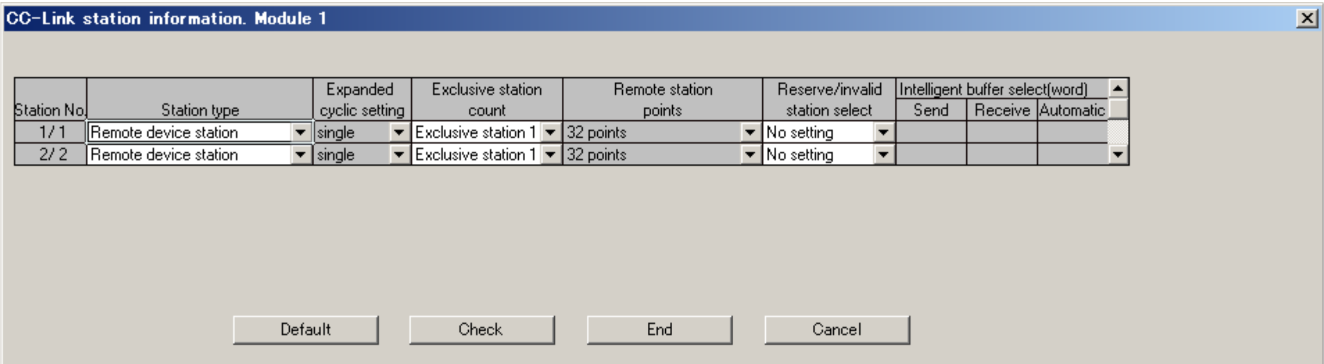
Number of occupied stations: Not specified, one occupied station, two occupied stations, three occupied stations, four occupied stations

Number of remote stations (Not changeable):
32 points [in the case of one occupied station], 64 points [in the case of two occupied stations], 96 points [in the case of one occupied station], 128 points [in the case of one occupied station]

Reserve/invalid station specification:
Not specified, reserve station, invalid station (error invalid station)

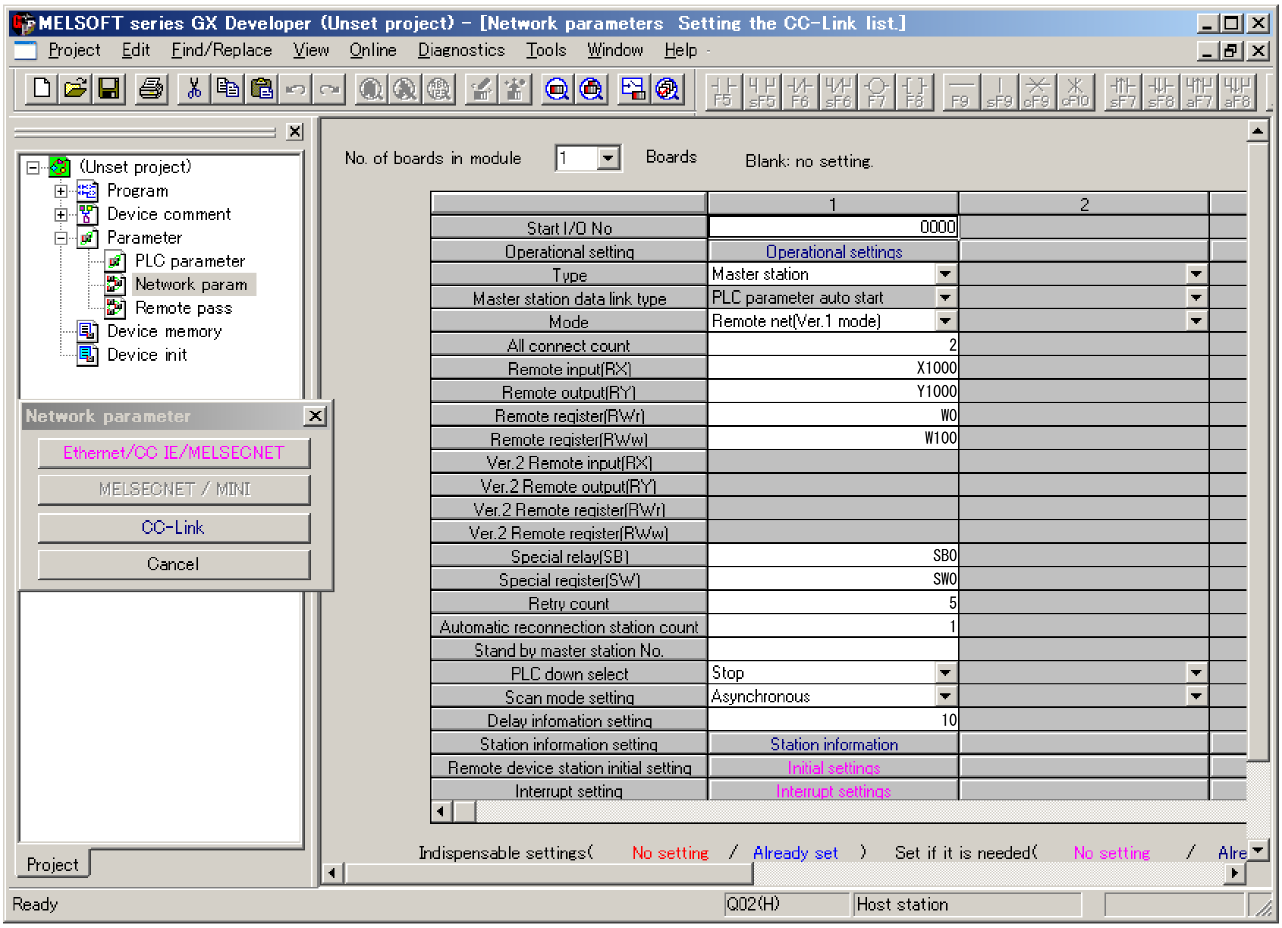
Intelligent buffer specification (word):
Not specified, send 0, 64-4096, receive 0, 64-4096, automatic 0, 64-4096

Example Set the station information according to the system configuration described in 4.3.
Since the MDU is a remote device station occupying one station, configure the setting as follows.



4.3.2 Master station automatic refresh parameter setting

(1) The following shows an example of the setting. See (2) for the actual setting.



(2) Set the automatic refresh parameter in the following procedure.

(a) Set the refresh device of remote input (RX) in the "Remote input (RX) refresh device".

Default value: None

Setting range: Device name - Select from X, M, L, B, D, W, R, and ZR.

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to X1000.

(b) Set the refresh device of remote output (RY) in the "Remote output (RY) refresh device".

Default value: None

Setting range: Device name - Select from Y, M, L, B, T, C, ST, D, W, R, and ZR.

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to Y1000.

(c) Set the refresh device of remote register (RWr) in the "Remote register (RWr) refresh device".

Default value: None

Setting range: Device name - Select from M, L, B, D, W, R, and ZR.

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to W0.

(d) Set the refresh device of remote register (RWw) in the "Remote register (RWw) refresh device".

Default value: None

Setting range: Device name - Select from M, L, B, T, C, ST, D, W, R, and ZR

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to W100.

(e) Set the refresh device of the special relay (SB) in the "Special relay (SB) refresh device".

Default value: None

Setting range: Device name - Select from M, L, B, D, W, R, SB, and ZR.

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to SB0.

(f) Set the refresh device of the special register (SW) in the "Special register (SW) refresh device".

Default value: None

Setting range: Device name - Select from M, L, B, D, W, R, SW, and ZR.

Device number - Select from within the range of number of device points possessed by the sequencer CPU

Example Set it to SW0.

Point

When you set X, Y, B, W, SB, or SW to the refresh device, avoid using the device numbers already used for other network, etc.

4.4 Data link status check

4.4.1 Master station I/O signal check

The data link status of the master station itself and the MDU connected to the master station can be checked by the status of the input signal status of the master station. The following table lists the I/O signals of the master station (= CC-Link system master local unit).

Table 4.4.1 List of I/O signals of master station

Signal direction: Sequencer CPU <= Master station			Signal direction: Sequencer CPU => Master station		
Input number (Note 1)	Signal name	Description	Output number (Note 1)	Signal name	Description
Xn0	Unit error	ON: Error, OFF: Normal (Note 2)	Yn0	Use prohibited	
Xn1	Own station data link status	ON: During data link, OFF: During stop	Yn1		
Xn2	Use prohibited		Yn2		
Xn3	Other station data link status	ON: Error station exists, OFF: All stations are normal (Note 3)	Yn3		
Xn4	Use prohibited		Yn4		
Xn5			Yn5		
Xn6			Yn6		
Xn7			Yn7		
Xn8			Yn8		
Xn9			Yn9		
XnA			YnA		
XnB			YnB		
XnC			YnC		
XnD			YnD		
XnE			YnE		
XnF	Unit ready	ON: Enable, OFF: Disable (Note 4)	YnF		
X(n+1)0	Use prohibited		Y(n+1)0		
X(n+1)1			Y(n+1)1		
X(n+1)2			Y(n+1)2		
X(n+1)3			Y(n+1)3		
X(n+1)4			Y(n+1)4		
X(n+1)5			Y(n+1)5		
X(n+1)6			Y(n+1)6		
X(n+1)7			Y(n+1)7		
X(n+1)8			Y(n+1)8		
X(n+1)9			Y(n+1)9		
X(n+1)A			Y(n+1)A		
X(n+1)B			Y(n+1)B		
X(n+1)C			Y(n+1)C		
X(n+1)D			Y(n+1)D		
X(n+1)E			Y(n+1)E		
X(n+1)F			Y(n+1)F		

Note 1: "n" in the table is determined by the first I/O number (= determined by the attached position of the master station and the unit attached preceding the master station) of the master station (= CC-Link system master local unit).
When the first I/O number of the master station is "X/Y30",
Xn0 - X(n+1)F => X30 - X4F, Yn0 - Y(n+1)F => Y30 - Y4F.

Note 2: When unit error (Xn0) is ON, unit ready (XnF) turns OFF.

Note 3: This signal has the same contents as those of the link special relay SB0080 of the master station.
The status of each station is stored in the link special register SW0080 - SW0083 of the master station.

Note 4: Immediately after the power supply is turned on, the signal turns off. When the unit becomes operable, the signal automatically turns ON. When there is an error in the switch setting of the unit or when unit error (Xn0) is ON, the signal turns OFF.

Point

Users cannot use the output signals described as use prohibited since they are used by the system. If such signals are used (turned on/off), the normal operation is not guaranteed.

4.4.2 Master station link special register check

The data link status of each MDU connected to the master station can be checked by the status of each bit of the link special register SW0080 to SW0083 of the master station.

Register No.	b15	b14	b13	b12	-	b3	b2	b1	b0	Master station buffer memory address
SW0080	16	15	14	13	-	4	3	2	1	…………680h
SW0081	32	31	30	29	-	20	19	18	17	…………681h
SW0082	48	47	46	45	-	36	35	34	33	…………682h
SW0083	64	63	62	61	-	52	51	50	49	…………683h

In the table, 1 to 64 indicate station numbers.
The data link status of each station number is stored in each bit.
When the bit value is 0, the data link is normal.
When the bit value is 1, the data link has an error.

In the case that special link register SW0 in the sequencer CPU is set in the special register (SW) refresh device as shown in the example described in "4.3.2 Master Station automatic refresh parameter setting", the contents shown in the table above is stored in SW0080 - SW0083 in the sequencer CPU by the automatic refreshing. Therefore, the data link status of each MDU connected to the master station can also be checked by each bit of SW0080 - SW0083 in the sequencer CPU.

5. Communication between the sequencer CPU and the MDU

5.1 Overview of communication

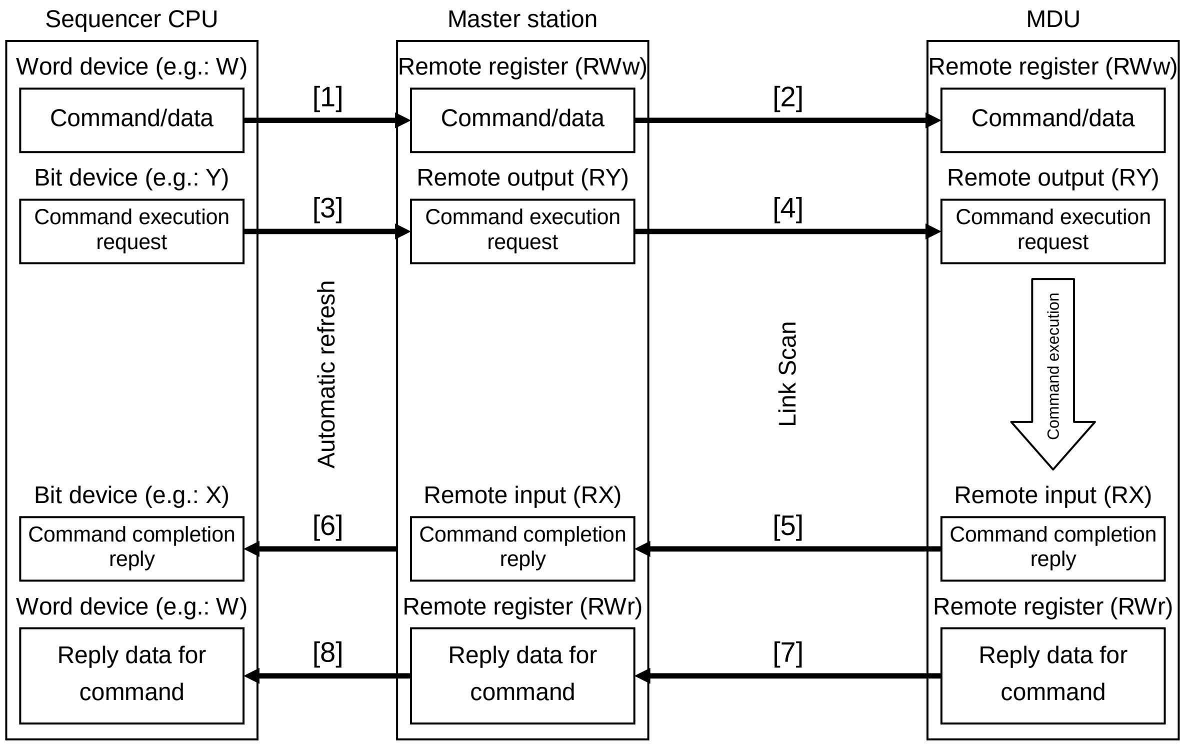
In the communication between the sequencer CPU and the MDU, there are three communication statuses including initial communication, normal communication, and error communication.

In the normal communication, the following setting is possible:

- Monitoring of ON/OFF information (bit data) of an alarm (PAL, etc.) and a cause for interruption (LTD, STD/INST, etc.)
- Monitoring of measurement value of the electric current, voltage, and electric energy (word data)
- Setting of the values of the demand time delay and time data (word data)

In the MDU, dedicated commands are provided for each measurement and setting item. It becomes possible to monitor each measurement value and to set values by writing a command assigned to an item to be monitored or to be set as well as the data associated with it to each device of the sequencer CPU set in the automatic refresh parameter.

Outline of command sending/receipt to/from the MDU



[1] By the automatic refresh, commands and the associated data stored in the word device of the sequencer CPU are stored in the remote register (RWw) of the master station.

[2] By the link scan, commands and the associated data stored in the remote register (RWw) of the master station are sent to the MDU and stored in the remote register (RWw) of the MDU.

[3] By the automatic refresh, the command execution request stored in the bit device of the sequencer CPU is stored in the remote output (RY) of the master station.

[4] By the link scan, the command execution request stored in the remote output (RY) of the master station is sent to the MDU and stored in the remote output (RY) of the MDU. Then, the MDU executes the command according to the command and the associated data.

[5] By the link scan, the command completion reply stored in the remote output (RY) of the MDU is sent to the mater station and stored in the remote output (RY) of the master station.

[6] By the automatic refresh, the command completion reply stored in the remote input (RX) of the master station is stored in the bit device of the sequencer CPU.

[7] By the link scan, the reply data for the command stored in the remote register (RWr) of the MDU is sent to the master station and stored in the remote register (RWr) of the master station.

[8] By the automatic refresh, the reply data for the command stored in the remote register (RWr) of the master station is stored in the word device of the sequencer CPU.

5.2 Remote input and output and remote register of the MDU

The remote input (RX) and remote output (RY) are used when the bit data is communicated between the sequencer CPU and the MDU. The remote register (RWw) and remote register (RWr) are used when the word data is communicated between the sequencer CPU and the MDU.

5.2.1 Remote input (RX)

Since the MDU is a remote device station occupying one station, it has 32 points of the remote input (RX).
The following table lists the allocation of the remote input (RX) of the MDU.
"n" of the device No. in the table below can be obtained by converting the calculation result of "(Station number -1) x 2" into the hexadecimal number.

Example When the station number of the MDU is 41, "(41 - 1) x 2 = 80". When this calculation result is converted into the hexadecimal number, the result is "50". Therefore, RXn0 - RX (n+1) F indicates RX500 - RX51F.

Remote input (RX) device No.		Signal name	Description		Remark
Inside the master station	Inside the MDU		OFF (0)	ON (1)	
RXn0	RX00	AX (on/off status)	OFF or trip	ON	Note 1
RXn1	RX01	AL (Trip status)	OFF or ON	Trip	Note 2
RXn2	RX02	PAL (Pre-alarm)	No alarm occurred	Alarm occurred	Note 5
RXn3	RX03	Unusable	-	-	
RXn4	RX04	Unusable	-	-	
RXn5	RX05	Unusable	-	-	
RXn6	RX06	LTD	Not occurred	Occurred	Note 3, 6
RXn7	RX07	STD/INST	Not occurred	Occurred	Note 3, 4, 6
RXn8	RX08	Lower limit alarm	Not occurred	Occurred	Note 5
RXn9	RX09	Upper limit alarm	Not occurred	Occurred	Note 5
RXnA	RX0A	IDM _ AL (Current demand alarm)	Not occurred	Occurred	Note 5
RXnB	RX0B	IUB _ AL (Current unbalanced alarm)	Not occurred	Occurred	Note 5
RXnC	RX0C	OVER (Overcurrent alarm)	No alarm occurred	Alarm occurred	Note 5
RXnD	RX0D	ILA _ AL (Current open-phase alarm)	Not occurred	Occurred	Note 5
RXnE	RX0E	Unusable	-	-	
RXnF	RX0F	Command completion reply flag	No reply data received	Reply data received	Note 7
RX(n+1)0	RX10	Unusable	-	-	
RX(n+1)1	RX11	Unusable	-	-	
RX(n+1)2	RX12	Unusable	-	-	
RX(n+1)3	RX13	Unusable	-	-	
RX(n+1)4	RX14	Unusable	-	-	
RX(n+1)5	RX15	Unusable	-	-	
RX(n+1)6	RX16	Unusable	-	-	
RX(n+1)7	RX17	Unusable	-	-	
RX(n+1)8	RX18	Initial data processing request flag	POWER OFF, remote READY ON, or error staus flag is ON	Power supply is turned ON or reset	Note 7
RX(n+1)9	RX19	Unusable	-	-	
RX(n+1)A	RX1A	Error flag	No error occurred	Error occurred	Note 7
RX(n+1)B	RX1B	Remote ready	Command sending disabled	Normal communication status (Command sending enabled)	Note 7
RX(n+1)C	RX1C	Unusable	-	-	
RX(n+1)D	RX1D	Unusable	-	-	
RX(n+1)E	RX1E	Unusable	-	-	
RX(n+1)F	RX1F	Unusable	-	-	

Note 1: This becomes available when the AX switch for transmission with MDU breaker (optional) is attached to the MDU breaker.
Note 2: This becomes available when the AL switch for transmission with MDU breaker (optional) is attached to the MDU breaker.
AL (Trip status) shows the status of the main body mechanism of the MDU breaker.
Note 3: Any one of the causes of the fault is regarded as "Occurred".
Note 4: The causes of the fault by INST becomes available when the AL switch for transmission with MDU breaker (optional) is attached to the MDU breaker.
Note 5: The reset method of PAL (self-retention or automatic reset) is set by the data set (2h) of the intermodel standard command. (See page 40.)
The reset method of OVER (overcurrent alarm) is "automatic reset" regardless of the setting.
Note 6: The reset of LTD, STD/INST, and respective upper/lower limit alarm are set in the data set (2h) of the intermodel standard command. (See page 40.)
Note 7: For the details, see "5.3 Initial communication", "5.4 Normal communication", and "5.5 Error communication".

5.2.2 Remote output (RY)

Since the MDU is a remote device station occupying one station, it has 32 points of the remote output (RY).

The following table lists the allocation of the remote outputs (RY) of the MDU.

"n" of the device No. in the table below can be obtained by converting the calculation result of "(Station number -1) x 2" into the hexadecimal number.

Example When the station number of the MDU is 42, "(42 - 1) x 2 = 82". When this calculation result is converted into the hexadecimal number, the result is "52".
Therefore, RYn0 - RY (n+1) F => RY520 - RY53F.

Remote output (RY) device No.		Signal name	Description		Remark
Inside the master station	Inside the MDU		ON (1) → OFF (0)	OFF (0) → ON (1)	
RYn0	RY00	Unusable	-	-	
RYn1	RY01	Unusable	-	-	
RYn2	RY02	Unusable	-	-	
RYn3	RY03	Unusable	-	-	
RYn4	RY04	Unusable	-	-	
RYn5	RY05	Unusable	-	-	
RYn6	RY06	Unusable	-	-	
RYn7	RY07	Unusable	-	-	
RYn8	RY08	Unusable	-	-	
RYn9	RY09	Unusable	-	-	
RYnA	RY0A	Unusable	-	-	
RYnB	RY0B	Unusable	-	-	
RYnC	RY0C	Unusable	-	-	
RYnD	RY0D	Unusable	-	-	
RYnE	RY0E	Unusable	-	-	
RYnF	RY0F	Command execution request flag	When the command execution request is cancelled	When the command execution is requested	Note 1
RY(n+1)0	RY10	Unusable	-	-	
RY(n+1)1	RY11	Unusable	-	-	
RY(n+1)2	RY12	Unusable	-	-	
RY(n+1)3	RY13	Unusable	-	-	
RY(n+1)4	RY14	Unusable	-	-	
RY(n+1)5	RY15	Unusable	-	-	
RY(n+1)6	RY16	Unusable	-	-	
RY(n+1)7	RY17	Unusable	-	-	
RY(n+1)8	RY18	Initial data processing completion flag	When the remote ready request is cancelled	When the remote ready is requested	Note 1
RY(n+1)9	RY19	Unusable	-	-	
RY(n+1)A	RY1A	Error reset request flag	When the error status reset request is cancelled	When the error status reset is requested	Note 1
RY(n+1)B	RY1B	Unusable	-	-	
RY(n+1)C	RY1C	Unusable	-	-	
RY(n+1)D	RY1D	Unusable	-	-	
RY(n+1)E	RY1E	Unusable	-	-	
RY(n+1)F	RY1F	Unusable	-	-	

Note 1: For the details, see "5.3 Initial communication", "5.4 Normal communication", and "5.5 Error communication".

Point

When an unusable device is turned ON or OFF in the sequence program, we will not guarantee the MDU functions.

5.2.3 Remote register (RWw), remote register (RWr)

Since the MDU is a remote device station occupying one station, it has the remote registers (RWw) and remote registers (RWr) of four words respectively as shown below.

"m" of the address shown in the table below can be obtained by converting the calculation result of "(Station number -1) x 4" into the hexadecimal number.

"n" of the address shown in the table below can be obtained by converting the calculation result of "(Station number -1) x 4" into the hexadecimal number.

Example When the station number of the MDU is 42, "(42-1) x 4 = 164". When this calculation result is converted into the hexadecimal number, the result is "A4".
Therefore, RWwm - RWw (m+3) => RWwA4 – RWwAF, and RWrn – RWr (n+3) => RWrA4 - RWrAF.

Remote register (RWw)

Address			
Inside the MDU	Inside the master station	b15 ………………	b0
RWw0	RWwm		
RWw1	RWw(m+1)		
RWw2	RWw(m+2)		
RWw3	RWw(m+3)		

Remote register (RWr)

Address			
Inside the MDU	Inside the master station	b15 ………………	b0
RWr0	RWrn		
RWr1	RWr(n+1)		
RWr2	RWr(n+2)		
RWr3	RWr(n+3)		

5.2.4 Relation with the sequencer CPU devices

(1) Relation of the sequencer CPU device and remote register (RWw), remote register (RWr)
In the automatic refresh parameter setting, assuming that the word device □i of the sequencer CPU is set in the remote register (RWw) refresh device and that the word device △j of the sequencer CPU is set in the remote register (RWr) refresh device, the relation among them is as shown in the table below.
"n" and "m" in the table below can be obtained by converting the calculation result of "(Station number -1) x 4" into the hexadecimal number.
The word devices in the sequencer CPU that can be used for the word devices □i and △j are D (data register), W (link register), R (file register), and ZR (file register).
For the word device number "i" and "j", use a device number usable within the range of the number of points of word devices to be used. (See "4.3.2 Master station automatic refresh parameter setting".)

Example Assuming that the link register W0 is set for the word device □i, that the link register W100 is set for the word device △j, and that the station number of the MDU is 42, "(42-1) x 4 = 164 ". When this calculation result is converted into the hexadecimal number, the result is "A4 ".
Therefore,□ (i+m) - □(i+ (m+3)) => WA4 - WA7 corresponds to RWwm - RWw (m+3) => RWwA4 - RWwA7,and △ (j+m)- △(j+ (n+3)) => W1A4 - W1A7 corresponds to RWrn - RWr (n+3) => RWrA4 – RWrA7

Table 5.2.4.1 Relation of the sequencer CPU word device and remote register (RWw), remote register (RWr)

Word device No.	Remote register (RWw)		Word device No.	Remote register (RWr)	
	Inside the master station	Inside the MDU		Inside the master station	Inside the MDU
□(i + m)	RWwm	RWw0	△(j + n)	RWrn	RWr0
□(i + (m+1))	RWw(m+1)	RWw1	△(j + (n+1))	RWr(n+1)	RWr1
□(i + (m+1))	RWw(m+2)	RWw2	△(j + (n+2))	RWr(n+2)	RWr2
□(i + (m+1))	RWw(m+3)	RWw3	△(j + (n+3))	RWr(n+3)	RWr3

The table below shows the relation of the sequencer CPU device, remote register (RWw) of the master station, and remote register (RWw) of the MDU when the link register W100 of the sequencer CPU is set in the remote register (RWw) refresh device of the automatic refresh parameter.
In addition, the table shows the relation of the station number for the remote register (RWw) and link register W in the sequencer CPU.

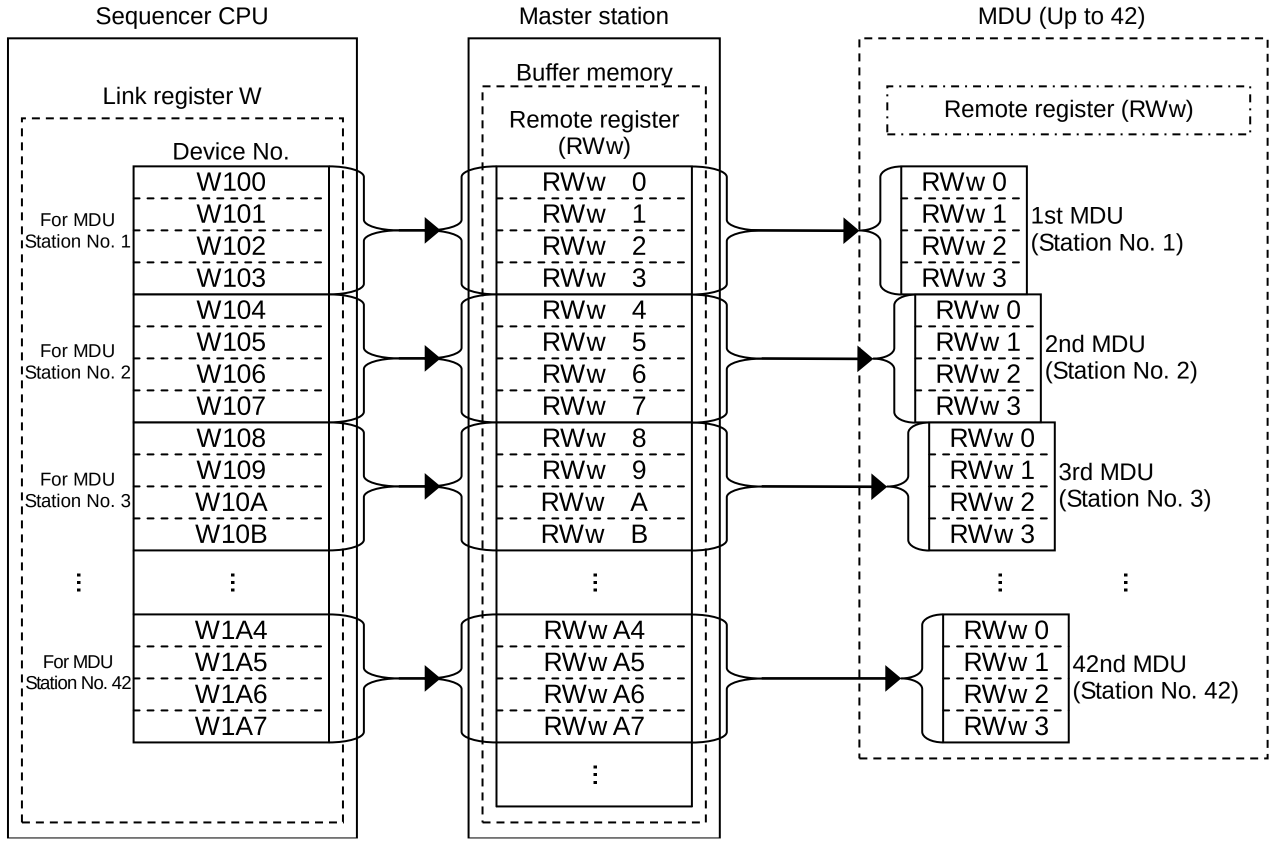


Table 5.2.4.2 Relation of the station number for the remote register (RWw) and the link register W in the sequencer CPU

Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.
1	W100 - W103	14	W134 - W137	27	W168 - W16B	40	W19C - W19F	53	W1D0 - W1D3
2	W104 - W107	15	W138 - W13B	28	W16C - W16F	41	W1A0 - W1A3	54	W1D4 - W1D7
3	W108 - W10B	16	W13C - W13F	29	W170 - W173	42	W1A4 - W1A7	55	W1D8 - W1DB
4	W10C - W10F	17	W140 - W143	30	W174 - W177	43	W1A8 - W1AB	56	W1DC - W1DF
5	W110 - W113	18	W144 - W147	31	W178 - W17B	44	W1AC - W1AF	57	W1E0 - W1E3
6	W114 - W117	19	W148 - W14B	32	W17C - W17F	45	W1B0 - W1B3	58	W1E4 - W1E7
7	W118 - W11B	20	W14C - W14F	33	W180 - W183	46	W1B4 - W1B7	59	W1E8 - W1EB
8	W11C - W11F	21	W150 - W153	34	W184 - W187	47	W1B8 - W1BB	60	W1EC - W1EF
9	W120 - W123	22	W154 - W157	35	W188 - W18B	48	W1BC - W1BF	61	W1F0 - W1F3
10	W124 - W127	23	W158 - W15B	36	W18C - W18F	49	W1C0 - W1C3	62	W1F4 - W1F7
11	W128 - W12B	24	W15C - W15F	37	W190 - W193	50	W1C4 - W1C7	63	W1F8 - W1FB
12	W12C - W12F	25	W160 - W163	38	W194 - W197	51	W1C8 - W1CB	64	W1FC - W1FF
13	W130 - W133	26	W164 - W167	39	W198 - W19B	52	W1CC - W1CF		

The table below shows the relation of the sequencer CPU device, remote register (RWr) of the master station, and remote register (RWr) of the MDU when the link register W0 of the sequencer CPU is set in the remote register (RWr) refresh device of the automatic refresh parameter.
In addition, the table shows the relation of station number for the remote register (RWr) and link register W in the sequencer CPU.

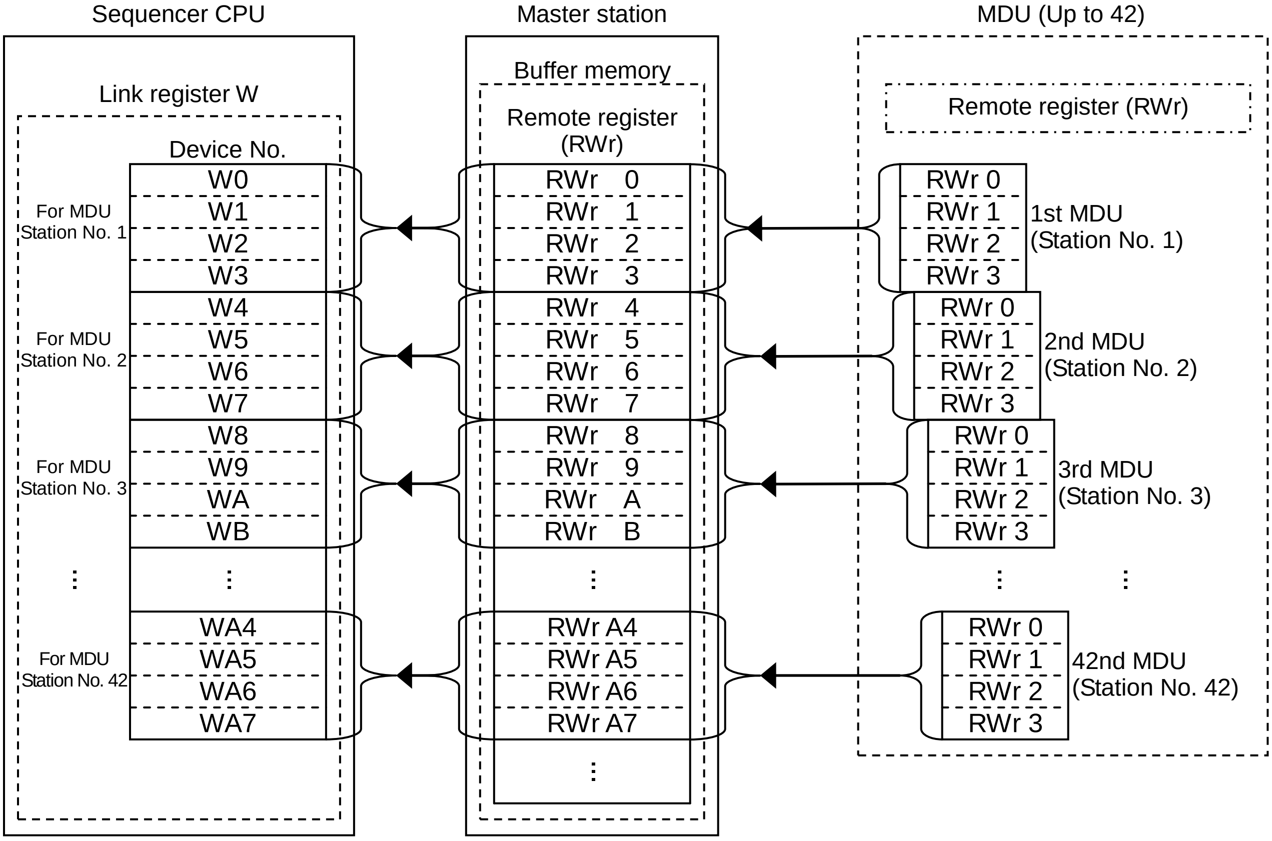


Table 5.2.4.3 Relation of the station number for the remote register (RWr) and the link register W in the sequencer CPU

Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.	Station No.	Link register No.
1	W0 - W3	14	W34 - W37	27	W68 - W6B	40	W9C - W9F	53	WD0 - WD3
2	W4 - W7	15	W38 - W3B	28	W6C - W6F	41	WA0 - WA3	54	WD4 - WD7
3	W8 - WB	16	W3C - W3F	29	W70 - W73	42	WA4 - WA7	55	WD8 - WDB
4	WCH - WF	17	W40 - W43	30	W74 - W77	43	WA8 - WAB	56	WDC - WDF
5	W10 - W13	18	W44 - W47	31	W78 - W7B	44	WAC - WAF	57	WE0 - WE3
6	W14 - W17	19	W48 - W4B	32	W7C - W7F	45	WB0 - WB3	58	WE4 - WE7
7	W18 - W1B	20	W4C - W4F	33	W80 - W83	46	WB4 - WB7	59	WE8 - WEB
8	W1C - W1F	21	W50 - W53	34	W84 - W87	47	WB8 - WBB	60	WEC - WEF
9	W20 - W23	22	W54 - W57	35	W88 - W8B	48	WBC - WBF	61	WF0 - WF3
10	W24 - W27	23	W58 - W5B	36	W8C - W8F	49	WC0 - WC3	62	WF4 - WF7
11	W28 - W2B	24	W5C - W5F	37	W90 - W93	50	WC4 - WC7	63	WF8 - WFB
12	W2C - W2F	25	W60 - W63	38	W94 - W97	51	WC8 - WCB	64	WFC - WFF
13	W30 - W33	26	W64 - W67	39	W98 - W9B	52	WCC - WCF		

(2) Relation of the sequencer CPU device and remote input (RX), remote output (RY)

In the automatic refresh parameter setting, assuming that the bit device □i of the sequencer CPU is set in the remote input (RX) refresh device and that the bit device △j of the sequencer CPU is set in the remote output (RY) refresh device, the relation among them is as shown in the table below.

"n" of the remote input (RX) and remote output (RY) in the table below can be obtained by converting the calculation result of "(Station number -1) x 2" into the hexadecimal number.

"k" of the bit device number in the table below can be obtained by converting the calculation result of "(Station number -1) x 32" into the hexadecimal number.

The bit devices in the sequencer CPU that can be used for the bit device □i are X (input device), M (internal relay), L (latch relay), and B (link relay).

The bit devices in the sequencer CPU that can be used for the bit device △j are Y (output device), M (internal relay), L (latch relay), B (link relay), T (timer), C (counter), and ST (integration timer).

For the bit device number "i" and "j", use a device number usable within the range of the number of points of bit devices to be used. (See "4.3.2 Master station automatic refresh parameter setting".)

Example Assuming that the bit device □i is the input device X1000, that bit device △j is the output device Y1000, and that the station number of the MDU is 42, "n" = "(42-1) x 2 = 82". When this calculation result is converted into the hexadecimal number, "n" is "52". "k" is "(42-1) x 32 = 1312". When this result is converted into the hexadecimal number, "k" is "520".
Therefore, RXn0 - RX (n+1) F => RX520 - RX53F corresponds to □ (i+k) - □ (i+ (k+1F)) => X1520 - X153F, and RYn0 - RY (n+1) F => RY520 - RY53F corresponds to △ (j+k) - △ (j+ (k+1F)) => Y1520 - Y153F.

Table 5.2.4.4 Relation of the sequencer CPU bit device and remote input and output (RX), (RY)

Bit device No.	Remote input (RX)		Bit device No.	Remote output (RY)	
	Inside the master station	Inside the MDU		Inside the master station	Inside the MDU
□ (i+k)	RXn0	RX00	△ (j+k)	RYn0	RY00
□ (i+(k+1))	RXn1	RX01	△ (j+(k+1))	RYn1	RY01
□ (i+(k+2))	RXn2	RX02	△ (j+(k+2))	RYn2	RY02
□ (i+(k+3))	RXn3	RX03	△ (j+(k+3))	RYn3	RY03
□ (i+(k+4))	RXn4	RX04	△ (j+(k+4))	RYn4	RY04
□ (i+(k+5))	RXn5	RX05	△ (j+(k+5))	RYn5	RY05
□ (i+(k+6))	RXn6	RX06	△ (j+(k+6))	RYn6	RY06
□ (i+(k+7))	RXn7	RX07	△ (j+(k+7))	RYn7	RY07
□ (i+(k+8))	RXn8	RX08	△ (j+(k+8))	RYn8	RY08
□ (i+(k+9))	RXn9	RX09	△ (j+(k+9))	RYn9	RY09
□ (i+(k+A))	RXnA	RX0A	△ (j+(k+A))	RYnA	RY0A
□ (i+(k+B))	RXnB	RX0B	△ (j+(k+B))	RYnB	RY0B
□ (i+(k+C))	RXnC	RX0C	△ (j+(k+C))	RYnC	RY0C
□ (i+(k+D))	RXnD	RX0D	△ (j+(k+D))	RYnD	RY0D
□ (i+(k+E))	RXnE	RX0E	△ (j+(k+E))	RYnE	RY0E
□ (i+(k+F))	RXnF	RX0F	△ (j+(k+F))	RYnF	RY0F
□ (i+(k+10))	RX(n+1)0	RX10	△ (j+(k+10))	RY(n+1)0	RY10
□ (i+(k+11))	RX(n+1)1	RX11	△ (j+(k+11))	RY(n+1)1	RY11
□ (i+(k+12))	RX(n+1)2	RX12	△ (j+(k+12))	RY(n+1)2	RY12
□ (i+(k+13))	RX(n+1)3	RX13	△ (j+(k+13))	RY(n+1)3	RY13
□ (i+(k+14))	RX(n+1)4	RX14	△ (j+(k+14))	RY(n+1)4	RY14
□ (i+(k+15))	RX(n+1)5	RX15	△ (j+(k+15))	RY(n+1)5	RY15
□ (i+(k+16))	RX(n+1)6	RX16	△ (j+(k+16))	RY(n+1)6	RY16
□ (i+(k+17))	RX(n+1)7	RX17	△ (j+(k+17))	RY(n+1)7	RY17
□ (i+(k+18))	RX(n+1)8	RX18	△ (j+(k+18))	RY(n+1)8	RY18
□ (i+(k+19))	RX(n+1)9	RX19	△ (j+(k+19))	RY(n+1)9	RY19
□ (i+(k+1A))	RX(n+1)A	RX1A	△ (j+(k+1A))	RY(n+1)A	RY1A
□ (i+(k+1B))	RX(n+1)B	RX1B	△ (j+(k+1B))	RY(n+1)B	RY1B
□ (i+(k+1C))	RX(n+1)C	RX1C	△ (j+(k+1C))	RY(n+1)C	RY1C
□ (i+(k+1D))	RX(n+1)D	RX1D	△ (j+(k+1D))	RY(n+1)D	RY1D
□ (i+(k+1E))	RX(n+1)E	RX1E	△ (j+(k+1E))	RY(n+1)E	RY1E
□ (i+(k+1F))	RX(n+1)F	RX1F	△ (j+(k+1F))	RY(n+1)F	RY1F

The table below shows the relation of the sequencer CPU device, remote input (RX) of the master station, and remote input (RX) of the MDU when the input device X1000 of the sequencer CPU is set in the remote input (RX) refresh device of the automatic refresh parameter.
In addition, the table shows the relation of the station number for the remote input (RX) and input device X in the sequencer CPU.

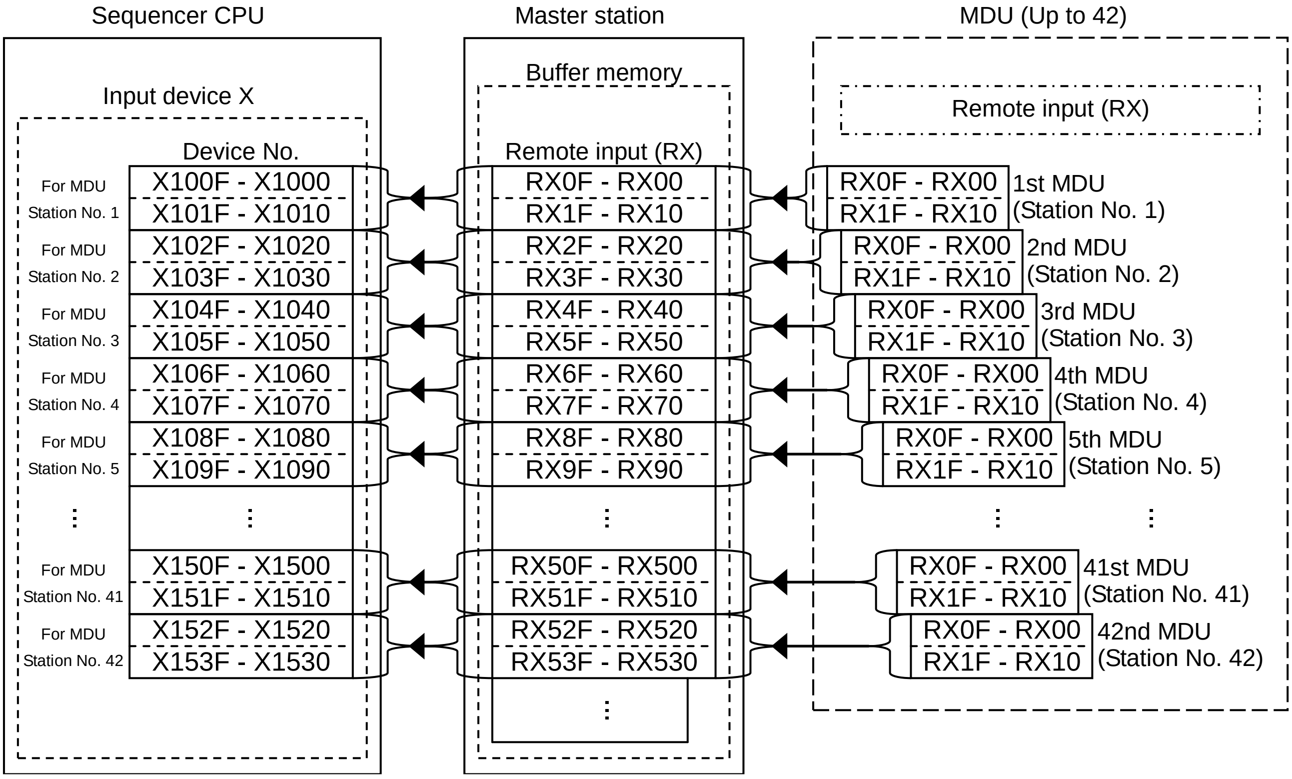


Table 5.2.4.5 Relation of the station number for the remote input (RX) and the input device X in the sequencer CPU

Station No.	Input device No.	Station No.	Input device No.	Station No.	Input device No.	Station No.	Input device No.	Station No.	Input device No.
1	X1000 - X101F	14	X11A0 - X11BF	27	X1340 - X135F	40	X14E0 - X14FF	53	X1680 - X169F
2	X1020 - X103F	15	X11C0 - X11DF	28	X1360 - X137F	41	X1500 - X151F	54	X16A0 - X16BF
3	X1040 - X105F	16	X11E0 - X11FF	29	X1380 - X139F	42	X1520 - X153F	55	X16C0 - X16DF
4	X1060 - X107F	17	X1200 - X121F	30	X13A0 - X13BF	43	X1540 - X155F	56	X16E0 - X16FF
5	X1080 - X109F	18	X1220 - X123F	31	X13C0 - X13DF	44	X1560 - X157F	57	X1700 - X171F
6	X10A0 - X10BF	19	X1240 - X125F	32	X13E0 - X13FF	45	X1580 - X159F	58	X1720 - X173F
7	X10C0 - X10DF	20	X1260 - X127F	33	X1400 - X141F	46	X15A0 - X15BF	59	X1740 - X175F
8	X10E0 - X10FF	21	X1280 - X129F	34	X1420 - X143F	47	X15C0 - X15DF	60	X1760 - X177F
9	X1100 - X111F	22	X12A0 - X12BF	35	X1440 - X145F	48	X15E0 - X15FF	61	X1780 - X179F
10	X1120 - X113F	23	X12C0 - X12DF	36	X1460 - X147F	49	X1600 - X161F	62	X17A0 - X17BF
11	X1140 - X115F	24	X12E0 - X12FF	37	X1480 - X149F	50	X1620 - X163F	63	X17C0 - X17DF
12	X1160 - X117F	25	X1300 - X131F	38	X14A0 - X14BF	51	X1640 - X165F	64	X17E0 - X17FF
13	X1180 - X119F	26	X1320 - X133F	39	X14C0 - X14DF	52	X1660 - X167F		

The table below shows the relation of the sequencer CPU device, remote output (RY) of the master station, and remote output (RY) of the MDU when the output device Y1000 of the sequencer CPU is set in the remote output (RY) refresh device of the automatic refresh parameter.
In addition, the table shows the relation of the station number for the remote output (RY) and output device Y in the sequencer CPU.

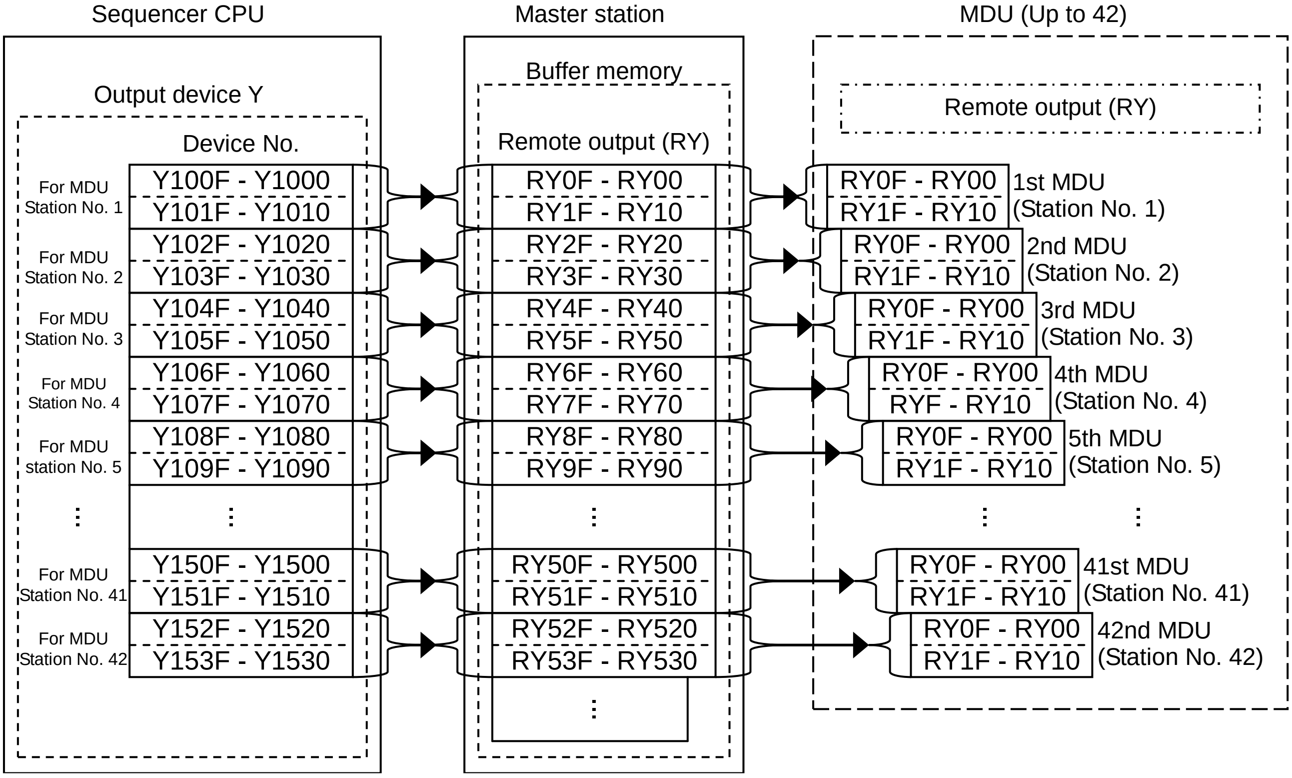
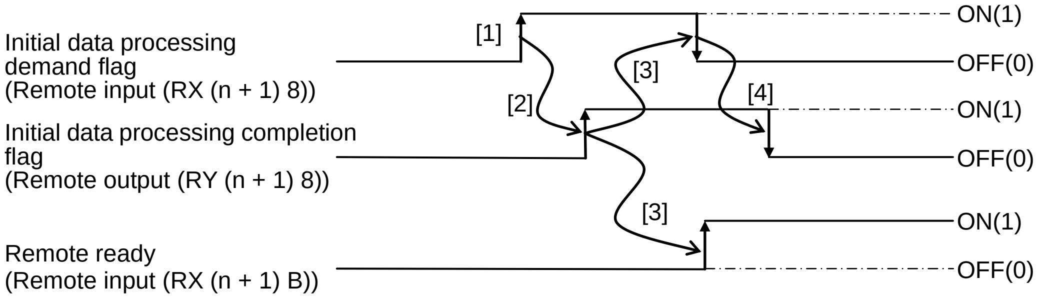


Table 5.2.4.6 Relation of the station number for the remote output (RY) and the output device Y in the sequencer CPU

Station No.	Output device No.	Station No.	Output device No.	Station No.	Output device No.	Station No.	Output device No.	Station No.	Output device No.
1	Y1000 - Y101F	14	Y11A0 - Y11BF	27	Y1340 - Y135F	40	Y14E0 - Y14FF	53	Y1680 - Y169F
2	Y1020 - Y103F	15	Y11C0 - Y11DF	28	Y1360 - Y137F	41	Y1500 - Y151F	54	Y16A0 - Y16BF
3	Y1040 - Y105F	16	Y11E0 - Y11FF	29	Y1380 - Y139F	42	Y1520 - Y153F	55	Y16C0 - Y16DF
4	Y1060 - Y107F	17	Y1200 - Y121F	30	Y13A0 - Y13BF	43	Y1540 - Y155F	56	Y16E0 - Y16FF
5	Y1080 - Y109F	18	Y1220 - Y123F	31	Y13C0 - Y13DF	44	Y1560 - Y157F	57	Y1700 - Y171F
6	Y10A0 - Y10BF	19	Y1240 - Y125F	32	Y13E0 - Y13FF	45	Y1580 - Y159F	58	Y1720 - Y173F
7	Y10C0 - Y10DF	20	Y1260 - Y127F	33	Y1400 - Y141F	46	Y15A0 - Y15BF	59	Y1740 - Y175F
8	Y10E0 - Y10FF	21	Y1280 - Y129F	34	Y1420 - Y143F	47	Y15C0 - Y15DF	60	Y1760 - Y177F
9	Y1100 - Y111F	22	Y12A0 - Y12BF	35	Y1440 - Y145F	48	Y15E0 - Y15FF	61	Y1780 - Y179F
10	Y1120 - Y113F	23	Y12C0 - Y12DF	36	Y1460 - Y147F	49	Y1600 - Y161F	62	Y17A0 - Y17BF
11	Y1140 - Y115F	24	Y12E0 - Y12FF	37	Y1480 - Y149F	50	Y1620 - Y163F	63	Y17C0 - Y17DF
12	Y1160 - Y117F	25	Y1300 - Y131F	38	Y14A0 - Y14BF	51	Y1640 - Y165F	64	Y17E0 - Y17FF
13	Y1180 - Y119F	26	Y1320 - Y133F	39	Y14C0 - Y14DF	52	Y1660 - Y167F		

5.3 Initial communication

The chart below shows the communication made first after the control power of the MDU is turned on or reset.
Write values to each device (bit device set for each refresh device in the automatic refresh parameter) of the corresponding sequencer CPU or read values from each device so that each signal changes as shown in the chart below.

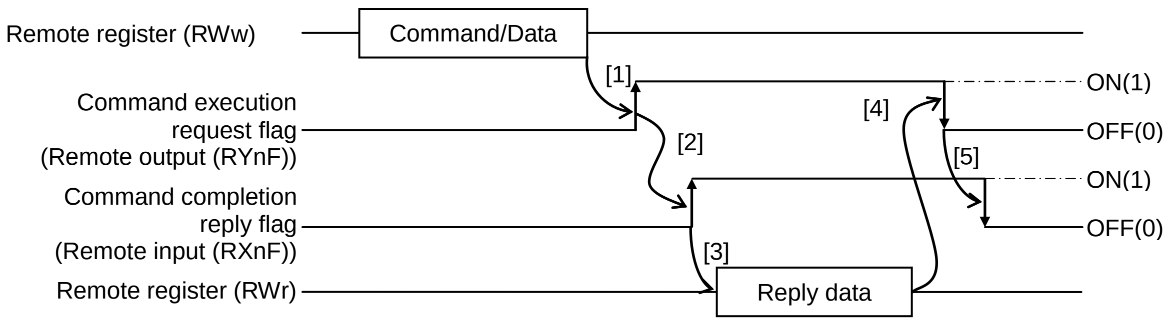


[1] After the control power of the MDU is turned on, after a power failure, or after the reset switch is turned on, the initial data processing request flag is turned on.
[2] After the initial data processing request flag is turned on, turn on the initial data processing completion flag.
[3] After the initial data processing completion flag is turned on, the initial data processing request flag is turned off and the remote ready is turned on.
[4] After the initial data processing request flag is turned off, turn off the initial data processing completion flag.

Note: The clock is not backed up in the MDU. Therefore, it is recommended to set the clock by the command transmitted first after the initial data processing request flag is turned on.

5.4 Normal communication

After the initial communication is complete, the status changes to the normal communication (remote ready is on), and it becomes possible to monitor measurement values or send and receive a command to configure the setting. The chart below shows the procedure of sending and receiving a command.
Write values to each device (bit device and word device set for each refresh device in the automatic refresh parameter) of the corresponding sequencer CPU or read values from each device so that each signal changes as shown in the chart below.



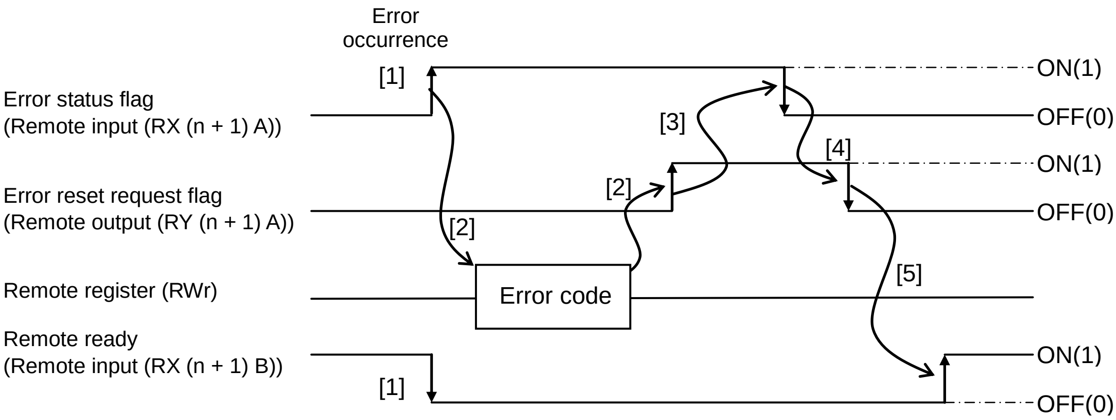
[1] After completing the writing of the command allocated for the item to be monitored or set and the associated data to the remote register (RWw), turn on the command execution request flag.
[2] After receiving the reply data corresponding to the sent command, the command completion reply flag is turned on.
[3] After the command completion reply flag is turned on, read the reply data from the remote register (RWr).
[4] After completing the reading of the reply data, turn off the command execution request flag to cancel the command execution request.
[5] When the command execution request flag is turned off, the command completion reply flag is turned off.

Note 1 : To send commands in succession, repeat the above steps [1] to [5].
Note 2 : It is possible to send and receive a command only when the remote ready (remote input (RX (n+1) B)) is ON (1).

5.5 Error communication

When an error occurs in the MDU, the status changes to the error communication. The chart below shows the procedure to cancel the error.

Write values to each device (bit device and word device set for each refresh device in the automatic refresh parameter) of the corresponding sequencer CPU or read values from each device so that each signal changes as shown in the chart below.



[1] When an error occurs in the MDU, the error flag is turned on and the remote ready is turned off.
[2] When the error flag is turned on, read the error code from the remote register (RWr). Remove the cause for the error by reading the error code and turn on the error reset request flag when restarting the communication with the MDU.
[3] When the error reset request flag is turned on, the error flag is turned off.
[4] After the error flag is turned off, turn off the error reset request flag.
[5] After the error reset request flag is turned off, the remote ready is turned on and the normal communication is restarted.

Note：For the error code, see "7. Error occurrence" to be mentioned later.

6. Commands supported by the MDU

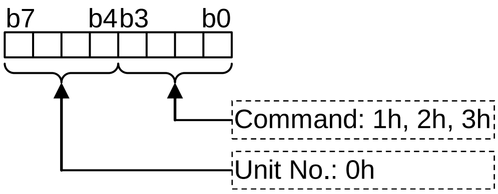
To monitor or set each measurement value or setting value of the MDU, write the command, group number, channel number, and unit number to the remote register RWw of the MDU. Then, you can monitor the measurement values and set the setting values.
(Group number and unit number are required only for the intermodel standard commands.)

(1) Commands
Commands show contents of a request given by the sequencer to the MDU.
Intermodel standard commands and model specific commands are used. See "6.1 List of commands" for details.

(2) Group numbers and channel numbers
These numbers are allocated to various data of the MDU so that they are identified when intermodel standard commands are used. Numbers are allocated in the matrix structure of group numbers and channel numbers. See the list of group channels of each intermodel standard command for details of the numbers.

	Description
Group No.	The number allocated to each measurement factor (current, voltage, etc.)
Channel No.	The number allocated to each category according to the details of each measurement factor (phase 1, phase 2, etc.)

(3) Unit numbers
The unit number of the MDU is fixed to 0h.
For intermodel standard commands, the number is indicated by an 8-bit data consisting of high 4 bits (unit number) and low 4 bits (command).



For example, when the unit number is 0h and the command is 1h, the unit number is indicated by "01h".

6.1 List of commands

The following table lists the commands supported by the MDU. See "6.2 Details of commands" for details of each command.

Table 6.1 List of commands

Command	Name	Description	Remark
01h	Data monitor	Monitor of various data (measurement data, setting data, etc.)	
02h	Data set	Setting of various data (phase wire system, demand time, etc.)	Other than date and clock time data
03h	Clock data set	Setting of date and clock time data	

Note 1 : Command sending is available only when the Remote ready (Remote input (RX (n+1) B)) is ON (1).
Note 2 : To send commands and receive reply data, use the command execution request flag (Remote output (RYnF) and the command completion reply flag (Remote input (RXnF)). See "5.4 Normal communication " for details.
Note 3 : When the present value and the maximum value are monitored in succession, a maximum value smaller than the present value may be monitored depending on the data update timing of the MDU.

6.2 Details of commands

This section describes details of the commands and reply data supported by the MDU.
The following figure shows the way of understanding the details of each command to be explained in the subsequent pages.

Command value **Command name** **Explanation of command sending/receipt**

1h	Data monitor (For measurement value, setting value, and bit information)

・A group number and a channel number are allocated to the measurement value data, clock time data, setting value data, and bit information data. (See Table 6.2.1.)

Remote register RWw (Sequencer => MDU)

<For data other than clock/clock time data>

	b15 … b8	b7 … b4	b3 … b0
m	Group No.	0h*1	1h
m+1	00h	Channel No.	
m+2	00h	00h	
m+3	00h	00h	

*1 Unit No. (Fixed to 0h)

Remote register RWr (MDU => Sequencer)

	b15 … b8	b7 … b0
n	Channel Number	Group Number
n+1	Exponent part	00h
n+2	Lower Medium Level of Data	Lower Level of Data
n+3	Upper Level of Data	Upper Medium Level of Data

Fixed unit number (0h)

Command

This is the content of a register sent from the master station to the MDU (remote device station).
Store the command value in the lower 1 byte of the first word; and data and the unit number in the second and subsequent words.
The length of the send data is fixed to the 4-word length. Therefore, store 00h in the area having no data.

This is the content of a register sent from the MDU (remove device station) to the master station.
The length of the received data is fixed to the 4-word length. Therefore, 00h is stored in the area having no reply data.

1h	Data monitor

- A group number and a channel number are allocated to the measurement value data, clock time data, setting value data, and bit information data. (See Table 6.2.1.)
- As shown below, write Command 1h and the group and channel numbers of the data to be monitored to the remote register RWw (the unit number is fixed to 0h); and set the command execution request flag (Remote output (RYnF)) to ON (1).
- If the contents of the remote register RWr are read after the command completion reply flag (Remote input (RXnF)) turns ON (1), you can monitor measurement values, clock time, setting values, and bit information of the specified group and channel numbers.
- The format and configuration of the data sent from the MDU vary depending on the channel number. (See Table 6.2.2.)
- Stored measurement and setting values vary depending on the model name and setting value of the MDU. Note that an out-of-channel range error occurs when any measurement or setting value not stored is requested. (See Table 6.2.1.)
- You can also monitor bit information such as circuit breaker alarm and interruption causes using this command.

Remote register RWw (Sequencer => MDU)

<For data other than clock/clock time data>

	b15 – b8	b7 – b4	b3 – b0
m	Group No.	0h[*1]	1h
m+1	00h	Channel No.	
m+2	00h	00h	
m+3	00h	00h	

*1 Unit No. (Fixed to 0h)

<For clock/clock time data>

	b15 – b8	b7 – b4	b3 – b0
m	Group No.	0h[*1]	1h
m+1	00h	Channel No.	
m+2	00h	00h	
m+3	00h	00h	

*1 Unit No. (Fixed to 0h)

Remote register RWr (MDU => Sequencer)

For data other than clock/clock time data:

	b15 – b8	b7 – b0
n	Channel No.	Group No.
n+1	Exponent part	00h
n+2	Lower medium data	Lower data
n+3	Upper data	Upper medium data

For clock/clock time data:

	b15 – b8	b7 – b0
n	Channel No.	Group No.
n+1	Year	Month
n+2	Day	Hour
n+3	Minute	Second

m, n: Addresses allocated in the station number setting

Table 6.2.1 Data monitor: Group and channel number allocation (1/3 (Note 1, 2, 3, and 4))

Group No. (h)	Channel No. (h)	Data type	Data name				Data format
15	01	Measurement value	Fault current			(A)	[1]
01	21	Measurement value	Load current	Phase 1	Present value	* (A)	[1]
01	41			Phase 2		(A)	
01	61			Phase 3		* (A)	
01	81			Phase N		(A)	
01	01			-	Present average value	(A)	
01	A1			Max. phase	Present value	(A)	
02	21			Phase 1	Demand value	* (A)	
02	41			Phase 2		(A)	
02	61			Phase 3		* (A)	
02	81			Phase N		(A)	
02	A1			Max. phase		(A)	
02	A2			-	Demand maximum value	(A)	
02	A3	Date and time		Time of occurrence of maximum demand value in all phases			[3]
03	21	Measurement value	Line voltage	Phase 1-N	Present value	* (V)	[1]
03	41			Phase 2-N		(V)	
03	61			Phase 3-N		* (V)	
05	21			Line 1-2		* (V)	
05	41			Line 2-3		(V)	
05	61			Line 3-1		* (V)	
05	01			-	Present average value	(V)	
05	A2			Max. phase	Present value	(V)	
05	A3	Date and time		Time of occurrence of maximum value in all lines			[3]
07	01	Measurement value	Electric power	Present value		(kW)	[1]
08	01			Demand value		(kW)	
08	02			Demand maximum value		(kW)	
08	03	Date and time		Time of occurrence of maximum demand value			[3]
09	01	Measurement value	Reactive power	Present value		(kvar)	[1]
0A	01			Demand value		(kvar)	
0A	02			Demand maximum value		(kvar)	
0A	03	Date and time		Time of occurrence of maximum demand value			[3]
80	01	Measurement value	Electric energy	Integrated value		(kWh)	[2]
80	21			Amont of last 1 hour		(kWh)	
80	22			Maximum value of amont of last 1 hour		(kWh)	
80	23	Date and time		Time of occurrence of max. value			[3]
81	01	Measurement value	Reactive energy	Integrated value		(kvarh)	[2]
81	21			Amont of last 1 hour		(kvarh)	
81	22			Maximumvalue of amont of last 1 hour		(kvarh)	
81	23	Date and time		Time of occurrence of max. value			[3]
0D	01	Measurement value	Power factor	Present value		(%)	[1]
0D	02			Maximum value		(%)	
0F	01		Frequency	Present value		(Hz)	

Table 6.2.1 Data Monitor: Group and Channel Number Allocation (2/3 (Note 1, 2, 3, and 4))

Group No. (h)	Channel No. (h)	Data type	Data name					Data format
33	21	Measurement value	Harmonic current	Phase 1	Total	Present value	* (A)	[1]
33	41	Measurement value	Harmonic current	Phase 2	Total	Present value	(A)	[1]
33	61	Measurement value	Harmonic current	Phase 3	Total	Present value	* (A)	[1]
33	81	Measurement value	Harmonic current	Phase N	Total	Present value	(A)	[1]
34	21	Measurement value	Harmonic current	Phase 1	Total	Demand value	* (A)	[1]
34	41	Measurement value	Harmonic current	Phase 2	Total	Demand value	(A)	[1]
34	61	Measurement value	Harmonic current	Phase 3	Total	Demand value	* (A)	[1]
34	81	Measurement value	Harmonic current	Phase N	Total	Demand value	(A)	[1]
34	A2	Measurement value	Harmonic current	-	Total	Maximum demand value	(A)	[1]
34	A3	Date and time	Harmonic current	Time of occurrence of maximum demand value				[3]
1D	21	Measurement value	Harmonic current	Phase 1	Fundamental	Present value	* (A)	[1]
1F	21	Measurement value	Harmonic current	Phase 1	3rd	Present value	* (A)	[1]
21	21	Measurement value	Harmonic current	Phase 1	5th	Present value	* (A)	[1]
23	21	Measurement value	Harmonic current	Phase 1	7th	Present value	* (A)	[1]
25	21	Measurement value	Harmonic current	Phase 1	9th	Present value	* (A)	[1]
27	21	Measurement value	Harmonic current	Phase 1	11th	Present value	* (A)	[1]
29	21	Measurement value	Harmonic current	Phase 1	13th	Present value	* (A)	[1]
2B	21	Measurement value	Harmonic current	Phase 1	15th	Present value	* (A)	[1]
2D	21	Measurement value	Harmonic current	Phase 1	17th	Present value	* (A)	[1]
2F	21	Measurement value	Harmonic current	Phase 1	19th	Present value	* (A)	[1]
1D	41	Measurement value	Harmonic current	Phase 2	Fundamental	Present value	(A)	[1]
1F	41	Measurement value	Harmonic current	Phase 2	3rd	Present value	(A)	[1]
21	41	Measurement value	Harmonic current	Phase 2	5th	Present value	(A)	[1]
23	41	Measurement value	Harmonic current	Phase 2	7th	Present value	(A)	[1]
25	41	Measurement value	Harmonic current	Phase 2	9th	Present value	(A)	[1]
27	41	Measurement value	Harmonic current	Phase 2	11th	Present value	(A)	[1]
29	41	Measurement value	Harmonic current	Phase 2	13th	Present value	(A)	[1]
2B	41	Measurement value	Harmonic current	Phase 2	15th	Present value	(A)	[1]
2D	41	Measurement value	Harmonic current	Phase 2	17th	Present value	(A)	[1]
2F	41	Measurement value	Harmonic current	Phase 2	19th	Present value	(A)	[1]
1D	61	Measurement value	Harmonic current	Phase 3	Fundamental	Present value	* (A)	[1]
1F	61	Measurement value	Harmonic current	Phase 3	3rd	Present value	* (A)	[1]
21	61	Measurement value	Harmonic current	Phase 3	5th	Present value	* (A)	[1]
23	61	Measurement value	Harmonic current	Phase 3	7th	Present value	* (A)	[1]
25	61	Measurement value	Harmonic current	Phase 3	9th	Present value	* (A)	[1]
27	61	Measurement value	Harmonic current	Phase 3	11th	Present value	* (A)	[1]
29	61	Measurement value	Harmonic current	Phase 3	13th	Present value	* (A)	[1]
2B	61	Measurement value	Harmonic current	Phase 3	15th	Present value	* (A)	[1]
2D	61	Measurement value	Harmonic current	Phase 3	17th	Present value	* (A)	[1]
2F	61	Measurement value	Harmonic current	Phase 3	19th	Present value	* (A)	[1]
1D	81	Measurement value	Harmonic current	Phase N	Fundamental	Present value	(A)	[1]
1F	81	Measurement value	Harmonic current	Phase N	3rd	Present value	(A)	[1]
21	81	Measurement value	Harmonic current	Phase N	5th	Present value	(A)	[1]
23	81	Measurement value	Harmonic current	Phase N	7th	Present value	(A)	[1]
25	81	Measurement value	Harmonic current	Phase N	9th	Present value	(A)	[1]
27	81	Measurement value	Harmonic current	Phase N	11th	Present value	(A)	[1]
29	81	Measurement value	Harmonic current	Phase N	13th	Present value	(A)	[1]
2B	81	Measurement value	Harmonic current	Phase N	15th	Present value	(A)	[1]
2D	81	Measurement value	Harmonic current	Phase N	17th	Present value	(A)	[1]
2F	81	Measurement value	Harmonic current	Phase N	19th	Present value	(A)	[1]

Table 6.2.1 Data Monitor: Group and Channel Number Allocation (3/3 (Note 1, 2, 3, and 4))

Group No. (h)	Channel No. (h)	Data type	Data name					Data format
1D	A2	Measurement value	Harmonic current	-	Fundamental	maximum value	(A)	[1]
1F	A2	Measurement value		-	3rd	maximum value	(A)	[1]
1F	A3	Date and time		Time of occurrence of max. value of 3rd-harmonic current				[3]
21	A2	Measurement value		-	5th	maximum value	(A)	[1]
21	A3	Date and time		Time of occurrence of max. value of 5th-harmonic current				[3]
23	A2	Measurement value		-	7th	maximum value	(A)	[1]
23	A3	Date and time		Time of occurrence of max. value of 7th-harmonic current				[3]
25	A2	Measurement value		-	9th	Maximum value	(A)	[1]
25	A3	Date and time		Time of occurrence of max. value of 9th-harmonic current				[3]
27	A2	Measurement value		-	11th	Maximum value	(A)	[1]
27	A3	Date and time		Time of occurrence of max. value of 11th-harmonic current				[3]
29	A2	Measurement value		-	13th	maximum value	(A)	[1]
29	A3	Date and time		Time of occurrence of max. value of 13th-harmonic current				[3]
2B	A2	Measurement value		-	15th	maximum value	(A)	[1]
2B	A3	Date and time		Time of occurrence of max. value of 15th-harmonic current				[3]
2D	A2	Measurement value		-	17th	Maximum value	(A)	[1]
2D	A3	Date and time		Time of occurrence of max. value of 17th-harmonic current				[3]
2F	A2	Measurement value		-	19th	Maximum value	(A)	[1]
2F	A3	Date and time		Time of occurrence of max. value of 19th-harmonic current				[3]
02	14	Setting value	Upprer limit alarm				(A)	[4]
02	15		Lower limit alarm				(A)	
AE	80	Alarm status	16-bit monitor					[5]
F0	80	Setting value	MDU series code					[6]
E0	70		Rated current (In)				(A)	
E0	72		Number of poles					
E0	16		Demand time				(Minute)	
E0	88		Alarm reset method					
E0	13		Phase wire system					
E0	87		Phase switch (1- to 3-phase connection)					
F0	85	Measurement value	Open/close count				(Note 5) (Number of Times)	[1]
F0	86		Trip count				(Note 6) (Number of Times)	
E0	71	Setting value	Current setting (Ir)				(A)	[6]
E0	7E		INST pickup ratio				(%)	
F0	A2		INST reference value				(%)	
E0	76		PAL pickup current (Ip)				(%)	
E0	7C		STD pickup current (Is)				(Times)	
E0	7D		STD operating time (Ts)				(ms)	
E0	7B		LTD operating time (TL)				(s)	
F0	D0		Alarm ON/OFF setting					[7]
F0	D1		IDM_AL (Current demand alarm) pickup current				(%)	[6]
F0	D2		IDM_AL (Current demand alarm) demand time				(Minute)	
E0	01	Clock time	Current time					[3]

Note 1: Some channel numbers cannot be used depending on the model of the MDU breaker to be used.

MDU breaker model	Unusable group and channel numbers
3-pole (3P) product	01h/81h, 02h/81h, 03h/21h, 03h/41h, 03h/61h, 33h/81h, 34h/81h, 1Dh/81h, 1Fh/81h, 21h/81h, 23h/81h, 25h/81h, 27h/81h, 29h/81h, 2Bh/81h, 2Dh/81h, 2Fh/81h

Note 2: Items with an asterisk mark (*) refer to items that can be switched by the phase switch setting value.

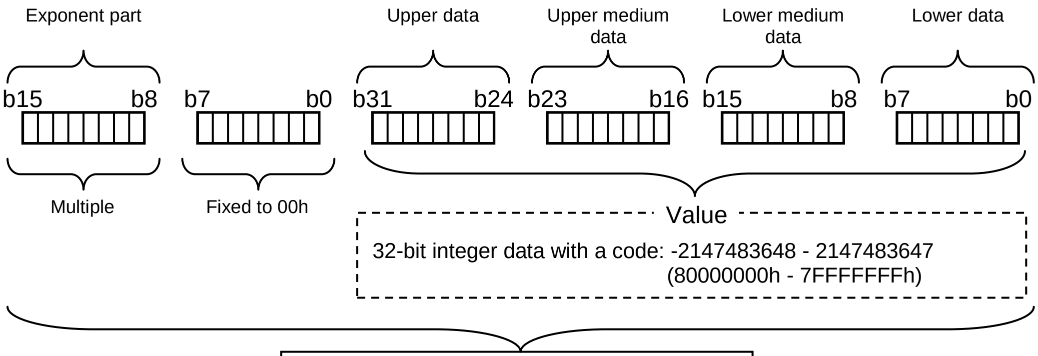
Note 3: When any group/channel number other than that specified in the list of group and channel number allocations described above is specified, an out-of-group range error (Error code 41h) and an out-of channel range error (Error code 42h) occur.

Note 4: When the present value and the maximum value are monitored in succession, a maximum value smaller than the present value may be monitored depending on the data update timing of the MDU.

Note 5: This becomes available when the AX switch for transmission with MDU breaker (optional) is attached to the MDU breaker.

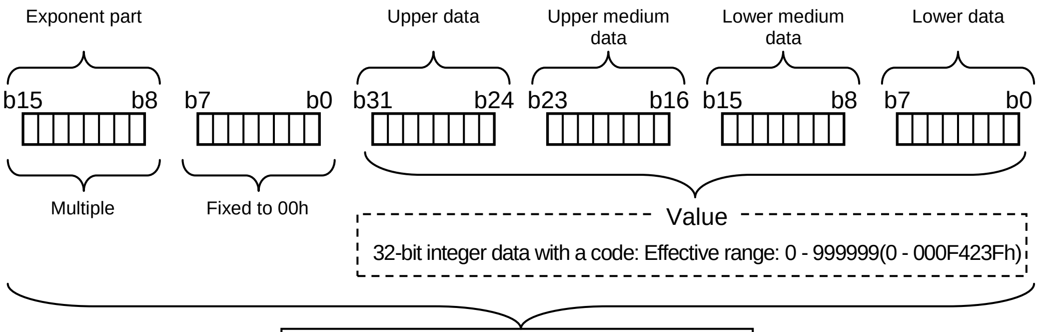
Note 6: This becomes available when the AL switch for transmission with MDU breaker (optional) is attached to the MDU breaker.

Table 6.2.2 Data formats and their configurations (1 / 6)

<table>
<tr><th>Data format</th><th>Configuration</th></tr>
<tr><td>[1]
Measurement value
Other than electric energy and reactive electric energy</td><td>

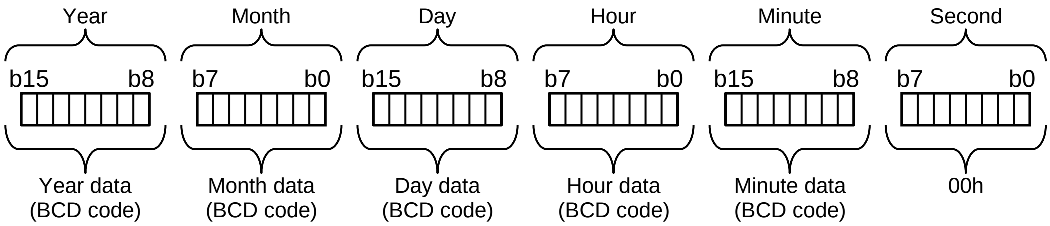
<u>Value x Multiple = Actual value</u>
<Multiples>
Exponent part = 00h: Multiple = 1, "Value x 1" is the actual value.
Exponent part = FFh: Multiple = 0.1, "Value x 0.1" is the actual value.

<Values>
The negative value is a two's-complement number.
e.g. Electric energy present value
Data = Value 000000FFh, Exponent part FFh => 255 x 0.1 = 25.5 [kW]
Data = Value FFFFFF01h, Exponent part FFh => -255 x 0.1 = - 25.5 [kW]

Note : The multiples vary depending on the measurement value. Therefore, calculate values based on the multiple information. (See Table 6.2.3.)</td></tr>
<tr><td>[2]
Measurement value
Electric energy and reactive electric energy</td><td>

<u>Value x Multiple = Actual value</u>

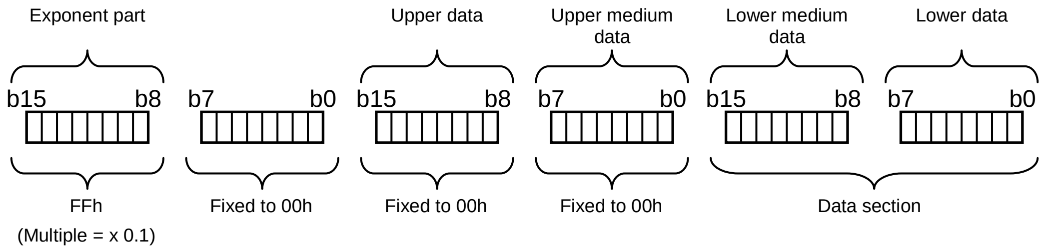
<table>
<tr><th></th><th>Applicable models</th><th>Exponent part</th><th>Data range</th><th>Measurement value range</th><th>Unit</th></tr>
<tr><td rowspan="2">Electric energy</td><td>250A Frame</td><td>FFh
(Multiple = 0.1)</td><td>0 - 999999d
(0 - 000F423Fh)</td><td>0.0 - 99999.9 [kWh]</td><td>0001h
(0.1 [kWh])</td></tr>
<tr><td>400/800A Frame</td><td>00h
(Multiple = 1)</td><td>0 - 999999d
(0 - 000F423Fh)</td><td>0 - 999999 [kWh]</td><td>0001h
(1 [kWh])</td></tr>
<tr><td rowspan="2">Reactive energy</td><td>250A Frame</td><td>FFh
(Multiple = 0.1)</td><td>0 - 999999d
(0 - 000F423Fh)</td><td>0.0 - 99999.9 [kvarh]</td><td>0001h
(0.1 [kvarh])</td></tr>
<tr><td>400/800A Frame</td><td>00h
(Multiple = 1)</td><td>0 - 999999d
(0 - 000F423Fh)</td><td>0 - 999999 [kvarh]</td><td>0001h
(1 [kvarh])</td></tr>
</table>

e.g. Electric energy (Integrated value)
Data = Exponent part FFh, Value 000000FFh => 255 x 0.1 = 25.5 [kWh]</td></tr>
<tr><td>[3]
Time of occurrence of maximum value
Current time</td><td>

Year data: Last 2 digits of the Christian era (e.g., 18h indicates year 2018.)
Month data: Month data (e.g., 11h indicates November.)
Day data: Day data (e.g., 16h indicates day 16th.)
Hour data: Hour data (e.g., 17h indicates 17 o'clock.)
Minute data: Minute data (e.g., 15h indicates 15 minutes.)</td></tr>
</table>

Table 6.2.2 Data formats and their configurations (2 / 6)

Data format	Data configuration
[4] **Setting value** Upper limit alarm and lower limit alarm	See below



[Upper limit alarm]

Group No. (h)	Channel No. (h)	Applicable models	Data range	Upper limit value	Unit	Default
02	14	250A Frame	0000h – 1388h	0.0 – 500.0 [A]	0001h (0.1[A])	1388h (500.0[A])
		400A Frame	0000h – 1F40h	0.0 – 800.0 [A]	0001h (0.1[A])	1F40h (800.0[A])
		800A Frame	0000h – 270Fh	0.0 – 999.9 [A]	0001h (0.1[A])	04ECh (1260[A])
			03E8h – 04ECh	1000 – 1260 [A]	0001h (1[A])	
			0000h – 270Fh	0.0 – 999.9 [A]	0001h (0.1[A])	0640h (1600[A])
			03E8h – 0640h	1000 – 1600 [A]	0001h (1[A])	

*The data is calculated by multiplying the upper limit value by 10.

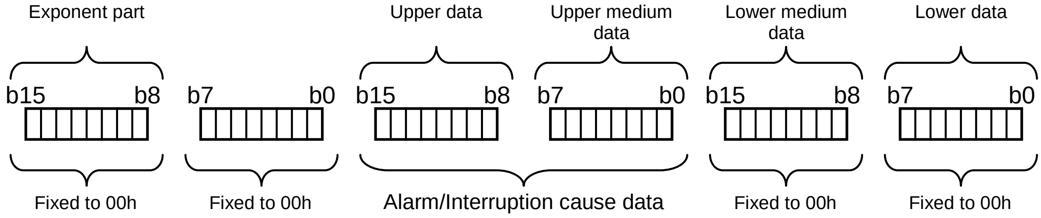
[Lower limit alarm]

Group No. (h)	Channel No. (h)	Applicable models	Data range	Lower limit value	Unit	Default
02	15	250A Frame	0000h – 1388h	0.0 – 500.0 [A]	0001h (0.1[A])	0000h (0[A])
		400A Frame	0000h – 1F40h	0.0 – 800.0 [A]	0001h (0.1[A])	0000h (0[A])
		800A Frame	0000h – 270Fh	0.0 – 999.9 [A]	0001h (0.1[A])	0000h (0[A])
			03E8h – 04ECh	1000 – 1260 [A]	0001h (1[A])	
			0000h – 270Fh	0.0 – 999.9 [A]	0001h (0.1[A])	0000h (0[A])
			03E8h – 0640h	1000 – 1600 [A]	0001h (1[A])	

*The data is calculated by multiplying the lower limit value by 10.

Table 6.2.2 Data formats and their configurations (3 / 6)

Data format	Data configuration
[5] **Alarm status** 16-bit monitor	[16-bit monitor] (Group number: AEh, channel number: 80h)



	bit	Description	For 1	For 0	Remark
Upper medium data	b0	AX (ON/OFF status)	ON	OFF or trip	Note 1
	b1	AL (Trip status)	Trip	ON or OFF	Note 2
	b2	PAL (Pre-alarm)	Alarm occurred	Alarm not occurred	Note 5
	b3	Reserved	-	-	
	b4	Reserved	-	-	
	b5	Reserved	-	-	
	b6	LTD	Occurred	Not occurred	Note 3, 6
	b7	STD/INST	Occurred	Not occurred	Note 3, 4, 6
Upper data	b8	Lower limit alarm	Occurred	Not occurred	Note 5
	b9	Upper limit alarm	Occurred	Not occurred	Note 5
	b10	IDM_AL (Current demand alarm)	Occurred	Not occurred	Note 5
	b11	IUB_AL (Current unbalance alarm)	Occurred	Not occurred	Note 5
	b12	OVER (Overcurrent alarm)	Alarm occurred	Alarm not occurred	Note 5
	b13	ILA_AL (Current open-phase alarm)	Occurred	Not occurred	Note 5
	b14	Reserved	-	-	
	b15	Reserved	-	-	

Note 1: This becomes available when the AX switch for transmission with MDU breaker (optional) is attached to the MDU breaker.

Note 2: This becomes available when the AL switch for transmission with MDU breaker (optional) is attached to the MDU breaker.
AL (Trip status) shows the status of the main body mechanism of the MDU breaker.

Note 3: Any one of the causes of the fault is regarded as "Occurred".

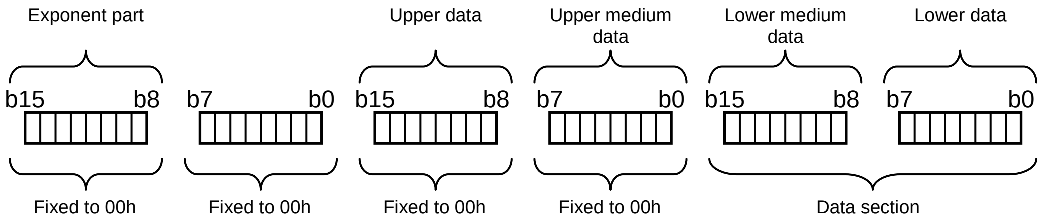
Note 4: The causes of the fault by INST becomes available when the AL switch for transmission with MDU breaker (optional) is attached to the MDU breaker.

Note 5: The reset method of PAL (self-retention or automatic reset) is set by the data set (2h) of the intermodel standard command. (See pages 44, 46, 51, and 52.)
The reset method of OVER (overcurrent alarm) is "automatic reset" regardless of the setting.

Note 6: The reset of LTD, STD/INST, and respective upper/lower limit alarm are set in the data set (2h) of the intermodel standard command. (See pages 44, 48, and 50.)

Table 6.2.2 Data formats and their configurations (4 / 6)

Data format	Data configuration
[6] Setting value Other than upper limit alarm, lower limit alarm, and alarm ON/OFF setting	(see below)



[MDU series code]

Group No. (h)	Channel No. (h)	Data	Default
F0	80	0001h	Molded Case Circuit Breaker

[Rated current (In)]

Group No. (h)	Channel No. (h)	Applicable models	Data	Rated current (In)
E0	70	250A Frame	00FAh	250 [A]
		400A Frame	0190h	400 [A]
		800A Frame	0276h	630 [A]
			0320h	800 [A]

[Number of poles]

Group No. (h)	Channel No. (h)	Data	Number of poles
E0	72	0003h	3-pole
		0004h	4-pole

[Demand time]

Group No. (h)	Channel No. (h)	Data range	Demand time delay	Unit	Default
E0	16	0000h (0d) - 000Fh (15d)	0 - 15 [minutes]	0001h (1 [minute])	0002h (2 [minutes])

[Alarm reset method]

Group No. (h)	Channel No. (h)	Data	Alarm reset method
E0	88	0000h	Automatic reset
		0001h	Self-retention

[Phase wire system]

Group No. (h)	Channel No. (h)	Data	Phase wire system	Default
E0	13	0001h	Single-phase 2-wire	0003h (3-phase 3-wire)
		0002h	Single-phase 3-wire	
		0003h	3-phase 3-wire	
		0004h	3-phase 4-wire	

[Phase switch (1 to 3-phase connection)]

Group No. (h)	Channel No. (h)	Data	Phase wire system	Default
E0	87	0000h	Phase not switched (1 to 3-phase connection)	0000h Phase not switched (1 to 3-phase connection)
		0001h	Phase switched (3 to 1-phase connection)	

Table 6.2.2 Data formats and their configurations (5 / 6)

Data format	Data configuration

[6] Setting value

Other than upper limit alarm, lower limit alarm, and alarm ON/OFF setting

[Current setting (Ir)]

Group No. (h)	Channel No. (h)	Applicable models	Data	Current setting (Ir)
E0	71	250A Frame	0096h - 00FAh	125 [A] - 250 [A]
		400A Frame	00C8h - 0190h	200 [A] - 400 [A]
		800A Frame	012Ch - 0276h	300 [A] - 630 [A]
			0190h - 0320h	400 [A] - 800 [A]

Note : The current is adjustable in steps of 12.5A. (125 A ⇔ 137.5A ⇔ 150A …)
For communication data, the fractional portion of the number is rounded up.
e.g. 137.5A setting ⇒ 138 A

[INST pickup ratio]

Group No. (h)	Channel No. (h)	Applicable models	Data	INST pickup ratio	Unit	Step
E0	7E	250A Frame	0014h - 008Ch	20 - 140	0.1[%]	1
		400A Frame	0028h - 00A0h	40 - 160		
		800A Frame	0028h - 0096h	40 - 150		
			0028h - 0078h	40 - 120		

[INST refernce ratio]

Group No. (h)	Channel No. (h)	Applicable models	Data	INST pickup ratio	Unit	Step
E0	A2	250A Frame	0028h - 0064h	40 - 100	[%]	1
		400/800A Frame	0064h	100	[%]	Fixed

* The INST pickup current Ii is obtained by the following formula.
Ii = (Rated current (In) x INST pickup ratio x INST reference value) / 1000 (Unit : A)
e.g. When the Rated current is 250 (A), the INST pickup ratio is 140 (x 0.1%), and The INST reference value is 95% :
Ii = (250 x 140 x 95) / 1000 = 3325 A

[6] Setting value

Other than current demand alarm upper limit value, current demand alarm lower limit value, and alarm ON/OFF setting

[PAL pickup current (Ip)]

Group No. (h)	Channel No. (h)	Data	INST pickup ratio	Unit	Default
E0	76	0046h - 0064h	70 – 100 [%]	0005h (5[%])	0046h (70[%])

[STD pickup current (Is)]

Group No. (h)	Channel No. (h)	250A Frame		400/800A Frame	
		Data	STD pickup current (Is)	Data	STD pickup current (Is)
E0	7C	0014h (20d)	x 2.0	0014h (20d)	x 2.0
		0019h (25d)	x 2.5	0019h (25d)	x 2.5
		001Eh (30d)	x 3.0	001Eh (30d)	x 3.0
		0023h (35d)	x 3.5	0023h (35d)	x 3.5
		0028h (40d)	x 4	0028h (40d)	x 4
		0032h (50d)	x 5	0032h (50d)	x 5
		003Ch (60d)	x 6	003Ch (60d)	x 6
		0046h (70d)	x 7	0046h (70d)	x 7
		0050h (80d)	x 8	0050h (80d)	x 8
		005Ah (90d)	x 9		
		0064h (100d)	x 10	0064h (100d)	x 10

*The data is calculated by multiplying the STD pickup current by 10.

[STD operating time (Ts)]

Group No. (h)	Channel No. (h)	250A Frame		400/800A Frame	
		Data	STD pickup current (Is)	Data	STD pickup current (Is)
E0	7D			0000h	60 [ms]
		0001h	100 [ms]	0001h	100 [ms]
		0002h	200 [ms]	0002h	200 [ms]
		0003h	300 [ms]	0003h	300 [ms]

Table 6.2.2 Data formats and their configurations (6 / 6)

Data format	Data configuration

[6] Setting value

Other than upper limit alarm, lower limit alarm, and alarm ON/OFF setting

[LTD operating time (TL)]

Group No. (h)	Channel No. (h)	250A Frame		400/800A Frame	
		Data	STD pickup current (Is)	Data	STD pickup current (Is)
E0	7B	0078h (120d)	12 [s]	0078h (120d)	12 [s]
		0258h (600d)	60 [s]	0258h (600d)	60 [s]
		0320h (800d)	80 [s]	03E8h (1000d)	100 [s]
		03E8h (1000d)	100 [s]	05DCh (1500d)	150 [s]

*The data is calculated by multiplying the LTD operating time by 10.

[IDM_AL (Current demand alarm) pickup current]

Group No. (h)	Channel No. (h)	Data range	IDM_AL pickup current	Unit	Default
F0	D1	0032h - 0064h	50 – 100 [%]	0005h (5[%])	0064h (100[%])

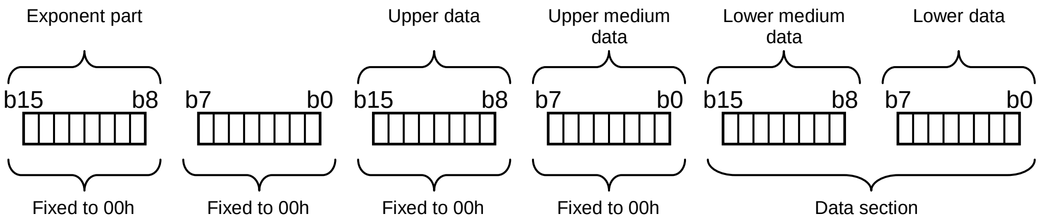
[IDM_AL (Current demand alarm) demand time]

Group No. (h)	Channel No. (h)	Data range	IDM_AL demand time	Unit	Default
F0	D2	0001h – 000Ah	1 – 10 [Minutes]	0001h (1[Minute])	0002h (2[Minute])
		000Fh	15 [Minutes]		
		0014h	20 [Minutes]		
		0019h	25 [Minutes]		
		001Eh	30 [Minutes]		

[7] Setting value

Alarm ON/OFF setting

[Alarm ON/OFF Setting] (Group Number: F0h, Channel Number: D0h)



	bit	Description	For 1	For 0	Remark
Lower data	b0	IDM _ AL (Current demand alarm)	OFF	ON	
	b1	IUB _ AL (Current unbalanced alarm)	OFF	ON	
	b2	ILA _ AL (Current open-phase alarm)	OFF	ON	
	b3	Reserved	Fixed to 1		
	b4	Reserved	Fixed to 1		
	b5	Reserved	Fixed to 1		
	b6	Reserved	Fixed to 1		
	b7	Reserved	Fixed to 1		
Lower medium data	b8	Reserved	Fixed to 1		
	b9	Reserved	Fixed to 1		
	b10	Reserved	Fixed to 1		
	b11	Reserved	Fixed to 1		
	b12	Reserved	Fixed to 1		
	b13	Reserved	Fixed to 1		
	b14	Reserved	Fixed to 1		
	b15	Reserved	Fixed to 1		

Table 6.2.3 Data ranges and units of measurement values (1 / 2)

	Applicable models	Rated current	Measurement range	Data range	Data unit	Exponent part	Remark
Load current	250A Frame	125～250A	0.0 - 499.9 A 500 A or more	0 - 4999 Fixed to 5000	0.1 A 0.1 A	FF h FF h	Fixed to 0 A for less than 2.5 A
	400A Frame	400 A	0.0 - 799.9 A 800 A or more	0 - 7999 Fixed to 8000	0.1 A 0.1 A	FF h FF h	Fixed to 0 A for less than 4.0 A
	800A Frame	630 A	0.0 - 999.9 A 1000 - 1259 A 1260 A or more	0 - 9999 1000 - 1259 Fixed to 1260	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 6.3 A
		800 A	0.0 - 999.9 A 1000 - 1599 A 1600 A or more	0 - 9999 1000 - 1599 Fixed to 1600	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 8.0 A
Line voltage	common	common	0.0 - 99.9 V 100 - 758 V 759 V or more	0 - 999 100 - 758 Fixed to 759	0.1 V 1 V 1 V	FF h 00 h 00 h	Fixed to 0 V for less than 22 V
Harmonic current	250A Frame	125～250A	0.0 - 99.9 A 100 - 249 A 250 A or more	0 - 999 100 - 249 Fixed to 250	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 5.0 A
	400A Frame	400 A	0.0 - 99.9 A 100 - 399 A 400 A or more	0 - 999 100 - 399 Fixed to 400	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 8.0 A
	800A Frame	630 A	0.0 - 99.9 A 100 - 629 A 630 A or more	0 - 999 100 - 629 Fixed to 630	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 12.6 A
		800 A	0.0 - 99.9 A 100 - 799 A 800 A or more	0 - 999 100 - 799 Fixed to 800	0.1 A 1 A 1 A	FF h 00 h 00 h	Fixed to 0 A for less than 16.0 A
Electric power	250A Frame	125～250A	-657.3kW or less -657.2 - 0.0 kW 0.0 - 657.2 kW 657.3 kW or more	Fixed to -6573 -6572 - 0 0 - 6572 Fixed to 6573	0.1 kW 0.1 kW 0.1 kW 0.1 kW	FF h FF h FF h FF h	Also fixed when the current or the voltage is equal to or more than the measurement maximum value.
	400A Frame	400 A	-1052 kW or less -1051 - 1000 kW -999.9 - 0.0 kW 0.0 - 999.9 kW 1000 - 1051 kW 1052 kW or more	Fixed to -1052 -1051 - 1000 -999 - 0 0 - 999 1000 - 1051 Fixed to 1052	1 kW 1 kW 0.1 kW 0.1 kW 1 kW 1 kW	00 h 00 h FF h FF h 00 h 00 h	
	800A Frame	630 A	-1656 kW or less -1655 - 1000 kW -999.9 - 0.0 kW 0.0 - 999.9 kW 1000 - 1655 kW 1656 kW or more	Fixed to -1656 -1055 - 1000 -999 - 0 0 - 999 1000 - 1055 Fixed to 1656	1 kW 1 kW 0.1 kW 0.1 kW 1 kW 1 kW	00 h 00 h FF h FF h 00 h 00 h	
		800 A	-2103 kW or less -2102 - 1000 kW -999.9 - 0.0 kW 0.0 - 999.9 kW 1000 - 2102 kW 2103 kW or more	Fixed to -2103 -2102 - 1000 -999 - 0 0 - 999 1000 - 2102 Fixed to 2103	1 kW 1 kW 0.1 kW 0.1 kW 1 kW 1 kW	00 h 00 h FF h FF h 00 h 00 h	
Reactive power	250A Frame	125～250A	-657.3 kvar or less -657.2 - 0.0 kvar 0.0 - 657.2 kvar 657.3 kvar or more	Fixed to -6573 -6572 - 0 0 - 6572 Fixed to 6573	0.1 kvar 0.1 kvar 0.1 kvar 0.1 kvar	FF h FF h FF h FF h	Also fixed when the current or the voltage is equal to or more than the measurement maximum value.
	400A Frame	400 A	-1052 kvar or less -1051 - 1000 kvar -999.9 - 0.0 kvar 0.0 - 999.9 kvar 1000 - 1051 kvar 1052 kvar or more	Fixed to -1052 -1051 - 1000 -999 - 0 0 - 999 1000 - 1051 Fixed to 1052	1 kvar 1 kvar 0.1 kvar 0.1 kvar 1 kvar 1 kvar	00 h 00 h FF h FF h 00 h 00 h	
	800A Frame	630 A	-1656 kvar or less -1655 - 1000 kvar -999.9 - 0.0 kvar 0.0 - 999.9 kvar 1000 - 1655 kvar 1656 kvar or more	Fixed to -1656 -1055 - 1000 -999 - 0 0 - 999 1000 - 1055 Fixed to 1656	1 kvar 1 kvar 0.1 kvar 0.1 kvar 1 kvar 1 kvar	00 h 00 h FF h FF h 00 h 00 h	
		800 A	-2103 kvar or less -2102 - 1000 kvar -999.9 - 0.0 kvar 0.0 - 999.9 kvar 1000 - 2102 kvar 2103 kvar or more	Fixed to -2103 -2102 - 1000 -999 - 0 0 - 999 1000 - 2102 Fixed to 2103	1 kvar 1 kvar 0.1 kvar 0.1 kvar 1 kvar 1 kvar	00 h 00 h FF h FF h 00 h 00 h	

Table 6.2.3 Data ranges and units of measurement values (2 / 2)

	Applicable models	Rated current	Measurement range	Data range	Data unit	Exponent part	Remark
Electric energy	250A Frame	125～250A	0.0 - 99999.9 kWh	0 - 999999	0.1 kWh	FFh	When the electric energy exceeds 99999.9 kWh, the value is reset to 0 kWh and calculation continues.
	400/800A Frame	common	0 - 999999 kWh	0 - 999999	1 kWh	00h	When the electric energy exceeds 999999 kWh, the value is reset to 0 kWh and calculation continues.
Reactive energy	250A Frame	125～250A	0.0 - 99999.9 kvarh	0 - 999999	0.1 kvarh	FFh	When the reactive electric energy exceeds 99999.9 kvarh, the value is reset to 0 kvarh and calculation continues.
	400/800A Frame	common	0 - 999999 kWh	0 - 999999	1 kvarh	00h	When the electric energy exceeds 999999 kvarh, the value is reset to 0 kvarh and calculation continues.
Electric energy amount for last 1-hour	250A Frame	125～250A	0.0 – 657.3 kWh	0 - 6573	0.1 kWh	FFh	
	400/800A Frame	common	0 - 3824 kWh	0 - 3824	1 kWh	00h	
Reactive energy amount for last 1-hour	250A Frame	125～250A	0.0 - 657.3 kvarh	0 - 6573	0.1 kvarh	FFh	
	400/800A Frame	common	0 - 3824 kvarh	0 - 3824	1 kvarh	00h	
Power factor	common	common	Lead of 0 - 100 to lag of 0%	Lead of 0 - 1000 - lag of 0	0.1%	FFh	Lead is indicated in minus (-).
Fault current Long time delay Short time delay Instantaneous	250A Frame	125～250A	0 - 3999 A 4000 A or more	0 - 3999 Fixed to 4000	1 A 1 A	00h 00h	
	400A Frame	400A	0 - 6399 A 6400 A or more	0 - 6399 Fixed to 6400	1 A 1 A	00h 00h	
	800A Frame	630A	0 - 10079 A 10080 A or more	0 - 10079 Fixed to 10080	1 A 1 A	00h 00h	
		800A	0 - 12799 A 12800 A or more	0 - 12799 Fixed to 12800	1 A 1 A	00h 00h	
Frequency	common	common	0.0, 45 - 65	0, 450 - 650	0.1 Hz	00h	Fixed to 450 and 650 when the frequency is 45 Hz or less or 65 Hz or more respectively. Fixed to 0 when voltage is no input.

2h	Data set

- You can change each setting value of the MDU from the sequencer side.
- As shown below, write Command 2h and the group and channel numbers of the measurement and setting values to be set to the remote register RWw (the unit number is fixed to 0h); and set the command execution request flag (Remote output (RYnF)) to ON (1).
- When the command completion reply flag (Remote input (RXnF)) turns ON (1), the measurement and setting values of the specified group and channel numbers are set.
- See Table 6.2.4 for the group and channel numbers that can be set.
- See Table 6.2.5 for data formats and their configurations.
- You can also reset or erase bit information such as breaker alarm and interruption causes by using this command.

* When the setting of this unit is changed, it takes a few seconds until its operation becomes stable. The unit does not perform the measurement during this time.

Remote register RWw (Sequencer => MDU)

	b15 … b8	b7 … b4	b3 … b0
m	Group No.	0h*1	2h
m+1	Exponent part	Channel No.	
m+2	Lower medium data	Lower data	
m+3	Upper data	Upper medium data	

*1 Unit No. (Fixed to 0h)

Remote register RWr (MDU => Sequencer)

	b15 … b8	b7 … b0
n	Channel No.	Group No.
n+1	00h	00h
n+2	00h	00h
n+3	00h	00h

m, n: Addresses allocated in the station number setting

Table 6.2.4 Data set: Group and channel number allocations

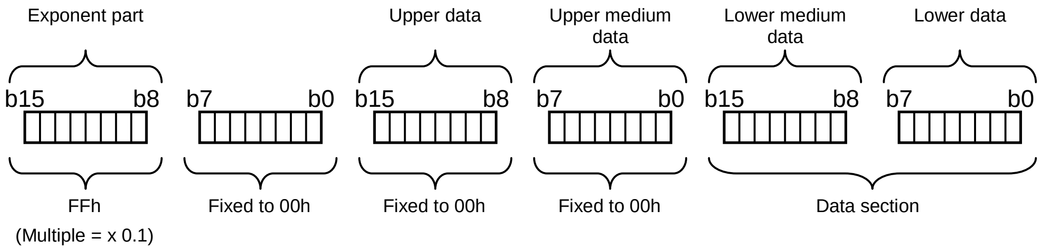
Group No. (H)	Channel No. (H)	Data type	Data name	Data format
02	14	Setting value	Upper limit alarm (A)	[1]
02	15		Lower limit alarm (A)	
AF	80	Reset	16-bit set/Reset	[3]
E0	16	Setting value	Demand time (Minute)	[2]
E0	88		Alarm reset method	
E0	13		Phase wire system	
E0	87		Phase switch (1- to 3-phase connection)	
F0	D0		Alarm ON/OFF setting	[4]
F0	D1		IDM_AL (Current demand alarm) pickup current (%)	[2]
F0	D2		IDM_AL (Current demand Alarm) demand time (Minute)	
80	01	Electric energy/ Reactive energy set	Electric energy (kWh)	[5]
81	01		Reactive energy (kvarh)	

Note 1: When any channel number other than those described above is specified or any data other than that in the setting data range specified in Table 6.2.5 is specified, the normal operation is not guaranteed.

Note 2: Each setting value is registered in the non-volatile memory (E^2PROM) at the time of setting.

Table 6.2.5 Data formats and their configurations (1 / 4)

Data format	Data configuration
[1] Setting value Current demand alarm upper limit value, and current demand alarm lower limit value	(see below)



[Upper limit alarm]

Group No. (h)	Channel No. (h)	Applicable models	Rated current	Setting data range	Upper limit value	Unit	Default
02	14	250A Frame	125 – 250A	0000h-1388h	0.0 - 500.0 [A]	0001h (0.1[A])	1388h (500.0[A])
		400A Frame	400A	0000h-1F40h	0.0 - 500.0 [A]	0001h (0.1[A])	1F40h (800.0[A])
		800A Frame	630A	0000h-270Fh	0.0 - 999.9 [A]	0001h (0.1[A])	04ECh (1260[A])
				03E8h-04ECh	1000 -1260[A]	0001h (1[A])	
			800A	0000h - 270Fh	0.0 - 999.9 [A]	0001h (0.1[A])	0640h (1600[A])
				03E8h-0640h	1000 -1600[A]	0001h (1[A])	

Note 1 : Values lower than the lower limit value cannot be set.
Note 2 : The maximum value among the current demand present values of each phase is monitored.

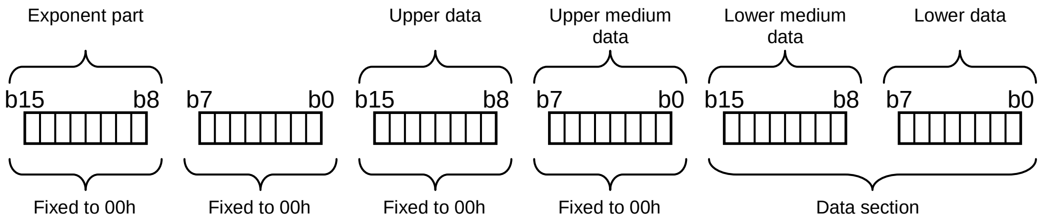
[Lower limit alarm]

Group No. (h)	Channel No. (h)	Applicable models	Rated current	Setting data range	Lower limit value	Unit	Default
02	14	250A Frame	125 – 250A	0000h-1388h	0.0 - 500.0 [A]	0001h (0.1[A])	0h (0[A])
		400A Frame	400A	0000h-1F40h	0.0 - 500.0 [A]	0001h (0.1[A])	0h (0[A])
		800A Frame	630A	0000h-270Fh	0.0 - 999.9 [A]	0001h (0.1[A])	0h (0[A])
				03E8h-04ECh	1000 -1260[A]	0001h (1[A])	
			800A	0000h - 270Fh	0.0 - 999.9 [A]	0001h (0.1[A])	0h (0[A])
				03E8h-0640h	1000 -1600[A]	0001h (1[A])	

Note 1: Values higher than the upper limit value cannot be set.
Note 2: The maximum value among the current demand present values of each phase is monitored

Table 6.2.5 Data formats and their configurations (2 / 4)

Data format	Data configuration
[2] Setting value Other than current demand alarm upper limit value, current demand alarm lower limit value, and alarm ON/OFF setting	See below



[Demand time]

Group No. (h)	Channel No. (h)	Setting data range	Demand time delay	Unit	Default
E0	16	0000h - 000Fh	0 - 15 [minute(s)]	0001h (1 [minute])	0002h (2 [minutes])

[Alarm reset method]

Group No. (h)	Channel No. (h)	Setting data	Alarm reset method
E0	88	0000h	Automatic reset
		0001h	Self-retention

[Phase wire system]

Group No. (h)	Channel No. (h)	Setting data	Phase wire system	Default
E0	13	0001h	Single-phase 2-wire	0003h (3-phase 3-wire)
		0002h	Single-phase 3-wire	
		0003h	3-phase 3-wire	
		0004h	3-phase 4-wire	

[Phase switch (1- to 3-phase connection)]

Group No. (h)	Channel No. (h)	Setting data	Phase wire system	Default
E0	87	0000h	Phase not switched (1- to 3-phase connection)	0000h (Phase not switched: 1- to 3-phase connection)
		0001h	Phase switched (3- to 1-phase connection)	

Table 6.2.5 Data formats and their configurations (3 / 4)

Data format	Data configuration
[2] Setting value Other than upper limit alarm, lower limit alarm, and alarm ON/OFF setting	see below

[IDM_AL (Current demand alarm) pickup current]

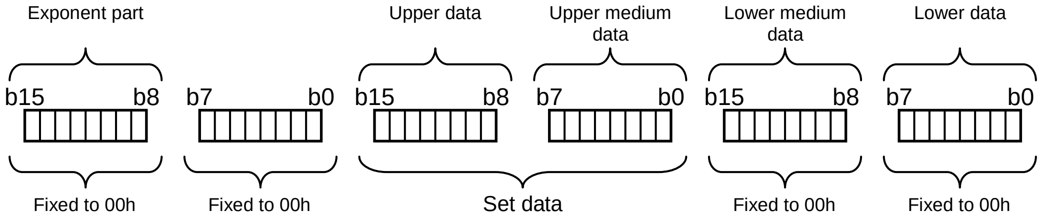
Group No. (h)	Channel No. (h)	Setting data range	IDM_AL pickup current	Unit	Default
F0	D1	0032h - 0064h	50 - 100 [%]	0001h (1 [%])	0064h (100 [%])

[IDM_AL (Current demand alarm) demand time delay]

Group No. (h)	Channel No. (h)	Setting data range	IDM_AL pickup current	Unit	Default
F0	D2	0001h – 000Ah	1[minute] - 10 [minutes]	0001h (1 [minute])	0002h (1 [minute])
		000Fh	15 [minutes]		
		0014h	20 [minutes]		
		0019h	25 [minutes]		
		001Eh	30 [minutes]		

[3] 16-bit set/Reset

[16 bit set/Reset] (Group number: AFh, Channel number: 80h)



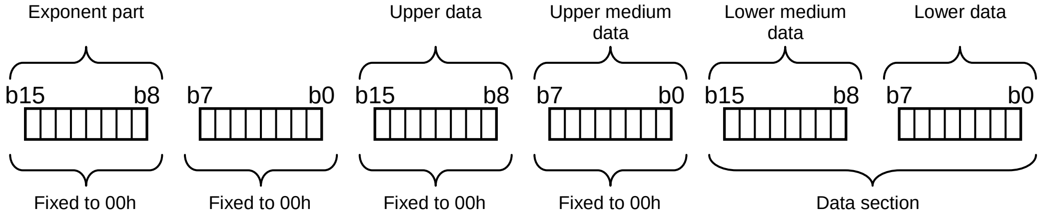
Details of data configurations

	bit	Description		"0"	"1"	Remark
Upper Medium data	b0	Reset(collective)	Circuit breaker alarm	-	Reset execution	
	b1	All memory clear		-	Execution of all clear	Notes 1, 2, and 5
	b2	Memory clear (collective)	Order-specific harmonic current maximum value	-	Clear execution	Notes 1, 3, and 5
	b3	Reserved			Fixed to 0	Note 4
	b4	Memory clear	Power factor maximum value	-	Clear execution	Notes 1 and 5
	b5	Reserved			Fixed to 0	Note 4
	b6	Memory clear	Electric power demand maximum value	-	Clear execution	Notes 1 and 5
	b7	Memory clear	Fault information (cause + current)	-	Clear execution	Note 5
Upper data	b8	Memory clear	Reactive power demand maximum value	-	Clear execution	Notes 1 and 5
	b9	Memory clear	Reactive energy (Integrated value)	-	Clear execution	Note 5
	b10	Memory clear	Reactive energy (Maximum value of amont of last 1 hour)	-	Clear execution	Notes 1 and 5
	b11	Memory clear	Current demand maximum value	-	Clear execution	Notes 1 and 5
	b12	Memory clear	Voltage maximum value	-	Clear execution	Notes 1 and 5
	b13	Memory clear	Total harmonic current demand maximum value	-	Clear execution	Notes 1 and 5
	b14	Memory clear	Electric energy (Integrated value)	-	Clear execution	Note 5
	b15	Memory clear	Electric energy (Maximum value of amont of last 1 hour)	-	Clear execution	Notes 1 and 5

Note 1: This clear includes the clear of the memory of date and time of occurrence of each maximum value.
Note 2: All memory clear refers to the clear of all items from items b2 to b15 above (zero clear). (Alarm reset is not included.)
Note 3: 3rd-, 5th-, 7th-, 9th-, 11th-, 13th-, 15th-, 17th-, and 19th-order harmonic current maximum values are collectively reset.
Note 4: b3 and b5 cannot be used.
Note 5: When b1 to b15 are cleared, contents stored in the non-volatile memory (E^2PROM) are cleared.

Table 6.2.5 Data formats and their configurations (4 / 4)

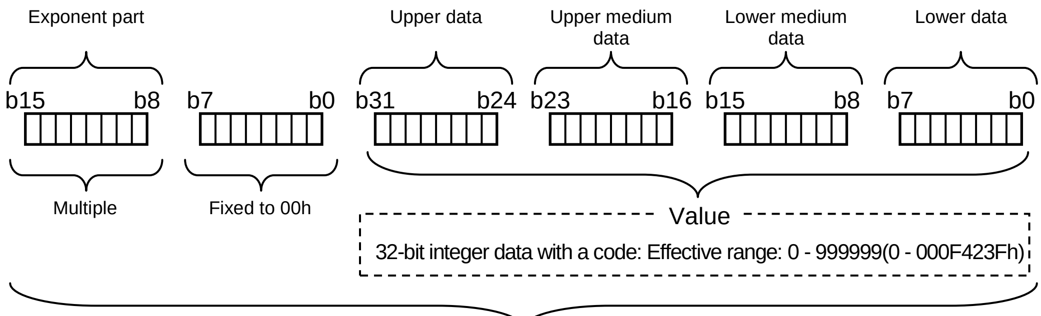
Data format	Data configuration
[4] Setting value Alarm ON/OFF setting	[Alarm ON/OFF setting] (Group Number: F0h, Channel Number: D0h)



	Bit	Description	For 1	For 0
Lower level of data	b0	IDM _ AL (Current demand alarm)	OFF	ON
	b1	IUB _ AL (Current unbalanced alarm)	OFF	ON
	b2	ILA _ AL (Current open-phase alarm)	OFF	ON
	b3	Reserved	Fixed to 1	
	b4	Reserved	Fixed to 1	
	b5	Reserved	Fixed to 1	
	b6	Reserved	Fixed to 1	
	b7	Reserved	Fixed to 1	
Medium lower level of data	b8	Reserved	Fixed to 1	
	b9	Reserved	Fixed to 1	
	b10	Reserved	Fixed to 1	
	b11	Reserved	Fixed to 1	
	b12	Reserved	Fixed to 1	
	b13	Reserved	Fixed to 1	
	b14	Reserved	Fixed to 1	
	b15	Reserved	Fixed to 1	

Note: Be sure to set 1 to the unused bit.

Data format	Data configuration
[5] Setting value Electric energy and reactive energy	



Value x Multiple = Actual value

	Applicable models	Exponent part	Data range	Measurement value range	Unit
Electric energy	250A Frame	FFh (Multiple = 0.1)	0 - 999999d (0 - 000F423Fh)	0.0 - 99999.9 [kWh]	0001h (0.1 [kWh])
	400/800A Frame	00h (Multiple = 1)	0 - 999999d (0 - 000F423Fh)	0 - 999999 [kWh]	0001h (1 [kWh])
Reactive energy	250A Frame	FFh (Multiple = 0.1)	0 - 999999d (0 - 000F423Fh)	0.0 - 99999.9 [kvarh]	0001h (0.1 [kvarh])
	400/800A Frame	00h (Multiple = 1)	0 - 999999d (0 - 000F423Fh)	0 - 999999 [kvarh]	0001h (1 [kvarh])

e.g.: Electric energy (Integrated value)
Data = Exponent FFh, Value 000000FFh => 255 x 0.1 = 25.5 [kWh]

3h	Clock data set

- You can change the clock data of the MDU from the sequencer side. You cannot set the second in the MDU. Set 00h for the second data.
  As shown below, write Command 3h and year-month-day-hour-minute-second (00h) to be set to the remote register RWw (the unit number is fixed to 0h); and set the command execution request flag (Remote output (RYnF)) to ON (1).
- If the command completion reply flag (Remote input (RXnF)) turns ON (1), the clock data will be set.
- See Table 6.2.6 for data formats and their configurations.

Remote register RWw (Sequencer => MDU)

	b15 – b8	b7 – b4	b3 – b0
m	00h	0h*1	3h
m+1	Year	Month	
m+2	Day	Hour	
m+3	Minute	Second (00h)	

*1 Unit No. (Fixed to 0h)

Remote register RWr (MDU => Sequencer)

	b15 – b8	b7 – b4	b3 – b0
n	00h	0h*1	3h
n+1	00h	00h	
n+2	00h	00h	
n+3	00h	00h	

*1 Unit No. (Fixed to 0h)

m, n: Addresses allocated in the station number setting
Note: You cannot set the second in the MDU.

Table 6.2.6 Data formats and their configurations

Data format	Data configuration
Current time	[Present year-month-day-hour-minute] (Group number: E0h, Channel number: 01h)

	Year	Month	Day	Hour	Minute	Second
Bits	b15 – b8	b7 – b0	b15 – b8	b7 – b0	b15 – b8	b7 – b0
Data	Year data (BCD code)	Month data (BCD code)	Day data (BCD code)	Hour data (BCD code)	Minute data (BCD code)	00h

Year data: Lower 2 digits of the Christian era (e.g.12h indicates year 2012.)
Month data: Month data (e.g.11h indicates November.)
Day data: Day data (e.g.16h indicates day 16th.)
Hour data: Hour data (e.g.17h indicates 17 o'clock.)
Minute data: Minute data (e.g.15h indicates 15 minutes.)

Note: You cannot set the second in the MDU.

7. Error occurrence

When any command sent to the MDU or the associated data has an error or a H/W error occurs in the MDU, the error flag (Remote input (RX (n + 1) A)) turns ON (1) and the error code shown in Table 7.1 is returned as a reply data.

Table 7.1 Error codes

Error description	Error code (Hex number)
Undefined Command	01h
Out of group range	41h
Out of channel range	42h
Out of setting value range	51h
Upper/Lower limit value cross	53h
H/W error	10h

When an error occurs, the error code is written in the remote register RWr and the error flag (Remote input (RX (n + 1) A)) turns ON (1: Error occurrence state) and the Remote Ready (Remote input (RX (n + 1)B)) turns OFF (0: Normal communication stop) as shown in the table below.
See "5.5 Error Communication" for the error state cancelation method.

Remote register RWr (MDU => Sequencer)

<For intermodel standard commands>

	b15 … b8	b7 … b0
n	Channel No.	Group No.
n+1	00h	00h
n+2	00h	Error Code
n+3	00h	00h

Remote register RWr (MDU => Sequencer)

<For model specific commands>

	b15 … b8	b7 … b0
n	00h	Error Code
n+1	00h	00h
n+2	00h	00h
n+3	00h	00h

n: Addresses allocated in the station number setting

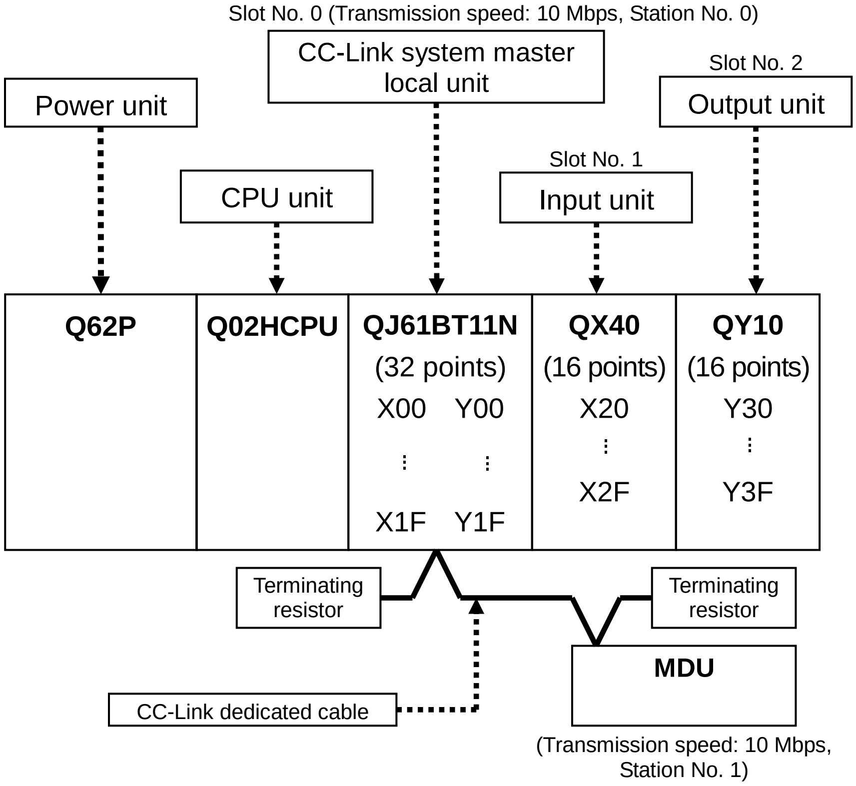
Note: Note that Remote inputs (RXn2) to (RXn9) do not change while an error is occurring (Remote Ready (Remote input RX (n+1) B) is off).

8. Sample program

8.1 Contents of the sample program

This sample program is assumed to have the following system configuration.
This is a program to monitor the 1-phase current present value, electric energy, alarm status and fault causes of the MDU in order and in succession.
At the start, the sample program stores the sent data for monitoring the load current present values(phase 1), electric energy, alarm status, and fault causes in the data register; and check the condition of the data link between the CC-Link system master local unit and the MDU. Next, if the data link is normal, the sample program conducts initial communication, sets the date and clock time data once, and monitors 1-phase current present values, electric energy, alarm status, and fault causes in series.
When an error occurs during the monitor communication, the sample program communicates the error and stores the error code in the data register.
Note) This sample program was created by using SW8D5C-GPPW GX Developer.

8.2 Device configuration



In the sample program, the first input/output number is 00h (or 0000) because the CC-Link master unit (QJ61BT11N) is equipped to the slot No. 0 of the base unit as shown in the configuration above.

⚠ Caution

- Since the sample program is the minimum content required to monitor the MDU breaker, please eventually change to a program that suits your environment. In addition, we are not responsible for damages, secondary damage, accident compensation, damages to products other than our products, and other operations arising from programs created by you, including sample programs.
- When programming in order not to cause abnormality in the system at the end, please pay attention to safety design by reading process twice.

Carry out safety design

8.3 Device allocations

Allocation of sending and receiving devices

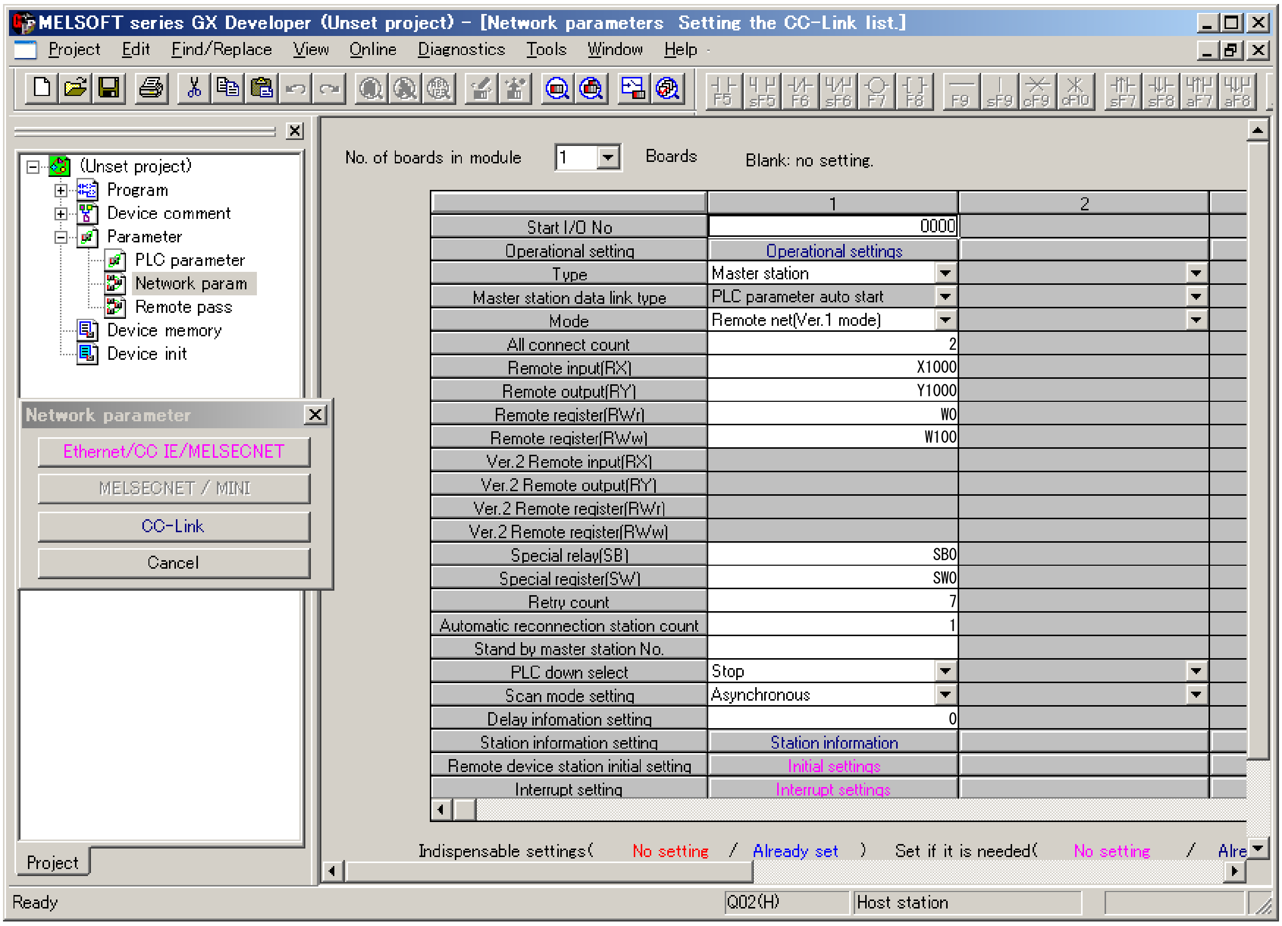
Item	Description	Device No.	Remark
Remote input (RX)	Contents of remote input (RX00 - RX1F) of the MDU station No. 1	X1000 - X1031	Set X1000 to the refresh device.
Remote output (RY)	Contents of remote output (RY00 - RY1F) of the MDU station No. 1	Y1000 - Y1031	Set Y1000 to the refresh device.
Remote register (RWr)	Contents of remote register (RWr0 - RWr3) of the MDU station No. 1	W0 - W3	Set W0 to the remote register (RWr) refresh device.
Remote register (RWw)	Contents of remote register (RWw0 - RWw3) of the MDU station No. 1	W100 - W103	Set W100 to the remote register (RWw) refresh device.
Ling special relay SB	Contents of link special relay (SB0 - SB01FF) of the master station	SB0 - SB01FF	Set SB0 to the link special relay (SB) refresh device.
Link special register SW	Contents of link special register (SW0 - SW01FF) of the master station	SW0 - SW01FF	Set SW0 to the link special register (SW) refresh device.
Date setting	Send data	D200 - D203	
	Received data	D210 - D213	
Clock time setting	Send data	D205 - D208	
	Received data	D215 - D218	
MDU circuit 1 1-phase current present value monitor	Send data	D300 - D303	
	Received data (value of this time)	D510 - D513	
	Received data (value of the previous time)	D514 - D517	
	Medium and low bytes of the measurement data	D550	Unit: 1 [A] (Multiply 1/10 when 0.1 A is used for the unit.)
	High byte of the measurement data	D551	
MDU circuit 1 electric energy monitor	Send data	D310 - D313	
	Received data (value of this time)	D520 - D523	
	Received data (value of the previous time)	D524 - D527	
	Medium and low bytes of the measurement data	D570	Unit: 1 [kWh] (Multiply 1/10 when 0.1 kWh is used for the unit.)
	High byte of the measurement data	D571	
MDU circuit 1 alarm/interruption cause monitor (16-bit monitor)	Send data	D320 - D323	
	Received data (value of this time)	D530 - D533	
	Received data (value of the previous time)	D534 - D537	
	Alarm/interruption cause monitor data (16-bit monitor data)	D580	See "6.2 Details of commands" for the allocation of alarm and fault causes to each bit.
Error code	Error communication received data	D10 - D13	

8.4 Parameter setting

Set the parameters using GX Developer as described later.

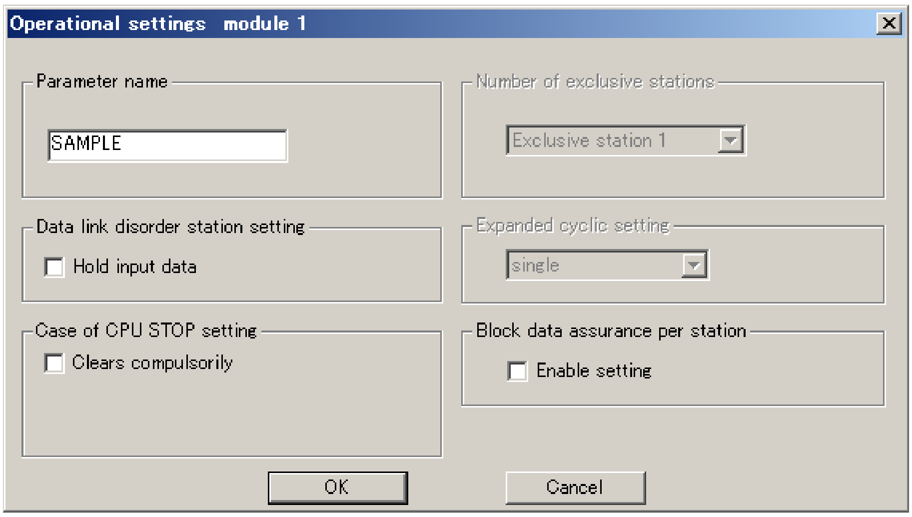
8.4.1 Network parameter and automatic refresh parameter setting

The settings for the CC-Link network parameters and automatic refresh parameters are as follows.



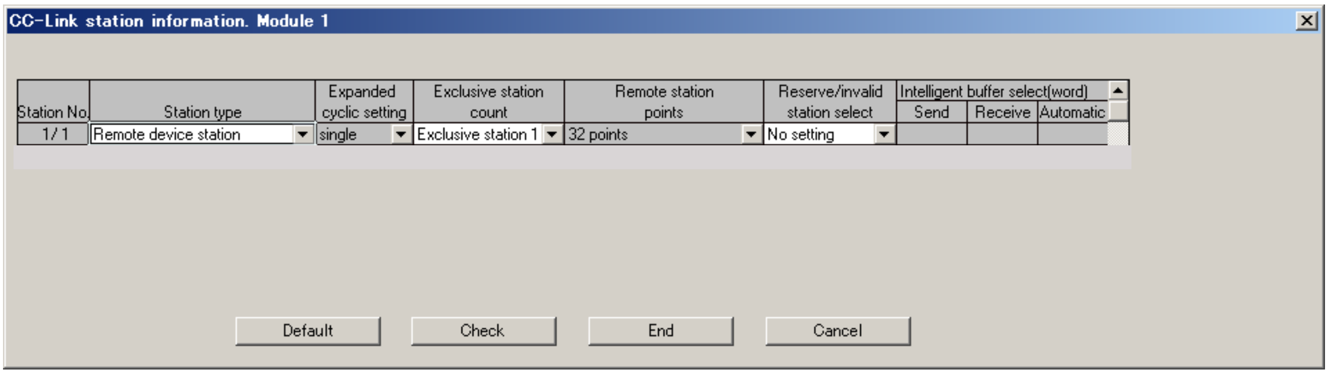
8.4.2 Operation setting

The contents of the operation setting are as follows.



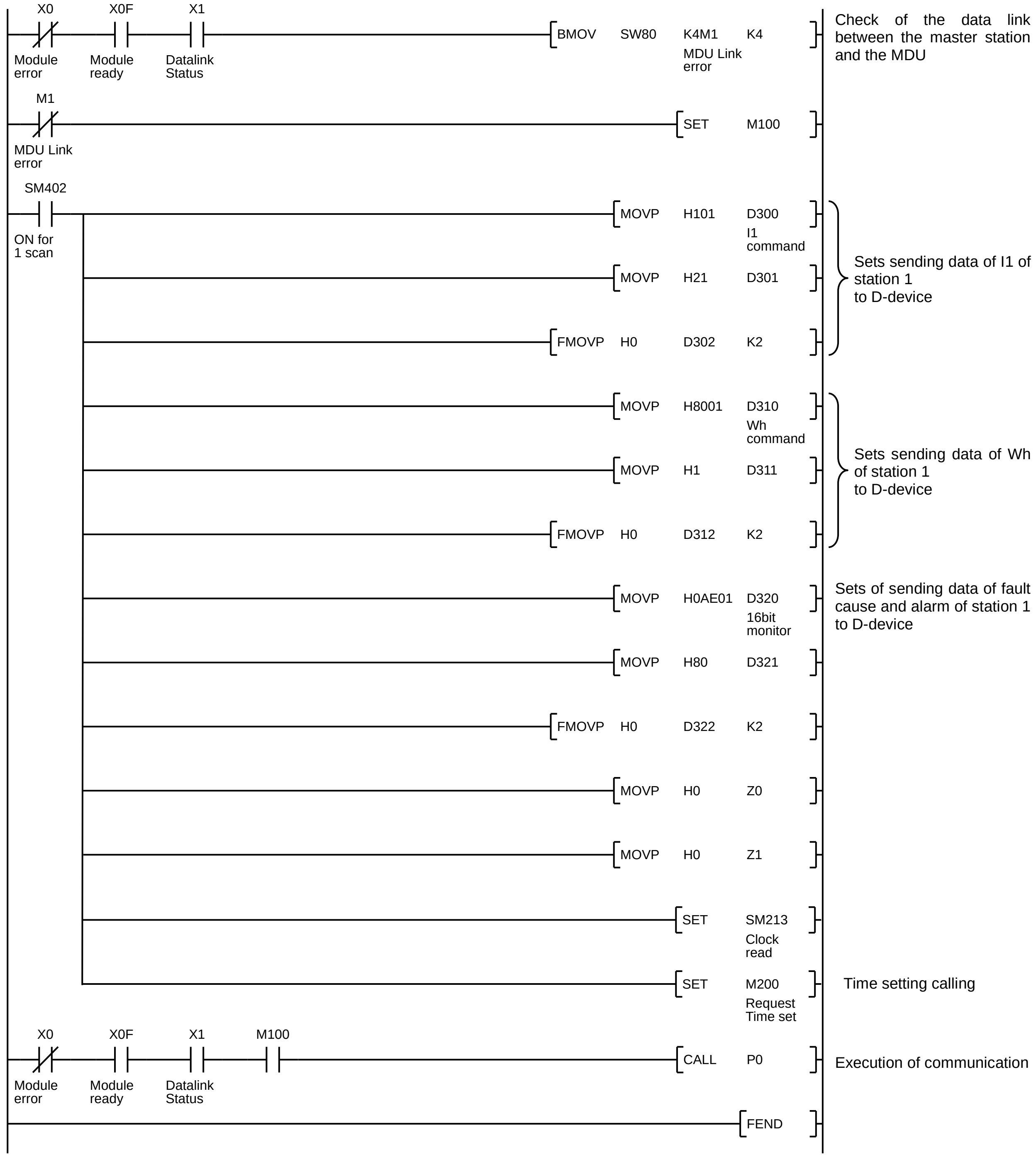
8.4.3 Station information setting

The station information settings are as follows.

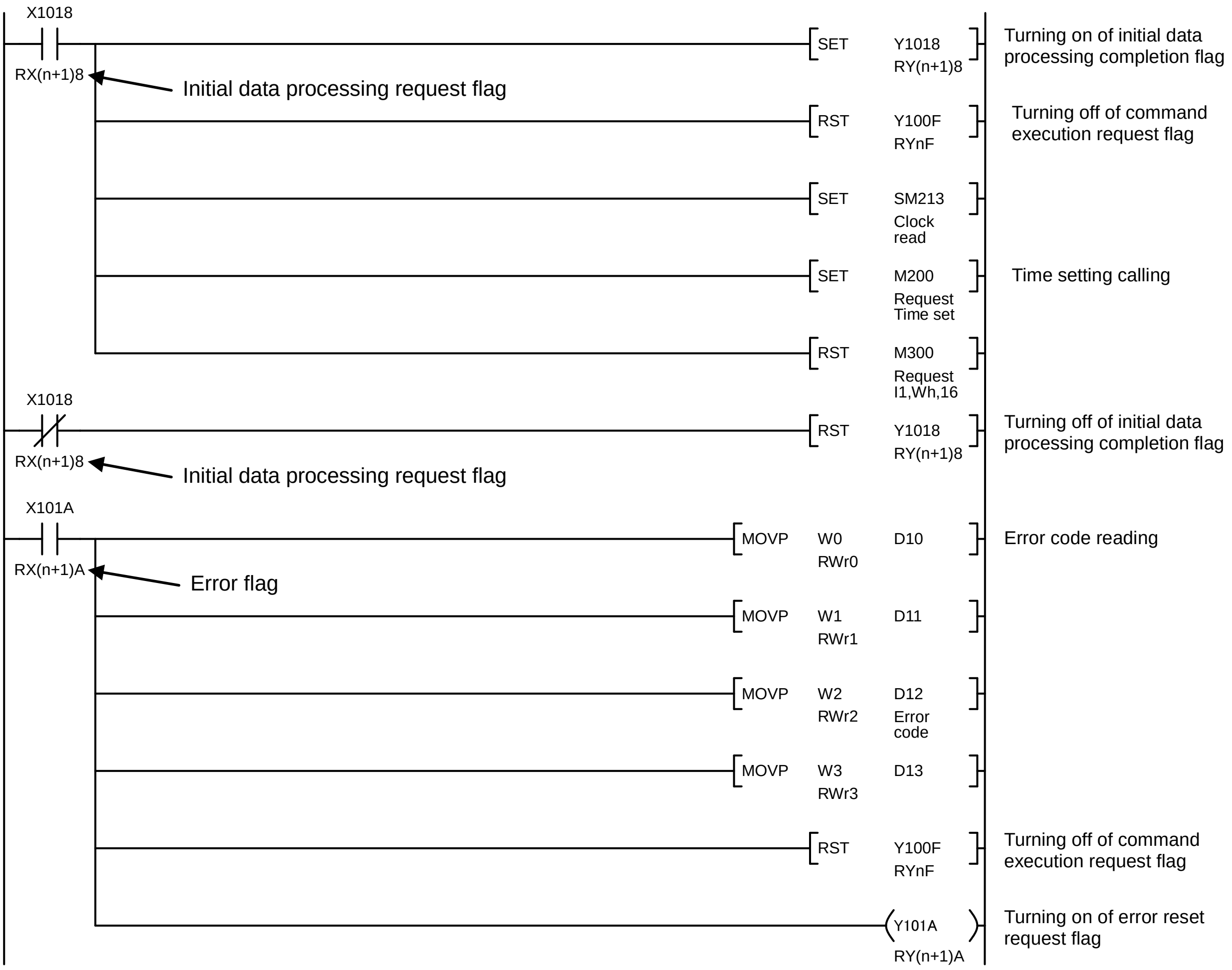


8.5 Sample program (Circuit form)

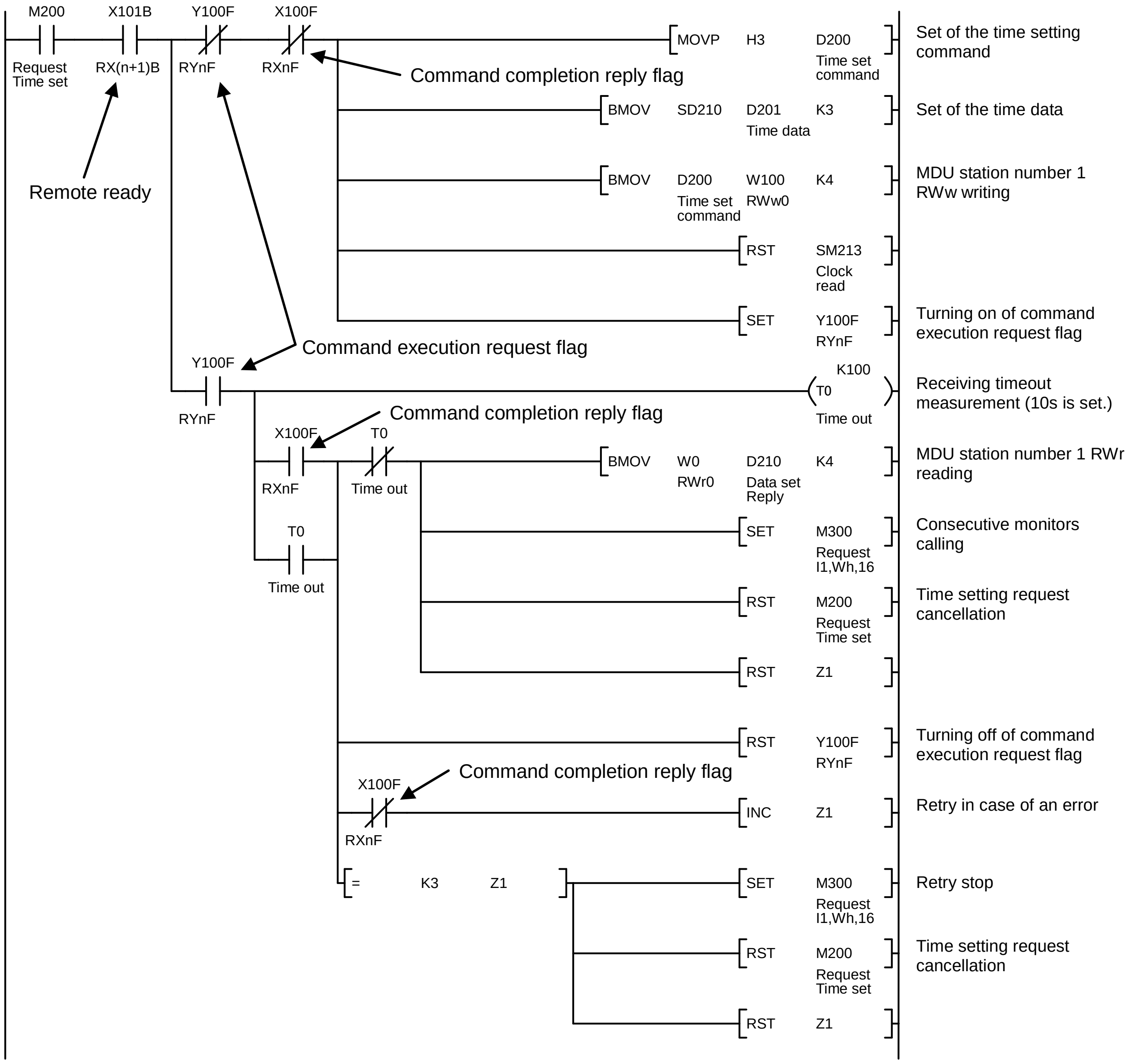
Data link check and command set.



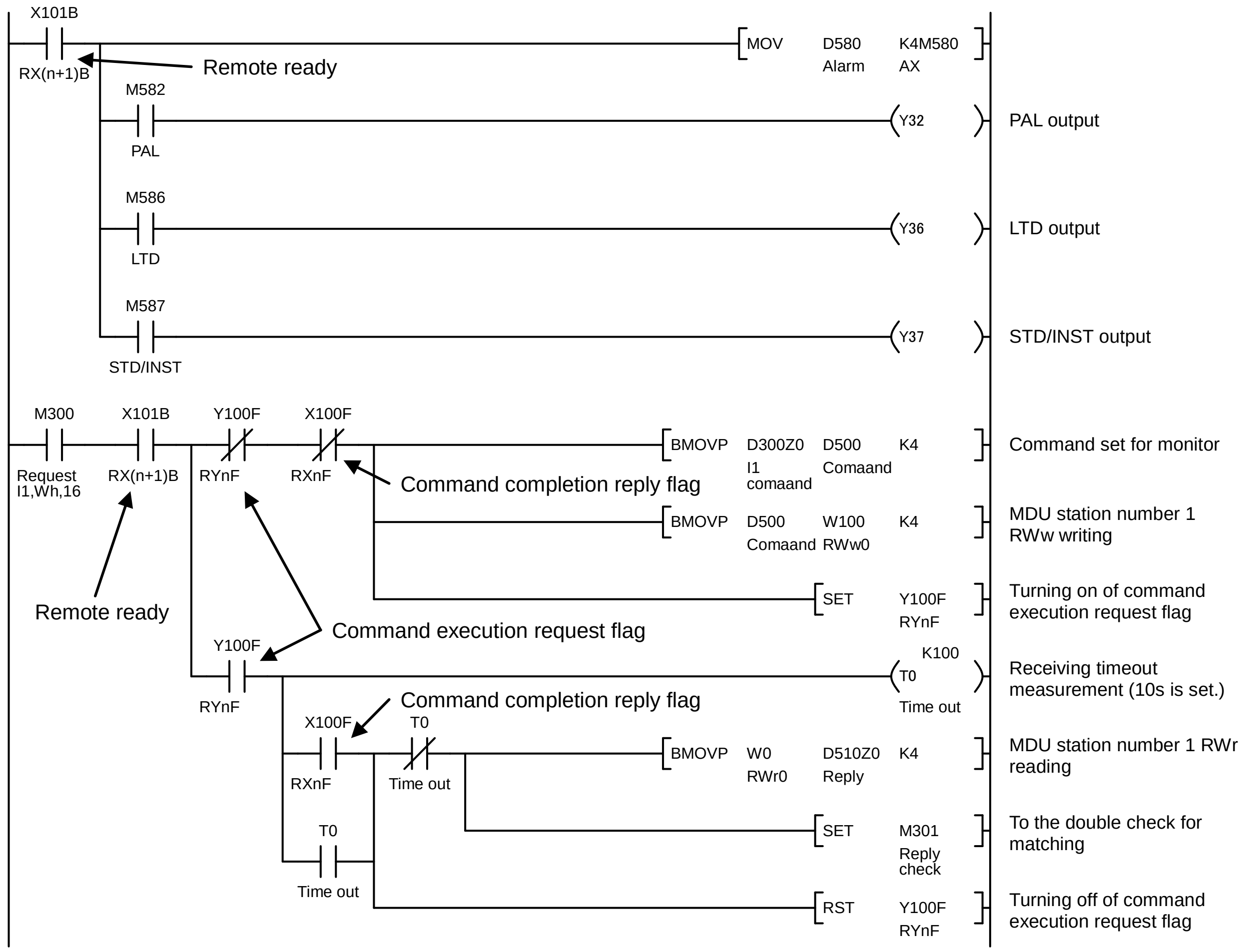
Initial communication and error communication.



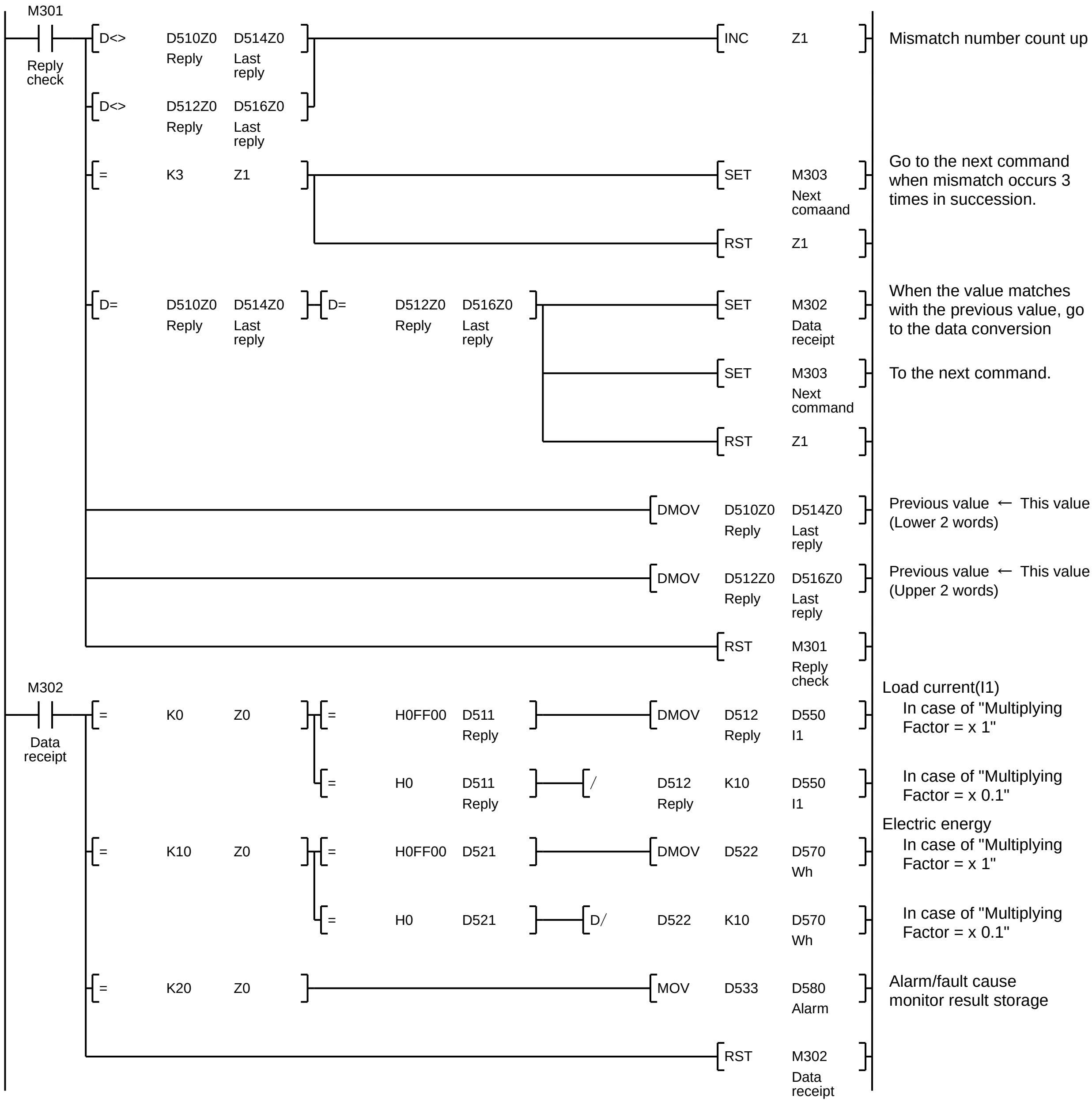
Current time setting (executed once at the time of the MDU startup).



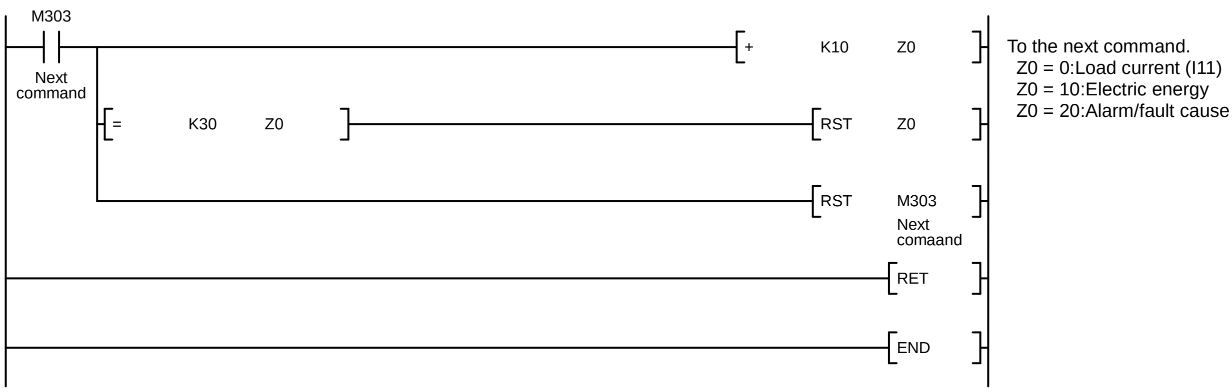
Monitoring of alarm/fault cause, load current present value of phase 1(=I1) and electric energy.



Double check for matching and data conversion.



Repetition handling of command



9. Abbreviations and terms used in this manual

Abbreviations and terms used in this Manual are explained below.

Abbreviation/Term	Description
Master station	A station that controls remote stations and local stations. One station is required for one system.
Local station	A station that has a CPU and can communicate with other local stations.
Remote I/O station	A remote station that handles bit information only.
Remote device station	A remote station that handles bit information and word information.
Remote station	A general name for remote I/O stations and remote device stations. These stations are controlled by the master station.
Intelligent device station	A station that can conduct transient transmission (including local stations).
RX	Remote input
RY	Remote output
RWw	Remote register (writing area)
RWr	Remote register (reading area)
Hourly electric energy	Hourly electric energy calculated based on the internal clock time data between the hour (00 minute, 00 second) and the hour (00 minute, 00 second) of the MDU.
Demand value	The demand value is an approximate average value of the demand time delay. When the demand time delay is set to 0 minute, each demand present value is equal to the present value.
Command	An identification code allocated by the monitor or the item to be set. The MDU monitors each measurement value and sets setting values by sending the dedicated commands.
GX Developer	Designing and maintenance tool for the sequencer. A general product name of the following product types: SWnD5C-GPPW ("n" of the type name is 4 or larger.)

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