MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Flexible High-Speed I/O Control Module Function Block Reference

CONTENTS

1 FUNCTION BLOCK (FB) LIST

This chapter lists the FB for the MELSEC iQ-R series flexible high-speed I/O control module.

Name*1	Description
M+RD40PD01_SaveSamplingData	Reads sampling data collected using the logic analyzer function, and saves it in a CSV file.
M+RD40PD01_ContinuousLoggingRequest	Issues the continuous logging start/stop request.
M+RD40PD01_ReadContinuousLogging	Reads logging data collected using the continuous logging function and stores it in the specified file register.

*1 Note that this reference does not describe the FB version information which is displayed such as "_00A" at the end of the FB name.

MEMO

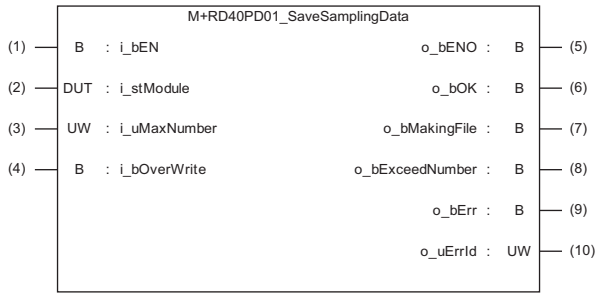
2 FLEXIBLE HIGH-SPEED I/O CONTROL MODULE FB

2.1 M+RD40PD01_SaveSamplingData

Name

M+RD40PD01_SaveSamplingData

Overview

Item	Description
Functional overview	Reads sampling data collected using the logic analyzer function, and saves it in a CSV file.
Symbol	

Labels

■Input labels

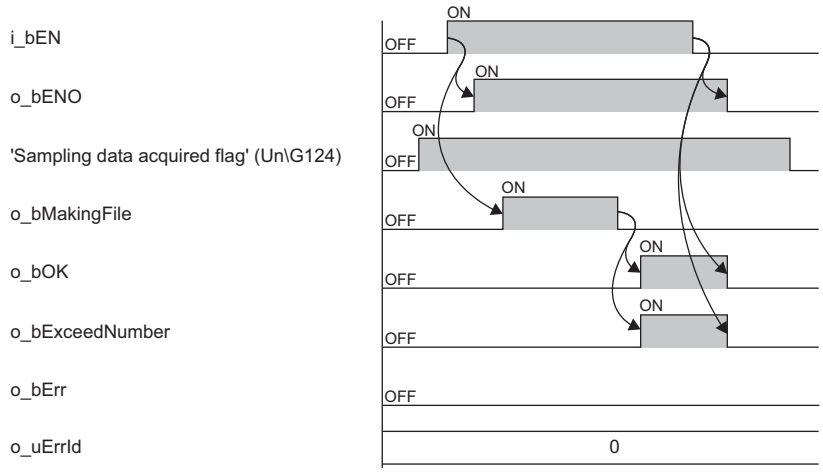
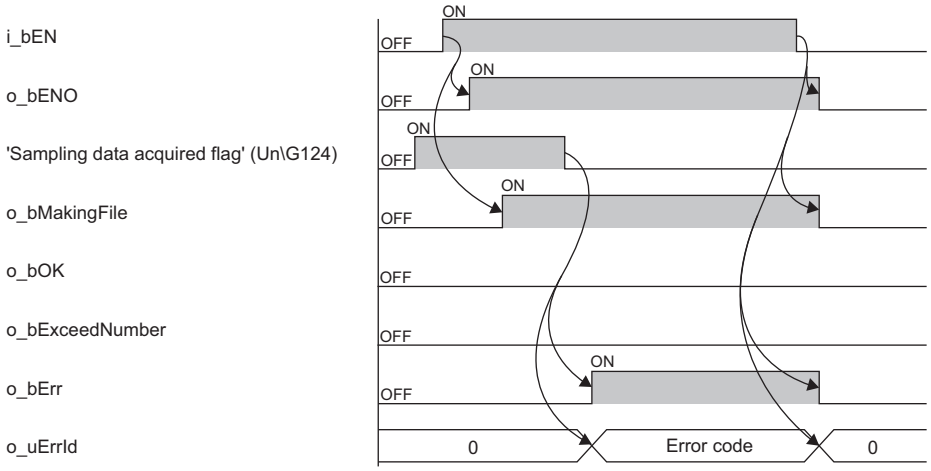
No.	Variable name	Name	Data type	Scope	Description
(1)	i_bEN	Execution command	Bit	On or off	On: The FB is activated. Off: The FB is not activated.
(2)	i_stModule	Module label	Structure	The scope differs depending on the module label.	Specify the module label of the flexible high-speed I/O control module.
(3)	i_uMaxNumber	Maximum number of save files	Word [unsigned]	1 to 999	Specify the maximum number of CSV files that this FB saves.
(4)	i_bOverWrite	Overwrite save command	Bit	On or off	Specify whether or not to overwrite the CSV files having smaller consecutive numbers when the number of CSV files that this FB has saved reaches the maximum number of save files. If the setting is off, the save processing of sampling data stops.

■Output labels

No.	Variable name	Name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	Off	On: The execution command is on. Off: The execution command is off.
(6)	o_bOK	Normal completion	Bit	Off	The on state indicates that saving files has been completed. Restarting the logic analyzer function turns off this label.
(7)	o_bMakingFile	File creation in progress	Bit	Off	The on state indicates that files are being created.
(8)	o_bExceedNumber	Maximum number reached flag	Bit	Off	The on state indicates that the number of CSV files that this FB has saved has reached the maximum number of save files.
(9)	o_bErr	Error completion	Bit	Off	The on state indicates that an error has occurred in the FB.
(10)	o_uErrId	Error code	Word [unsigned]	0	The error code of an error that has occurred in the FB is stored.

FB details

Item	Description	
Available device	Target module	RD40PD01
	CPU module	MELSEC iQ-R series CPU modules
	Engineering tool	GX Works3
Language	Ladder diagram	
Number of basic steps	4957 steps The number of steps of the FB embedded in a program depends on the CPU module used, the input/output definitions, and the options setting of GX Works3. For the options setting of GX Works3, refer to the GX Works3 Operating Manual.	
Processing	• If i_bEN (Execution command) is on and 'Sampling data acquired flag' (Un\G124) is on, sampling data are acquired from the flexible high-speed I/O control module. The acquired sampling data are sorted in chronological order, and the data are saved in the SD memory card inserted into the CPU module in the CSV format. • If i_bEN (Execution command) is on, this FB starts the save processing of sampling data every time 'Sampling data acquired flag' (Un\G124) turns on. • Multiple scans are required to complete the save processing of sampling data. Check o_bOK (Normal completion) to see that the processing has been completed. • If 'Sampling data acquired flag' (Un\G124) is turned off while sampling data is being saved, o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). A partially created CSV file is saved in the SD memory card. • When this FB saves CSV files in an SD memory card, the file name is given as follows: "FLEX" + "Middle two digits of the four digits representing the start I/O number of the flexible high-speed I/O control module" + "Consecutive number" + ".CSV". The maximum number of consecutive numbers varies with i_uMaxNumber (Maximum number of save files). Turning off i_bEN (Execution command) resets the consecutive numbers, and thereafter a consecutive number is given from 1 again. If the start I/O number of the flexible high-speed I/O control module is H0450 and i_uMaxNumber (Maximum number of save files) is 30, the file name of the 6th file created by this FB will be "FLEX45006.CSV". • When this FB creates a CSV file in an SD memory card and another CSV file that already exists in the SD memory card has the same name as that of the newly created file, the existing file is replaced with the newly created file. • If i_bOverWrite (Overwrite save command) is on and the number of files that this FB has saved in an SD memory card exceeds i_uMaxNumber (Maximum number of save files), the consecutive number returns back to 1 and the save processing of sampling data continues. • If i_bOverWrite (Overwrite save command) is off and the number of files that this FB has saved in an SD memory card reaches i_uMaxNumber (Maximum number of save files), the save processing of sampling data stops. • If the number of files that this FB has saved in an SD memory card reaches i_uMaxNumber (Maximum number of save files), o_bExceedNumber (Maximum number reached flag) turns on regardless of the on or off state of i_bOverWrite (Overwrite save command). • If an incorrect value is set in i_uCH (Target channel) or i_uMaxNumber (Maximum number of save files), o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). • A CPU error occurs in the following cases: when this FB has been executed with no SD memory card inserted into the CPU module; when the inserted SD memory card has no sufficient free space; or when the number of files stored is exceeded. When an error has occurred and the CPU module is in a stop error state, o_bErr (Error completion) and o_uErrId (Error code) are not updated. When an error has occurred and the CPU module is in a continuation error state, o_bErr (Error completion) turns on and the error code is stored in o_uErrId (Error code). For the capacity of SD memory cards and the number of files stored, refer to the MELSEC iQ-R Module Configuration Manual. The operating status (continue or stop) of the CPU module at the time of the failure of access to the SD memory card can be set with the parameter. • For the format of CSV files that this FB creates, refer to the MELSEC iQ-R Flexible High-Speed I/O Control Module User's Manual (Application).	
FB compilation method	Macro type	
FB operation	Pulsed execution type (multiple scan execution type)	

Item	Description
Timing chart of I/O signals	■When the operation is completed successfully  ■When the operation is completed with an error 
Restrictions and precautions	• This FB does not include the error recovery processing. Program the error recovery processing separately in accordance with the required system operation. • This FB cannot be used in an interrupt program. • Do not use this FB in programs that are executed only once, such as a subroutine program or FOR-NEXT loop, because i_bEN (Execution command) cannot be turned off and the normal operation cannot be acquired. Always use this FB in programs that can turn off i_bEN (Execution command). • This FB cannot save sampling data in any mediums other than SD memory cards. • This FB uses the SP.FWRITE instruction. Thus, if an error occurs in the execution of the SP.FWRITE instruction, a CPU error occurs. • When this FB is used in two or more places, create an interlock to prevent the FBs from being activated at the same time. • If SM606 (SD memory card forced disable instruction) is on while sampling data is being saved, the SP.FWRITE instruction is not processed. Thus, the sampling data cannot be saved. In this case, o_bErr (Error completion) turns on and the error code is stored in o_uErrId (Error code). • This FB requires the configuration of the ladder for every input label. • Set i_uMaxNumber (Maximum number of save files) with consideration for the capacity of the SD memory card and the number of files stored. If the capacity of the SD memory card or the number of files stored is exceeded as a result of execution of this FB, a CPU error occurs. For the capacity of SD memory cards and the number of files stored, refer to the MELSEC iQ-R Module Configuration Manual. • To operate the flexible high-speed I/O control module, a hardware logic must be set according to each connected device and system. For how to set a hardware logic, refer to the MELSEC iQ-R Flexible High-Speed I/O Control Module User's Manual (Application).

Error code

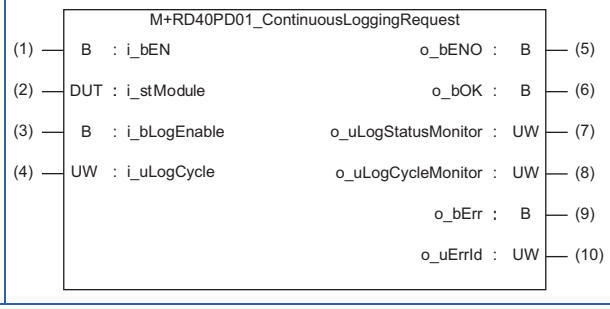
Error code	Description	Action
101H	The maximum number of save files is set out of the setting range. The maximum number of save files is set out of the range of 1 to 999.	Review and correct the setting and then execute the FB again.
200H	The processing is interrupted because the 'Sampling data acquired flag' (Un\G124) was turned off while sampling data was being saved. A partially created CSV file is saved in the SD memory card.	—
201H	The SD memory card cannot be accessed because SM606 (SD memory card forced disable instruction) is on. If SM606 (SD memory card forced disable instruction) is turned on while sampling data is being saved, a partially created CSV file is saved in the SD memory card.	Turn off SM606, check that SM607 (SD memory card forced disable state flag) is off, and execute the FB again.
202H	Execution of this FB has been attempted with no SD memory card inserted into the CPU module.	Insert an SD memory card to save the target CSV files into the CPU module, and then execute the FB again.
203H	The SD memory card cannot be accessed because SM600 (Memory card enabled/disabled flag) is off (disabled).	Make the SD memory card enabled, and then execute the FB again.
204H	The SD memory card is frequently accessed from programs in addition to this FB, and a timeout has occurred in the sampling data write processing.	Reduce the frequency of the access to the SD memory card.
205H	Because SM601 (Memory card protect flag) is on (write inhibited), data cannot be written to the SD memory card.	Turn off the protect switch on the SD memory card (enable writing data), check that SM601 has turned off, and execute the FB again.
Error codes other than the above	Error codes related to the SP.FWRITE instruction executed when sampling data is written to an SD memory card	For details on the error code that has occurred, refer to the description of the SP.FWRITE instruction. (📖 MELSEC iQ-R Programming Manual (Instructions, Standard Functions/ Function Blocks))

2.2 M+RD40PD01_ContinuousLoggingRequest

Name

M+RD40PD01_ContinuousLoggingRequest

Overview

Item	Description
Functional overview	Issues the continuous logging start/stop request.
Symbol	

Labels

■Input labels

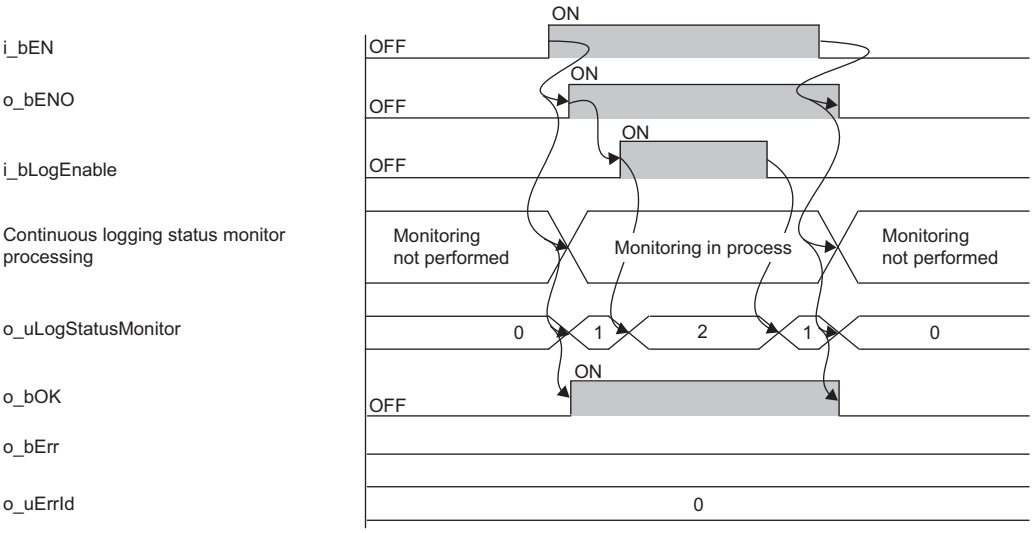
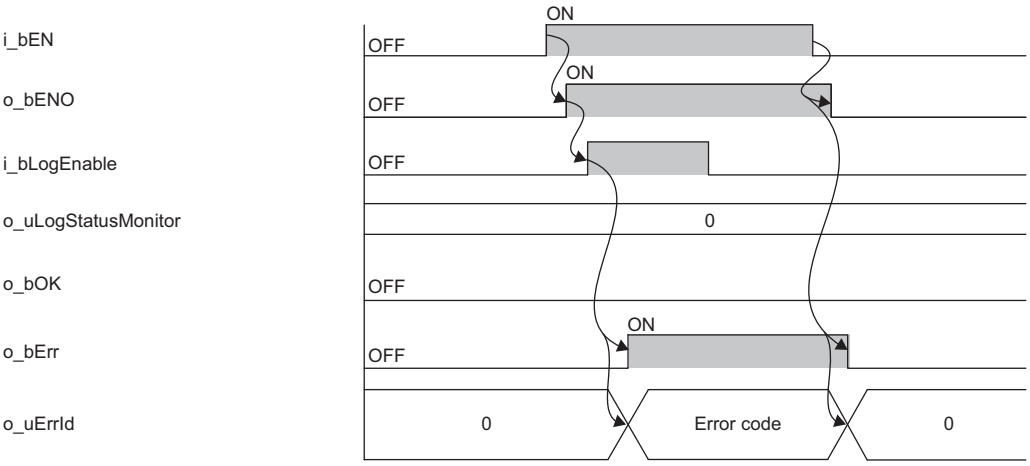
No.	Variable name	Name	Data type	Scope	Description
(1)	i_bEN	Execution command	Bit	On or off	On: The FB is activated. Off: The FB is not activated.
(2)	i_stModule	Module label	Structure	The scope differs depending on the module label.	Specify the module label of the flexible high-speed I/O control module.
(3)	i_bLogEnable	Continuous logging start/stop request	Bit	Off: Stop On: Start	Off: The continuous logging is stopped. On: The continuous logging is started.
(4)	i_uLogCycle	Continuous logging cycle setting	Word [unsigned]	0: 1μs 1: 10μs 2: 100μs 3: 1000μs	Set the continuous logging cycle.

■Output labels

No.	Variable name	Name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	Off	On: The execution command is on. Off: The execution command is off.
(6)	o_bOK	Normal completion	Bit	Off	The on state indicates that the continuous logging start/stop request has been completed.
(7)	o_uLogStatusMonitor	Continuous logging status monitor	Word [unsigned]	0	The continuous logging status is indicated. 0: Disabled 1: Start request waiting 2: In progress
(8)	o_uLogCycleMonitor	Continuous logging cycle monitor	Word [unsigned]	0	The continuous logging cycle (in units of μs) is stored.
(9)	o_bErr	Error completion	Bit	Off	The on state indicates that an error has occurred in the FB.
(10)	o_uErrId	Error code	Word [unsigned]	0	The error code of an error that has occurred in the FB is stored.

FB details

Item	Description	
Available device	Target module	RD40PD01
	CPU module	MELSEC iQ-R series CPU modules
	Engineering tool	GX Works3
Language	Ladder diagram	
Number of basic steps	86 steps The number of steps of the FB embedded in a program depends on the CPU module used, the input/output definitions, and the options setting of GX Works3. For the options setting of GX Works3, refer to the GX Works3 Operating Manual.	
Processing	• This FB outputs the values of 'Continuous logging status monitor' (Un\G15010) and 'Continuous logging cycle monitor' (Un\G15011) when i_bEN (Execution command) is turned on. • After i_bEN (Execution command) has been turned on, the continuous logging function starts by turning on (start) i_bLogEnable (Continuous logging start/stop request) from off (stop). The continuous logging function stops by turning off (stop) i_bLogEnable (Continuous logging start/stop request) from on (start). • After i_bEN (Execution command) has been turned on, i_uLogCycle (Continuous logging cycle setting) is reflected by turning on (start) i_bLogEnable (Continuous logging start/stop request) from off (stop). Even when a setting value is changed during the continuous logging, the setting is not reflected. To reflect the setting, turn off (stop) and on (start) i_bLogEnable (Continuous logging start/stop request) again. • When the hardware logic control is stopped and i_bLogEnable (Continuous logging start/stop request) is turned on (start) from off (stop), o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). For the error code, refer to the list of error codes. (☞ Page 11 Error code) • When the setting value other than 0 to 3 is set to i_uLogCycle (Continuous logging cycle setting), o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). For the error code, refer to the list of error codes. (☞ Page 11 Error code) • When 'Continuous logging status monitor' (Un\G15010) is Disabled (0), o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For the error code, refer to the list of error codes. (☞ Page 11 Error code)	
FB compilation method	Macro type	
FB operation	Real-time execution	

Item	Description
Timing chart of I/O signals	■When the operation is completed successfully  ■When the operation is completed with an error 
Restrictions and precautions	• This FB does not include the error recovery processing. Program the error recovery processing separately in accordance with the required system operation. • This FB cannot be used in an interrupt program. • Do not use this FB in programs that are executed only once, such as a subroutine program or FOR-NEXT loop, because i_bEN (Execution command) cannot be turned off and the normal operation cannot be acquired. Always use this FB in programs that can turn off i_bEN (Execution command). • This FB requires the configuration of the ladder for every input label. • To operate the flexible high-speed I/O control module, a hardware logic must be set according to each connected device and system. For how to set a hardware logic, refer to the MELSEC iQ-R Flexible High-Speed I/O Control Module User's Manual (Application).

Error code

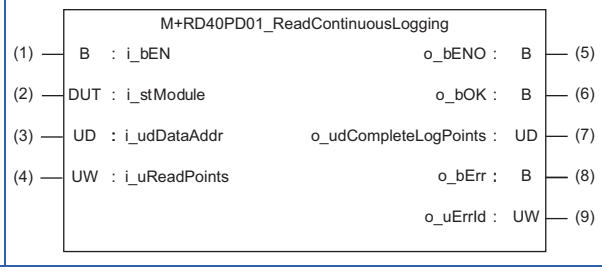
Error code	Description	Action
103H	The setting value is out of the range of the continuous logging cycle setting. Set a value within 0 to 3 to the continuous logging cycle setting.	Review and correct the setting and then execute the FB again.
208H	When 'Continuous logging status monitor' (Un\G15010) was Disabled (0), the continuous logging start request was issued. In any of the following cases, the continuous logging function cannot be performed. • A target module is specified as an inter-module synchronization target module in the inter-module synchronization setting of the system parameter. • Hardware logic area (High speed area) (Un\G1000 to Un\G1029) is assigned to "User Address" of an item in the hardware logic. • An SSI encoder block is used for the hardware logic. • The logic analyzer function is in progress. • The simulation function is in progress. • The hardware logic control is stopped.	Review and correct the setting and program, and then execute the FB again.

2.3 M+RD40PD01_ReadContinuousLogging

Name

M+RD40PD01_ReadContinuousLogging

Overview

Item	Description
Functional overview	Reads logging data collected using the continuous logging function and stores it in the specified file register.
Symbol	

Labels

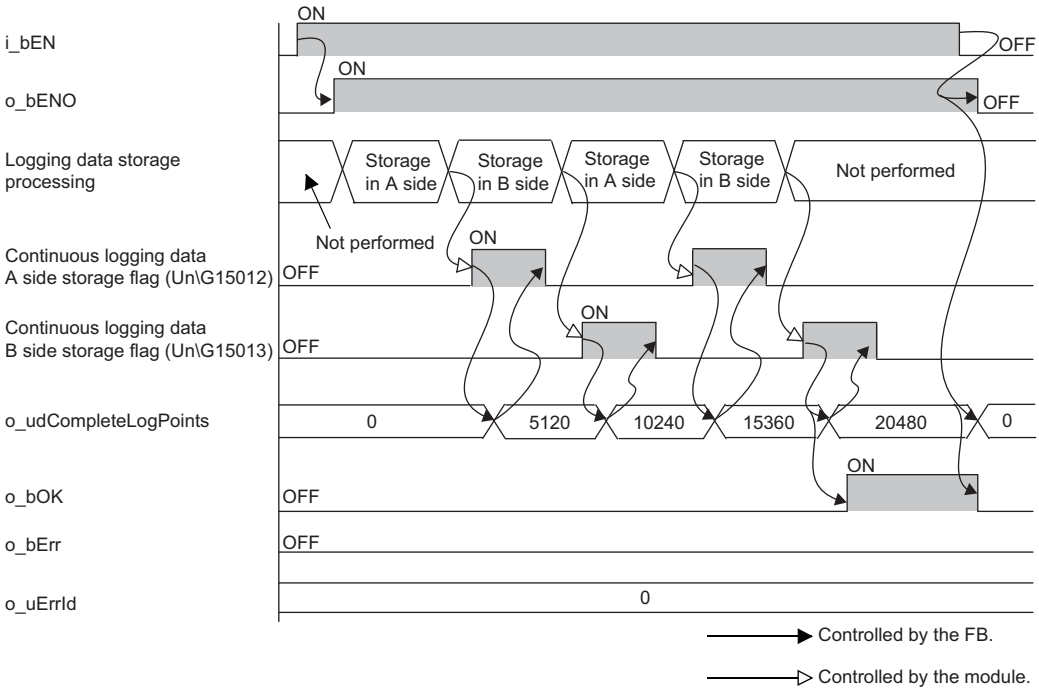
■Input labels

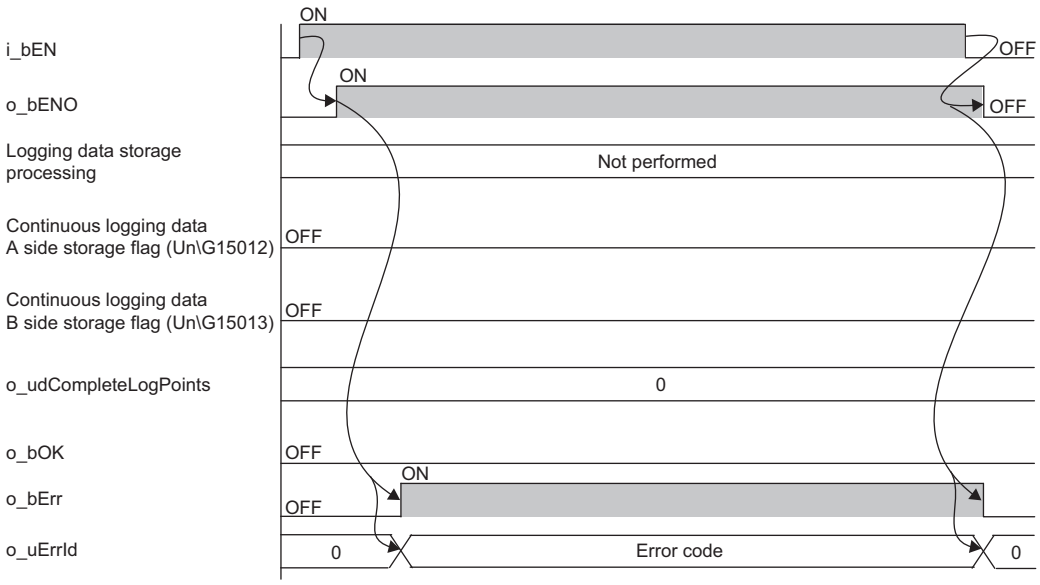
No.	Variable name	Name	Data type	Scope	Description
(1)	i_bEN	Execution command	Bit	On or off	On: The FB is activated. Off: The FB is not activated.
(2)	i_stModule	Module label	Structure	The scope differs depending on the module label.	Specify the module label of the flexible high-speed I/O control module.
(3)	i_udDataAddr	File register start address	Double Word [unsigned]	The effective device range. The scope differs depending on the file register setting of the CPU parameter.	Specify the start address of the file register (ZR).
(4)	i_uReadPoints	Number of read points	Word [unsigned]	1 to 2000	Specify the number of read points of the continuous logging data in increments of 5120 points. ■Example • When i_uReadPoints (Number of read points) is 1, the number of read points is 5120 points. • When i_uReadPoints (Number of read points) is 2000, the number of read points is 10240000 points.

■Output labels

No.	Variable name	Name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	Off	On: The execution command is on. Off: The execution command is off.
(6)	o_bOK	Normal completion	Bit	Off	The on state indicates that the read processing of the continuous logging data has been completed.
(7)	o_udCompleteLogPoints	Number of read completed logging data points	Double Word [unsigned]	0	The number of read completed logging data points is returned.
(8)	o_bErr	Error completion	Bit	Off	The on state indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [unsigned]	0	The error code of an error that has occurred in the FB is stored.

FB details

Item	Description	
Available device	Target module	RD40PD01
	CPU module	MELSEC iQ-R series CPU modules
	Engineering tool	GX Works3
Language	Ladder diagram	
Number of basic steps	167 steps The number of steps of the FB embedded in a program depends on the CPU module used, the input/output definitions, and the options setting of GX Works3. For the options setting of GX Works3, refer to the GX Works3 Operating Manual.	
Processing	• This FB reads the continuous logging data when i_bEN (Execution command) is turned on. • This FB turns on o_bENO (Execution status) while i_bEN (Execution command) is on. • Logging data is continuously transferred into the file register of the CPU module in the storage order of the logging data (A side → B side → A side →···). When the total of read logging data points reaches the value of i_uReadPoints (Number of read points) × 5120 points, the data transfer ends and o_bOK (Normal completion) turns on. • At the first execution of this FB, both of Continuous logging data A side storage flag and Continuous logging data B side storage flag are turned off. After the off of both flags, at the first turning on of either Continuous logging data A side storage flag or Continuous logging data B side storage flag, the logging data read starts. • If both of Continuous logging data A side storage flag and Continuous logging data B side storage flag are turned on during the execution of this FB, o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). For the error code, refer to the list of error codes. (☞ Page 14 Error code) • Set the number of read points of the continuous logging data in increments of 5120 points. • If the setting value of the number of read points is out of the range, o_bErr (Error completion) turns on and the processing of the FB is interrupted. In addition, the error code is stored in o_uErrId (Error code). For the error code, refer to the list of error codes. (☞ Page 14 Error code)	
FB compilation method	Macro type	
FB operation	Pulsed execution type (multiple scan execution type)	
Timing chart of I/O signals	■When the operation is completed successfully When the number of read points is set to 20480 points  The number of logging data increases by 5120 every time data is transferred to the file register.	

Item	Description
Timing chart of I/O signals	■When the operation is completed with an error 
Restrictions and precautions	• This FB does not include the error recovery processing. Program the error recovery processing separately in accordance with the required system operation. • To use more than one of this FB, set the start address and the number of read points not to overlap file register areas. • This FB uses the long index register LZ0. When using an interrupt program, do not use the corresponding index register. • This FB requires the configuration of the ladder for every input label. • When saving of the logging data is attempted to the file register areas other than the ones reserved by the file register setting of the CPU parameters, a CPU error (2820H: Device/label/buffer memory specification incorrect) occurs. Set the start address and the number of read points so that the logging data is saved in the reserved file register areas. • Arrange this FB in the programs such as a scan execution type program and fixed scan execution type program that are executed periodically. The program including this FB must satisfy the condition of "Execution interval of the FB (μs) ≤ 5120 (points) × Continuous logging cycle monitor - 1100 (μs)". When this condition is not satisfied, both of Continuous logging data A side storage flag and Continuous logging data B side storage flag may be turned on and the FB may be completed with an error. • To operate the flexible high-speed I/O control module, a hardware logic must be set according to each connected device and system. For how to set a hardware logic, refer to the MELSEC iQ-R Flexible High-Speed I/O Control Module User's Manual (Application).

Error code

Error code	Description	Action
104H	The number of read points is out of the range. Set the number of read points within 1 to 2000.	Review and correct the setting and then execute the FB again.
209H	Both of Continuous logging data A side storage flag and Continuous logging data B side storage flag are turned on. Create a program so that the execution interval of the FB satisfies the following condition. • Execution interval of the FB (μs) ≤ 5120 (points) × Continuous logging cycle monitor - 1100 (μs)	Review and correct the program and then execute the FB again.

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INSTRUCTION INDEX

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
October 2016	BCN-P5999-0684-A	First edition
April 2017	BCN-P5999-0684-B	■Added or modified parts Chapter 1, Section 2.1 to 2.3

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