MELSEC-Q/L Temperature Control Module FB Library Reference Manual

Applicable modules:

Q64TCTT, Q64TCTTBW, Q64TCRT, Q64TCRTBW, Q64TCTTN, Q64TCTTBWN, Q64TCRTN, Q64TCRTBWN, L60TCTT4, L60TCTT4BW, L60TCRT4, L60TCRT4BW

<CONTENTS>

Reference Manual Revision History

Reference Manual Number	Date	Description
FBM-M064-A	2011/09	First edition
FBM-M064-B	2014/06	The following FB Library is added. •M+TC4_SetPVAverage
FBM-M064-C	2017/05	Added applicable GX Works2 Version. • This FB is able to install on GX Works2 of all language versions.

1. Overview

1.1. Overview of the FB Library

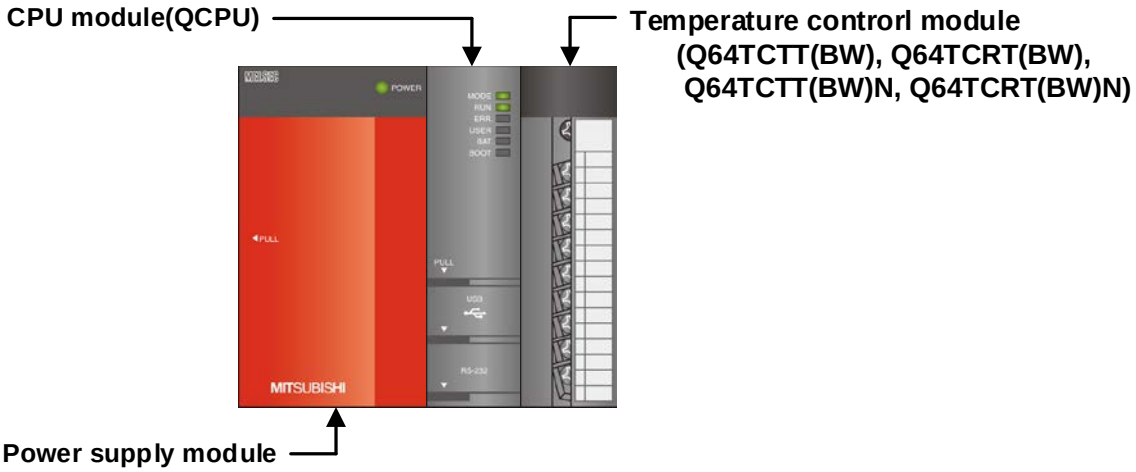
This FB library is for using the MELSEC-Q temperature control module Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N , or the MELSEC-L temperature control module L60TCTT4(BW), L60TCRT4(BW).

1.2. Function of the FB Library

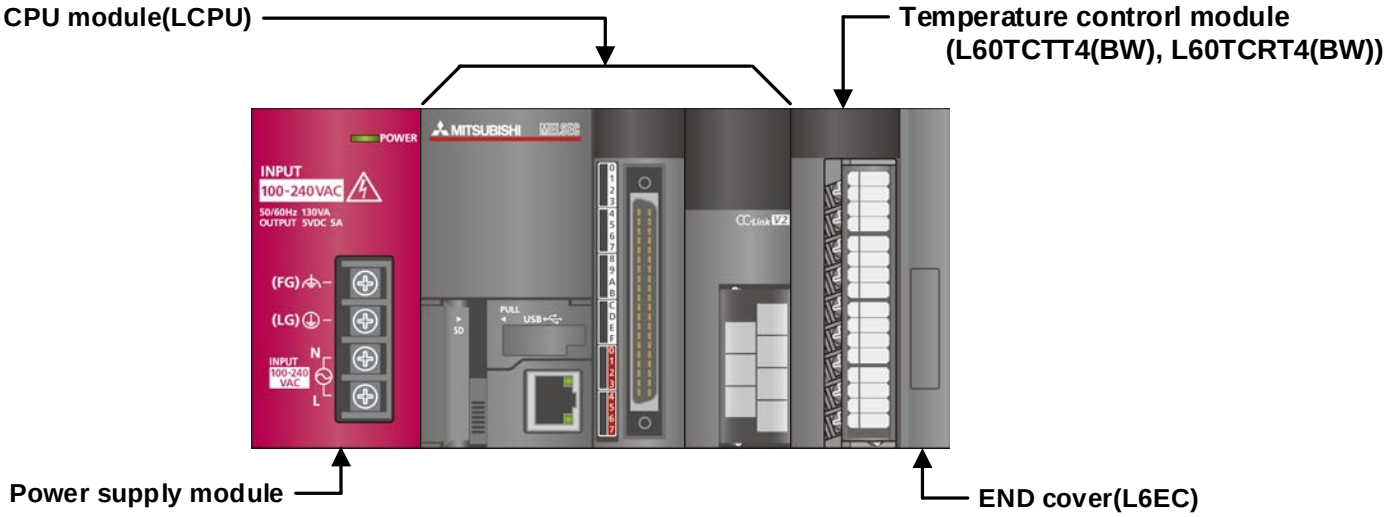
Item	Description
M+TC4_SetBPARAM	Sets the basic settings.
M+TC4_SetCNTBPARAM	Sets the control basic parameters settings.
M+TC4_SetCNTDPARAM	Set the control detailed parameters settings.
M+TC4_SetAlertsFunction	Sets the alert function setting.
M+TC4_SetOtherSettings	Sets the other settings.
M+TC4_SetConversion	Sets the conversion enable/disable setting.
M+TC4_SetProcessAlarm	Sets the process alarm setting.
M+TC4_SetRateAlarm	Sets the rate alarm.
M+TC4_SetPVScaling	Sets the process value (PV) scaling function.
M+TC4_MoniCJTemperature	Sets the cold junction temperature compensation and reads the cold junction temperature process value.
M+TC4_Autotuning	Sets and executes auto tuning.
M+TC4_Selftuning	Sets the self tuning setting and monitors the self tuning flag.
M+TC4_PIDControl	Reads the PID constants and executes a forced PID control stop.
M+TC4_HeaterDisconnection	Sets the heater disconnection detection and monitors the heater disconnection.
M+TC4_LoopDisconnection	Sets the loop disconnection detection and monitors the loop disconnection.
M+TC4_SimultaneousTemperature	Sets simultaneous temperature rise function setting and monitors the status of the simultaneous temperature rise.
M+TC4_SetPeakCurrentSuppress	Sets the peak current limit control setting.
M+TC4_AlertStatus	Monitors an alert that has occurred.
M+TC4_ErrorOperation	Monitors an error code and perform an error reset.
M+TC4_ReadVal	Reads the values to the specified devices.
M+TC4_ParamBackup	Backs up the setting value or executes the default setting registration command.
M+TC4_SetPVAverage	Sets the number of moving averaging of the moving averaging process function for the temperature process value (PV).

1.3. System Configuration Example

(1) Q series system configuration Example



(2) L series system configuration Example



1.4. Relevant Manuals

MELSEC-Q Temperature Control Module User's Manual

MELSEC-L Temperature Control Module User's Manual

QCPU User's Manual (Hardware Design, Maintenance and Inspection)

MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)

GX Works2 Version 1 Operating Manual (Common)

GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

1.5. Note

Please make sure to read user's manuals for the corresponding products before using the products.

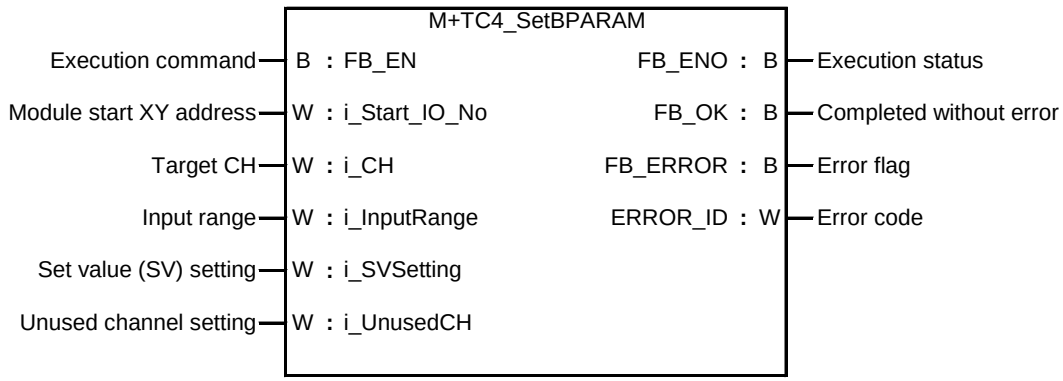
2. Details of the FB Library

2.1. M+TC4_SetBPARAM (Basic settings)

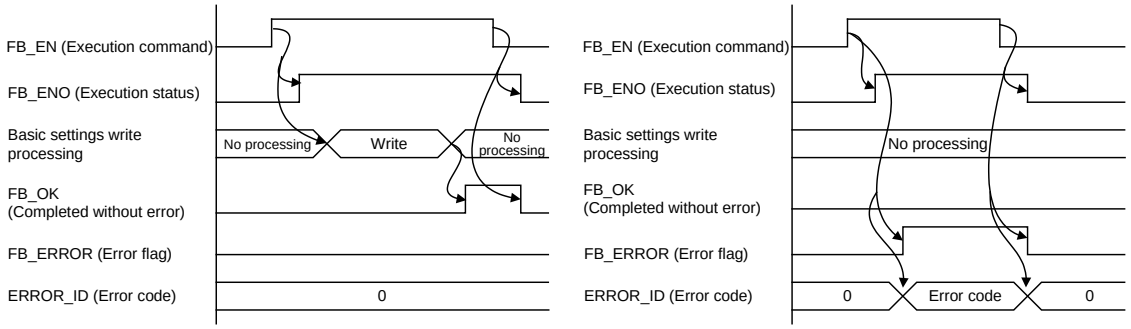
FB Name

M+TC4_SetBPARAM

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the basic settings.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">197 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the basic settings are written to the buffer memory.
2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
3) FB operation is one-shot only, triggered by the FB_EN signal.
4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Input range	i_InputRange	Word	When using the internal temperature sensor. 1~99: The unit is Centigrade. 100~199: The unit is Fahrenheit. When using other analog module input. 200~299: The unit is digit.	Set the input range so that the type of the thermocouple and the measurement temperature range are set automatically.
Set value (SV) setting	i_SVSetting	Word	Set a value within the temperature setting range specified in the input range setting.	Sets the temperature for the set value of PID operation.

Name(Comment)	Label name	Data type	Setting range	Description
Unused channel setting	i_UnusedCH	Word	0: Used 1: Unused	Use to specify as unused channels where temperature control will not be performed and temperature sensors will not be connected.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the basic settings are completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

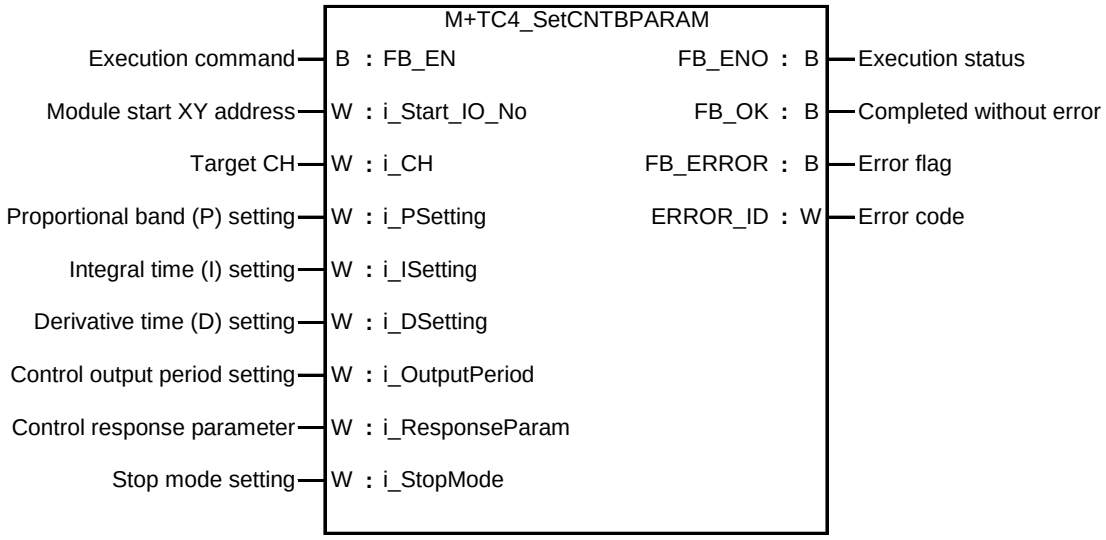
This chapter includes information related to the M+TC4_SetBPARAM function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.2. M+TC4_SetCNTBPARAM (Control basic parameters settings)

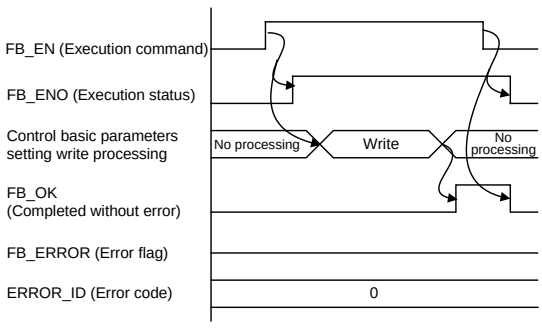
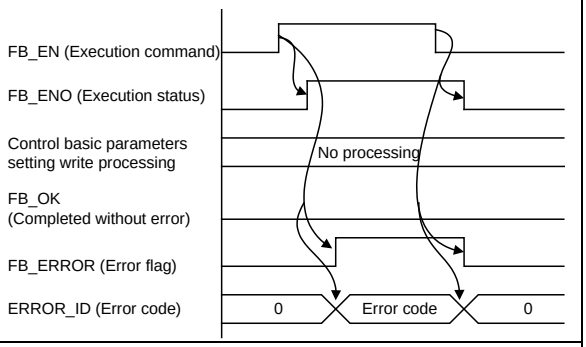
FB Name

M+TC4_SetCNTBPARAM

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the control basic parameters settings.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW),
Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">227 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the control basic parameters settings is written to the buffer memory.
2) FB operation is one-shot only, triggered by the FB_EN signal.
3) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Proportional band (P) setting	i_PSetting	Word	0~10,000	Set the proportional band (P) setting.
Integral time (I) setting	i_ISetting	Word	0~3,600	Set the integral time (I) setting.
Derivative time (D) setting	i_DSetting	Word	0~3,600	Set the derivative time (D) setting.
Control output period setting	i_OutputPeriod	Word	Control output period unit switch setting = 0:1s *1 1~100 Control output period unit switch setting = 1: 0.1s *1 5~1,000	Set the ON/OFF period of the transistor output. *1: For L60, the control output period unit switch setting can be performed by using the intelligent function module switch.

Name(Comment)	Label name	Data type	Setting range	Description
Control response parameter	i_ResponseParam	Word	0: Slow 1: Normal 2: Fast	Set the response to a PID control set value (SV) change.
Stop mode setting	i_StopMode	Word	0: Stop 1: Monitor 2: Alert	Set the mode to be entered at a PID operation stop.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the control basic parameters settings is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

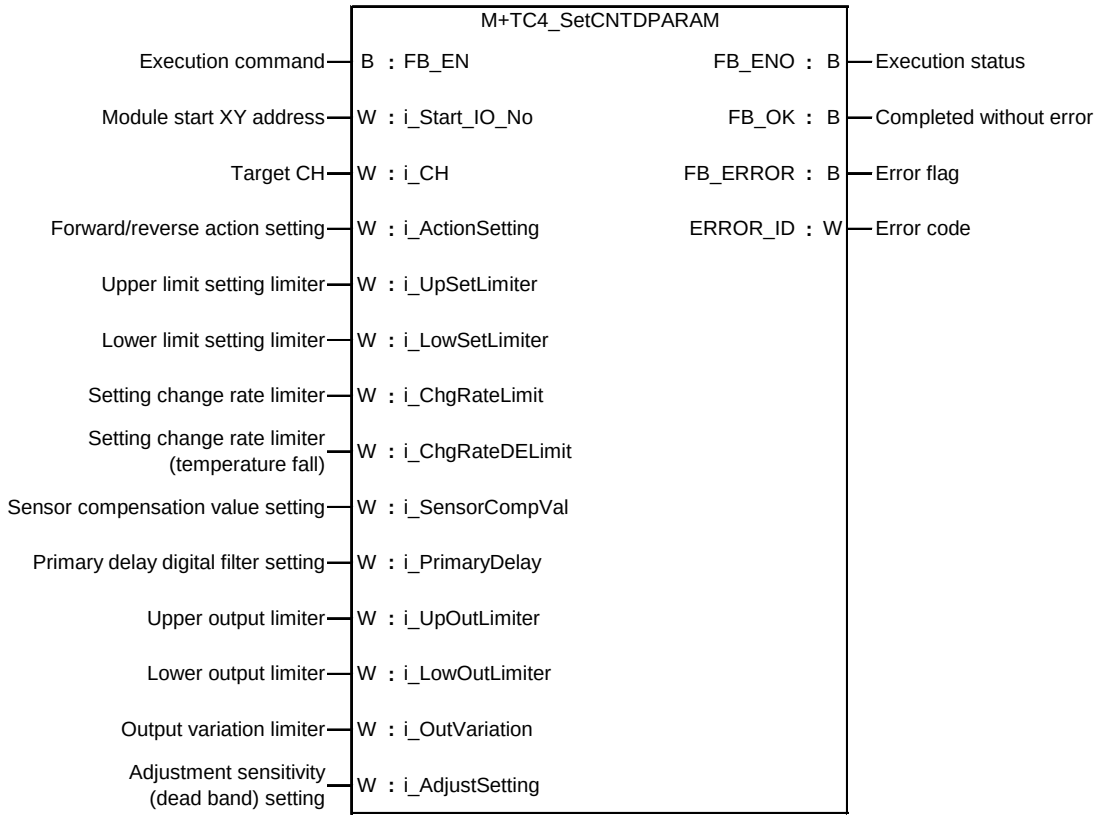
This chapter includes information related to the M+TC4_SetCNTBPARAM function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.3. M+TC4_SetCNTDPARAM (Control detailed parameters settings)

FB Name

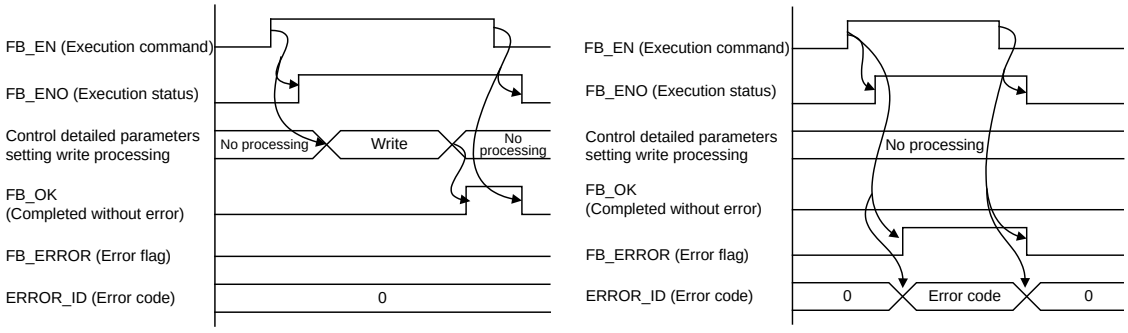
M+TC4_SetCNTDPARAM

Function Overview

Item	Description
Function overview	Set the control detailed parameters settings.
Symbol	
Applicable hardware and software	Temperature control module

Series	Model
MELSEC-Q series	Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N
MELSEC-L series	L60TCTT4(BW), L60TCRT4(BW)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2"></td><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".
</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">254 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the control detailed parameters settings is written to the buffer memory.
2) FB operation is one-shot only, triggered by the FB_EN signal.
3) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Forward/reverse action setting	i_ActionSetting	Word	0: Forward action 1: Reverse action	Specify the forward or reverse action.
Upper limit setting limiter	i_UpSetLimiter	Word	Set a value within the measurement temperature range that has been set with the input range.	Specify a value within the measurement temperature range that has been set with the input range.
Lower limit setting limiter	i_LowSetLimiter	Word	Set a value within the measurement temperature range that has been set with the input range.	Specify a value within the measurement temperature range that has been set with the input range.

Name(Comment)	Label name	Data type	Setting range	Description
Setting change rate limiter	i_ChgRateLimit	Word	0: Disabled 1~1,000 (0.1~100.0%)	Set the variation of the set value per unit time to a set value (SV) change. If the separate settings of the rise temperature and fall temperature are set for the change rate limiter setting of the intelligent function module switch setting, the setting change rate limiter is the rise temperature setting.
Setting change rate limiter (temperature fall)	i_ChgRateDELimit	Word	0: Disabled 1~1,000(0.1~100.0%) *1	This parameter can be set when the separate settings of the rise temperature and fall temperature are set for the change rate limiter setting of the switch setting 3. *1: To disable this setting, set 0.
Sensor compensation value setting	i_SensorCompVal	Word	-5,000~5,000 (-50.00~50.00%)	Sets the compensation value used when there is a difference between the measured temperature and the actual temperature.
Primary delay digital filter setting	i_PrimaryDelay	Word	0: Disabled 1~100	Specify the primary delay digital filter.
Upper output limiter	i_UpOutLimiter	Word	Standard control -50~1,050 (-5.0~105.0%) Heating/cooling control 0~1,050 (0.0~105.0%)	Specify the upper limit value for outputting to an external device.

Name(Comment)	Label name	Data type	Setting range	Description
Lower output limiter	i_LowOutLimiter	Word	Standard control -50~1,050 (-5.0~105.0%) Heating/cooling control 0~1,050 (0.0~105.0%)	Specify the lower limit value for outputting to an external device.
Output variation limiter	i_OutVariation	Word	0: Disabled 1~1,000 (0.1~100.0%/s)	Specify a range to suppress the variation of the manipulated value.
Adjustment sensitivity (dead band) setting	i_AdjustSetting	Word	1~100 (0.1~10.0%)	Set a range to prevent chattering of the transistor output.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the control detailed parameters settings is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

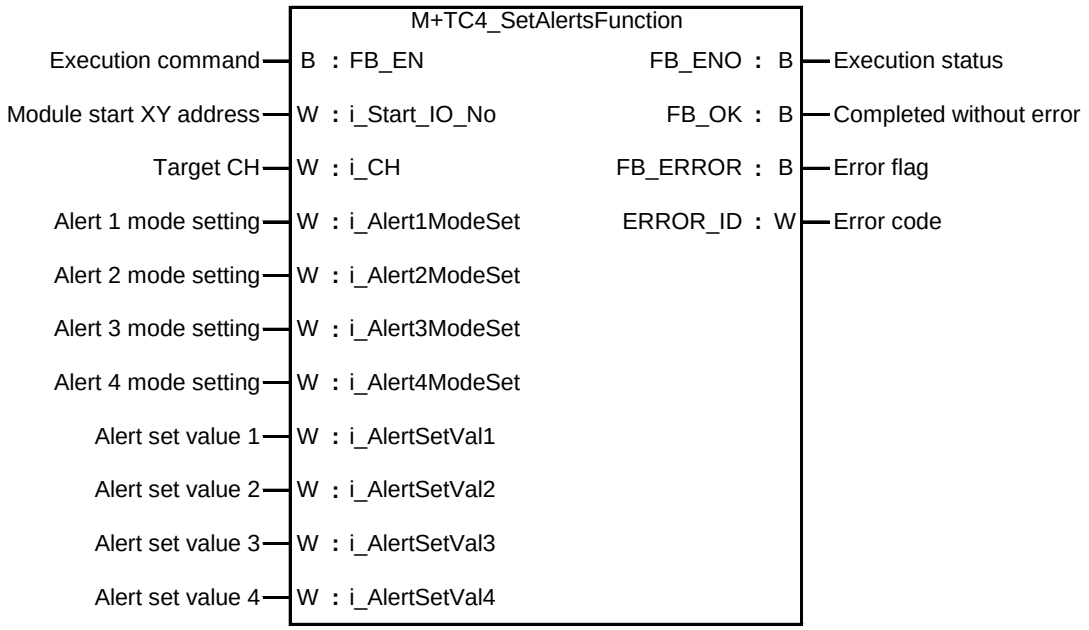
This chapter includes information related to the M+TC4_SetCNTDPARAM function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.4. M+TC4_SetAlertsFunction (Alert function setting)

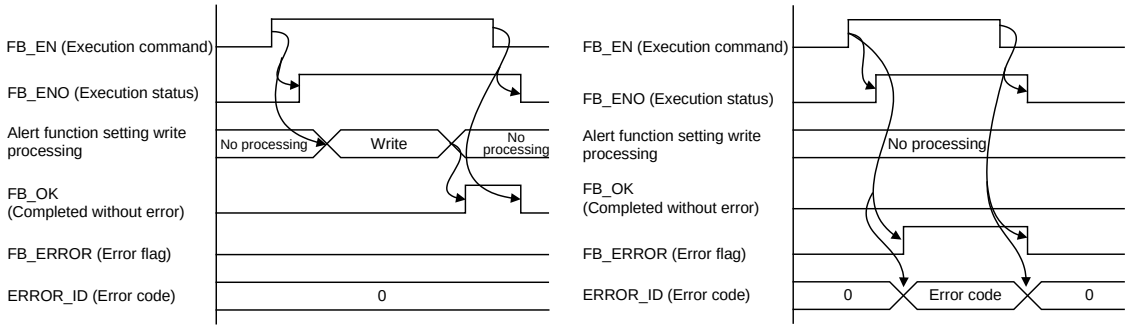
FB Name

M+TC4_SetAlertsFunction

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the alert function setting.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW),
Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table>
</td></tr>
<tr><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">246 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the alert function setting is written to the buffer memory.
2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
3) FB operation is one-shot only, triggered by the FB_EN signal.
4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z6, Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Alert 1 mode setting	i_Alert1ModeSet	Word	0: No alert 1~24	Set the alert 1 mode setting.
Alert 2 mode setting	i_Alert2ModeSet	Word	0: No alert 1~24	Set the alert 2 mode setting.
Alert 3 mode setting	i_Alert3ModeSet	Word	0: No alert 1~24	Set the alert 3 mode setting.
Alert 4 mode setting	i_Alert4ModeSet	Word	0: No alert 1~24	Set the alert 4 mode setting.
Alert set value 1	i_AlertSetVal1	Word	Perform the setting according to the alert type. 1 and 2: The temperature	Set the alert set value 1.
Alert set value 2	i_AlertSetVal2	Word		Set the alert set value 2.
Alert set value 3	i_AlertSetVal3	Word		Set the alert set value 3.

Name(Comment)	Label name	Data type	Setting range	Description
Alert set value 4	i_AlertSetVal4	Word	measurement range of the input range. 3, 4, 15, and 16: -(full-scale)~+(full-scale) 5, 6, 17, and 18: 0~+(full-scale)	Set the alert set value 4.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the alert function setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

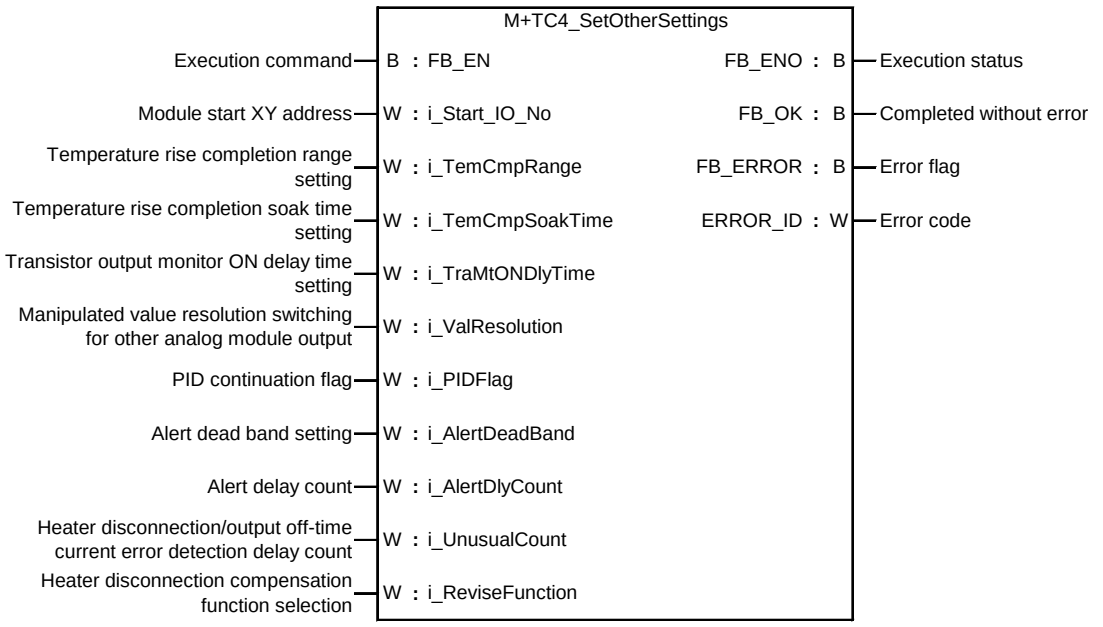
This chapter includes information related to the M+TC4_SetAlertsFunction function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.5. M+TC4_SetOtherSettings (Other settings)

FB Name

M+TC4_SetOtherSettings

Function Overview

Item	Description
Function overview	Sets the other settings.
Symbol	

Applicable hardware and software

Temperature control module

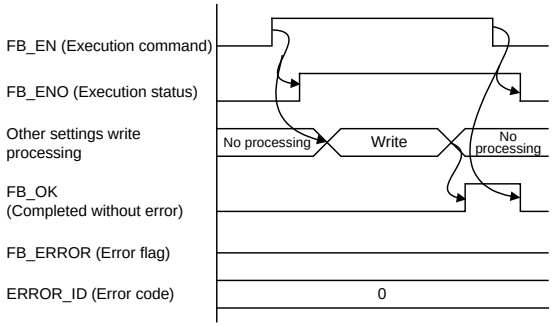
Series	Model
MELSEC-Q series	Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N
MELSEC-L series	L60TCTT4(BW), L60TCRT4(BW)

Hardware details

Series	Model
MELSEC-Q series *1	Basic model
	High performance model
	Universal model
MELSEC-L series	LCPU

*1 Not applicable to QCPU (A mode)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">194 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) When FB_EN (Execution command) is turned ON, the other settings are written to the buffer memory.
2) FB operation is one-shot only, triggered by the FB_EN signal.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
<tr><td>Restrictions and Precautions</td><td colspan="2">1) The FB cannot be used in an interrupt program.
2) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF.
3) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program.
4) Every input must be provided with a value for proper FB operation.
5) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary.
6) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module.
For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).</td></tr>
<tr><td>FB operation type</td><td colspan="2">Pulsed execution (1 scan execution type)</td></tr>
<tr><td>Application example</td><td colspan="2">Refer to "Appendix 1. FB Library Application Examples".</td></tr>
</table>

Item	Description
Timing chart	[When operation completes without error] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
None	None	None

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Temperature rise completion range setting	i_TemCmpRange	Word	1~10 (°C)	Set the temperature rise value, at which a temperature rise will be judged as completed, relative to the set value.
Temperature rise completion soak time setting	i_TemCmpSoakTime	Word	0~3600 (min)	Set a delay from when a temperature rise is completed until the temperature rise completion judgment flag is turned ON.
Transistor output monitor ON delay time setting	i_TraMtONDlyTime	Word	0: Disabled 1~50 (10~500ms)	Set the delay time for transistor ON delay output.
Manipulated value resolution switching for other analog module output	i_ValResolution	Word	0: 0~4,000 1: 0~12,000 2: 0~16,000 3: 0~20,000	Set the resolution for the manipulated value.
PID continuation flag	i_PIDFlag	Word	0: Stop 1: Continue	Set the operation mode to be entered when the setting/operation mode command (Yn1) turns OFF.

Name(Comment)	Label name	Data type	Setting range	Description
Alert dead band setting	i_AlertDeadBand	Word	0~100 (0.0~10.0%)	Set the dead band for alerts.
Alert delay count	i_AlertDlyCount	Word	0~255 (times)	Set the sampling count for judging an alert.
Heater disconnection/output off-time current error detection delay count *1	i_UnusualCount	Word	3~255 (times)	Set how many errors will occur before alert judgment is made. *1: Set 0 for modules other than below because they do not support the heater disconnection detection function. Q64TCTTBW, Q64TCRTBW, Q64TCTTBWN, Q64TCRTBWN, L60TCTT4BW, and L60TCRT4BW
Heater disconnection compensation function selection *1	i_ReviseFunction	Word	0: Heater disconnection compensation function is not used 1: Heater disconnection compensation function is used	Set whether the heater disconnection compensation function is used or not. *1: Set 0 for modules other than below because they do not support the heater disconnection detection function. Q64TCTTBW, Q64TCRTBW, Q64TCTTBWN, Q64TCRTBWN, L60TCTT4BW, and L60TCRT4BW

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates the other settings are completed.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

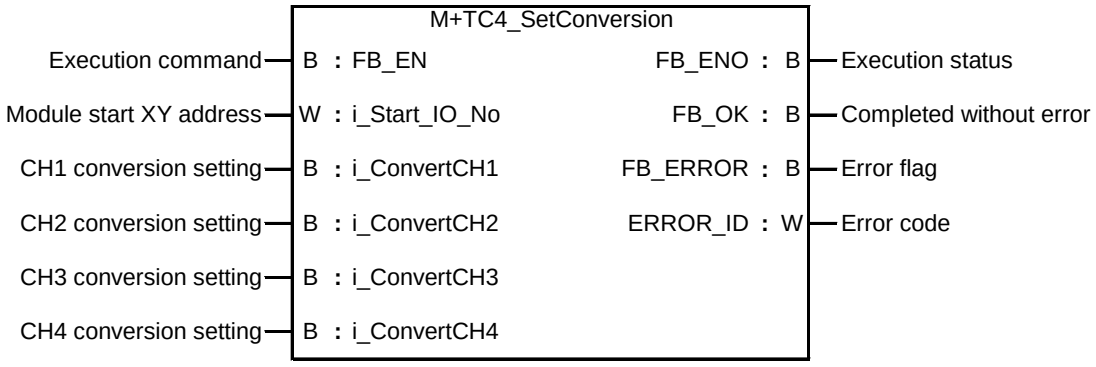
This chapter includes information related to the M+TC4_SetOtherSettings function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

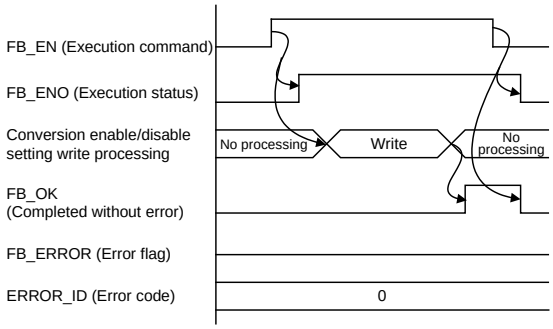
2.6. M+TC4_SetConversion (Conversion enable/disable setting)

FB Name

M+TC4_SetConversion

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the conversion enable/disable setting.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Temperature control module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table></td></tr>
<tr><td>Hardware details</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>Japanese version</td><td>Version1.86Q or later</td></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr><tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr><tr><td>Korean version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
</table>

Item	Description
Number of steps	221 steps (for MELSEC-L series CPU) * The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.
Function description	1) By turning ON FB_EN (Execution command), the conversion enable/disable setting of the specified channel is performed. 2) FB operation is one-shot only, triggered by the FB_EN signal.
Compiling method	Macro type
Restrictions and Precautions	1) The FB cannot be used in an interrupt program. 2) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 3) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 4) Every input must be provided with a value for proper FB operation. 5) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 6) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
None	None	None

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
CH1 conversion setting	i_ConvertCH1	Bit	ON,OFF	By turning ON each parameter, conversion is disabled for the corresponding channel.
CH2 conversion setting	i_ConvertCH2	Bit		
CH3 conversion setting	i_ConvertCH3	Bit		
CH4 conversion setting	i_ConvertCH4	Bit		

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates the conversion enable/disable setting is completed.
Error flag	FB_ERROR	Bit	OFF	Always OFF.
Error code	ERROR_ID	Word	0	Always 0.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

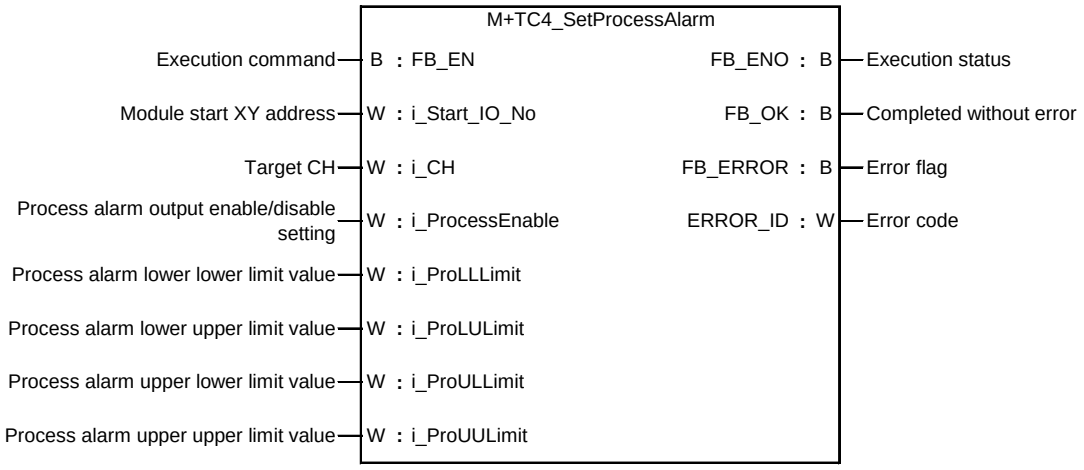
This chapter includes information related to the M+TC4_SetConversion function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.7. M+TC4_SetProcessAlarm (Process alarm setting)

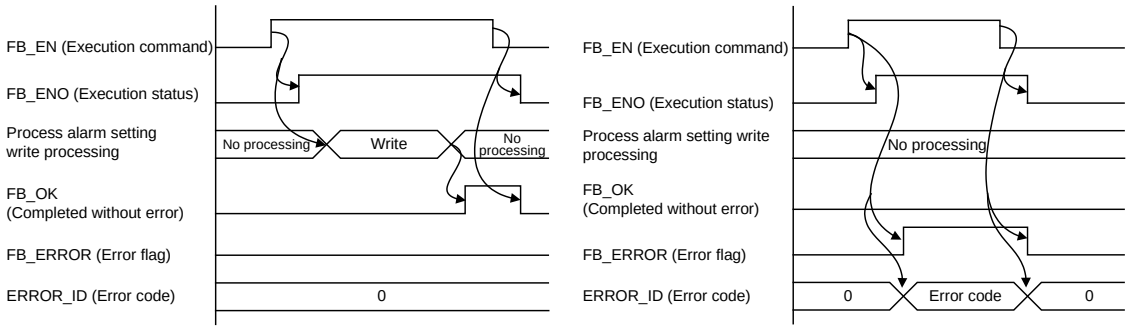
FB Name

M+TC4_SetProcessAlarm

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the process alarm setting.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Temperature control module</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table>
</td></tr>
<tr><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
</td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
</table>

Item	Description
Programming language	Ladder
Number of steps	216 steps (for MELSEC-L series CPU) * The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.
Function description	1) By turning ON FB_EN (Execution command), the setting values of the process alarm are written to the buffer memory. 2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode. 3) FB operation is one-shot only, triggered by the FB_EN signal. 4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) Do not use this FB in modules other than applicable modules. If used in modules other than applicable modules, an error will occur in the module. 9) To use this FB, set the temperature input mode. 10) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.

Name(Comment)	Label name	Data type	Setting range	Description
Process alarm output enable/disable setting	i_ProcessEnable	Word	0: Enabled 1: Disabled	Set whether to enable or disable the output of the process alarm.
Process alarm lower lower limit value	i_ProLLLimit	Word	Set values within the temperature setting range specified in the input range setting.	Set the lower/lower limit value of the process alarm..
Process alarm lower upper limit value	i_ProLULimit	Word		Set the lower/upper limit value of the process alarm.
Process alarm upper lower limit value	i_ProULLimit	Word		Set the upper/lower limit value of the process alarm.
Process alarm upper upper limit value	i_ProUULimit	Word		Set the upper/upper limit value of the process alarm.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the process alarm setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

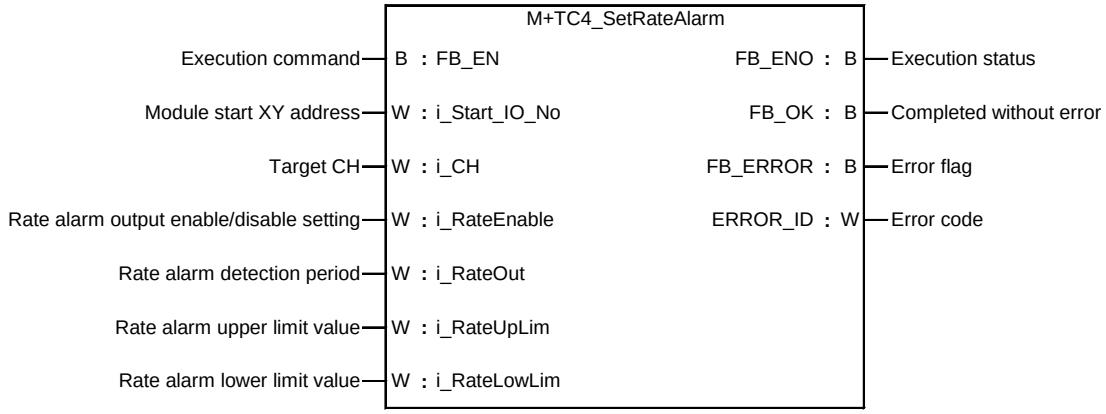
This chapter includes information related to the M+TC4_SetProcessAlarm function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.8. M+TC4_SetRateAlarm (Rate alarm setting)

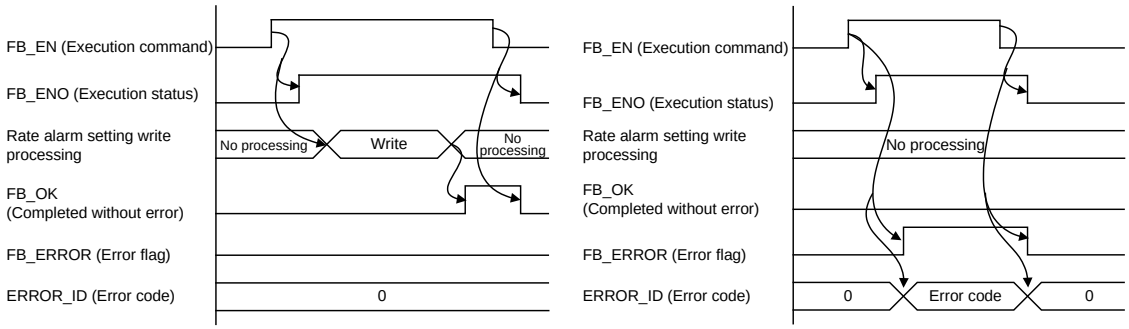
FB Name

M+TC4_SetRateAlarm

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the rate alarm.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Temperature control module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table></td></tr>
<tr><td>Hardware details</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>Japanese version</td><td>Version1.86Q or later</td></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr><tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr><tr><td>Korean version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
</table>

Item	Description
Number of steps	207 steps (for MELSEC-L series CPU) * The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.
Function description	1) By turning ON FB_EN (Execution command), the setting values of the rate alarm are written to the buffer memory. 2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode. 3) FB operation is one-shot only, triggered by the FB_EN signal. 4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) Do not use this FB in modules other than applicable modules. If used in modules other than applicable modules, an error will occur in the module. 9) To use this FB, set the temperature input mode. 10) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.

Name(Comment)	Label name	Data type	Setting range	Description
Rate alarm output enable/disable setting	i_RateEnable	Word	0: Enabled 1: Disabled	Set the rate alarm.
Rate alarm detection period	i_RateOut	Word	1~6000 (times)	Set the number of periods to check the changes of the measured temperature value.
Rate alarm upper limit value	i_RateUpLim	Word	-32,768~32,767	Set the upper limit value of the rate alarm.
Rate alarm lower limit value	i_RateLowLim	Word	-32,768~32,767	Set the lower limit value of the rate alarm.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the rate alarm setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

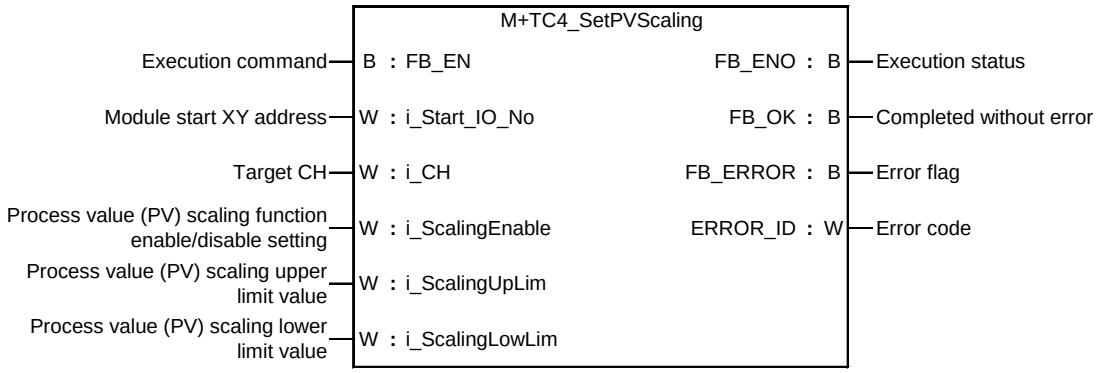
This chapter includes information related to the M+TC4_SetRateAlarm function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.9. M+TC4_SetPVScaling (Process value (PV) scaling function setting)

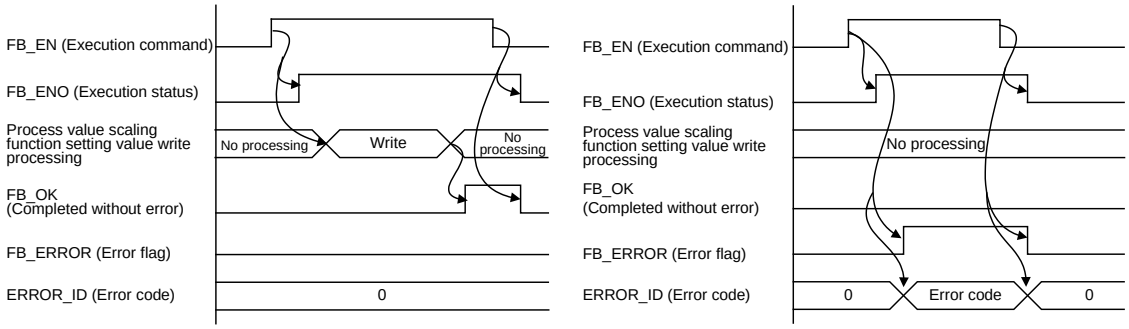
FB Name

M+TC4_SetPVScaling

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the process value (PV) scaling function.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-Q series</td><td>Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table></td></tr>
<tr><td>Hardware details</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr><tr><td>High performance model</td></tr><tr><td>Universal model</td></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table>*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">232 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the set parameters are written to the buffer memory.
2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
3) FB operation is one-shot only, triggered by the FB_EN signal.
4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Process value (PV) scaling function enable/disable setting	i_ScalingEnable	Word	0: Disabled 1: Enabled	Set whether to enable or disable the process value (PV) scaling function.
Process value (PV) scaling upper limit value	i_ScalingUpLim	Word	-32,000~32,000	Set the process value (PV) scaling upper limit value.
Process value (PV) scaling lower limit value	i_ScalingLowLim	Word	-32,000~32,000	Set the process value (PV) scaling lower limit value.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the process value (PV) scaling setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

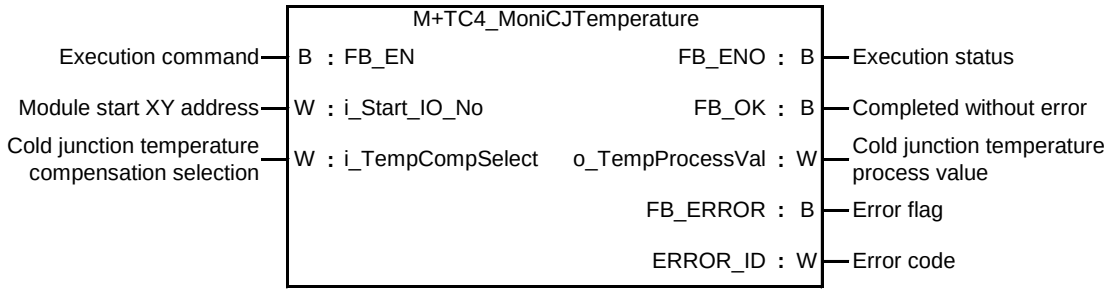
This chapter includes information related to the M+TC4_SetPVScaling function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

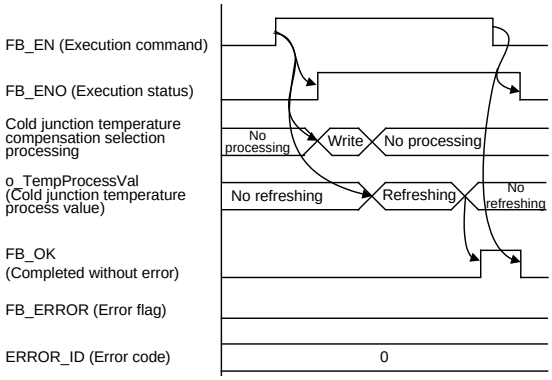
2.10. M+TC4_MoniCJTemperature (Cold junction temperature process value monitoring function)

FB Name

M+TC4_MoniCJTemperature

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the cold junction temperature compensation and reads the cold junction temperature process value.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCTT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW)</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)</td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
</table>

Item	Description
Programming language	Ladder
Number of steps	203 steps (for MELSEC-Q series universal model CPU) * The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.
Function description	1) By turning ON FB_EN (Execution command), the value of i_TempCompSelect (Cold junction temperature compensation selection) is written to the buffer memory and the cold junction temperature process value is read from the buffer memory.
Compiling method	Macro type
Restrictions and Precautions	1) The FB cannot be used in an interrupt program. 2) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 3) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 4) Every input must be provided with a value for proper FB operation. 5) Do not use this FB in modules that are not listed in applicable hardware section. If used in modules other than applicable modules, an error will occur in the module. 6) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] 

Item	Description
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
None	None	None

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Cold junction temperature compensation selection	i_TempCompSelect	Word	0: Standard terminal block is used. 1: Temperature control terminal block conversion module 2: Cold junction temperature compensation is not used. *1	Set the cold junction temperature compensation. *1: For Q64TCTT(BW), do not set "2" because this model does not support the setting.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the cold junction temperature process value is being read.
Cold junction temperature process value	o_TempProcessVal	Word	0	Store the cold junction temperature process value.
Error flag	FB_ERROR	Bit	OFF	Always OFF.
Error code	ERROR_ID	Word	0	Always 0.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

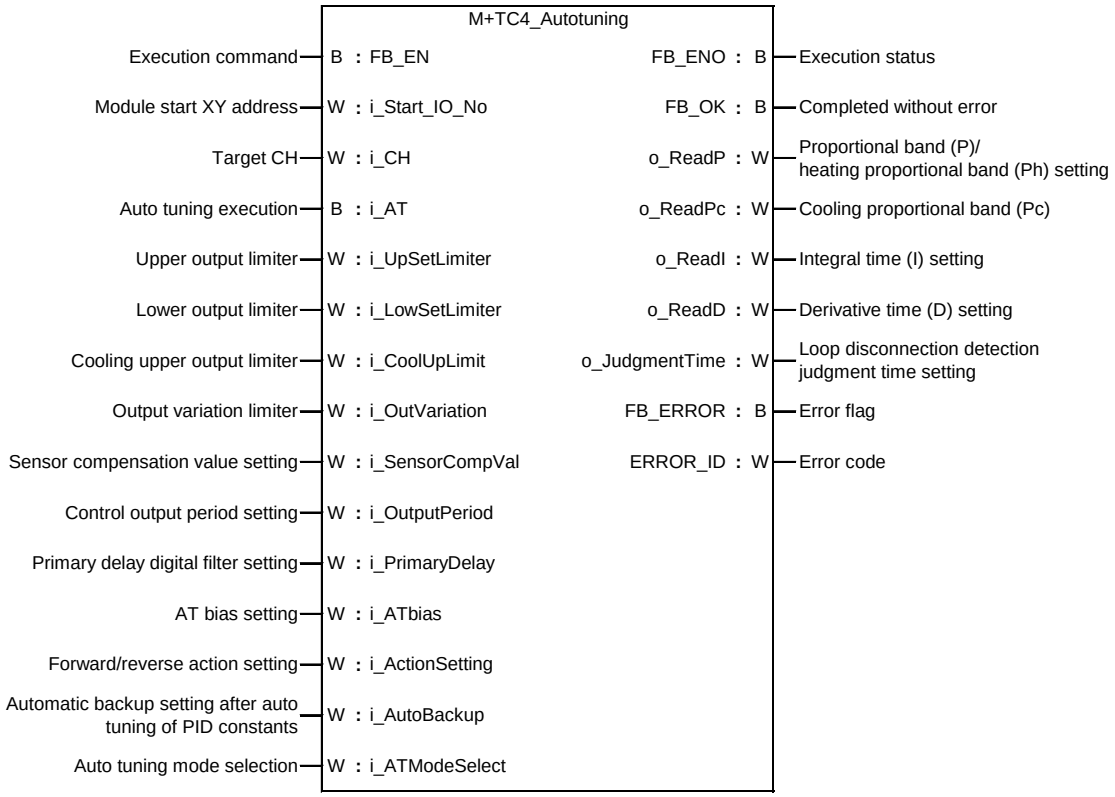
This chapter includes information related to the M+TC4_MoniCJTemperature function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.11. M+TC4_Autotuning (Auto tuning)

FB Name

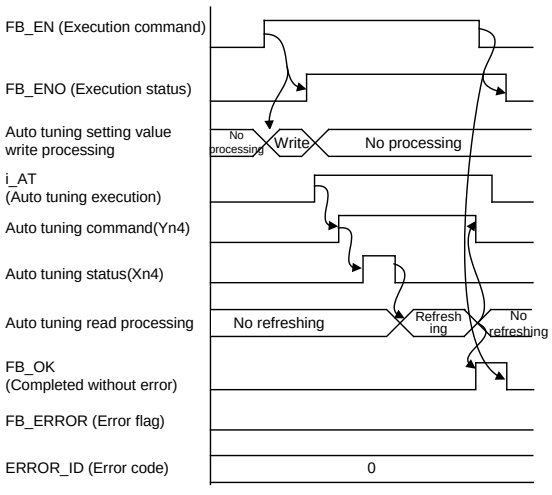
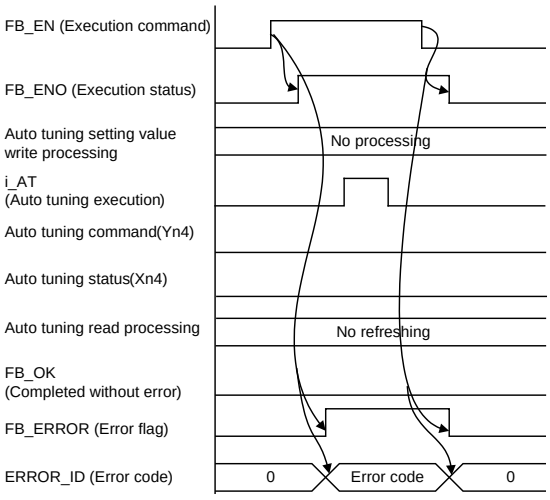
M+TC4_Autotuning

Function Overview

Item	Description
Function overview	Sets and executes auto tuning.
Symbol	
Applicable hardware and software	Temperature control module

Series	Model
MELSEC-Q series	Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N
MELSEC-L series	L60TCTT4(BW), L60TCRT4(BW)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2"></td><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".
</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">352 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the parameters are set, and by turning ON i_AT (Auto tuning execution), auto tuning is executed.
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned ON. 6) This FB uses index registers Z4, Z5, Z6, Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) When this FB is used in two or more places, a duplicated coil warning will occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (multiple scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] (CH1)  [When an error occurs] (CH1) 

Item	Description
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Auto tuning execution	i_AT	Bit	ON,OFF	To execute auto tuning, turn ON this parameter.
Upper output limiter	i_UpSetLimiter	Word	Standard control -50~1,050 (-5.0~105.0%) Heating/cooling control 0~1,050 (0.0~105.0%)	Specify the upper limit value for outputting to an external devise.

Name(Comment)	Label name	Data type	Setting range	Description
Lower output limiter	i_LowSetLimiter	Word	Standard control -50~1,050 (-5.0~105.0%) Heating/cooling control *1 This parameter is disabled even if it is set.	Specify the lower limit value for outputting to an external devise. *1: Set 0 for heating/cooling control.
Cooling upper output limiter	i_CoolUpLimit	Word	Standard control This parameter is disabled even if it is set. Heating/cooling control *1 0~1,050 (0.0~105.0%)	Set the cooling upper limiter. *1: Set 0 for Q64TCTT (BW) and Q64TCRT (BW) because they are not supported.
Output variation limiter	i_OutVariation	Word	0: Disabled 1~1,000(0.1~100.0%/s)	Specify a range to prevent a sudden manipulated value change.
Sensor compensation value setting	i_SensorCompVal	Word	-5,000~5,000 (-50.00~50.00%)	Set the compensation value for when there is a difference between the measured temperature and actual temperature.
Control output period setting	i_OutputPeriod	Word	Control output period unit switch setting = 0: 1s 1~100 Control output period unit switch setting = 1: 0.1s 5~1,000	Set the ON/OFF period of the transistor output.
Primary delay digital filter setting	i_PrimaryDelay	Word	0: Disabled 1~100 s	Set the primary delay digital filter.
AT bias setting	i_ATbias	Word	Input range	Set the AT bias setting.
Forward/reverse action setting	i_ActionSetting	Word	0: Forward action *1 1: Reverse action	Set the forward/reverse action setting. *Set 0 for heating/cooling control.
Automatic backup setting after auto tuning of PID constants	i_AutoBackup	Word	0: Disable 1: Enable	Set whether to automatically back up the PID constants.

Name(Comment)	Label name	Data type	Setting range	Description
Auto tuning mode selection	i_ATModeSelect	Word	0: Standard mode 1: Fast response mode	Set the auto tuning mode.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the auto tuning is completed.
Proportional band (P)/heating proportional band (Ph) setting	o_ReadP	Word	0	Store the proportional band (P)/heating proportional band (Ph) setting.
Cooling proportional band (Pc)	o_ReadPc	Word	0	Store the cooling proportional band (Pc). *Do not set any output label circuits for Q64TCTT(BW) and Q64TCRT(BW) because they do not have read targets.
Integral time (I) setting	o_ReadI	Word	0	Store the integral time (I) setting.
Derivative time (D) setting	o_ReadD	Word	0	Store the derivative time (D) setting.
Loop disconnection detection judgment time setting	o_JudgmentTime	Word	0	Store the loop disconnection detection judgment time setting.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

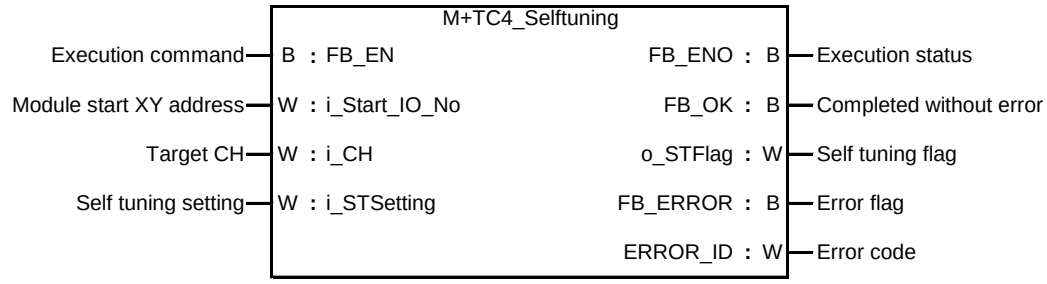
This chapter includes information related to the M+TC4_ Autotuning function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.12. M+TC4_Selftuning (Self tuning)

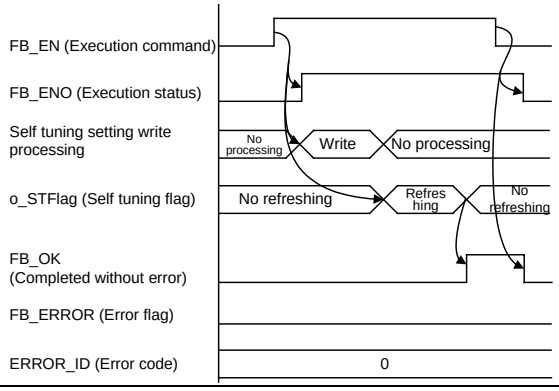
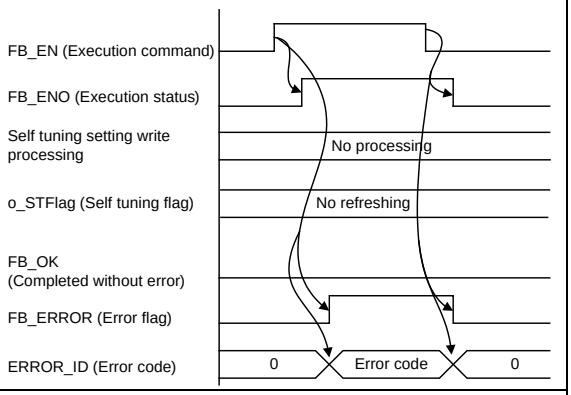
FB Name

M+TC4_Selftuning

Function Overview

Item	Description	
Function overview	Sets the self tuning setting and monitors the self tuning flag.	
Symbol		
Applicable hardware and software	Temperature control module	<table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-Q series</td><td>Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table>
	Hardware details	<table><tr><th>Series</th><th>Model</th></tr><tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr><tr><td>High performance model</td></tr><tr><td>Universal model</td></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table> *1 Not applicable to QCPU (A mode)
	Engineering software	GX Works2 *1 <table><tr><th>Language</th><th>Software version</th></tr><tr><td>Japanese version</td><td>Version1.86Q or later</td></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr><tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr><tr><td>Korean version</td><td>Version1.49B or later</td></tr></table> *1 For software versions applicable to the modules used, refer to "Relevant manuals".

Item	Description
Programming language	Ladder
Number of steps	189 steps (for MELSEC-Q series universal model CPU) * The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.
Function description	1) By turning ON FB_EN (Execution command), i_STSetting (Self tuning setting) is set and o_STFlag (Self tuning flag) is monitored. 2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) This FB sets the self tuning and monitors its flag. For details on the self tuning, refer to MELSEC-L Temperature Control Module User's Manual. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Self tuning setting	i_STSetting	Word	0: Self tuning is not performed 1: Start-up ST (Calculates PID constants only) 2: Start-up ST (Calculates simultaneous temperature rise parameter only) 3: Start-up ST (Calculates PID constants and simultaneous temperature rise parameter) 4: Start-up ST + Vibration ST (Both calculates PID constants only)	Set the self tuning operation setting.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the self tuning is being monitored.
Self tuning flag	o_STFlag	Word	0	Store the status of the self tuning.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

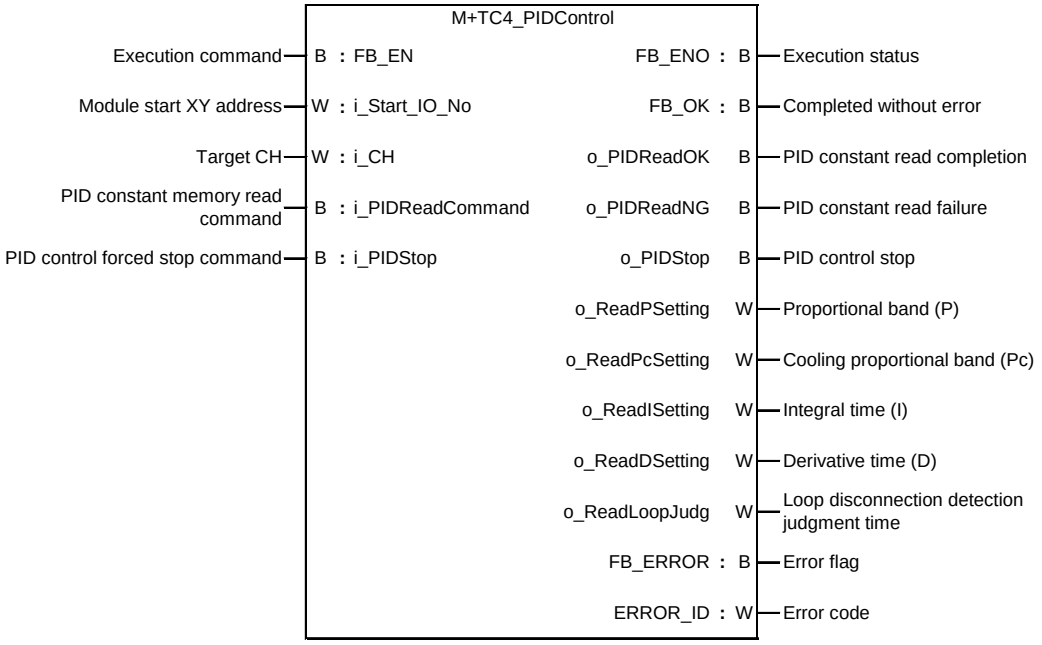
This chapter includes information related to the M+TC4_Selftuning function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.13. M+TC4_PIDControl (PID control)

FB Name

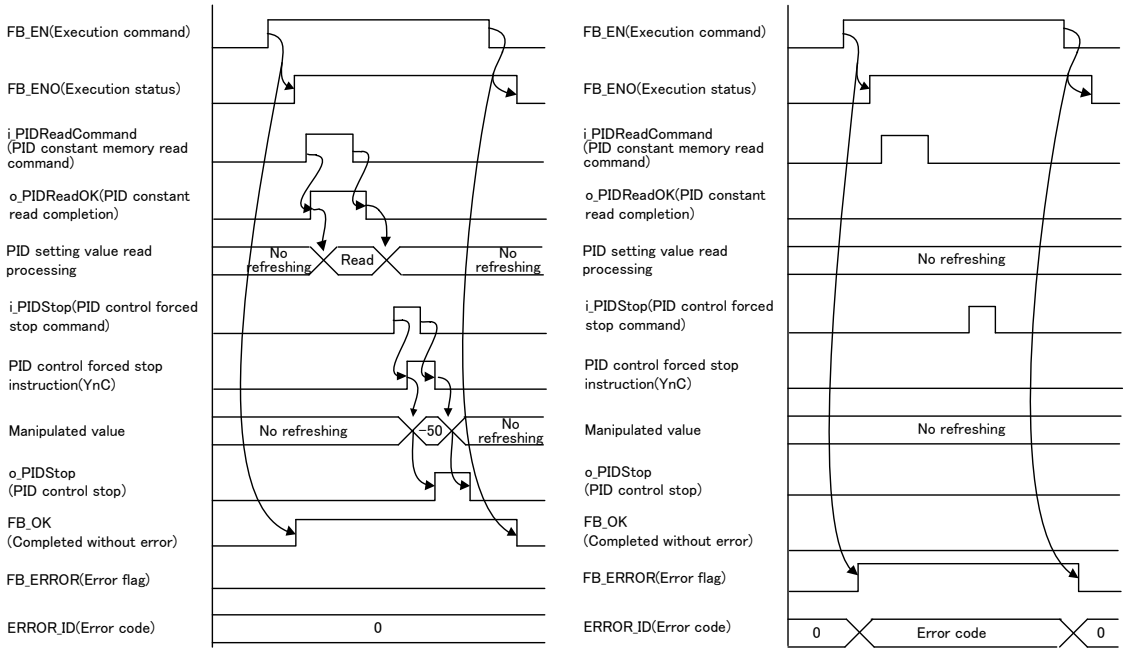
M+TC4_PIDControl

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Reads the PID constants and executes a forced PID control stop.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-Q series</td><td>Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table></td></tr>
<tr><td>Hardware details</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr><tr><td>High performance model</td></tr><tr><td>Universal model</td></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table>*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">313 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) After FB_EN (Execution command) is turned ON, the PID constants are read by turning ON i_PIDReadCommand (PID constant memory read command) and a forced PID control stop is executed by turning ON i_PIDStop (PID control forced stop command).
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z5, Z6, Z7, Z8, and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) The action to be taken at a PID operation stop depends on the setting of the stop mode setting. For details, refer to MELSEC-L Temperature Control Module User's Manual and MELSEC-Q Temperature Control Module User's Manual. 8) When this FB is used in two or more places, a duplicated coil warning will occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] (CH1) 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
PID constant memory read command	i_PIDReadCommand	Bit	ON,OFF	ON: Read the PID commands. OFF: Do not read the PID commands.
PID control forced stop command	i_PIDStop	Bit	ON,OFF	ON: Execute a forced PID control stop. OFF: Do not execute a forced PID control stop.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, the PID setting can be read and a forced PID control stop can be executed.
PID constant read completion	o_PIDReadOK	Bit	OFF	ON: Read is completed. OFF: Read is not executed.
PID constant read failure	o_PIDReadNG	Bit	OFF	ON: Read failed. OFF: Read is not executed.
PID control stop	o_PIDStop	Bit	OFF	ON: PID control is stopped. OFF: PID control is being performed.
Proportional band (P)	o_ReadPSetting	Word	0	Store the proportional band (P) that was read.
Cooling proportional band (Pc)	o_ReadPcSetting	Word	0	Store the cooling proportional band (Pc) that was read. *Do not set any output label circuits for Q64TCTT(BW) or Q64TCRT(BW) because they do not have read targets.
Integral time (I)	o_ReadISetting	Word	0	Store the integral time (I) that was read.
Derivative time (D)	o_ReadDSetting	Word	0	Store the derivative time (D) that was read.
Loop disconnection detection judgment time	o_ReadLoopJudg	Word	0	Store the loop disconnection detection judgment time that was read.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

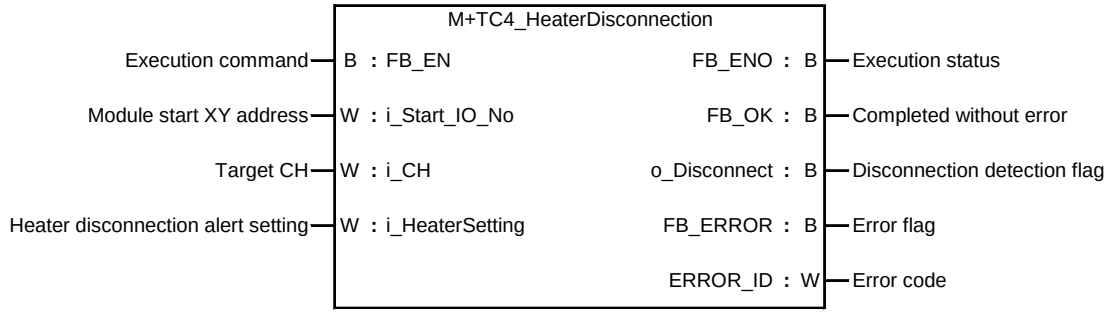
This chapter includes information related to the M+TC4_PIDControl function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.14. M+TC4_HeaterDisconnection (Heater disconnection detection function)

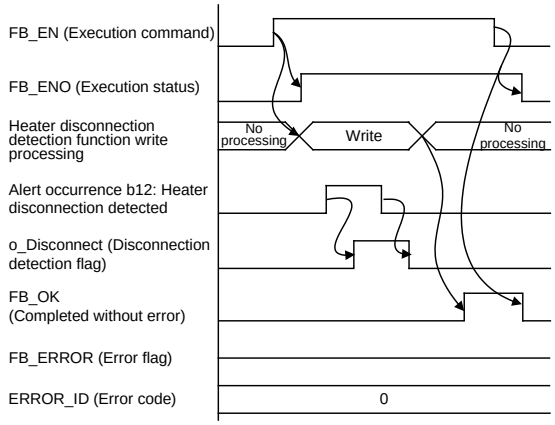
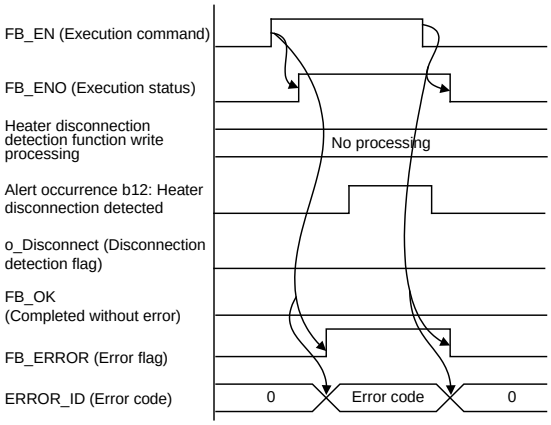
FB Name

M+TC4_HeaterDisconnection

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the heater disconnection detection and monitors the heater disconnection.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTTBW, Q64TCRTBW,
Q64TCTTBWN, Q64TCRTBWN</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4BW, L60TCRT4BW</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">252 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the set parameters are written to the buffer memory and the heater disconnection is monitored.
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z6, Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) Do not use this FB in modules other than applicable modules. If used in modules other than applicable modules, an error will occur in the module. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error codes	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Heater disconnection alert setting	i_HeaterSetting	Word	0: Disabled 1~100(%)	Set the heater disconnection alert setting.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the heater disconnection detection function setting is completed.
Disconnection detection flag	o_Disconnect	Bit	OFF	ON: Heater disconnection occurring. OFF: Heater disconnection not occurring.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

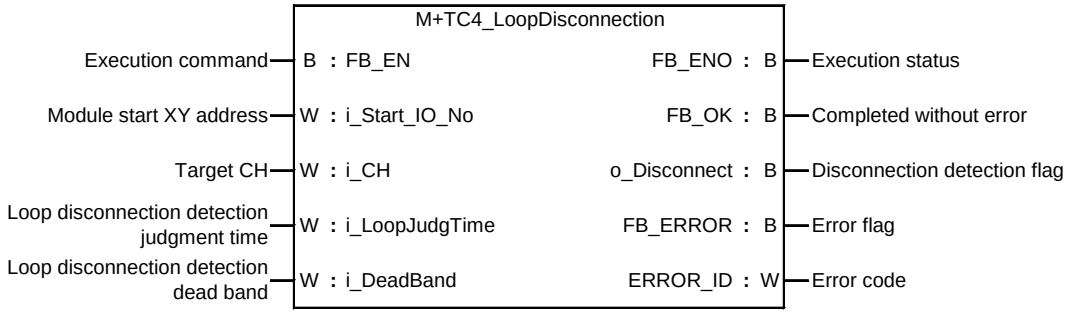
This chapter includes information related to the M+TC4_HeaterDisconnection function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.15. M+TC4_LoopDisconnection (Loop disconnection detection function)

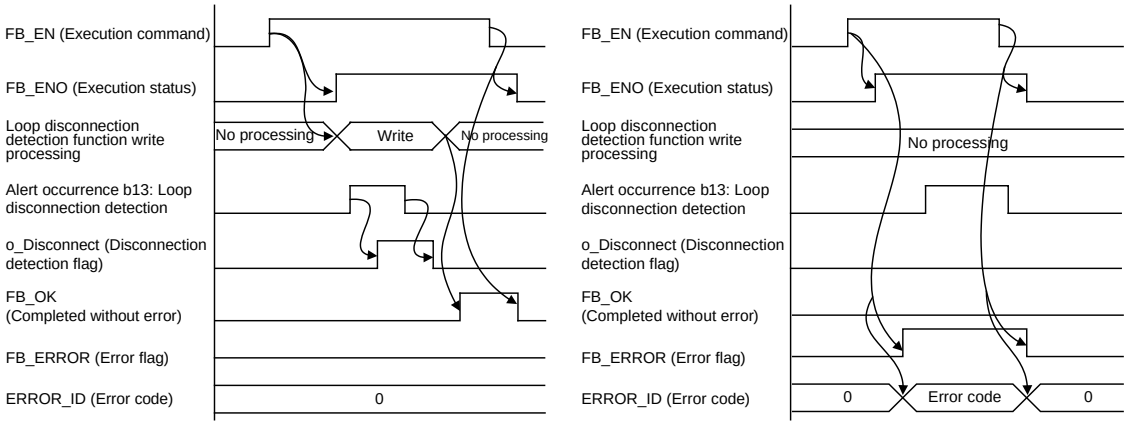
FB Name

M+TC4_LoopDisconnection

Function Overview

Item	Description	
Function overview	Sets the loop disconnection detection and monitors the loop disconnection.	
Symbol		
Applicable hardware and software	Temperature control module	<table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table>
	Hardware details	<table><tr><th>Series</th><th>Model</th></tr><tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr><tr><td>High performance model</td></tr><tr><td>Universal model</td></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table> *1 Not applicable to QCPU (A mode)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">248 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the set parameters are written to the buffer memory and the loop disconnection is monitored.
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z6, Z7, Z8, and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Loop disconnection detection judgment time	i_LoopJudgTime	Word	0~7,200(s)	Set the loop disconnection detection judgment time.
Loop disconnection detection dead band	i_DeadBand	Word	Input range	Set the loop disconnection detection dead band.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the loop disconnection detection function setting is completed.
Disconnection detection flag	o_Disconnect	Bit	OFF	ON: Loop disconnection occurring. OFF: Loop disconnection not occurring.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

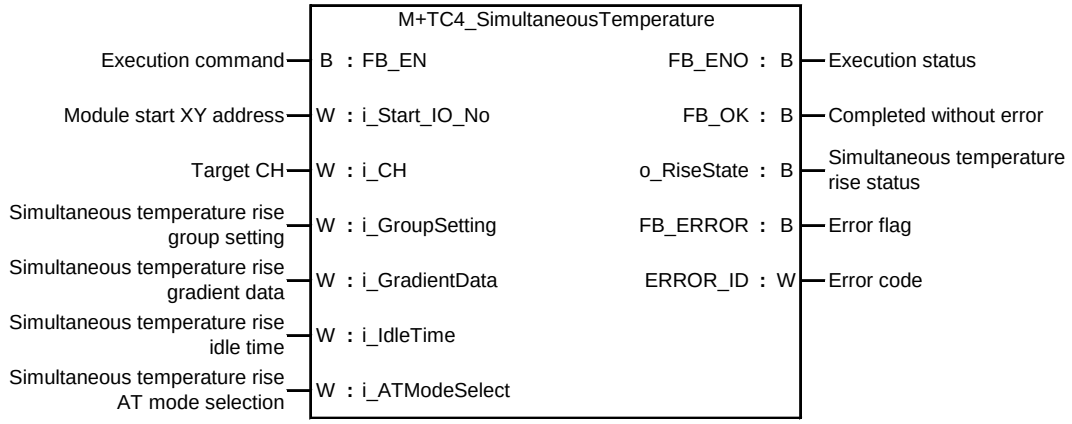
This chapter includes information related to the M+TC4_LoopDisconnection function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.16. M+TC4_SimultaneousTemperature (Simultaneous temperature rise function setting)

FB Name

M+TC4_SimultaneousTemperature

Function Overview

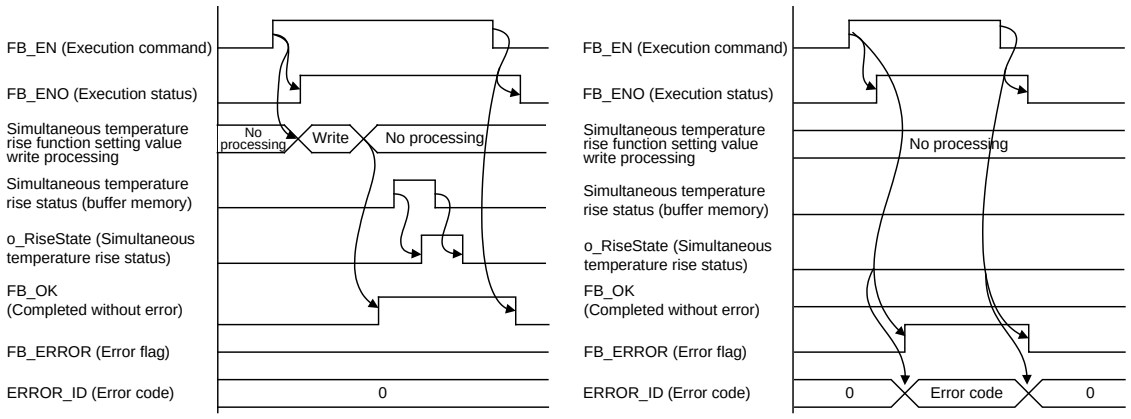
Item	Description	
Function overview	Sets simultaneous temperature rise function setting and monitors the status of the simultaneous temperature rise.	
Symbol		
Applicable hardware and software	Temperature control module	See table below
	Hardware details	See table below

Series	Model
MELSEC-Q series	Q64TCTT(BW)N, Q64TCRT(BW)N
MELSEC-L series	L60TCTT4(BW), L60TCRT4(BW)

Series	Model
MELSEC-Q series *1	Basic model
	High performance model
	Universal model
MELSEC-L series	LCPU

*1 Not applicable to QCPU (A mode)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">253 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the setting values of the simultaneous temperature rise function are written to the buffer memory.
2) After FB_OK (Completed without error) is turned ON, the simultaneous temperature rise status is monitored.
3) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.
Simultaneous temperature rise group setting	i_GroupSetting	Word	<Standard control> 0: Simultaneous temperature rise is not performed 1: Group 1 selection 2: Group 2 selection <Mixed control> 0: Simultaneous temperature rise is not performed 1: Simultaneous temperature rise is performed	Set the simultaneous temperature rise group setting.
Simultaneous temperature rise gradient data	i_GradientData	Word	0~Upper limit value of the input range	Set the simultaneous temperature rise gradient data.

Name(Comment)	Label name	Data type	Setting range	Description
Simultaneous temperature rise idle time	i_IdleTime	Word	0~3,600(s)	Set the simultaneous temperature rise idle time.
Simultaneous temperature rise AT mode selection	i_ATModeSelect	Word	0: Standard auto tuning selection 1: Simultaneous temperature rise auto tuning selection	Set the auto tuning mode setting.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the simultaneous temperature rise function setting is completed.
Simultaneous temperature rise status	o_RiseState	Bit	OFF	ON: Simultaneous temperature rise is being performed. OFF: Simultaneous temperature rise is not performed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

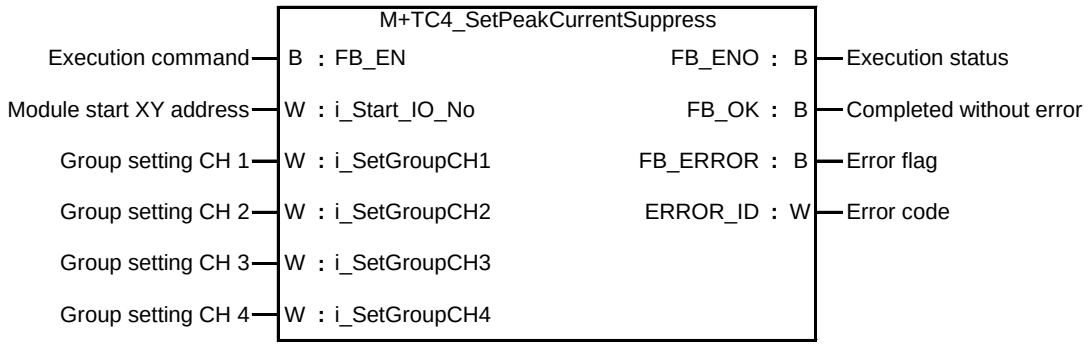
This chapter includes information related to the M+TC4_SimultaneousTemperature function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.17. M+TC4_SetPeakCurrentSuppress (Peak current limit control setting)

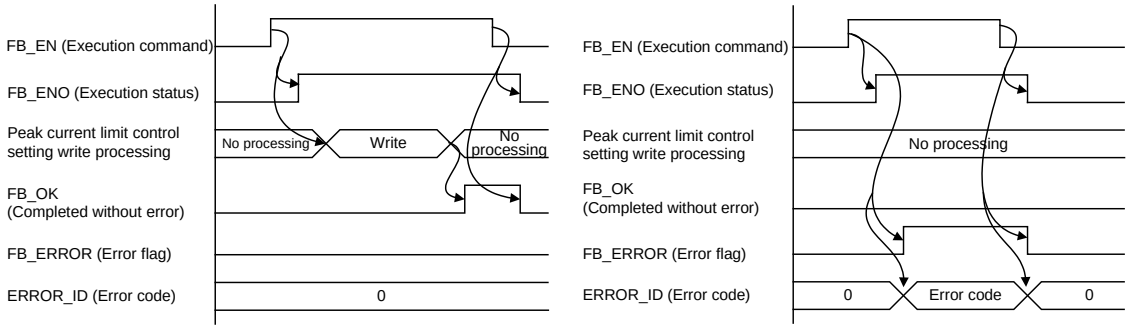
FB Name

M+TC4_SetPeakCurrentSuppress

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the peak current limit control setting.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table>
</td></tr>
<tr><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">236 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the divided groups of each channel is written to the peak current limit control setting divided group setting.
2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
3) FB operation is one-shot only, triggered by the FB_EN signal.
4) When the setting value of i_SetGroupCH1 (Group setting CH1) to i_SetGroupCH4 (Group setting CH 4) is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 11 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 5) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) Do not use this FB in modules that are not listed in applicable hardware section. If used in modules other than applicable modules, an error will occur in the module. 8) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 9) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
11 (Decimal)	Group settings CH1 to CH4 are not valid. Group settings CH1 to CH 4 are not within the range of 0 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Group setting CH 1	i_SetGroupCH1	Word	0: Not divided 1: Group 1 2: Group 2 3: Group 3 4: Group 4	Set the peak current limit control divided group settings for CH1 to CH4.
Group setting CH 2	i_SetGroupCH2	Word		
Group setting CH 3	i_SetGroupCH3	Word		
Group setting CH 4	i_SetGroupCH4	Word		

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the peak current limit control setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

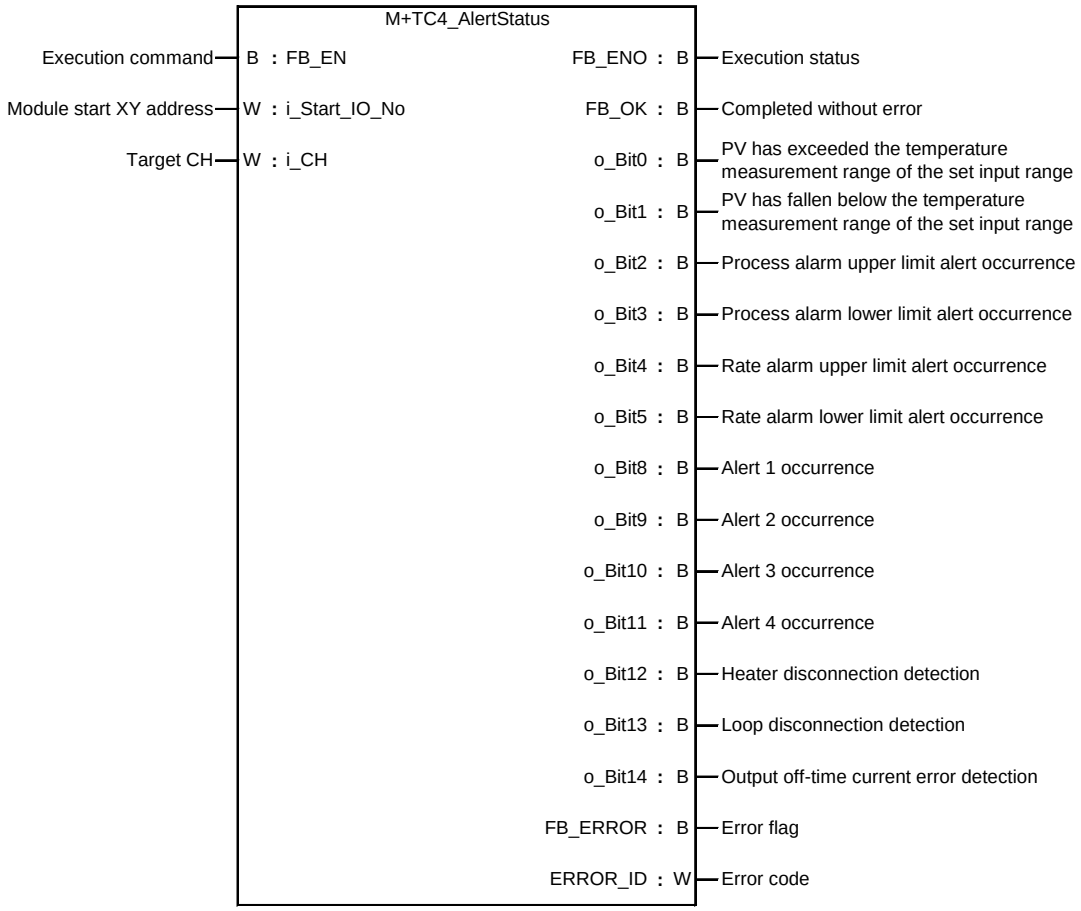
This chapter includes information related to the M+TC4_SetPeakCurrentSuppress function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.18. M+TC4_AlertStatus (Alert status check)

FB Name

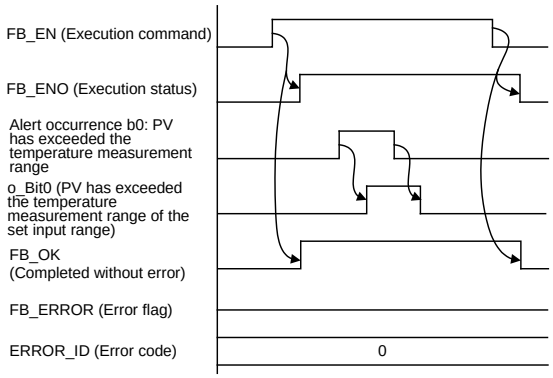
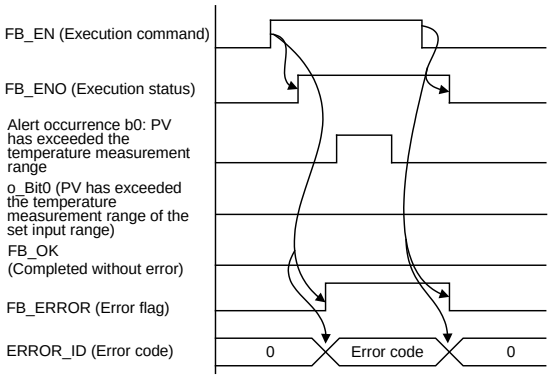
M+TC4_AlertStatus

Function Overview

Item	Description
Function overview	Monitors an alert that has occurred.
Symbol	
Applicable hardware and software	Temperature control module

Series	Model
MELSEC-Q series	Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N
MELSEC-L series	L60TCTT4(BW), L60TCRT4(BW)

<table>
<tr><td>Item</td><td colspan="2">Description</td></tr>
<tr><td rowspan="2"></td><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".
</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">262 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), an alert is monitored.
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] (When alert occurrence b0 is monitored)  [When an error occurs] (When alert occurrence b0 is monitored) 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that an alert is being monitored.
PV has exceeded the temperature measurement range of the set input range	o_Bit0	Bit	OFF	ON: PV has exceeded the temperature measurement range of the set input range. OFF: Alert not occurring.

Name(Comment)	Label name	Data type	Initial value	Description
PV has fallen below the temperature measurement range of the set input range	o_Bit1	Bit	OFF	ON: PV has fallen below the temperature measurement range of the set input range. OFF: Alert not occurring.
Process alarm upper limit alert occurrence	o_Bit2	Bit	OFF	ON: Process alarm upper limit alert occurring. OFF: Alert not occurring.
Process alarm lower limit alert occurrence	o_Bit3	Bit	OFF	ON: Process alarm lower limit alert occurring. OFF: Alert not occurring.
Rate alarm upper limit alert occurrence	o_Bit4	Bit	OFF	ON: Rate alarm upper limit alert occurring. OFF: Alert not occurring.
Rate alarm lower limit alert occurrence	o_Bit5	Bit	OFF	ON: Rate alarm lower limit alert occurring. OFF: Alert not occurring.
Alert 1 occurrence	o_Bit8	Bit	OFF	ON: Alert 1 occurring. OFF: Alert not occurring.
Alert 2 occurrence	o_Bit9	Bit	OFF	ON: Alert 2 occurring. OFF: Alert not occurring.
Alert 3 occurrence	o_Bit10	Bit	OFF	ON: Alert 3 occurring. OFF: Alert not occurring.
Alert 4 occurrence	o_Bit11	Bit	OFF	ON: Alert 4 occurring. OFF: Alert not occurring.
Heater disconnection detection	o_Bit12	Bit	OFF	ON: Heater disconnection was detected. OFF: Alert not occurring.
Loop disconnection detection	o_Bit13	Bit	OFF	ON: Loop disconnection was detected. OFF: Alert not occurring.
Output off-time current error detection	o_Bit14	Bit	OFF	ON: A current error when the output is OFF was detected. OFF: Alert not occurring.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

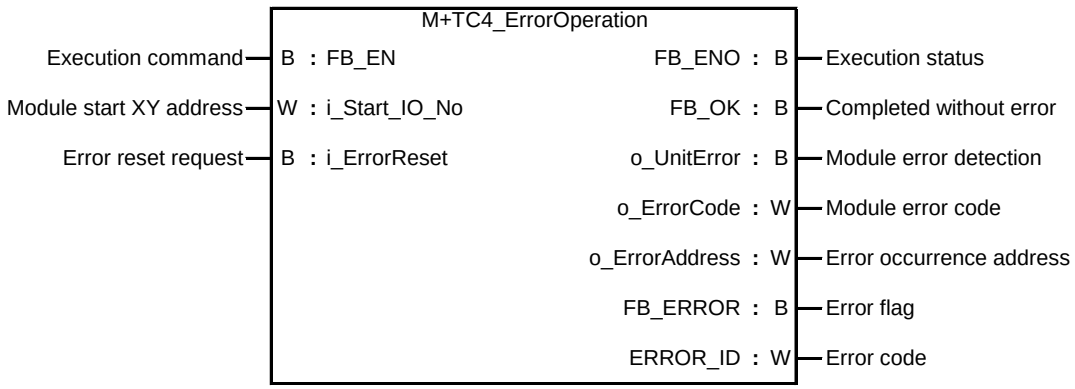
This chapter includes information related to the M+TC-4_AlertStatus function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.19. M+TC4_ErrorOperation (Error operation)

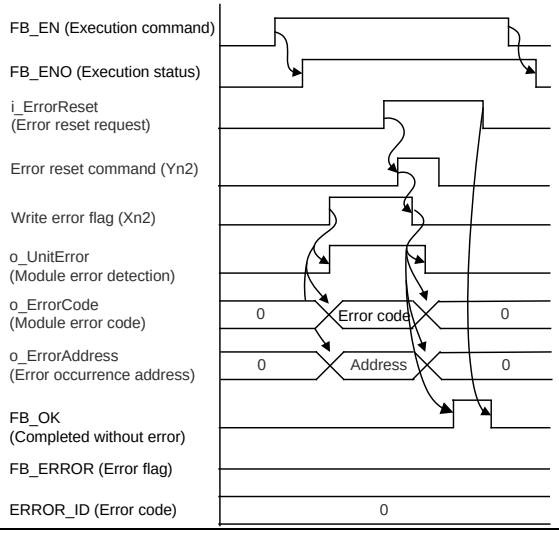
FB Name

M+TC4_ErrorOperation

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Monitors an error code and perform an error reset.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW),
Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">219 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), whether an error occurred is monitored.
2) When a module error occurs, o_UnitError (Module error detection) is turned ON and the module error information is stored in o_ErrorCode (Module error code) and o_ErrorAddress (Error occurrence address).
3) After FB_EN (Execution command) is turned ON, an error reset is performed by turning ON i_ErrorReset (Error reset request) during error occurrence.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
<tr><td>Restrictions and Precautions</td><td colspan="2">1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
2) The FB cannot be used in an interrupt program.
3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF.
4) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program.
5) Every input must be provided with a value for proper FB operation.
6) When this FB is used in two or more places, a duplicated coil warning will occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error.
7) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module.
For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).</td></tr>
</table>

Item	Description
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
None	None	None

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Error reset request	i_ErrorReset	Bit	ON,OFF	Turn ON this parameter to perform an error reset. Turn OFF the request when FB_OK (Completed without error) is turned ON.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that an error reset is completed.
Module error detection	o_UnitError	Bit	OFF	When ON, it indicates that an error has occurred.
Module error code	o_ErrorCode	Word	0	Store an error code for an error that occurred in the module.
Error occurrence address	o_ErrorAddress	Word	0	Store an address in which an error has occurred.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

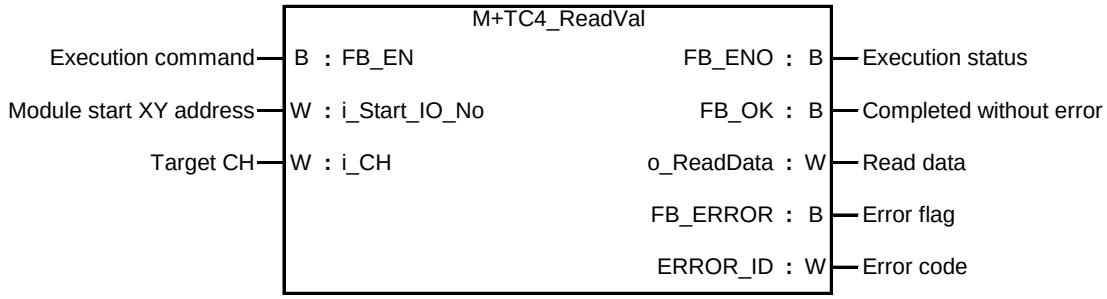
This chapter includes information related to the M+TC4_ErrorOperation function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.20. M+TC4_ReadVal (Value read)

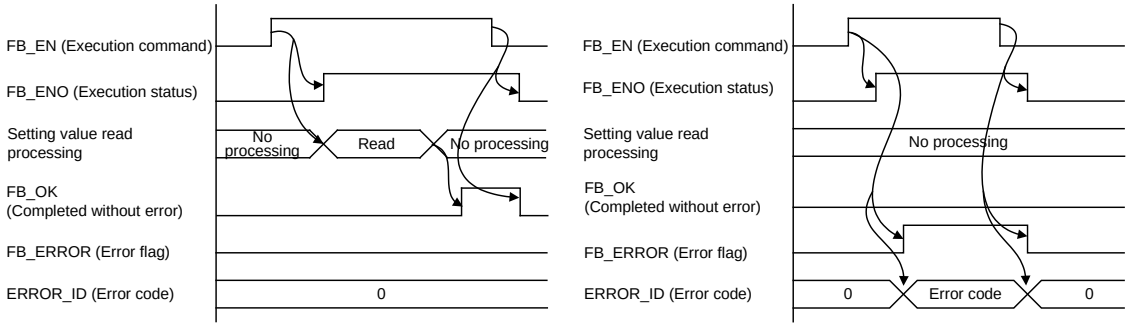
FB Name

M+TC4_ReadVal

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Reads the values to the specified devices.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW),
Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table></td></tr>
<tr><td>Hardware details</td><td><table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">267 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the specified values are read to o_ReadData (Read data).
2) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
<tr><td>Restrictions and Precautions</td><td colspan="2">1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
2) The FB cannot be used in an interrupt program.
3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF.
4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel.
5) This FB uses index registers Z5, Z6, Z7, Z8 and Z9. Please do not use these index registers in an interrupt program.
6) Every input must be provided with a value for proper FB operation.
7) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary.</td></tr>
<tr><td>FB operation type</td><td colspan="2">Real-time execution</td></tr>
<tr><td>Application example</td><td colspan="2">Refer to "Appendix 1. FB Library Application Examples".</td></tr>
</table>

Item	Description
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1~4	Specify the channel number.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the data are being read.
Read data	o_ReadData	Word	0	The following values are stored in the specified devices. (Example: If D0 is set, the temperature process value (PV) is stored in D2.) +0: Error code +1: Alert occurrence data +2: Temperature process value (PV) +3: Manipulated value (MV) +4: Temperature rise judgment flag +5: Transistor output flag +6: Set value (SV) setting +7: Proportional band (P) setting +8: Integral time (I) setting +9: Derivative time (D) setting +10: Alert setting value 1 +11: Alert setting value 2 +12: Alert setting value 3 +13: Alert setting value 4 +14: Heater disconnection alert setting +15: Loop disconnection detection judgment time setting +16: Manipulated value for other analog module output (MV) +17: CT1 Heater current measurement value +18: CT2 Heater current measurement value +19: CT3 Heater current measurement value +20: CT4 Heater current measurement

Name(Comment)	Label name	Data type	Initial value	Description
				value +21: CT5 Heater current measurement value +22: CT6 Heater current measurement value +23: CT7 Heater current measurement value +24: CT8 Heater current measurement value +25: Cooling proportional band setting (Pc) +26: Cooling manipulated value (MVc) +27: Cooling transistor output flag +28: Cooling manipulated value (MVc) (For other analog module output)
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

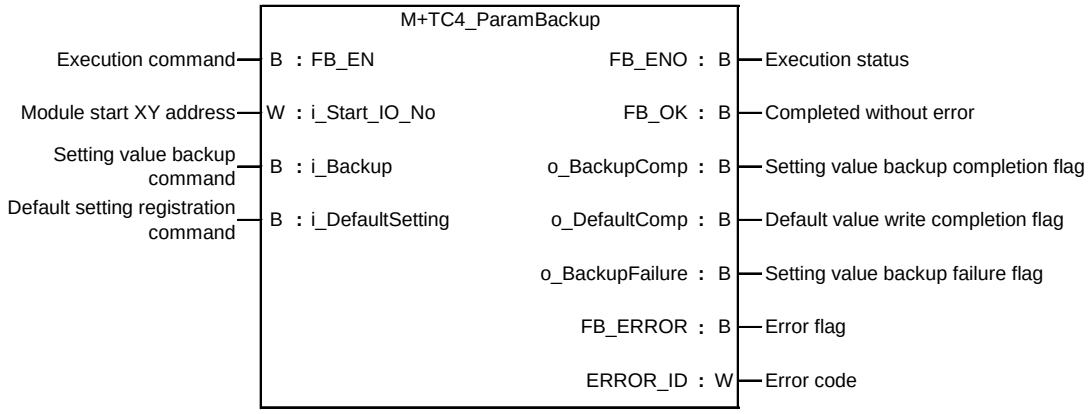
This chapter includes information related to the M+TC4_ReadVal function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.21. M+TC4_ParamBackup (Setting value backup)

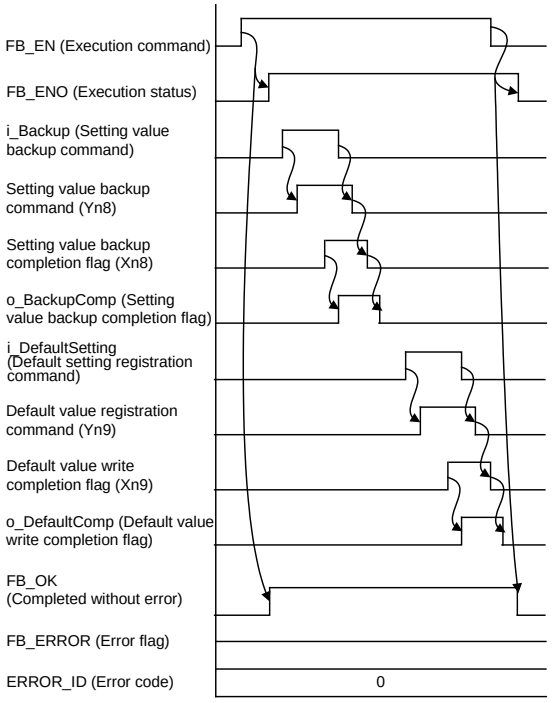
FB Name

M+TC4_ParamBackup

Function Overview

Item	Description	
Function overview	Backs up the setting value or executes the default setting registration command.	
Symbol		
Applicable hardware and software	Temperature control module	<table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-Q series</td><td>Q64TCTT(BW), Q64TCRT(BW), Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr><tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr></table>
	Hardware details	<table><tr><th>Series</th><th>Model</th></tr><tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr><tr><td>High performance model</td></tr><tr><td>Universal model</td></tr><tr><td>MELSEC-L series</td><td>LCPU</td></tr></table> *1 Not applicable to QCPU (A mode)

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">174 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) After FB_EN (Execution command) is turned ON, the control mode selection of the switch setting and the parameter settings in the buffer memory are backed up by turning ON i_Backup (Setting value backup command) and the buffer memory contents are returned to the default values by turning ON i_DefaultSetting (Default setting registration command).</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop, etc. because it is impossible to turn OFF. 4) This FB uses index register Z9. Please do not use this index register in an interrupt program. 5) Every input must be provided with a value for proper FB operation. 6) If the parameters are set using the configuration function of GX Works 2, using this FB is unnecessary. 7) When this FB is used in two or more places, a duplicated coil warning will occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error. 8) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] 

Item	Description
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
None	None	None

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Setting value backup command	i_Backup	Bit	ON,OFF	When ON, the parameter setting in the buffer memory is written to the non-volatile memory.
Default setting registration command	i_DefaultSetting	Bit	ON,OFF	When ON, the buffer memory contents are returned to the default values.

●Output labels

Name(Comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that it is possible to back up the setting values and return to the default values.
Setting value backup completion flag	o_BackupComp	Bit	OFF	When ON, it indicates that backing up the setting values is completed.
Default value write completion flag	o_DefaultComp	Bit	OFF	When ON, it indicates that writing the default values is completed.
Setting value backup failure flag	o_BackupFailure	Bit	OFF	When ON, it indicates backing up the setting values failed. *When the setting value backup failure flag is turned ON, it can be turned OFF by re-executing the setting value backup command (i_Backup) and after the write operation is completed normally.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2011/09/16	First edition

Note

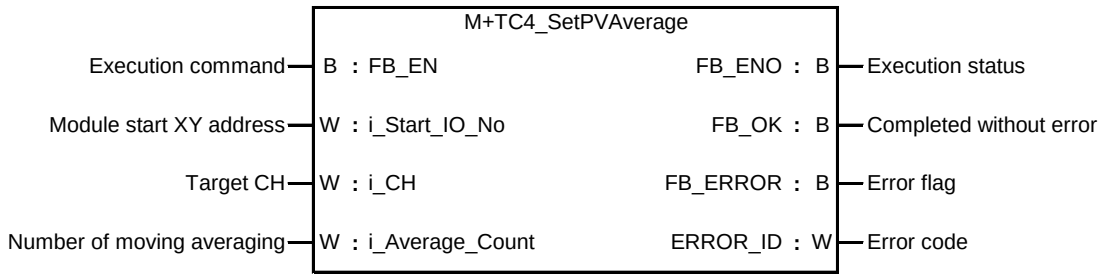
This chapter includes information related to the M+TC4_ParamBackup function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

2.22. M+TC4_SetPVAverage (Process value (PV) moving averaging process setting)

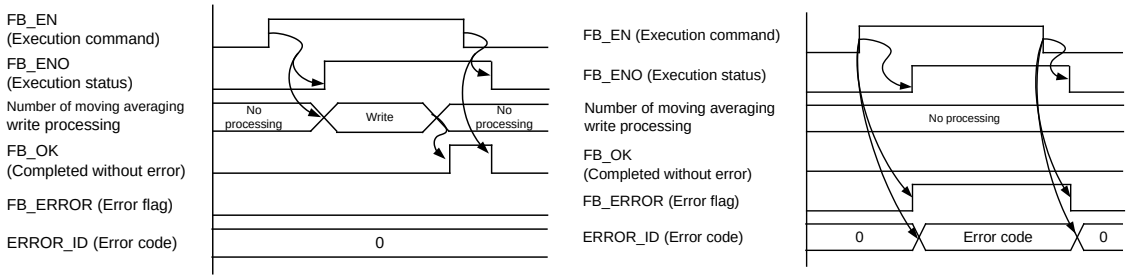
FB Name

M+TC4_SetPVAverage

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the number of moving averaging of the moving averaging process function for the temperature process value (PV) of the specified channel.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="2">Applicable hardware and software</td><td>Temperature control module</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td>MELSEC-Q series</td><td>Q64TCTT(BW)N, Q64TCRT(BW)N</td></tr>
<tr><td>MELSEC-L series</td><td>L60TCTT4(BW), L60TCRT4(BW)</td></tr>
</table>
* Applicable to temperature control modules whose first five digits of the product information are "14032" or later
</td></tr>
<tr><td>Hardware details</td><td>
<table>
<tr><th>Series</th><th>Model</th></tr>
<tr><td rowspan="3">MELSEC-Q series *1</td><td>Basic model</td></tr>
<tr><td>High performance model</td></tr>
<tr><td>Universal model</td></tr>
<tr><td>MELSEC-L series</td><td>LCPU</td></tr>
</table>
*1 Not applicable to QCPU (A mode)
</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Engineering software</td><td>GX Works2 *1
<table>
<tr><th>Language</th><th>Software version</th></tr>
<tr><td>Japanese version</td><td>Version1.86Q or later</td></tr>
<tr><td>English version</td><td>Version1.24A or later</td></tr>
<tr><td>Chinese (Simplified) version</td><td>Version1.49B or later</td></tr>
<tr><td>Chinese (Traditional) version</td><td>Version1.49B or later</td></tr>
<tr><td>Korean version</td><td>Version1.49B or later</td></tr>
</table>
*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">277 steps (for MELSEC-Q series universal model CPU)
* The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the set parameters are written to the buffer memory.
2) To enable the setting values, turn the setting change command (YnB) OFF, ON and then OFF in the setting mode.
3) FB operation is one-shot only, triggered by the FB_EN signal.
4) When the setting value of the target channel is out of range, the FB_ERROR output turns ON, processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code).
Refer to the error code explanation section for details.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and Precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of the target channel. 5) To execute this FB, the setting/operation mode command (Yn1) must be turned OFF. 6) This FB uses index registers Z7, Z8 and Z9. Please do not use these index registers in an interrupt program. 7) Every input must be provided with a value for proper FB operation. 8) Do not use this FB in modules other than applicable modules. If used in modules other than applicable modules, an error will occur in the module. 9) To use this FB, set the temperature input mode. 10) Perform the setting using the GX Works2 intelligent function module switch setting to match systems and devices connected to the temperature control module. For details on how to use the intelligent function module switch setting, refer to GX Works2 Operating Manual (Common).
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1. FB Library Application Examples".
Timing chart	[When operation completes without error] [When an error occurs] 
Relevant manuals	•MELSEC-Q Temperature Control Module User's Manual •MELSEC-L Temperature Control Module User's Manual •QCPU User's Manual (Hardware Design, Maintenance and Inspection) •MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) •GX Works2 Version 1 Operating Manual (Common) •GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Countermeasure
10 (Decimal)	The specified target channel is not valid. The target channel is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON,OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	i_Start_IO_No	Word	Depends on the I/O point range. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the temperature control module is mounted. (For example, enter H10 for X10.)
Target CH	i_CH	Word	1 to 4	Specify the channel number.
Number of moving averaging	i_Average_Count	Word	2 to 10 (times)	Set the number of moving averaging.

●Output labels

Name(Comment)	Label name	Data type	Setting range	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that setting the number of moving averaging is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/06/30	First edition

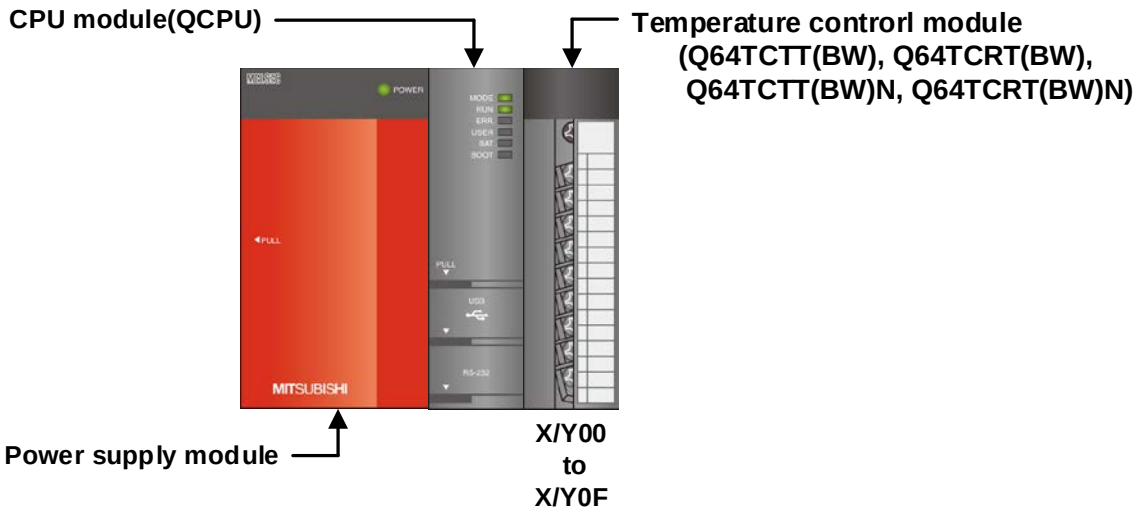
Note

This chapter includes information related to the M+TC4_SetPVAverage function block.
It does not include information on restrictions of use such as combination with temperature modules or programmable controller CPUs.
Before using any Mitsubishi products, please read all the relevant manuals.

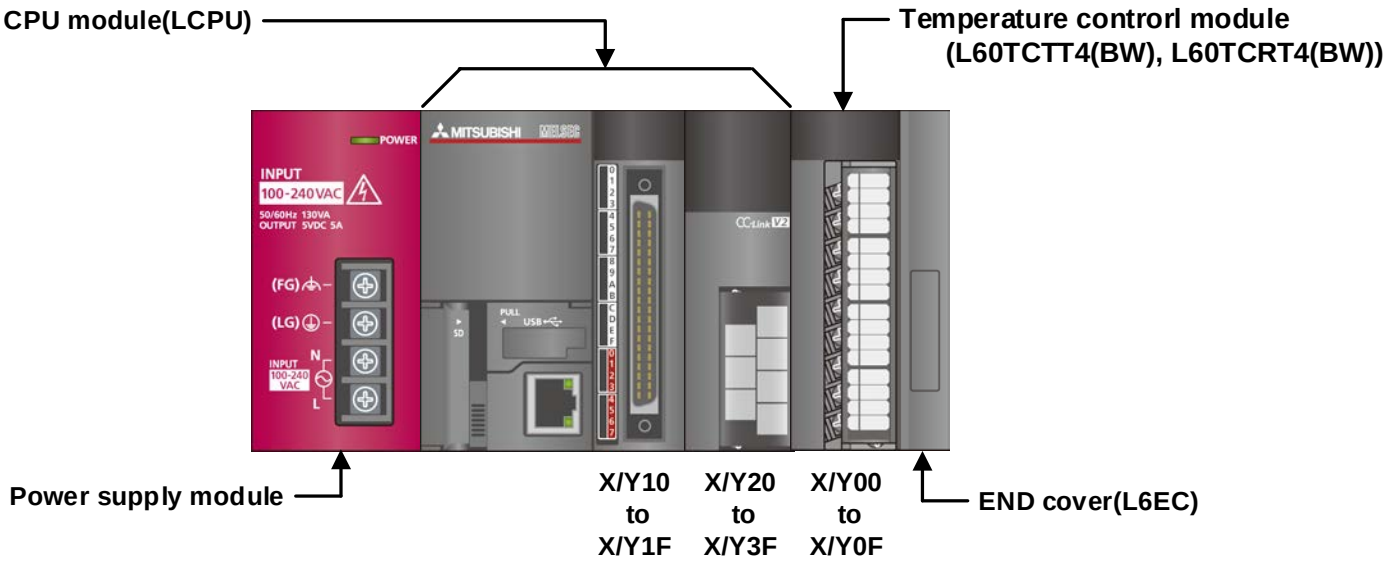
Appendix 1. FB Library Application Examples

1) System Configuration

(1) Q series system configuration Example



(2) L series system configuration Example



Reminder

- Every input must be provided with a value for proper FB operation.
  If not set, the values will be unspecified.
- Abbreviations may be used in the label comments due to the limitation on the number of the characters to display in GX Works2.

2) Device list

a) External Input (commands)

Device	FB name	Application (ON details)
M0	M+TC4_SetBPARAM	Basic settings request
M10	M+TC4_SetCNTBPARAM	Cnt BParam setting request
M20	M+TC4_SetCNTDPARAM	Cnt DParam setting request
M30	M+TC4_SetAlertsFunction	Alert function setting request
M40	M+TC4_SetOtherSettings	Other settings request
M50	M+TC4_SetConversion	Conv enable/disable set request
M51		CH1 conversion command
M52		CH2 conversion command
M53		CH3 conversion command
M54		CH4 conversion command
M60	M+TC4_SetProcessAlarm	Process alarm setting request
M70	M+TC4_SetRateAlarm	Rate alarm setting request
M80	M+TC4_SetPVScaling	scaling function setting request
M90	M+TC4_MoniCJTemperature	CJ temp PV monitor request
M100	M+TC4_Autotuning	Auto tuning request
M101		Auto tuning ready
M110	M+TC4_Selftuning	Self tuning request
M120	M+TC4_PIDControl	PID control command
M121		PID control FB
M122		PID control forced stop command
M130	M+TC4_HeaterDisconnection	Heater disc detection request
M140	M+TC4_LoopDisconnection	Loop disc detection command
M150	M+TC4_SimultaneousTemperature	Simultaneous temp rise request
M160	M+TC4_SetPeakCurrentSuppress	Peak current limit cnt request
M170	M+TC4_AlertStatus	Alert status check command
M190	M+TC4_ErrorOperation	Error operation FB start
M191		Error reset request
M200	M+TC4_ReadVal	Value read command
M210	M+TC4_ParamBackup	Setting value backup FB start
M211		Setting value backup command
M212		Default set registration command
M220	M+TC4_SetPVAverage	Moving ave proc set request

b) External Output (checks)

Device	FB name	Application (ON details)
M1	M+TC4_SetBPARAM	Basic settings FB ready
M2		Basic settings complete
F0		Basic settings FB error
D0		Basic settings FB error code
M11	M+TC4_SetCNTBPARAM	Cnt BParam setting FB ready
M12		Cnt BParam setting complete
F5		Cnt BPraam setting FB error
D10		Cnt BParam setting FB error code
M21	M+TC4_SetCNTDPARAM	Cnt DParam setting FB ready
M22		Cnt DParam setting complete
F10		Cnt DParam setting FB error
D20		Cnt DParam setting FB error code
M31	M+TC4_SetAlertsFunction	Alert function setting FB ready
M32		Alert function setting complete
F15		Alert function setting error
D30		Alert function setting err code
M41	M+TC4_SetOtherSettings	Other settings FB ready
M42		Other settings complete
M55	M+TC4_SetConversion	Conv enable/disable set ready
M56		Conv enable/disable set complete
M61	M+TC4_SetProcessAlarm	Process alarm setting FB ready
M62		Process alarm setting complete
F20		Process alarm setting FB error
D60		Process alarm setting error code
M71	M+TC4_SetRateAlarm	Rate alarm setting FB ready
M72		Rate alarm setting complete
F25		Rate alarm setting FB error
D70		Rate alarm setting FB error code
M81	M+TC4_SetPVScaling	scaling function setting ready
M82		scaling function set complete
F30		scaling function setting error
D80		scaling function set error code
M91	M+TC4_MoniCJTemperature	CJ temp PV monitor ready
M92		CJ temp PV monitor complete
D90		Cold junction temp PV

Device	FB name	Application (ON details)
M102	M+TC4_Autotuning	Auto tuning FB ready
M103		Auto tuning complete
D100		Proportional / heat proportional
D101		Cooling proportional band
D102		Integral time value
D103		Derivative time value
D104		Loop disc detection time value
F35		Auto tuning FB error
D105		Auto tuning FB error code
M111	M+TC4_Selftuning	Self tuning FB ready
M112		Self tuning complete
D110		Self tuning flag
F40		Self tuning FB error
D111		Self tuning FB error code
M123	M+TC4_PIDControl	PID control FB ready
M124		PID control complete
M125		PID constant read completion
M126		PID constant read failure
M127		PID control stop flag
D120		Proportional band
D121		Cooling proportional band
D122		Integral time
D123		Derivative time
D124		Loop disconnection detection jud
F45		PID control FB error
D125		PID control FB error code
M131	M+TC4_HeaterDisconnection	Heater disc detection ready
M132		Heater disc detection complete
M133		Heater disc detection flag
F50		Heater disc detection error
D130		Heater disc detection error code
M141	M+TC4_LoopDisconnection	Loop disc detection FB ready
M142		Loop disc detection complete
M143		Loop disc detection flag
F55		Loop disc detection FB error
D140		Loop disc detection FB error cod

Device	FB name	Application (ON details)
M151	M+TC4_SimultaneousTemperature	Simultaneous temp rise ready
M152		Simultaneous temp rise complete
M153		Simultaneous temperature rise st
F60		Simultaneous temp rise error
D150		Simultaneous temp rise err code
M161	M+TC4_SetPeakCurrentSuppress	Peak current limit cnt ready
M162		Peak current limit cnt complete
F65		Peak current limit cnt error
D160		Peak current limit cnt err code
M171	M+TC4_AlertStatus	Alert status check FB ready
M172		Alert status checking
M173		PV exceeded the temp range
M174		PV fallen below the temp range
M175		Process alarm upper limit alert
M176		Process alarm lower limit alert
M177		Rate alarm upper limit alert
M178		Rate alarm lower limit alert
M179		Alert 1 occurrence
M180		Alert 2 occurrence
M181		Alert 3 occurrence
M182		Alert 4 occurrence
M183		Heater disconnection detection
M184		Loop disconnection detection
M185		Output off-time current error
F70		Alert status check FB error
D170		Alert status check FB error code
M192	M+TC4_ErrorOperation	Error operation FB ready
M193		Error reset request complete
M194		Module error detection
D190		Module error code
D191		error occurrence address

Device	FB name	Application (ON details)
M201	M+TC4_ReadVal	Value read FB ready
M202		Value read complete
F75		Value read FB error
D200		Value read FB error code
D201 to D229		Read data
M213	M+TC4_ParamBackup	Setting value backup FB ready
M214		Setting value backup complete
M215		Backup complete flag
M216		Default value write comp flag
M217		Backup failure flag
M221	M+TC4_SetPVAverage	Moving ave proc set FB ready
M222		Moving ave proc set complete
F80		Moving ave proc set FB error
D230		Moving ave proc set FB err code

3) Global label setting

none

4) Application example settings

a) Common setting

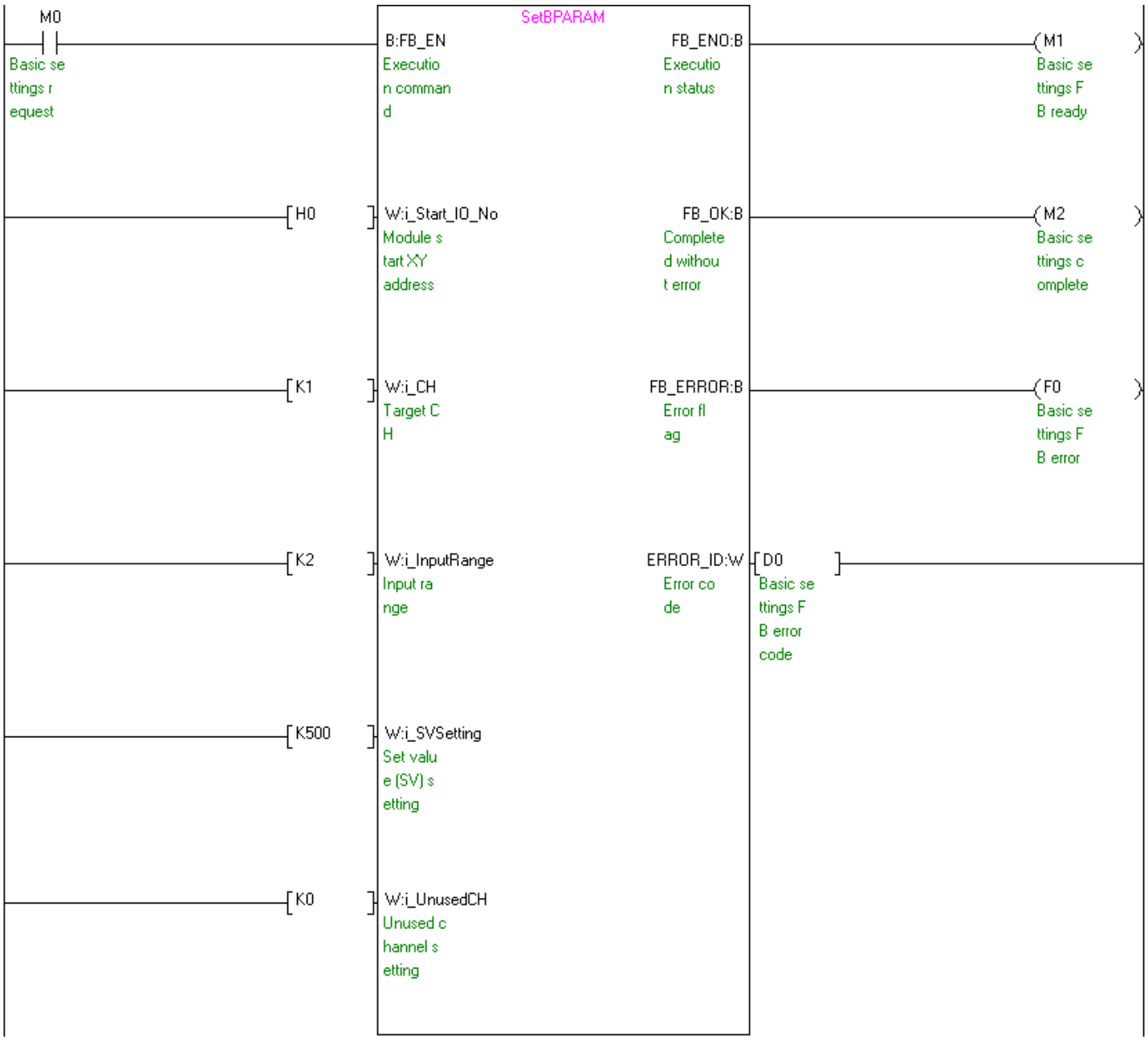
Input and output item	Value	Description
Module start XY address	0	Specify the starting XY address where the temperature control module is mounted.

5) Program

M+TC4_SetBPARAM (Basic settings)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_InputRange	K2	Set the measurement temperature range to 0 to 1300 °C.
i_SVSetting	K500	Sets the temperature for the set value to 500°C.
i_UnusedCH	K0	Set the channel 1 as the channel where temperature control will be performed and temperature sensors will be connected.

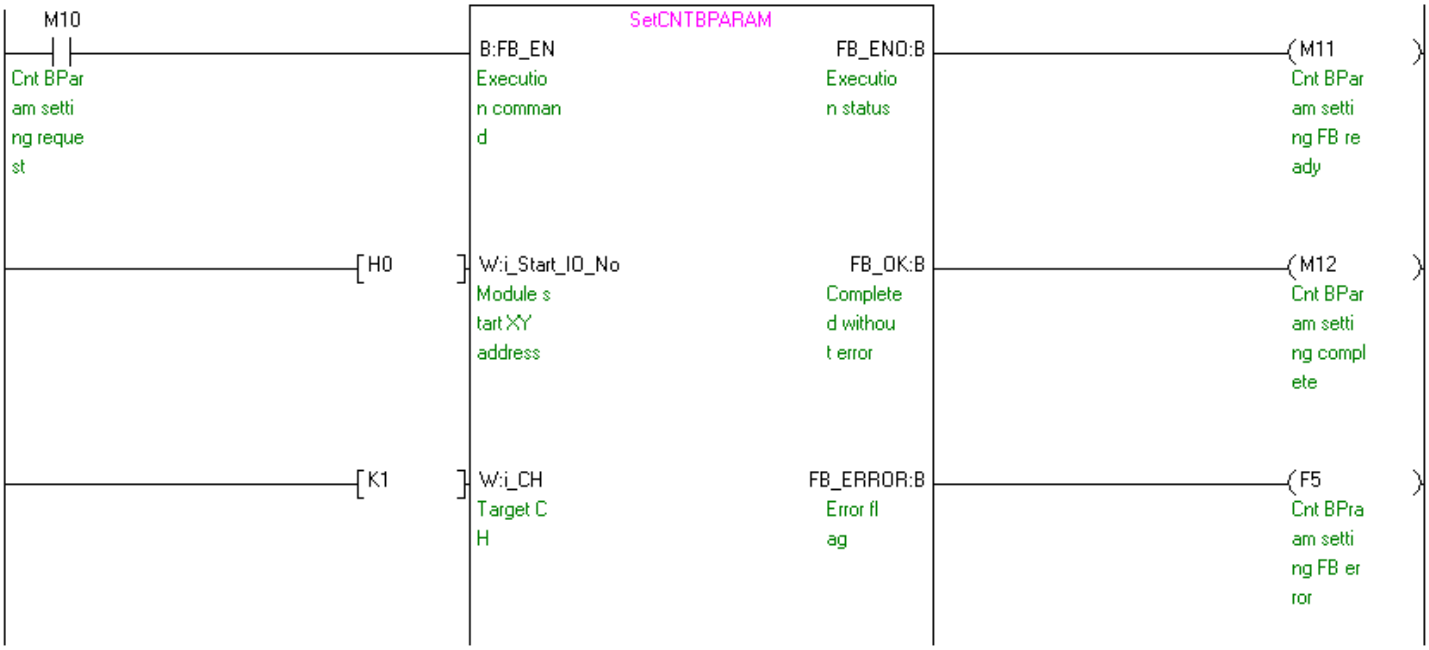
By turning ON M0, the values of the basic settings for channel 1 are written to the buffer memory.


M0
Basic se
ttings r
equest
SetBPARAM
B:FB_EN
Executio
n comman
d
FB_ENO:B
Executio
n status
M1
Basic se
ttings F
B ready
H0
W:i_Start_IO_No
Module s
tart XY
address
FB_OK:B
Complete
d withou
t error
M2
Basic se
ttings c
omplete
K1
W:i_CH
Target C
H
FB_ERROR:B
Error fl
ag
F0
Basic se
ttings F
B error
K2
W:i_InputRange
Input ra
nge
ERROR_ID:W
Error co
de
D0
Basic se
ttings F
B error
code
K500
W:i_SVSetting
Set valu
e (SV) s
etting
K0
W:i_UnusedCH
Unused c
hannel s
etting

M+TC4_SetCNTBPARAM (Control basic parameters settings)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_PSetting	K100	Set the proportional band (P) setting for PID operation to 10.0%.
i_ISetting	K200	Set the integral time (I) setting for PID operation to 200s.
i_DSetting	K300	Set the derivative time (D) setting for PID operation to 300s.
i_OutputPeriod	K5	Set the control output period setting to 5 s. (When "Control output period unit switch setting" which is bit 2 of switch 3 is 0.)
i_ResponseParam	K1	Set the response to a PID control set value (SV) change to "Normal".
i_StopMode	K1	Set the mode to be entered at a PID operation stop to "monitor".

By turning ON M10, the values of the control basic parameters settings for channel 1 are written to the buffer memory.



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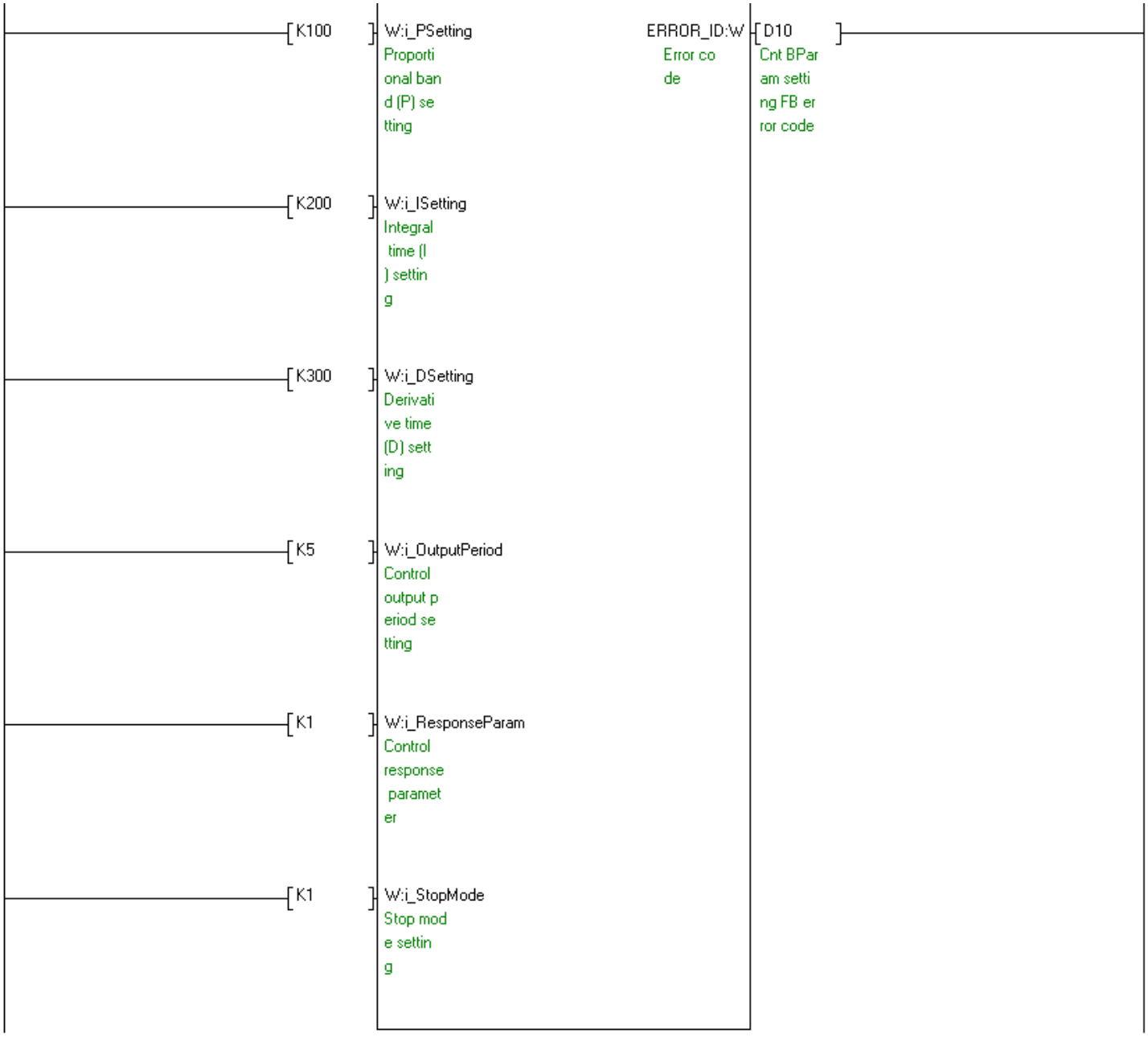
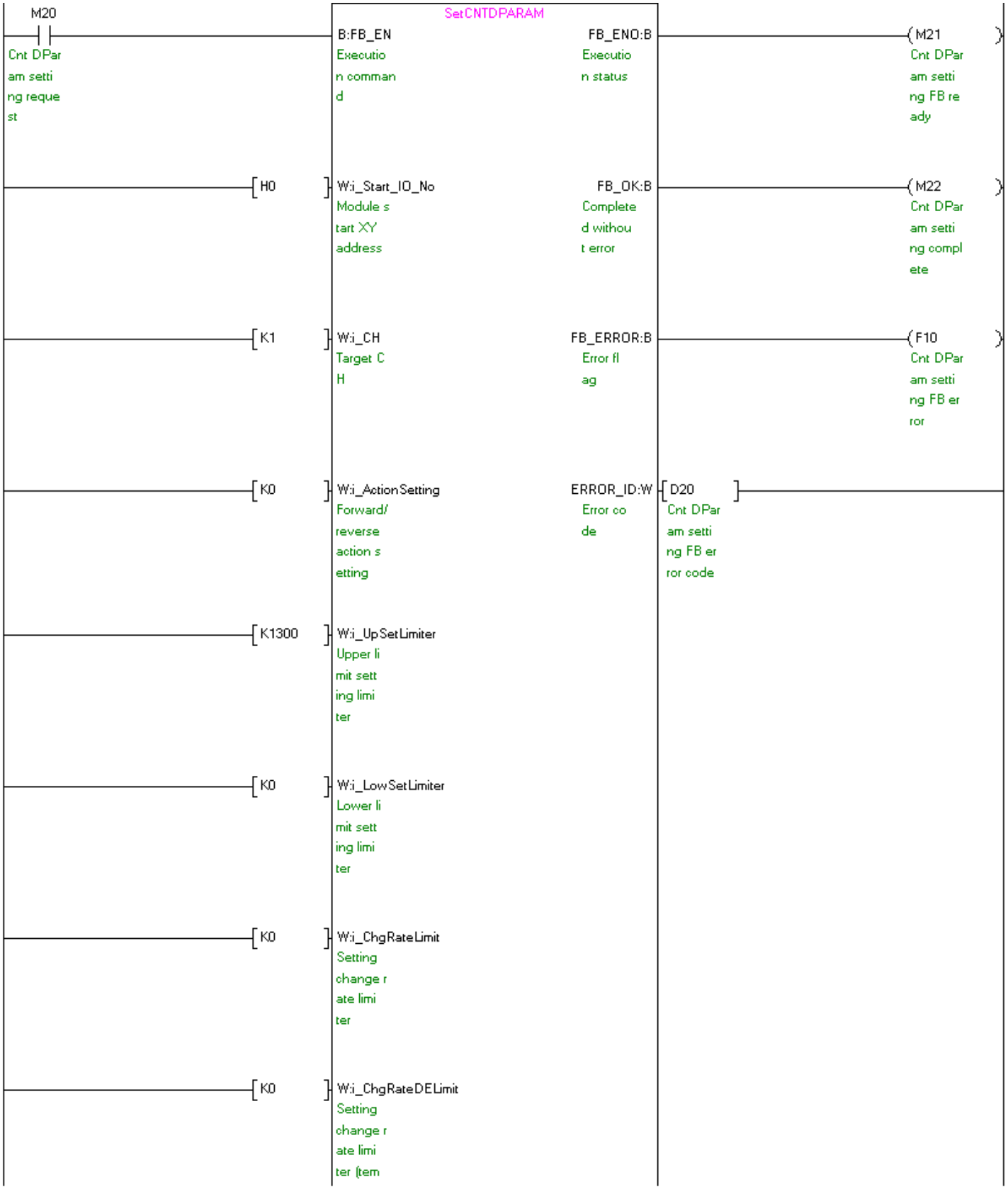

K100
W:i_PSetting
Proporti
onal ban
d (P) se
tting
K200
W:i_ISetting
Integral
time (I
) settin
g
K300
W:i_DSetting
Derivati
ve time
(D) sett
ing
K5
W:i_OutputPeriod
Control
output p
eriod se
tting
K1
W:i_ResponseParam
Control
response
paramet
er
K1
W:i_StopMode
Stop mod
e settin
g
ERROR_ID:W
Error co
de
D10
Cnt BPar
am setti
ng FB er
ror code

M+TC4_SetCNTDPARAM (Control detailed parameters settings)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_ActionSetting	K0	Set the action for channel 1 to "Forward action".
i_UpSetLimiter	K1300	Set the upper limit value of the set value (SV) to 1300.
i_LowSetLimiter	K0	Set the lower limit value of the set value (SV) to 0.
i_ChgRateLimit	K0	Set the change rate limiter of the set value per unit time to a set value (SV) change to "Disabled".
i_ChgRateDELimit	K0	Set the change rate limiter of the set value per unit time to a set value (SV) change to "Disabled".
i_SensorCompVal	K100	Sets the compensation value used when there is a difference between the measured temperature and the actual temperature to 10.0%.
i_PrimaryDelay	K0	Set the primary delay digital filter for channel 1 to "Disabled".
i_UpOutLimiter	K500	Set the upper limit value for outputting to an external device to 50.0%.
i_LowOutLimiter	K0	Set the lower limit value for outputting to an external device to 0.0%.
i_OutVariation	K0	Set the output variation limiter for channel 1 to "Disabled".
i_AdjustSetting	K10	Set the adjustment sensitivity for the set value to 1.0%.

By turning ON M20, the values of the control detailed parameters settings for channel 1 are written to the buffer memory.



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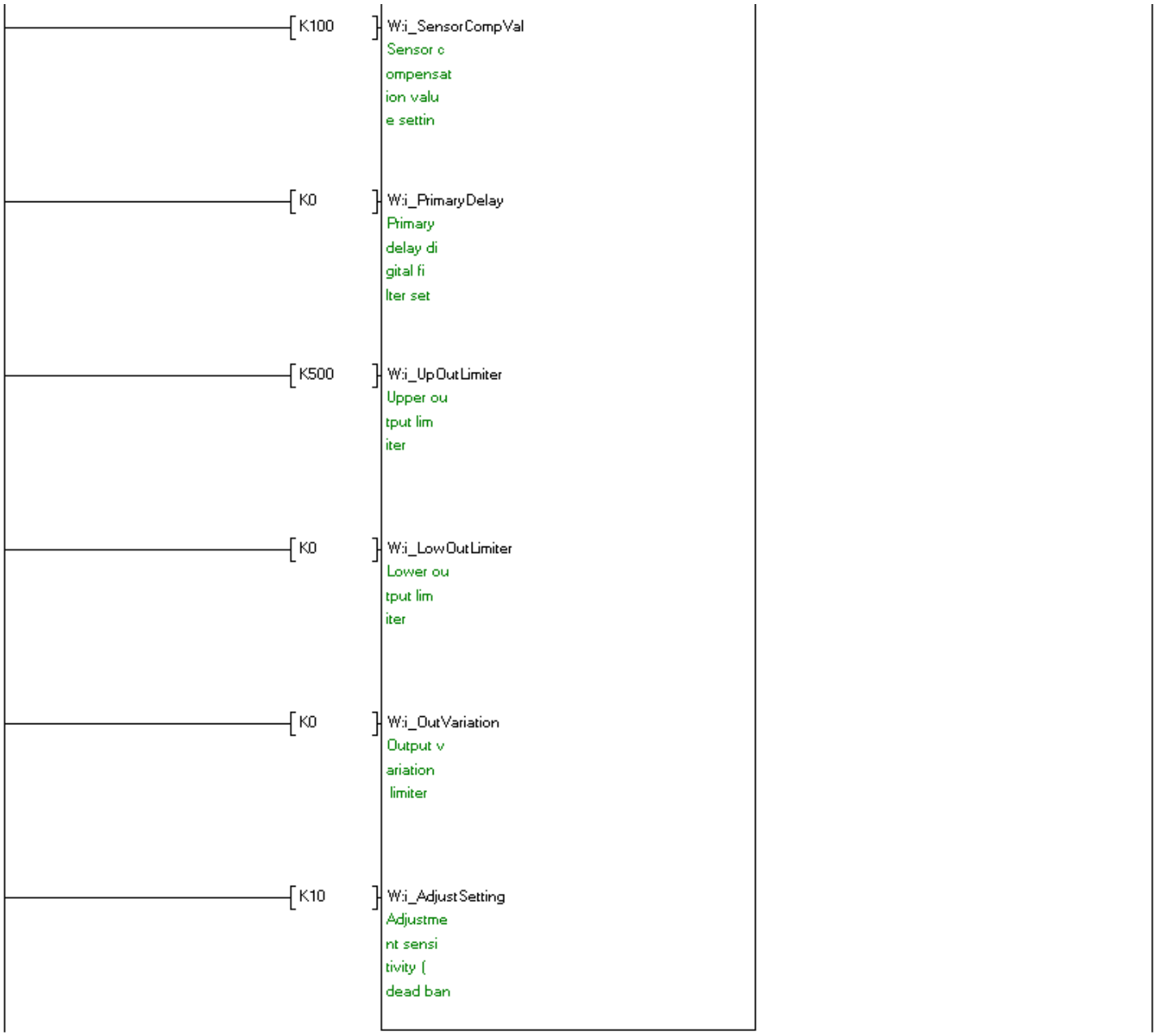
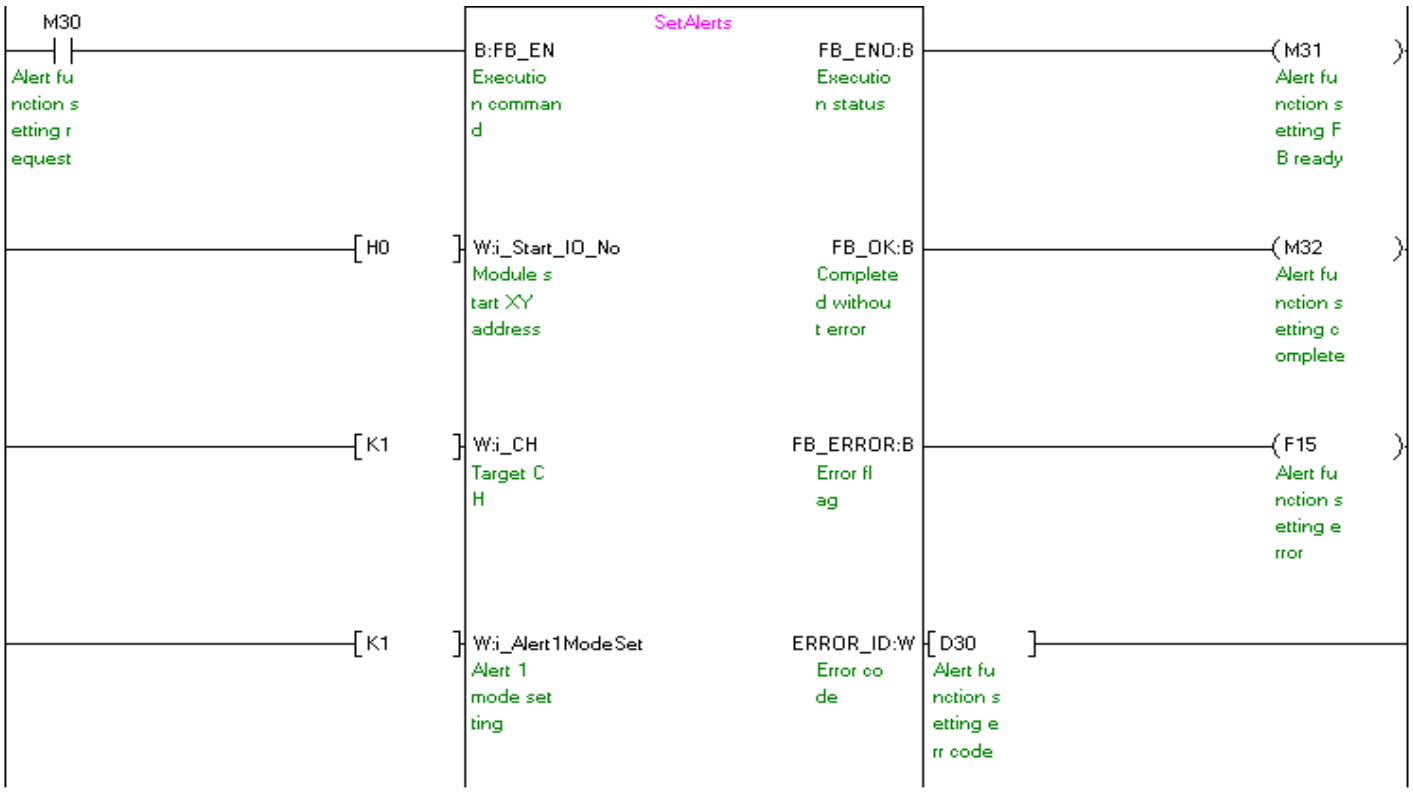

K100
W:i_SensorCompVal
Sensor c
ompensat
ion valu
e settin
K0
W:i_PrimaryDelay
Primary
delay di
gital fi
lter set
K500
W:i_UpOutLimiter
Upper ou
tput lim
iter
K0
W:i_LowOutLimiter
Lower ou
tput lim
iter
K0
W:i_OutVariation
Output v
ariation
limiter
K10
W:i_AdjustSetting
Adjustme
nt sensi
tivity (
dead ban

M+TC4_SetAlertsFunction (Alert function setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_Alert1ModeSet	K1	Set the alert 1 mode setting to "Upper limit input alert".
i_Alert2ModeSet	K0	Set the alert 2 mode setting to "No alert".
i_Alert3ModeSet	K15	Set the alert 3 mode setting to "Upper limit deviation alert".
i_Alert4ModeSet	K17	Set the alert 4 mode setting to "Upper/lower limit deviation alert".
i_AlertSetVal1	K1000	Set the alert set value 1 to 1000.
i_AlertSetVal2	K0	Set the alert set value 2 to "No alert".
i_AlertSetVal3	K1000	Set the alert set value 3 to 1000.
i_AlertSetVal4	K500	Set the alert set value 4 to 500.

By turning ON M30, the alert function setting values for channel 1 are written to the buffer memory.



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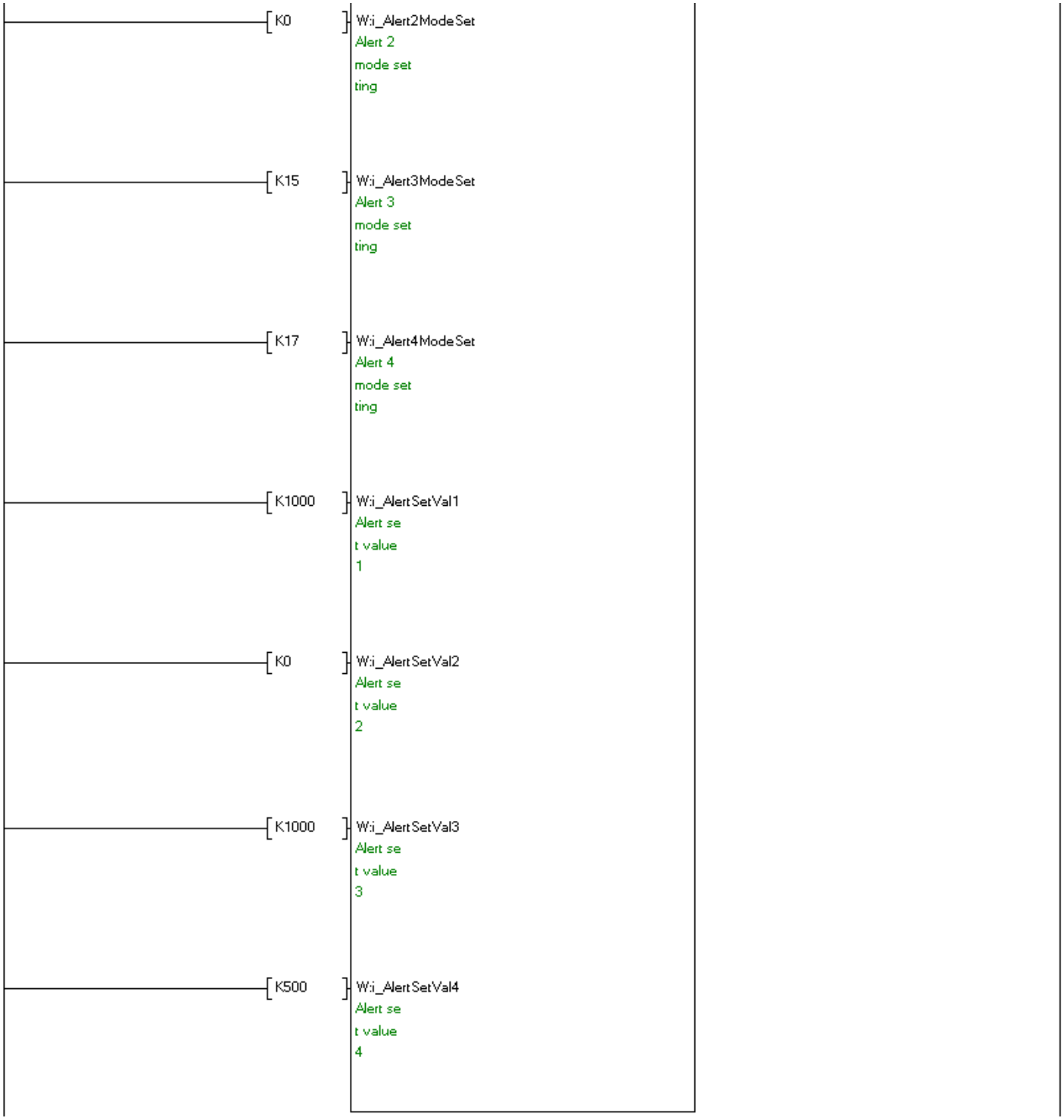
K0
W:i_Alert2ModeSet
Alert 2
mode set
ting
K15
W:i_Alert3ModeSet
Alert 3
mode set
ting
K17
W:i_Alert4ModeSet
Alert 4
mode set
ting
K1000
W:i_AlertSetVal1
Alert se
t value
1
K0
W:i_AlertSetVal2
Alert se
t value
2
K1000
W:i_AlertSetVal3
Alert se
t value
3
K500
W:i_AlertSetVal4
Alert se
t value
4

M+TC4_SetOtherSettings (Other settings)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_TemCmpRange	K2	Set the temperature rise completion range to ±2°C.
i_TemCmpSoakTime	K500	Set a delay from when a temperature rise is completed until the temperature rise completion judgment flag is turned ON to 500 min.
i_TraMtONDlyTime	K0	Set the transistor output monitor ON delay time to "Disabled".
i_ValResolution	K1	Set the manipulated value resolution to "0 to 12,000".
i_PIDFlag	K1	Set the PID continuation flag to "Continue".
i_AlertDeadBand	K10	Set the alert dead band to 1.0%.
i_AlertDlyCount	K50	Set the alert delay count to 50 times.
i_UnusualCount	K100	Set the heater disconnection/output off-time current error detection delay count to 100 times.
i_ReviseFunction	K1	Set the heater disconnection compensation to "Heater disconnection compensation function is used".

By turning ON M40, the values of the other settings for channel 1 are written to the buffer memory.

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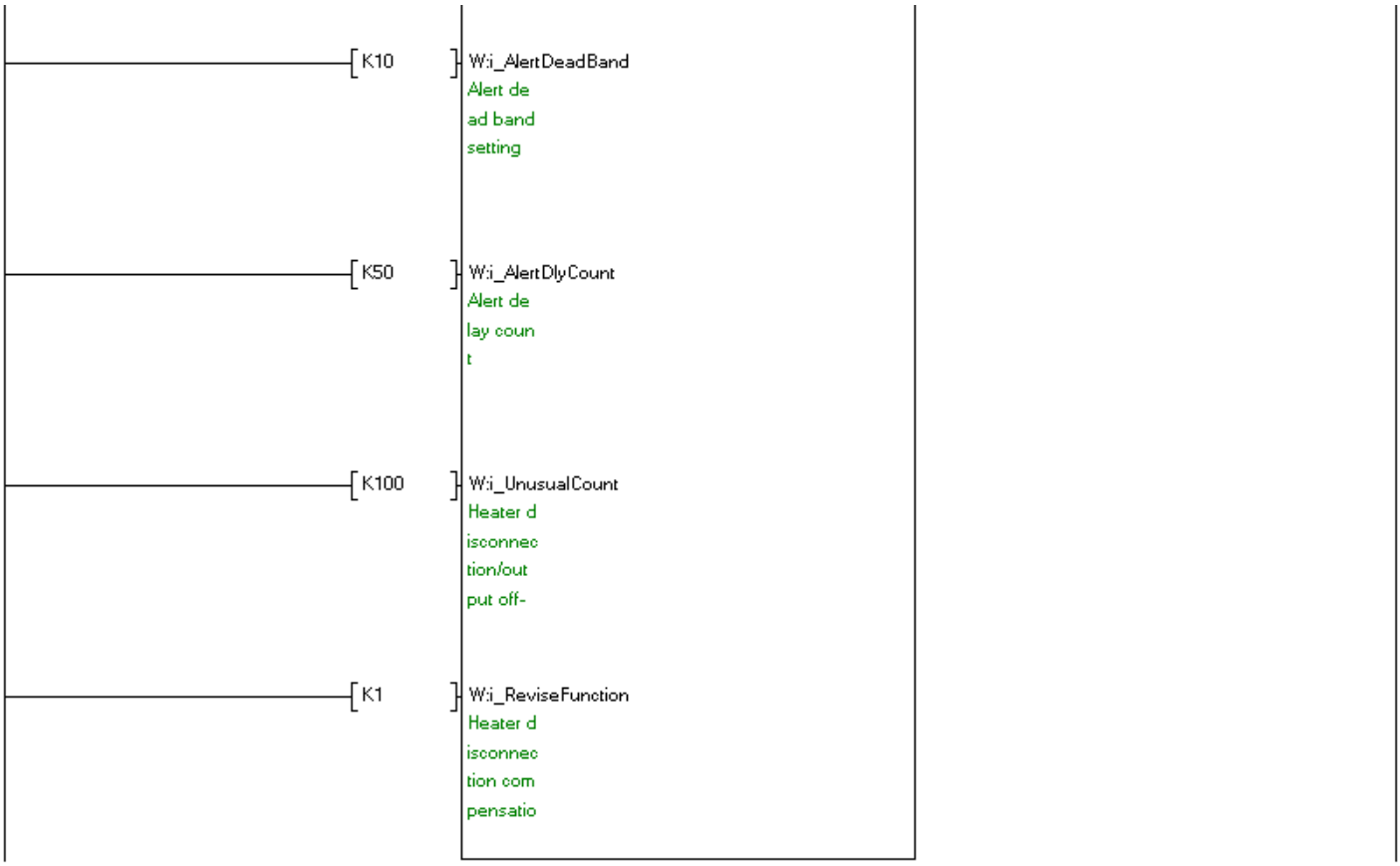
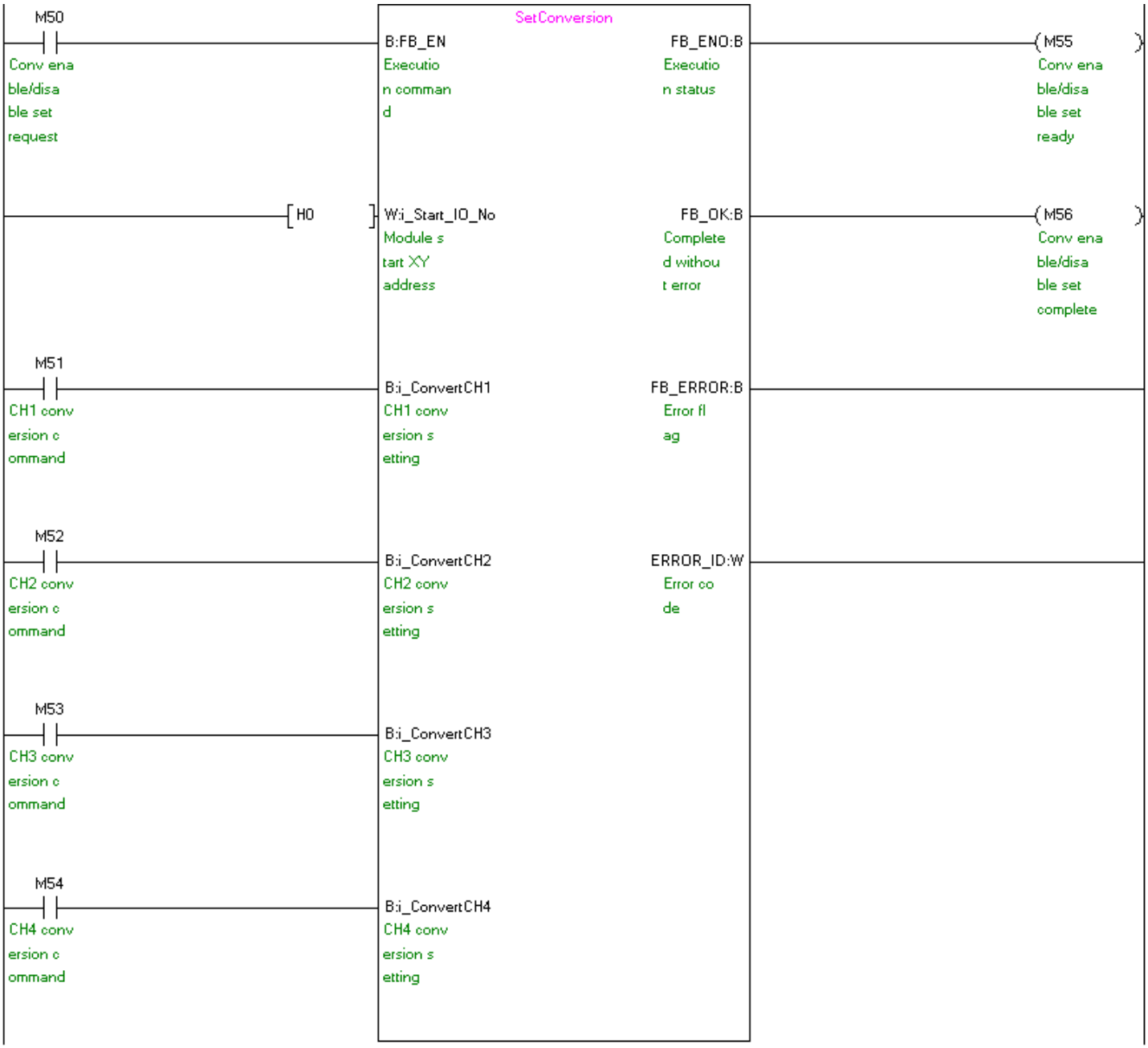

K10
W:i_AlertDeadBand
Alert de
ad band
setting
K50
W:i_AlertDlyCount
Alert de
lay coun
t
K100
W:i_UnusualCount
Heater d
isconnec
tion/out
put off-
K1
W:i_ReviseFunction
Heater d
isconnec
tion com
pensatio

M+TC4_SetConversion (Conversion enable/disable setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_ConvertCH1	ON/OFF	Turn ON this parameter to disable the conversion setting for the specified channel 1.
i_ConvertCH2	ON/OFF	Turn ON this parameter to disable the conversion setting for the specified channel 2.
i_ConvertCH3	ON/OFF	Turn ON this parameter to disable the conversion setting for the specified channel 3.
i_ConvertCH4	ON/OFF	Turn ON this parameter to disable the conversion setting for the specified channel 4.

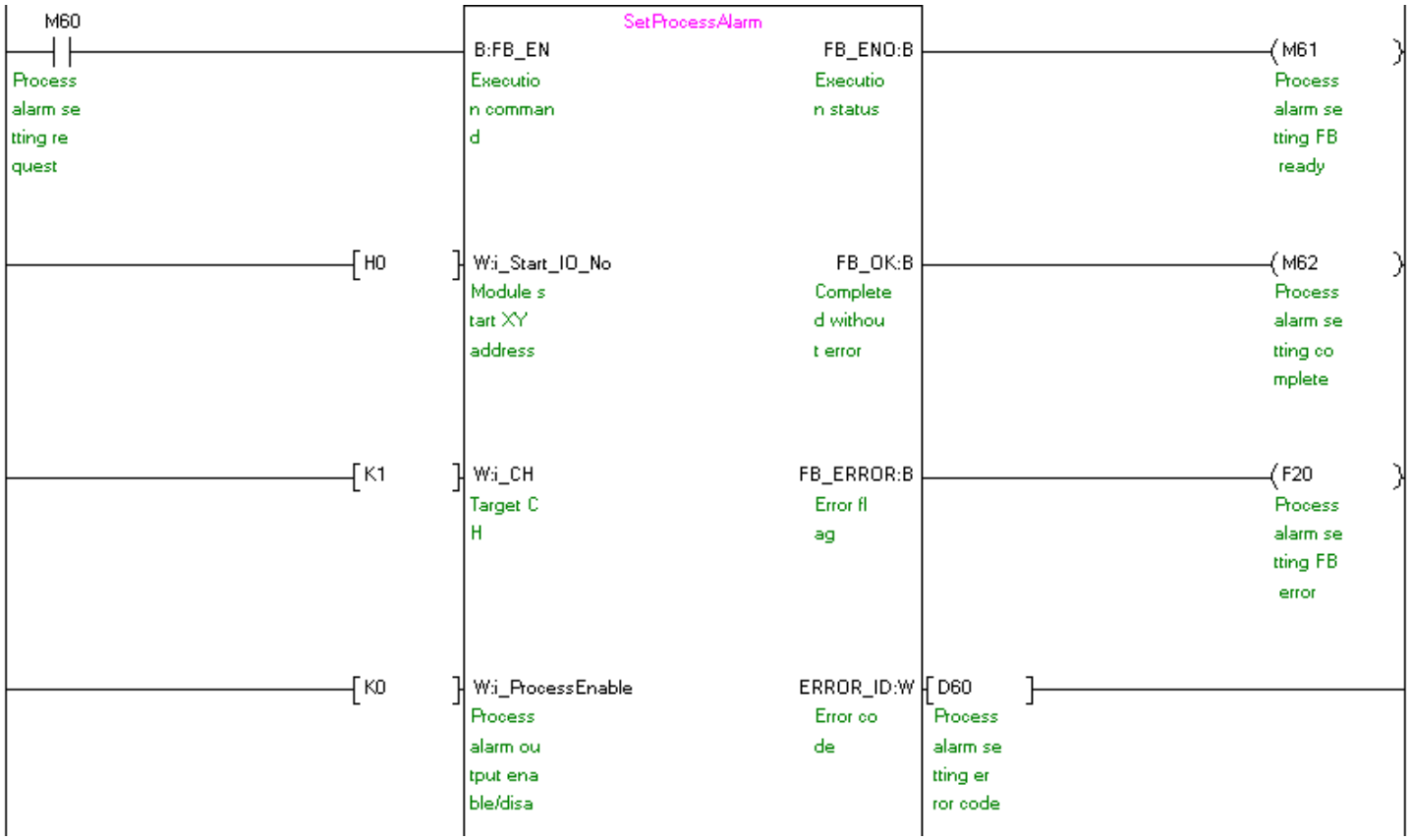
After turning ON M51 to M54, the conversion settings for the specified channels are disabled by turning ON M50.


M50
Conv enable/disable set request
SetConversion
B:FB_EN
Execution command
FB_ENO:B
Execution status
M55
Conv enable/disable set ready
H0
W:i_Start_IO_No
Module start XY address
FB_OK:B
Completed without error
M56
Conv enable/disable set complete
M51
CH1 conversion command
B:i_ConvertCH1
CH1 conversion setting
FB_ERROR:B
Error flag
M52
CH2 conversion command
B:i_ConvertCH2
CH2 conversion setting
ERROR_ID:W
Error code
M53
CH3 conversion command
B:i_ConvertCH3
CH3 conversion setting
M54
CH4 conversion command
B:i_ConvertCH4
CH4 conversion setting

M+TC4_SetProcessAlarm (Process alarm setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_ProcessEnable	K0	Set the process alarm to "Enabled".
i_ProLLLimit	K100	Set the process alarm lower lower limit value to 100.
i_ProLULimit	K200	Set the process alarm lower upper limit value to 200.
i_ProULLimit	K1000	Set the process alarm upper lower limit value to 1000.
i_ProUULimit	K1100	Set the process alarm upper upper limit value to 1100.

By turning ON M60, the process alarm setting values for channel 1 are written to the buffer memory.



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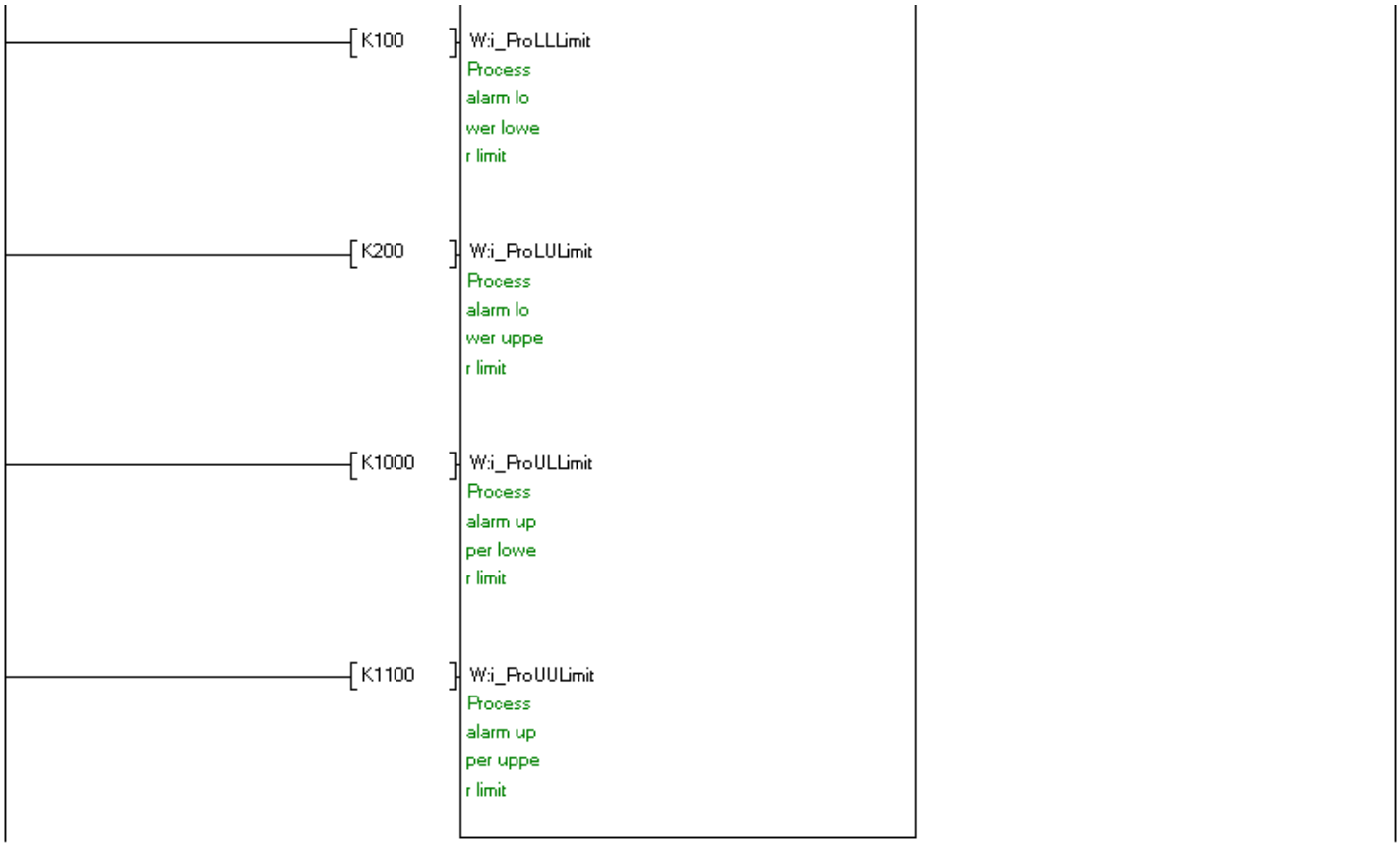
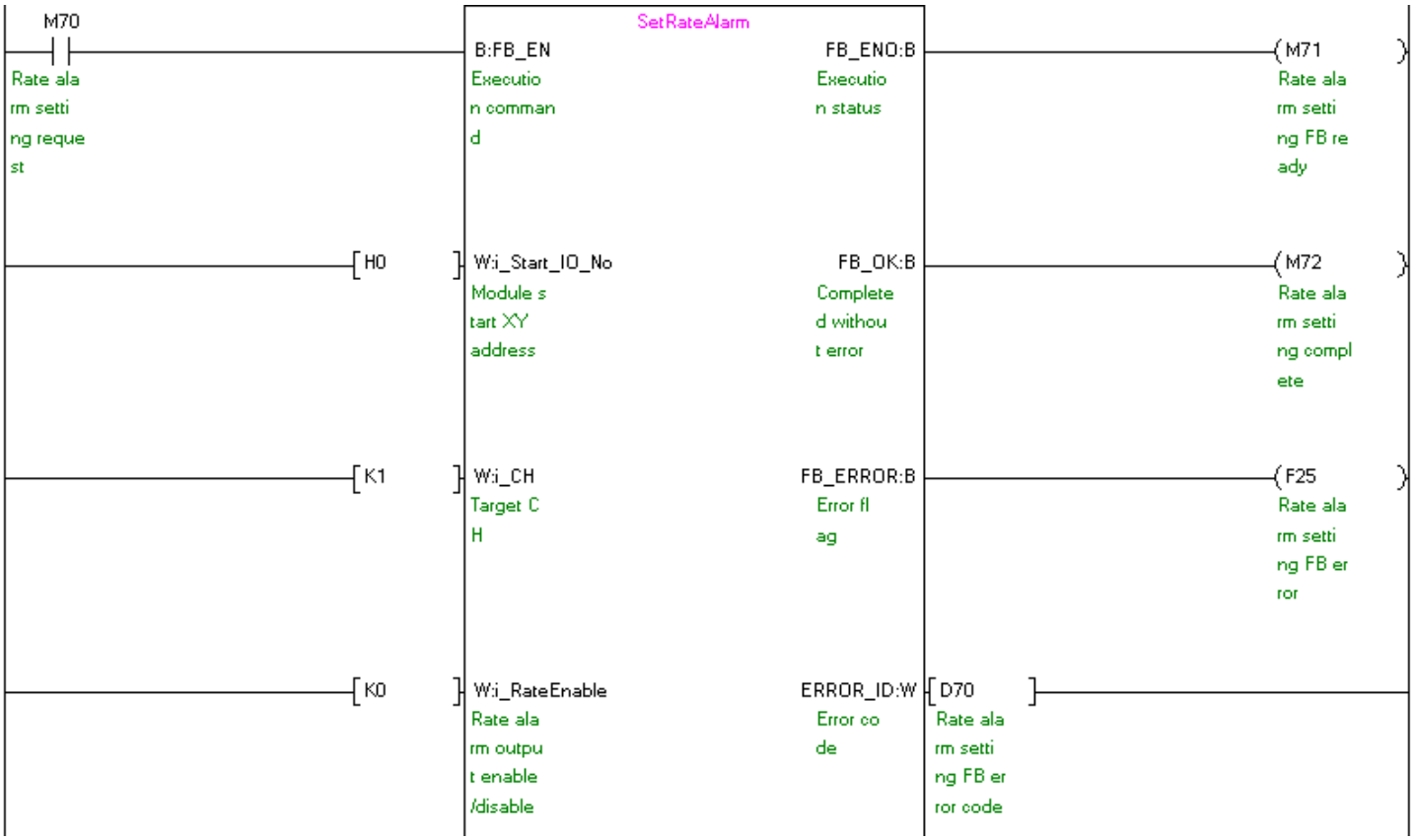

K100
W:i_ProLLLimit
Process
alarm lo
wer lowe
r limit
K200
W:i_ProLULimit
Process
alarm lo
wer uppe
r limit
K1000
W:i_ProULLimit
Process
alarm up
per lowe
r limit
K1100
W:i_ProUULimit
Process
alarm up
per uppe
r limit

M+TC4_SetRateAlarm (Rate alarm setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_RateEnable	K0	Set the rate alarm output to "Enabled".
i_RateOut	K1000	Set the number of periods to check the changes of the measured temperature value using the rate alarm function to 1000 times.
i_RateUpLim	K5000	Set the rate alarm upper limit value to 5000.
i_RateLowLim	K-5000	Set the rate alarm lower limit value to -5000.

By turning ON M70, the rate process alarm setting values for channel 1 are written to the buffer memory. The setting values of the rate alarm are written to the buffer memory.



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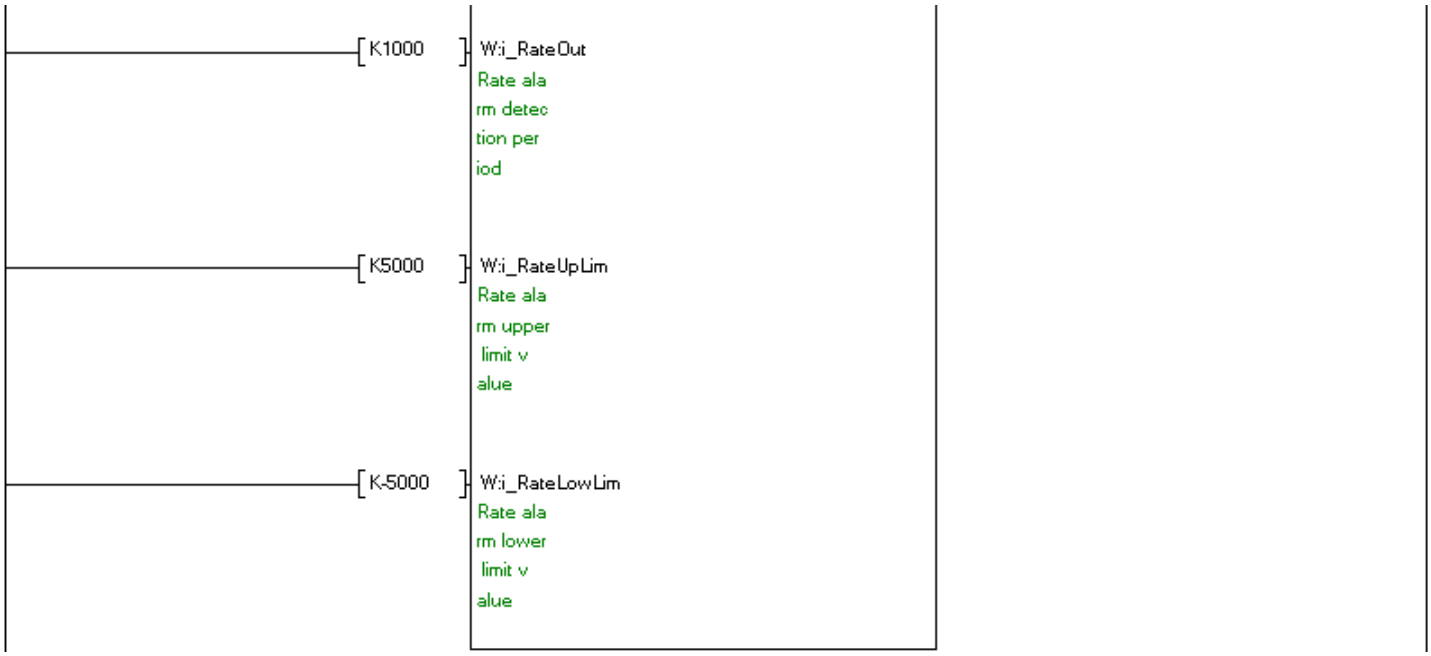
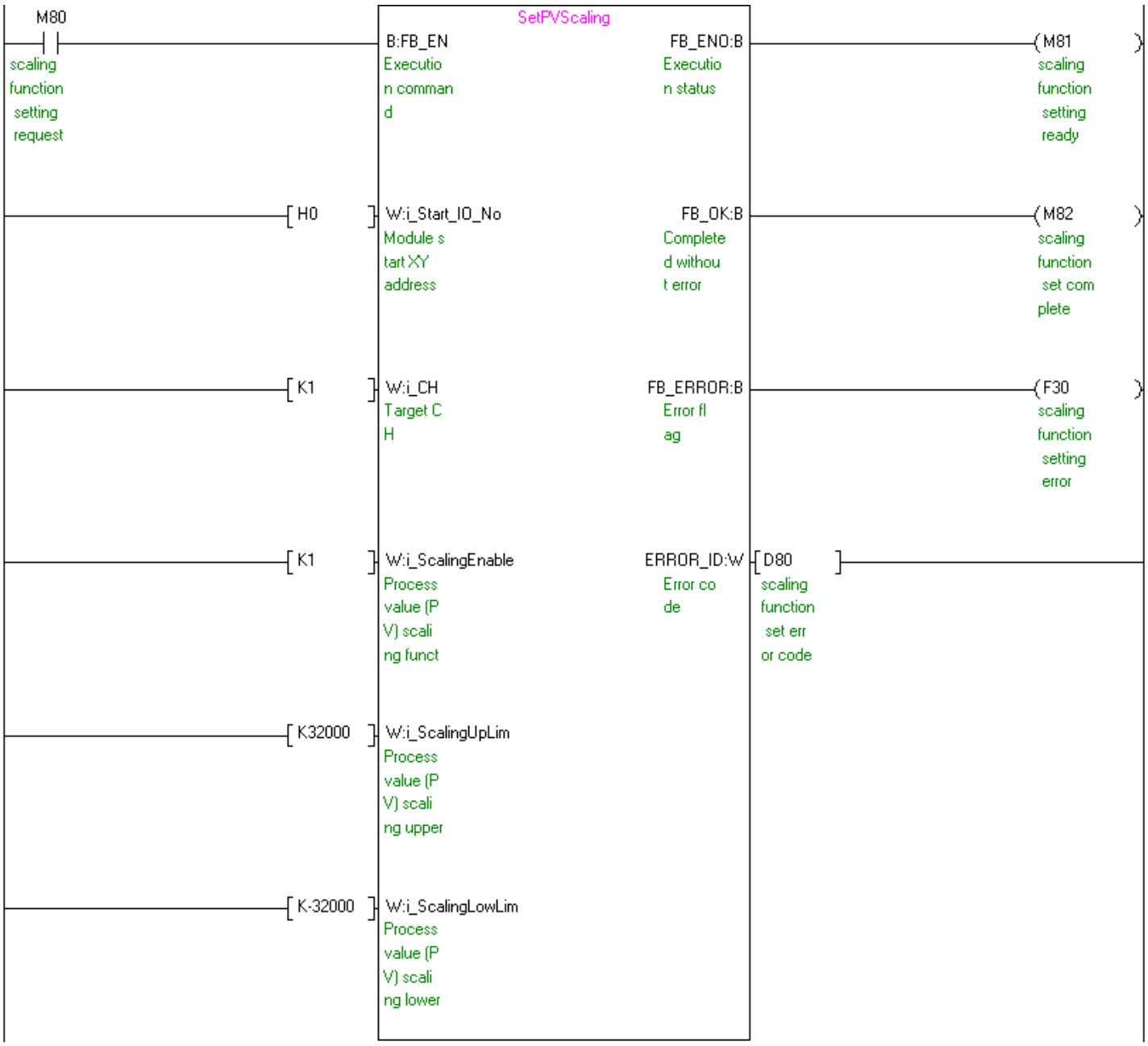

K1000
W:i_RateOut
Rate ala
rm detec
tion per
iod
K5000
W:i_RateUpLim
Rate ala
rm upper
limit v
alue
K-5000
W:i_RateLowLim
Rate ala
rm lower
limit v
alue

M+TC4_SetPVScaling (Process value (PV) scaling function setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_ScalingEnable	K1	Set the process value (PV) scaling function to "Enabled".
i_ScalingUpLim	K32000	Set the process value (PV) scaling upper limit value to 32000.
i_ScalingLowLim	K-32000	Set the process value (PV) scaling lower limit value to -32000.

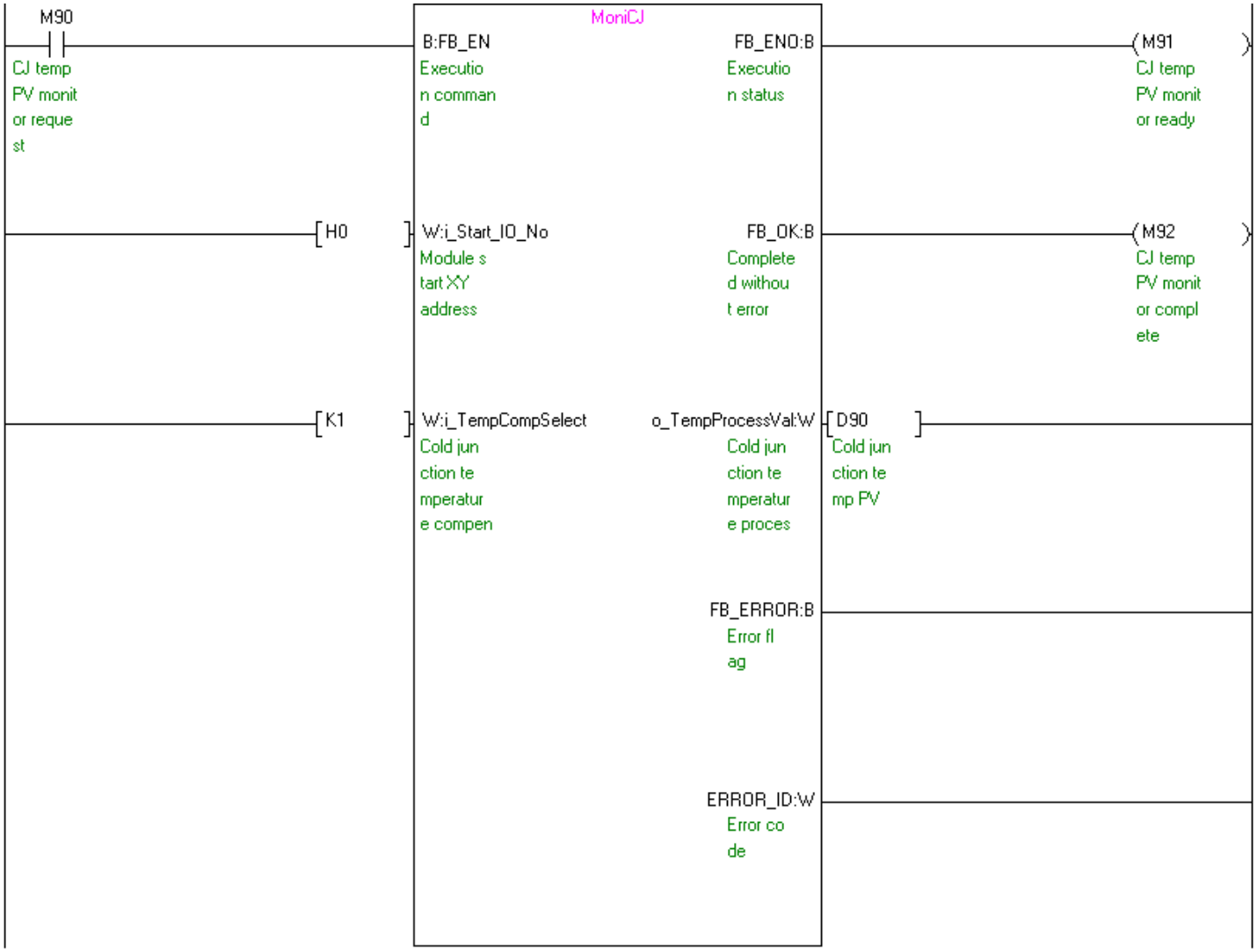
By turning ON M80, the process value (PV) scaling function setting values for channel 1 are written to the buffer memory.


M80
scaling function setting request
SetPVScaling
B:FB_EN
Executio n comman d
FB_ENO:B
Executio n status
M81
scaling function setting ready
H0
W:i_Start_IO_No
Module s tart XY address
FB_OK:B
Complete d withou t error
M82
scaling function set com plete
K1
W:i_CH
Target C H
FB_ERROR:B
Error fl ag
F30
scaling function setting error
K1
W:i_ScalingEnable
Process value (P V) scali ng funct
ERROR_ID:W
Error co de
D80
scaling function set err or code
K32000
W:i_ScalingUpLim
Process value (P V) scali ng upper
K-32000
W:i_ScalingLowLim
Process value (P V) scali ng lower

M+TC4_MoniCJTemperature (Cold junction temperature process value monitoring function)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_TempCompSelect	K1	Set the cold junction temperature compensation to "Temperature control terminal block conversion module".

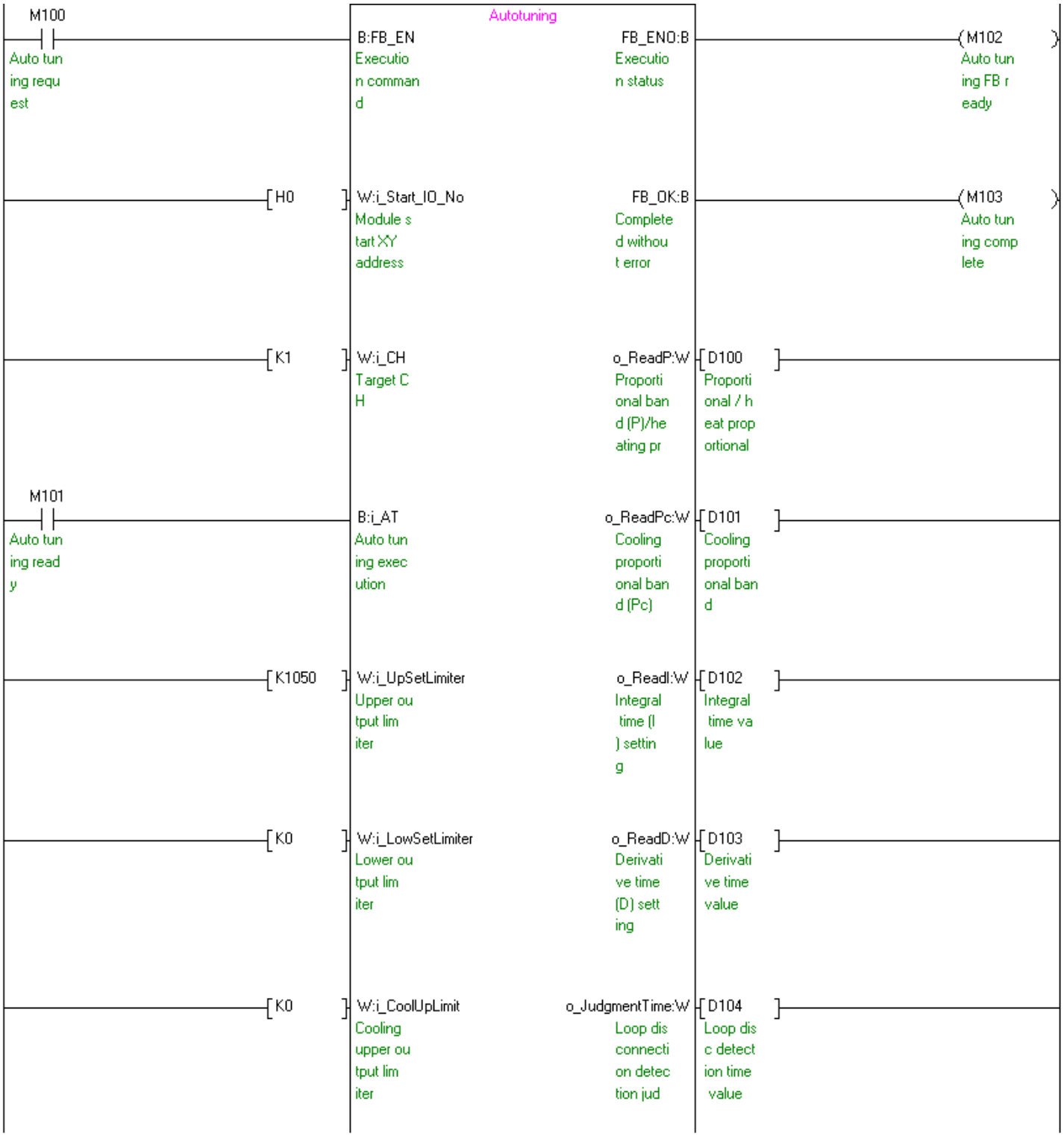
By turning ON M90, the cold junction temperature compensation selection value is written to the buffer and the cold junction temperature process value is monitored.



M+TC4_Autotuning (Auto tuning)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_AT	ON/OFF	To execute auto tuning, turn ON this parameter.
i_UpSetLimiter	K1050	Specify the upper limit value for outputting to an external devise to 105.0%.
i_LowSetLimiter	K0	Specify the lower limit value for outputting to an external devise to 0.0%.
i_CoolUpLimit	K0	Set the cooling upper limit value for outputting to an external devise to 0.0%.
i_OutVariation	K1	Set a range to prevent a sudden manipulated value change to 0.1%/s.
i_SensorCompVal	K1000	Set the compensation value for when there is a difference between the measured temperature and actual temperature to 10.00%.
i_OutputPeriod	K1	Set the ON/OFF period of the transistor output to 1 s. (When "Control output period unit switch setting" which is bit 2 of switch 3 is 0.)
i_PrimaryDelay	K100	Set the primary delay digital filter setting to 100s.
i_ATbias	K500	Set the AT bias setting to 500.
i_ActionSetting	K0	Set the forward action for channel 1.
i_AutoBackup	K1	Set the automatic backup setting after auto tuning of PID constants to enabled.
i_ATModeSelect	K1	Set the auto tuning mode to "Fast response mode".

The auto tuning parameters are set by turning ON M100, and the auto tuning is executed by turning ON M101.



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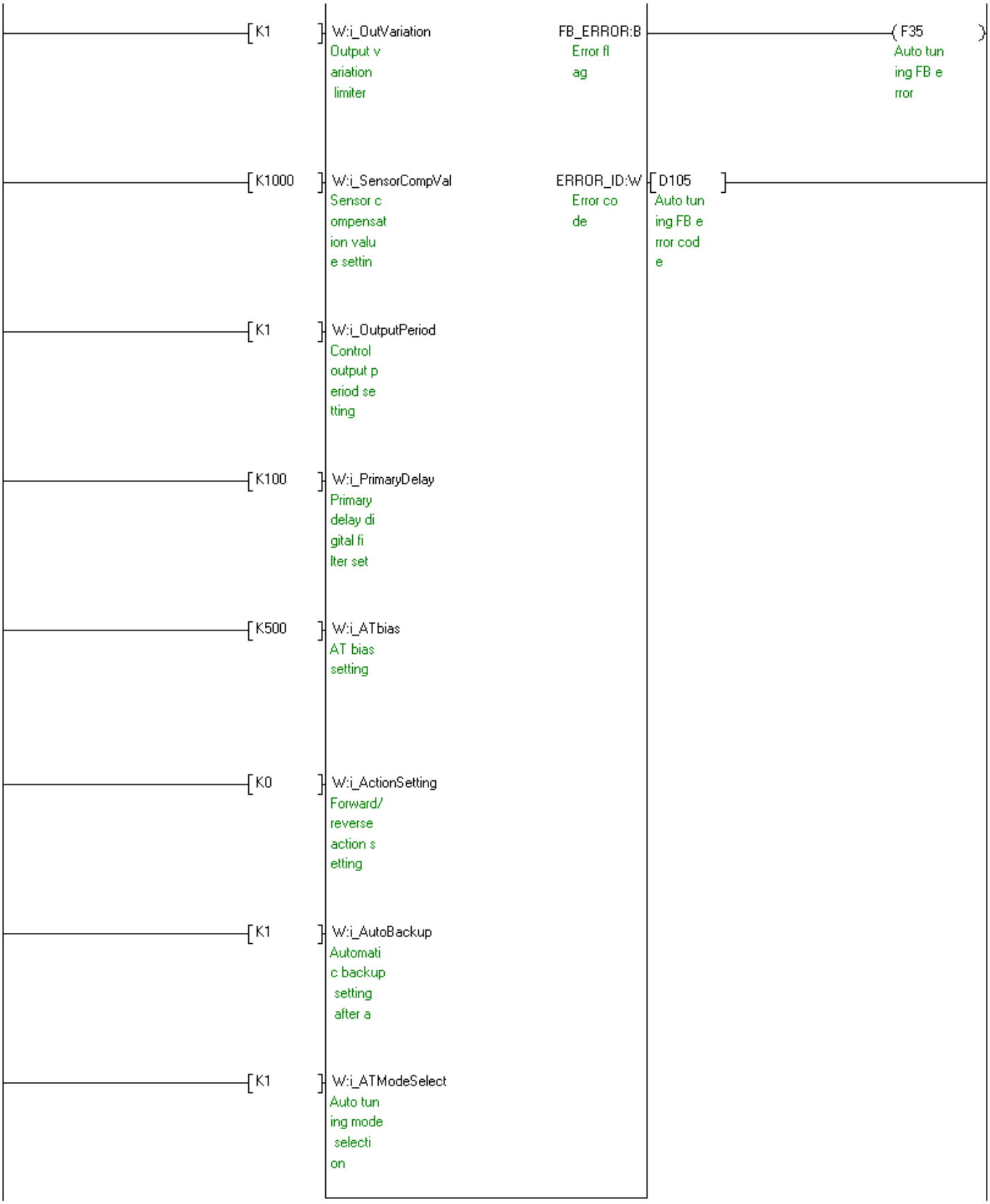
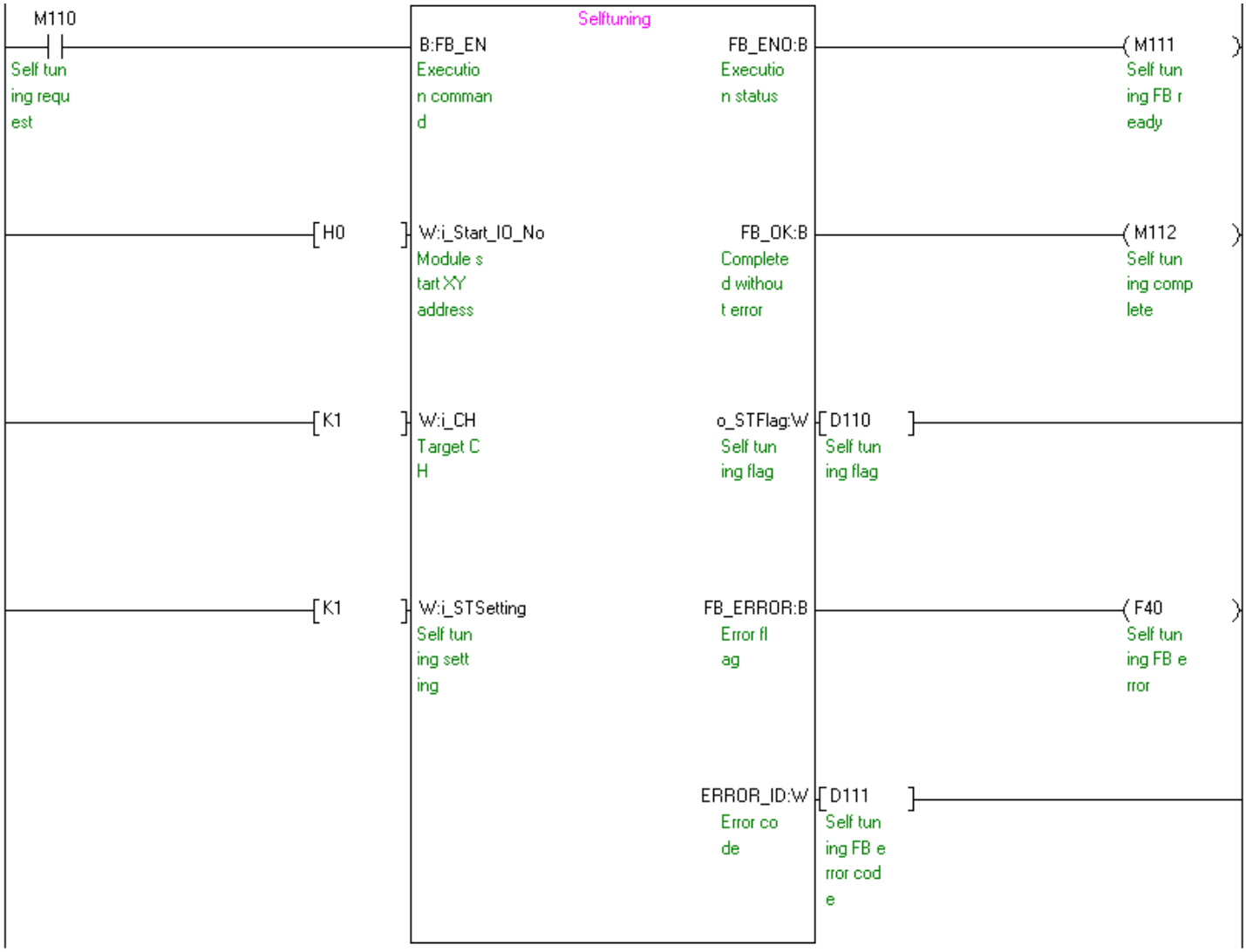

K1
W:i_OutVariation
Output variation limiter
FB_ERROR:B
Error flag
F35
Auto tuning FB error
K1000
W:i_SensorCompVal
Sensor compensation value setting
ERROR_ID:W
Error code
D105
Auto tuning FB error code
K1
W:i_OutputPeriod
Control output period setting
K100
W:i_PrimaryDelay
Primary delay digital filter set
K500
W:i_ATbias
AT bias setting
K0
W:i_ActionSetting
Forward/reverse action setting
K1
W:i_AutoBackup
Automatic backup setting after a
K1
W:i_ATModeSelect
Auto tuning mode selection

M+TC4_Selftuning (Self tuning)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_STSetting	K1	Set the self tuning setting to "Start-up ST (Calculates PID constants only)".

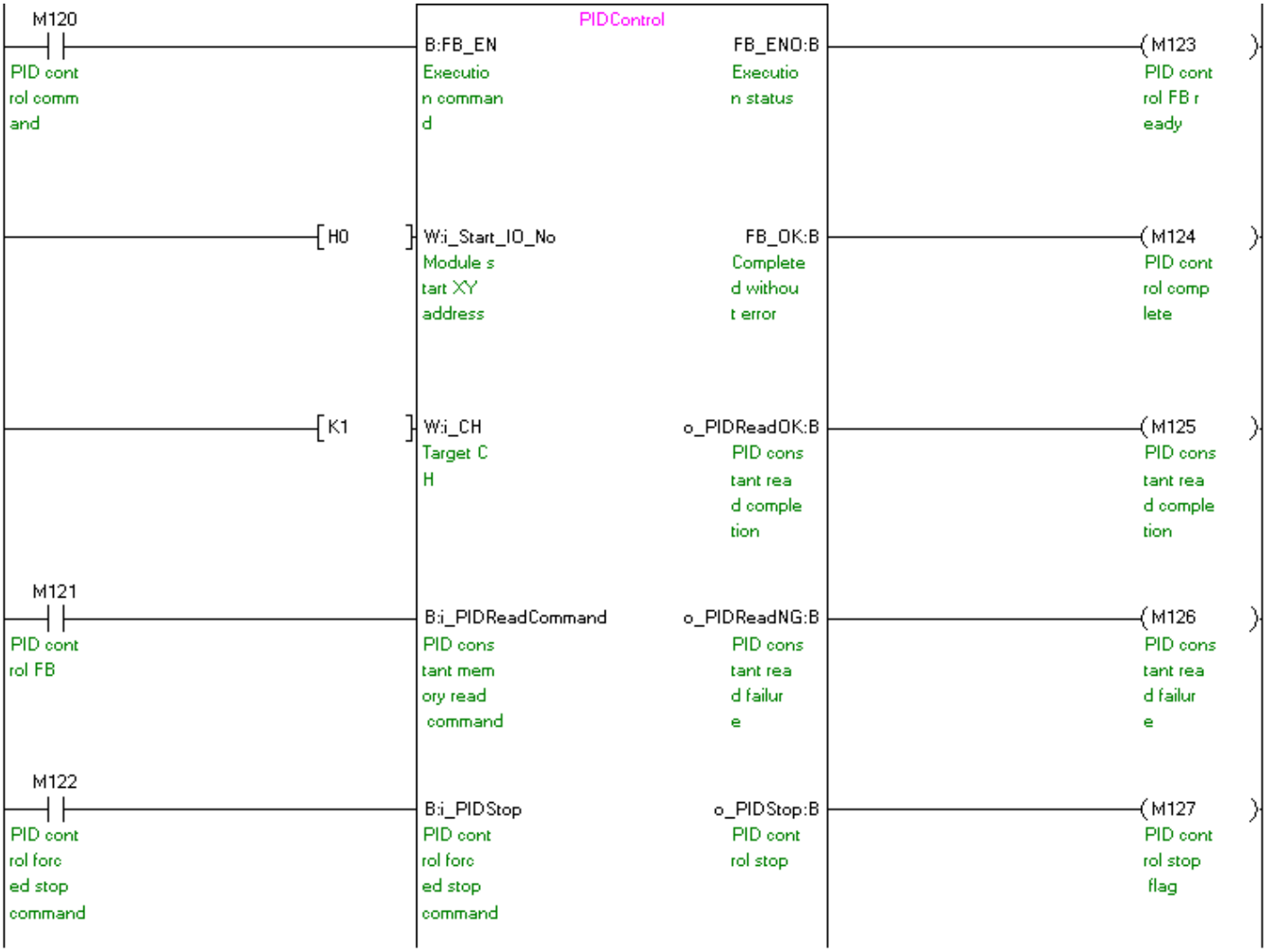
By turning ON M110, the self tuning setting values are written to the buffer memory and the self tuning flag is monitored.



M+TC4_PIDControl (PID control)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_PIDReadCommand	ON/OFF	Turn ON to execute the PID constant memory read command for channel 1.
i_PIDStop	ON/OFF	Turn ON to execute the PID control forced stop command for channel 1.

After M120 is turned ON, the PID constant memory read command is executed by turning ON M121 and the PID control forced stop command is executed by turning ON M122.



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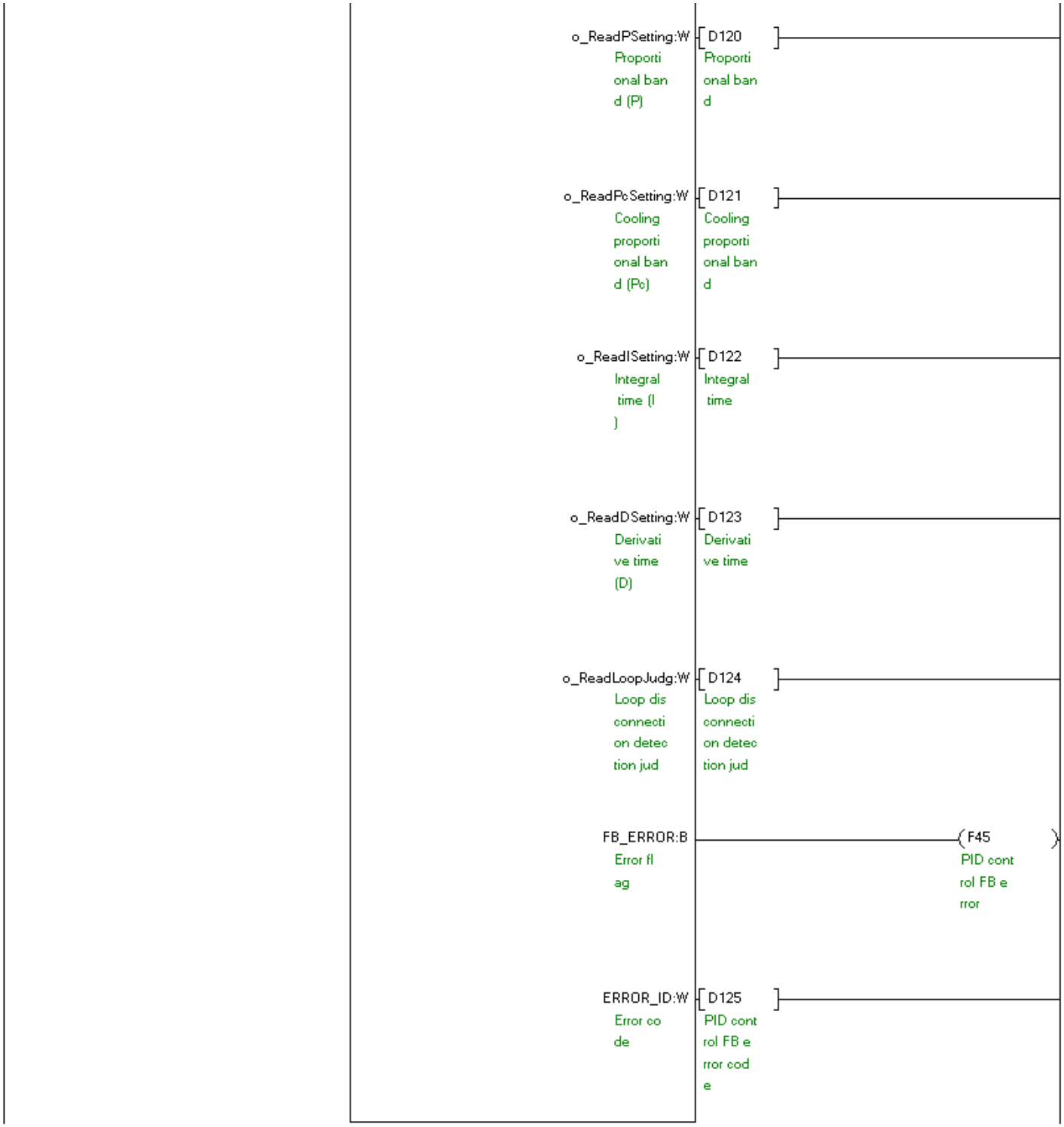
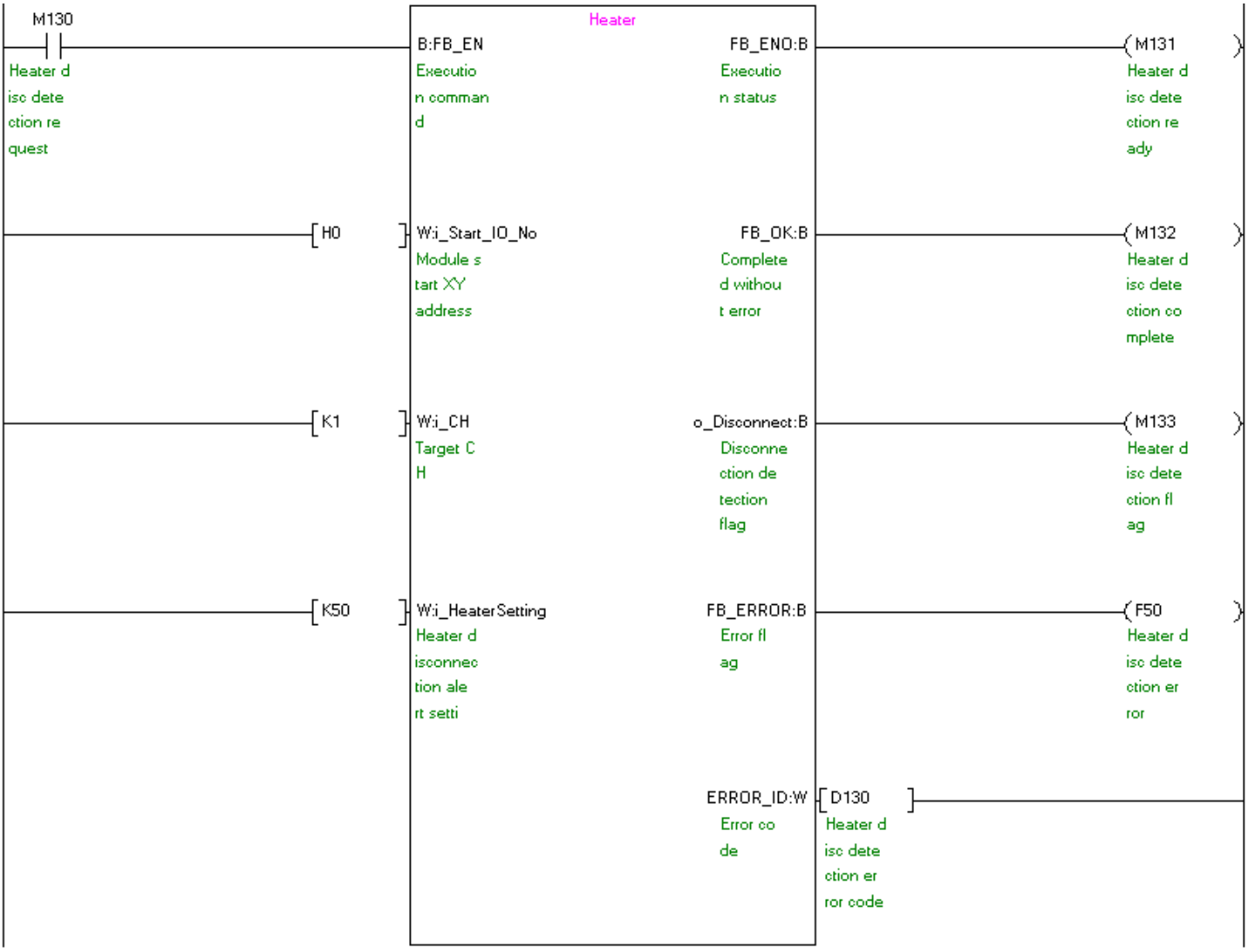

o_ReadPSetting:W
Proporti
onal ban
d (P)
D120
Proporti
onal ban
d
o_ReadPcSetting:W
Cooling
proporti
onal ban
d (Pc)
D121
Cooling
proporti
onal ban
d
o_ReadISetting:W
Integral
time (I
)
D122
Integral
time
o_ReadDSetting:W
Derivati
ve time
(D)
D123
Derivati
ve time
o_ReadLoopJudg:W
Loop dis
connecti
on detec
tion jud
D124
Loop dis
connecti
on detec
tion jud
FB_ERROR:B
Error fl
ag
F45
PID cont
rol FB e
rror
ERROR_ID:W
Error co
de
D125
PID cont
rol FB e
rror cod
e

M+TC4_HeaterDisconnection (Heater disconnection detection function)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_HeaterSetting	K50	Set the reference heater current value to 50%.

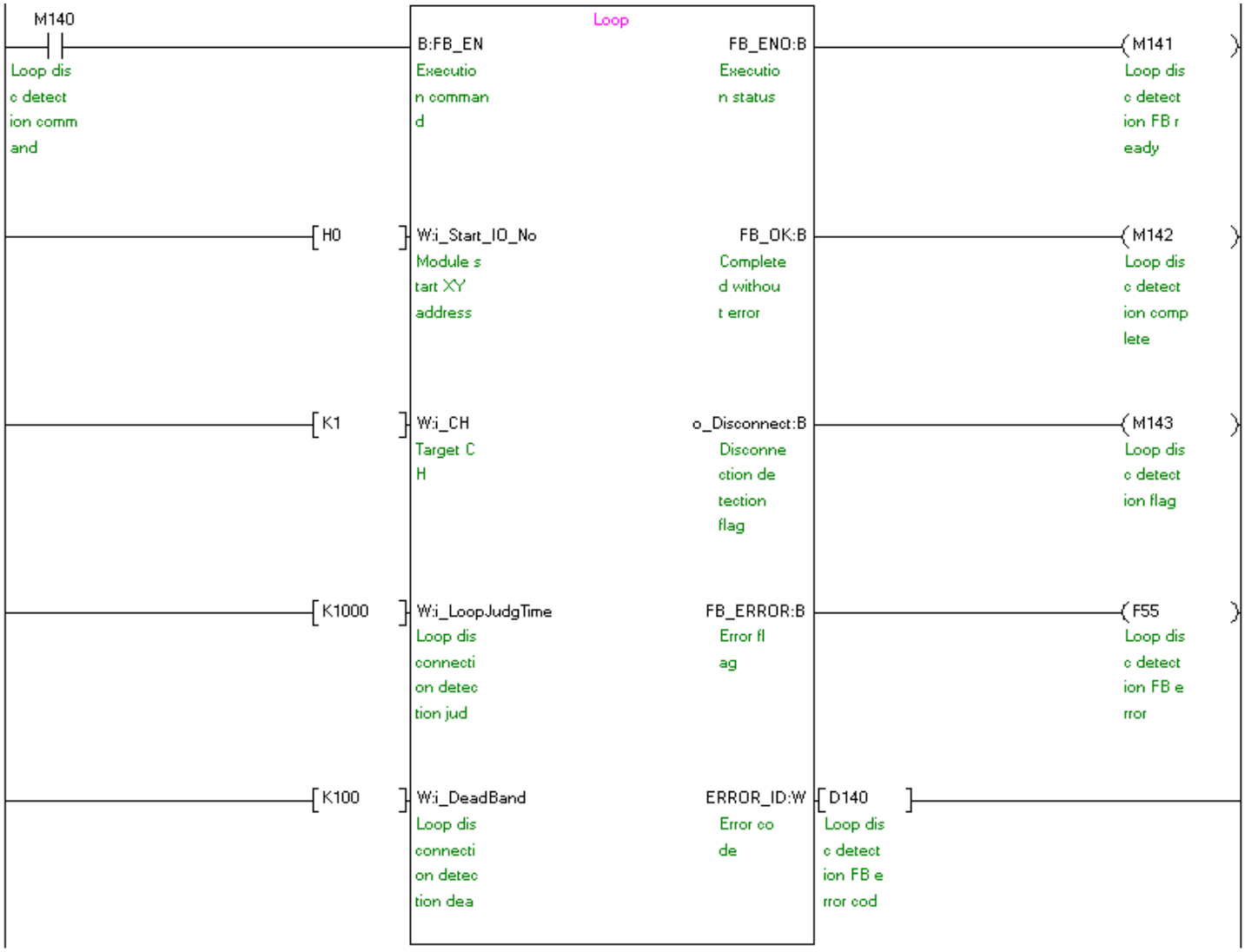
By turning ON M130, the heater disconnection alert setting values are written to the buffer memory and a heater disconnection is monitored.



M+TC4_LoopDisconnection (Loop disconnection detection function)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_LoopJudgTime	K1000	Set the judgment time of a loop disconnection to 1000s.
i_DeadBand	K100	Set the temperature width where loop disconnection is not detected to 100.

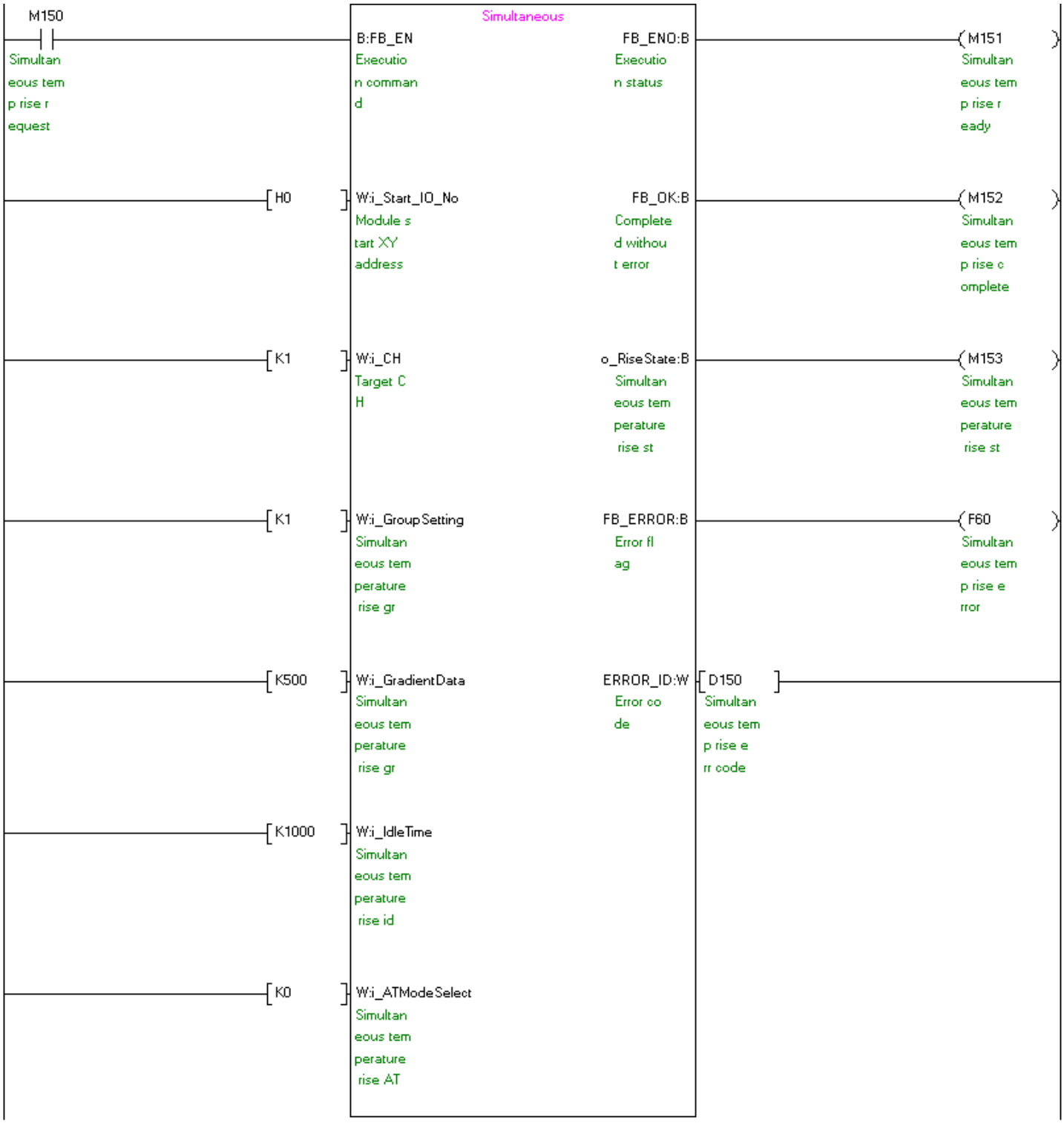
By turning ON M140, the values for the loop disconnection detection are written to the buffer memory and a loop disconnection is monitored.



M+TC4_SimultaneousTemperature (Simultaneous temperature rise function setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_GroupSetting	K1	Set channel 1 to group 1 selection.
i_GradientData	K500	Set the simultaneous temperature rise gradient data to 500.
i_IdleTime	K1000	Set the time from when the output is turned ON until the temperature starts rising to 1000s.
i_ATModeSelect	K0	Set the simultaneous temperature rise AT mode to "Standard auto tuning selection".

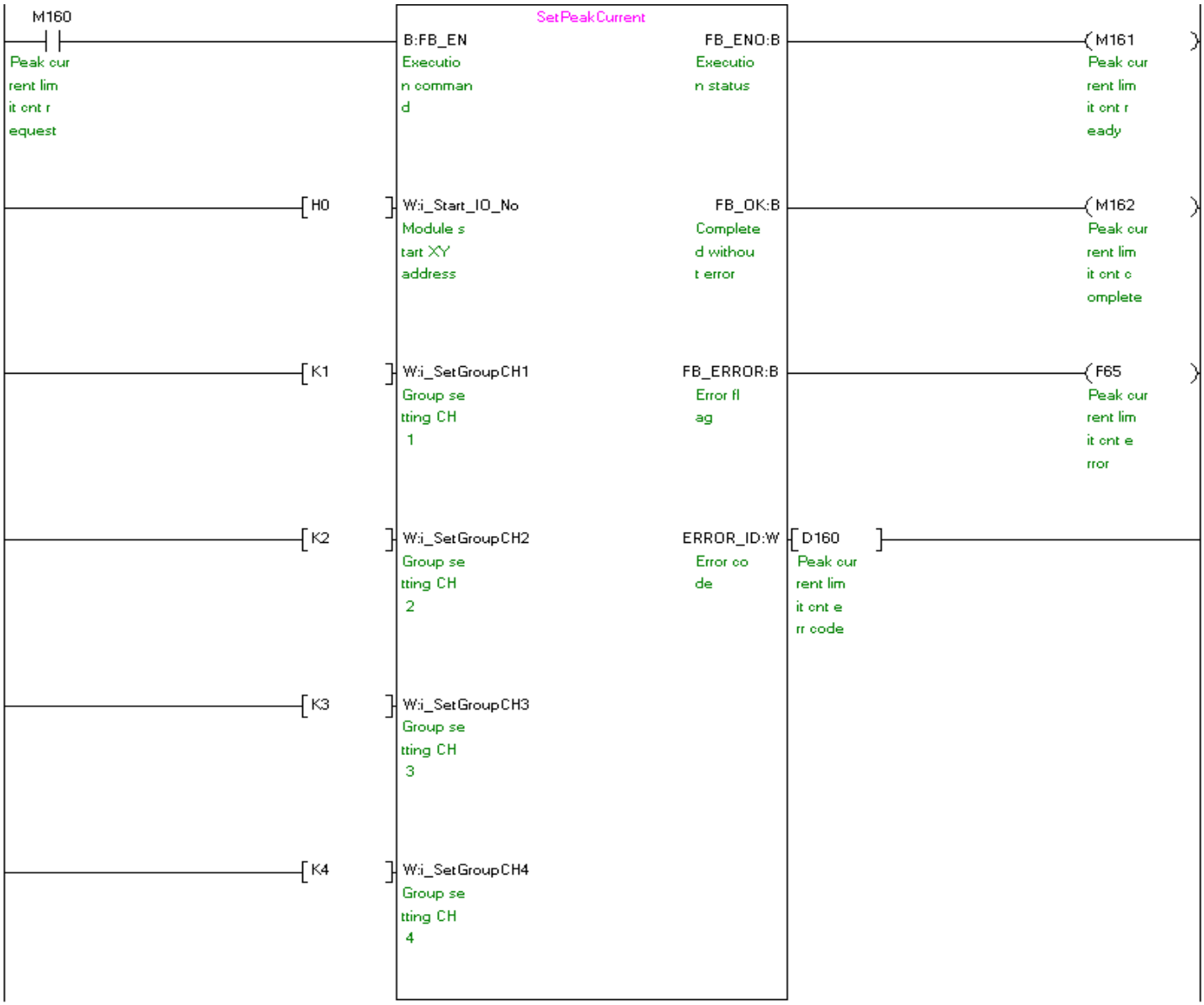
By turning ON M150, the simultaneous temperature rise function setting values are written to the buffer memory and the simultaneous temperature rise status is monitored.



M+TC4_SetPeakCurrentSuppress (Peak current limit control setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_SetGroupCH1	K1	Set channel 1 to group 1.
i_SetGroupCH2	K2	Set channel 2 to group 2.
i_SetGroupCH3	K3	Set channel 3 to group 3.
i_SetGroupCH4	K4	Set channel 4 to group 4.

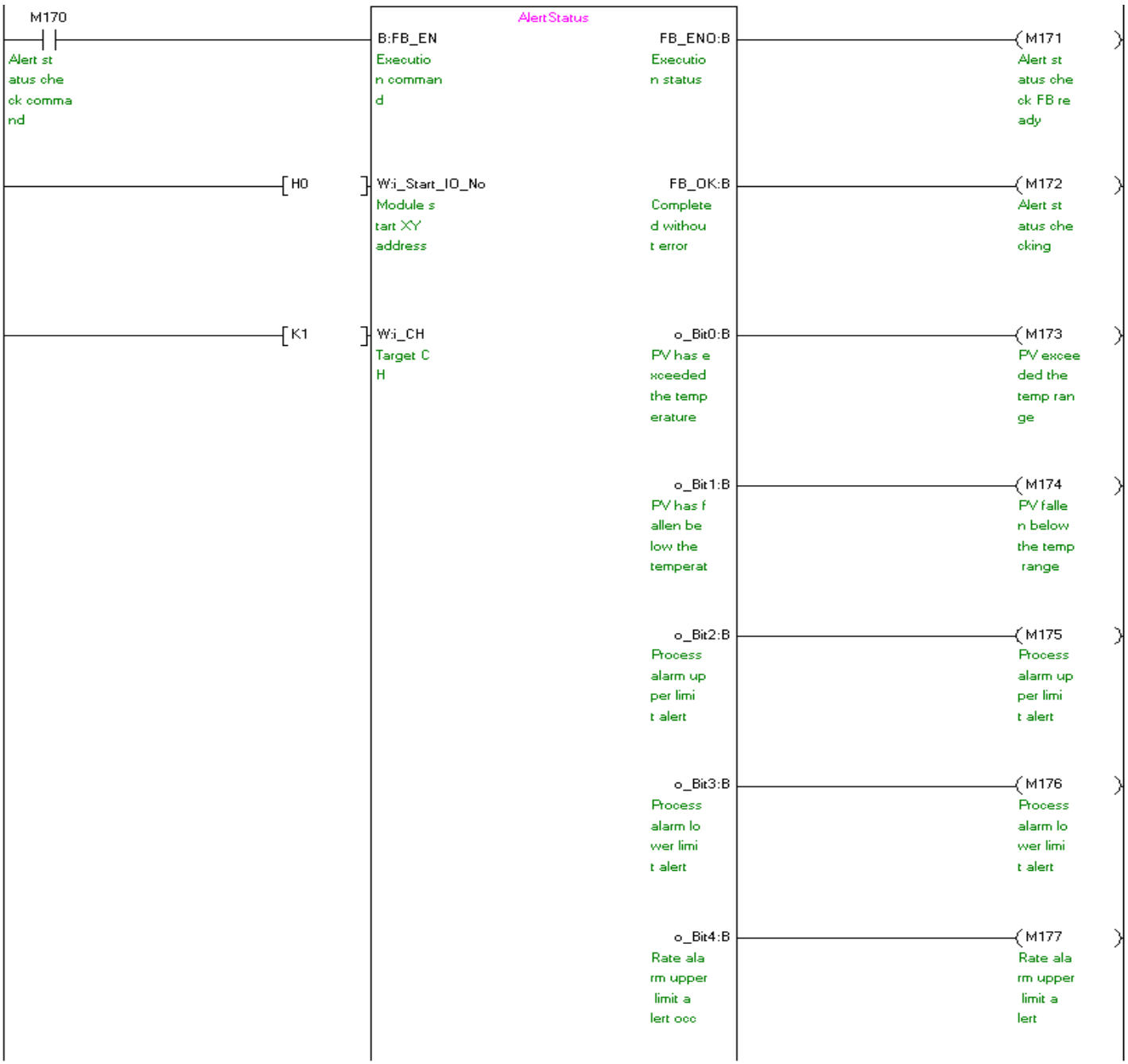
By turning ON M160, the divided groups of each channel is written to the peak current limit control setting divided group setting.



M+TC4_AlertStatus (Alert status check)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.

By turning ON M170, an alert that has occurred is monitored.



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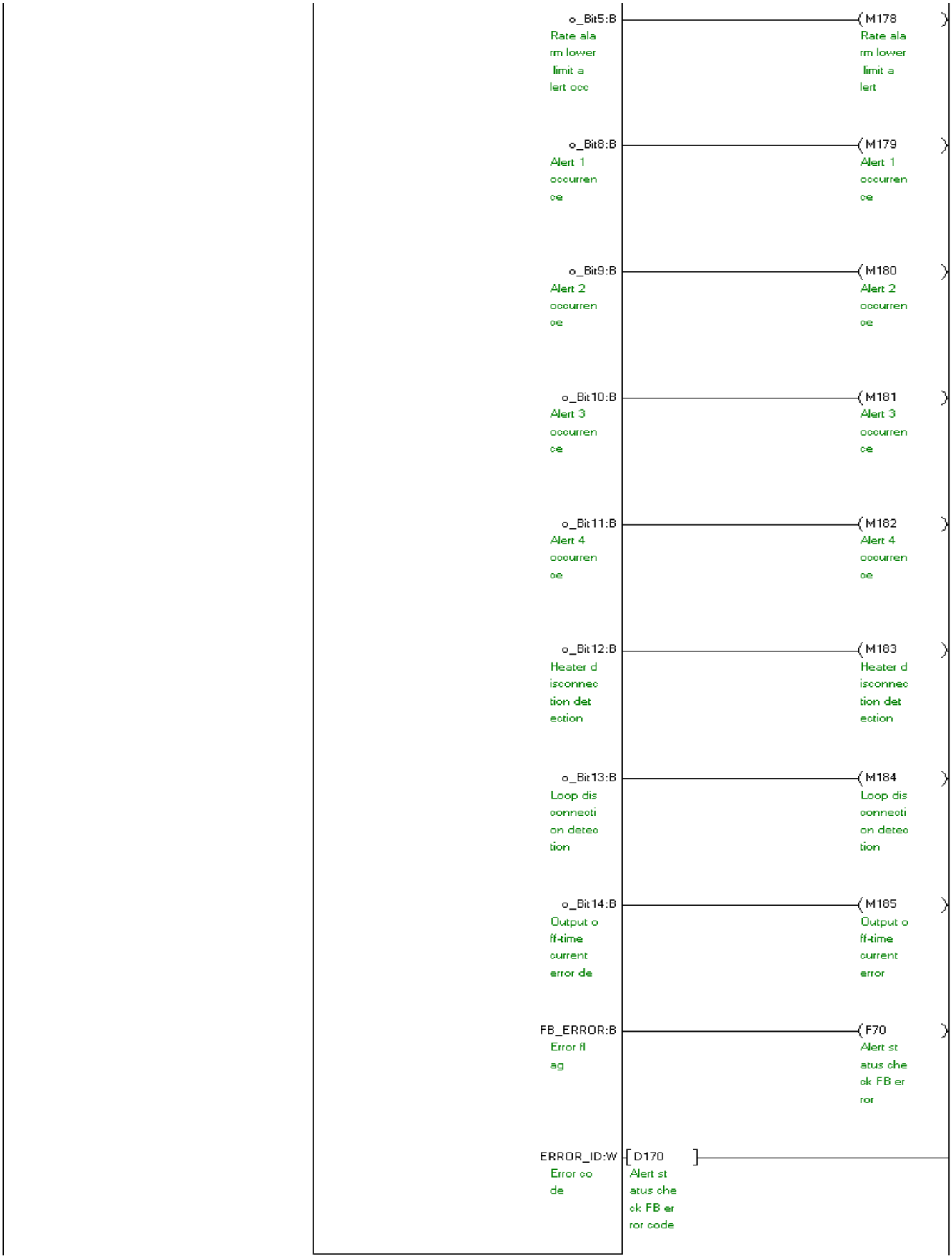
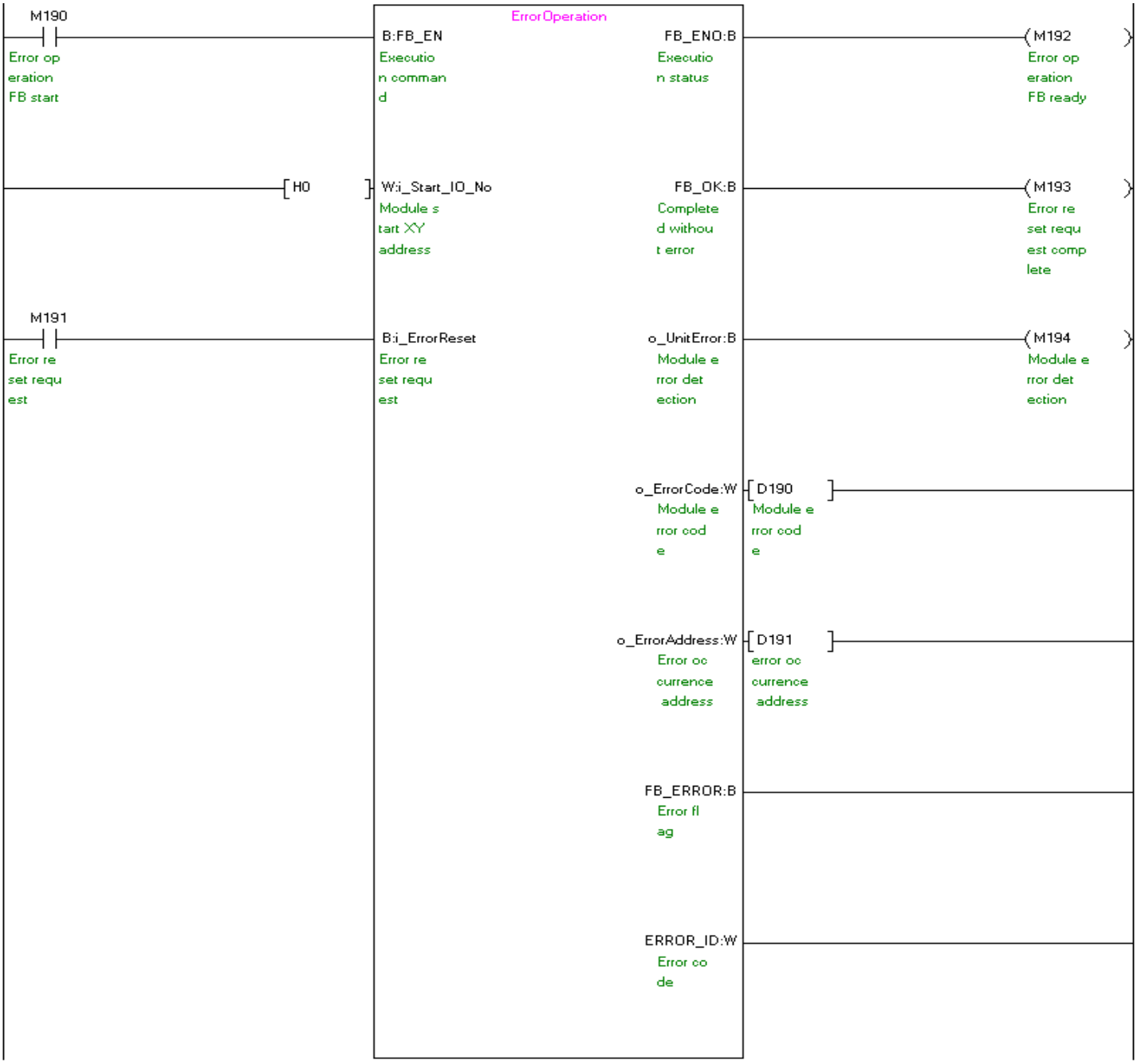

o_Bit5:B
Rate alarm lower limit alert occ
M178
Rate alarm lower limit alert
o_Bit8:B
Alert 1 occurrence
M179
Alert 1 occurrence
o_Bit9:B
Alert 2 occurrence
M180
Alert 2 occurrence
o_Bit10:B
Alert 3 occurrence
M181
Alert 3 occurrence
o_Bit11:B
Alert 4 occurrence
M182
Alert 4 occurrence
o_Bit12:B
Heater disconnection detection
M183
Heater disconnection detection
o_Bit13:B
Loop disconnection detection
M184
Loop disconnection detection
o_Bit14:B
Output off-time current error de
M185
Output off-time current error
FB_ERROR:B
Error flag
F70
Alert status check FB error
ERROR_ID:W
Error code
D170
Alert status check FB error code

M+TC4_ErrorOperation (Error operation)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_ErrorReset	ON/OFF	Turn ON this parameter to perform an error reset.

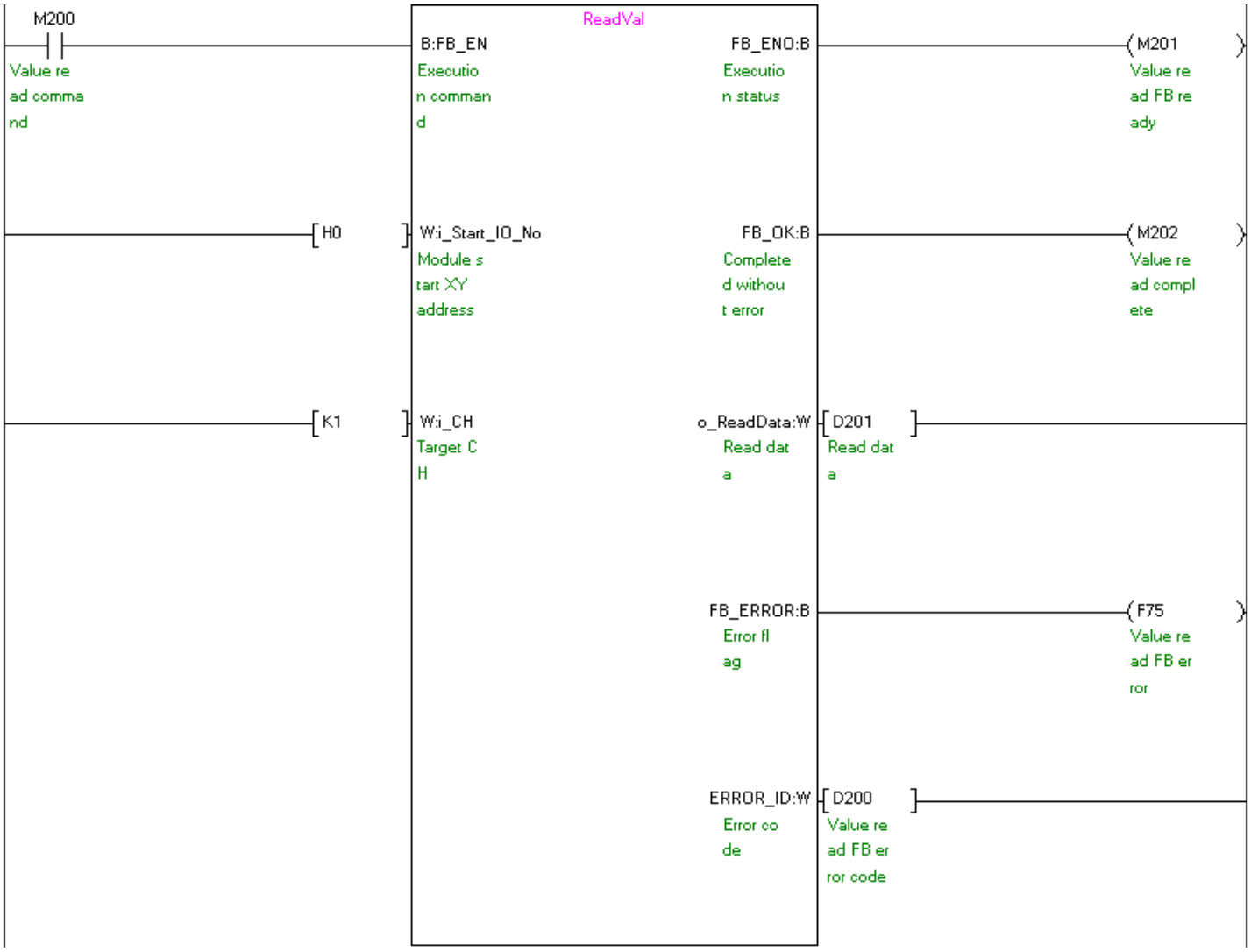
By turning ON M190, an error code and an address in which an error has occurred are output when an error has occurred.



M+TC4_ReadVal (Value read)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.

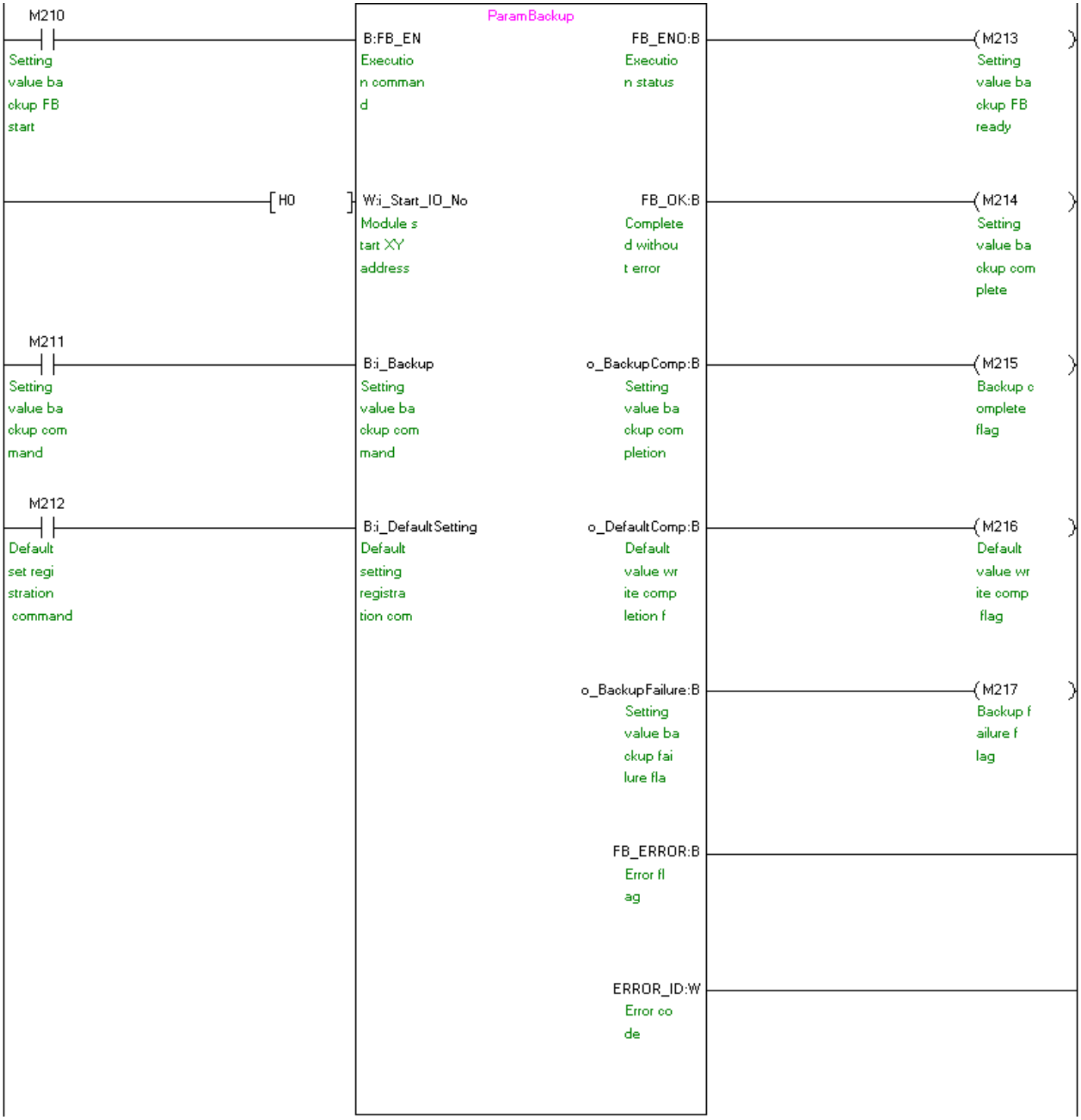
By turning ON M200, the specified values are output to the read data.



M+TC4_ParamBackup (Setting value backup)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_Backup	ON/OFF	Turn ON this parameter to write the parameter setting in the buffer memory to the non-volatile memory.
i_DefaultSetting	ON/OFF	Turn ON this parameter to return the buffer memory contents to the default values.

After M210 is turned ON, the setting value backup command is performed by turning ON M211 and the buffer memory contents are returned to the default values by turning ON M212.


M210
Setting value backup FB start
ParamBackup
B:FB_EN
Execution command
FB_ENO:B
Execution status
M213
Setting value backup FB ready
H0
W:i_Start_IO_No
Module start XY address
FB_OK:B
Completed without error
M214
Setting value backup complete
M211
Setting value backup command
B:i_Backup
Setting value backup command
o_BackupComp:B
Setting value backup completion
M215
Backup complete flag
M212
Default set registration command
B:i_DefaultSetting
Default setting registration com
o_DefaultComp:B
Default value write comp letion f
M216
Default value write comp flag
o_BackupFailure:B
Setting value backup failure fla
M217
Backup failure flag
FB_ERROR:B
Error flag
ERROR_ID:W
Error code

M+TC4_SetPVAverage (Process value (PV) moving averaging process setting)

Label Name	setting values	Description
i_Start_IO_No	H0	Specify the starting XY address where the temperature control module is mounted to 0H.
i_CH	K1	Set the target channel to channel 1.
i_Average_Count	K8	Set the number of moving averaging to 8.

By turning on M220, the number of moving averaging of the moving averaging process function for the temperature process value (PV) of channel 1 is written to the buffer memory.