DATA LINK FB LIBRARY REFERENCE MANUAL

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Reference Manual Revision History

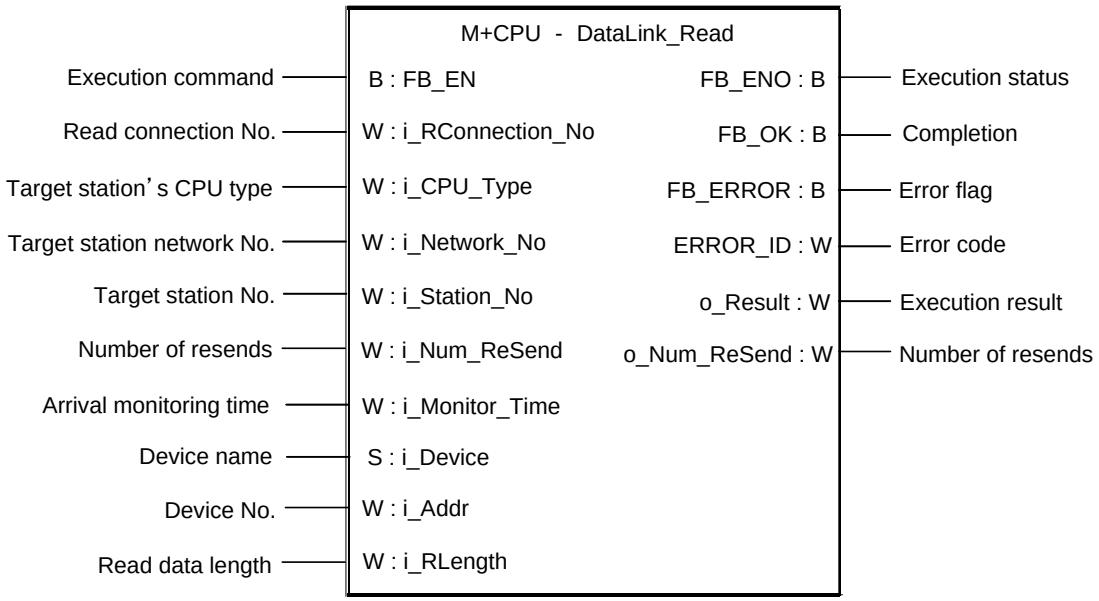
Reference manual number	Date	Description
FBM-M060-A	2011/07/29	First edition

1. M+CPU- DataLink_Read (for Data Link - READ Instruction)

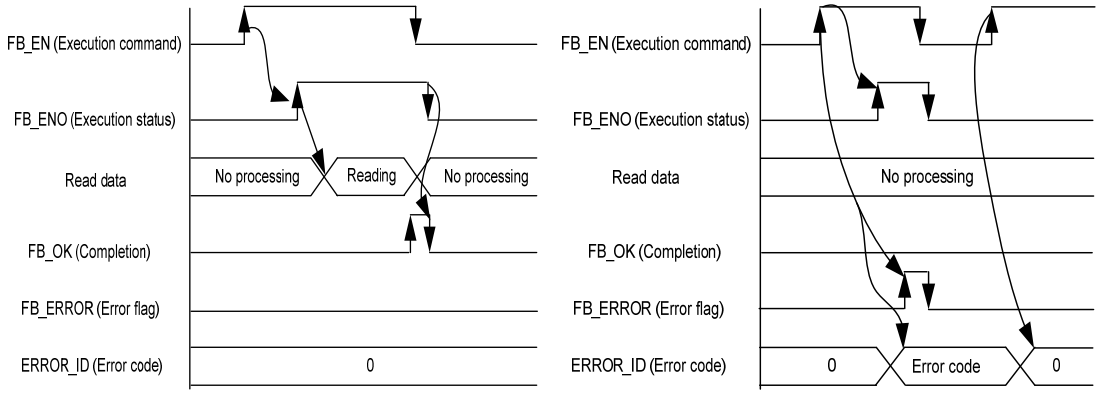
FB Name

M+CPU- DataLink_Read

Function Overview

Item	Description
Function overview	This FB provides a function equivalent to "Word device data reading using Data link instruction (READ)" in socket communication through a built-in Ethernet port in the CPU module. This FB reads word device data in the target station using the device read function of the MC protocol.
Symbol	
Applicable hardware and software	CPU module Q series: Built-in Ethernet port QCPU Engineering tool Q series: GX Works 2 Version 1.31H or later
Programming language	Ladder
Number of steps (maximum value)	Universal model QCPU: 655* *The value is the number of steps in a label program and therefore is a reference value. For details, refer to the GX Works2 Version 1 Operating Manual (Simple Project).

Item	Description
Function description	By turning on FB_EN (Execution command), this FB reads word device data using the following socket communication: 1) This FB sorts input data, adds a header and a command to the input data, sends the data to the target station, and reads data in the target station. 2) The process is continued until data are read starting from the start address of the specified device by the number of device points. 3) If the process is not completed after the elapse of the arrival monitoring time, communications fail and are terminated. 4) If the process is abnormally ended or an invalid value is input, FB_ERROR turns ON and the FB process is suspended. The error code is stored in ERROR_ID. 5) Even if FB_EN (Execution command) is turned OFF before FB operation is completed, the processing continues to operate until data reading is completed or an error occurs.
FB compilation type	Macro type
Restrictions and precautions	1) This FB does not include error recovery processing. Program the processing separately in accordance with the system and requirements. 2) This FB cannot be used in an interrupt program. 3) This FB uses the index register Z9. Do not use Z9 in an interrupt program. 4) If a message "Insufficient word device points in device/label (VAR) automatic-assign setting" appears when a program is complied, change the automatic device assignment setting. 5) This FB uses the UDP protocol. Use Open completion signal of the socket communication as an interlock to activate the FB. 6) Check that Open completion signal (SD1282) corresponding to the selected connection number is ON. 7) Basic functions are the same as those of Data link instruction (READ). However, "Abnormal completion type" is fixed at "Clock data setting is not required." and "Arrival monitoring time unit" is fixed at "Increments of 1s" in control data. 8) When the target station is an Ethernet interface module, set "1388h (5000)" under "Destination Port No." in the "Built-in Ethernet Port Open Setting" window of the PLC parameter dialog box. 9) When the target station is Built-in Ethernet port QCPU, set parameters so that data can be read from the target station using the MC protocol. 10) When the target station is Built-in Ethernet port QCPU, set Target station's CPU type, Target station network number, and Target station number as described below: Target station's CPU type: 03FFh, Target station network number: 0, Target station number: FFh 11) "254" cannot be set for Target station network number. Because even if "254" is set, the CPU module cannot access the module specified in "Valid Module During Other Station Access".
FB operation type	Pulsed execution (multiple scan execution type)
Application example	Refer to Appendix 1. Application Examples.

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manual	QnUCPU User's Manual (Communication via Built-in Ethernet Port) QCPU User's Manual (Hardware Design, Maintenance and Inspection)

Error Codes

■ Error code list

Error code	Description	Action
02h to A2h (Hexadecimal)	An end code added to response data sent from the target device in the MC protocol	For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).
4000h to 4FFFh (Hexadecimal)	An error code output if an error occurs in a programmable controller CPU	For details, refer to the MELSEC-Q/L Programming Manual (Common Instruction).
C000h to CFFFh (Hexadecimal)	An error code output if an Ethernet interface module detects an error	For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).

Labels

■ Input labels

Name	Variable name	Data type	Setting range	Description
Execution command	FB_EN	B	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Read connection No.	i_RConnection_No	W	1 to 16	Specify the connection number where communications are performed.
Target station's CPU type	i_CPU_Type	W	03D0h to 03D3h, 03FFh	03D0h: Control system CPU 03D1h: Standby system CPU 03D2h: System A CPU 03D3h: System B CPU 03FFh: Target station CPU/own system CPU

Name	Variable name	Data type	Setting range	Description
Target station network number	i_Network_No	W	0 or 1 to 239	Specify the network number including the station from which data are read. "254" cannot be set. (When specifying the target station CPU or own system CPU for Target station's CPU type, set "0" for this label.)
Target station number	i_Station_No	W	1 to 120 or FFh	Specify the station number form which data are read. When specifying the target station CPU or own system CPU for Target station's CPU type, set "FFh" for this label. ("FFh" cannot be set for the CPU other than the target station CPU/own system CPU.)
Number of resends	i_Num_ReSend	W	0 to 15 (time)	Specify the number of resends performed when a process is not completed within the arrival monitoring time. (When more than 15 is set, it will be regarded as 5 times.)
Arrival monitoring time	i_Monitor_Time	W	1 to 16383 (second)	Specify monitoring time until an instruction is completed. (When a value other than 1 to 16383 is set, it will be regarded as 10 seconds.)
Device name	i_Device	S	Enabled device name	Specify the device name from which data are read. (To specify a D device, input "D".)
Device number	i_Addr	W	Enabled device range	Specify the device number from where data reading is started. (To specify a D10 device, input "K10".)
Read data length	i_RLength	W	1 to 960 (word)	Specify the number of data to be read.

■ Output labels

Name	Variable name	Data type	Initial value	Description
Execution status	FB_ENO	B	OFF	ON: The FB is being executed. OFF: The FB is not executed.
Completion	FB_OK	B	OFF	When this label turns ON, it indicates that the processing is completed.
Error flag	FB_ERROR	B	OFF	If this label turns ON, it indicates that an error occurs in the FB.
Error code	ERROR_ID	W	0	This label stores an error code occurs in the FB.
Execution result	o_Result	W	0	This label stores binary data read from the target station.
Number of resends	o_Num_ReSend	W	–	This label stores the number of resends performed after the elapse of arrival monitoring time.

Upgrade History

Version	Date	Description
1.00A	2011/07/29	First edition

Note

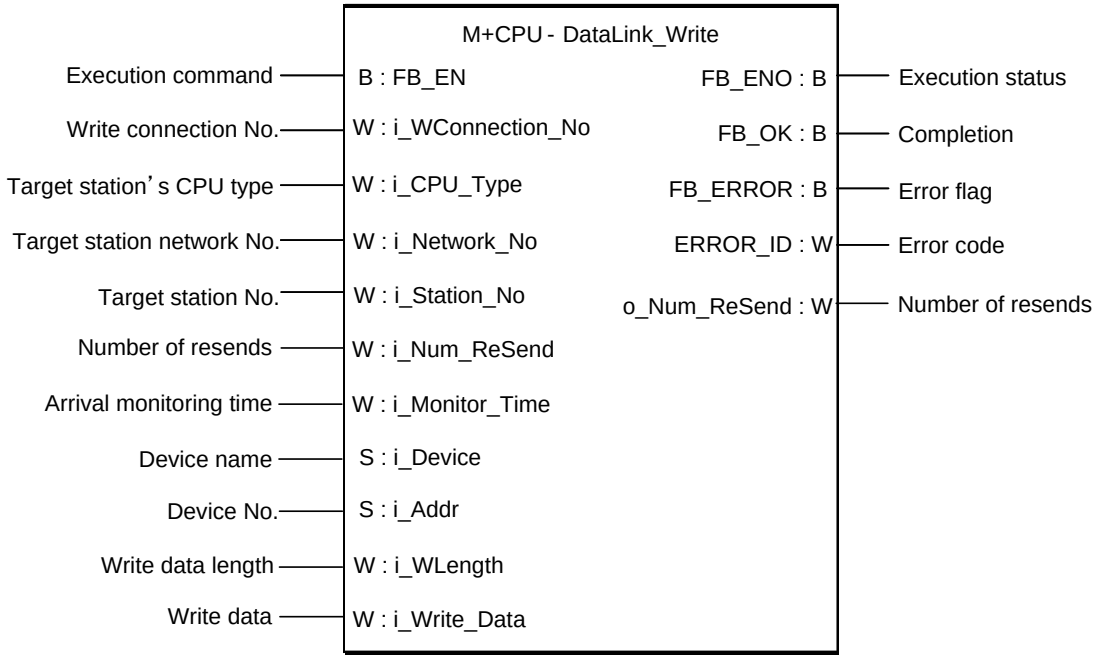
This chapter describes the functionalities of the function block. It does not describe restrictions on use of a programmable controller CPU and other modules and combination use of them.
Before use, please read the user's manuals for the products used.

2. M+CPU-DataLink_Write (for Data Link - WRITE Instruction)

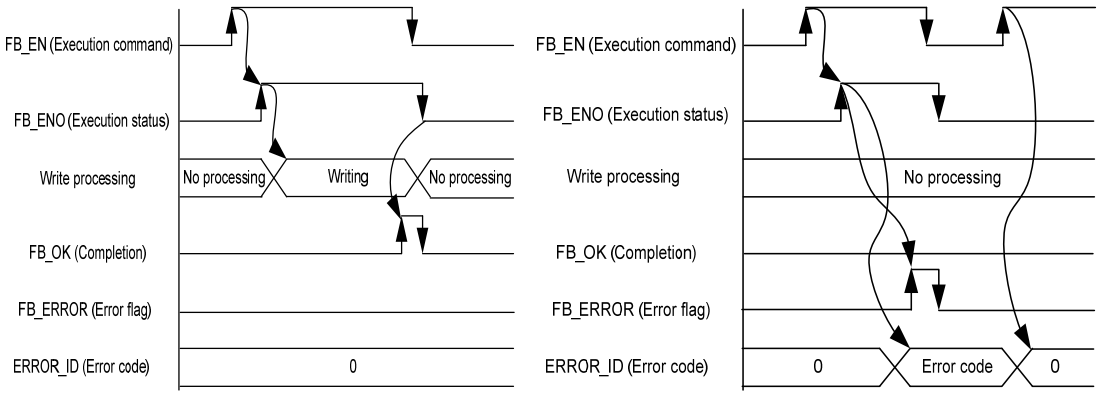
FB Name

M+CPU-DataLink_Write

Function Overview

Item	Description
Function overview	This FB provides a function equivalent to "Word device data writing using Data link instruction (WRITE)" in socket communication through a built-in Ethernet port in the CPU module. This FB writes word device data to the target station using the device write function of the MC protocol.
Symbol	
Applicable hardware and software	CPU module Q series: Built-in Ethernet port QCPU Engineering tool Q series: GX Works 2 Version 1.31H or later
Programming language	Ladder
Number of steps (maximum value)	Universal model QCPU: 673* *The value is the number of steps in a label program and therefore is a reference value. For details, refer to the GX Works2 Version 1 Operating Manual (Simple Project).

Item	Description
Function description	By turning on FB_EN (Execution command), this FB writes word device data using the following socket communication: 1) This FB adds a header and a command to the write data and sends the data to the target station. 2) The CPU module waits for a response from the target station and checks the end code in the header information upon reception of response data. 3) If the process is not completed after the elapse of the arrival monitoring time, communications fail and are terminated. 4) If the process is abnormally ended or an invalid value is input, FB_ERROR turns ON and the FB process is suspended. The error code is stored in ERROR_ID. 5) Even if FB_EN (Execution command) is turned OFF before FB operation is completed, the processing continues to operate until data writing is completed or an error occurs.
FB compilation type	Macro type
Restrictions and precautions	1) This FB does not include error recovery processing. Program the processing separately in accordance with the system and requirements. 2) This FB cannot be used in an interrupt program. 3) This FB uses the index register Z9. Do not use Z9 in an interrupt program. 4) If a message "Insufficient word device points in device/label (VAR) automatic-assign setting" appears when a program is complied, change the automatic device assignment setting. 5) This FB uses the UDP protocol. Use Open completion signal of the socket communication as an interlock to activate the FB. 6) Check that Open completion signal (SD1282) corresponding to the selected connection number is ON. 7) Basic functions are the same as those of Data link instruction (WRITE). However, "Abnormal completion type" is fixed at "With arrival check" and "Clock data setting is not required." and "Arrival monitoring time unit" is fixed at "Increments of 1s" in control data. 8) When the target station is an Ethernet interface module, set "1388h (5000)" under "Destination Port No." in the "Built-in Ethernet Port Open Setting" window of the PLC parameter dialog box. 9) When the target station is Built-in Ethernet port QCPU, set parameters so that data can be written to the target station using the MC protocol. 10) When the target station is Built-in Ethernet port QCPU, set Target station's CPU type, Target station network number, and Target station number as described below: Target station's CPU type: 03FFh, Target station network number: 0, Target station number: FFh 11) "254" cannot be set for Target station network number. Because even if "254" is set, the CPU module cannot access the module specified in "Valid Module During Other Station Access". 12) Since cannot be executed, "Specification in units of groups" (81h to A0h) cannot be set for Target station number.

Item	Description
FB operation type	Pulsed execution (multiple scan execution type)
Application example	Refer to Appendix 1. Application Examples.
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manual	QnUCPU User's Manual (Communication via Built-in Ethernet Port) QCPU User's Manual (Hardware Design, Maintenance and Inspection)

Error Codes

■ Error code list

Error code	Description	Action
02h to A2h (Hexadecimal)	An end code added to response data sent from the target device in the MC protocol	For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).
4000h to 4FFFh (Hexadecimal)	An error code output if an error occurs in a programmable controller CPU	For details, refer to the MELSEC-Q/L Programming Manual (Common Instruction).
C000h to CFFFh (Hexadecimal)	An error code output if an Ethernet interface module detects an error	For details, refer to the Q Corresponding Ethernet Interface Module User's Manual (Basic).

Labels

■ Input labels

Name	Variable name	Data type	Setting range	Description
Execution command	FB_EN	B	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Write connection No.	i_WConnection_No	W	1 to 16	Specify the connection number where communications are performed.
Target station's CPU type	i_CPU_Type	W	03D0h to 03D3h, 03FFh	03D0h: Control system CPU 03D1h: Standby system CPU 03D2h: System A CPU 03D3h: System B CPU 03FFh: Target station CPU/own system CPU

Name	Variable name	Data type	Setting range	Description
Target station network number	i_Network_No	W	0 or 1 to 239	Specify the network number including the station to which data are written. "254" cannot be set. (When specifying the target station CPU or own system CPU for Target station's CPU type, set "0" for this label.)
Target station number	i_Station_No	W	1 to 120 or FFh	Specify the station number to which data are written. "Specification in units of groups" (81h to A0h) cannot be set. When specifying the target station CPU or own system CPU for Target station's CPU type, set "FFh" for this label. ("FFh" cannot be set for the CPU other than the target station CPU/own system CPU.)
Number of resends	i_Num_ReSend	W	0 to 15 (time)	Specify the number of resends performed when a process is not completed within the arrival monitoring time. (When more than 15 is set, it will be regarded as 5 times.)
Arrival monitoring time	i_Monitor _Time	W	1 to 16383 (second)	Specify monitoring time until an instruction is completed. (When a value other than 1 to 16383 is set, it will be regarded as 10 seconds.)
Device name	i_Device	S	Enabled device name	Specify the device name to which data are written. (To specify a D device, input "D".)
Device number	i_Addr	W	Enabled device range	Specify the device number from where data writing is started. (To specify a D10 device, input "K10".)
Write data length	i_WLength	W	1 to 960 (word)	Specify the number of data to be written.
Write data	i_Write_Data	W	Enabled device range	Specify binary data written to the target station.

■ Output labels

Name	Variable name	Data type	Initial value	Description
Execution status	FB_ENO	B	OFF	ON: The FB is being executed. OFF: The FB is not executed.
Completion	FB_OK	B	OFF	When this label turns ON, it indicates that the processing is completed.
Error flag	FB_ERROR	B	OFF	If this label turns ON, it indicates that an error occurs in the FB.
Error code	ERROR_ID	W	0	This label stores an error code occurs in the FB.
Number of resends	o_Num_ReSend	W	–	This label stores the number of resends performed after the elapse of arrival monitoring time.

Upgrade History

Version	Date	Description
1.00A	2011/07/29	First edition

Note

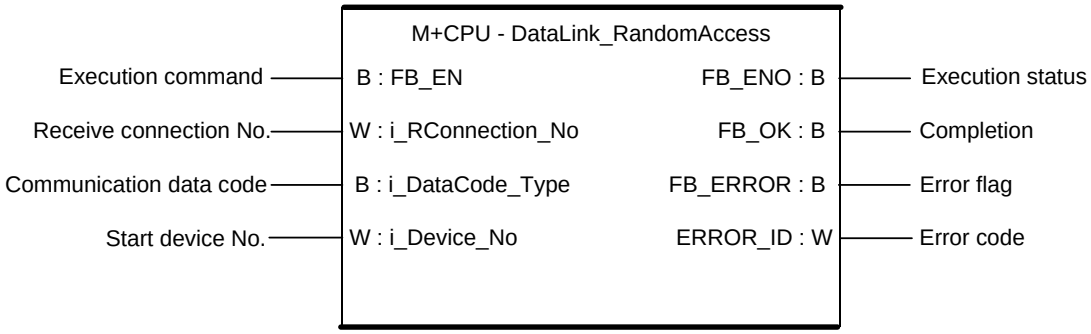
This chapter describes the functionalities of the function block. It does not describe restrictions on use of a programmable controller CPU and other modules and combination use of them.
Before use, please read the user's manuals for the products used.

3. M+CPU-DataLink_RandomAccess (for Data Link - Random Access Buffer Communication)

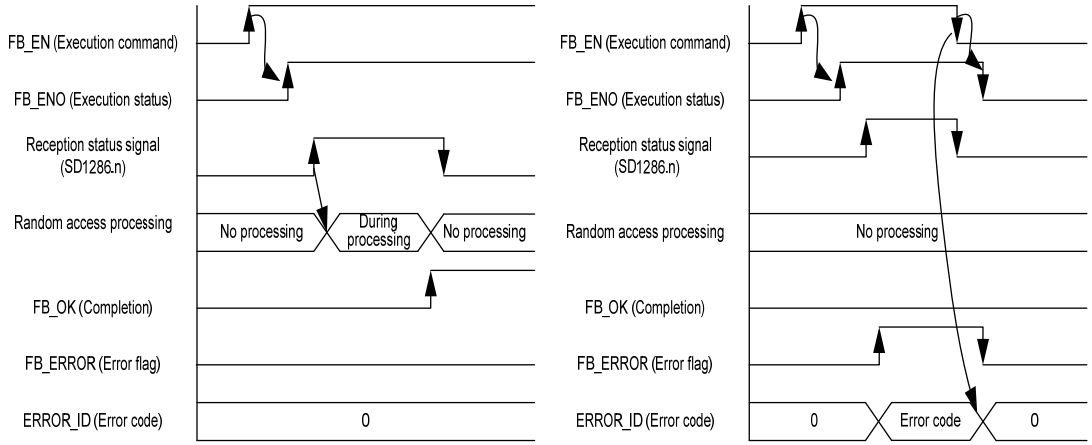
FB Name

M+CPU-DataLink_RandomAccess

Function Overview

Item	Description
Function overview	This FB provides a function equivalent to "Communication using the random access buffer" in socket communication through a built-in Ethernet port in the CPU module.
Symbol	
Applicable hardware and software	CPU module Q series: Built-in Ethernet port QCPU Engineering tool Q series: GX Works 2 Version 1.31H or later
Programming language	Ladder
Number of steps (maximum value)	Universal model QCPU: 1116* *The value is the number of steps in a label program and therefore is a reference value. For details, refer to the GX Works2 Version 1 Operating Manual (Simple Project).

Item	Description
Function description	By turning on FB_EN (Execution command), this FB performs communications using a random access buffer in the following socket communication: 1) This FB reads data received in the socket communication receive area of the receive connection number. 2) The CPU module checks the subheader in the receive data and judges whether the data is read request or write request data. 3) When the data is write request data, the data excluding the subheader is stored in a device starting from the start device number. 4) If an invalid value is input, FB_ERROR turns ON and the FB process is suspended. The error code is stored in ERROR_ID. 5) Even if FB_EN (Execution command) is turned OFF before FB operation is completed, the processing continues to operate until the process is completed or an error occurs. 6) When the data is read request data, response data including the read-requested-address (device) data starting from the start device number is sent to the target device. 7) Even if FB_EN (Execution command) is turned OFF before FB operation is completed, the processing continues to operate until data reading is completed or an error occurs.
FB compilation type	Macro type
Restrictions and precautions	1) This FB does not include error recovery processing. Program the processing separately in accordance with the system and requirements. 2) This FB cannot be used in an interrupt program. 3) This FB uses index registers Z9 to Z7. Do not use these registers in an interrupt program. 4) This FB uses data registers D0 and D1. Do not use these registers in an interrupt program. 5) If a message "Insufficient word device points in device/label (VAR) automatic-assign setting" appears when a program is complied, change the automatic device assignment setting. 6) Check that Open completion signal (SD1282) corresponding to the selected connection number is ON. 7) A bit device cannot be set for a start device number. [Using TCP] 1) Establish TCP connection before executing this FB. 2) When performing socket communication in TCP, set Passive for the connection method and create a program so that turning ON Open completion signal corresponding to the selected connection number will be an interlock to activate the FB. [Using UDP] 1) When using UDP, use Open completion signal of the socket communication as an interlock to activate the FB.
FB operation type	Executed when necessary
Application example	Refer to Appendix 1. Application Examples.

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manual	QnUCPU User's Manual (Communication via Built-in Ethernet Port) QCPU User's Manual (Hardware Design, Maintenance and Inspection)

Error Codes

■ Error code list

Error code	Description
10 (Decimal)	i_RConnection_No (Receive connection No.) is outside the range. Set the number of data within the range (1 to 16) and turn OFF and ON FB_EN again.
41A1h to 41B9h (Hexadecimal)	Communication failure occurs. For details, refer to "Appendix 1.11 Error codes returned to request source during communication with CPU module" in the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

Labels

■ Input labels

Name	Variable name	Data type	Setting range	Description
Execution command	FB_EN	B	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Receive connection No.	i_RConnection_No	W	1 to 16	Specify the connection number where communications using a random access buffer are performed.
Communication data code	i_DataCode_Type	B	ON, OFF	OFF: Binary code communication ON: ASCII code communication
Start device number	i_Device_No	W	Enabled device code and start device number	Specify the device number from where communications using a random access buffer are started.

■ Output labels

Name	Variable name	Data type	Initial value	Description
Execution status	FB_ENO	B	OFF	ON: The FB is being executed. OFF: The FB is not executed.
Completion	FB_OK	B	OFF	When this label turns ON, it indicates that the processing is completed.
Error flag	FB_ERROR	B	OFF	If this label turns ON, it indicates that an error occurs in the FB.
Error code	ERROR_ID	W	0	This label stores an error code occurs in the FB.

Upgrade History

Version	Date	Description
1.00A	2011/07/29	First edition

Note

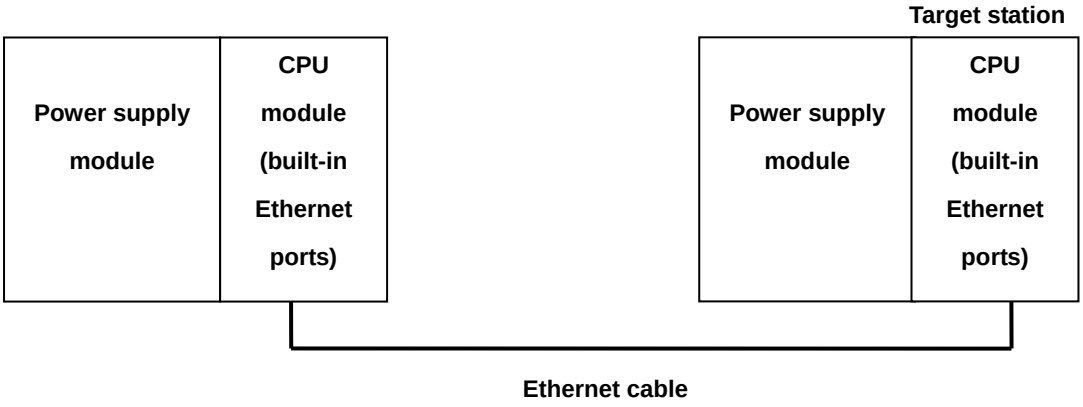
This chapter describes the functionalities of the function block. It does not describe restrictions on use of a programmable controller CPU and other modules and combination use of them.
Before use, please read the user's manuals for the products used.

Appendix 1. Application Examples

Application examples of Data link instruction (READ/WRITE) FBs

1) The target station is Built-in Ethernet port QCPU

(1) System Configuration



(2) Device Lists

External output (check)

Device	FB name	Application (at ON)
Y10	Socket communication - Data link instruction (READ)	Abnormally ended
Y20	Socket communication - Data link instruction (WRITE)	Abnormally ended

Data register

Device	FB name	Application (at ON)
D100	Socket communication - Data link instruction (READ)	Error code
D101		Number of resends (result)
D102		Read data
D200	Socket communication - Data link instruction (WRITE)	Error code
D201		Number of resends (result)
D1000		Write data

Relay

Device	FB name	Application (at ON)
M0	Socket communication - Data link instruction (READ)	Instruction execution request
M1		Ready
M2		Completion
M10	Socket communication - Data link instruction (WRITE)	Instruction execution request
M11		Ready
M12		Completion

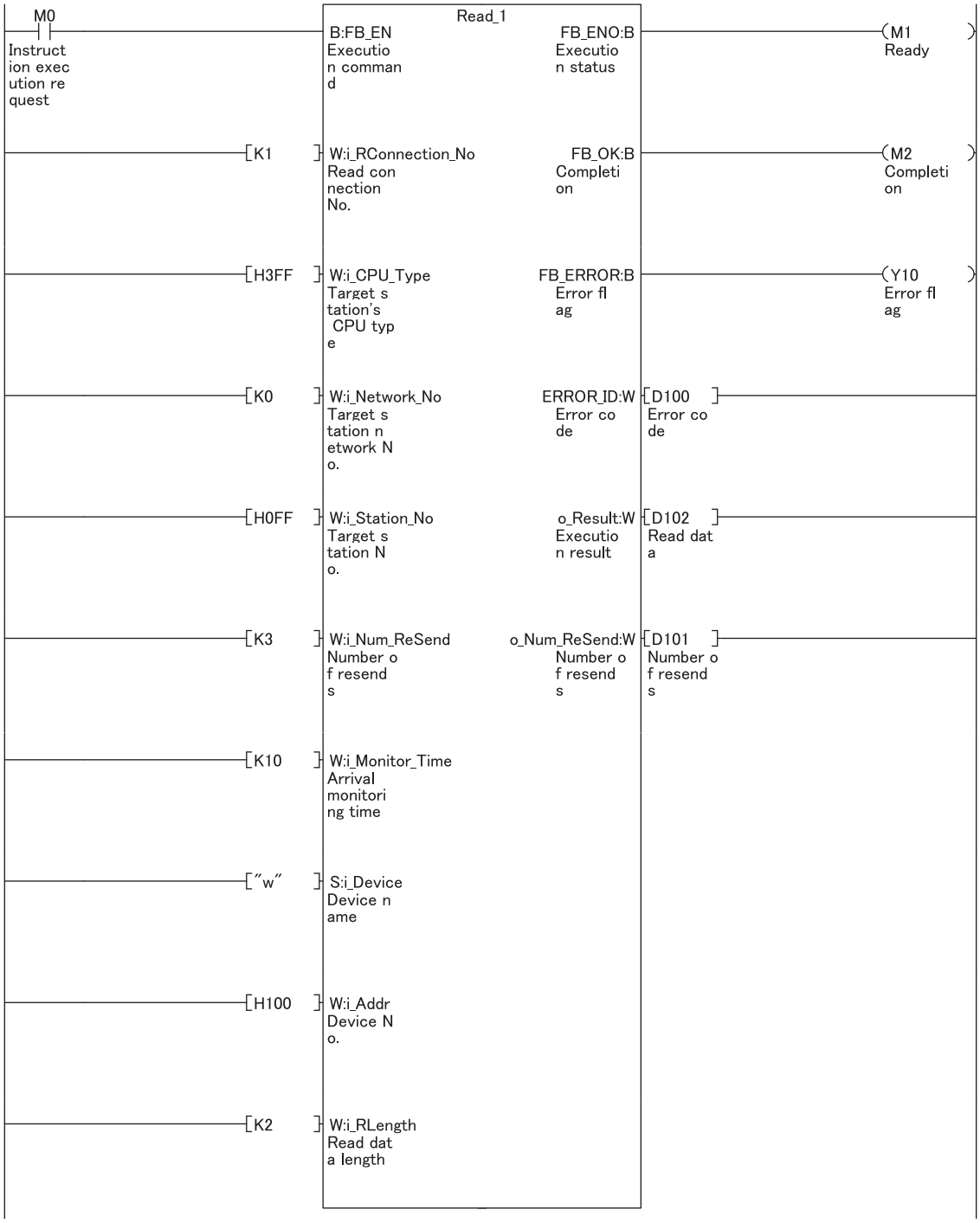
(3) Programs

M+CPU- DataLink_Read (for data link – READ instruction)

The following describes a program example using labels listed in the following table.

Label name	Setting value	Description
Connection number	1	Specify "1" for the connection number where data reading is performed.
Target station's CPU type	03FFh	Specify the target station CPU/own system CPU (03FFh).
Target station network number	0	Specify "0" for the network number including the target station.
Target station number	FFh	Specify "FFh" for the target station number.
Number of resends	3	Specify "3" for the number of resends performed when a process is not completed within the arrival monitoring time.
Arrival monitoring time	10	Specify "10" seconds for arrival monitoring time.
Device name	W	Specify "W" for the device name from which data are read.
Start device number	100h	Specify "100h" for the W device number from where data reading is started.
Read data length	2	Specify "2" for the number of words of read data.

When M0 is turned ON, the following program reads data from the target station and outputs the read data.

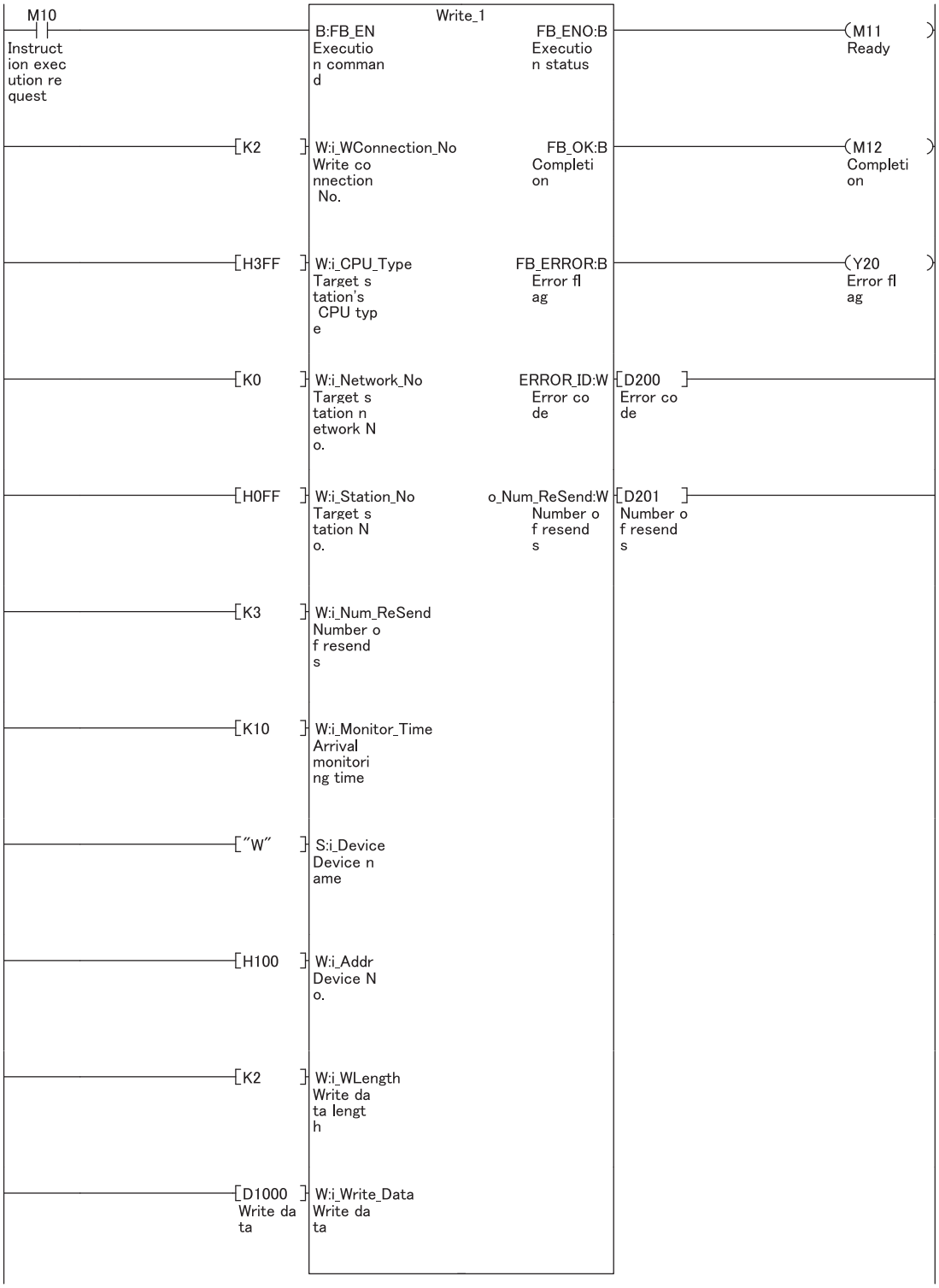


M+CPU- DataLink_Write (for data link – WRITE instruction)

The following describes a program example using labels listed in the following table.

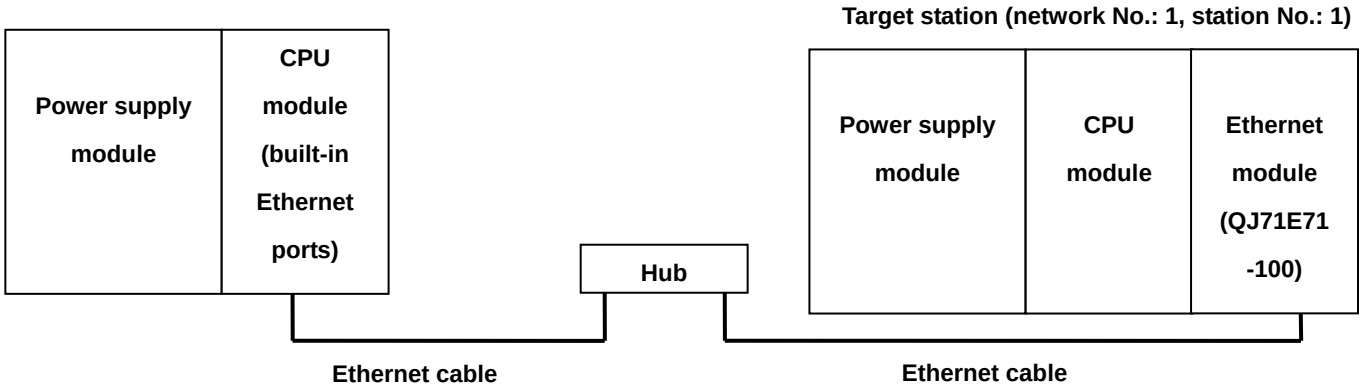
Label name	Setting value	Description
Connection number	2	Specify "2" for the connection number where data writing is performed.
Target station's CPU type	03FFh	Specify the target station CPU/own system CPU (03FFh).
Target station network number	0	Specify "0" for the network number including the target station.
Target station number	FFh	Specify "FFh" for the target station number.
Number of resends	3	Specify "3" for the number of resends performed when a process is not completed within the arrival monitoring time.
Arrival monitoring time	10	Specify "10" seconds for arrival monitoring time.
Device name	W	Specify "W" for the device name to which data are written.
Device number	100h	Specify "100h" for the W device number from where data writing is started.
Write data length	2	Specify "2" for the number of words of write data.
Write data	D1000	Specify "D1000" for the storage location of write data.

When M10 is turned ON, the following program writes data stored in D1000 by two words to W100.



2) The target station is an Ethernet interface module

(1) System Configuration



(2) Device Lists

External output (check)

Device	FB name	Application (at ON)
Y10	Socket communication – Data link instruction (READ)	Abnormally ended
Y20	Socket communication – Data link instruction (WRITE)	Abnormally ended

Data register

Device	FB name	Application (at ON)
D100	Socket communication – Data link instruction (READ)	Error code
D101		Number of resends (result)
D102		Read data
D200	Socket communication – Data link instruction (WRITE)	Error code
D201		Number of resends (result)
D2000		Write data

Relay

Device	FB name	Application (at ON)
M0	Socket communication – Data link instruction (READ)	Instruction execution request
M1		Ready
M2		Completion
M10	Socket communication – Data link instruction (WRITE)	Instruction execution request
M11		Ready
M12		Completion

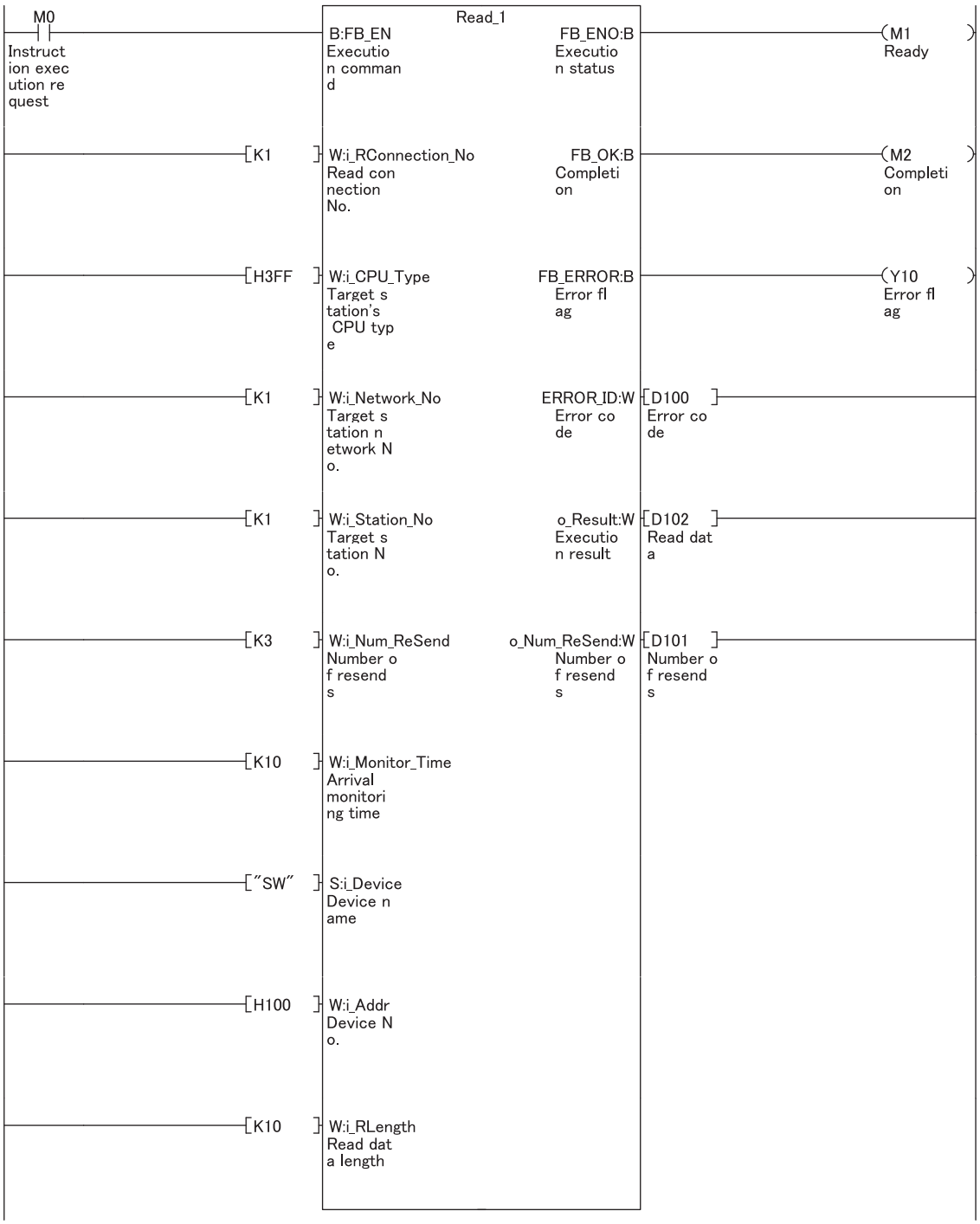
(3) Programs

M+CPU- DataLink_Read (for data link – READ instruction)

The following describes a program example using labels listed in the following table.

Label name	Setting value	Description
Connection number	1	Specify "1" for the connection number where data reading is performed.
Target station's CPU type	03FFh	Specify the target station CPU/own system CPU (03FFh).
Target station network number	1	Specify "1" for the network number including the target station.
Target station number	1	Specify "1" for the target station number.
Number of resends	3	Specify "3" for the number of resends performed when a process is not completed within the arrival monitoring time.
Arrival monitoring time	10	Specify "10" seconds for arrival monitoring time.
Device name	SW	Specify "SW" for the device name from which data are read.
Device number	100h	Specify "100h" for the SW device number from where data reading is started.
Read data length	10	Specify "10" for the number of words of read data.

When M0 is turned ON, the following program reads data from the target station and outputs the read data.

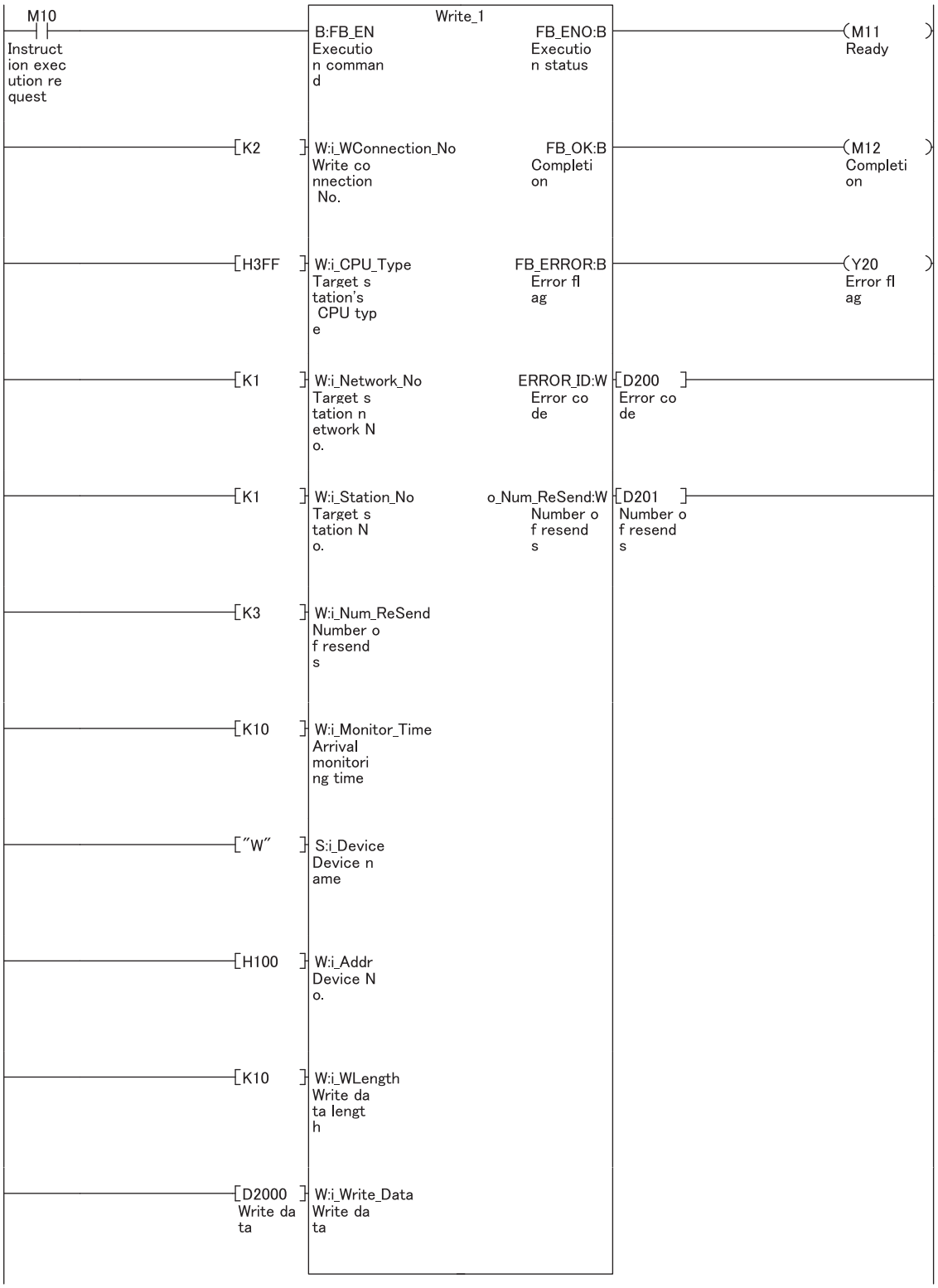


M+CPU- DataLink_Write (for data link – WRITE instruction)

The following describes a program example using labels listed in the following table.

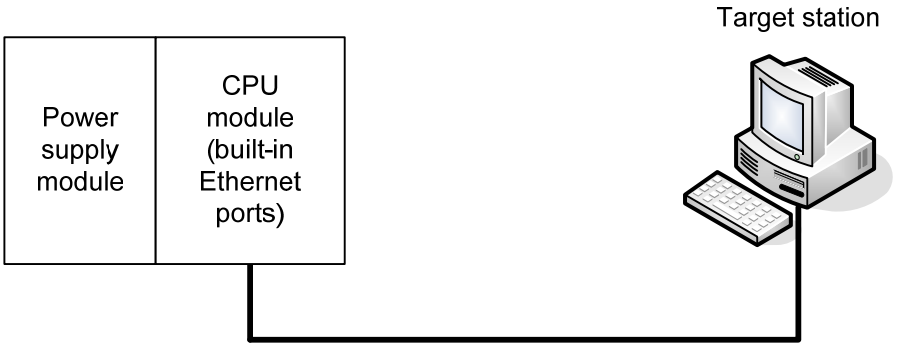
Label name	Setting value	Description
Connection number	2	Specify "2" for the connection number where data writing is performed.
Target station's CPU type	03FFh	Specify the target station CPU/own system CPU (03FFh).
Target station network number	1	Specify "1" for the network number including the target station.
Target station number	1	Specify "1" for the target station number.
Number of resends	3	Specify "3" for the number of resends performed when a process is not completed within the arrival monitoring time.
Arrival monitoring time	10	Specify "10" seconds for arrival monitoring time.
Device name	W	Specify "W" for the device name to which data are written.
Device number	100h	Specify "100h" for the W device number from where data writing is started.
Write data length	10	Specify "10" for the number of words of write data.
Write data	D2000	Specify "D2000" for the storage location of write data.

When M10 is turned ON, the following program writes data stored in D2000 by ten words to W100.



Application example of Data link instruction (communications using random access buffer) FB

(1) System Configuration



(2) Device Lists

External input (command)

Device	FB name	Application (at ON)
X00	Socket communication - Random access communication	Communication data code (ON: ASCII data)

External output (check)

Device	FB name	Application (at ON)
Y10	Socket communication - Random access communication	Socket communication - Random access communication FB abnormally ended

Data register

Device	FB name	Application (at ON)
D100	Socket communication - Random access communication	Socket communication - Random access communication FB error code

Link register

Device	FB name	Application (at ON)
W100	Socket communication - Random access communication	Socket communication - Random access communication buffer area

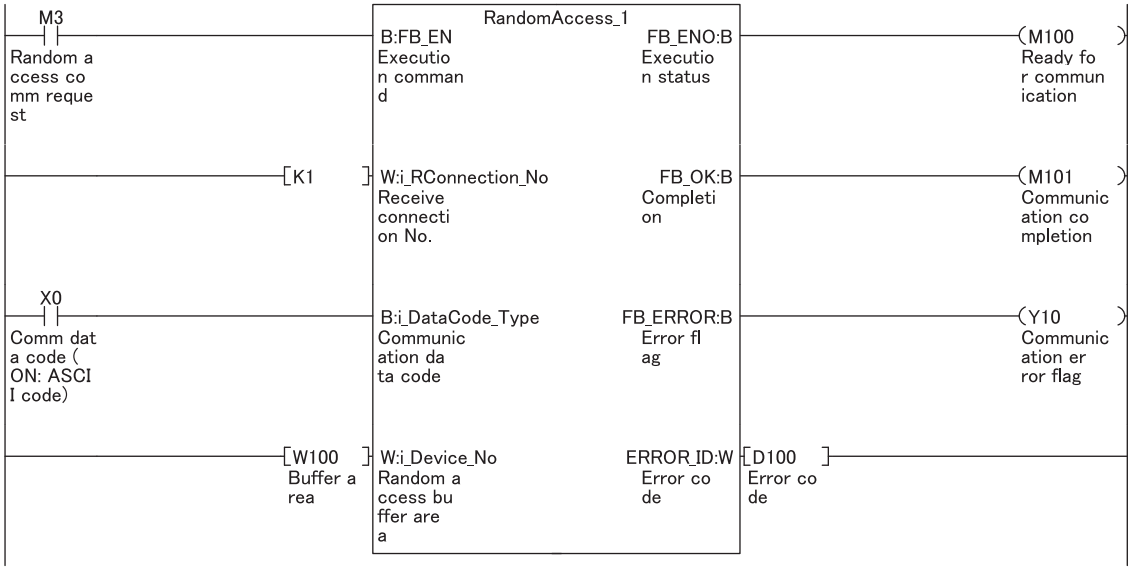
Relay

Device	FB name	Application (at ON)
M3	Socket communication - Random access communication	Socket communication - Random access communication request
M100	Socket communication - Random access communication	Socket communication - Random access communication ready
M101	Socket communication - Random access communication	Socket communication - Random access communication completion

(3) Program

M+CPU- DataLink_RandomAccess (for data link – communications using random access buffer)

The following describes a program example using labels listed in the following table.

Label name	Setting value	Description
Receive connection number	1	Specify "1" for the connection number where data reception is performed.
Communication data code	ON	Specify "ASCII code" for communication data code.
Start device number	W100	Specify "W100" for the device number from where communications using a random access buffer are started.

When M3 is turned ON, data is processed according to the request packet received from the target station.