



Programmable Controller

MELSEC iQ-F
series

MELSEC iQ-F

FX5 CPU Module Function Block Reference

CONTENTS

CHAPTER 1	FUNCTION BLOCK (FB) LIST	2
CHAPTER 2	INPUT/OUTPUT FB	4
2.1	M+FX5UCPU-IO_OutputOnTimes	4
2.2	M+FX5UCPU-IO_CompareRelayOnTimes	6
CHAPTER 3	POSITIONING FB	9
3.1	M+FX5UCPU-Positioning_ABRST	9
3.2	M+FX5UCPU-Positioning_StartPositioning	13
CHAPTER 4	SERIAL COMMUNICATION FB	18
4.1	M+FX5UCPU-SerialComm_InputOutput	18
4.2	M+FX5UCPU-SerialComm_Input	22
4.3	M+FX5UCPU-SerialComm_Output	26
4.4	M+FX5UCPU-SerialComm_ExeCommonProtocol	29
CHAPTER 5	HIGH-SPEED COUNTER FB	33
5.1	M+FX5UCPU-Counter_PulseMeasure	33
CHAPTER 6	TEMPERATURE CONTROL FB	37
6.1	M+FX5UCPU-TemperatureCtrl_TwoPositionControl	37
6.2	M+FX5UCPU-TemperatureCtrl_TwoPositionControlPd	40
6.3	M+FX5UCPU-TemperatureCtrl_TwoPositionControlPi	43
6.4	M+FX5UCPU-TemperatureCtrl_ThreePositionControl	46
6.5	M+FX5UCPU-TemperatureCtrl_ThreePositionControlPd	50
6.6	M+FX5UCPU-TemperatureCtrl_ThreePositionControlPi	55
	INSTRUCTION INDEX	60
	REVISIONS	62

1 FUNCTION BLOCK (FB) LIST

This chapter lists the FBs for the MELSEC iQ-F series FX5U, FX5UC CPU module.

Input/Output FB

Name*1	Description
M+FX5UCPU-IO_OutputOnTimes	This FB counts (cumulatively) the number of ON times of the specified relay device number within the range from 0 to 4294967295.
M+FX5UCPU-IO_CompareRelayOnTimes	<ul style="list-style-type: none"> This FB counts (cumulatively) the number of ON times of the specified relay device number within the range from 0 to 4294967295. This FB compares the counted number of ON times with the set value, and outputs the comparison result.

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

Positioning FB

Name*1	Description
M+FX5UCPU-Positioning_ABRST	This FB reads the absolute position (ABS) data from the servo amplifier, and writes the read value to the current address (pulse unit) of the target axis.
M+FX5UCPU-Positioning_StartPositioning	This FB uses the table data set using the module parameters to activate the positioning operation.

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

Serial Communication FB

Name*1	Description
M+FX5UCPU-SerialComm_InputOutput	This FB stores the received data and sends the specified number of data points using non-protocol in serial communication.
M+FX5UCPU-SerialComm_Input	This FB stores the data received using non-protocol in serial communication.
M+FX5UCPU-SerialComm_Output	This FB sends the specified number of data points using non-protocol in serial communication.
M+FX5UCPU-SerialComm_ExeCommonProtocol	This FB executes the protocol registered with GX Works3.

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

High-speed Counter FB

Name*1	Description
M+FX5UCPU-Counter_PulseMeasure	This FB starts the pulse measurement function, and stores the pulse measured value.

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

Temperature Control FB

Name*1	Description
M+FX5UCPU-TemperatureCtrl_TwoPositionControl	This FB performs two-position control to turn the control output ON/OFF based on the input of the measured value, target value, and dead band.
M+FX5UCPU-TemperatureCtrl_TwoPositionControlPd	This FB performs two-position control with a PD characteristic to turn the control output ON/OFF based on the input of the measured value, target value, dead band, delay time, and maximum feedback value.
M+FX5UCPU-TemperatureCtrl_TwoPositionControlPi	This FB performs two-position control with a PI characteristic to turn the control output ON/OFF and output the output time based on the input of the measured value, target value, proportional band, integral band, dead band, and integral time.
M+FX5UCPU-TemperatureCtrl_ThreePositionControl	This FB performs three-position control to turn the control output + side and control output - side ON/OFF individually based on the input of the measured value, target value, dead band, and adjustment sensitivity.
M+FX5UCPU-TemperatureCtrl_ThreePositionControlPd	This FB performs three-position control with a PD characteristic to turn the control output + side and control output - side ON/OFF individually based on the input of the measured value, target value, dead band, delay time of the control output + side, maximum feedback value of the control output + side, delay time of the control output - side, and maximum feedback value of the control output - side.
M+FX5UCPU-TemperatureCtrl_ThreePositionControlPi	This FB performs three-position control with a PI characteristic to turn the control output + side and control output - side ON/OFF individually and output the control time based on the input of the measured value, target value, proportional band, integral band, dead band, and integral time.

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

Precautions

If upgrading module FB versions updates instructions, adds a new instruction, or adds a new device, please use the GX Works3 corresponding to the latest module FB.

2 INPUT/OUTPUT FB

2.1 M+FX5UCPU-IO_OutputOnTimes

Name

M+FX5UCPU-IO_OutputOnTimes

Overview

Item	Description
Overview	This FB counts (cumulatively) the number of ON times of the specified relay device number within the range from 0 to 4294967295.
Symbol	<pre> graph LR subgraph M+FX5UCPU-IO_OutputOnTimes direction LR i_bEN((1) B : i_bEN) i_stModule((2) DUT: i_stModule) i_uRaNo((3) UW : i_uRaNo) o_bENO((4) o_bENO : B) o_udOutputOnTotal((5) o_udOutputOnTotal : UD) o_bOK((6) o_bOK : B) o_bErr((7) o_bErr : B) o_uErrId((8) o_uErrId : UW) end </pre>

Labels

■Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	The setting range differs depending on the module label.	Specify the module label of the CPU module.
(3)	i_uRaNo	Target relay device number)	Word [Unsigned]	0 to the value in Y device size*1	Specify the relay device number for counting the number of ON times. For example, specify "10 (octal)*2" to specify the output Y010.

*1 The set value of SD262 and SD263 (32 bit) shall be the upper limit.


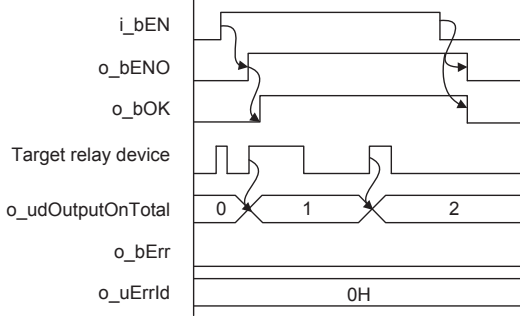
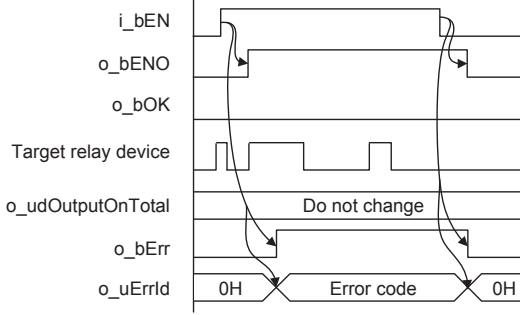

*2 In GX Works3, program with 8#10.

■Output label

No.	Variable name	Name	Data type	Default value	Description
(4)	o_bENO	Execution status	Bit	OFF	ON: The execution command is ON. OFF: The execution command is OFF.
(5)	o_udOutputOnTotal	Integration value of number of relay ON times	Double Word [Unsigned]	0	Stores the counted integration value of the number of times the specified relay device number has turned ON.*1
(6)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the FB is counting the relay ON times.
(7)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(8)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.

*1 Note that if o_udOutputOnTotal (Integration value of number of relay ON times) exceeds "4294967295", the integration value returns to 0.

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU
	Engineering tool GX Works3 Version 1.007H or later
Language	Ladder diagram
Number of basic steps	102 steps The number of steps of the FB in a program depends on the CPU module used and input and output definition.
Processing	<ul style="list-style-type: none"> This FB starts counting when i_bEN (Execution command) turns ON. If the setting value of i_uRaNo (Target relay device number) is out of the setting range, o_bErr (Error completion) turns ON and the processing of this FB is aborted. o_uErrId (Error code) stores the error code "100 (hexadecimal)". For the error code, refer to  Page 5 Error code.
FB compilation method	Macro type
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] (When the target relay device number is outside the setting range)</p> 
Restrictions or precautions	<ul style="list-style-type: none"> 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). When this FB is used twice or more, precaution must be taken to avoid duplication of the relay device number. This FB uses the index register Z9. When using an interrupt program, do not use this index register in the interrupt program. Every input must be provided with a value for proper FB operation. When clearing current value of o_udOutputOnTotal (Integration value of No. of relay ON times), write K0 to "Instance name .o_udOutputOnTotal (Integration value of No. of relay ON times)" by DMOV instruction. Because the target relay device is counted in ladder, the FB cannot count correctly if the target relay device is turned ON and OFF twice or more in 1 scan. This FB uses latch labels. If the latch label area capacity is insufficient for the contents of the program, a message is displayed in GX Works3 when the program is compiled. In such a case, correct the program in accordance with the contents of the message. Set the module parameters in GX Works3 in accordance with the connected equipment and system. For the module parameters, refer to the  MELSEC iQ-F FX5 User's Manual (Application).

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uRaNo (target relay device number) is out of the range. The target relay device number is not within the range of 0 to the value in Y device size.	Try again after checking the setting.

2.2 M+FX5UCPU-IO_CompareRelayOnTimes

Name

M+FX5UCPU-IO_CompareRelayOnTimes

Overview

Item	Description
Overview	<ul style="list-style-type: none"> This FB counts (cumulatively) the number of ON times of the specified relay device number within the range from 0 to 4294967295. This FB compares the counted number of ON times with the set value, and outputs the comparison result.
Symbol	<p>The symbol diagram for M+FX5UCPU-IO_CompareRelayOnTimes shows the following connections:</p> <ul style="list-style-type: none"> (1) B : i_bEN (Bit) connected to input (5) o_bENO : B (2) DUT: i_stModule (Structure) connected to output (6) o_udOutputOnTotal : UD (3) UW : i_uRaNo (Word [Unsigned]) connected to output (7) o_bOK : B (4) UD : i_udCompareCount (Double Word [Unsigned]) connected to output (8) o_bErr : B Output (9) o_uErrId : UW Output (10) o_bFbResult : B

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	The setting range differs depending on the module label.	Specify the module label of the CPU module.
(3)	i_uRaNo	Target relay device number)	Word [Unsigned]	0 to the value in Y device size ^{*1}	Specify the relay device number for counting the ON times. For example, specify "10 (octal) ^{*2} " for specifying the output Y010.
(4)	i_udCompareCount	Number of comparisons	Double Word [Unsigned]	0 to 4294967295 ^{*3*4}	Set the value to be compared with the integration value of the number of relay ON times.

*1 The set value of SD262 and SD263 (32 bit) shall be the upper limit.

*2 In GX Works3, program with 8#10.

*3 Setting method

1 to 2147483647: Set a desired value in decimal.

2147483648 to 4294967295: Set a desired value converted into hexadecimal.

*4 Refer to "Product life of relay output contacts" in the following manual and specify a contact switching life suitable for the usage environment including switching current.

MELSEC iQ-F FX5U User's Manual (Hardware).


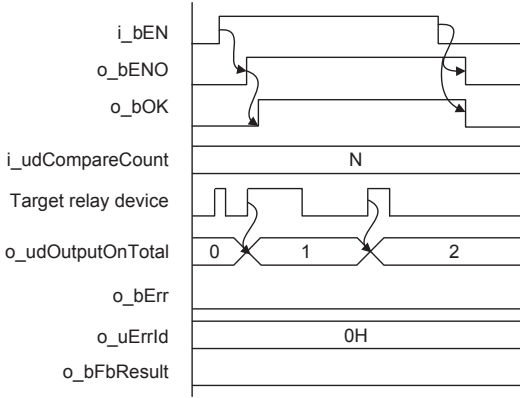
MELSEC iQ-F FX5UC User's Manual (Hardware).

Output label

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_udOutputOnTotal	Integration value of number of relay ON times	Double Word [Unsigned]	0	Stores the counted integration value of the number of times the specified relay device number has turned ON.*1
(7)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the FB is counting the relay ON times.
(8)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.
(10)	o_bFbResult	Comparison operation result	Bit	OFF*1	When this label is ON, it indicates that o_udOutputOnTotal (Integration value of number of relay ON times) is larger than i_udCompareCount (Number of comparisons).

*1 Note that if o_udOutputOnTotal (Integration value of number of relay ON times) exceeds "4294967295", the integration value returns to 0, and o_bFbResult (Comparison operation result) turns ON→OFF.

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU
	Engineering tool GX Works3 Version 1.007H or later
Language	Ladder diagram
Number of basic steps	118 steps The number of steps of the FB in a program depends on the CPU module used and input and output definition.
Processing	<ul style="list-style-type: none"> This FB outputs the integration value of the number of output ON times of the relay specified by i_uRaNo (Target relay device number) in the module specified by i_stModule (Module label) to o_udOutputOnTotal (Integration value of number of relay ON times) when i_bEN (Execution command) turns ON. If o_udOutputOnTotal (Integration value of number of relay ON times) exceeds the value set by i_udCompareCount (Number of comparisons), o_bFbResult (Comparison operation result) turns ON. If the setting value of i_uRaNo (Target relay device number) is out of the setting range, o_bErr (Error completion) turns ON and the processing of this FB is aborted. o_uErrId (Error code) stores the error code "100 (hexadecimal)". For the error code, refer to  Page 8 Error code.
FB compilation method	Macro type
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully] (In the case of "o_udOutputOnTotal (Integration value of number of relay ON times) ≤ i_udCompareCount (Number of comparisons)")</p> 

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully] (In the case of "o_udOutputOnTotal (Integration value of number of relay ON times) > i_udCompareCount (Number of comparisons)")</p> <p>[When the operation is completed with an error] (When the target relay device number is outside the setting range)</p>
Restrictions or precautions	<ul style="list-style-type: none"> • 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). • When this FB is used twice or more, precaution must be taken to avoid duplication of the relay device number. • This FB uses the index register Z9. When using an interrupt program, do not use this index register in the interrupt program. • Every input must be provided with a value for proper FB operation. • When clearing current value of o_udOutputOnTotal (Integration value of No. of relay ON times), write K0 to "Instance name .o_udOutputOnTotal (Integration value of No. of relay ON times)" by DMOV instruction. • Because the target relay device is counted in the ladder, normal counting is disabled if the target relay device is turned ON and OFF twice or more in 1 scan. • This FB uses the latch label. If the latch label area capacity is insufficient for the contents of the program, a message is displayed in GX Works3 while the program is converted. In such a case, correct the program in accordance with the contents of the message. • Set the module parameters in GX Works3 in accordance with the connected equipment and system. For the module parameters, refer to the MELSEC iQ-F FX5 User's Manual (Application).

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uRaNo (Target relay device number) is out of the range. The target relay device number is not within the range of 0 to the value in Y device size.	Try again after checking the setting.

3 POSITIONING FB

3.1 M+FX5UCPU-Positioning_ABRST

Name

M+FX5UCPU-Positioning_ABRST

Overview

Item	Description																																																												
Overview	This FB reads the absolute position (ABS) data from the servo amplifier, and writes the read value to the current address (pulse unit) of the target axis.																																																												
Symbol	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="text-align: center; margin: 0;">M+FX5UCPU-Positioning_ABRST</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: right;">(1)</td> <td style="width: 40%;">B : i_bEN</td> <td style="width: 40%;"></td> <td style="width: 10%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bENO : B</td> <td style="text-align: right;">(7)</td> </tr> <tr> <td>(2)</td> <td>DUT: i_stModule</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bOK : B</td> <td style="text-align: right;">(8)</td> </tr> <tr> <td>(3)</td> <td>UW : i_uAxis</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bServoON : B</td> <td style="text-align: right;">(9)</td> </tr> <tr> <td>(4)</td> <td>B : i_bAbsBit0</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bAbsTrMode : B</td> <td style="text-align: right;">(10)</td> </tr> <tr> <td>(5)</td> <td>B : i_bAbsBit1</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bAbsReq : B</td> <td style="text-align: right;">(11)</td> </tr> <tr> <td>(6)</td> <td>B : i_bTrDataComp</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bAbsNG : B</td> <td style="text-align: right;">(12)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_uAbsErrId : UW</td> <td style="text-align: right;">(13)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bErr : B</td> <td style="text-align: right;">(14)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_uErrId : UW</td> <td style="text-align: right;">(15)</td> </tr> </table> </div>	(1)	B : i_bEN					o_bENO : B	(7)	(2)	DUT: i_stModule					o_bOK : B	(8)	(3)	UW : i_uAxis					o_bServoON : B	(9)	(4)	B : i_bAbsBit0					o_bAbsTrMode : B	(10)	(5)	B : i_bAbsBit1					o_bAbsReq : B	(11)	(6)	B : i_bTrDataComp					o_bAbsNG : B	(12)			o_uAbsErrId : UW	(13)			o_bErr : B	(14)			o_uErrId : UW	(15)
(1)	B : i_bEN																																																												
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		o_uErrId : UW	(15)																																																										

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	The setting range differs depending on the module label.	Specify the module label of the CPU module.
(3)	i_uAxis	Target axis	Word [Unsigned]	1 to 12 ^{*1}	Specify the axis number.
(4)	i_bAbsBit0	ABS data bit 0	Bit	ON, OFF	The lower bit of the data received from the servo amplifier.
(5)	i_bAbsBit1	ABS data bit 1	Bit	ON, OFF	The upper bit of the data received from the servo amplifier.
(6)	i_bTrDataComp	ABS transmission data ready	Bit	ON: Ready OFF: In preparation	The ready signal from the servo amplifier.

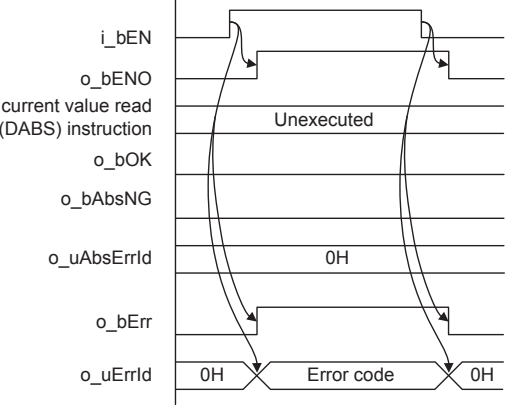
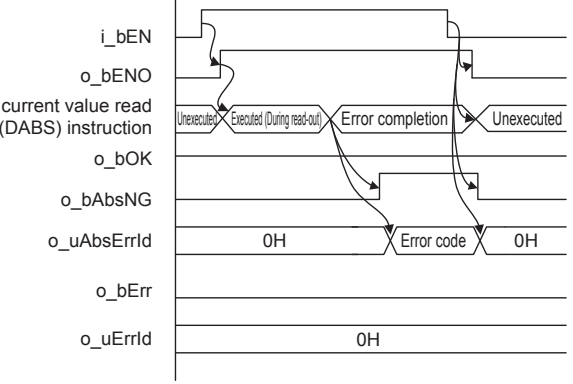
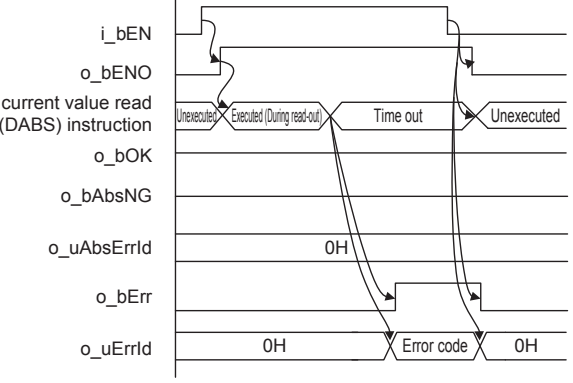
*1 The target axis can be set from axis 1 to axis 4 for the built-in input/output in a CPU module and from axis 5 to axis 12 for the high-speed pulse input/output module.

Output label

No.	Variable name	Name	Data type	Default value	Description
(7)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(8)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that absolute position restoration (ABS current value read) is completed.
(9)	o_bServoON	Servo ON signal	Bit	OFF	Servo ON signal is on while this label is on.
(10)	o_bAbsTrMode	ABS transmission mode	Bit	OFF	The servo amplifier is in the ABS transmission mode while this label is on.
(11)	o_bAbsReq	ABS request flag	Bit	OFF	The ABS data is requested while this label is on.
(12)	o_bAbsNG	ABS error	Bit	OFF	When this label is on, it indicates that the absolute position restoration has been completed with an error.
(13)	o_uAbsErrId	ABS error code	Word [Unsigned]	0	Stores the error code of the ABS current value read (DABS) instruction.
(14)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(15)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU Engineering tool GX Works3 Version 1.007H or later
Language	Ladder diagram
Number of basic steps	240 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to GX Works3 Operating Manual .
Processing	<ul style="list-style-type: none"> By turning on i_bEN (Execution command), the absolute position is restored. When the absolute position restoration (ABS current value read) is completed with an error, o_bAbsNG (ABS error) turns ON and an error code is stored in o_uAbsErrId (ABS error code). For the error codes, refer to MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module). If the set value of the target axis is outside the setting range, o_bErr (Error completion) turns ON and the processing of this FB is aborted. In addition, the error code 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 12 Error code. If absolute position restoration (ABS current value read) is not completed in 6 seconds, o_bErr (Error completion) turns ON and the processing of this FB is aborted. In addition, the error code 200 (hexadecimal) is stored in o_uErrId (Error code). For error codes, refer to Page 12 Error code.
FB compilation method	Macro type
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p> <p>The timing chart illustrates the following sequence of events:</p> <ul style="list-style-type: none"> i_bEN (Execution command) transitions from OFF to ON, initiating the process. o_bENO (Execution status) transitions from OFF to ON, indicating that the execution command is active. The ABS current value read (DABS) instruction is executed. The execution period is divided into three phases: <i>Unexecuted</i>, <i>Executed (During read-out)</i>, and <i>Read complete</i>. Upon completion of the read-out phase, o_bOK (Normal completion) transitions from OFF to ON. o_bAbsNG (ABS error) remains OFF throughout the process. o_uAbsErrId (ABS error code) is set to 0H. o_bErr (Error completion) remains OFF. o_uErrId (Error code) is set to 0H.

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed with an error] (Out of the target axis setting range)</p>  <p>[When the operation is completed with an error] (When the ABS current value read (DABS) instruction completes with an error)</p>  <p>[When the operation is completed with an error] (When the ABS current value read (DABS) instruction times out)</p> 

Item	Description
Restrictions or precautions	<ul style="list-style-type: none"> This FB does not include the error recovery processing. Program the error recovery processing separately in accordance with the required system operation. This FB uses the ABS current value read (DABS) instruction. Executing this instruction 17 or more times at the same time will cause an error. When using an interrupt program, use the DI/EI instruction before and after executing this FB so that this FB is executed in the interrupt disabled status. This FB cannot be used in interrupt programs. 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). When this FB is used twice or more, precaution must be taken to avoid duplication of the target axis. Every input must be provided with a value for proper FB operation. When this FB is used, i_bEN (Execution command) must remain ON even after absolute position restoration (ABS current value reading) is completed. Do not turn OFF i_bEN (Execution command) during absolute position restoration (ABS current value reading). If i_bEN (Execution command) is turned OFF before absolute position restoration (ABS current value read) is completed, reset the CPU module and servo amplifier, and then turn OFF and ON i_bEN (Execution command) again. The number of available axes varies depending on the setting of the pulse output mode. Select a proper axis in accordance with the system. When the servo ON signal is required in the first zero point detection, create a program that sets and resets the output connected to the servo ON signal (o_ServoON) of this FB. Set the pulse output mode, external I/O signal logic, etc. in accordance with the connected equipment and system. Set the module parameters in GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module).

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uAxis (Target axis) is outside the setting range. The target axis is set to a value outside the range from 1 to 12.	Try again after checking the setting.
200H	Absolute position restoration (ABS current value read) was not completed in 6 seconds (timeout).	Review the system configuration, servo amplifier parameters and wiring, and then execute the FB again.

Version upgrade history

Version	Date	Description
00A	January 2015	First edition
01A	July 2015	Some of the label names and data type for the module label used in the FB program were changed.*1
02A	May 2016	The target axis was changed to a value from 1 to 12.

*1 The label name for the following module label and data type used in the FB program were changed. As needed, delete the module label (structured data types) used in the GX Works3 project, and add (import) it again, and then replace with the latest version of the FB in the program. (Does not replace automatically.)

		Before the change	After the change
Positioning current address (user unit)	Label name	udCurrentAddressU	dCurrentAddressU
	Data type	Double Word [Unsigned]	Double Word [Signed]
Positioning current address (pulse unit)	Label name	udCurrentAddressP	dCurrentAddressP
	Data type	Double Word [Unsigned]	Double Word [Signed]
Positioning zero-point address	Label name	udZeroPointAddress	dZeroPointAddress
	Data type	Double Word [Unsigned]	Double Word [Signed]

3.2 M+FX5UCPU-Positioning_StartPositioning

Name

M+FX5UCPU-Positioning_StartPositioning

Overview

Item	Description																																				
Overview	This FB uses the table data set using the module parameters to activate the positioning operation.																																				
Symbol	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">M+FX5UCPU-Positioning_StartPositioning</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: right;">(1)</td> <td style="width: 45%;">B : i_bEN</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 5%; text-align: left;">(5)</td> </tr> <tr> <td style="text-align: right;">(2)</td> <td>DUT: i_stModule</td> <td></td> <td style="text-align: right;">o_bOK : B</td> <td></td> <td style="text-align: left;">(6)</td> </tr> <tr> <td style="text-align: right;">(3)</td> <td>UW : i_uAxis</td> <td></td> <td style="text-align: right;">o_bErr : B</td> <td></td> <td style="text-align: left;">(7)</td> </tr> <tr> <td style="text-align: right;">(4)</td> <td>UW : i_uStartNo</td> <td></td> <td style="text-align: right;">o_uErrId : UW</td> <td></td> <td style="text-align: left;">(8)</td> </tr> <tr> <td></td> <td>(9) pbi_uEndNo</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>(10) pbi_bTableExeMethod</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </div>	(1)	B : i_bEN				(5)	(2)	DUT: i_stModule		o_bOK : B		(6)	(3)	UW : i_uAxis		o_bErr : B		(7)	(4)	UW : i_uStartNo		o_uErrId : UW		(8)		(9) pbi_uEndNo						(10) pbi_bTableExeMethod				
(1)	B : i_bEN				(5)																																
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(4)	UW : i_uStartNo		o_uErrId : UW		(8)																																
	(9) pbi_uEndNo																																				
	(10) pbi_bTableExeMethod																																				

Labels

■Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	The setting range differs depending on the module label.	Specify the module label of the CPU module.
(3)	i_uAxis	Target axis	Word [Unsigned]	1 to 12 ^{*1}	Specify the axis number.
(4)	i_uStartNo	Positioning activation number	Word [Unsigned]	1 to 100 ^{*2}	Specify the table data to begin activation.

*1 The target axis can be set from axis 1 to axis 4 for the built-in input/output in a CPU module and from axis 5 to axis 12 for the high-speed pulse input/output module.

*2 If the table data is not set to use device by parameter, the range for the built-in input/output in a CPU module will be a value from 1 to 32. (The range for the high-speed pulse input/output module is fixed to a value from 1 to 100.)

■Output label

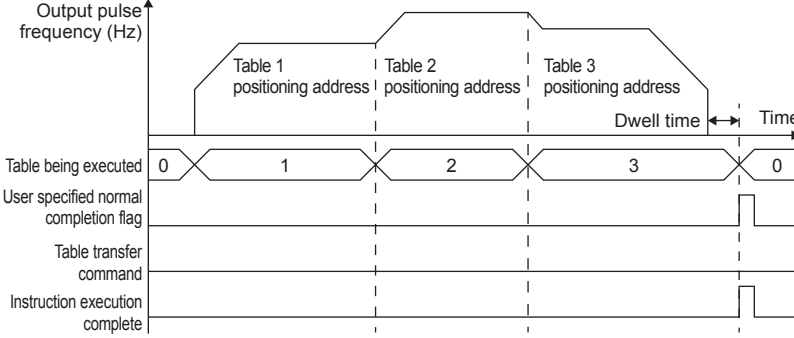
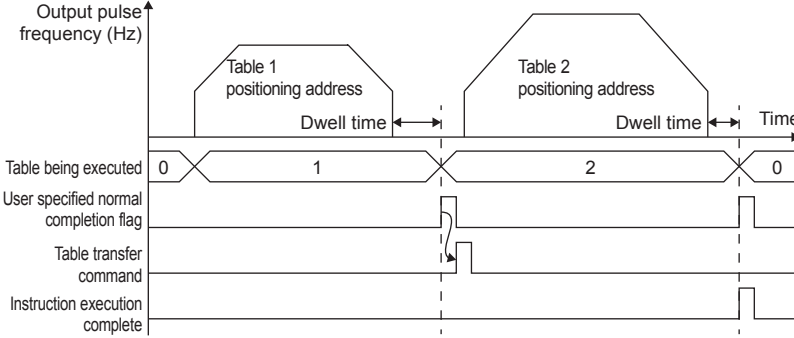
No.	Variable name	Name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(6)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the positioning operation has been completed.
(7)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(8)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.

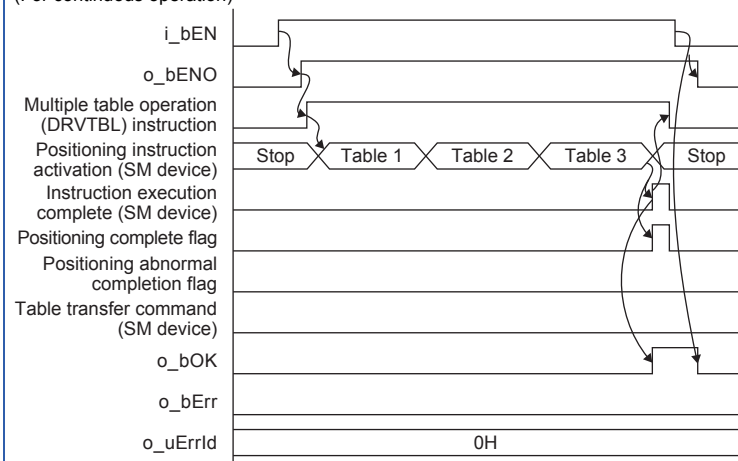
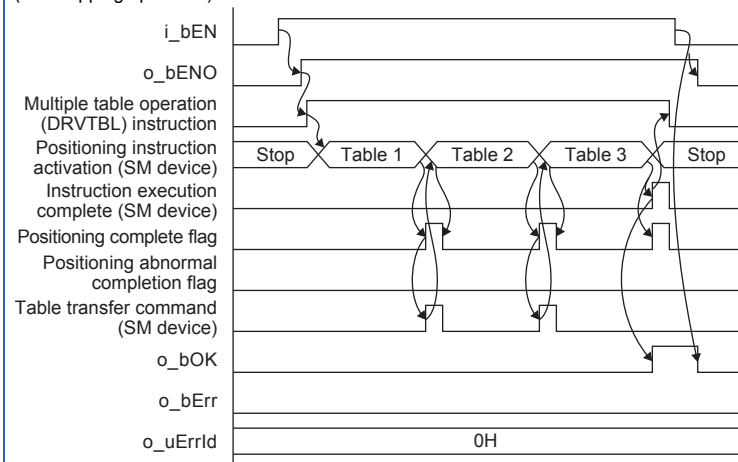
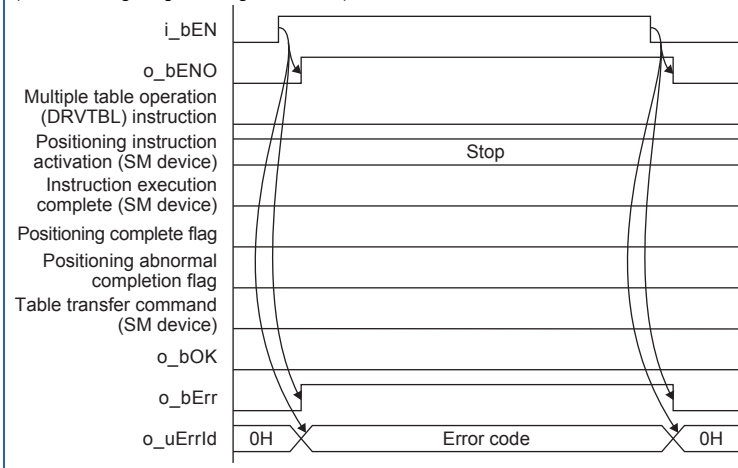
■Public label

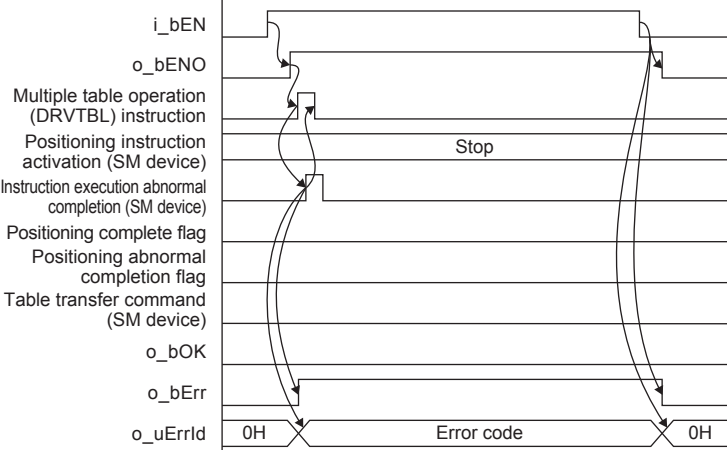
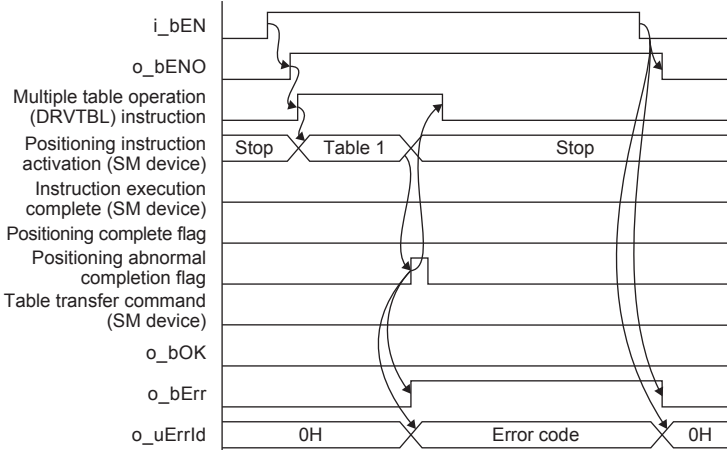
No.	Variable name	Name	Data type	Range	Description
(9)	pbi_uEndNo	Last table number	Word [Unsigned]	1 to 100 ^{*1}	Specify the table data to stop activation.
(10)	pbi_bTableExeMethod	Table execution method	Bit	ON, OFF	ON: Continuous operation is executed. OFF: Stepping operation is executed.

*1 If the table data is not set to use device by parameter, the range for the built-in input/output in a CPU module will be a value from 1 to 32. (The range for the high-speed pulse input/output module is fixed to a value from 1 to 100.)

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU
	Engineering tool GX Works3 Version 1.025B or later
Language	Ladder diagram
Number of basic steps	187 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to GX Works3 Operating Manual .
Processing	<ul style="list-style-type: none"> Activates from the table data specified by i_uStartNo (Positioning activation number) using the multiple table operation (DRVTL) instruction, by turning i_bEN (Execution command) on. If pbi_bTableExeMethod (Table execution method) is on, continuous operation of the multiple table operation (DRVTL) instruction is performed.  <ul style="list-style-type: none"> If pbi_bTableExeMethod (Table execution method) is off, stepping operation of the multiple table operation (DRVTL) instruction is performed together with an added function for automatic table transfer.  <ul style="list-style-type: none"> If the set value of the target axis is outside the setting range, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 17 Error code. If the set value of the positioning activation number is outside the setting range, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code 101 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 17 Error code. If positioning has been activated for the target axis, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code 201 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 17 Error code. If an error occurs when positioning is activated or has been activated, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code is stored in o_uErrId (Error code). For the error codes, refer to MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module).
FB compilation method	Macro type
FB operation	Pulsed execution (multiple scan execution type)

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully] (For continuous operation)</p>  <p>The diagram shows a sequence of three tables (Table 1, Table 2, Table 3) separated by 'Stop' periods. The 'i_bEN' signal is active during each table. The 'o_bENO' signal is active during the 'Stop' periods. The 'DRVTBL instruction' signal is active during each table. The 'Positioning instruction activation (SM device)' signal is active during each table. The 'Instruction execution complete (SM device)' signal is active at the end of each table. The 'Positioning complete flag' signal is active at the end of each table. The 'Positioning abnormal completion flag' signal is active during the 'Stop' periods. The 'Table transfer command (SM device)' signal is active during the 'Stop' periods. The 'o_bOK' signal is active at the end of each table. The 'o_bErr' signal is active during the 'Stop' periods. The 'o_uErrId' signal is active during the 'Stop' periods and contains the value '0H'.</p>
	<p>[When the operation is completed successfully] (For stepping operation)</p>  <p>The diagram shows a sequence of three tables (Table 1, Table 2, Table 3) separated by 'Stop' periods. The 'i_bEN' signal is active during each table. The 'o_bENO' signal is active during the 'Stop' periods. The 'DRVTBL instruction' signal is active during each table. The 'Positioning instruction activation (SM device)' signal is active during each table. The 'Instruction execution complete (SM device)' signal is active at the end of each table. The 'Positioning complete flag' signal is active at the end of each table. The 'Positioning abnormal completion flag' signal is active during the 'Stop' periods. The 'Table transfer command (SM device)' signal is active during the 'Stop' periods. The 'o_bOK' signal is active at the end of each table. The 'o_bErr' signal is active during the 'Stop' periods. The 'o_uErrId' signal is active during the 'Stop' periods and contains the value '0H'.</p>
	<p>[When the operation is completed with an error] (Out of setting range for target axis, etc.)</p>  <p>The diagram shows a single 'Stop' period. The 'i_bEN' signal is active during the 'Stop' period. The 'o_bENO' signal is active during the 'Stop' period. The 'DRVTBL instruction' signal is active during the 'Stop' period. The 'Positioning instruction activation (SM device)' signal is active during the 'Stop' period. The 'Instruction execution complete (SM device)' signal is active at the end of the 'Stop' period. The 'Positioning complete flag' signal is active at the end of the 'Stop' period. The 'Positioning abnormal completion flag' signal is active during the 'Stop' period. The 'Table transfer command (SM device)' signal is active during the 'Stop' period. The 'o_bOK' signal is active at the end of the 'Stop' period. The 'o_bErr' signal is active during the 'Stop' period. The 'o_uErrId' signal is active during the 'Stop' period and contains an 'Error code'.</p>

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed with an error] (Multiple table operation (DRVTBL) instruction completes abnormally)</p>  <p>[When the operation is completed with an error] (Positioning completes abnormally)</p> 
Restrictions or precautions	<ul style="list-style-type: none"> • This FB does not include error recovery processing. Program error recovery processing separately in accordance with the system or required behavior. • Configure appropriate set values for the i_uStartNo (positioning activation number) and pbi_uEndNo (last table number) according to the parameter settings. • Use a user program when the table shift command is controlled by the user in the stepping operation of the DRVTBL instruction. • When the same axis number is used both inside and outside this FB, precautions must be taken in regards to duplicate coils in the table transfer command. It is recommended to use the SET/RST instruction to control the table transfer command. • In the parameter setting, set the external start signal "enable/disable" to "disable". • To control the system, input the required signal to the input terminal by the set control method or use a user program. For the required signals, refer to the MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module). • Turn i_bEN (Execution command) off after o_bOK (Normal completion) or o_bErr (Error completion) is turned on. If i_bEN (Execution command) is turned off when positioning has been activated, it will decelerate and stop. • This FB cannot be used in interrupt programs. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned off and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) off. • When this FB is used twice or more, precaution must be taken to avoid duplicating the target axis. • Every input must be provided with a value for proper FB operation. • The number of available axes varies depending on the setting of the pulse output mode. Select a proper target axis in accordance with the system. • The pulse output mode, external I/O signal logic, etc. must be set in accordance with the connected equipment and system. Set the module parameters for GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module).

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 12.	Try again after checking the setting.
200H	The set value of i_uStartNo (Cd.3: Positioning start No.) is out of range. The positioning start No. is not within the range of 1 to 100.	Review the system configuration, servo amplifier parameters and wiring, and then execute the FB again.
201H	Positioning has been activated for the target axis.	Try executing the FB again after stopping activation of the target axis.
Positioning error code	This is the same as the error code that occurs in the multiple table operation (DRVTBL) instruction.	Refer to the MELSEC iQ-F FX5 User's Manual (Positioning Control - CPU module built-in, High-speed pulse input/output module).
Self-diagnostics error	This may occur in the multiple table operation (DRVTBL) instruction.*1	Refer to the MELSEC iQ-F FX5 User's Manual (Application).

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

4 SERIAL COMMUNICATION FB

4.1 M+FX5UCPU-SerialComm_InputOutput

Name

M+FX5UCPU-SerialComm_InputOutput

Overview

Item	Description																																																												
Overview	This FB sends the specified number of data points using the non-protocol in serial communication.																																																												
Symbol	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">M+FX5UCPU-SerialComm_InputOutput</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: right;">(1)</td> <td style="width: 40%;">B : i_bEN</td> <td style="width: 40%;"></td> <td style="width: 10%; text-align: left;">(8)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bENO : B</td> <td></td> </tr> <tr> <td>(2)</td> <td>DUT: i_stModule</td> <td></td> <td style="text-align: left;">(9)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bSendComp : B</td> <td></td> </tr> <tr> <td>(3)</td> <td>UW : i_uCh</td> <td></td> <td style="text-align: left;">(10)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bRecvComp : B</td> <td></td> </tr> <tr> <td>(4)</td> <td>UW : i_uSendDataLength</td> <td></td> <td style="text-align: left;">(11)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_bErr : B</td> <td></td> </tr> <tr> <td>(5)</td> <td>UW : i_uSendData</td> <td></td> <td style="text-align: left;">(12)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_uErrId : UW</td> <td></td> </tr> <tr> <td>(6)</td> <td>B : i_bSendReq</td> <td></td> <td style="text-align: left;">(13)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_uRecvDataLength : UW</td> <td></td> </tr> <tr> <td>(7)</td> <td>UW : i_uMaxRecvData</td> <td></td> <td style="text-align: left;">(14)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">o_uRecvData : UW</td> <td></td> </tr> <tr> <td colspan="4" style="text-align: center; padding-top: 10px;">(15) pb_bSerialComErrUndetection</td> </tr> </table> </div>	(1)	B : i_bEN		(8)			o_bENO : B		(2)	DUT: i_stModule		(9)			o_bSendComp : B		(3)	UW : i_uCh		(10)			o_bRecvComp : B		(4)	UW : i_uSendDataLength		(11)			o_bErr : B		(5)	UW : i_uSendData		(12)			o_uErrId : UW		(6)	B : i_bSendReq		(13)			o_uRecvDataLength : UW		(7)	UW : i_uMaxRecvData		(14)			o_uRecvData : UW		(15) pb_bSerialComErrUndetection			
(1)	B : i_bEN		(8)																																																										
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		o_uRecvData : UW																																																											
(15) pb_bSerialComErrUndetection																																																													

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	—	Specify the module label of the CPU module.
(3)	i_uCh	Communication channel	Word [Unsigned]	1 to 4	Specify the send/receive channel number. FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set channel to one of ch1, ch3, ch4. <ul style="list-style-type: none"> • 1: Channel 1 (CH1 side) • 2: Channel 2 (CH2 side) • 3: Channel 3 (CH3 side) • 4: Channel 4 (CH4 side)
(4)	i_uSendDataLength	Number of send data points	Word [Unsigned]	0 to 4096	Specify the number of bytes of the send data.
(5)	i_uSendData	Send data storage device	Word [Unsigned]	Available devices: D, W, SD, SW and R	Specify the head address of the device which stores the send data.*1*2
(6)	i_bSendReq	Send request	Bit	ON, OFF	ON: Request data sending OFF: Not request data sending
(7)	i_uMaxRecvData	Allowable number of receive data points	Word [Unsigned]	0 to 4096	Specify the allowable number of bytes of receive data that can be stored in the receive data storage device.*1*2

*1 The data storage position in the word device varies depending on the 8-bit/16-bit mode setting.

*2 The number of required word devices varies depending on the 8-bit/16-bit mode setting.

Output label

No.	Variable name	Name	Data type	Default value	Description
(8)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(9)	o_bSendComp	Send completion	Bit	OFF	When this bit is ON, it indicates that data sending is completed.
(10)	o_bRecvComp	Receive completion	Bit	OFF	When this bit is ON, it indicates that data receiving is completed.
(11)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(12)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.
(13)	o_uRecvDataLength	Number of receive data points	Word [Unsigned]	0	Stores the number of bytes of data received.
(14)	o_uRecvData	Receive data storage device	Word [Unsigned]	0	Specify the head address of the device which stores the received data.*1*2

*1 The data storage position in the word device varies depending on the 8-bit/16-bit mode setting.

*2 The number of required word devices varies depending on the 8-bit/16-bit mode setting.



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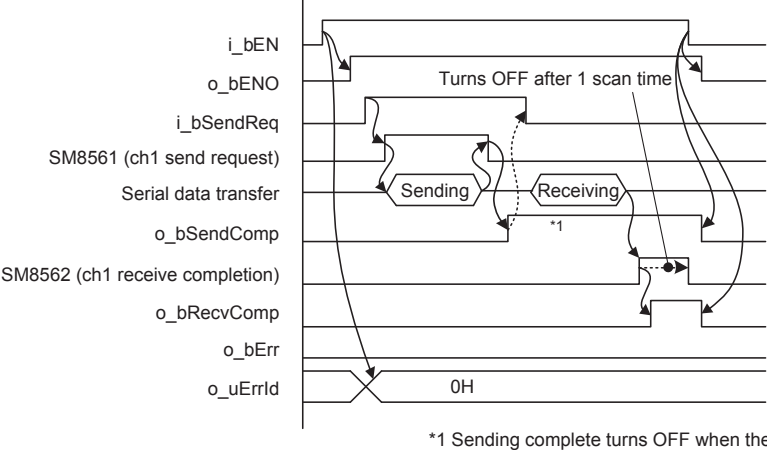
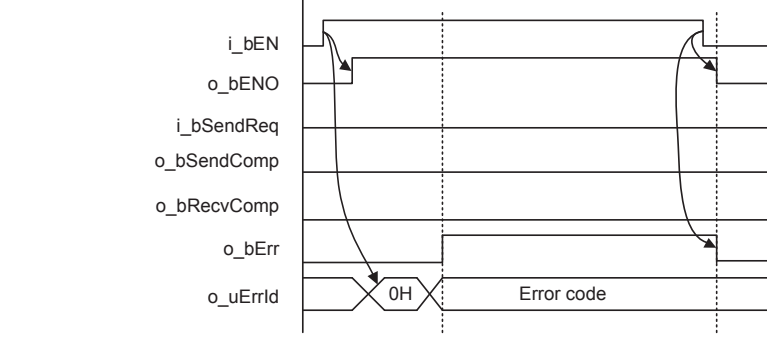
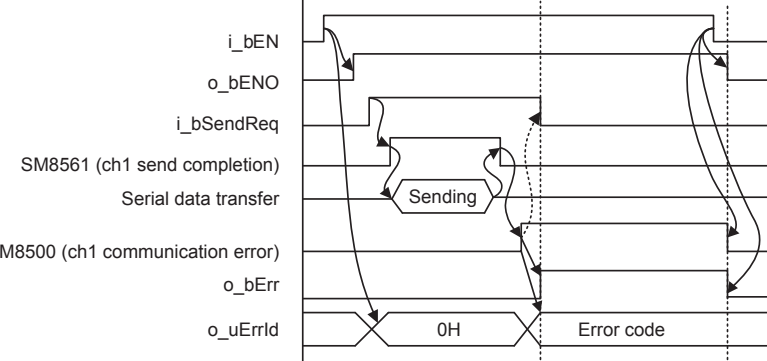
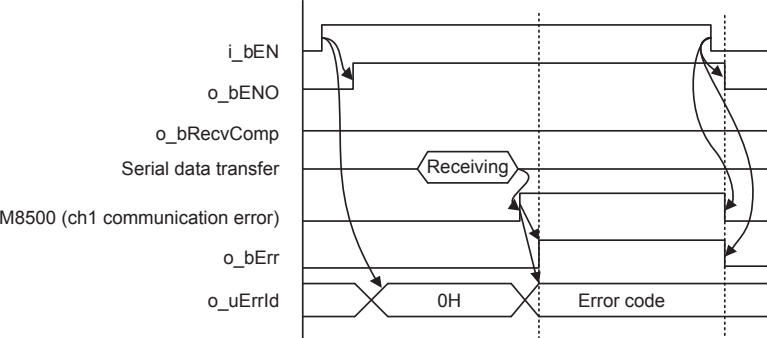
No.	Variable name	Name	Data type	Range	Description
(15)	pb_bSerialComErrUndetection	Serial communication error undetection mode	Bit	ON, OFF	ON: FB does not detect serial communication error.*1 OFF: FB detects serial communication error.

*1 Even if a serial communication error occurs in the used communication channel, error completion and error code are not output and the FB does not stop. Use a user program to detect the error. For serial communication error and serial communication error code, refer to the following manual.

 MELSEC iQ-F FX5 User's Manual (Serial Communication)

FB details

Item	Description				
Available device	<table border="1"> <tr> <td>CPU module</td> <td>FX5U CPU, FX5UC CPU</td> </tr> <tr> <td>Engineering tool</td> <td>GX Works3 Version 1.007H or later</td> </tr> </table>	CPU module	FX5U CPU, FX5UC CPU	Engineering tool	GX Works3 Version 1.007H or later
CPU module	FX5U CPU, FX5UC CPU				
Engineering tool	GX Works3 Version 1.007H or later				
Language	Ladder diagram				
Number of basic steps	<p>713 steps</p> <p>The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to  GX Works3 Operating Manual.</p>				
Processing	<ul style="list-style-type: none"> When i_bEN (Execution command) turns ON, serial data transfer goes into sending/receiving standby state. In data sending standby state, this FB sends the send data specified by i_uSendData (Send data storage device) and i_uSendDataLength (Number of send data points) using non-protocol triggered by the serial data transfer (RS2) instruction when i_bSendReq (Sending request) turns ON. When sending is completed, o_bSendComp (Sending complete) turns ON. In data receiving standby state, when the FB receives the data, the FB writes the number of the received data to o_uRecvDataLength (Number of receive data points), writes the received data to o_uRecvData (Receive data storage device) and then o_bRecvComp (Receiving complete) turns ON. This FB checks the following input values when started up. If an error occurs, o_bErr (Error completion) turns ON, and o_uErrId (Error code) stores the error code. <ul style="list-style-type: none"> (1) Send/receive channel number (2) Allowable number of receive data points (3) Number of send data points (Only when sending request) If an error occurs during data communication processing, o_bErr (Error completion) turns ON, and o_uErrId (Error code) stores the serial communication error code. For error codes, refer to  Page 21 Error code. When pb_bSerialComErrUndetection (Serial communication error undetection mode) is turned ON by a user program, this FB does not detect serial communication error. Detect serial communication error by a user program. When data receiving is suspended and the time-out time elapses, time-out occurs, and then o_bRecvComp (Receiving complete) turns ON. 				
FB compilation method	Macro type				
FB operation	Always executed				

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully] <ch1 example></p>  <p>[When the operation is completed with an error] FB error (When the send/receive channel number is outside the setting range)</p>  <p>[When the operation is completed with an error] Module error (Serial communication sending error) <ch1 example></p>  <p>[When the operation is completed with an error] Module error (Serial communication receiving error) <ch1 example></p> 

Item	Description
Restrictions or precautions	<ul style="list-style-type: none"> 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. This FB uses the serial communication (RS2) instruction. 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). When switching the "M+FX5UCPU-SerialComm_InputOutput" FB (this FB), "M+FX5UCPU-SerialComm_Input" FB, "M+FX5UCPU-SerialComm_Output" FB, and RS2 instruction using the same communication channel, turn OFF unused target FBs and RS2 instruction for at least 1 scan. This FB uses the index register Z9. When using an interrupt program, do not use this index register in the interrupt program. When using an interrupt program, use the DI/EI instruction before and after executing this FB so that this FB is executed in the interrupt disabled status. If executing this FB in the interrupt enabled status, a self-diagnosis error that occurs in an interrupt program is detected as an error that occurred in the FB. When keeping the sending/receiving standby state of serial data using this FB, it is necessary to let i_bEN (Execution command) remain ON even after sending and receiving are completed. Turn off i_bEN (Execution command) after o_bOK (Normal completion) or o_bErr (Error completion) is turned on. By turning off i_bEN (Execution command), o_bOK (Normal completion) and o_bErr (Error completion) are turned off. Receiving complete flag of the corresponding channel (SM8562, SM8572, SM8582, and SM8592) are reset after one operation cycle. Receive the data of o_uRecvDataLength (Number of receive data points) and o_uRecvData (Receive data storage device) within one operation cycle. Set the module parameters of the used communication channel in GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication). To validate the change of the setting value of allowable number of receive data, restart this FB. FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set channel to one of ch1, ch3, ch4. This FB does not support the SM/SD devices of FX3 series compatibility. When using this FB in communication channel ch1 or ch2, set the SM/SD devices of FX3 series compatibility of the module parameters of the used communication channel in GX Works3 to "Disable."

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uCh (communication channel) is outside the setting range. The target channel is set to a value outside the range from 1 to 4.	Try again after checking the setting.
101H	The set value of i_uMaxRecvData (Allowable number of receive data) is outside the setting range. The allowable number of receive data is set to a value outside the range from 0 to 4,096.	Try again after checking the setting.
102H	The set value of i_uSendDataLength (Send data length) is outside the setting range. The send data length is set to a value outside the range from 0 to 4,096.	Try again after checking the setting.
103H	The serial communication operation mode is set to an invalid mode. The serial communication operation mode is not set to "Non-protocol communication".	Try again after checking the setting.
Serial communication error	The contents are same as the error code that occurred in the serial communication (RS2) instruction.	Refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication).
Self-diagnostics error	This error may occur in the serial communication (RS2) instruction.*1	Refer to the MELSEC iQ-F FX5 User's Manual (Application).

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

4.2 M+FX5UCPU-SerialComm_Input

Name

M+FX5UCPU-SerialComm_Input

Overview

Item	Description
Overview	This FB stores the data received using the non-protocol in serial communication.
Symbol	

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	—	Specify the module label of the CPU module.
(3)	i_uCh	Receive channel	Word [Unsigned]	1 to 4	Set the channel that receives the data. FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set channel to one of ch1, ch3, ch4. • 1: Channel 1 (CH1 side) • 2: Channel 2 (CH2 side) • 3: Channel 3 (CH3 side) • 4: Channel 4 (CH4 side)
(4)	i_uMaxRecvData	Allowable number of receive data points	Word [Unsigned]	1 to 4096	Specify the allowable number of bytes of the receive data that can be stored in the receive data storage device.*1*2

*1 The data storage position in the word device varies depending on the 8-bit/16-bit mode setting.

*2 The number of required word devices varies depending on the 8-bit/16-bit mode setting.

Output label

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	When this bit is ON, it indicates that data receiving is completed normally.
(7)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(8)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code occurred in the FB.
(9)	o_uRecvDataLength	Number of receive data points	Word [Unsigned]	0	Stores the number of bytes which received the data.
(10)	o_uRecvData	Receive data storage device	Word [Unsigned]	0	Specify the head address of the device which stores the received data.*1*2

*1 The data storage position in the word device varies depending on the 8-bit/16-bit mode setting.

*2 The number of required word devices varies depending on the 8-bit/16-bit mode setting.

Public label

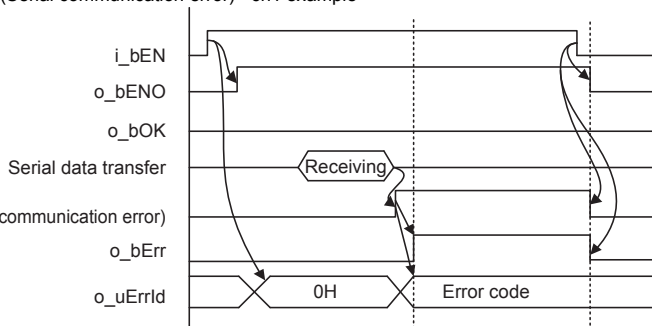
No.	Variable name	Name	Data type	Range	Description
(11)	pb_bSerialComErrUndetection	Serial communication error undetection mode	Bit	ON, OFF	ON: FB does not detect serial communication error.*1 OFF: FB detects serial communication error.

*1 Even if a serial communication error occurs in the used communication channel, error completion and error code are not output and the FB does not stop. Use a user program to detect the error. For serial communication error and serial communication error code, refer to the following manual.

📖 MELSEC iQ-F FX5 User's Manual (Serial Communication)

FB details

Item	Description				
Available device	<table border="1"> <tr> <td>CPU module</td> <td>FX5U CPU, FX5UC CPU</td> </tr> <tr> <td>Engineering tool</td> <td>GX Works3 Version 1.007H or later</td> </tr> </table>	CPU module	FX5U CPU, FX5UC CPU	Engineering tool	GX Works3 Version 1.007H or later
CPU module	FX5U CPU, FX5UC CPU				
Engineering tool	GX Works3 Version 1.007H or later				
Language	Ladder diagram				
Number of basic steps	496 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to 📖 GX Works3 Operating Manual.				
Processing	<ul style="list-style-type: none"> When i_bEN (Execution command) turns ON, serial data transfer goes into receiving standby state. In data receiving standby state, when the FB receives the data, the FB writes the number of received data to o_uRecvDataLength (Number of receive data points) and writes the received data to o_uRecvData (Receive data storage device). When receiving is completed, o_bRecvComp (Normal completion) turns ON. This FB checks the following input values when started up. If an error occurs, o_bErr (Error completion) turns ON, and o_uErrId (Error code) stores the error code. <ol style="list-style-type: none"> Receive channel number Allowable number of receive data points If an error occurs during the data communication processing, o_bErr (Error completion) turns ON, and the serial communication error code is stored to o_uErrId (Error code). For error codes, refer to 📖 Page 25 Error code. When pb_bSerialComErrUndetection (Serial communication error undetection mode) is turned ON by a user program, this FB does not detect serial communication error. Detect serial communication error by a user program. When data receiving is suspended and passes time-out time, time-out occurs, and then o_bRecvComp (Receiving complete) turns ON. 				
FB compilation method	Macro type				
FB operation	Pulsed execution (multiple scan execution type)				
Timing chart of I/O signals	<p>[When the operation is completed successfully] <ch1 example></p> <p>[When the operation is completed with an error] FB error (When the receive channel number is outside the setting range)</p>				

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed with an error] Module error (Serial communication error) <ch1 example></p> 
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • This FB uses the serial communication (RS2) instruction. • 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). • When switching the "M+FX5UCPU-SerialComm_InputOutput" FB, "M+FX5UCPU-SerialComm_Input" FB (this FB), "M+FX5UCPU-SerialComm_Output" FB, and RS2 instruction using the same communication channel, turn OFF unused target FBs and RS2 instruction for at least 1 scan. • This FB uses the index register Z9. When using an interrupt program, do not use this index register in the interrupt program. • When using an interrupt program, use the DI/EI instruction before and after executing this FB so that this FB is executed in the interrupt disabled status. If executing this FB in the interrupt enabled status, a self-diagnosis error that occurs in an interrupt program is detected as an error that occurred in the FB. • The following FB does not support full-duplex bi-directional communication, interlink mode, communication using control line. To perform full-duplex bi-directional communication, interlink mode, communication using control line, please use "M+FX5UCPU-SerialComm_InputOutput" FB. <ul style="list-style-type: none"> - M+FX5UCPU-SerialComm_Input (this FB) - M+FX5UCPU-SerialComm_Output • Turn off i_bEN (Execution command) after o_bOK (Normal completion) or o_bErr (Error completion) is turned on. By turning off i_bEN (Execution command), o_bOK (Normal completion) and o_bErr (Error completion) are turned off. • This FB can receive data only once. To receive the next data, restart the FB after the previous receiving is completed. • Receiving complete flag of the corresponding channel (SM8562, SM8572, SM8582, and SM8592) are reset after one operation cycle. Receive the data of o_uRecvDataLength (Number of receive data points) and o_uRecvData (Receive data storage device) within one operation cycle. • Set the module parameters of the used communication channel in GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication). • Restart this FB to allow changes to the number of allowable receive data points. • FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set a channel of one of ch1, ch3, ch4. • This FB does not support the SM/SD devices of FX3 series compatibility. When using this FB in communication channel ch1 or ch2, set the SM/SD devices of FX3 series compatibility of the module parameters of the used communication channel in GX Works3 to "Disable."

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uCh (Receive channel) is outside the setting range. The target channel is set to a value outside the range from 1 to 4.	Try again after checking the setting.
101H	The set value of i_uMaxRecvData (Allowable number of receive data) is outside the setting range. The allowable number of receive data is set to a value outside the range from 1 to 4,096.	Try again after checking the setting.
103H	The serial communication operation mode is set to an unavailable mode. The serial communication operation mode is not set to "Non-protocol communication".	Try again after checking the setting.
Serial communication error	The contents are same as the error code occurred in the serial communication (RS2) instruction.	Refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication) .
Self-diagnostics error	This error may occur in the serial communication (RS2) instruction. ^{*1}	Refer to the MELSEC iQ-F FX5 User's Manual (Application) .

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

4.3 M+FX5UCPU-SerialComm_Output

Name

M+FX5UCPU-SerialComm_Output

Overview

Item	Description
Overview	This FB sends the specified number of data points using the non-protocol in serial communication.
Symbol	<p>The symbol diagram for M+FX5UCPU-SerialComm_Output shows the following connections:</p> <ul style="list-style-type: none"> (1) B : i_bEN (Bit input) (2) DUT: i_stModule (Structure input) (3) UW : i_uCh (Word [Unsigned] input) (4) UW : i_uSendDataLength (Word [Unsigned] input) (5) UW : i_uSendData (Word [Unsigned] input) (6) o_bENO : B (Bit output) (7) o_bOK : B (Bit output) (8) o_bErr : B (Bit output) (9) o_uErrID : UW (Word [Unsigned] output) (10) pb_bSerialComErrUndetection (Bit output)

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	—	Specify the module label of the MELSEC iQ-F CPU module.
(3)	i_uCh	Send channel	Word [Unsigned]	1 to 4	Specify the send channel number. FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set channel to one of ch1, ch3, ch4. <ul style="list-style-type: none"> • 1: Channel 1 (CH1 side) • 2: Channel 2 (CH2 side) • 3: Channel 3 (CH3 side) • 4: Channel 4 (CH4 side)
(4)	i_uSendDataLength	Number of send data points	Word [Unsigned]	1 to 4096	Specify the number of bytes of the send data.
(5)	i_uSendData	Send data storage device	Word [Unsigned]	Available devices: D, W, SD, SW and R	Specify the head address of the device which stores the send data. *1*2

*1 The data storage position in the word device varies depending on the 8-bit/16-bit mode setting.

*2 The number of required word devices varies depending on the 8-bit/16-bit mode setting.

Output label

No.	Variable name	Name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this bit is ON, it indicates that data sending is completed normally.
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code occurred in the FB.

Public label

No.	Variable name	Name	Data type	Range	Description
(10)	pb_bSerialComErrUndetection	Serial communication error undetection mode	Bit	ON, OFF	ON: FB does not detect serial communication error.*1 OFF: FB detects serial communication error.

*1 Even if a serial communication error occurs in the used communication channel, error completion and error code are not output and the FB does not stop. Use a user program to detect the error. For serial communication error and serial communication error code, refer to the following manual.

📖 MELSEC iQ-F FX5 User's Manual (Serial Communication)

FB details

Item	Description				
Available device	<table border="1"> <tr> <td>CPU module</td> <td>FX5U CPU, FX5UC CPU</td> </tr> <tr> <td>Engineering tool</td> <td>GX Works3 Version 1.007H or later</td> </tr> </table>	CPU module	FX5U CPU, FX5UC CPU	Engineering tool	GX Works3 Version 1.007H or later
CPU module	FX5U CPU, FX5UC CPU				
Engineering tool	GX Works3 Version 1.007H or later				
Language	Ladder diagram				
Number of basic steps	508 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to 📖 GX Works3 Operating Manual.				
Processing	<ul style="list-style-type: none"> This FB sends the data specified by i_uSendData (Send data storage device) and i_uSendDataLength (Number of send data points) using the non-procedural protocol triggered by the serial data transfer (RS2) instruction when i_bEN (Execution command) turns ON. When sending is completed, o_bOK (Normal completion) turns ON. This FB checks the following input values when started up. If an error occurs, o_bErr (Error completion) turns ON, and o_uErrId (Error code) stores the error code. <p>(1) Send channel number (2) Number of send data points</p> <ul style="list-style-type: none"> If an error occurs during the data communication processing, o_bErr (Error completion) turns ON, and the serial communication error code is stored to o_uErrId (Error code). For the error code, refer to 📖 Page 28 Error code. When pb_bSerialComErrUndetection (Serial communication error undetection mode) is turned ON by a user program, this FB does not detect serial communication error. Detect serial communication error by a user program. 				
FB compilation method	Macro type				
FB operation	Pulsed execution (multiple scan execution type)				
Timing chart of I/O signals	<p>[When the operation is completed successfully] <ch1 example></p> <p>[When the operation is completed with an error] FB error (When the send channel number is outside the setting range)</p>				

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed with an error] Module error (Serial communication error) <ch1 example></p>

Restrictions or precautions	<ul style="list-style-type: none"> • 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. • This FB uses the serial communication (RS2) instruction. • 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). • When switching the "M+FX5UCPU-SerialComm_InputOutput" FB, "M+FX5UCPU-SerialComm_Input" FB, "M+FX5UCPU-SerialComm_Output" FB (this FB), and RS2 instruction using a same communication channel, turn OFF unused target FBs and RS2 instruction for at least 1 scan. • This FB uses the index register Z9. When using an interrupt program, do not use this index register in the interrupt program. • When using an interrupt program, use the DI/EI instruction before and after executing this FB so that this FB is executed in the interrupt disabled status. If executing this FB in the interrupt enabled status, a self-diagnosis error that occurs in an interrupt program is detected as an error that occurred in the FB. • The following FB does not support full-duplex bi-directional communication, interlink mode, communication using control line. To perform full-duplex bi-directional communication, interlink mode, communication using control line, please use "M+FX5UCPU-SerialComm_InputOutput" FB. <ul style="list-style-type: none"> - M+FX5UCPU-SerialComm_Input - M+FX5UCPU-SerialComm_Output (this FB) • Turn off i_bEN (Execution command) after o_bOK (Normal completion) or o_bErr (Error completion) is turned on. By turning off i_bEN (Execution command), o_bOK (Normal completion) and o_bErr (Error completion) are turned off. • Set the module parameters of the used communication channel in GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication). • FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set a channel of one of ch1, ch3, ch4. • This FB does not support the SM/SD devices of FX3 series compatibility. When using this FB in communication channel ch1 or ch2, set the SM/SD devices of FX3 series compatibility of the module parameters of the used communication channel in GX Works3 to "Disable."
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Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uCh (Send channel) is outside the setting range. The target channel is set to a value outside the range from 1 to 4.	Try again after checking the setting.
102H	The set value of i_uSendDataLength (Send data length) is outside the setting range. The send data length is set to a value outside the range from 1 to 4,096.	Try again after checking the setting.
103H	The serial communication operation mode is set to an unavailable mode. The serial communication operation mode is not set to "Non-protocol communication".	Try again after checking the setting.
Serial communication error	The contents are same as the error code occurred in the serial communication (RS2) instruction.	Refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication)
Self-diagnostics error	This error may occur in the serial communication (RS2) instruction.*1	Refer to the MELSEC iQ-F FX5 User's Manual (Application)

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

4.4 M+FX5UCPU-SerialComm_ExecCommonProtocol

Name

M+FX5UCPU-SerialComm_ExecCommonProtocol

Overview

Item	Description
Overview	This FB executes the protocol registered with GX Works3.
Symbol	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p style="text-align: center;">M+FX5UCPU-SerialComm_ExecCommonProtocol</p> <p>(1) B : i_bEN o_bENO : B (6)</p> <p>(2) DUT : i_stModule o_bOK : B (7)</p> <p>(3) UW : i_uCh o_bErr : B (8)</p> <p>(4) UW : i_uNumberOfExecutions o_uErrId : UW (9)</p> <p>(5) UW : i_uExeProtocolNo o_uNumberOfExecutions : UW (10)</p> <p style="text-align: center;">o_uMatchPacketNo : UW (11)</p> <p style="text-align: center;">(12) pb_bSerialComErrUndetection</p> </div>

4

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	—	Specify the module label of the CPU module.
(3)	i_uCh	Communication channel	Word [Unsigned]	1 to 4	Specify the communication channel number. FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set channel to one of ch1, ch3, ch4. <ul style="list-style-type: none"> • 1: Channel 1 (CH1 side) • 2: Channel 2 (CH2 side) • 3: Channel 3 (CH3 side) • 4: Channel 4 (CH4 side)
(4)	i_uNumberOfExecutions	Number of consecutive protocol executions	Word [Unsigned]	1 to 8	Specify number of continuous executions of the protocol.
(5)	i_uExeProtocolNo	Execution protocol number	Word [Unsigned] (0..7)	1 to 64	Specify the protocol number to be executed. Protocols are executed in the specified order of the execution protocol numbers. 1st word: Execution protocol number 1 : 8th word: Execution protocol number 8 When it is specified using a label, use "ARRAY" for the data type.

■Output label

No.	Variable name	Name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this bit is ON, it indicates that data communication is completed normally.
(8)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.
(10)	o_uNumberOfExecutions	Number of protocol executions	Word [Unsigned]	0	The number of protocol executions is stored. The protocol in which an error has occurred is included in the number of executions. If the setting data and the setting details of the control data are incorrect, 0 is stored.
(11)	o_uMatchPacketNo	Matched receive packet number	Word [Unsigned] (0..7)	0	1st word: Matched receive packet No. 1 : 8th word: Matched receive packet No. 8 A value is stored in the area corresponding to the execution protocol number. When the communication type of the executed protocol is "Send only" or "Send and receive", the receive packet number that matches with the executed protocol, is stored. In the following cases, 0 is stored. <ul style="list-style-type: none"> • When the communication type is "Receive only" • When an error occurs in the executed protocol • The area is greater than or equal to the number of protocol executions When it is specified using a label, use "ARRAY" for the data type.

■Public label

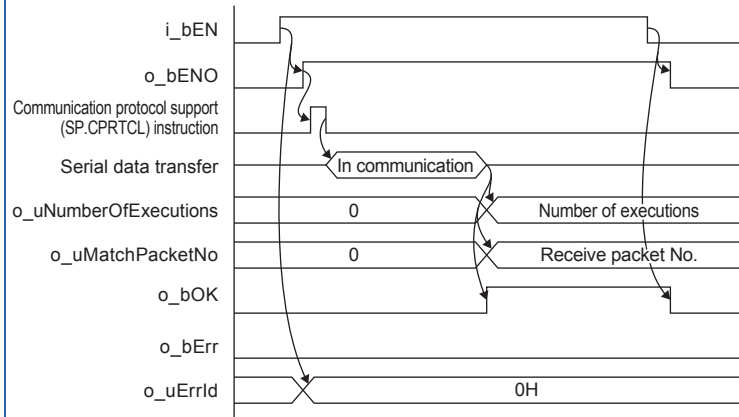
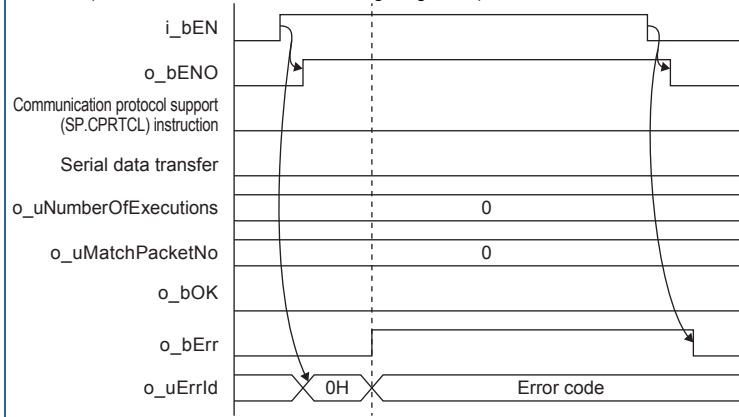
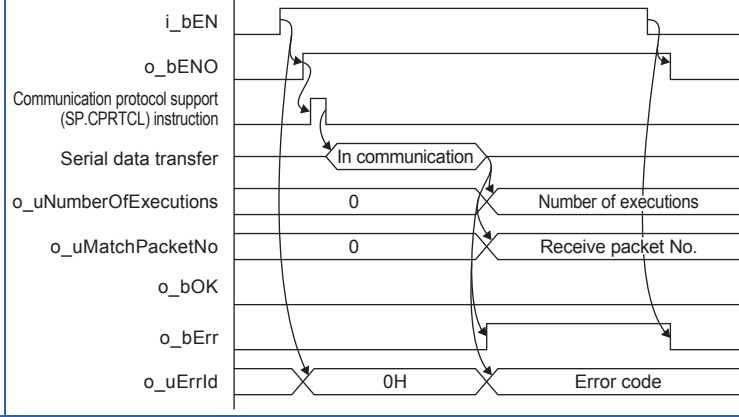
No.	Variable name	Name	Data type	Range	Description
(12)	pb_bSerialComErrUndetection	Serial communication error undetection mode	Bit	ON, OFF	ON: FB does not detect serial communication error.*1 OFF: FB detects serial communication error.

*1 Even if a serial communication error occurs in the used communication channel, error completion and error code are not output and the FB does not stop. Use a user program to detect the error. For serial communication error and serial communication error code, refer to the following manual.

📖 MELSEC iQ-F FX5 User's Manual (Serial Communication)

FB details

Item	Description
Available device	CPU module FX5U CPU (Version 1.015 or later), FX5UC CPU (Version 1.015 or later) Engineering tool GX Works3 Version 1.015R or later
Language	Ladder diagram
Number of basic steps	216 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to 📖 GX Works3 Operating Manual.
Processing	<ul style="list-style-type: none"> • Executes the registered protocol by the communication protocol support function (predefined protocol support function) on GX Works3 using the communication protocol support (SP.CPRTCL) instruction, by turning i_bEN (Execution command) on. After executing the protocols specified with i_uExeProtocolNo (Execution protocol number) and i_uNumberOfExecutions (Number of consecutively-executed protocols), o_bOK (Normal completion) turns on. • This FB checks the following input values when started up. If an error occurs, o_bErr (Error completion) turns on, and o_uErrId (Error code) stores the error code. (1) Communication channel (2) Number of consecutive protocol executions • If an error occurs during data communication processing, o_bErr (Error completion) turns on, and the serial communication error code is stored to o_uErrId (Error code). For the error code, refer to 📖 Page 32 Error code. When pb_bSerialComErrUndetection (Serial communication error undetection mode) is turned on by a user program, this FB does not detect serial communication errors for error codes 7F67H to 7F6AH (the FB continues to operate). Detect serial communication errors using a user program.
FB compilation method	Macro type
FB operation	Pulsed execution (multiple scan execution type)

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] FB error (Send channel is outside the setting range, etc.)</p>  <p>[When the operation is completed with an error] Module error (Serial communication error)</p> 

Item	Description
Restrictions or precautions	<ul style="list-style-type: none"> This FB does not include error recovery processing. Program error recovery processing separately in accordance with the required system operation. This FB cannot be used in interrupt programs. This FB uses the communication protocol support (SP.CPRTCL) instruction. In communication protocol support function (predefined protocol support function), up to two channels are available to use in one CPU module. 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). When using an interrupt program, use the DI/EI instruction before and after executing this FB so that this FB is executed in the interrupt disabled status. If executing this FB in the interrupt enabled status, a self-diagnosis error that occurs in an interrupt program is detected as an error that occurred in the FB. Turn off i_bEN (Execution command) after o_bOK (Normal completion) or o_bErr (Error completion) is turned on. By turning off i_bEN (Execution command), o_bOK (Normal completion) and o_bErr (Error completion) are turned off. However, because the SP.CPRTCL instruction which is a pulse instruction in the FB is used, if a write is performed while the FB is executed, the instruction may not be executed, and o_bOK (Normal completion) and o_bErr (Error completion) may not turn on. If this happens, turn i_bEN (Execute command) from off to on again. Set the module parameters of the used communication channel in GX Works3 in accordance with the application. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication). FX5UC CPU does not have serial communication port ch2. When using this FB in FX5UC CPU, set a channel of one of ch1, ch3, ch4.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uCh (Communication channel) is outside the setting range. The target channel is set to a value outside the range from 1 to 4.	Try again after checking the setting.
104H	The set value for i_uNumberOfExecutions (Number of continuous protocol executions) is outside the setting range. The number of continuous protocol executions is set to a value outside the range from 1 to 8.	Try again after checking the setting.
105H	The serial communication operation mode is set to an unavailable mode. The serial communication operation mode is not set to "communication protocol support (predefined protocol support)".	Try again after checking the setting.
Serial communication error	The contents are same as the error code occurred in the communication protocol support (SP.CPRTCL) instruction.	Refer to the MELSEC iQ-F FX5 User's Manual (Serial Communication).
Self-diagnostics error	This may occur in the communication protocol support (SP.CPRTCL) instruction.*1	Refer to the MELSEC iQ-F FX5 User's Manual (Application).

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

Version upgrade history

Version	Date	Description
00A	July 2015	First edition
01A	May 2016	Changed so that if o_bOK (Normal completion) and o_bErr (Error completion) do not turn on, the FB can be executed again by turning i_bEN (Execute command) from off to on.

5 HIGH-SPEED COUNTER FB

5.1 M+FX5UCPU-Counter_PulseMeasure

Name

M+FX5UCPU-Counter_PulseMeasure

Overview

Item	Description
Overview	This FB starts the pulse measurement function, and stores the pulse measured value.
Symbol	<pre> graph LR subgraph M+FX5UCPU-Counter_PulseMeasure direction TB i_bEN((1) B : i_bEN) i_stModule((2) DUT: i_stModule) i_uCh((3) UW : i_uCh) o_bENO((4) o_bENO : B) o_bOK((5) o_bOK : B) o_bUpdate((6) o_bUpdate : B) o_dResult((7) o_dResult : D) o_bErr((8) o_bErr : B) o_uErrId((9) o_uErrId : UW) pb_bPulseMeasuringIntervalSetting((10) pb_bPulseMeasuringIntervalSetting) end </pre>

5

Labels

Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_stModule	Module label	Structure	The setting range differs depending on the module label.	Specify the module label of the CPU module.
(3)	i_uCh	Target channel	Word [Unsigned]	1 to 12 ^{*1}	Specify the channel number.

*1 The target channel can be set from CH1 to CH4 for the built-in input/output in a CPU module and from CH5 to CH12 for the high-speed pulse input/output module.

Output label

No.	Variable name	Name	Data type	Default value	Description
(4)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(5)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that pulses are being measured.
(6)	o_bUpdate	Measured pulse value update flag	Bit	OFF	When this label is on, it indicates that measured pulse value has been updated.
(7)	o_dResult	Measured pulse value	Double word [signed]	0	Stores the measured pulse value. The following intervals can be measured by combining the public label's pulse measurement interval with the logic switch parameter. <ul style="list-style-type: none"> • ON width • OFF width • Interval between rises of the edge • Interval between falls of the edge
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]	0	Stores the error code that occurred in the FB.

Public label


No.	Variable name	Name	Data type	Range	Description
(10)	pb_bPulseMeasuringIntervalSetting	Pulse measurement interval	Bit	ON, OFF	ON: Pulse period measurement OFF: Pulse width measurement

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU Engineering tool GX Works3 Version 1.025B or later
Language	Ladder diagram
Number of basic steps	250 steps The number of FB steps integrated in the program varies depending on the CPU module used, the input/output definition, and the setting options of GX Works3. For the setting options of GX Works3, refer to GX Works3 Operating Manual .
Processing	<ul style="list-style-type: none"> Starts pulse measurement by turning i_bEN (Execution command) on. If the set value of the target channel is outside the setting range, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 36 Error code. If an error occurs when starting pulse measurement, o_bErr (Error completion) turns on and the processing of this FB is aborted. In addition, the error code is stored in o_uErrId (Error code). For the error codes, refer to MELSEC iQ-F FX5 User's Manual (Application).
FB compilation method	Macro type
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully] (Positive logic, pulse width measurement, consecutive measurement mode)</p> <p>[When the operation is completed successfully] (Negative logic, pulse period measurement, consecutive measurement mode)</p>

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed with an error] (Target channel is outside the setting range)</p> <p>[When the operation is completed with an error] (Pulse measurement start (HIOEN) instruction completes abnormally)</p>
Restrictions or precautions	<ul style="list-style-type: none"> • 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). • When this FB is used twice or more, precaution must be taken to avoid duplicating the target channel. • Every input must be provided with a value for proper FB operation. • If the measurement interval of the measurement target is quicker than the scan time, normal measurement may not be possible. Adjust the measurement interval so that it is at least double the scan time. • This FB operates with the parameters (SM) set when i_bEN (Execution command) is turned on. Do not modify parameter (SM) settings related to the pulse measurement function by a user program when the FB is operating. • This FB supports only consecutive measurement mode. Set the measurement mode to consecutive measurement mode. • When executing the pulse measurement function, set the module parameters in GX Works3 in accordance with the connected equipment and system. For the module parameter setting method, refer to the MELSEC iQ-F FX5 User's Manual (Application).

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uAxis (Target channel) is outside the setting range. The target channel is set to a value outside the range from 1 to 12.	Try again after checking the setting.
Self-diagnostics error	This may occur in the pulse measurement start (HIOEN) instruction.*1	Refer to the  MELSEC iQ-F FX5 User's Manual (Application).

*1 When the same self-diagnosis error as another instruction occurs in this FB, this FB may not detect the error.

6 TEMPERATURE CONTROL FB

6.1 M+FX5UCPU- TemperatureCtrl_TwoPositionControl

Name

M+FX5UCPU-TemperatureCtrl_TwoPositionControl

Overview

Item	Description
Overview	This FB performs two-position control to turn the control output ON/OFF based on the input of the measured value, target value, and dead band.
Symbol	<pre> M+FX5UCPU-TemperatureCtrl_TwoPositionControl (1) B : i_bEN o_bENO : B (5) (2) W : i_wProcessValue o_bOK : B (6) (3) W : i_wSetpointValue o_bErr : B (7) (4) UW : i_uDeadBand o_uErrId : UW (8) o_bControlOutput : B (9) </pre>

Labels

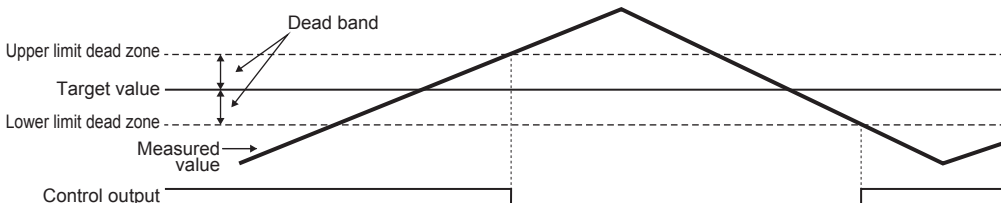
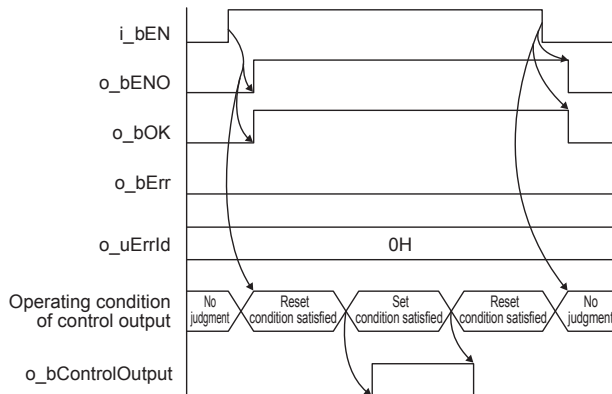
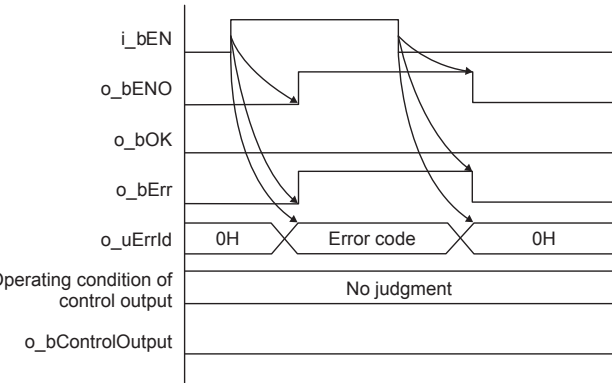
■Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_wProcessValue	Measured value	Word [Signed]	-32768 to +32767	Enter the measured value to be controlled.
(3)	i_wSetpointValue	Target value	Word [Signed]	-32768 to +32767	Set the target value to be controlled.
(4)	i_uDeadBand	Dead band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the range in which the control output is not switched. The value should be within the following ranges: • Target value + Dead band ≤ 32767 • Target value - Dead band ≥ -32768

■Output label

No.	Variable name	Name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	OFF	Outputs the execution status of the FB. ON: The FB has been executed. OFF: The FB has not been executed.
(6)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the processing of the FB has completed normally.
(7)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(8)	o_uErrId	Error code	Word [Unsigned]/ Bit string [16 bits]	0	Stores the error code that occurred in the FB.
(9)	o_bControlOutput	Control output	Bit	OFF	Turns ON/OFF the control output of the two-position control.

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU
	Engineering tool GX Works3 Version 1.050C or later
Language	Ladder diagram
Number of basic steps	108 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .
Processing	<ul style="list-style-type: none"> Control details of the two-position control  <ul style="list-style-type: none"> This FB starts the two-position control when i_bEN (Execution command) turns ON. The operating conditions of the control output are as follows. Condition where the control output is set: Measured value < Lower limit dead zone (Target value - Dead band) Condition where the control output is reset: Measured value > Upper limit dead zone (Target value + Dead band) o_bControlOutput (Control output) turns ON or OFF according to the operating condition of the control output. If i_uDeadBand (Dead band) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 39 Error code. To interrupt the processing of the FB by error completion, turn OFF o_bControlOutput (Control output).
FB compilation method	Macro type
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p> 

Item	Description
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uDeadBand (Dead band) is invalid.	Reset the set value of i_uDeadBand (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768

6.2 M+FX5UCPU- TemperatureCtrl_TwoPositionControlPd

Name

M+FX5UCPU-TemperatureCtrl_TwoPositionControlPd

Overview

Item	Description
Overview	This FB performs two-position control with a PD characteristic to turn the control output ON/OFF based on the input of the measured value, target value, dead band, delay time, and maximum feedback value.
Symbol	<pre> M+FX5UCPU-TemperatureCtrl_TwoPositionControlPd (1) B : i_bEN o_bENO : B (7) (2) W : i_wProcessValue o_bOK : B (8) (3) W : i_wSetpointValue o_bErr : B (9) (4) UW : i_uDeadBand o_uErrId : UW (10) (5) UW : i_uDelayTime o_bControlOutput : B (11) (6) UW : i_uMaxFeedbackValue </pre>

Labels

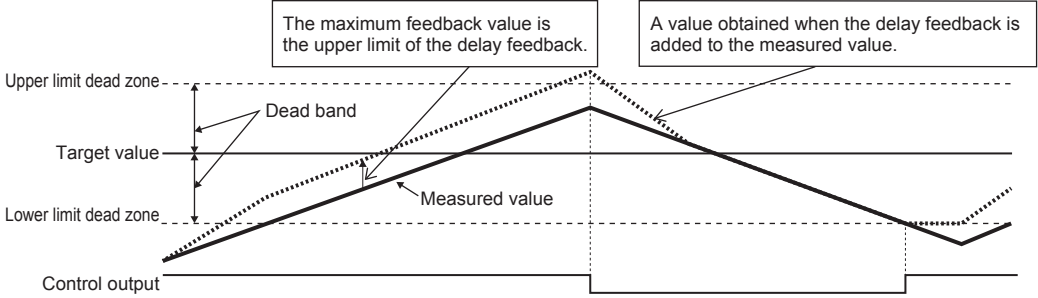
Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_wProcessValue	Measured value	Word [Signed]	-32768 to +32767	Enter the measured value to be controlled.
(3)	i_wSetpointValue	Target value	Word [Signed]	-32768 to +32767	Set the target value to be controlled.
(4)	i_uDeadBand	Dead band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the range in which the control output is not switched. The value should be within the following ranges: • Target value + Dead band ≤ 32767 • Target value - Dead band ≥ -32768
(5)	i_uDelayTime	Delay time	Word [Unsigned]/ Bit string [16 bits]	0 to 32767 (× 100 ms)	Specify the delay time for the feedback.
(6)	i_uMaxFeedbackValue	Maximum feedback value	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the maximum value of the feedback.

Output label

No.	Variable name	Name	Data type	Default value	Description
(7)	o_bENO	Execution status	Bit	OFF	Outputs the execution status of the FB. ON: The FB has been executed. OFF: The FB has not been executed.
(8)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the processing of the FB has completed normally.
(9)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(10)	o_uErrId	Error code	Word [Unsigned]/ Bit string [16 bits]	0	Stores the error code that occurred in the FB.
(11)	o_bControlOutput	Control output	Bit	OFF	Turns ON/OFF the control output of the two-position control with a PD characteristic.

FB details

Item	Description	
Available device	CPU module	FX5U CPU, FX5UC CPU
	Engineering tool	GX Works3 Version 1.050C or later
Language	Ladder diagram	
Number of basic steps	194 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .	
Processing	<ul style="list-style-type: none"> Control details of the two-position control with a PD characteristic.  <ul style="list-style-type: none"> This FB starts the two-position control with a PD characteristic when <code>i_bEN</code> (Execution command) turns ON. Based on the input of <code>i_wProcessValue</code> (Measured value), <code>i_wSetpointValue</code> (Target value), and <code>i_uDelayTime</code> (Delay time), the delay feedback used for the two-position control with a PD characteristic is calculated. The delay feedback is specified as follows. <ul style="list-style-type: none"> - Initial value <code>K0</code> - While the control output is ON, the value is incremented at every delay time. - While the control output is OFF, the value is decremented at every delay time. - If the value goes below <code>K0</code>, it is fixed to <code>K0</code>. - The maximum feedback value is used as the upper limit. The operating conditions of the control output are as follows. <ul style="list-style-type: none"> Condition where the control output is set: $\text{Measured value} + \text{Delay feedback} < \text{Lower limit dead zone}$ ($\text{Target value} - \text{Dead band}$) Condition where the control output is reset: $\text{Measured value} + \text{Delay feedback} > \text{Upper limit dead zone}$ ($\text{Target value} + \text{Dead band}$) If the delay feedback exceeds <code>i_uMaxFeedbackValue</code> (Maximum feedback value), the value of <code>i_uMaxFeedbackValue</code> (Maximum feedback value) is assigned to the delay feedback. <code>o_bControlOutput</code> (Control output) turns ON or OFF according to the operating condition of the control output. If <code>i_uDeadBand</code> (Dead band) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 42 Error code. If <code>i_uDelayTime</code> (Delay time) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 101 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 42 Error code. If <code>i_uMaxFeedbackValue</code> (Maximum feedback value) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 102 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 42 Error code. To interrupt the processing of the FB by error completion, turn OFF <code>o_bControlOutput</code> (Control output). 	
FB compilation method	Macro type	
FB operation	Always executed	

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p> <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p>
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system. • This FB uses a timer.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uDeadBand (Dead band) is invalid.	Reset the set value of i_uDeadBand (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768
101H	The set value of i_uDelayTime (Delay time) is invalid.	Reset the set value of i_uDelayTime (Delay time) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767 (\times 100 ms)
102H	The set value of i_uMaxFeedbackValue (Maximum feedback value) is invalid.	Reset the set value of i_uMaxFeedbackValue (Maximum feedback value) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767

6.3 M+FX5UCPU- TemperatureCtrl_TwoPositionControlPi

Name

M+FX5UCPU-TemperatureCtrl_TwoPositionControlPi

Overview

Item	Description																												
Overview	This FB performs two-position control with a PI characteristic to turn the control output ON/OFF and output the output time based on the input of the measured value, target value, proportional band, integral band, dead band, and integral time.																												
Symbol	<div style="border: 1px solid black; padding: 5px;"> <p>M+FX5UCPU-TemperatureCtrl_TwoPositionControlPi</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: right;">(1)</td> <td style="width: 45%;">B : i_bEN</td> <td style="width: 45%;">o_bENO : B</td> <td style="width: 5%; text-align: left;">(8)</td> </tr> <tr> <td style="text-align: right;">(2)</td> <td>W : i_wProcessValue</td> <td>o_bOK : B</td> <td style="text-align: left;">(9)</td> </tr> <tr> <td style="text-align: right;">(3)</td> <td>W : i_wSetpointValue</td> <td>o_bErr : B</td> <td style="text-align: left;">(10)</td> </tr> <tr> <td style="text-align: right;">(4)</td> <td>UW : i_uPBand</td> <td>o_uErrId : UW</td> <td style="text-align: left;">(11)</td> </tr> <tr> <td style="text-align: right;">(5)</td> <td>UW : i_uIBand</td> <td>o_bControlOutput : B</td> <td style="text-align: left;">(12)</td> </tr> <tr> <td style="text-align: right;">(6)</td> <td>UW : i_uDeadBand</td> <td>o_uOutputTime : UW</td> <td style="text-align: left;">(13)</td> </tr> <tr> <td style="text-align: right;">(7)</td> <td>UW : i_uIntegralTime</td> <td></td> <td></td> </tr> </table> </div>	(1)	B : i_bEN	o_bENO : B	(8)	(2)	W : i_wProcessValue	o_bOK : B	(9)	(3)	W : i_wSetpointValue	o_bErr : B	(10)	(4)	UW : i_uPBand	o_uErrId : UW	(11)	(5)	UW : i_uIBand	o_bControlOutput : B	(12)	(6)	UW : i_uDeadBand	o_uOutputTime : UW	(13)	(7)	UW : i_uIntegralTime		
(1)	B : i_bEN	o_bENO : B	(8)																										
(2)	W : i_wProcessValue	o_bOK : B	(9)																										
(3)	W : i_wSetpointValue	o_bErr : B	(10)																										
(4)	UW : i_uPBand	o_uErrId : UW	(11)																										
(5)	UW : i_uIBand	o_bControlOutput : B	(12)																										
(6)	UW : i_uDeadBand	o_uOutputTime : UW	(13)																										
(7)	UW : i_uIntegralTime																												

Labels

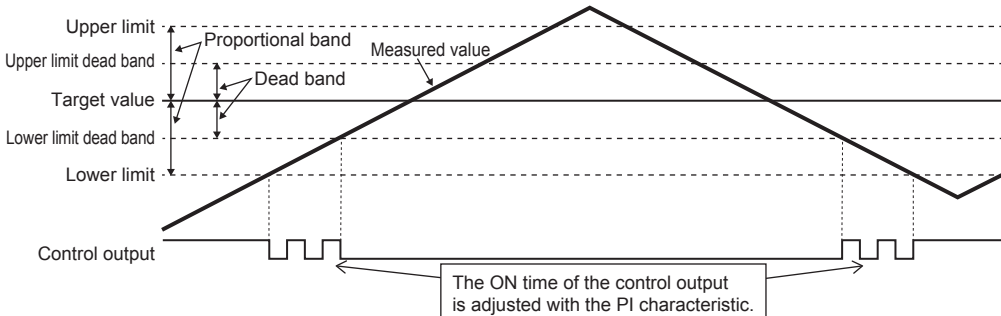
Input label

No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_wProcessValue	Measured value	Word [Signed]	-32768 to +32767	Enter the measured value to be controlled.
(3)	i_wSetpointValue	Target value	Word [Signed]	-32768 to +32767	Set the target value to be controlled.
(4)	i_uPBand	Proportional band	Word [Unsigned]/ Bit string [16 bits]	1 to 32767	A proportional band is a range of measured values or a band area where a proportional operation is performed. The value should be within the following ranges: <ul style="list-style-type: none"> Target value + Proportional band ≤ 32767 Target value - Proportional band ≥ -32768
(5)	i_uIBand	Integral band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	An integral band is a range of measured values or a band area where an integral operation is performed. The value should be within the following ranges: <ul style="list-style-type: none"> (Measured value - Target value) × Integral band = -32768 to 32767 When the value is outside the setting range, it is fixed to the maximum or minimum value obtained with the calculation above.
(6)	i_uDeadBand	Dead band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the range in which the control output is not switched. The value should be within the following ranges: <ul style="list-style-type: none"> Target value + Dead band ≤ 32767 Target value - Dead band ≥ -32768
(7)	i_uIntegralTime	Integral time	Word [Unsigned]/ Bit string [16 bits]	0 to 32767 (× 100 ms)	Specify the period during which an integral operation is active in increments of 100 ms.

Output label

No.	Variable name	Name	Data type	Default value	Description
(8)	o_bENO	Execution status	Bit	OFF	Outputs the execution status of the FB. ON: The FB has been executed. OFF: The FB has not been executed.
(9)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the processing of the FB has completed normally.
(10)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(11)	o_uErrId	Error code	Word [Unsigned]/ Bit string [16 bits]	0	Stores the error code that occurred in the FB.
(12)	o_bControlOutput	Control output	Bit	OFF	Turns ON/OFF the control output of the two-position control with a PI characteristic.
(13)	o_uOutputTime	Output time	Word [Unsigned]/ Bit string [16 bits]	0	Duration of the output signal specified in increments of 100 ms.

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU Engineering tool GX Works3 Version 1.050C or later
Language	Ladder diagram
Number of basic steps	267 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .
Processing	<ul style="list-style-type: none"> Control details of the two-position control with a PI characteristic  <ul style="list-style-type: none"> This FB starts the two-position control with a PI characteristic when i_bEN (Execution command) turns ON. Based on the input of i_wProcessValue (Measured value), i_wSetpointValue (Target value), i_uPBand (Proportional band), and i_uIBand (Integral band), the output time used for the two-position control with a PI characteristic is calculated. <ul style="list-style-type: none"> Output time = (Target value - Measured value) × Integral band ÷ Proportional band The operating conditions of the control output are as follows. <p>Condition where the control output turns ON: When either of the following (1) or (2) is satisfied</p> <p>(1) Lower limit (Target value - Proportional band) > Measured value</p> <p>(2) When all of the following conditions are satisfied</p> <ul style="list-style-type: none"> Lower limit (Target value - Proportional band) ≤ Measured value ≤ Upper limit (Target value + Proportional band) Measured value < Lower limit dead zone (Target value - Dead band) Output time > Integral time <p>Condition where the control output turns OFF: Any state other than the condition where the control output turns ON</p> o_bControlOutput (Control output) turns ON or OFF according to the operating condition of the control output. If i_uDeadBand (Dead band) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 45 Error code. If i_uPBand (Proportional band) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 103 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 45 Error code. If i_uIntegralTime (Integral time) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 104 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 45 Error code. If i_uDeadBand (Dead band) and i_uPBand (Proportional band) are within the setting range and i_uDeadBand (Dead band) ≥ i_uPBand (Proportional band), o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 110 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 45 Error code. To interrupt the processing of the FB by error completion, turn OFF o_bControlOutput (Control output).
FB compilation method	Macro type

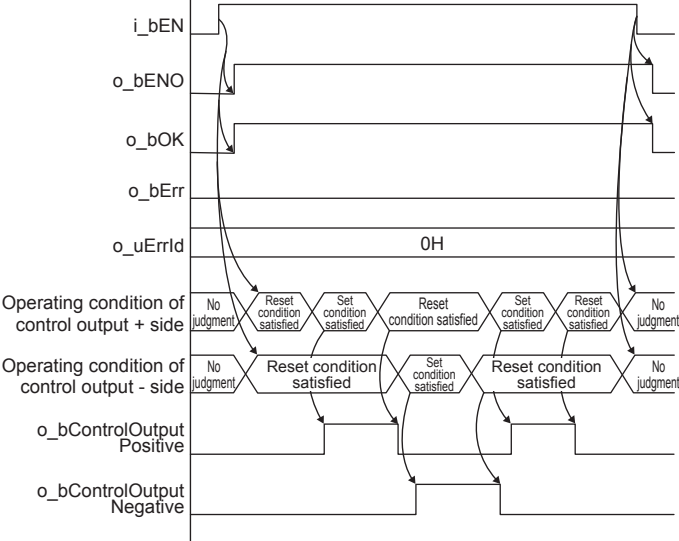
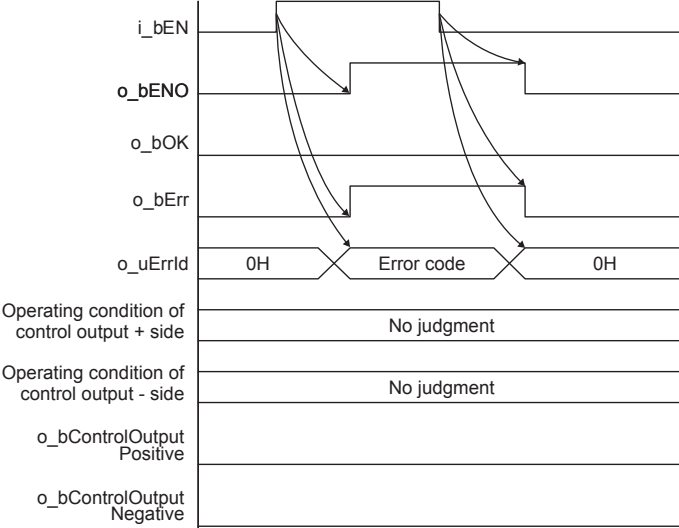
Item	Description
FB operation	Always executed
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p> <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p>
Restrictions or precautions	<ul style="list-style-type: none"> • This 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uDeadBand (Dead band) is invalid.	Reset the set value of i_uDeadBand (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768
103H	The set value of i_uPBand (Proportional band) is invalid.	Reset the set value of i_uPBand (Proportional band) to a value that satisfies all the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Proportional band \leq 32767 • Target value - Proportional band \geq -32768 • Proportional band: 1 to 32767
104H	The set value of i_uIntegralTime (Integral time) is invalid.	Reset the set value of i_uIntegralTime (Integral time) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767 (\times 100 ms)
110H	The set value of i_uDeadBand (Dead band) or i_uPBand (Proportional band) is invalid.	Reset the set values of i_uDeadBand (Dead band) and i_uPBand (Proportional band) to values that satisfy the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Dead band < Proportional band

FB details

Item	Description
Available device	CPU module FX5U CPU, FX5UC CPU
	Engineering tool GX Works3 Version 1.050C or later
Language	Ladder diagram
Number of basic steps	243 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .
Processing	<p>• Control details of the three-position control</p> <p>• This FB starts the three-position control when <code>i_bEN</code> (Execution command) turns ON.</p> <p>• The operating conditions of the control output are as follows.</p> <p>Condition where the control output + side is set: When either (1) or (2) is satisfied</p> <p>(1) Measured value < Lower limit hysteresis (Target value - Adjustment sensitivity)</p> <p>(2) When all of the following conditions are satisfied</p> <ul style="list-style-type: none"> - Measured value \geq Lower limit hysteresis (Target value - Adjustment sensitivity) - Measured value < Lower limit dead zone (Target value - Dead band) - Condition (1) has been satisfied immediately before the point. <p>• Condition where the control output + side is reset: Any state other than the conditions where the control output + side is set</p> <p>• Condition where the control output - side is set: When either (3) or (4) is satisfied</p> <p>(3) Measured value > Upper limit hysteresis (Target value + Adjustment sensitivity)</p> <p>(4) When all of the following conditions are satisfied</p> <ul style="list-style-type: none"> - Measured value > Upper limit dead zone (Target value + Dead band) - Measured value \leq Upper limit hysteresis (Target value + Adjustment sensitivity) - Condition (3) has been satisfied immediately before the point. <p>• Condition where the control output - side is reset: Any state other than the conditions where the control output - side is set</p> <p>• <code>o_bControlOutputPositive</code> (Control output + side) and <code>o_bControlOutputNegative</code> (Control output - side) turn ON or OFF according to the operating condition of the control output.</p> <p>• If <code>i_uDeadBand</code> (Dead band) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 49 Error code.</p> <p>• If <code>i_uAdjustmentSensitivity</code> (Adjustment sensitivity) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 109 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 49 Error code.</p> <p>• If <code>i_uDeadBand</code> (Dead band) and <code>i_uAdjustmentSensitivity</code> (Adjustment sensitivity) are within the setting range and <code>i_uDeadBand</code> (Dead band) \geq <code>i_uAdjustmentSensitivity</code> (Adjustment sensitivity), <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 111 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 49 Error code.</p> <p>• To interrupt the processing of the FB by error completion, turn OFF <code>o_bControlOutputPositive</code> (Control output + side) and <code>o_bControlOutputNegative</code> (Control output - side).</p>
FB compilation method	Macro type
FB operation	Always executed

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p> 
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uDeadBand (Dead band) is invalid.	Reset the set value of i_uDeadBand (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768
109H	The set value of i_uAdjustmentSensitivity (Adjustment sensitivity) is invalid.	Reset the set value of i_uAdjustmentSensitivity (Adjustment sensitivity) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Adjustment sensitivity \leq 32767 • Target value - Adjustment sensitivity \geq -32768
111H	The set value of i_uDeadBand (Dead band) or i_uAdjustmentSensitivity (Adjustment sensitivity) is invalid.	Reset the set values of i_uDeadBand (Dead band) and i_uAdjustmentSensitivity (Adjustment sensitivity) to values that satisfy the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Dead band < Adjustment sensitivity

6.5 M+FX5UCPU- TemperatureCtrl_ThreePositionControlPd

Name

M+FX5UCPU-TemperatureCtrl_ThreePositionControlPd

Overview

Item	Description
Overview	This FB performs three-position control with a PD characteristic to turn the control output + side and control output - side ON/OFF individually based on the input of the measured value, target value, dead band, delay time of the control output + side, maximum feedback value of the control output + side, delay time of the control output - side, and maximum feedback value of the control output - side.
Symbol	<div style="border: 1px solid black; padding: 5px;"> <pre> M+FX5UCPU-TemperatureCtrl_ThreePositionControlPd (1) B : i_bEN o_bENO : B (9) (2) W : i_wProcessValue o_bOK : B (10) (3) W : i_wSetpointValue o_bErr : B (11) (4) UW: i_uDeadBand o_uErrId : UW (12) (5) UW: i_uDelayTimePositive o_bControlOutputPositive : B (13) (6) UW: i_uMaxFeedbackValuePositive o_bControlOutputNegative : B (14) (7) UW: i_uDelayTimeNegative (8) UW: i_uMaxFeedbackValueNegative </pre> </div>

Labels

Input label

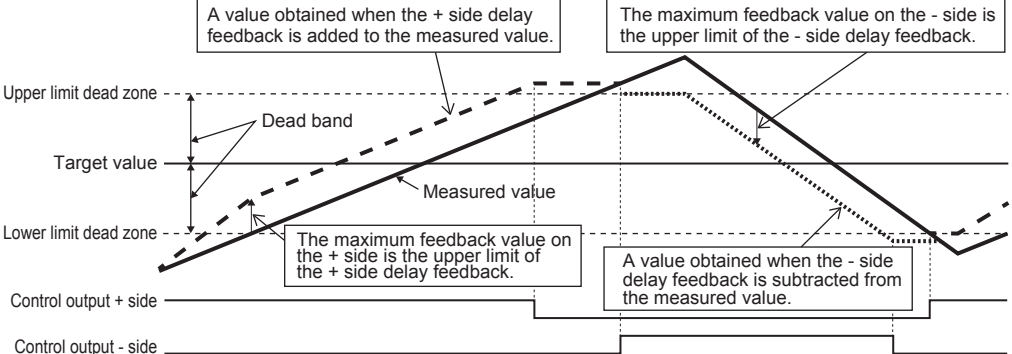
No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_wProcessValue	Measured value	Word [Signed]	-32768 to +32767	Enter the measured value to be controlled.
(3)	i_wSetpointValue	Target value	Word [Signed]	-32768 to +32767	Set the target value to be controlled.
(4)	i_uDeadBand	Dead band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the range in which the control output + side is not switched. The value should be within the following ranges: • Target value + Dead band ≤ 32767 • Target value - Dead band ≥ -32768
(5)	i_uDelayTimePositive	Delay time of the control output + side	Word [Unsigned]/ Bit string [16 bits]	0 to 32767 (× 100 ms)	Specify the delay time of the control output + side.
(6)	i_uMaxFeedbackValuePositive	Maximum feedback value of the control output + side	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the maximum value of the delay feedback of the control output + side.
(7)	i_uDelayTimeNegative	Delay time of the control output - side	Word [Unsigned]/ Bit string [16 bits]	0 to 32767 (× 100 ms)	Specify the delay time of the control output - side.
(8)	i_uMaxFeedbackValueNegative	Maximum feedback value of the control output - side	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the maximum value of the delay feedback of the control output - side.

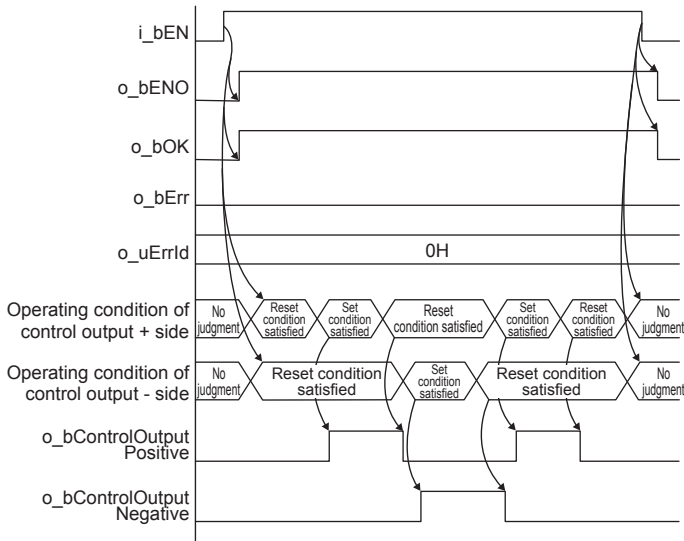
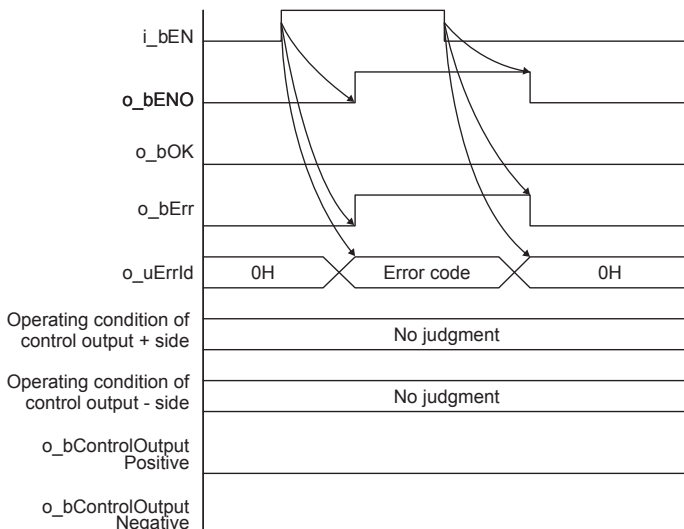
■Output label

No.	Variable name	Name	Data type	Default value	Description
(9)	o_bENO	Execution status	Bit	OFF	Outputs the execution status of the FB. ON: The FB has been executed. OFF: The FB has not been executed.
(10)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the processing of the FB has completed normally.
(11)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(12)	o_uErrId	Error code	Word [Unsigned]/ Bit string [16 bits]	0	Stores the error code that occurred in the FB.
(13)	o_bControlOutputPositive	Control output + side	Bit	OFF	Turns ON/OFF the control output on the + side of the three-position control with a PD characteristic.
(14)	o_bControlOutputNegative	Control output - side	Bit	OFF	Turns ON/OFF the control output on the - side of the three-position control with a PD characteristic.

FB details

Item	Description	
Available device	CPU module	FX5U CPU, FX5UC CPU
	Engineering tool	GX Works3 Version 1.050C or later
Language	Ladder diagram	
Number of basic steps	295 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .	

Item	Description
Processing	<p>• Control details of the three-position control with a PD characteristic</p>  <p>• This FB starts the three-position control with a PD characteristic when <code>i_bEN</code> (Execution command) turns ON.</p> <p>• Based on the input of <code>i_wProcessValue</code> (Measured value), <code>i_wSetpointValue</code> (Target value), <code>i_uDelayTimePositive</code> (Delay time of the control output + side), and <code>i_uDelayTimeNegative</code> (Delay time of the control output - side), the +/- side delay feedback used for the three-position control with a PD characteristic is calculated.</p> <p>• The +/- side delay feedback is specified as follows.</p> <ul style="list-style-type: none"> - Initial value <code>K0</code> - While the control output +/- side is ON, the value is incremented at every delay time of the control output + side. - While the control output +/- side is OFF, the value is decremented at every delay time of the control output + side. - If the value goes below <code>K0</code>, it is fixed to <code>K0</code>. - The upper limit will be the maximum feedback value of the control output +/- side. <p>• The operating conditions of the control output are as follows.</p> <ul style="list-style-type: none"> Condition where the control output + side is set: $\text{Measured value} + \text{"+" side delay feedback"} < \text{Lower limit dead zone (Target value - Dead band)}$ Condition where the control output + side is reset: $\text{Measured value} + \text{"+" side delay feedback"} > \text{Upper limit dead zone (Target value + Dead band)}$ Condition where the control output - side is set: $\text{Measured value} - \text{"-" side delay feedback"} > \text{Upper limit dead zone (Target value + Dead band)}$ Condition where the control output - side is reset: $\text{Measured value} - \text{"-" side delay feedback"} < \text{Lower limit dead zone (Target value - Dead band)}$ <p>• <code>o_bControlOutputPositive</code> (Control output + side) and <code>o_bControlOutputNegative</code> (Control output - side) turn ON or OFF according to the operating condition of the control output.</p> <p>• If <code>i_uDeadBand</code> (Dead band) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 54 Error code.</p> <p>• If <code>i_uDelayTimePositive</code> (Delay time of the control output + side) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 105 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 54 Error code.</p> <p>• If <code>i_uMaxFeedbackValuePositive</code> (Maximum feedback value of the control output + side) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 106 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 54 Error code.</p> <p>• If <code>i_uDelayTimeNegative</code> (Delay time of the control output - side) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 107 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 54 Error code.</p> <p>• If <code>i_uMaxFeedbackValueNegative</code> (Maximum feedback value of the control output - side) is outside the setting range, <code>o_bOK</code> (Normal completion) turns OFF, <code>o_bErr</code> (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 108 (hexadecimal) is stored in <code>o_uErrId</code> (Error code). For the error code, refer to Page 54 Error code.</p> <p>• To interrupt the processing of the FB by error completion, turn OFF <code>o_bControlOutputPositive</code> (Control output + side) and <code>o_bControlOutputNegative</code> (Control output - side).</p>
FB compilation method	Macro type
FB operation	Always executed

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p> 
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system. • This FB uses a timer.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of <code>i_uDeadBand</code> (Dead band) is invalid.	Reset the set value of <code>i_uDeadBand</code> (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768
105H	The set value of <code>i_uDelayTimePositive</code> (Delay time of the control output + side) is invalid.	Reset the set value of <code>i_uDelayTimePositive</code> (Delay time of the control output + side) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767 (\times 100 ms)
106H	The set value of <code>i_uMaxFeedbackValuePositive</code> (Maximum feedback value of the control output + side) is invalid.	Reset the set value of <code>i_uMaxFeedbackValuePositive</code> (Maximum feedback value of the control output + side) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767
107H	The set value of <code>i_uDelayTimeNegative</code> (Delay time of the control output - side) is invalid.	Reset the set value of <code>i_uDelayTimeNegative</code> (Delay time of the control output - side) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767 (\times 100 ms)
108H	The set value of <code>i_uMaxFeedbackValueNegative</code> (Maximum feedback value of the control output - side) is invalid.	Reset the set value of <code>i_uMaxFeedbackValueNegative</code> (Maximum feedback value of the control output - side) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767

6.6 M+FX5UCPU- TemperatureCtrl_ThreePositionControlPi

Name

M+FX5UCPU-TemperatureCtrl_ThreePositionControlPi

Overview

Item	Description
Overview	This FB performs three-position control with a PI characteristic to turn the control output + side and control output - side ON/ OFF individually and output the control time based on the input of the measured value, target value, proportional band, integral band, dead band, and integral time.
Symbol	<pre> M+FX5UCPU-TemperatureCtrl_ThreePositionControlPi (1) --- B : i_bEN o_bENO : B --- (8) (2) --- W : i_wProcessValue o_bOK : B --- (9) (3) --- W : i_wSetpointValue o_bErr : B --- (10) (4) --- UW : i_uPBand o_uErrId : UW --- (11) (5) --- UW : i_ulBand o_bControlOutputPositive : B --- (12) (6) --- UW : i_uDeadBand o_bControlOutputNegative : B --- (13) (7) --- UW : i_uIntegralTime o_uOutputTime : UW --- (14) </pre>

Labels

Input label

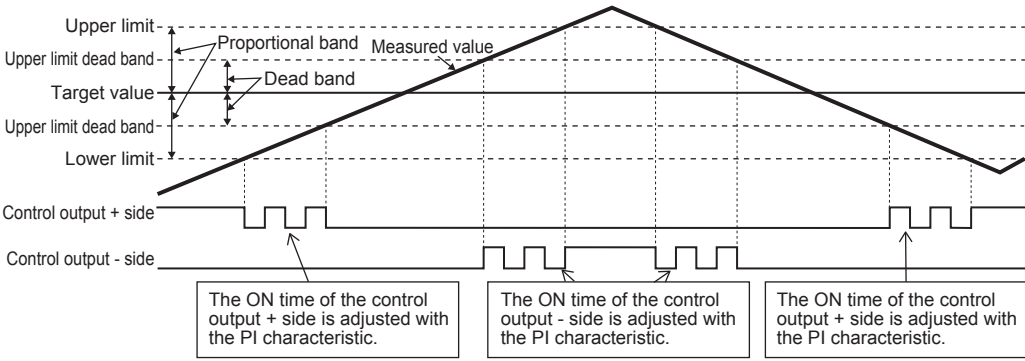
No.	Variable name	Name	Data type	Range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_wProcessValue	Measured value	Word [Signed]	-32768 to +32767	Enter the measured value to be controlled.
(3)	i_wSetpointValue	Target value	Word [Signed]	-32768 to +32767	Set the target value to be controlled.
(4)	i_uPBand	Proportional band	Word [Unsigned]/ Bit string [16 bits]	1 to 32767	A proportional band is a range of measured values or a band area where a proportional operation is performed. The value should be within the following ranges: • Target value + Proportional band ≤ 32767 • Target value - Proportional band ≥ -32768
(5)	i_ulBand	Integral band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	An integral band is a range of measured values or a band area where an integral operation is performed. The value should be within the following ranges: • (Measured value - Target value) × Integral band = -32768 to 32767 When the value is outside the setting range, it is fixed to the maximum or minimum value obtained with the calculation above.
(6)	i_uDeadBand	Dead band	Word [Unsigned]/ Bit string [16 bits]	0 to 32767	Specify the range in which the control output + side is not switched. The value should be within the following ranges: • Target value + Dead band ≤ 32767 • Target value - Dead band ≥ -32768
(7)	i_uIntegralTime	Integral time	Word [Unsigned]/ Bit string [16 bits]	0 to 32767 (× 100 ms)	Specify the period during which an integral operation is active in increments of 100 ms.

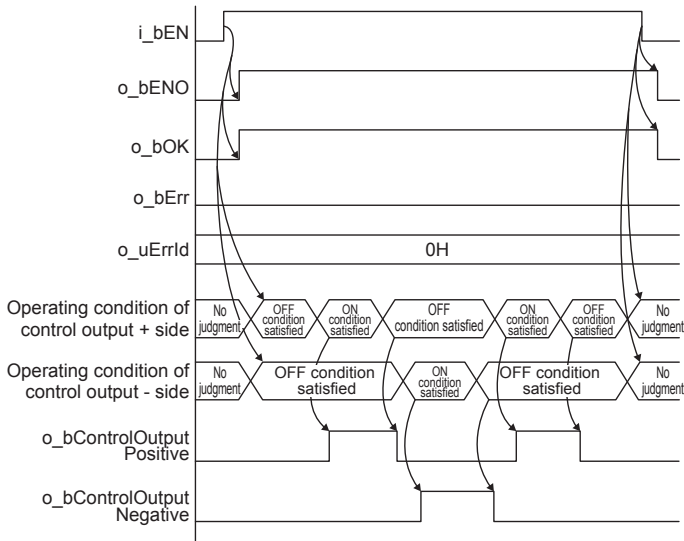
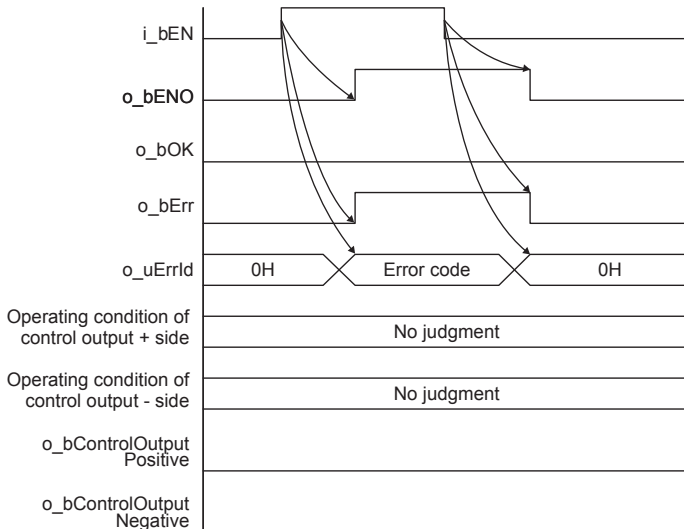
■Output label

No.	Variable name	Name	Data type	Default value	Description
(8)	o_bENO	Execution status	Bit	OFF	Outputs the execution status of the FB. ON: The FB has been executed. OFF: The FB has not been executed.
(9)	o_bOK	Normal completion	Bit	OFF	When this label is ON, it indicates that the processing of the FB has completed normally.
(10)	o_bErr	Error completion	Bit	OFF	When this label is ON, it indicates that an error has occurred in the FB.
(11)	o_uErrId	Error code	Word [Unsigned]/ Bit string [16 bits]	0	Stores the error code that occurred in the FB.
(12)	o_bControlOutputPositive	Control output + side	Bit	OFF	Turns ON/OFF the control output on the + side of the three-position control with a PI characteristic.
(13)	o_bControlOutputNegative	Control output - side	Bit	OFF	Turns ON/OFF the control output on the - side of the three-position control with a PI characteristic.
(14)	o_uOutputTime	Output time	Word [Unsigned]/ Bit string [16 bits]	0	Duration of the output signal specified in increments of 100 ms.

FB details

Item	Description	
Available device	CPU module	FX5U CPU, FX5UC CPU
	Engineering tool	GX Works3 Version 1.050C or later
Language	Ladder diagram	
Number of basic steps	307 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and the option setting of GX Works3. For the option setting of GX Works3, refer to GX Works3 Operating Manual .	

Item	Description
Processing	<ul style="list-style-type: none"> Control details of the three-position control with a PI characteristic  <ul style="list-style-type: none"> This FB sets the three-position control with a PI characteristic when i_bEN (Execution command) turns ON. Based on the input of i_wProcessValue (Measured value), i_wSetpointValue (Target value), i_uPBand (Proportional band), and i_ulBand (Integral band), the output time used for the three-position control with a PI characteristic is calculated. $\text{Output time} = (\text{Target value} - \text{Measured value}) \times \text{Integral band} \div \text{Proportional band}$ The operating conditions of the control output are as follows. Condition where the control output + side turns ON: When either of the following (1) or (2) is satisfied (1) Lower limit (Target value - Proportional band) > Measured value (2) When all of the following conditions are satisfied - Lower limit (Target value - Proportional band) ≤ Measured value ≤ Upper limit (Target value + Proportional band) - Measured value < Lower limit dead zone (Target value - Dead band) - Output time > Integral time Condition where the control output + side turns OFF: Any state other than the condition where the control output + side turns ON Condition where the control output - side turns ON: When either of the following (1) or (2) is satisfied (1) Upper limit (Target value + Proportional band) < Measured value (2) When all of the following conditions are satisfied - Lower limit (Target value - Proportional band) ≤ Measured value ≤ Upper limit (Target value + Proportional band) - Measured value > Upper limit dead zone (Target value + Dead band) - Output time > Integral time Condition where the control output - side turns OFF: Any state other than the condition where the control output - side turns ON o_bControlOutputPositive (Control output + side) and o_bControlOutputNegative (Control output - side) turn ON or OFF according to the operating condition of the control output. If i_uDeadBand (Dead band) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 100 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 59 Error code. If i_uPBand (Proportional band) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 103 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 59 Error code. If i_uIntegralTime (Integral time) is outside the setting range, o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 104 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 59 Error code. If i_uDeadBand (Dead band) and i_uPBand (Proportional band) are within the setting range and i_uDeadBand (Dead band) ≥ i_uPBand (Proportional band), o_bOK (Normal completion) turns OFF, o_bErr (Error completion) turns ON, and the processing of this FB is interrupted. In addition, 110 (hexadecimal) is stored in o_uErrId (Error code). For the error code, refer to Page 59 Error code. To interrupt the processing of the FB by error completion, turn OFF o_bControlOutputPositive (Control output + side) and o_bControlOutputNegative (Control output - side).
FB compilation method	Macro type
FB operation	Always executed

Item	Description
Timing chart of I/O signals	<p>[When the operation is completed successfully]</p>  <p>[When the operation is completed with an error] (When the set value is outside the setting range)</p> 
Restrictions or precautions	<ul style="list-style-type: none"> • 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. • If this FB is used in a program that is executed only once (such as a subroutine program or FOR-NEXT loop), i_bEN (Execution command) cannot be turned OFF and normal operation will become impossible. Therefore, use this FB in programs that can turn i_bEN (Execution command) OFF. • Every input must be provided with a value for proper FB operation. • Set the module parameters in GX Works3 in accordance with the connected equipment and system.

Error code

Error code (hexadecimal)	Description	Action
100H	The set value of i_uDeadBand (Dead band) is invalid.	Reset the set value of i_uDeadBand (Dead band) to a value that satisfies the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Dead band \leq 32767 • Target value - Dead band \geq -32768
103H	The set value of i_uPBand (Proportional band) is invalid.	Reset the set value of i_uPBand (Proportional band) to a value that satisfies all the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Target value + Proportional band \leq 32767 • Target value - Proportional band \geq -32768 • Proportional band: 1 to 32767
104H	The set value of i_uIntegralTime (Integral time) is invalid.	Reset the set value of i_uIntegralTime (Integral time) to the following value and then execute the FB again. <ul style="list-style-type: none"> • 0 to 32767 (\times 100 ms)
110H	The set value of i_uDeadBand (Dead band) or i_uPBand (Proportional band) is invalid.	Reset the set values of i_uDeadBand (Dead band) and i_uPBand (Proportional band) to values that satisfy the following conditions and then execute the FB again. <ul style="list-style-type: none"> • Dead band < Proportional band

INSTRUCTION INDEX

M

M+FX5UCPU-Counter_PulseMeasure	33
M+FX5UCPU-IO_CompareRelayOnTimes	6
M+FX5UCPU-IO_OutputOnTimes	4
M+FX5UCPU-Positioning_ABRST	9
M+FX5UCPU-Positioning_StartPositioning	13
M+FX5UCPU-SerialComm_ExecCommonProtocol	29
M+FX5UCPU-SerialComm_Input	22
M+FX5UCPU-SerialComm_InputOutput	18
M+FX5UCPU-SerialComm_Output	26
M+FX5UCPU-TemperatureCtrl_ThreePositionControl	46
M+FX5UCPU-TemperatureCtrl_ThreePositionControlPd	50
M+FX5UCPU-TemperatureCtrl_ThreePositionControlPi	55
M+FX5UCPU-TemperatureCtrl_TwoPositionControl	37
M+FX5UCPU-TemperatureCtrl_TwoPositionControlPd	40
M+FX5UCPU-TemperatureCtrl_TwoPositionControlPi	43

MEMO

REVISIONS

Revision date	Revision	Description
January 2015	A	First Edition
April 2015	B	A part of the cover design is changed.
July 2015	C	■Added or modified parts Chapter 1, Section 3.1, 4.1, 4.2, 4.3, 4.4
May 2016	D	■Added or modified parts Chapter 1, Section 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, Chapter 5
April 2017	E	■Added or modified parts Chapter 1, 2, 3, 4, 5
January 2019	F	■Added or modified parts Chapter 1, 6

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