Loop Control Module

User's Manual

MITSUBISHI


Mitsubishi
Programmable Controller

MELSEC-Q

***Q62HLC***
***GX Configurator-TC***
***(SW0D5C-QTCU-E)***

# • SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module User's Manual.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

| | |
|---|---|
| ⚠ DANGER | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury. |
| ⚠ CAUTION | Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage. |

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

## [Design Precautions]

### ⚠ DANGER

- Do not write data into the "read-only area" in the buffer memory of the intelligent function module. In addition, do not turn on/off the "reserved" signals among the I/O signals transferred to/from the programmable controller CPU.
  Doing so can malfunction the programmable controller system.
- Depending on the output element or the malfunction of the internal circuit, abnormal output may occur. Install external monitoring circuitry for output signals that may lead to major accidents.

### ⚠ CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 100mm (3.94inch) or more from each other.
  Not doing so could result in noise that may cause malfunction.
- During the power supply ON/OFF, current may run instantaneously from the output terminal. Wait and see whether the analog output is constant, then start the control.


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## [Installation Precautions]

### ⚠ CAUTION

- Use the programmable controller in an environment that meets the general specifications contained in the CPU User's Manual.
  Using this programmable controller in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
  Improper installation may result in malfunction, breakdown or the module coming loose and dropping. Securely fix the module with screws if it is subject to vibration during use.
- Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause electric shock or damage to the module.
  In the system where a CPU module supporting the online module change is used and on the MELSECNET/H remote I/O stations, modules can be replaced online (during energizing). However, there are some restrictions on replaceable modules and the replacement procedures are predetermined for each module.
  For details, refer to the chapter of the online module change in this manual.
- Do not directly touch the conductive area or electronic components of the module.
  Doing so may cause malfunction or failure in the module.

## [Wiring Precautions]

### ⚠ CAUTION

- Be careful not to let foreign matters such as sawdust or wire chips get inside the module.
  They may cause fires, failure or malfunction.
- The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring.
  Do not remove this film until the wiring is complete.
  Before operating the system, be sure to remove the film to provide adequate heat ventilation.
- Be sure to fix communication cables or power supply cables leading from the module by placing them in the duct or clamping them.
  Cables not placed in the duct or without clamping may hang or shift, allowing them to be accidentally pulled, which may cause a module malfunction and cable damage.
- Do not grab on the cable when removing the communication or power cable connected to the module.
  When disconnecting a cable without a connector, first loosen the screws on the part that is connected to the module.
  Pulling the cable when it is still connected to the module may cause damage to the module or cable, or misoperation due to cable contact failure.

## [Wiring Precautions]

### ⚠ DANGER

- Always ground the FG terminal and the shielded cable for the programmable controller.
  There is a risk of electric shock or malfunction.
- If energizing or operating after the wiring, be sure to put the terminal cover included with the product.
  Not doing do so may cause electric shock.
- Tighten with the specified torque, using an applicable crimping terminal for the crimping terminal.
  If a crimping terminal with open end is used, the terminal screw falls off when coming loose, and it can cause a malfunction.
- When wiring, be sure to verify the rated voltage of the product as well as the terminal layout. Fire or failure may result if incorrect voltage is input or incorrect wiring is performed.
- Connecting terminals with incorrect voltage may result in malfunction or mechanical failure.

## [Startup/Maintenance Precautions]

### ⚠ CAUTION

- Do not disassemble or modify the module.
  Doing so could cause failure, malfunction, injury or fire.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause failure or malfunction of the module.
  In the system where a CPU module supporting the online module change is used and on the MELSECNET/H remote I/O stations, modules can be replaced online (during energizing).
  However, there are some restrictions on replaceable modules and the replacement procedures are predetermined for each module.
  For details, refer to the chapter of the online module change in this manual.
- Do not install/remove the module to/from the base unit, or the terminal block to/from the module more than 50 times after the first use of the product. (IEC 61131-2 compliant)
  Failure to do so may cause malfunction.
- Do not touch the connector while the power is on.
  Doing so may cause malfunction.
- Be sure to shut off all phases of the external power supply used in the system, before cleaning or retightening the screws or module fixing screws.
  Not doing so may cause failure or malfunction of the module.
  If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damages to the screws and/or the module, resulting in the module falling out, short circuits or malfunction.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
  Failure to do so may cause a failure or malfunctions of the module.

## [Disposal Precautions]

| ⚠ CAUTION |
| --- |
| • When disposing of the product, handle it as industrial waste. |


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REVISIONS

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

| Print Date | * Manual Number | Revision |
|---|---|---|
| Aug., 2005 | SH (NA)-080573ENG-A | First edition |
| Jan., 2008 | SH (NA)-080573ENG-B | Correction<br>SAFETY PRECAUTION, CONTENTS, About the Generic Terms and Abbreviations, Chapter 1, Section 1.1, 2.1 to 2.3, 3.1.1, 3.2, 3.2.1, 3.2.10, 3.2.13, 3.5.1, 3.5.3, 3.5.14, 3.5.15, 3.5.49, 3.5.50, 3.5.57, 3.5.65, 5.1, 5.2.2, 6.2.1, 6.2.2, 8.1, INDEX |
| Apr., 2008 | SH (NA)-080573ENG-C | Correction<br>Compliance with the EMC and Low Voltage Directives, Section 2.1, 2.3, 3.1.1, 3.2.10, 3.2.16, 3.5.15, 3.5.46, 3.5.47, 3.5.64, 4.5, 5.2.1, 5.3.3, 5.4, 5.5, 6.2, 6.3, 7.1, 8.1, 8.13<br>Addition<br>Appendix 2 |
| May, 2008 | SH (NA)-080573ENG-D | Correction<br>SAFETY PRECAUTIONS, About the Generic Terms and Abbreviations, Section 2.1, 2.3, 4.1, 5.2.1, 5.3.1, 5.3.3, Chapter 7, Section 7.1 |
| | | |

Japanese Manual Version SH-080547-D

INTRODUCTION

Thank you for the purchasing the MELSEC-Q series programmable controller.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Q series programmable controller you have purchased, so as to ensure correct use.

CONTENTS

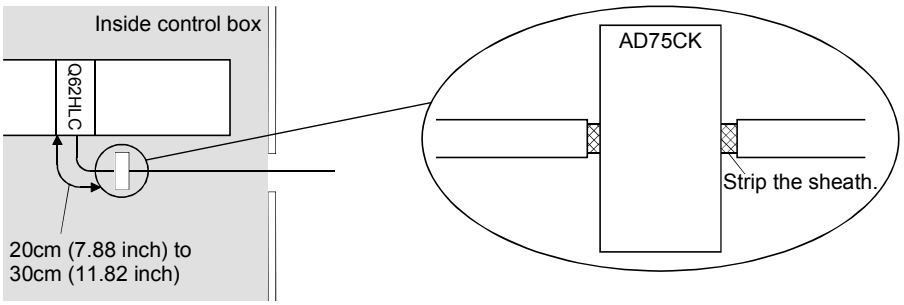
Compliance with the EMC and Low Voltage Directives

(1) For programmable controller system
To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 9 "EMC AND LOW VOLTAGE DIRECTIVES" of the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product
The following wiring is required for the compliance of this product with the EMC and Low Voltage Directives.

(a) Use shielded cables for all external wiring and ground them to the control panel with the AD75CK cable clamp.




(b) Four cables can be grounded together with the AD75CK cable clamp when the diameter of each cable is approximately 7mm (0.28 inch).

About the Generic Terms and Abbreviations

Unless otherwise specified, this manual uses the following generic terms and abbreviations to describe the Loop control module.

| Generic term/abbreviation | Description |
|---|---|
| Personal computer | DOS/V-compatible personal computer of IBM PC/AT® or its compatible |
| GX Developer | Generic product name of the product types SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV and SWnD5C-GPPW-EVA.<br>"n" in the model name is 4 or greater.<br>("n" is 4 or greater.)<br>"-A" and "-V" denote volume license product and upgraded product respectively. |
| QCPU (Q mode) | Generic term of the Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q13UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q13UDEHCPU and Q26UDEHCPU. |
| Process CPU | Generic term of the Q02PHCPU, Q06PHCPU, Q12PHCPU and Q25PHCPU. |
| GX Configurator-TC | Generic term of temperature control module setting/monitoring tool GX Configurator-TC(SW0D5C-QTCU-E) |
| Q62HLC | Abbreviation of Type Q62HLC loop control module |
| Windows Vista® | Generic term for the following:<br>Microsoft® Windows Vista® Home Basic Operating System,<br>Microsoft® Windows Vista® Home Premium Operating System,<br>Microsoft® Windows Vista® Business Operating System,<br>Microsoft® Windows Vista® Ultimate Operating System,<br>Microsoft® Windows Vista® Enterprise Operating System |
| Windows® XP | Generic term for the following:<br>Microsoft® Windows® XP Professional Operating System,<br>Microsoft® Windows® XP Home Edition Operating System |

Product Structure

The product structure of the product is given in the table below.

| Model code | Product name | Quantity |
|---|---|---|
| Q62HLC | Type Q62HLC loop control module | 1 |
| SW0D5C-QTCU-E | GX Configurator-TC Version 1 (1-license product) (CD-ROM) | 1 |
| SW0D5C-QTCU-EA | GX Configurator-TC Version 1 (Multiple-license product) (CD-ROM) | 1 |

# 1 GENERAL DESCRIPTION



This manual deals with the specifications, handling and instructions wiring and programming methods of the following loop control module Q62HLC (hereafter abbreviated to the Q62HLC used with the MELSEC-Q series programmable controller CPU module (hereafter abbreviated to the programmable controller CPU).

## (1) What is Q62HLC

(a) The Q62HLC is the intelligent function module for the continuous proportional control.
The Q62HLC converts analog inputs from various external sensors (temperature, humidity, pressure, and flow rate, etc.) into measured values (with 16-bit signed binary), performs PID operations to attain target set values, and outputs the calculated manipulated values to external operation device with current output.

(b) The Q62HLC has the following five control functions.
- Normal mode (Normal control mode)
- Program control (Program control mode)
- Cascade mode
- Manual control (Manual control mode 1)
- Manual control (Manual control mode 2)

(c) The Q62HLC has an auto tuning function which automatically sets the proportional band (P), integral time (I) and derivative time (D) for PID operations.

(d) The Q62HLC accepts K, J, T, B, S, E, R, N, PLII and W5Re/W26Re type thermocouples and the sensors compatible with various input ranges of micro voltage, voltage and current.

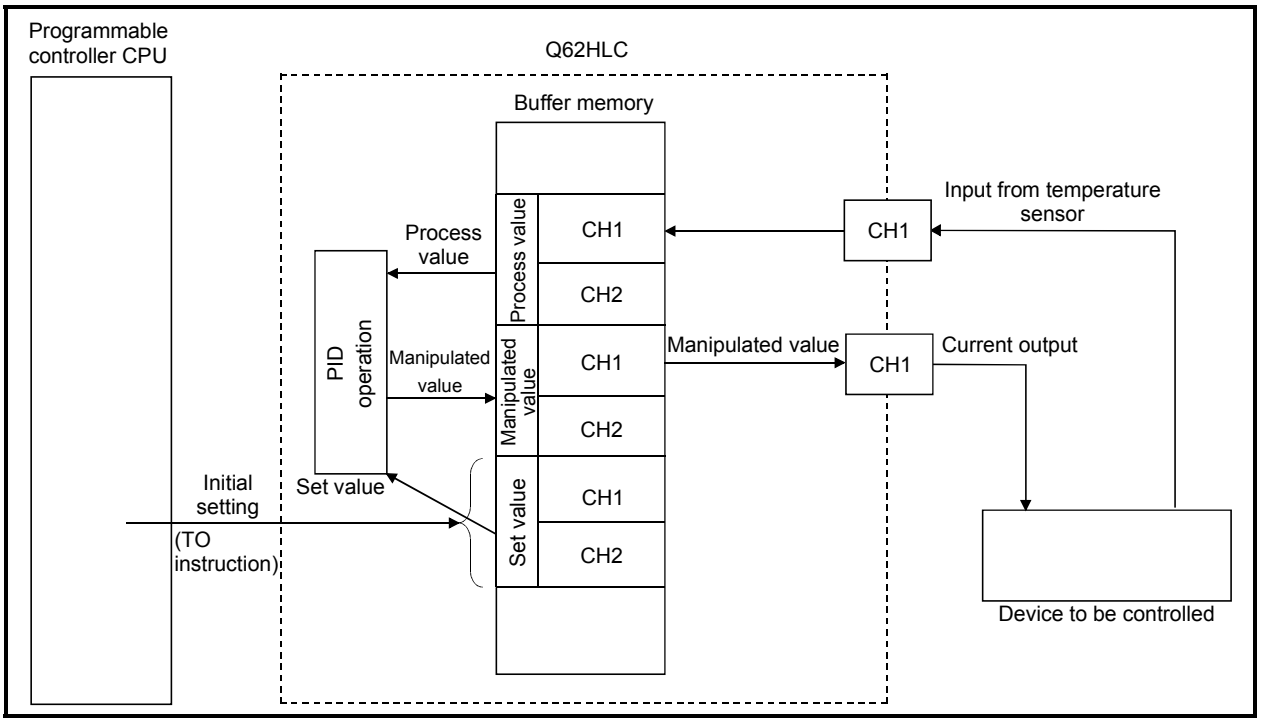



Fig. 1.1 Q62HLC Processing Outline

## 1.1 Features



The Q62HLC has the following features.

### (1) High speed continuous proportional control (PID control)

The Q62HLC is the intelligent function module that performs the continuous proportional control.
The specifications of the Q62HLC are the high speed 25ms sampling cycle, the high accurate and high resolution analog input (thermocouple, micro voltage, voltage and current), and the current output.
This will enable the Q62HLC to support the target controls with high speed response such as the rising and falling temperature control, pressure control and flow rate control with high speed.

### (2) Optimum temperature adjustment control (PID control)

(a) The Q62HLC exercises PID control automatically by merely setting the PID constants (proportional band (P), integral time (I), derivative time (D)) (set value: (SV) necessary for PID operations.
Therefore, no special instructions are needed to perform PID control.

(b) The Q62HLC can be operated selecting a control function from several options.

1) Normal mode (Normal control mode)
: controls the control target using the manipulated values calculated in PID operations as the control output.

2) Program control (Program control mode)
: changes the set values automatically and performs the control, following the set program pattern. The calculated operational rate in PID operations is used for the control output.

3) Cascade control
: performs the control using the channel 1 as master and the channel 2 as slave.

4) Manual control (Manual control mode 1)
: controls the control target using the numerical values written in the manual output setting (-5.0 to 105.0%) as the control output.

5) Manual control (Manual control mode 2)
: controls the control target using the numerical values (0 to 4000) written in the manual output setting as the control output.
This mode is for the simplified analog I/O function.

(c) Using the auto tuning function at normal control mode, enables the PID constants to be set automatically by the Q62HLC.
Hence, you can use the equipment without being conscious of cumbersome PID operation expressions to find the PID constants.

### (3) Connection of thermocouples compatible with JIS, IEC, NBS and ASTM Standards

(a) The Q62HLC accepts the following thermocouples compatible with the JIS, IEC, NBS and ASTM Standards. (Refer to Section 3.2.1)

- JIS Standards : R, K, J, S, B, E, T
- IEC Standards: R, K, J, S, B, E, T, N
- NBS Standards : PL II
- ASTM Standards: W5Re, W26Re

### (4) Connection of sensors compatible with various input ranges of micro voltage, voltage and current

With the input sensor for micro voltage, voltage and current, the measuring of the analog input is available within the following ranges.

- Micro voltage : 0 to 10mV, 0 to 100 mV, -10 to 10 mV, -100 to 100 mV
- Voltage : 0 to 1V, 1 to 5V, 0 to 5V, 0 to 10V, -1 to 1V, -5 to 5 V, -10 to 10V
- Current : 4 to 20mA, 0 to 20mA

### (5) RFB limiter function

The RFB (Reset Feed Back) limiter suppresses overshooting which is liable to occur at a startup or when the set values (SV) is increased. (Refer to Section 3.2.4)

### (6) Sensor compensation function

By setting a sensor compensation value, the sensor compensation function eliminates a difference between measured values (PV) and actual temperature, humidity, pressure, flow rate or others, if any. (Refer to Section 3.2.5)

### (7) Program control function

By merely setting the program pattern, the function performs the control automatically changing the set values (SV) or PID constants (proportional band (P), integral time (I), derivative time (D)) by the hour. (Refer to Section 3.2.12)

### (8) Cascade control function

The cascade control can perform the control using the channel 1 as master and the channel 2 as slave. (Refer to Section 3.2.13)

### (9) Scaling function

The result scaling the measured value (PV) can be automatically stored in the buffer memory. (Refer to Section 3.2.14)

### (10) Simplified analog I/O function

Monitoring the measured value and setting the manipulated value manually can use the Q62HLC as simplified thermocouple/micro voltage input module, analog-digital conversion module and digital-analog conversion. (Refer to 3.2.15)

### (11) Auto tuning mode setting function

Setting AT (auto tuning) differential gap and AT additional lag can set the auto tuning mode according to a control target to be used. (Refer to 3.2.2)

### (12) Online module change function

The Q62HLC can be changed without stopping the system. (Refer to Chapter 7)

### (13) FeRAM for backing up set values

The set values in buffer memory can be stored into FeRAM for data backup. Using the test function of GX Developer to write data directly to the buffer memory, what is required in a sequence program is "LD∗∗" + "OUT Yn1" at the minimum. (Refer to Section 3.2.9)

### (14) Utility package for ease of setting

The optional utility package (GX Configurator-TC) is available.
Though you are not required to use the utility package, it allows initial and auto refresh settings to be made on the screen, reducing sequence programs and also enabling you to check the setting and operating states and execute auto tuning easily. (Refer to Chapter 5)

## 1.2 The PID Control System

### (1) The PID control system

Figure 1.2 indicates the system configuration when performing PID control.

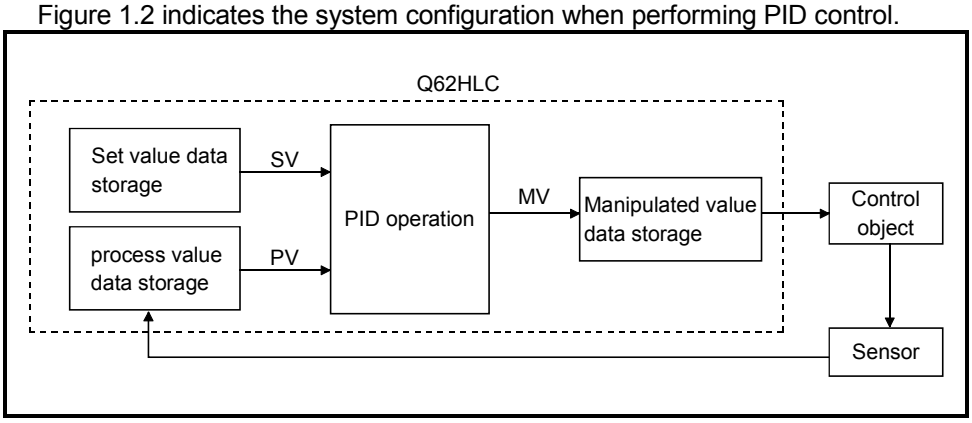



Fig. 1.2 The PID control system

### (2) PID control procedure

The PID control is performed in the procedure shown in Figure 1.3 below:

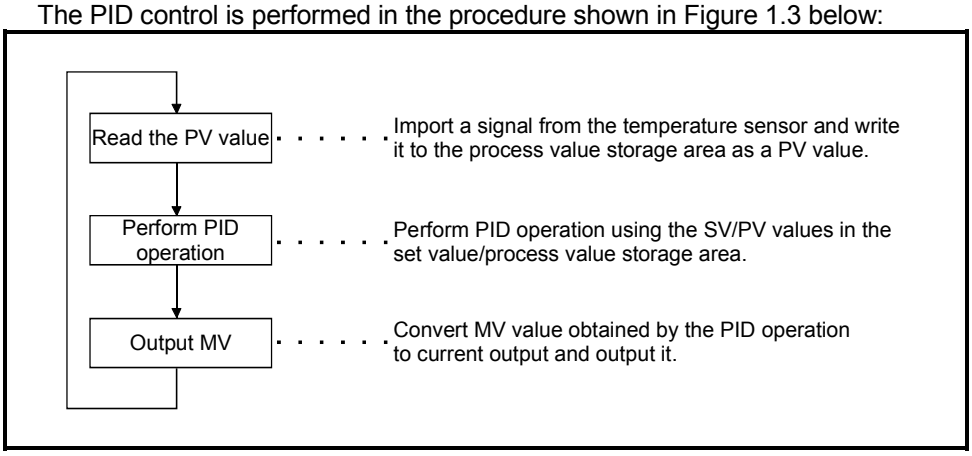



Fig. 1.3 PID control procedure

### (3) PID control (simplified two-level response selection)

In general, when the P, I, and D constants to improve the "response to the setting" are set, the "response to the disturbance" degrades by the PID control. Conversely, when the P, I, and D constants to improve the "response to the disturbance" are set, the "response to the setting" degrades by the PID control. In the PID control (simplified two-level response selection) of this module, "fast", "normal", or "slow" can be selected for the "response to the setting" while the P, I, and D constants for better "response for the disturbance" are selected.

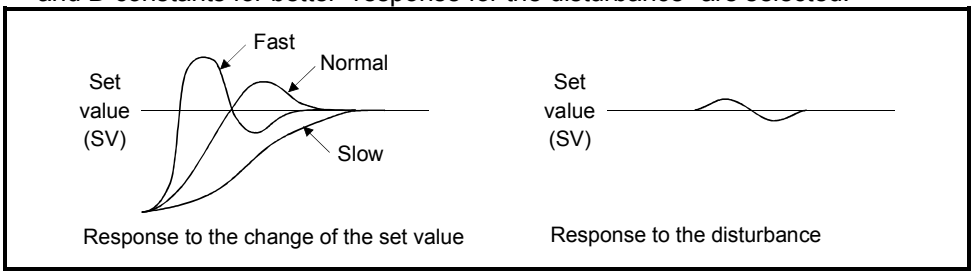



Fig. 1.4 simplified two-level response selection

## 1.3 About the PID Operation

The Q62HLC can perform PID control in measured value incomplete differentiation.

### 1.3.1 Operation method and formula

The PID control in measured value incomplete differentiation is an operation method which puts the first-order delay filter as the input for derivative control action, and performs PID operation with the error value (E) after deleting the high-frequency noise component.

(1) The algorithm of the PID control in measured value incomplete differentiation is shown in Figure 1.5.

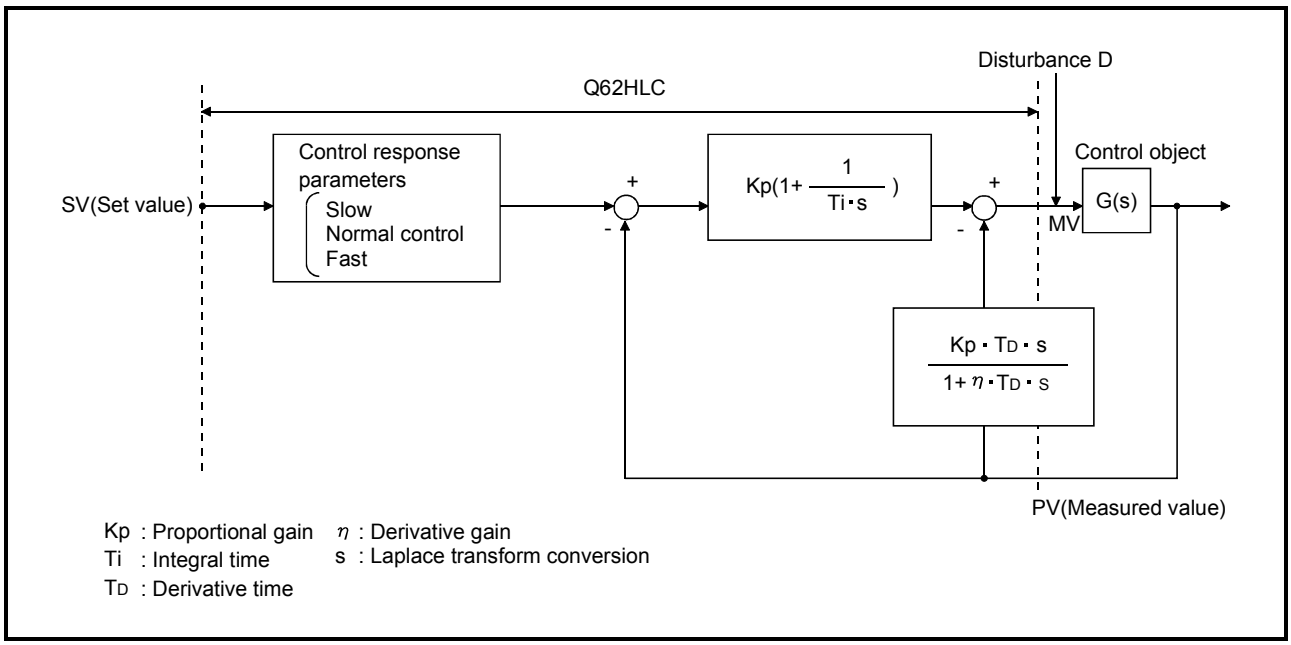



Fig. 1.5 Algorithm of PID control in measured value incomplete differentiation

(2) The formula used for Q62HLC is shown below:

$$MV_n = MV_{n-1} + \frac{T_D}{\tau + \eta \cdot T_D}\left\{(PV_{n-1} - PV_n) - \frac{\tau}{T_D} \cdot MV_{n-1}\right\}$$

$\tau$ : Sampling period
MV : Incomplete derivative output
PV : Measured value
$T_D$ : Derivative time
$\frac{1}{\eta}$ : Derivative gain

### 1.3.2 The Q62HLC actions

The Q62HLC performs PID operations in reverse action and forward action.

(1) Reverse action

In a reverse action, the process value (PV) increases toward the set value (SV) as the manipulation value (MV) increases.
The reverse action is effective for heat control.

(2) Forward action

In a forward action, the process value (PV) decreases toward the set value (SV) as the manipulation value (MV) increases.
The forward action is effective for cooler control.

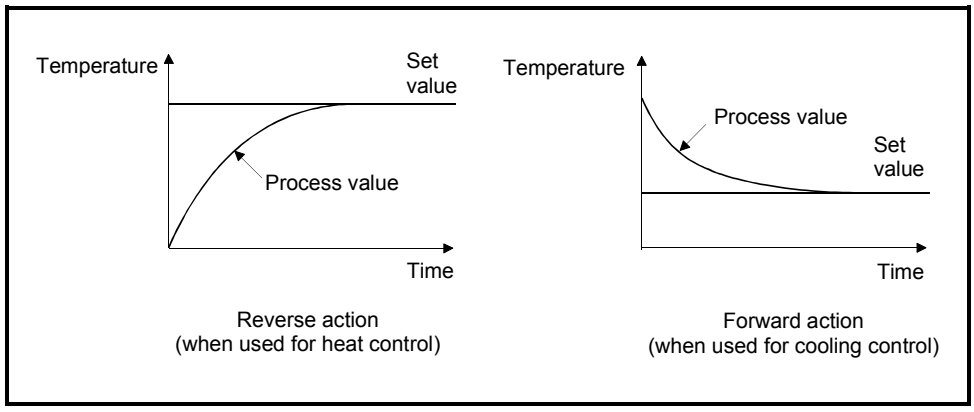



Fig. 1.6 Process control example in reverse action and forward action

### 1.3.3 Proportional action (P-action)

(1) The proportional action is an action to obtain the manipulation value proportional to the deviation (difference between set value and process value).

(2) With the proportional action, the relationship between the changes in the deviation and manipulation value can be expressed in the following formula:

$MV = K_P \cdot E$

where Kp is a proportional constant and is called the proportional gain.

(3) The proportional action for the step response when the error value is constant is shown in Figure 1.7.

(4) The manipulation value changes between -5.0% and 105.0 %. As the Kp increases, the manipulation value for the same error value becomes larger, and the corrective action becomes stronger.

(5) The proportional action will generate an offset (remaining deflection).

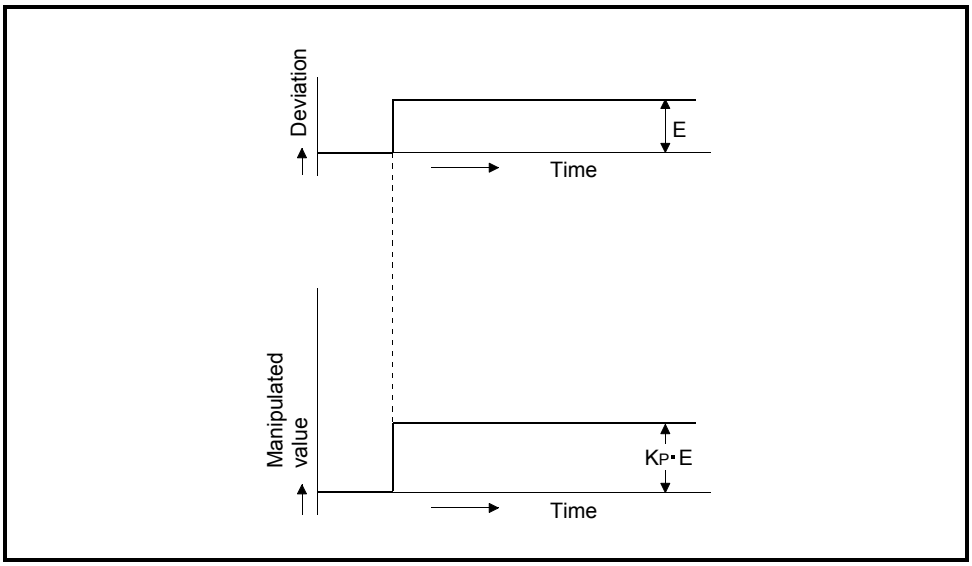



Fig. 1.7 Proportional action for step response

## 1.3.4 Integral action (I-action)

(1) The integral action is an action which continuously changes the manipulation value to eliminate the deviation when there is an deviation.
The offset produced by the proportional action can be eliminated.

(2) In the integral action, the time from the deviation occurrence until the manipulation value of the integral action becomes that of the proportional control action is called the integral time, and is indicated by TI.

(3) The integral action for the step response when the error value is constant is shown in Figure 1.8.

(4) The integral action is used as a PI action in combination with the proportional action, or PID action in combination with the proportional and derivative actions.
The integral action cannot be used alone.

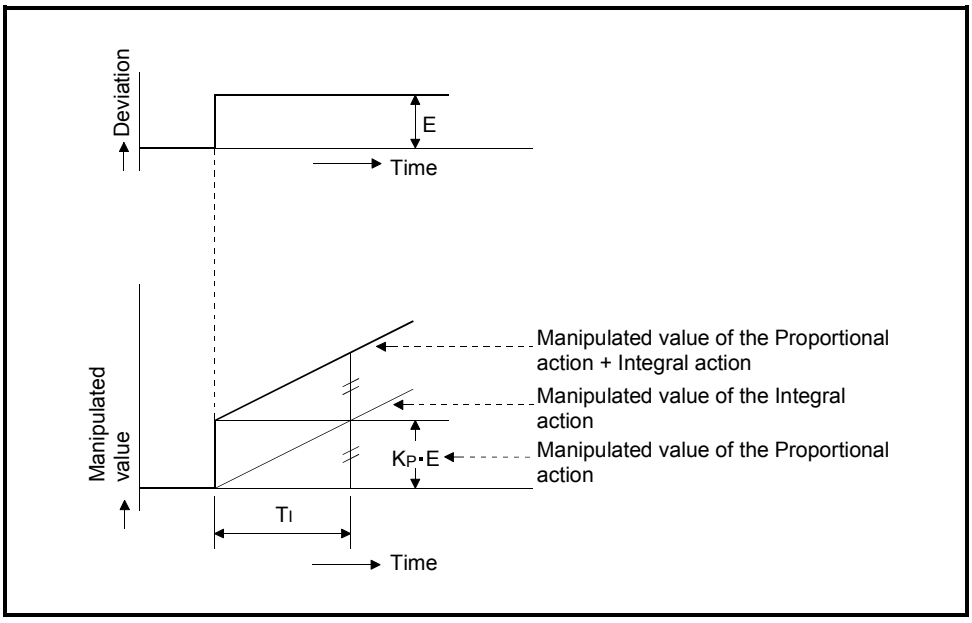



Fig. 1.8 Integral action for step response

## 1.3.5 Derivative action (D-action)

(1) The derivative action adds the manipulation value proportional to the change speed to eliminate error when an deviation occurs.
The derivative control action can prevent the control target from changing significantly due to disturbance.

(2) In the derivative action, the time from the deviation occurrence until the manipulation value of the derivative action becomes that of the proportional action is called the derivative time, and is indicated by $T_D$.

(3) The derivative action for the step response when the deviation is constant is shown in Figure 1.9.

(4) The derivative action is used as a PD action in combination with the proportional action, or PID action in combination with the proportional and integral actions.
The derivative action cannot be used alone.

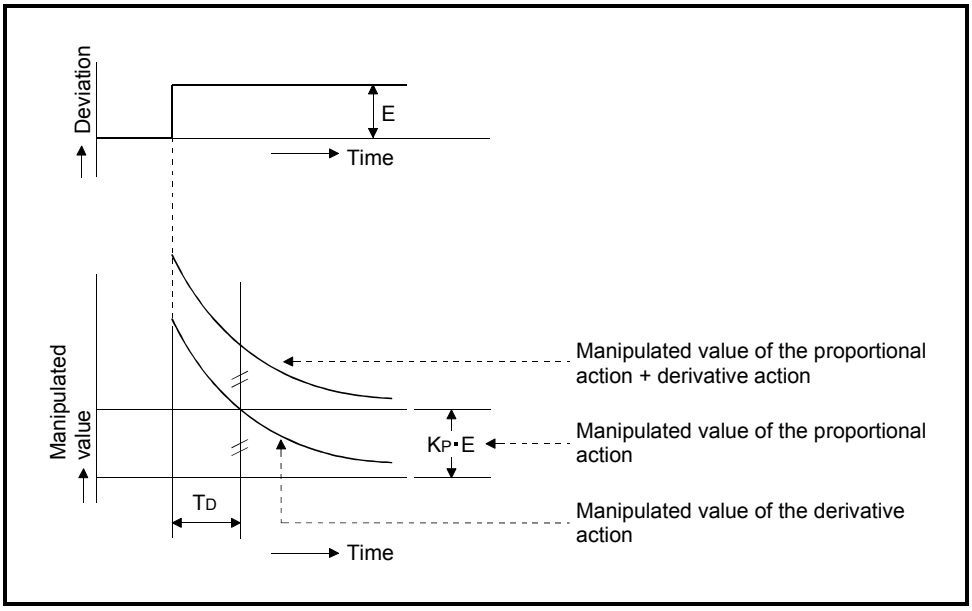



Fig. 1.9 Derivative action for step response

### 1.3.6 PID action

(1) The PID action performs control using the manipulation value obtained by merging proportional action, integral action and derivative action.

(2) The PID action for the step response when the deviation is constant is shown in Figure 1.10.

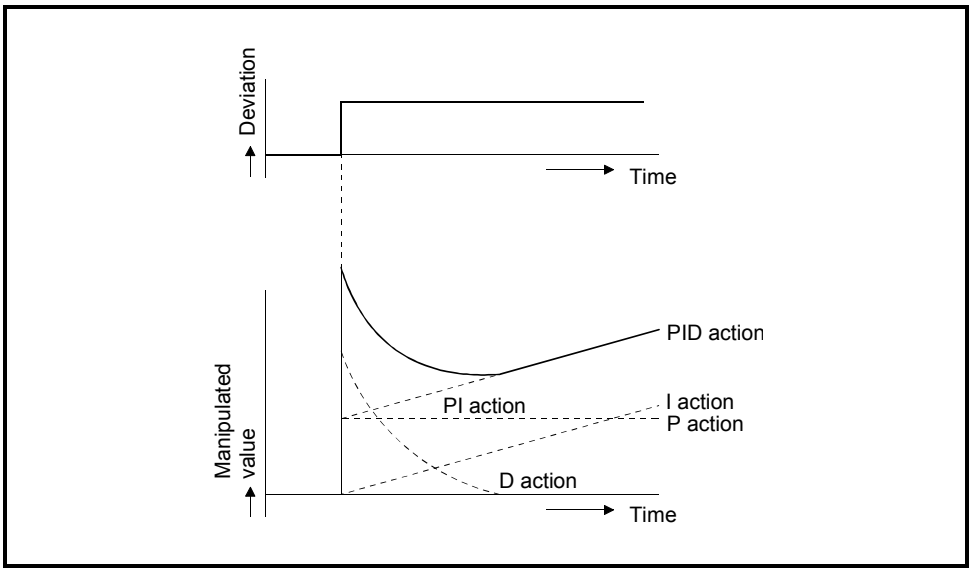



Fig. 1.10 PID action for step response

# 2 SYSTEM CONFIGURATION

This chapter explains the system configuration of the Q62HLC.

## 2.1 Applicable Systems



This section describes the applicable systems.

### (1) Applicable modules and base units, and No. of modules

(a) When mounted with a CPU module

The table below shows the CPU modules and base units applicable to the Q62HLC and quantities for each CPU model.

Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.

Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

| Applicable CPU module | | | No. of modules[*1] | Base unit[*2] | |
|---|---|---|---|---|---|
| CPU type | | CPU model | | Main base unit | Extension base unit |
| Programmable controller CPU | Basic model QCPU | Q00JCPU | Up to 16 | ○ | ○ |
| | | Q00CPU | Up to 24 | | |
| | | Q01CPU | | | |
| | High Performance model QCPU | Q02CPU | Up to 64 | ○ | ○ |
| | | Q02HCPU | | | |
| | | Q06HCPU | | | |
| | | Q12HCPU | | | |
| | | Q25HCPU | | | |
| | Process CPU | Q02PHCPU | Up to 64 | ○ | ○ |
| | | Q06PHCPU | | | |
| | | Q12PHCPU | | | |
| | | Q25PHCPU | | | |
| | Redundant CPU | Q12PRHCPU | Up to 53 | × | ○ |
| | | Q25PRHCPU | | | |
| | Universal model QCPU | Q02UCPU | Up to 36 | ○ | ○ |
| | | Q03UDCPU | Up to 64 | | |
| | | Q04UDHCPU | | | |
| | | Q06UDHCPU | | | |
| | | Q13UDHCPU | | | |
| | | Q26UDHCPU | | | |
| | | Q03UDECPU | | | |
| | | Q04UDEHCPU | | | |
| | | Q06UDEHCPU | | | |
| | | Q13UDEHCPU | | | |
| | | Q26UDEHCPU | | | |
| | Safety CPU | QS001CPU | N/A | × | × |

| Applicable CPU module | | No. of modules*1 | Base unit*2 | |
|---|---|---|---|---|
| CPU type | CPU model | | Main base unit | Extension base unit |
| C Controller module | Q06CCPU-V | Up to 64 | ○ | ○ |
| | Q06CCPU-V-B | | | |

○ Applicable × N/A

*1 Limited within the range of I/O points for the CPU module.
*2 Can be installed to any I/O slot of a base unit.



(b) Mounting to a MELSECNET/H remote I/O station

The table below shows the network modules and base units applicable to the Q62HLC and quantities for each network module model.
Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.
Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

| Applicable network module | No. of modules*1 | Base unit*2 | |
|---|---|---|---|
| | | Main base unit of remote I/O station | Extension base unit of remote I/O station |
| QJ72LP25-25 | Up to 64 | ○ | ○ |
| QJ72LP25G | | | |
| QJ72LP25GE | | | |
| QJ72BR15 | | | |

○ Applicable × N/A

*1 Limited within the range of I/O points for the network module.
*2 Can be installed to any I/O slot of a base unit.

Remark

The Basic model QCPU or C Controller module cannot create the MELSECNET/H remote I/O network.

## (2) Support of the multiple CPU system

When using the Q62HLC in a multiple CPU system, refer to the following manual first.

• QCPU User's Manual (Multiple CPU System)

(a) Intelligent function module parameters

Write intelligent function module parameters to only the control CPU of the Q62HLC.

## (3) Compatibility with online module change

Q62HLC is compatible with online module change.

### (4) Supported software packages

Relation between the system containing the Q62HLC and software package is shown in the following table.

GX Developer is necessary when using the Q62HLC.

| | | Software version | |
|---|---|---|---|
| | | GX Developer | GX Configurator-TC |
| Q00J/Q00/Q01CPU | Single CPU system | Version 7 or later | Version 1.20W or later |
| | Multiple CPU system | Version 8 or later | |
| Q02/Q02H/Q06H/ Q12H/Q25HCPU | Single CPU system | Version 4 or later | |
| | Multiple CPU system | Version 6 or later | |
| Q02PH/Q06PHCPU | Single CPU system | Version 8.68W or later | |
| | Multiple CPU system | | |
| Q12PH/Q25PHCPU | Single CPU system | Version 7.10L or later | |
| | Multiple CPU system | | |
| Q12PRH/ Q25PRHCPU | Redundant CPU system | Version 8.45X or later | |
| Q02U/Q03UD/ Q04UDH/ Q06UDHCPU | Single CPU system | Version 8.48A or later | Version 1.23Z or later |
| | Multiple CPU system | | |
| Q13UDH/ Q26UDHCPU | Single CPU system | Version 8.62Q or later | |
| | Multiple CPU system | | |
| Q03UDE/Q04UDEH/ Q06UDEH/Q13UDEH/ Q26UDEHCPU | Single CPU system | Version 8.68W or later | |
| | Multiple CPU system | | |
| If installed in a MELSECNET/H remote I/O station | | Version 6 or later | Version 1.20W or later |

**POINT**

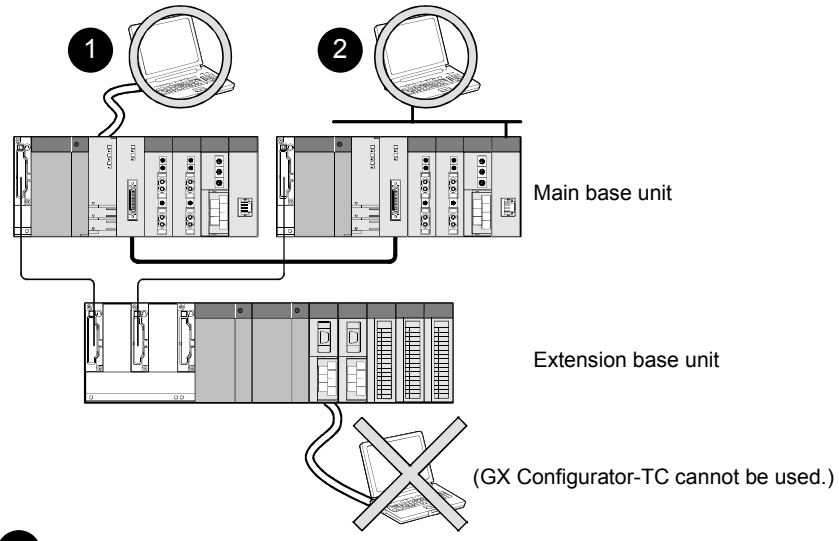
(1) Supported system and CPU module differ according to the version of GX Configurator-TC.

## 2.2 About Use of the Q62HLC with the Q12PRH/Q25PRHCPU

Here, use of the Q62HLC with the Q12PRH/Q25PRHCPU is explained.

### (1) GX Configurator-TC connection

GX Configurator-TC cannot be used when accessing the Q12PRH/Q25PRHCPU via an intelligent function module on an extension base unit from GX Developer. Connect a personal computer with a communication path indicated below.




1 Direct connection to the CPU

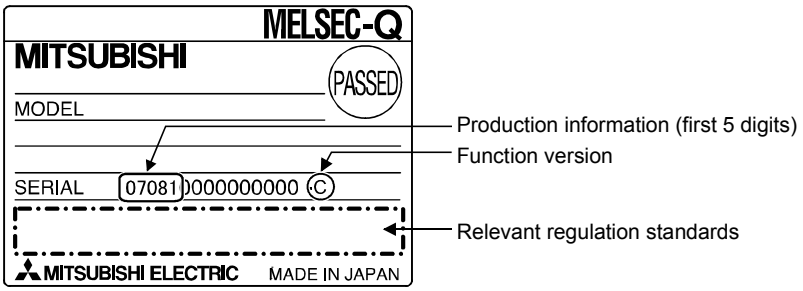
2 Connection through an intelligent function module on the main base unit
(Through Ethernet module, MELSECNET/H module, or CC-Link module)

## 2.3 How to Check the Function Version, Production Information, Product Information and Software Version

This section describes how to check the function version, production information and product information of the Q62HLC and the GX Configuration-TC software version.

### (1) How to check the function version, production information and product information of the Q62HLC

(a) To check the function version and production information using the "SERIAL column of the rating plate" located on the side of the module




(b) To check the function version and product information using the GX Developer

See Section 8.13 of this manual.

**POINT**

The serial No. on the rating plate may be different from the serial No. displayed on the product information screen of GX Developer.

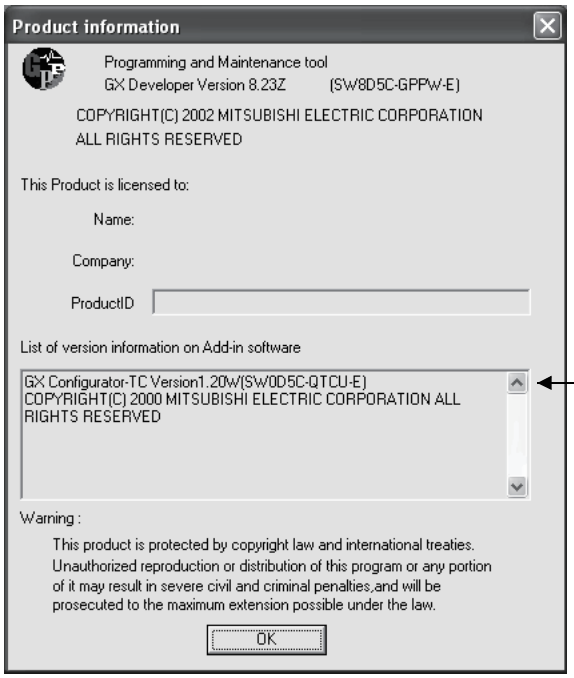
- The serial No. on the rating plate indicates the management information of the product.
- The serial No. displayed on the product information screen of GX Developer indicates the function information of the product.
  The function information of the product is updated when a new function is added.

(2) Checking the software version of GX Configurator-TC

The software version of GX Configurator-TC can be checked in GX Developer's "Product information" screen.

[Operating procedure]

GX Developer → [Help] → [Product information]




(In the case of GX Developer Version 8)

# 3 SPECIFICATIONS

This chapter provides the performance specifications of the Q62HLC, I/O signals transferred to/from the programmable controller CPU and the specifications of buffer memory.
For the general specifications of the Q62HLC, refer to the User's Manual (hardware) of the CPU module used.

## 3.1 Performance Specifications

### 3.1.1 Performance specifications of the Q62HLC

Table 3.1 Q62HLC performance specification list



| Item | | | Specifications | | |
|---|---|---|---|---|---|
| Analog I/O points | | | 2 channels/module | | |
| Specification for analog input | | | | Specification for analog output | |
| Input points | | | 2points(2 channels) | Output points | 2points(2 channels) |
| Analog input | | | Refer to this section (1) | Digital input | 16-bit signed binary |
| Digital output | | | 16-bit signed binary | Analog output | Current |
| Applicable thermocouple | | | K,J,T,S,R,N,E,B, PLII,W5Re/W26Re | - | - |
| Input characteristics | | | Refer to this section (1) | Output characteristics | Digital input value: 0 to 1000 (When using simplified analog output:0 to 4000) Output range : 4 to 20mA |
| Maximum resolution | | | Refer to this section (1) | Maximum resolution | 4μA |
| Accuracy | Indicated accuracy | Ambient temperature 23℃±2℃ | Refer to this section (2) | Output accuracy: Ambient temperature 23℃±2℃ | Full-scale × (±0.2%) |
| | | Ambient temperature 0℃ to 55℃ | Refer to this section (2) | Output accuracy: Ambient temperature 0℃ to 55℃ | Full-scale × (±0.4%) |
| | Cold junction temperature compensation accuracy | Ambient temperature 23℃±2℃ | ±0.5℃ | - | - |
| | | Ambient temperature 0℃ to 55℃ | ±1.0℃ | - | - |
| Conversion speed | | | 25ms/2 channels (Stable regardless of the number of used channels) | Conversion speed | 25ms/2 channels (Stable regardless of the number of used channels) |
| Sampling period | | | 25ms/2 channels (Stable regardless of the number of used channels) | - | - |
| Absolute maximum input | | | Micro voltage: ±12V Voltage: ±15V Current: ±30mA | Allowable load resistance | 600Ω or less |
| Input impedance | | | Thermocouple, Micro voltage, Voltage:1M Ω Current:250Ω | Output impedance | 5MΩ |
| Normal mode rejection ratio | | | 60dB or more (50/60Hz) | - | - |
| Common mode rejection ratio | | | 120dB or more (50/60Hz) | - | - |
| Input filter (primary delay digital filter) | | | 0.0 to 100.0s (0: Input filter OFF) | - | - |
| Sensor compensation value setting | | | Thermocouple: -500.0 to 500.0℃ Micro voltage, Voltage, Current: -50.00 to 50.00% | - | - |
| Operation at input wire disconnection | | | Refer to section 3.1.2 | - | - |

(To next page)

∗1: Calculate the accuracy in the following method.
(Accuracy) = (Indication accuracy) + (Cold junction temperature compensation accuracy)
Example) Accuracy when measuring a temperature in the following conditions:
- Input sensor used: Thermocouple T type (-200 to 400℃) (Select "2" at input range setting.)
- Operating ambient temperature: 35℃
- Temperature measurement value: 300℃

The accuracy values will become as follows from the above conditions.
- Indicated accuracy : ±1.0℃ (Value shown in the table 3.4)
- Cold junction compensation temperature accuracy : ±1.0℃ (Value shown in the table 3.1)

Accuracy = (±1.0℃) + (±1.0℃) = ±2.0℃

Table 3.1 Q62HLC performance specification list (from previous page)

| Item | | Specifications |
|---|---|---|
| Control method | | Continuous proportional control |
| PID constant range | PID constant setting | Auto tuning setting available |
| | Proportional band (P) | Thermocouple: 0.1 to Full-scale ℃<br>Micro voltage, Voltage, Current: 0.1 to 1000.0% |
| | Integral time (I) | 0.0 to 3276.7s |
| | Derivative time (D) | 0.0 to 3276.7s |
| Set value setting range | | Thermocouple: Input range of the thermocouple to be used<br>Micro voltage, Voltage, Current: Set input range |
| Dead band setting range | | Thermocouple: 0.0 to 100.0℃<br>Micro voltage, Voltage, Current: 0.00 to 10.00% |
| Time accuracy | | ±0.2% |
| Noise immunity | | *2 |
| Insulation | | Insulation part: Between input and earth — Insulation method: Transformer insulation — Dielectric withstand voltage: 500VAC for 1 minute — Insulation resistance: 500VDC 20MΩ or more<br>Insulation part: Between input channels — Insulation method: Transformer insulation — Dielectric withstand voltage: 500VAC for 1 minute — Insulation resistance: 500VDC 20MΩ or more |
| FeRAM read/write count | | Max. $10^{10}$times |
| Number of occupied I/O points | | 16 points/slot (I/O assignment: 16 intelligent points) |
| Connection terminal | | 18-point terminal block |
| Applicable wire size | | 0.3 to 0.75mm$^2$ |
| Applicable crimping terminal | | R1.25-3, RAV1.25-3 |
| External power supply | | 24 VDC +20%, -15% |
| | | Ripple, spike 500mV$_{P-P}$ or less |
| | | Inrush current: 0.2A, 4ms or less |
| | | 0.07A |
| Internal current consumption | | 0.27A |
| Weight | | 0.25kg |
| External dimension | | 27.4 (W)×98(H)×112(D)mm |

*2: For the noise immunity, dielectric withstand voltage, insulation resistance and others of the programmable controller system which uses this module, refer to the power supply module specifications given in the User's Manual of the CPU module used.

### (1) Usable input sensor types and measurement range, data resolution list

Table 3.2 shows usable input sensor types and measurement range for Q62HLC, data resolution.

Table 3.2 Input sensor types and measurement range, data resolution list

| Input | | Input range | Digital value | Resolution |
|---|---|---|---|---|
| Thermocouple | K | -200 to 1372℃ | -2000 to 13720 | 0.1℃ |
| | J | -200 to 1200℃ | -2000 to 12000 | |
| | T | -200 to 400℃ | -2000 to 4000 | |
| | S | -50 to 1768℃ | -500 to 17680 | |
| | R | -50 to 1768℃ | -500 to 17680 | |
| | N | 0 to 1300℃ | 0 to 13000 | |
| | E | -200 to 1200℃ | -2000 to 10000 | |
| | B | 0 to 1800℃ | 0 to 18000 | |
| | PLII | 0 to 1390℃ | 0 to 13900 | |
| | W5Re/W26Re | 0 to 2300℃ | 0 to 23000 | |
| Micro voltage | | 0 to 10mV | 0 to 20000 | 0.5μV |
| | | 0 to 100mV | | 5μV |
| | | -10 to 10mV | -10000 to 10000 | 1μV |
| | | -100 to 10mV | | 10μV |
| Voltage | | 0 to 1V | 0 to 20000 | 0.05mV |
| | | 1 to 5V | | 0.2mV |
| | | 0 to 5V | | 0.25mV |
| | | 0 to 10V | | 0.5mV |
| | | -1 to 1V | -10000 to 10000 | 0.1mV |
| | | -5 to 5V | | 0.5mV |
| | | -10 to 10V | | 1mV |
| Current | | 4 to 20mA | 0 to 20000 | 0.8μA |
| | | 0 to 20mA | | 1μA |


3 - 3

## (2) Indication accuracy

Table 3.3 and Table 3.4 show the indication accuracy against ambient temperature.

(a) At ambient temperature 23±2℃

Table 3.3 Indication accuracy at ambient temperature 23±2℃

| Item | | Error | |
|---|---|---|---|
| Thermocouple | K,J,T,E, PLII | Less than -100℃ | ±1.0℃ |
| | | -100 to less than 500℃ | ±0.5℃ |
| | | 500 ℃ or more | ± (Indication value × (0.1%)+1 digit) |
| | S,R,N, W5Re/ W26Re | -50 to less than 1000℃ | ±1.0℃ |
| | | 1000℃ or more | ± (Indication value × (0.1%)+1 digit) |
| | B | Less than 400 ℃ | ±70.0℃ |
| | | 400 to less than 1000 ℃ | ±1.0℃ |
| | | 1000℃ or more | ± (Indicated value × (0.1%)+1 digit) |
| Micro voltage | | Full-scale × (±0.1%) | |
| Voltage | | | |
| Current | | | |

(b) At ambient temperature 0 to 55℃

Table 3.4 Indication accuracy at ambient temperature 0 to 55℃

| Item | | Error | |
|---|---|---|---|
| Thermocouple | K,J,T,E, PLII | Less than -100℃ | ±2.0℃ |
| | | -100 to less than 500℃ | ±1.0℃ |
| | | 500℃ or more | ± (Indication value × (0.2%)+1 digit) |
| | S,R,N, W5Re/ W26Re | -50 to less than 1000℃ | ±2.0℃ |
| | | 1000℃ or more | ± (Indication value × (0.2%)+1 digit) |
| | B | Less than 400 ℃ | ±140.0℃ |
| | | 400 to less than 1000 ℃ | ±2.0℃ |
| | | 1000℃ or more | ± (Indication value × (0.2%)+1 digit) |
| Micro voltage | | Full-scale × (±0.2%) | |
| Voltage | | | |
| Current | | | |

### 3.1.2 Operation at input disconnection

Table 3.5 shows operations for each input at the occurrence of input disconnection.

Table 3.5 Operation list at input disconnection

| Input | Input range | Operation |
|---|---|---|
| Thermocouple<br>Micro voltage | All | Up scale *1 |
| Voltage | 1 to 5V | Down scale *2 |
| | 0 to 1V,-1 to 1V,0 to 5V,-5 to 5V,<br>0 to 10V,-10 to 10V | Value near 0V is displayed. *3 |
| Current | 4 to 20mA | Down scale |
| | 0 to 20mA | Value near 0mA is displayed. *3 |

*1: "Input range upper limit + (Full-scale × 5%)" is displayed.

*2: "Input range lower limit - (Full-scale × 5%)" is displayed.

*3: In this case, no alert will occur at the channel without connecting a sensor, since the measured value is within the input range.

REMARK

To judge an error, there is a method to select the range, which the sensor actually uses, for preventing values near 0V/0mA to be displayed except when the sensor is connected.
(Example)
If using current input 0 to 5V range, specify 1 to 4V as the input range that the sensor actually uses.

## 3.2 Function Summary

The Q62HLC function summary is shown in Table 3.6.

Table 3.6 Q62HLC function summary

| Item | Specification | Reference |
|---|---|---|
| Auto tuning function | • The loop control module automatically sets the optimal PID constants. | 3.2.1 |
| Auto tuning mode setting function | • Sets the auto tuning mode according to the control target to use by setting AT (auto tuning) differential gap and AT additional lag. | 3.2.2 |
| Forward action/reverse action selection function | • Heat control (reverse action) or cooling control (forward action) can be selected and controlled. | 3.2.3 |
| RFB limiter function | • Limit the manipulation value overshoot which frequently occurs when the set value (SV) is changed or control target is changed. | 3.2.4 |
| Sensor compensation function | • Compensates a difference between measured values and actual temperature, humidity, pressure, flow rate or others, if any, according to the measured status, etc. | 3.2.5 |
| Unused channel setting function | • Sets the PID operation for channels that do not control to "not execute." | 3.2.6 |
| PID control forced stop function | • Stops the PID operation for channels that is performing temperature adjustment. | 3.2.7 |
| Loop disconnection detection function | • A function to detect errors in the control system (control loop) caused by a load (heater) disconnection, abnormal external operation device (such as magnet relay), or a Input Sensor disconnection. | 3.2.8 |
| Data storage in FeRAM function | • By backing up the buffer memory contents to FeRAM, the load of sequence program can be reduced. | 3.2.9 |
| Alert function | • Monitors the process value (PV) and alerts the user. | 3.2.10 |
| Control output setting for CPU stop error occurrence function | • This function continues/stops control output at CPU stop error occurrence. | 3.2.11 |
| Program control function | • Performs the control changing the set value, following the time schedule | 3.2.12 |
| Cascade control function | • Performs the control using the channel 1 as master and the channel 2 as slave. | 3.2.13 |
| Scaling function | • Scales the set value and stores it in the buffer memory. | 3.2.14 |
| Simplified analog I/O input function | • Uses the Q62HLC as simplified thermocouple/micro voltage input module analog-digital converter module, digital-analog converter module by monitoring the set value and manually setting the manipulated value. | 3.2.15 |
| Online module change function | • A module change is made without the system being stopped. | Chapter 7 |
| Control function of Q62HLC | • Controls the Q62HLC by the output signal of Q62HLC and the settings in the buffer memory. | 3.2.16 |

### 3.2.1 Auto tuning function

#### (1) What is the auto tuning function?

(a) The auto tuning function is designed for the Q62HLC to set the optimum PID constants automatically.
In auto tuning, a manipulated value turns ON/OFF and the PID constants are calculated according to the hunting cycle and amplitude, which take place when the measured value to a set value alternates between overshooting and undershooting.

(b) Setting the following data with normal mode enables auto tuning to be executed.

| Buffer memory address name | Buffer memory address (Decimal) | |
|---|---|---|
| | CH1 | CH2 |
| Input range | 32 | 64 |
| Set value (SV) setting | 34 | 66 |
| AT differential gap | 46 | 78 |
| AT additional lag | 47 | 79 |
| AT bias | 53 | 85 |

Note that since actual control starts on completion of auto tuning, the other data should be preset to the values used for actual operation.

| Buffer memory address name | Buffer memory address (Decimal) | |
|---|---|---|
| | CH1 | CH2 |
| Upper output limiter | 42 | 74 |
| Lower output limiter | 43 | 75 |
| Output variation limiter | 44 | 76 |
| Sensor compensation value setting | 45 | 77 |
| Primary delay digital filter setting | 48 | 80 |
| Forward/reverse action setting | 54 | 86 |

(c) On completion of auto tuning, calculated values are set to the following buffer memory addresses.

| Buffer memory address name | Buffer memory address (Decimal) | |
|---|---|---|
| | CH1 | CH2 |
| Proportional band (P) setting | 35 | 67 |
| Integral time (I) setting | 36 | 68 |
| Derivative time (D) setting | 37 | 69 |
| Loop disconnection detection judgment time ∗ | 59 | 91 |

∗: As the loop disconnection detection judgment time, a value twice greater than the calculated integral time is set. However, the loop disconnection detection judgment time remains unchanged from 0 when it is 0 at an auto tuning start.

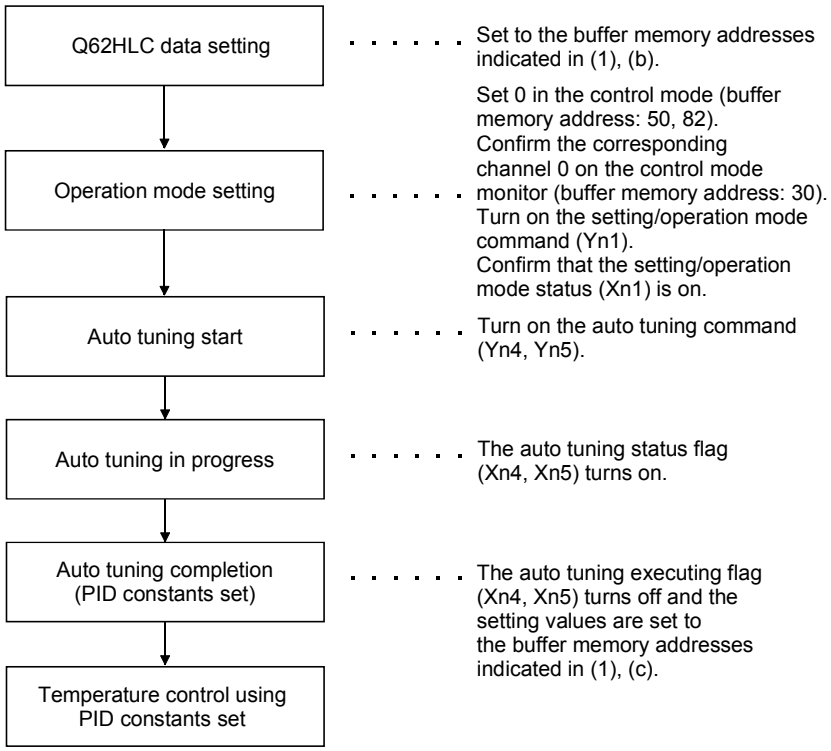
(2) Executing auto tuning

(a) Conditions for starting auto tuning

When any of the following conditions is met, auto tuning is not executable.

1) In the Unused channel setting (buffer memory address: 61, 93), 1 (Unused) is set for the channel.
2) The control mode switching (buffer memory address: 50, 82) is set in any of manual control mode 1, manual control mode 2 or program control mode.
3) The PID control forced stop command (YnC, YnD) is ON.
4) Hardware failure is identified. (The ERR. LED turns ON.)
5) A write error is occurred. (Xn2: ON)
6) The sensor is not connected correctly.
7) FeRAM backup command (Yn8) is turned on.
8) The default setting registration command (Yn9) is turned on.
9) In the FeRAM's PID constant read command (buffer memory address: 62, 94), 1 (With command) is set.
10) A bit of write flag (b4, b5) in the FeRAM's PID constant read/write flag (buffer memory address: 31) is ON.

(b) Auto tuning is performed in the following procedure.




POINT

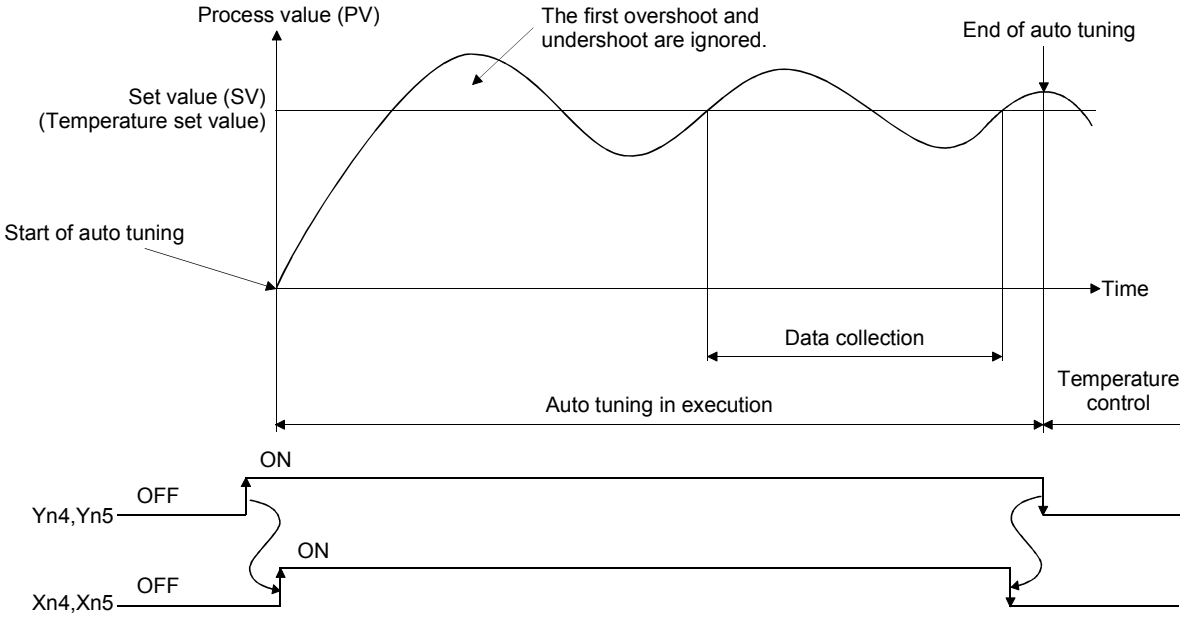
After powering off the programmable controller CPU, you can use the set PID constants in the following method.

- Write the values directly to the buffer memory using the sequence program.
- Store the PID constants into FeRAM and transfer them when powering on the programmable controller CPU.
- Use the initial settings of the GX Configurator-TC.

(c) Auto tuning operation

Auto tuning performs operation as shown below.

1) Auto tuning output is provided.
2) Data collection starts when the process value returns to the set value after the first overshoot and undershoot.
3) After data collection, auto tuning ends when PID constants and loop disconnection detection judgment time are set.




(d) Precautions for auto tuning

The following indicate the conditions under which auto tuning will result in abnormal termination.

1) Any of the following setting items for the channel has been changed during execution of auto tuning.

| Setting item | Buffer memory address (Decimal) | |
|---|---|---|
| | CH1 | CH2 |
| Input range | 32 | 64 |
| Set value (SV) setting | 34 | 66 |
| Upper output limiter | 42 | 74 |
| Lower output limiter | 43 | 75 |
| Output variation limiter | 44 | 76 |
| Sensor compensation value setting | 45 | 77 |
| AT differential gap | 46 | 78 |
| AT additional lag | 47 | 79 |
| Primary delay digital filter setting | 48 | 80 |
| AT bias | 53 | 85 |
| Forward/reverse operation setting | 54 | 86 |

2) The PID control forced stop command (YnC, YnD) has been turned ON.
3) The mode switching is changed to other than the standard control mode. (Setting mode, manual control mode1・2, program control mode, for instance.) (Except for the case where the PID continue flag (buffer memory address:169) changed to setting mode by "Continue.")
4) Hardware failure has occurred.
5) The measured value has exceeded the input range.
6) The following time exceeds 2 hours.
   • Time elapsed from the auto tuning start until the set value is reached at the first time.
   • A half of the hunting cycle
7) The value calculated by PID constants after auto tuning exceeds any of the following ranges.
   Proportional band (P): 0.1 to full-scale (°C)
   0.1 to 1000.0 (%)
   Integral time (I): 0.0 to 3276.7 (s)
   Derivative time (D): 0.0 to 3276.7 (s)

### (3) Operation at termination of auto tuning

(a) Operation at normal termination
- The auto tuning status flag (Xn4, Xn5) turns off.
- The PID constants are set.
- The loop disconnection detection judgment time (buffer memory address: 59, 91) is set. (If the loop disconnection detection judgment time is 0 at the start of auto tuning, it remains unchanged from 0.)

(b) Operation at abnormal termination
- The auto tuning status flag (Xn4, Xn5) turns off.
- The PID constants and loop disconnection judgement time are not set.
- The error code and the factor code of the corresponding cause are stored into the error code (buffer memory address: 0), and ERR. LED flashes. (Except when turned on the forced PID control stop command (YnC, YnD) and changed to setting mode.)
  For error code and factor code, refer to Section 8.1.

### (4) Adjustment after auto tuning

(a) Specific readjustment is not needed for the PID constants calculated by auto tuning.

(b) Use the control response parameters (buffer memory address: 49, 81) to change the control response for the PID constants calculated by auto tuning.

REMARK

1) The time between the start and completion of auto tuning depends on the object to be controlled.
2) You can confirm that auto tuning has been completed by checking that the auto tuning status flag (Xn4, Xn5) has turned from on to off.
3) When the automatic backup setting after auto tuning of PID constants (buffer memory address: 63, 95) is preset at AT start to be made valid, the PID constants and loop disconnection detection judgment time are automatically backed up by FeRAM on completion of auto tuning.
4) If the auto tuning does not complete after long period, make the following approaches.
   (a) When the measured value (PV) does not normally change
      1) Check if load and external operation device are normally connected. If not, normally connect them and then perform the auto tuning.
      2) If using in the reverse action, check whether the set value is set not to change the manipulated vale. If so, set the set value in the value to control and perform the auto tuning.
   (b) When the measured value (PV) are normally changing
      1) If the response of the control target is slow, wait until the completion of the auto tuning.
5) If the PID constants have not changed after the completion of the auto tuning, check if the PID constants are constantly written by the sequence program. If written, delete the sequence program of corresponding parts.

### 3.2.2 Auto tuning setting function

By setting AT differential gap (buffer memory address: 46, 78) and AT additional lag (buffer memory address: 47, 79), this function sets the auto tuning mode according to the control target to be used.
AT differential gap and AT additional lag can be optionally set within the setting range. However, almost all control targets are accepted by the following setting of "Standard mode" and "Fast response mode".

#### (1) Standard mode (Default)

This mode is compatible with almost all control targets.
Especially, this mode is effective for control targets which give an extremely slow response or which may be affected by noise or disturbance.
However, when the control target that either the ON or OFF time during auto tuning is about 10 seconds only, slow-response (low-gain) PID constants may be calculated. In this case, fast-response PID constants can be calculated by executing auto tuning in the fast response mode.
To perform the auto tuning in the standard mode, set AT differential gap and AT additional lag to 10 (0.1s).

#### (2) Fast response mode

This mode calculates faster-response (higher-gain) PID constants for the control targets which gives a fast response that the ON or OFF time during auto tuning is about 10 seconds only.
Note that the gains of the calculated PID constants may become so high that the measured value (PV) may oscillate near the set value (SV). In this case, execute auto tuning in the standard mode.
To perform the auto tuning in fast response mode, set AT differential gap and AT additional lag to 1 (0.01s).

### 3.2.3 Reverse/forward action select function

With the Q62HLC, "reverse action" or "forward action" can be selected to perform the PID operations.

(1) Q62HLC default

The default is set at "reverse action" for Q62HLC.
When performing the PID operations with the "forward action", set to the forward action in the forward/reverse action selection (buffer memory address: 54, 86).

(2) Reverse/forward action control details

(a) Reverse action : This is the operation to decrease the manipulated value according to the increase of the measured value. Used for heating control to increase temperature.

(b) Forward action : This is the operation to increase the manipulated value according to the increase of the measured value. Used for cooling control to decrease temperature.

REMARK

The Q62HLC doesn't respond to heat cooling control when 2 channels try to control one object, the temperature isn't stabilized, and cannot be controlled.

### 3.2.4 RFB limiter function

(1) RFB (Reset feed back) limiter function

The RFB limiter function limits the PID operation result (manipulated value : MV) not to exceed the valid range by the integral control action when an error continues for a long time.
With the RFB limiter function, if the PID operation result exceeds the upper/lower output limiter value, the amount exceeded is fed back to the integral value and the PID operation result is kept at the limit value.
Setting is not necessary as the RFB limiter function is automatically operated at PID control operation.

### 3.2.5 Sensor compensation function

(1) Sensor compensation function

The sensor compensation function compensates the difference among the measured temperature, actual temperature caused by measurement conditions.

(2) Sensor compensation value setting

When there is a difference between the measured and actual temperature, the temperature (-500.0 to 500.0℃) is set to the sensor compensation value setting (buffer memory: 45, 77) as the sensor compensation value. When there is a difference between the measured and actual humidity, pressure, flow rate, etc., the full-scale percentage (-50.00 to 50.00%) is set to the sensor compensation value setting (buffer memory: 45, 77) as the sensor compensation value.
Example; When there is a 0.3V error at the input range, 0 to 10V, 0.3÷10×100= 3% is set. This comes from the full-scale 10V. ("300" is set in the buffer memory.)

### 3.2.6 Unused channel setting function

#### (1) Unused channel setting

(a) When Q62HLC made unused channel setting, an alert will not occur at the channel without connecting a sensor, and the ALM LED will not be flicker. The sampling period remains unchanged if the unused channel setting is performed.

(b) To make unused channel setting, write "1" to the unused channel setting. (buffer memory address: 61, 93)

#### (2) Channels where temperature sensors are not connected

In Q62HLC, if a sensor is not connected, the same operation as when the input disconnection is performed. For details, refer to Section 3.1.2.

### 3.2.7 Forced PID control stop function

#### (1) Forced PID control stop

Forced PID control stop is a function to stop PID operations temporarily from the programmable controller CPU.
For details of the Q62HLC control status with the forced PID control stop, refer to Section 3.2.16.

#### (2) Normal control mode, manual control mode

(a) Executing forced PID control stop
To execute a forced PID control stop, turn on the forced PID control stop command (YnC, YnD).
When the PID operation is stopped, the operation of the Q62HLC differs depending on the stop mode setting (buffer memory address: 33, 65).
And the manipulated value storage (MV) (buffer memory address: 13, 14) is -50 (-5.0%).

(b) Cancelling forced PID control stop
When the forced PID control stop command (YnC, YnD) is turned off, a forced PID control stop is cancelled and the PID operation restarts from setting value of the lower output limiter (buffer memory address: 43, 75).

#### (3) Program control mode

To execute a forced PID control stop, turn on the forced PID control stop command (YnC, YnD).

(a) Executing forced PID control stop
When PID operation is forced to stop during program control, the Q62HLC operation is to be RESET.

(b) Cancelling forced PID control stop.
When the forced PID control stop command (YnC, YnD) turns off, the forced PID control stop is cancelled, and program control is executed.

### 3.2.8 Loop disconnection detection function

The loop disconnection detection function detects errors in the control system (control loop) caused by a load (heater) disconnection, external operation device (e.g. magnetic relay) fault, input disconnection and others.

The execution of the loop disconnection detection is performed with the setting of loop disconnection detection judgment time (buffer memory address: 59, 91).

When the manipulated value has reached 100% or 0%, this function starts monitoring the variation of the measured value per loop disconnection detection judgment time and detects errors in the control loop. *1

If the following variation has not been seen within the set loop disconnection detection judgment time, the corresponding bit (b13) of alert occurrence description (buffer memory address: 5, 6) becomes 1, and ALM LED flickers, and it is output as an alert.

If an alert occurs during control, the control continues its operation. Output doesn't turn off.

The variation ranges of the measured value of loop disconnection detection judgment are 2°C for thermocouple input and 0.2% for micro voltage, voltage and current.

The loop disconnection detection judgment function will be an alert status in the following cases.

(1) When the manipulated value has reached 0%

Forward operation: The measured value does not increase over the variation range within loop disconnection detection judgment time.

Reverse operation: The measured value does not decrease over the variation range within loop disconnection detection judgment time.

(2) When the manipulated value has reached 100%

Forward operation: The measured value does not decrease over the variation range within loop disconnection detection judgment time.

Reverse operation: The measured value does not increase over the variation range within loop disconnection detection judgment time.

*1: In the manual control mode, when the manipulated value is not 0% or 100%, the loop disconnection detection cannot be performed.

POINT

(1) When not using the loop disconnection detection function, set the loop disconnection detection judgment time (buffer memory address: 59, 91) to "0".
(2) Setting the loop disconnection detection dead band will not cause a loop disconnection if there is no temperature variation of 2℃ or more when the control output is provided 100% or 0% at the set value. (Refer to Section 3.5.31.)
(3) If loop disconnection alert occurs frequently despite the normal operation of sensor, load, and external operation device, check and operate the following points.
• Check whether or not load (heater) and external operation device (cooling fan, etc.) have proper efficiency in performance.
If they are deficient, make the setting value of loop disconnection detection judgment time (buffer memory address: 59, 91) longer than the time required for varying 2℃ or 0.2% with manipulated value 100%.
• If using for heating control, check whether the set value has dropped to below ambient temperature or not.
If so, set the loop disconnection detection dead band (buffer memory address: 60, 92) to prevent an alert occurrence near the ambient temperature.

### 3.2.9 Data storage on FeRAM function

#### (1) Data storage on FeRAM

(a) The Q62HLC buffer memory data can be stored onto FeRAM for backup.
The whole write-enabled area of the buffer memory can be backed up.
Refer to Section 3.5 for details of the buffer memory.

| Item | Buffer memory address (Decimal) |
|---|---|
| Program control | 57, 89 |
| PID constant read command from FeRAM | 62, 94 |
| Automatic backup setting after auto tuning of PID constants | 63, 95 |
| Hold command | 201, 217 |
| Command advancing | 202, 218 |
| Cascade ON/OFF | 176 |

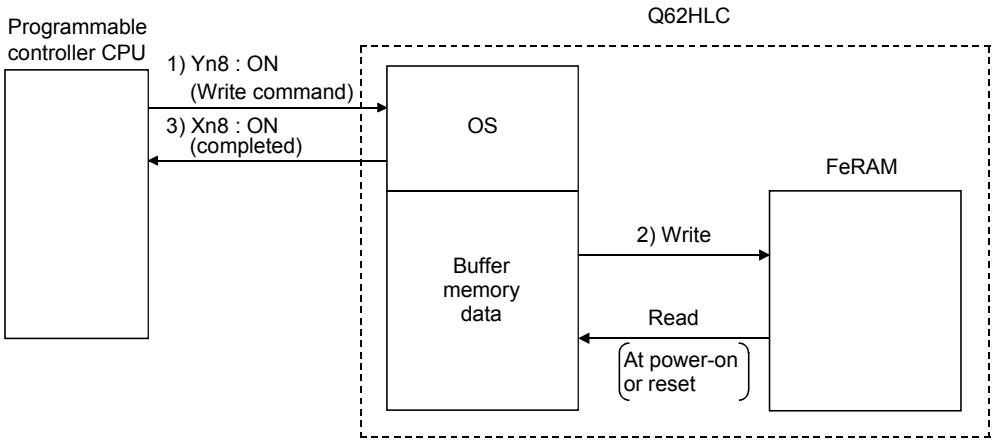
Write to FeRAM can be used to back up the PID constants set by auto tuning and the data written directly to the buffer memory using a peripheral device.

(b) The backed up data is transferred from FeRAM to buffer memory when the programmable controller CPU is powered on (power is switched on) or reset.
Hence, PID control can be exercised without data being written when the programmable controller CPU is powered on or reset.
The program used to set data to the Q62HLC can be eliminated.

## (2) Writing data to FeRAM

(a) When writing data to FeRAM, turn on the FeRAM backup command (Yn8).
- The FeRAM write completion flag (Xn8) turns on at completion of data write to FeRAM.
- After turning on Yn8, it takes more than ten seconds until Xn8 is on.
- The FeRAM write failure flag (XnA) turns on if write of data to FeRAM is not completed normally.

(b) Make changes to buffer memory when the FeRAM write completion flag (Xn8) is off.




## (3) Reading data from FeRAM

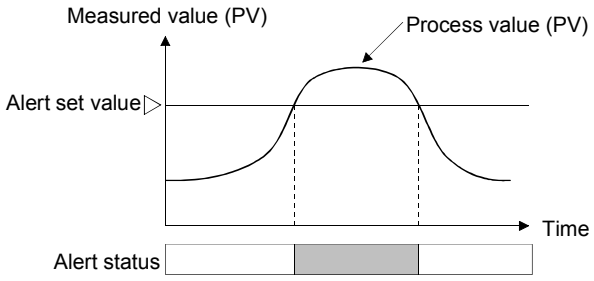
FeRAM data read occurs under either of the following conditions.
- When the programmable controller CPU is powered on or reset.
- When the FeRAM's PID constant read command (Buffer memory address: 62, 94) turns on. Note that the read data are only the PID constants and loop disconnection detection judgment time of the corresponding channel.

## 3.2.10 Alert function

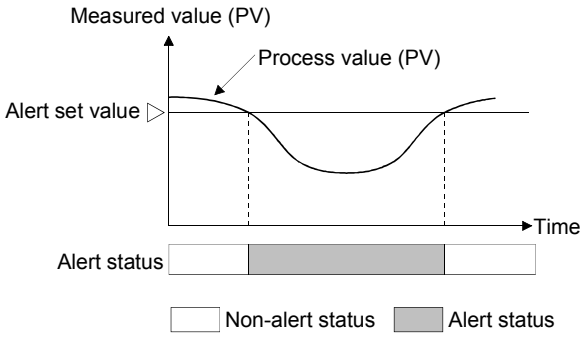
(1) The alert function is a function which sets the system in an alert status when the process value (PV) or deviation reaches the alert set value. It is used to turn on the device's hazard signal or operate the safety device.
The alert function is classified as follows:
• Input alerts ..... Upper limit input alert, lower limit input alert
• Deviation alerts..... Upper limit deviation alert, lower limit deviation alert, upper/lower limit deviation alert, within-range alert
If an alert occurs during the control, the control continues its operation. Output doesn't turn off.

(a) Input alerts

1) Upper limit input alert
When the measured value (PV) is equal to or greater than the alert set value, the system is put in an alert status. The setting range is the same as the input range.



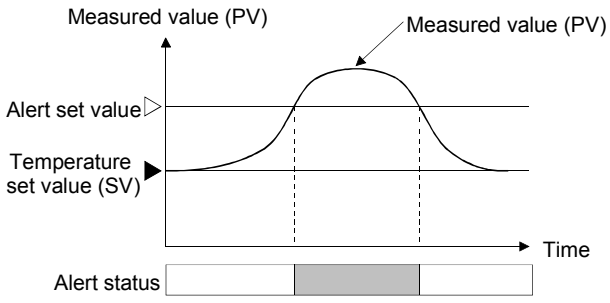

2) Lower limit input alert
When the measured value (PV) is equal to or less than the alert set value, the system is put in an alert status. The setting range is the same as the input range.



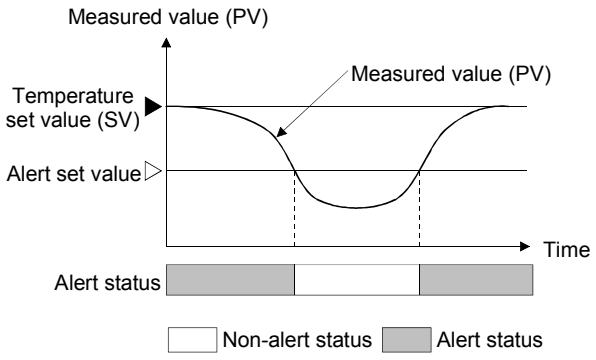

(b) Deviation alerts

1) Upper limit deviation alert
When the deviation [measured value (PV) - set value (SV)] is equal to or greater than the alert set value, the system is put in an alert status.
The setting range is ±full-scale.

[When alert set value is positive]



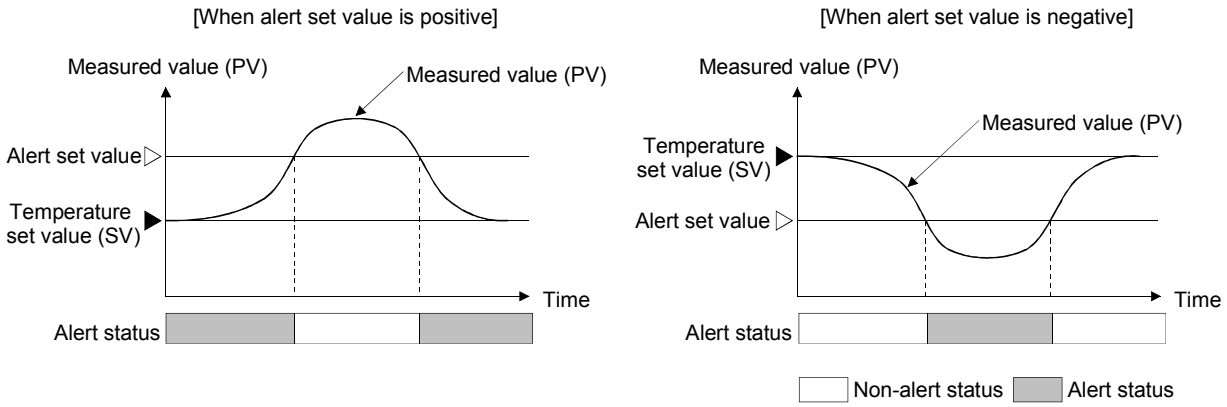

[When alert set value is negative]



2) Lower limit deviation alert

When the deviation [measured value (PV) - set value (SV)] is equal to or less than the alert set value, the system is put in an alert status.

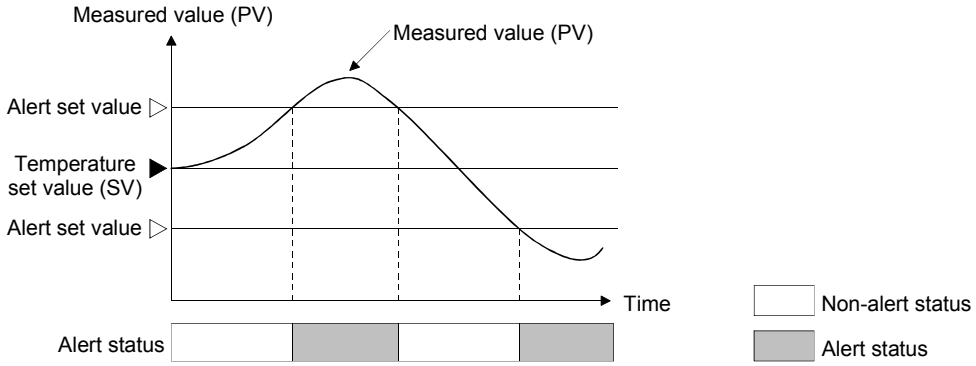
The setting range is ±full-scale.




3) Upper/lower limit deviation alert

When the absolute value of deviation [measured value (PV) - set value (SV)] is equal to or greater than the alert set value, the system is put in an alert status.

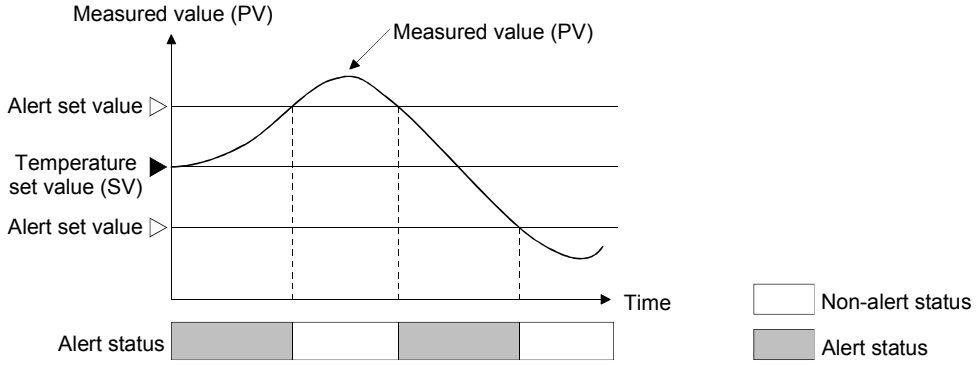
The setting range is 0 to + full-scale.




4) Within-range alert

When the absolute value of deviation [measured value (PV) - set value (SV)] is equal to or less than the alert set value, the system is put in an alert status.

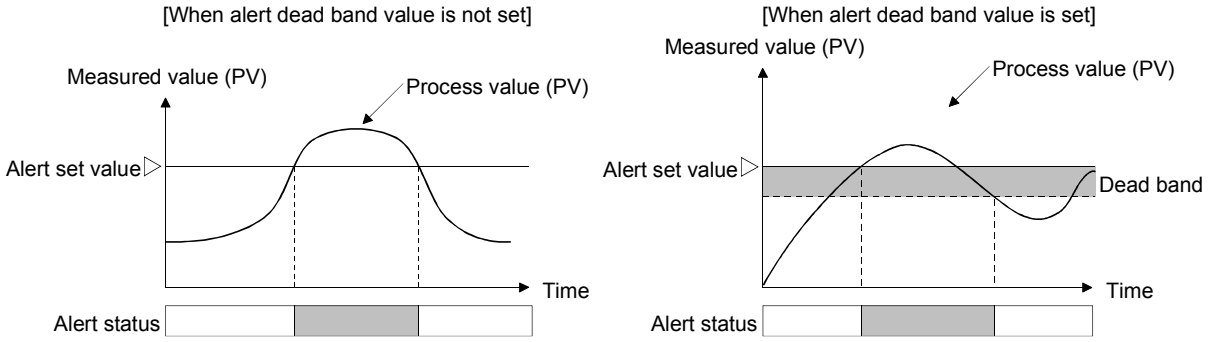
The setting range is 0 to + full-scale.



(2) The Q62HLC allows the alert function in (1) to be set with the addition of an alert dead band, alert delay count or wait/re-wait.
The following table indicates the alert functions which can be used with the addition of alert dead band, alert delay count and wait/re-wait.

| Alert function | | Dead band setting | Alert delay count | Wait | Re-wait |
|---|---|---|---|---|---|
| Input alert | Upper limit alert | ○ | ○ | ○ | ——— |
| | Lower limit alert | ○ | ○ | ○ | ——— |
| Deviation alert | Upper limit deviation alert | ○ | ○ | ○ | ○ |
| | Lower limit deviation alert | ○ | ○ | ○ | ○ |
| | Upper/lower limit deviation alert | ○ | ○ | ○ | ○ |
| | Within-range alert | ○ | ○ | ——— | ——— |

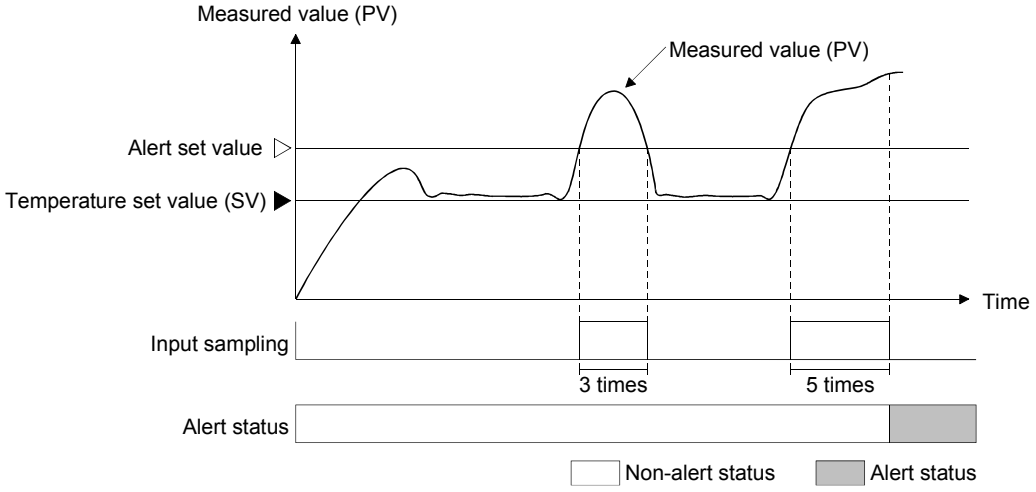
(a) Alert dead band setting
When the measured value (PV)/deviation is close to the alert set value, the alert status may alternate with the non-alert status due to input instability or the like.
Setting the alert dead band setting the alert status and non-alert status from alternating with each other due to input instability or the like when the measured value (PV)/deviation is near the alert set value.
The setting of alert dead band is made by the alert dead band setting (buffer memory address: 164).
Example: When the dead band value is set to the upper limit input alert, the system is placed in the alert status when the upper limit of the input rises to or above the alert set value. The system is put in the non-alert status when the upper limit falls below the alert dead band.



(b) Alert delay count setting

The system is set in the alert status when the process value (PV) that has reached the alert set value remains in the alert range until the sampling count becomes equal to or greater than the preset number of alert delays. The setting of alert delay count is made by the alert delay count (buffer memory address: 165).

Example: When the number of alert delays set to the input upper limit alert is 5, the system is not placed in the alert status if the sampling count is 4 or less.





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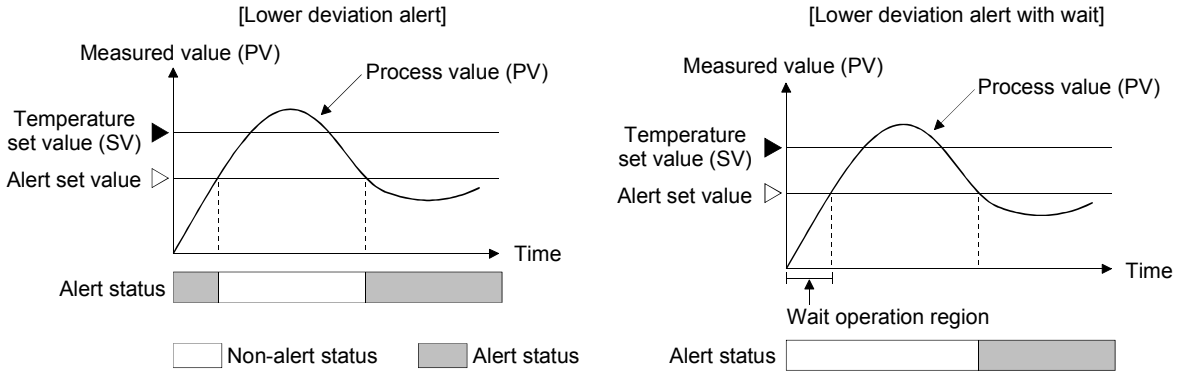
(c) Wait alert

Choosing the wait alert ignores the alert status if the process value (PV)/deviation is in that status when the setting mode is changed to the operation mode, and makes the alert function invalid until the process value comes out of the alert status once.

Example: Selecting the lower limit deviation alert with wait makes the alert function invalid until the process value exceeds the alert set value.



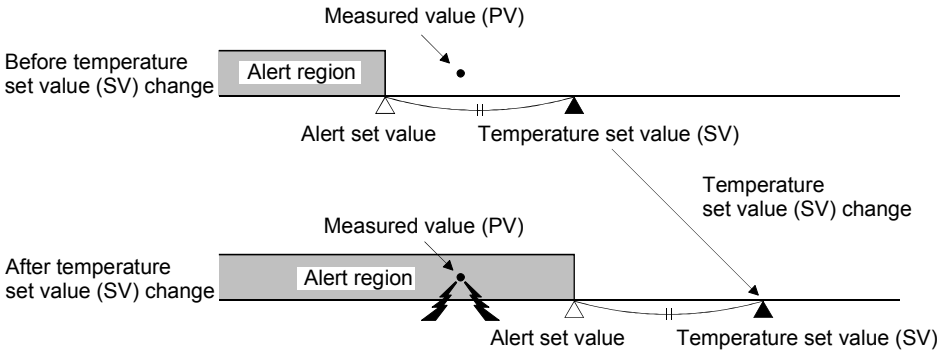

**POINT**

When the system has reached the non-alert status even once after an alert judgment start following the setting of the alert mode, the alert function with wait will be invalid if you choose the mode with wait.

(d) Re-wait alert

The re-wait alert is a wait alert-based feature which has the additional function to make the alert function invalid again when the set value (SV) is changed.
For set value changing control, choosing the re-wait alert avoids the alarm status reached when the set value is changed.

Example: If the measured value (PV) is at the position as shown below before the setting is changed, changing the set value (SV) for deviation alert will put the process value in the alert region and turn on the alert. To prevent this, the function makes the alert wait operation valid and the alert output to wait.



(3) The Q62HLC allows four different alerts (alerts 1 to 4) to be selected and used from among the alerts, wait alert and re-wait alert.
Set the alert modes used as alerts 1 to 4 at the following buffer memory addresses:

| Channel No. | Buffer memory addresses (Decimal) | | | |
|---|---|---|---|---|
| | Alert 1 | Alert 2 | Alert 3 | Alert 4 |
| 1 | 192 | 193 | 194 | 195 |
| 2 | 208 | 209 | 210 | 211 |

(4) Set the alert set value, alert dead band setting and alert delay count at the following buffer memory addresses:

| Channel No. | Buffer memory addresses (Decimal) | | |
|---|---|---|---|
| | Alert set value | Alert dead band setting | Alert delay count |
| 1 | 38 to 41 | 164 | 165 |
| 2 | 70 to 73 | | |

## 3.2.11 Control output setting at CPU stop error occurrence function

(1) You can set the Q62HLC control output (HOLD/CLEAR) to be provided when the programmable controller CPU has generated a stop error.

(2) To make this setting, use the intelligent function module switch setting on GX Developer.
- CLEAR : Stops the PID control, temperature judgement and alert judgement functions and turns off external outputs.
- HOLD : Continues the control status prior to a programmable controller CPU stop. For example, when PID control was exercised before a programmable controller CPU stop, PID control is continued if the programmable controller CPU stops.

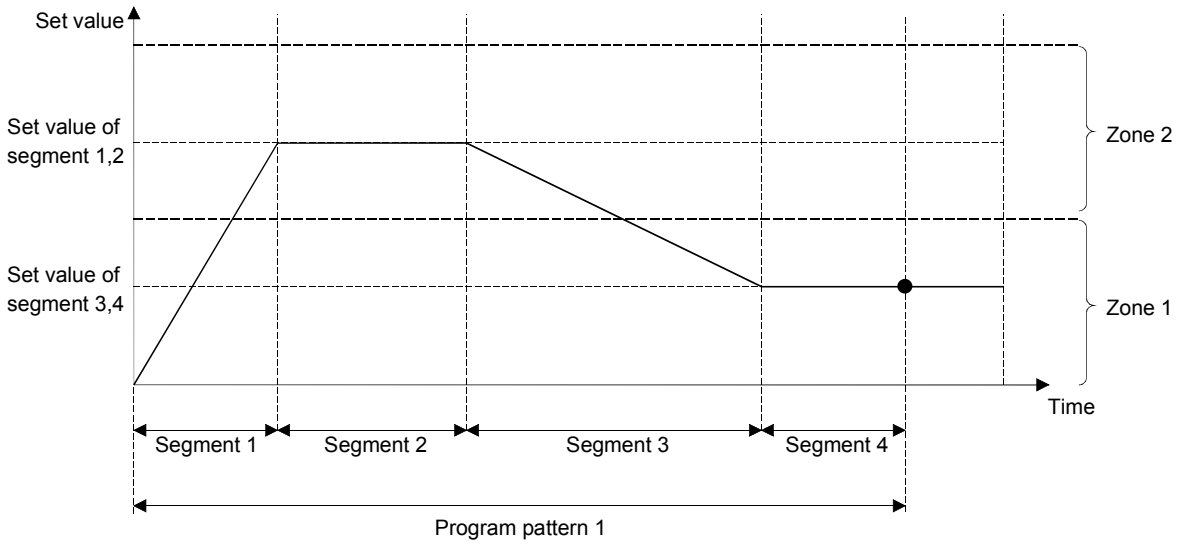
Refer to Section 4.5 for details of the setting method.

## 3.2.12 Program control function

### (1) Program control function

The Q62HLC performs PID control changing the set value (SV), according to the schedule set by users.
Program control function performs the control according to the setting description of the following items.

| Setting item | Description |
|---|---|
| Control data | Sets program pattern to be executed, starting method of set value at the start of control, and time scale of segment executing time. |
| Program pattern data | Sets segments up to 16 executing continuously PID control. Set value, execution time and zone No. to be used are set for each segment. |
| Zone PID data | Divides input range into 8 zones, and then sets PID constants and control response parameters for each zone. |



The following gives the detailed explanation of control data, program pattern, and zone PID data.

(a) Control data

Common data required for executing the program control are sets.

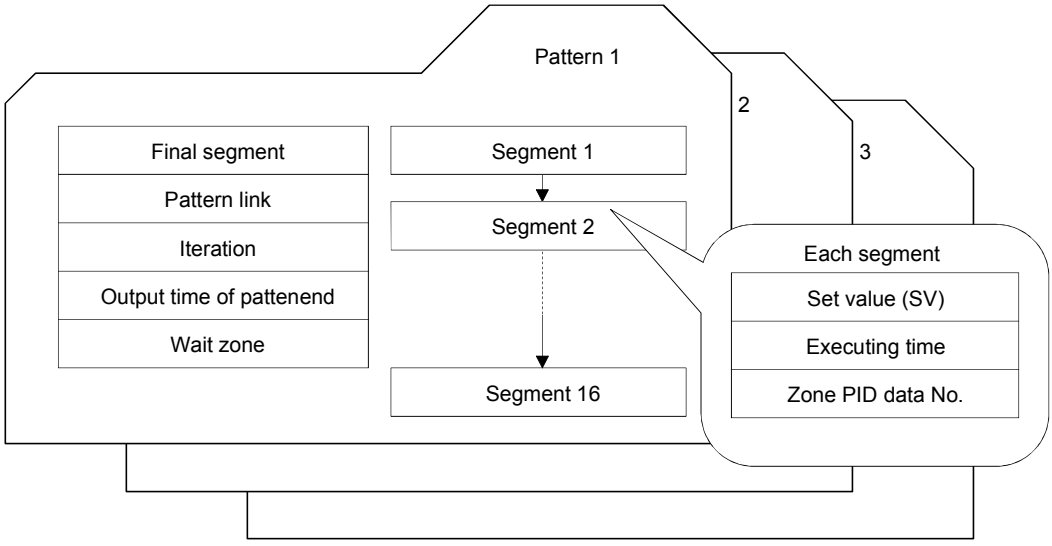
| Buffer memory name | Description | Buffer memory address (Decimal) | |
|---|---|---|---|
| | | CH1 | CH2 |
| Execution pattern setting | Sets a program to be executed selecting from the program patterns 1 to 3 | 272 | 528 |
| Start mode | Sets a starting method of set value (SV) selecting from zero starting/PV starting 1/ PV starting 2. | 273 | 529 |
| Time scale | Sets the executing time scale of the segment set in program pattern data. | 274 | 530 |

(b) Program pattern data

Program pattern consists of segments, which have set value, time (execution time), and zone PID data No.

The Q62HLC can set up to 3 patterns of 16-segment program pattern at the maximum.

Several program patterns can be linked by pattern link (refer to the next page for buffer memories).



| Buffer memory name | Description | CH | Buffer memory address (Decimal) | | |
|---|---|---|---|---|---|
| | | | Program pattern | | |
| | | | 1 | 2 | 3 |
| Final segment | Sets the final segment to complete the program pattern. | 1 | 320 | 384 | 448 |
| | | 2 | 576 | 640 | 704 |
| Pattern link | Sets the program pattern of link destination when linking several program patterns. | 1 | 321 | 385 | 449 |
| | | 2 | 577 | 641 | 705 |
| Iteration | Sets execution times of the program control. | 1 | 322 | 386 | 450 |
| | | 2 | 578 | 642 | 706 |
| Output time of pattern end | Sets the pattern end output time when completing the program pattern. | 1 | 323 | 387 | 451 |
| | | 2 | 579 | 643 | 707 |
| Wait zone | Sets a zone where the program control waits before moving to next segment when the measured value cannot follow the progress of the program control. | 1 | 324 | 388 | 452 |
| | | 2 | 580 | 644 | 708 |

*1: When the program pattern has been linked, the program pattern setting, which is set at the execution pattern setting (buffer memory address: 272,528), is valid.

*2: When the program pattern has been linked, the setting of the executing program pattern is valid.

| Buffer memory name | Description | Segment | Buffer memory address (Decimal) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Program pattern | | | | | |
| | | | 1 | | 2 | | 3 | |
| | | | CH1 | CH2 | CH1 | CH2 | CH1 | CH2 |
| Set value (SV) setting | Sets the set value of segment. | 1 | 325 | 581 | 389 | 645 | 453 | 709 |
| | | 2 | 328 | 584 | 392 | 648 | 456 | 712 |
| | | 3 | 331 | 587 | 395 | 651 | 459 | 715 |
| | | 4 | 334 | 590 | 398 | 654 | 462 | 718 |
| | | 5 | 337 | 593 | 401 | 657 | 465 | 721 |
| | | 6 | 340 | 596 | 404 | 660 | 468 | 724 |
| | | 7 | 343 | 599 | 407 | 663 | 471 | 727 |
| | | 8 | 346 | 602 | 410 | 666 | 474 | 730 |
| | | 9 | 349 | 605 | 413 | 669 | 477 | 733 |
| | | 10 | 352 | 608 | 416 | 672 | 480 | 736 |
| | | 11 | 355 | 611 | 419 | 675 | 483 | 739 |
| | | 12 | 358 | 614 | 422 | 678 | 486 | 742 |
| | | 13 | 361 | 617 | 425 | 681 | 489 | 745 |
| | | 14 | 364 | 620 | 428 | 684 | 492 | 748 |
| | | 15 | 367 | 623 | 431 | 687 | 495 | 751 |
| | | 16 | 370 | 626 | 434 | 690 | 498 | 754 |

(From previous page)

| Buffer memory name | Description | Segment | Buffer memory address (Decimal) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Program pattern | | | | | |
| | | | 1 | | 2 | | 3 | |
| | | | CH1 | CH2 | CH1 | CH2 | CH1 | CH2 |
| Executing time | Sets the execution time of segments. | 1 | 326 | 582 | 390 | 646 | 454 | 710 |
| | | 2 | 329 | 585 | 393 | 649 | 457 | 713 |
| | | 3 | 332 | 588 | 396 | 652 | 460 | 716 |
| | | 4 | 335 | 591 | 399 | 655 | 463 | 719 |
| | | 5 | 338 | 594 | 402 | 658 | 466 | 722 |
| | | 6 | 341 | 597 | 405 | 661 | 469 | 725 |
| | | 7 | 344 | 600 | 408 | 664 | 472 | 728 |
| | | 8 | 347 | 603 | 411 | 667 | 475 | 731 |
| | | 9 | 350 | 606 | 414 | 670 | 478 | 734 |
| | | 10 | 353 | 609 | 417 | 673 | 481 | 737 |
| | | 11 | 356 | 612 | 420 | 676 | 484 | 740 |
| | | 12 | 359 | 615 | 423 | 679 | 487 | 743 |
| | | 13 | 362 | 618 | 426 | 682 | 490 | 746 |
| | | 14 | 365 | 621 | 429 | 685 | 493 | 749 |
| | | 15 | 368 | 624 | 432 | 688 | 496 | 752 |
| | | 16 | 371 | 627 | 435 | 691 | 499 | 755 |
| Zone PID data No. | Sets the PID data No. to be used in segments. | 1 | 327 | 583 | 391 | 647 | 455 | 711 |
| | | 2 | 330 | 586 | 394 | 650 | 458 | 714 |
| | | 3 | 333 | 589 | 397 | 653 | 461 | 717 |
| | | 4 | 336 | 592 | 400 | 656 | 464 | 720 |
| | | 5 | 339 | 595 | 403 | 659 | 467 | 723 |
| | | 6 | 342 | 598 | 406 | 662 | 470 | 726 |
| | | 7 | 345 | 601 | 409 | 665 | 473 | 729 |
| | | 8 | 348 | 604 | 412 | 668 | 476 | 732 |
| | | 9 | 351 | 607 | 415 | 671 | 479 | 735 |
| | | 10 | 354 | 610 | 418 | 674 | 482 | 738 |
| | | 11 | 357 | 613 | 421 | 677 | 485 | 741 |
| | | 12 | 360 | 616 | 424 | 680 | 488 | 744 |
| | | 13 | 363 | 619 | 427 | 683 | 491 | 747 |
| | | 14 | 366 | 622 | 430 | 686 | 494 | 750 |
| | | 15 | 369 | 625 | 433 | 689 | 497 | 753 |
| | | 16 | 372 | 628 | 436 | 692 | 500 | 756 |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(c) Zone PID data

The zone PID data divides input range into 8 zones by zone upper limit setting, and then sets the PID constants and control response parameters used for each zone.

Zone dividing is performed by the upper limit setting (refer to the table on the next page for buffer memory) of zone 1 to 8.

Selecting the PID constants and control response parameters used in each segment is performed by the zone PID data No. (refer to the table on the previous page for buffer memory).

There are following three types for selecting the method.

1) When selecting optionally the PID constants and control response parameters

Set 1 to 8 to the zone PID data No. for each segment.

The Q62HLC performs the control using the PID constants and control response parameter of zone 1 to 8.

2) When selecting automatically the PID constants and control response parameters

The zone PID data No. is set to 0.

The Q62HLC performs the control after automatically selecting the zone including the set value of segment in execution.

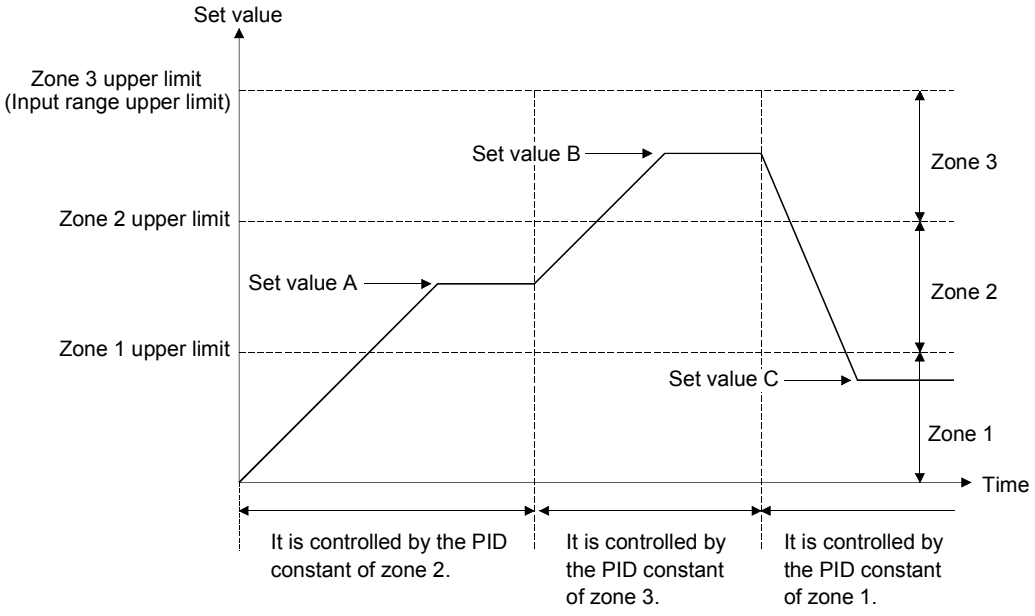
If the characteristics of control target differ depending on the zone, the control performance can be improved being compared with the case where a single PID constant is used for controlling.

3) When controlling with the PID constants and control response parameters

Zone 1 upper limit is set as input range upper limit, and 0 is set to zone PID data No. of each segment.

The Q62HLC performs the control using the PID constants and control response parameter of zone 1.

Example) When dividing the input range into 3 zones and when setting 2 for the PID data setting of the execution zone (For buffer memory addresses, check the following table) in the segment 1 and 2, setting 3 for the PID data setting of the execution zone in the segment 3 and 4, setting 1 for the PID data setting of the execution zone in the segment 5 and 6



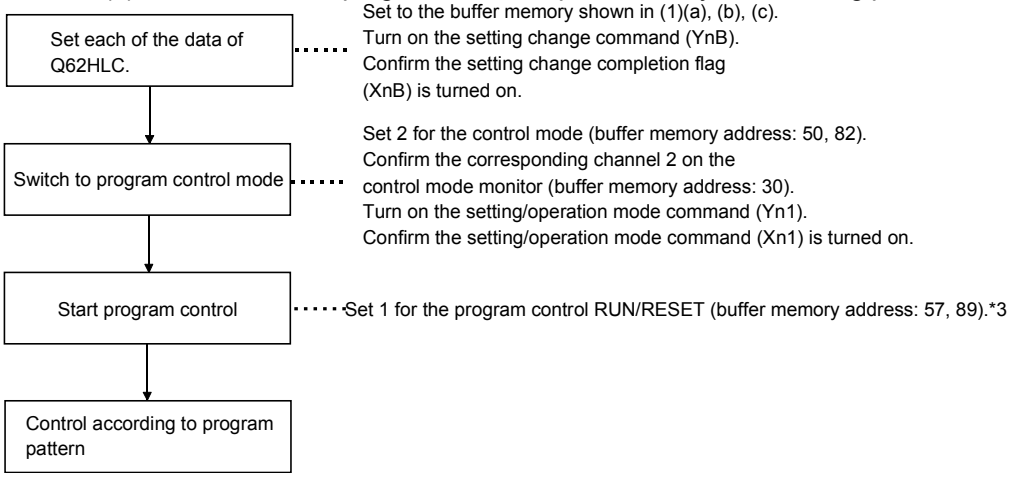


3 - 28

| Buffer memory name | Description | CH | Buffer memory address (Decimal) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Zone | | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Upper limit | Sets the upper limit for each zone to divide input range into zones. | 1 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | - |
| | | 2 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | - |
| Proportional band (P) setting | Sets the constants of proportional band (P) for zones. | 1 | 282 | 286 | 290 | 294 | 298 | 302 | 306 | 310 |
| | | 2 | 538 | 542 | 546 | 550 | 554 | 558 | 562 | 566 |
| Integral time (I) setting | Sets the constants of integral time (I) for zones. | 1 | 283 | 287 | 291 | 295 | 299 | 303 | 307 | 311 |
| | | 2 | 539 | 543 | 547 | 551 | 555 | 559 | 563 | 567 |
| Derivative time (D) setting | Sets the constants of derivative time (D) for zones. | 1 | 284 | 288 | 292 | 296 | 300 | 304 | 308 | 312 |
| | | 2 | 540 | 544 | 548 | 552 | 556 | 560 | 564 | 568 |
| Control response parameter | Sets the 3-step responses to the target change of PID control. | 1 | 285 | 289 | 293 | 297 | 301 | 305 | 309 | 313 |
| | | 2 | 541 | 545 | 549 | 553 | 557 | 561 | 565 | 569 |

### (2) Execution of program control

(a) The execution of program control is performed by the following procedure.

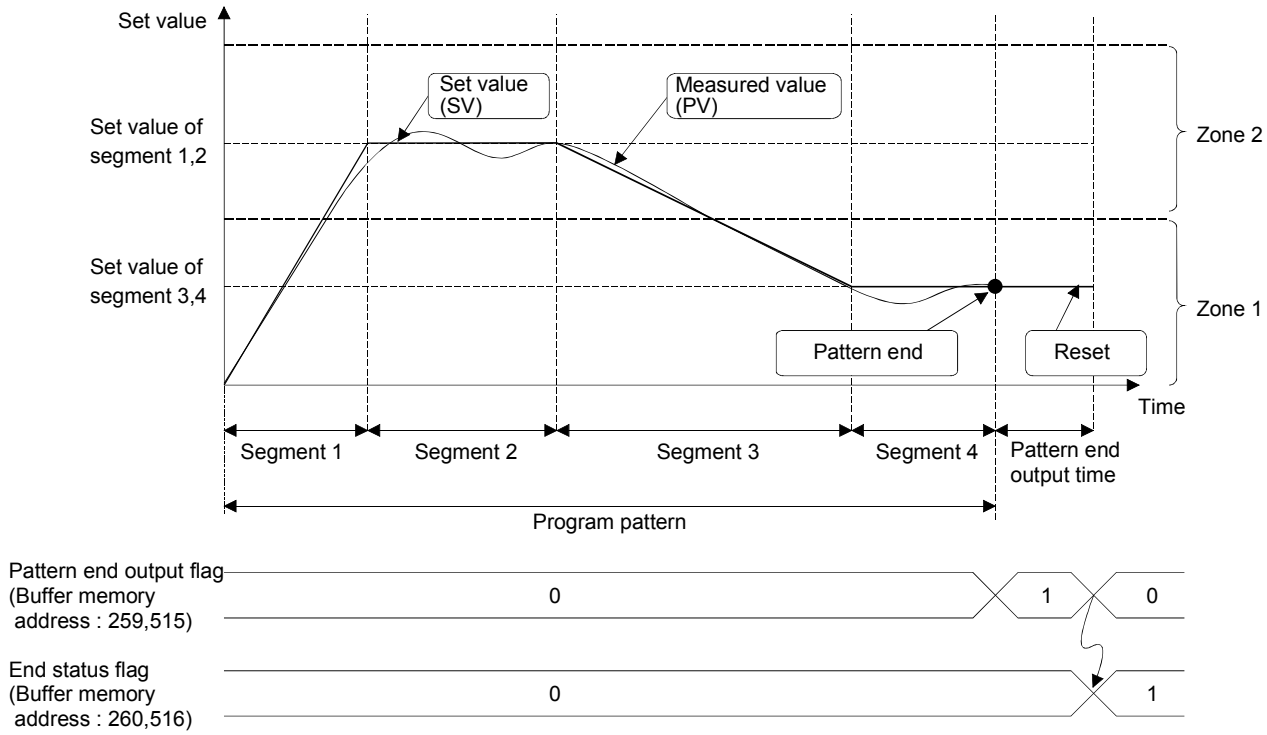



*3: If switching to the program control mode with the program control RUN/RESET set to 1, the program control is started as it is.
After switching to the program control mode, written data error of the control data, program pattern data and zone PID data will be checked.

(b) Operation of program control

If starting the program control, the control by the program patterns specified in the execution pattern (buffer memory address: 272, 528) is executed in the order of segment 1→segment 2→・・・→segment 16.
Each segment performs the control by the set value and zone PID data for the execution time set in executing time.

The following is the example of program pattern 1 controlled by the PID control in the order of segment 1→2→3→4. This section explains the program pattern data, control data, and zone PID data as an example.







1) Set the executed program pattern with the control data. Sets program pattern1.
2) Create the program pattern to be executed.
   - Set the information in the segment 1, 2, 3 and 4 of the program pattern 1, and execute in the order of segment 1→2→3→4.
   - As the zone PID data used by each segment, set 2 for segment 1 and 2, and 1 for segment 3 and 4.
   - Set the segment 4 for the final segment which completes the program pattern.
3) Set the PID constants and control response parameters with the zone PID data used for the PID control.
   Set the PID constants and control response parameters for the zone 1 and zone 2.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(c) Operation at the completion of program control

After the PID control of the final segment set by the final segment completes and reaches the pattern end, the pattern end output is performed.

- The pattern end output continues the PID control at the set value of the final segment for the time set by the output time setting of pattern end (buffer memory address: 323, 387, 451, 579, 643, 707).
- During the pattern end output, 1 is stored in the pattern end output flag (buffer memory address: 259, 515).
- After the completion of the pattern end output, the program control completes, 1 is stored in the end status flag (buffer memory address: 260, 516), and the program control becomes a reset status.
- At the RESET status, the PID control is stopped, and the stored value is 0 and the output is turned off*4.

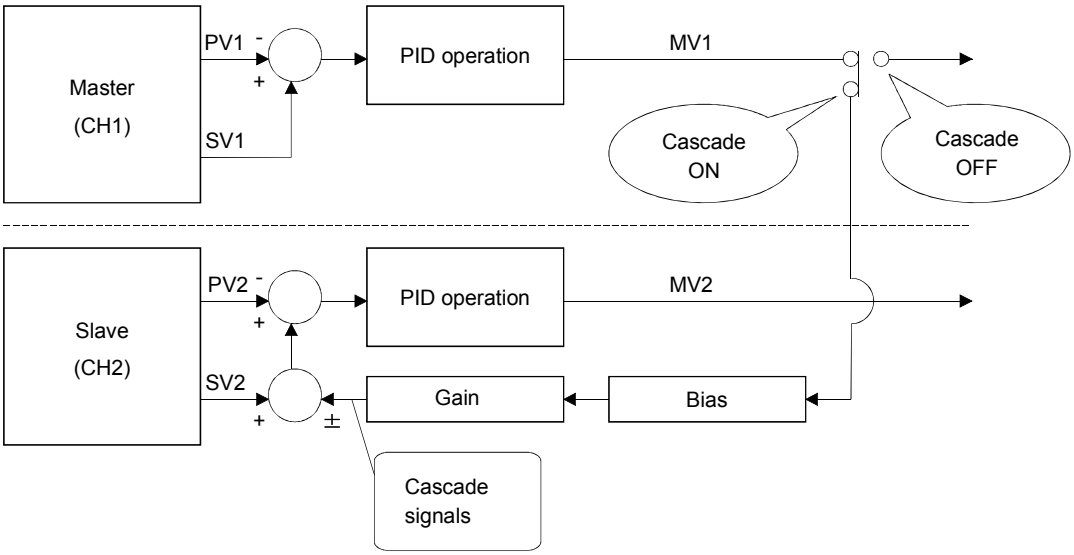
*4: The current value output at the RESET is the value set by the lower output limiter (buffer memory address: 43, 75).

| POINT |
| --- |
| When executing the program control continuously, wait for more than 0.05 seconds after resetting the first program control, and then set the program control RUN/RESET to RUN. (Set 1 for the buffer memory address: 57, 89.) |

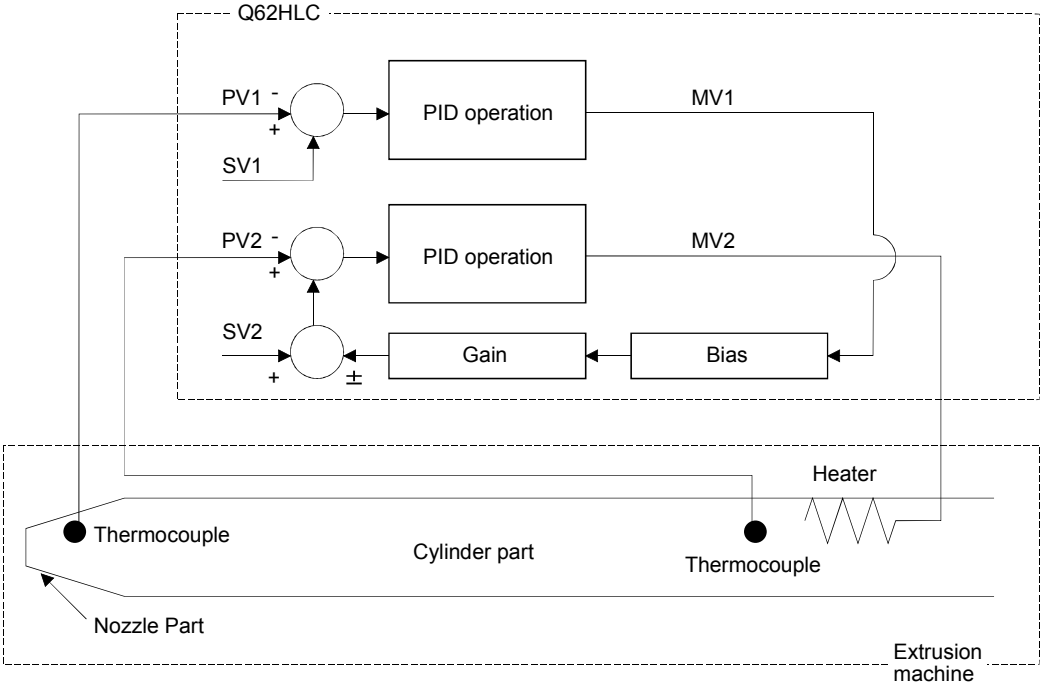
## 3.2.13 Cascade control function

### (1) Cascade control function

The cascade control can perform the control with the channel 1 as master and the channel 2 as slave.
The master performs PID operations by inputting the measured value (PV1) of targets that are controlled at the last, converts the manipulated value (MV1) to cascade signals by bias and gain, and corrects the set value (SV2) of the slave.
The slave performs the PID control according to the set value (SV2) corrected into the cascade signals.




The cascade control is suitable for when there is a large time delay between the heater and the part where needs temperature stabilized.
Example) Resin temperature control of a nozzle part of an extrusion machine



### (2) Cascade control and control mode

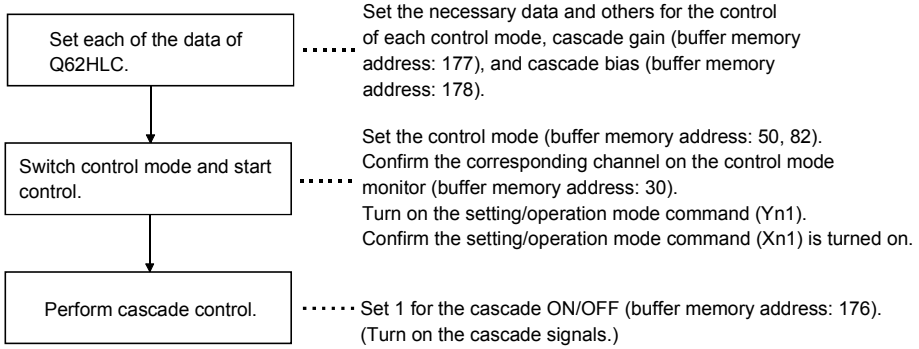
The cascade control function can only be used with the combination of the following three control modes.
When the control modes are combined with other ones in the following table, the cascade control is not performed even if the cascade ON/OFF (buffer memory address: 176) is set to 1(ON).
When control modes are combined with other control modes than the following three, each channel operates individually.

| No. | Control mode | |
|---|---|---|
| | CH1 | CH2 |
| 1 | Normal control mode | Normal control mode |
| 2 | Manual control mode | Manual control mode |
| 3 | Program control mode *1 | Program control mode *1 |

*1: When the program control is reset, each cascade control cannot be performed.

### (3) Execution of cascade control

The execution of cascade control is performed by the following procedure.
During the cascade control, the cascade signal is monitored on the cascade monitor (buffer memory address: 179).




**POINT**

- Auto tuning cannot be executed during cascade control. To execute auto tuning, set the cascade ON/OFF (buffer memory address: 176) to "0" (OFF). To check that the cascade control is stopped, confirm that "0" is stored in the cascade monitor (buffer memory address: 179).
- Auto tuning can be executed on the slave channel only.

## 3.2.14 Scaling function

The scaling function scales the measured value and stores it in the scaling value (buffer memory address: 196, 212).
The conversion method differs depending on micro voltage, voltage, current input in the case of thermocouple input.
The conversion method is automatically selected by the setting of input range (buffer memory address: 32, 64).

### (1) Thermocouple input

The measured value within the scaling range set by the scaling range upper limit value (buffer memory address: 197, 213) and also scaling range lower limit value (buffer memory address: 198, 214) is, by performing the scaling, set to the scaring width set by the scaling width upper limit value (buffer memory address: 199, 215) and also scaling width lower limit value (buffer memory address: 200, 216).
The following describes the calculation method of scaling value.

$$SCV = ( SCWU - SCWL ) \times \frac{TEPV - SCRL}{SCRU - SCRL} + SCWL$$

SCV : Scaling value
SCWU : Scaling width upper limit value
SCWL : Scaling width lower limit value
TEPV : Set value
SCRU : Scaling range upper limit value
SCRL : Scaling range lower limit value

Example) When scaling the temperature to a percentage (%)
When scaling the temperature 360℃ (temperature conversion value: 3600) in the following setting.
Scaling range: -100 to 500℃ (lower limit value = -1000, upper limit value = 5000)
Scaling width: 0 to 100% (lower limit value = 0, upper limit value = 100)

$$\text{Scaling value} = (100 - 0) \times \frac{3600 - (-1000)}{5000 - (-1000)} + 0$$

$$= 76.6666 \cdots$$

$$= 77\ (\%)$$

Rounded to the whole number.

**POINT**

The scaling is performed by the above method even if the upper limit value is set smaller than the lower limit value for the scaling range upper/lower limit value and scaling width upper/lower limit value.
When the upper limit value is set equal to the lower limit value, the scaling is not performed.
When the measured values out of the range set with the scaling range upper/lower limit value are measured, the values set with the scaling width upper/lower limit value are stored.

(2) Micro voltage, voltage, current input

The value converted from the digital output value within the range between the scaling range lower limit (buffer memory address: 198, 214) and the scaling range upper limit (buffer memory address: 197, 213) is stored in the scaling value.
Full-scale*1 should be set to a value under 20000.
The scaling width upper limit and scaling width lower limit are not used.

*1 The absolute value of (Scaling range upper limit - Scaling range lower limit)
If the scaling upper/lower limit values of which full-scale is larger than 20000 are set, a write data error (error code 4) occurs.
In this case, the scaling is performed for the set upper limit value and the lower limit value of (the upper limit value -20000).

| POINT |
|---|
| The scaling is performed even if the scaling range upper/lower limit value is set as the upper limit value is smaller than the lower limit value.<br>The following figure illustrates the movement of the scaling range.<br>Example) When setting the lower limit value 5000 and upper limit value 1000 in the range of 1 to 5V<br>1.000V → 1.001V → ••• →4.999V → 5.000V<br>5000 → 4999 → ••• → 1001 → 1000 |

## 3.2.15 Simplified analog I/O function

This function enables extra channels of the Q62HLC to be used as simplified thermocouple/micro voltage input modules, analog/digital conversion modules, and digital/analog conversion modules*1.
The execution of the simplified analog I/O function is performed by manual control mode 2. Set 3 for the control mode (buffer memory address: 50, 82).

The following describes how to use the analog input and analog output.

(1) Analog input

Monitors the measured value (PV) (buffer memory address: 9, 10).

(2) Analog output

Set the digital value 0 to 4000 (current value is 4 to 20mA) of the analog output to the MAN output setting (buffer memory address: 51, 83).
When not using the analog output, set a value ranging from -32768 to -1.*2

*1: There is no equivalent function to the analog/digital conversion module and digital/analog conversion module.
*2: The output is near 0mA.

## 3.2.16 Q62HLC control status controlling output signal and buffer memory settings and control status

The Q62HLC has the output signals (Y), buffer memory and intelligent function module switch setting which set its control status. The control status of the Q62HLC differs depending on the mode of the Q62HLC.
The control status of the Q62HLC on each mode is governed as indicated below by the settings of the output signals, buffer memory and intelligent function module switch setting.

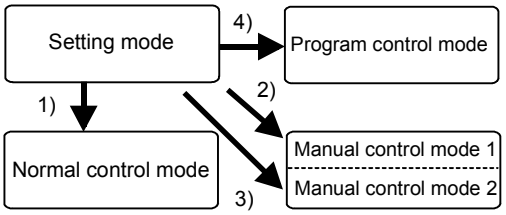
(1) Switching of modes

Q62HLC has a setting mode and an operation mode.

- The setting mode is a mode to make a setting of control conditions.
- The operation mode is a mode to execute the control (control mode).
  The operation modes consist of the normal control mode, manual control mode, and program control mode.
- The setting mode is selected when turning on the power and resetting.

(a) Setting mode→Operation mode ((1) to (4) of the chart)

After setting a value in the control mode (buffer memory address: 50, 82), the mode is switched by turning on the setting/operation mode command (Yn1).
After the completion of switching, the control mode value moved to the control mode monitor (buffer memory address: 30) is stored, and the setting/operation mode status (Xn1) is turned on.

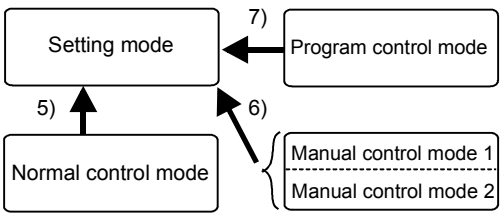



| No. | Control Mode<br>Buffer memory address<br>(Decimal) 50, 82 | Setting/operation mode command Yn1 |
|---|---|---|
| 1) | 0 | ON |
| 2) | 1 | |
| 3) | 3 | |
| 4) | 2 | |

*1: Manual control modes 1 and 2 have different setting ranges and settings for the MAN output setting. (Refer to Section 3.5.24)

(b) Operation mode → Setting mode (from (5 to 7) of the chart)

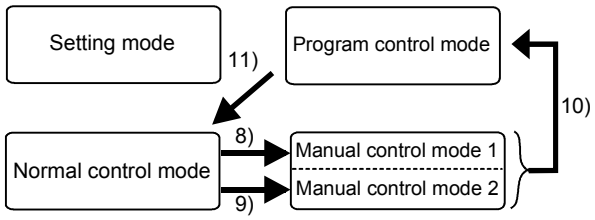
The mode is switched by turning off the setting/operation mode command (Yn1).
After the completion of the switching, the setting/operation mode status (Xn1) is turned off.



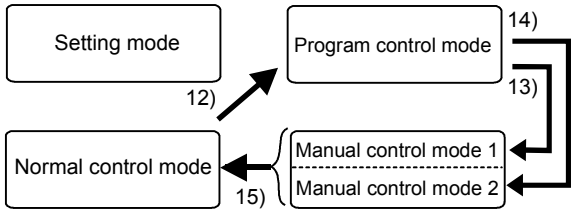

| No. | Setting\operation mode command Yn1 |
|---|---|
| 5) | OFF |
| 6) | |
| 7) | |

(c) Between control modes ((8) to (15) of the chart)

The mode is switched by setting a value to the control mode (buffer memory address: 50, 82) at the operation mode (Xn1: ON).
After the completion of the switching, the value of the control mode switched to the control mode (buffer memory address: 30) is stored.




| No. | Control mode Buffer memory address (Decimal) 50, 82 |
|---|---|
| 8) | 1 |
| 9) | 3 |
| 10) | 2*2 |
| 11) | 0 |




| No. | Control mode Buffer memory address (Decimal) 50, 82 |
|---|---|
| 12) | 2*2 |
| 13) | 1 |
| 14) | 3 |
| 15) | 0 |

*2: The control status at switching differs depending on the intelligent function module switch setting. (Refer to (3) in this section)

(2) Control status

The Q62HLC has the output signals (Y), buffer memory and intelligent function module switch which set its control status.
The control status of the Q62HLC is as indicated below.

(a) Intelligent function module switch setting

| Output setting for CPU stop error (refer to Section 4.5) / Intelligent function module switch setting | Control status | | |
|---|---|---|---|
| | PID control | Temperature judgment | Alert judgment |
| If a CPU stop error occurs at the setting of "CLEAR" | — | — | — |
| Other than above | In accordance with control status of other setting items | | |

○: Executed, —: Not executed

(b) Unused channel setting

| Unused channel setting (refer to Section 3.5.32) / Buffer memory address (Decimal) 61, 93 | Control status | | |
|---|---|---|---|
| | PID control | Temperature judgment | Alert judgment |
| Unused | — | — | — |
| Used | In accordance with control status of other setting items | | |

○: Executed, —: Not executed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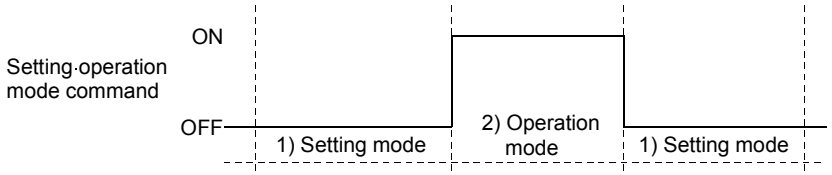
(c) Other settings

| Setting•operation mode command (refer to Section 3.4) *3 | PID continuation flag (refer to Section 3.5.39) | Forced PID control stop command (refer to Section 3.4.3) | Stop mode setting (refer to Section 3.5.13) | Control status | | |
|---|---|---|---|---|---|---|
| | | | | PID control | Temperature judgment | Alert judgment |
| Yn1, Xn1 | Buffer memory address (Decimal) 169 | YnC, YnD | Buffer memory address (Decimal) 33, 65 | | | |
| 1) Setting mode (at power-on) | Stop/continue | OFF/ON | Stop | — | — | — |
| | | | Monitor | — | ○ | — |
| | | | Alert | — | ○ | ○ |
| 2) Operation mode (during operation of normal control, Manual control 1, Manual control 2) | Stop/continue | OFF | Stop/monitor/alert | ○ | ○ | ○ |
| | | ON | Stop | — | — | — |
| | | | Monitor | — | ○ | — |
| | | | Alert | — | ○ | ○ |
| 2)' Operation mode (during operation) | Stop/continue | OFF | Stop/monitor/alert | ○ | ○ | ○ |
| | | ON | Stop/monitor/alert | —*4 | ○ | — |
| 3) Setting mode (after operation of normal control, Manual control 1, Manual control 2) | Stop | OFF/ON | Stop | — | — | — |
| | | | Monitor | — | ○ | — |
| | | | Alert | — | ○ | ○ |
| | Continue | OFF | Stop/monitor/alert | ○ | ○ | ○ |
| | | ON | Stop | — | — | — |
| | | | Monitor | — | ○ | — |
| | | | Alert | — | ○ | ○ |
| 3)' Setting mode (after operation) | Stop | OFF/ON | Stop/monitor/alert | —*4 | ○ | — |
| | Continue | OFF | Stop/monitor/alert | ○ | ○ | ○ |
| | | ON | Stop/monitor/alert | —*4 | ○ | — |

○: Executed, —: Not executed

*3: The settings of the setting•operation mode command will be explained in the following three different modes.




*4: The PID control becomes RESET during operation of Program control.

### (3) Control status selection when switching to program control

When switching standard control to program control or switching manual control to program control in the operation mode (Xn1: ON), the control status at switching can be selected.

Set the control status at switching with the intelligent function module switch setting (Switch 2).

Refer to Section 4.5 for the intelligent function module switch setting.

#### (a) When the program control RUN/REST (buffer memory address 57, 89) is set to 1.

| Control details | Control status | |
|---|---|---|
| | Set 1 for switch 2 | Set other than 1 for switch 2 |
| PID control | Continue | Suspends PID control. The manipulated value (MV) becomes -50 while suspending the control (for 25ms). |
| Alert status | Continues the processing in accordance with the set and measured values. | Clear |
| Loop disconnection warning | | |
| Approach flag | | |
| Cascade control | Suspends cascade control.Perform PID control while suspending the control. | Suspends PID and cascade controls.Resume the cascade control from a maximum of 500 ms after resuming the PID control. |

#### (b) When the program control RUN/REST (buffer memory address 57, 89) is set to 0.

The control status become as follows regardless of the setting of the Intelligent function module switch setting (Switch 2).

| Control details | Control status |
|---|---|
| PID control | Stop |
| Alert status | Clear |
| Loop disconnection warning | |
| Approach flag | |
| Cascade control | Stop |

**POINT**

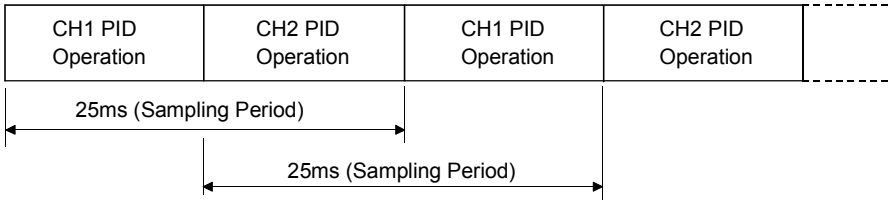
Check the following contents when switching to program control in the operation mode (Xn1: ON).

1) Set the start mode setting to PV starting 1 (Time fixed) or PV starting 2 (Time shortened).
2) Make sure that the each parameter settings for program control is not in an error status to prevent control operation in the setting error status.

## 3.3 Sampling Period and Control Output Period

### (1) Sampling period

(a) This is the time taken from the channel (CHn) where PID operations are currently executed until restart of PID operations of the current channel (CHn), and it is fixed as 25ms regardless of the number of used channels.





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## 3.4 I/O Signals Transferred to/from the Programmable Controller CPU

This section explains the allocation and applications of the Q62HLC I/O signals.

### 3.4.1 I/O signal list

(1) The Q62HLC uses 16 input points and 16 output points to transfer signals to/from the Programmable Controller CPU.

(2) Table 3.7 lists the I/O signals used by the Q62HLC.
Inputs (X) mean the signals from the Q62HLC to the Programmable Controller CPU and outputs (Y) the signals from the Programmable Controller CPU to the Q62HLC.

(3) The I/O signals (X, Y) indicated in this manual assume that the module is loaded on the I/O slot 0 of the main base unit.
If the Q62HLC is mounted on other than the I/O slot 0, change the I/O signals for those of the slot where the module is mounted.

Table 3.7 I/O signal list

| Input signal (Signal direction: Q62HLC → Programmable Controller CPU) | | Output signal (Signal direction: Q62HLC ← Programmable Controller CPU) | |
|---|---|---|---|
| Device No. | Signal name | Device No. | Signal name |
| Xn0 | Watchdog timer error flag | Yn0 | Reserved |
| Xn1 | Setting/operation mode status | Yn1 | Setting/operation mode command |
| Xn2 | Error flag | Yn2 | Error reset command |
| Xn3 | Module ready flag | Yn3 | Reserved |
| Xn4 | CH1 auto tuning status flag | Yn4 | CH1 auto tuning command |
| Xn5 | CH2 auto tuning status flag | Yn5 | CH2 auto tuning command |
| Xn6 | Reserved | Yn6 | Reserved |
| Xn7 | Reserved | Yn7 | Reserved |
| Xn8 | FeRAM write completion flag | Yn8 | FeRAM backup command |
| Xn9 | Default value write completion flag | Yn9 | Default setting registration command |
| XnA | FeRAM write failure flag | YnA | Reserved |
| XnB | Setting change completion flag | YnB | Setting change command |
| XnC | CH1 alert occurrence flag | YnC | CH1 forced PID control stop command |
| XnD | CH2 alert occurrence flag | YnD | CH2 forced PID control stop command |
| XnE | Reserved | YnE | Reserved |
| XnF | Reserved | YnF | Reserved |

**POINT**

We cannot guarantee the functions of the Q62HLC if any of the reserved areas is turned on/off in a sequence program.

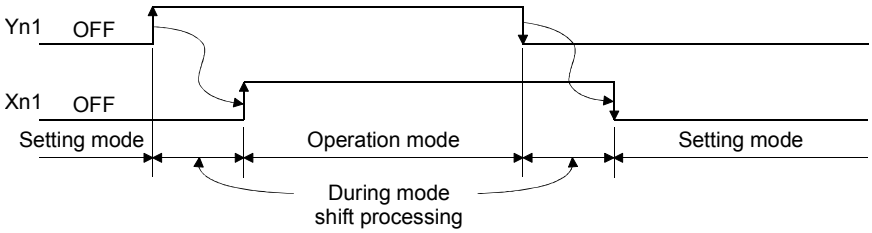
## 3.4.2 Input signal functions

### (1) Watchdog timer error flag (Xn0)

This signal turns on when the Q62HLC detects the watchdog timer error.

### (2) Setting/operation mode status (Xn1)

This signal turns on in the operation mode and turns off in the setting mode.
The switching of modes is performed by the setting/operation mode command (Yn1).
Do not change the set value during mode shift processing.

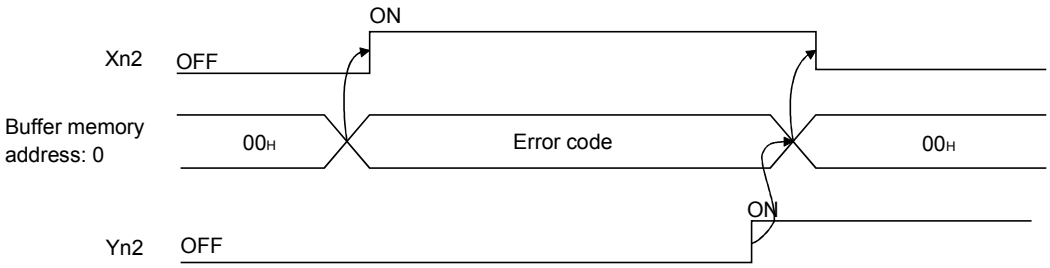



### (3) Error flag (Xn2)

(a) This signal turns on at the occurrence of write error to the buffer memory, the hardware error occurrence, and the abnormal completion of auto tuning.
A write error occurs under any of the following conditions.
- When data is set to the reserved area.
- When a setting change made to the area write-enabled in the setting mode only is made in the operation mode.
- When data outside the setting range is set.
- When data setting is changed during default setting registration.

At the occurrence of error, the error code and error occurrence factor of the factor corresponding to the error code (buffer memory address: 0) are stored. At the occurrence of error, the error code and error occurrence factor of the factor corresponding to the error code (buffer memory address: 0) are stored.

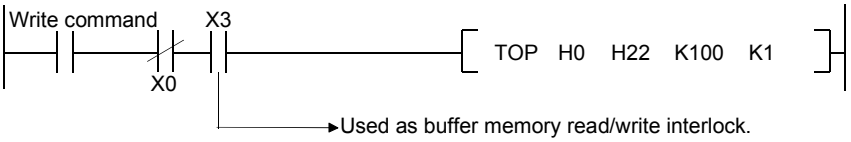
(b) By turning on the error reset directive (Yn2), the error flag (Xn2) is turned off, and the error code is cleared.



### (4) Module ready flag (Xn3)

(a) This signal turns on as soon as the Q62HLC is ready when the programmable controller CPU is powered on or reset.

(b) Read/write of Q62HLC buffer memory data from the programmable controller CPU is performed when the temperature control module ready flag (Xn3) is on.




(c) When the module ready flag (Xn3) is turned off, confirm the status of the watchdog timer error flag (Xn0).
When the watchdog timer error flag (Xn0) is on, operate referring to Section 8.6.

### (5) Auto tuning status flag (Xn4, Xn5)

(a) This signal turns on when auto tuning of the corresponding channel is executed.

| Channel | Auto tuning status flag | ON/OFF status |
|---|---|---|
| 1 | Xn4 | ON : Auto tuning in execution<br>OFF: Auto tuning not in execution or completed |
| 2 | Xn5 | |

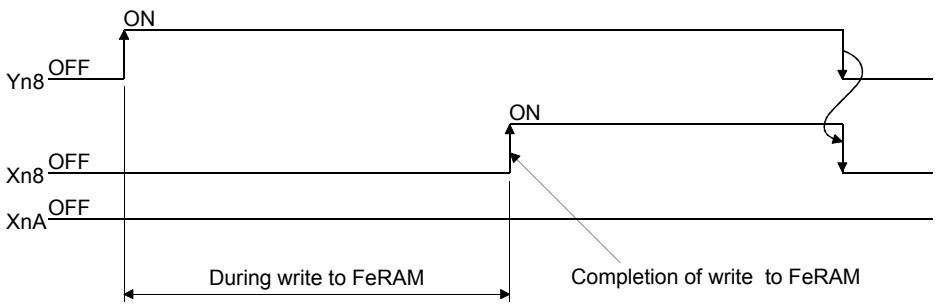
(b) Auto tuning is executed using the auto tuning command (Yn4, Yn5).

(c) This signal turns "on" while auto tuning is being executed and turns "off" automatically on completion of auto tuning.
At the abnormal completion of the auto tuning is being executed and turns "off" automatically, confirm the error code to be stored in (buffer memory address: 0).
Refer to Section 8.1 for error codes.

### (6) FeRAM write completion flag (Xn8)

(a) This signal turns on after completion of write of buffer memory contents to FeRAM which starts when the FeRAM backup command (Yn8) turns on.
After turning on Yn8, it takes more than ten seconds until Xn8 is on.

(b) When the FeRAM backup command (Yn8) turns off, the FeRAM write completion flag (Xn8) also turns off.

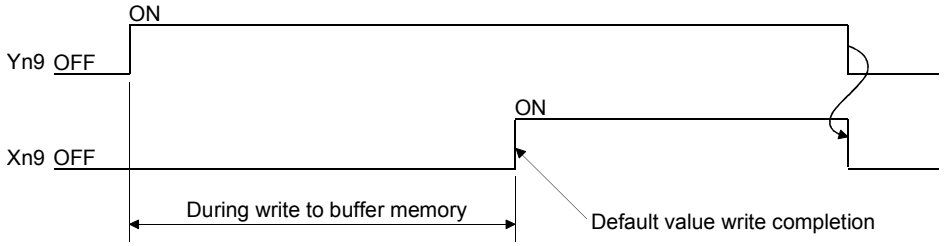


### (7) Default value write completion flag (Xn9)

(a) Turns on after completion of write of Q62HLC default values to buffer memory which starts when the default setting registration command (Yn9) turns on.

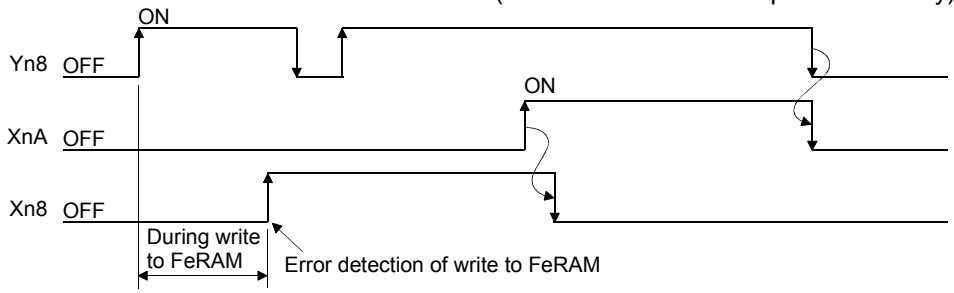
(b) When the default setting registration command (Yn9) turns off, the default value write completion flag (Xn9) also turns off.

(c) Perform unused channel setting to unused channels after completion of default value write.
If unused channel setting is not made to unused channels, the "ALM" LED of the Q62HLC is lit.




### (8) FeRAM write failure flag (XnA)

(a) This signal turns on at a failure of write of buffer memory contents to FeRAM which starts when the FeRAM backup command (Yn8) turns on.
- OFF : Completion of write to FeRAM
- ON : Failure of write to FeRAM (Write could not be completed normally)



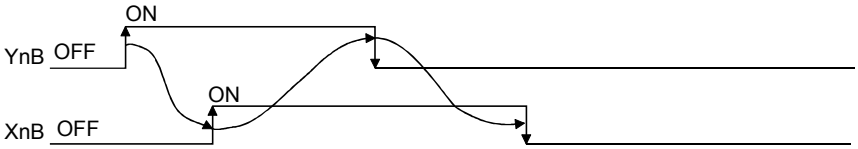

(b) The FeRAM write failure flag (XnA) turns off at normal completion of write to FeRAM.

(c) When the FeRAM write failure flag (XnA) has turned on, the FeRAM contents are undefined.
Hence, powering on the programmable controller CPU again or resetting it with the FeRAM write failure flag (XnA) on will make the buffer memory contents undefined, causing the Q62HLC to operate with the default values.

### (9) Setting change completion flag (XnB)

(a) This signal turns on the setting change completion of reflection of buffer memory settings on control which starts when the setting conversion command (YnB) turns on.

(b) When the setting change command (YnB) turns off, the setting change completion flag (XnB) also turns off.

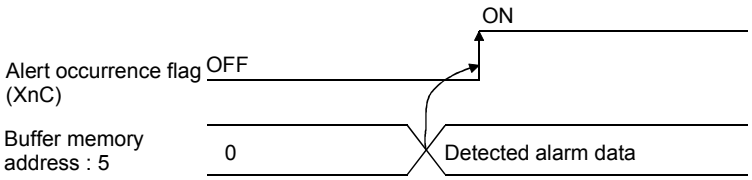



### (10) Alert occurrence flag (XnC, XnD)

(a) This signal turns on at alarm occurrence on the corresponding channel.

| Channel | Alert occurrence flag | ON/OFF status | Alert occurrence data buffer memory address |
|---|---|---|---|
| 1 | XnC | OFF: Without alarm occurrence<br>ON : With alarm occurrence | $5_H$ |
| 2 | XnD | | $6_H$ |

(b) When an alert occurs, the alert occurrence data is stored into alert definition (buffer memory address: 5, 6) and the alert occurrence flag (XnC, XnD) turns on.



### 3.4.3 Output signal functions

#### (1) Setting mode/operation mode command (Yn1)

(a) This signal sets the mode of the Q62HLC.
During the process of switching the modes, the set values cannot be changed.
- OFF : Setting mode
- ON : Operation mode

(b) This signal is set to all 2 channels together.

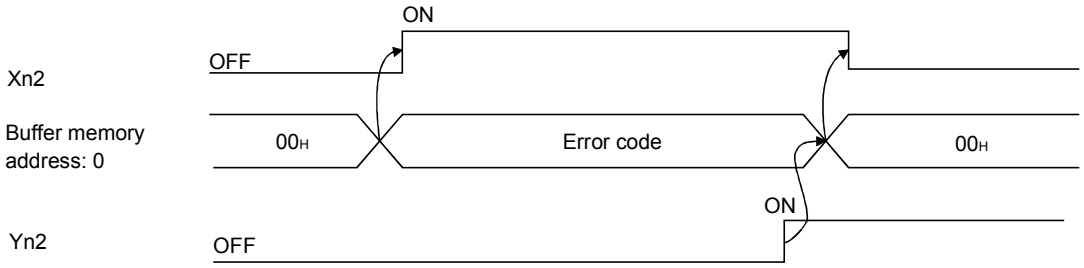
(c) The following setting items may be changed only when Yn1 is off.
A write data error (error code 3) will occur if any of these items is changed in the operation mode.
- Input range (Buffer memory address: 32, 64)
- Alert 1 to 4 mode setting (Buffer memory address: 192 to 195, 208 to 211)
- Control data used for the program control, zone PID data, program pattern data*1

*1: For details, refer to Section 3.2.12.

(d) Refer to Section 3.2.16 for the Q62HLC operation governed by ON/OFF of the setting mode/operation mode command.

#### (2) Error reset command (Yn2)

Clears (RESET) the error code (buffer memory address: 0) and this signal turns off the error flag (Xn2).



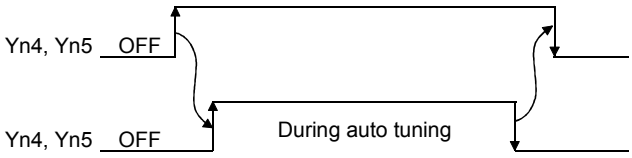

#### (3) Auto tuning command (Yn4, Yn5)

(a) This signal is used to start auto tuning.

(b) Turning on the auto tuning command (Yn4, Yn5) starts auto tuning and turns on the auto tuning status flag (Xn4, Xn5).
When auto tuning is completed, the auto tuning status flag (Xn4, Xn5) turns off.

(c) Keep the auto tuning command (Yn4, Yn5) on while auto tuning is in execution, and turn it off on completion of auto tuning.

(d) Turning off the auto tuning command (Yn4, Yn5) during auto tuning execution stops auto tuning.
When auto tuning is stopped, the PID constants in buffer memory do not change.

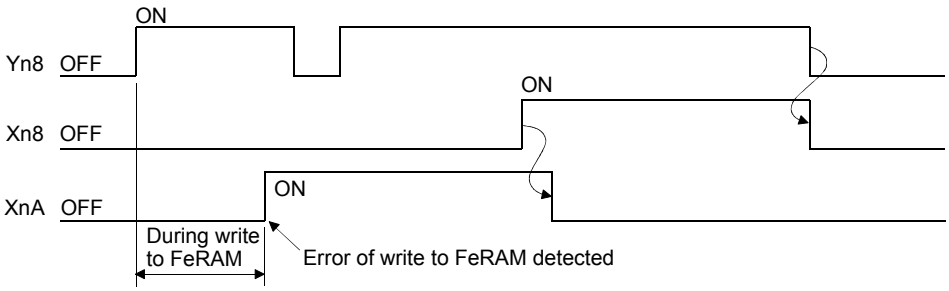



POINT

When executing the auto tuning continuously, wait for more than 1 second after turning off the first auto tuning command (Xn4, Xn5), and then turn on the second auto tuning command (Xn4, Xn5).

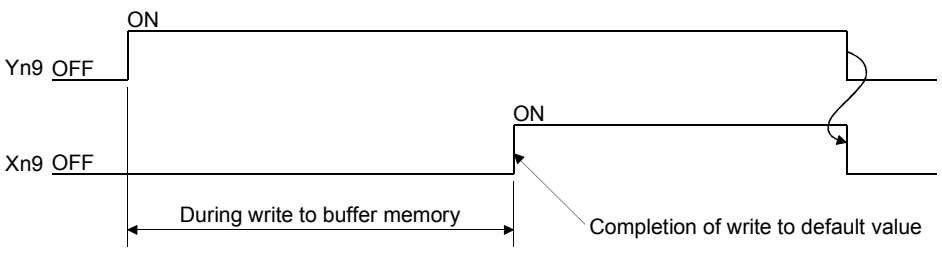
### (4) FeRAM backup command (Yn8)

(a) This signal is used to write buffer memory contents to FeRAM.
(b) Turning on the FeRAM backup command (Yn8) writes buffer memory contents to FeRAM.
1) The " FeRAM write completion flag (Xn8)" turns on at normal completion of write.
2) If write to FeRAM is not completed normally, the " FeRAM write failure flag (XnA)" turns on.
If XnA has turned on, turn on the FeRAM backup command (Yn8) again to write data to FeRAM.




### (5) Default setting registration command (Yn9)

(a) This signal is used to return buffer memory contents to default values.
Turning on the default setting registration command (Yn9) writes the default values of the Q62HLC to buffer memory and the default value write completion flag (Xn9) turns on at its completion.
(b) Make default setting in the setting mode (Xn1: OFF).
You cannot make default setting in the operation mode (Yn1: ON).
If the data setting is changed while writing the default setting, a write error occurs.



### (6) Setting change command (YnB)

(a) This signal is used to determine the following buffer memory (changeable items at setting mode) contents as set values.
- Input range setting (buffer memory address: 32, 64)
- Alert 1 to 4 mode setting (buffer memory address: 192 to 195, 208 to 211)
- Control data used for the program control, zone PID data, program pattern data[*1]

*1: For details, refer to Section 3.2.12.

(b) For the setting items indicated in (a), their set values are not reflected on the Q62HLC operation if they are written to the corresponding buffer memory addresses. To determine them as set values, this device must be turned on after the values are written to buffer memory.

(c) Turning on the setting change command (YnB) starts the operation as set in the corresponding buffer memory address. The setting change completion flag (XnB) turns on at completion of the setting change.
For setting items other than the above, their set values are determined by merely writing values to the buffer memory.

(d) This device is usable as an interlock for the setting/operation mode command (Yn1).

### (7) Forced PID control stop command (YnC, YnD)

(a) This signal is used to stop the PID operation of the corresponding channel forcibly.

(b) The operation status in which PID operation stops is governed by the stop mode setting buffer memory (buffer memory address: 33, 65) setting. Refer to section 3.2.16 for details of operation status.

## 3.5 Buffer Memory

### 3.5.1 Buffer memory list

The following table shows the buffer memory list of the Q62HLC.
The area non-listed in the list is disabled. Do not write any data into the disabled area.
Doing so may cause malfunction of programmable controller CPU.

| Address (Decimal (Hexadecimal)) | | Settings | Range | | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|
| CH1 | CH2 | | | | | Always | Setting mode | Disabled |
| 0(0H) | | Error code | — | | 0 | — | — | ○ |
| 5(5H) | 6(6H) | Alert definition | — | | 0 | — | — | ○ |
| 9(9H) | 10(AH) | Measured value (PV) | In accordance with input range setting | | — | — | — | ○ |
| 13(DH) | 14(EH) | Manipulated value (MV) | -50 to 1050 (×0.1%) | | -50 | — | — | ○ |
| 17(11H) | 18(12H) | Approach flag | — | | 0 | — | — | ○ |
| 25(19H) | 26(1AH) | Set value monitor | — | | 0 | — | — | ○ |
| 29(1DH) | | Cold junction temperature measured value | -10 to 100 (℃) | | — | — | — | ○ |
| 30(1EH) | | Control mode monitor | — | | 0 | — | — | ○ |
| 31(1FH) | | FeRAMs PID constant read/write completion flag | — | | 0 | — | — | ○ |
| 32(20H) | 64(40H) | Input range | 0 to 22 | | 0 | — | ○ | — |
| 33(21H) | 65(41H) | Stop mode setting | 0: Stop, 1: Monitor, 2: Warning | | 1 | ○ | — | — |
| 34(22H) | 66(42H) | Set value (SV) setting | Input range | | 0 | ○ | — | — |
| 35(23H) | 67(43H) | Proportional band (P) setting | Thermocouples (℃) | 1 to full-scale (×0.1℃) | 100 | ○ | — | — |
| | | | Micro voltage (mV), voltage (V), current input (mA) | 1 to 10000 (×0.1%) | | | | |
| 36(24H) | 68(44H) | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | ○ | — | — |
| 37(25H) | 69(45H) | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | ○ | — | — |
| 38(26H) | 70(46H) | Alert set value 1 | In accordance with alert mode setting and input range setting | | 0 | ○ | — | — |
| 39(27H) | 71(47H) | Alert set value 2 | | | | | | |
| 40(28H) | 72(48H) | Alert set value 3 | | | | | | |
| 41(29H) | 73(49H) | Alert set value 4 | | | | | | |
| 42(2AH) | 74(4AH) | Upper output limiter setting | -50 to 1050 (×0.1%) | | 1050 | ○ | — | — |
| 43(2BH) | 75(4BH) | Lower output limiter setting | | | -50 | ○ | — | — |
| 44(2CH) | 76(4CH) | Output variation limiter setting | 0 to 1000 (×0.1%/s) | | 0 | ○ | — | — |
| 45(2DH) | 77(4DH) | Sensor compensation value setting | -5000 to 5000 (×0.1℃, ×0.01%) | | 0 | ○ | — | — |
| 46(2EH) | 78(4EH) | AT differential gap | 0 to 10000 (×0.01s) | | 10 | ○ | — | — |
| 47(2FH) | 79(4FH) | AT additional lag | 0 to 1000 (×0.01s) | | 10 | ○ | — | — |
| 48(30H) | 80(50H) | Primary delay digital filter setting | 0 to 1000 (×0.1s) | | 0 | ○ | — | — |
| 49(31H) | 81(51H) | Control response parameter setting | 0: Slow, 1: Normal, 2: Fast | | 0 | ○ | — | — |
| 50(32H) | 82(52H) | Control mode | 0: Normal control<br>1: Manual control 1<br>2: Program control<br>3: Manual control 2 | | 0 | ○ | — | — |

(To next page)

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) CH1 | Address (Decimal (Hexadecimal)) CH2 | Settings | Range | | Default value | Write condition *1 Always | Write condition *1 Setting mode | Write condition *1 Disabled |
|---|---|---|---|---|---|---|---|---|
| 51(33H) | 83(53H) | MAN output setting | Manual control 1 | -50 to 1050 (×0.1%) | -50 | ○ | — | — |
| | | | Manual control 2 | 0 to 4000 | | | | |
| 52(34H) | 84(54H) | Setting change rate limiter | Thermocouples (℃) | 1 to 10000 (×0.1℃/min) | 0 | ○ | — | — |
| | | | Micro voltage (mV), voltage (V), current input (mA) | 0 to 1000 (×0.1%/min) | | | | |
| 53(35H) | 85(55H) | AT bias | ±full-scale | | 0 | ○ | — | — |
| 54(36H) | 86(56H) | Forward/reverse action setting | 0: Forward action, 1: Reverse action | | 1 | ○ | — | — |
| 55(37H) | 87(57H) | Upper setting limiter | Input range | | 13720 | ○ | — | — |
| 56(38H) | 88(58H) | Lower setting limiter | | | -2000 | ○ | — | — |
| 57(39H) | 89(59H) | Program control run/reset | 0: RESET, 1: RUN | | 0 | ○ | — | — |
| 59(3BH) | 91(5BH) | Loop disconnection detection judgement time | 0 to 7200 (s) | | 80 | ○ | — | — |
| 60(3CH) | 92(5CH) | Loop disconnection detection dead band | 0 to full-scale | | 0 | ○ | — | — |
| 61(3DH) | 93(5DH) | Unused channel setting | 0: Used, 1: Unused | | 0 | ○ | — | — |
| 62(3EH) | 94(5EH) | PID constant read command from FeRAM | 0: Without, 1: With command | | 0 | ○ | — | — |
| 63(3FH) | 95(5FH) | Automatic backup setting after auto tuning of PID constants | 0: OFF, 1: ON | | 0 | ○ | — | — |
| 164(A4H) | | Alert dead band setting | Thermocouples (℃) | 0 to 1000 (×0.1℃) | 5 | ○ | — | — |
| | | | Micro voltage (mV), voltage (V), current input (mA) | 0 to 1000 (×0.01%) | | | | |
| 165(A5H) | | Alert delay count | 0 to 255 | | 0 | ○ | — | — |
| 167(A7H) | | Approach range setting | Thermocouples (℃) | 0 to 100 (×0.1℃) | 1 | ○ | — | — |
| | | | Micro voltage (mV), voltage (V), current input (mA) | 0 to 100 (×0.1%) | | | | |
| 168(A8H) | | Approach soak time criteria | 0 to 32767 (×0.1s) | | 0 | ○ | — | — |
| 169(A9H) | | PID continuation flag | 0:Stop, 1:Continue | | 0 | ○ | — | — |
| 176(B0H) | | Cascade ON/OFF | 0: OFF, 1: ON | | 0 | ○ | — | — |
| 177(B1H) | | Cascade gain | -10000 to 10000 (×0.001) | | 1000 | ○ | — | — |
| 178(B2H) | | Cascade bias | -1000 to 1000 (×0.1%) | | 0 | ○ | — | — |
| 179(B3H) | | Cascade monitor | — | | — | — | — | ○ |
| 192(C0H) | 208(D0H) | Mode setting of Alert 1 | 0 to 14 | | 0 | — | ○ | — |
| 193(C1H) | 209(D1H) | Mode setting of Alert 2 | | | | | | |
| 194(C2H) | 210(D2H) | Mode setting of Alert 3 | | | | | | |
| 195(C3H) | 211(D3H) | Mode setting of Alert 4 | | | | | | |

(To next page)

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|
| | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | |
| 196(C4H) | 212(D4H) | Scaling value | — | — | — | — | ○ |
| 197(C5H) | 213(D5H) | Scaling range upper limit value | Refer to Section 3.5.46 | 0 | ○ | — | — |
| 198(C6H) | 214(D6H) | Scaling range lower limit value | | 0 | ○ | — | — |
| 199(C7H) | 215(D7H) | Scaling width upper limit value | -32768 to 32767 | 0 | ○ | — | — |
| 200(C8H) | 216(D8H) | Scaling width lower limit value | | 0 | ○ | — | — |
| 201(C9H) | 217(D9H) | Hold command | 0: without command, 1: hold | 0 | ○ | — | — |
| 202(CAH) | 218(DAH) | Command advancing | 0: without command, 1: advancing | 0 | ○ | — | — |
| 256(100H) | 512(200H) | Segment monitor | — | — | — | — | ○ |
| 257(101H) | 513(201H) | Segment remaining time | — | — | — | — | ○ |
| 258(102H) | 514(202H) | Execution times monitor | — | — | — | — | ○ |
| 259(103H) | 515(203H) | Pattern end output flag | — | — | — | — | ○ |
| 260(104H) | 516(204H) | End status flag | — | — | — | — | ○ |
| 261(105H) | 517(205H) | Wait status flag | — | — | — | — | ○ |
| 262(106H) | 518(206H) | Hold status flag | — | — | — | — | ○ |
| 263(107H) | 519(207H) | Advancing completion flag | — | — | — | — | ○ |
| 264(108H) | 520(208H) | Execution pattern monitor | — | — | — | — | ○ |
| 265(109H) | 521(209H) | Zone PID monitor | — | — | — | — | ○ |
| 272(110H) | 528(210H) | Execution pattern | 1 to 3 | 1 | — | ○ | — |
| 273(111H) | 529(211H) | Start mode | 0: Zero starting<br>1: PV starting 1<br>2: PV starting 2 | 0 | — | ○ | — |
| 274(112H) | 530(212H) | Time scale | 0: 0.01s, 1: 0.1s,<br>2: 1s, 3: 1min | 0 | — | ○ | — |
| 275(113H) | 531(213H) | Zone 1 upper limit | Input range lower limit to Zone 2 upper limit | Input range upper limit | — | ○ | — |
| 276(114H) | 532(214H) | Zone 2 upper limit | Zone 1 upper limit to Zone 3 upper limit | Input range upper limit | — | ○ | — |
| 277(115H) | 533(215H) | Zone 3 upper limit | Zone 2 upper limit to Zone 4 upper limit | Input range upper limit | — | ○ | — |
| 278(116H) | 534(216H) | Zone 4 upper limit | Zone 3 upper limit to Zone 5 upper limit | Input range upper limit | — | ○ | — |
| 279(117H) | 535(217H) | Zone 5 upper limit | Zone 4 upper limit to Zone 6 upper limit | Input range upper limit | — | ○ | — |
| 280(118H) | 536(218H) | Zone 6 upper limit | Zone 5 upper limit to Zone 7 upper limit | Input range upper limit | — | ○ | — |
| 281(119H) | 537(219H) | Zone 7 upper limit | Zone 6 upper limit to Input range upper limit | Input range upper limit | — | ○ | — |

(To next page)

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | Range | | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 282(11AH) | 538(21AH) | Zone 1 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 283(11BH) | 539(21BH) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 284(11CH) | 540(21CH) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 285(11DH) | 541(21DH) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 286(11EH) | 542(21EH) | Zone 2 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 287(11FH) | 543(21FH) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 288(120H) | 544(220H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 289(121H) | 545(221H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 290(122H) | 546(222H) | Zone 3 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | | | |
| 291(123H) | 547(223H) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 292(124H) | 548(224H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 293(125H) | 549(225H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 294(126H) | 550(226H) | Zone 4 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 295(127H) | 551(227H) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 296(128H) | 552(228H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 297(129H) | 553(229H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 298(12AH) | 554(22AH) | Zone 5 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 299(12BH) | 555(22BH) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 300(12CH) | 556(22CH) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 301(12DH) | 557(22DH) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |

(To next page)

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | Range | | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| CH1 | CH2 | | | | | | Always | Setting mode | Disabled |
| 302(12EH) | 558(22EH) | Zone 6 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 303(12FH) | 559(22FH) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 304(130H) | 560(230H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 305(131H) | 561(231H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 306(132H) | 562(232H) | Zone 7 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | — | ○ | — |
| 307(133H) | 563(233H) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 308(134H) | 564(234H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 309(135H) | 565(235H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |
| 310(136H) | 566(236H) | Zone 8 | Proportional band (P) setting | Thermocouple (℃) | 1 to full-scale (×0.1℃) | 100 | — | ○ | — |
| | | | | Micro voltage (mV), voltage (V), current (mA) | 1 to 10000 (×0.1%) | | | | |
| 311(137H) | 567(237H) | | Integral time (I) setting | 0 to 32767 (×0.1s) | | 400 | — | ○ | — |
| 312(138H) | 568(238H) | | Derivative time (D) setting | 0 to 32767 (×0.1s) | | 100 | — | ○ | — |
| 313(139H) | 569(239H) | | Control response parameter | 0: Slow, 1: Normal, 2: Fast | | 0 | — | ○ | — |

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*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 320(140H) | 576(240H) | Program pattern 1 | Final segment | | 1 to 16 | 16 | — | ○ | — |
| 321(141H) | 577(241H) | | Pattern link | | 0 to 3 (0: No link) | 0 | — | ○ | — |
| 322(142H) | 578(242H) | | Iteration | | 1 to 999 times, 1000: Endless | 1 | — | ○ | — |
| 323(143H) | 579(243H) | | Output time of pattern end | | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 324(144H) | 580(244H) | | Wait zone | | 0 to full-scale | 0 | — | ○ | — |
| 325(145H) | 581(245H) | | Segment 1 | Set value(SV) | Input range | 0 | — | ○ | — |
| 326(146H) | 582(246H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 327(147H) | 583(247H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 328(148H) | 584(248H) | | Segment 2 | Set value(SV) | Input range | 0 | — | ○ | — |
| 329(149H) | 585(249H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 330(14AH) | 586(24AH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 331(14BH) | 587(24BH) | | Segment 3 | Set value(SV) | Input range | 0 | — | ○ | — |
| 332(14CH) | 588(24CH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 333(14DH) | 589(24DH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 334(14EH) | 590(24EH) | | Segment 4 | Set value(SV) | Input range | 0 | — | ○ | — |
| 335(14FH) | 591(24FH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 336(150H) | 592(250H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 337(151H) | 593(251H) | | Segment 5 | Set value(SV) | Input range | 0 | — | ○ | — |
| 338(152H) | 594(252H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 339(153H) | 595(253H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 340(154H) | 596(254H) | | Segment 6 | Set value(SV) | Input range | 0 | — | ○ | — |
| 341(155H) | 597(255H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 342(156H) | 598(256H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 343(157H) | 599(257H) | | Segment 7 | Set value(SV) | Input range | 0 | — | ○ | — |
| 344(158H) | 600(258H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 345(159H) | 601(259H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

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(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 346(15AH) | 602(25AH) | Program pattern 1 | Segment 8 | Set value(SV) | Input range | 0 | — | ○ | — |
| 347(15BH) | 603(25BH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 348(15CH) | 604(25CH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 349(15DH) | 605(25DH) | | Segment 9 | Set value(SV) | Input range | 0 | — | ○ | — |
| 350(15EH) | 606(25EH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 351(15FH) | 607(25FH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 352(160H) | 608(260H) | | Segment 10 | Set value(SV) | Input range | 0 | — | ○ | — |
| 353(161H) | 609(261H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 354(162H) | 610(262H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 355(163H) | 611(263 H) | | Segment 11 | Set value(SV) | Input range | 0 | — | ○ | — |
| 356(164H) | 612(264H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 357(165H) | 613(265 H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 358(166H) | 614(266 H) | | Segment 12 | Set value(SV) | Input range | 0 | — | ○ | — |
| 359(167H) | 615(267H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 360(168H) | 616(268H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 361(169H) | 617(269H) | | Segment 13 | Set value(SV) | Input range | 0 | — | ○ | — |
| 362(16AH) | 618(26AH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 363(16BH) | 619(26BH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 364(16CH) | 620(26CH) | | Segment 14 | Set value(SV) | Input range | 0 | — | ○ | — |
| 365(16DH) | 621(26DH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 366(16EH) | 622(26EH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 367(16FH) | 623(26FH) | | Segment 15 | Set value(SV) | Input range | 0 | — | ○ | — |
| 368(170H) | 624(270H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 369(171H) | 625(271H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 370(172H) | 626(272H) | | Segment 16 | Set value(SV) | Input range | 0 | — | ○ | — |
| 371(173H) | 627(273H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 372(174H) | 628(274H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

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(From previous page)

| Address (Decimal (Hexadecimal)) | | | Settings | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| CH1 | CH2 | | | | | | Always | Setting mode | Disabled |
| 384(180H) | 640(280H) | Program pattern 2 | Final segment | | 1 to 16 | 16 | — | ○ | — |
| 385(181H) | 641(281H) | | Pattern link | | 0 to 3 (0: No link) | 0 | — | ○ | — |
| 386(182H) | 642(282H) | | Iteration | | 1 to 999 times, 1000: Endless | 1 | — | ○ | — |
| 387(183H) | 643(283H) | | Output time of pattern end | | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 388(184H) | 644(284H) | | Wait zone | | 0 to full-scale | 0 | — | ○ | — |
| 389(185H) | 645(285H) | | Segment 1 | Set value(SV) | Input range | 0 | — | ○ | — |
| 390(186H) | 646(286H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 391(187H) | 647(287H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 392(188H) | 648(288H) | | Segment 2 | Set value(SV) | Input range | 0 | — | ○ | — |
| 393(189H) | 649(289H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 394(18AH) | 650(28AH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 395(18BH) | 651(28BH) | | Segment 3 | Set value(SV) | Input range | 0 | — | ○ | — |
| 396(18CH) | 652(28CH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 397(18DH) | 653(28DH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 398(18EH) | 654(28EH) | | Segment 4 | Set value(SV) | Input range | 0 | — | ○ | — |
| 399(18FH) | 655(28FH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 400(190H) | 656(290H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 401(191H) | 657(291H) | | Segment 5 | Set value(SV) | Input range | 0 | — | ○ | — |
| 402(192H) | 658(292H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 403(193H) | 659(293H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 404(194H) | 660(294H) | | Segment 6 | Set value(SV) | Input range | 0 | — | ○ | — |
| 405(195H) | 661(295H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 406(196H) | 662(296H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 407(197H) | 663(297H) | | Segment 7 | Set value(SV) | Input range | 0 | — | ○ | — |
| 408(198H) | 664(298H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 409(199H) | 665(299H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

(To next page)

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(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 410(19AH) | 666(29AH) | Program pattern 2 | Segment 8 | Set value(SV) | Input range | 0 | — | ○ | — |
| 411(19BH) | 667(29BH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 412(19CH) | 668(29CH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 413(19DH) | 669(29DH) | | Segment 9 | Set value(SV) | Input range | 0 | — | ○ | — |
| 414(19EH) | 670(29EH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 415(19FH) | 671(29FH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 416(1A0H) | 672(2A0H) | | Segment 10 | Set value(SV) | Input range | 0 | — | ○ | — |
| 417(1A1H) | 673(2A1H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 418(1A2H) | 674(2A2H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 419(1A3H) | 675(2A3H) | | Segment 11 | Set value(SV) | Input range | 0 | — | ○ | — |
| 420(1A4H) | 676(2A4H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 421(1A5H) | 677(2A5H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 422(1A6H) | 678(2A6H) | | Segment 12 | Set value(SV) | Input range | 0 | — | ○ | — |
| 423(1A7H) | 679(2A7H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 424(1A8H) | 680(2A8H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 425(1A9H) | 681(2A9H) | | Segment 13 | Set value(SV) | Input range | 0 | — | ○ | — |
| 426(1AAH) | 682(2AAH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 427(1ABH) | 683(2ABH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 428(1ACH) | 684(2ACH) | | Segment 14 | Set value(SV) | Input range | 0 | — | ○ | — |
| 429(1ADH) | 685(2ADH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 430(1AEH) | 686(2AEH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 431(1AFH) | 687(2AFH) | | Segment 15 | Set value(SV) | Input range | 0 | — | ○ | — |
| 432(1B0H) | 688(2B0H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 433(1B1H) | 689(2B1H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 434(1B2H) | 690(2B2H) | | Segment 16 | Set value(SV) | Input range | 0 | — | ○ | — |
| 435(1B3H) | 691(2B3H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 436(1B4H) | 692(2B4H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

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(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 448(1C0H) | 704(2C0H) | Program pattern 3 | Final segment | | 1 to 16 | 16 | — | ○ | — |
| 449(1C1H) | 705(2C1H) | | Pattern link | | 0 to 3 (0: No link) | 0 | — | ○ | — |
| 450(1C2H) | 706(2C2H) | | Iteration | | 1 to 999 times, 1000: Endless | 1 | — | ○ | — |
| 451(1C3H) | 707(2C3H) | | Output time of pattern end | | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 452(1C4H) | 708(2C4H) | | Wait zone | | 0 to full-scale | 0 | — | ○ | — |
| 453(1C5H) | 709(2C5H) | | Segment 1 | Set value(SV) | Input range | 0 | — | ○ | — |
| 454(1C6H) | 710(2C6H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 455(1C7H) | 711(2C7H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 456(1C8H) | 712(2C8H) | | Segment 2 | Set value(SV) | Input range | 0 | — | ○ | — |
| 457(1C9H) | 713(2C9H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 458(1CAH) | 714(2CAH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 459(1CBH) | 715(2CBH) | | Segment 3 | Set value(SV) | Input range | 0 | — | ○ | — |
| 460(1CCH) | 716(2CCH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 461(1CDH) | 717(2CDH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 462(1CEH) | 718(2CEH) | | Segment 4 | Set value(SV) | Input range | 0 | — | ○ | — |
| 463(1CFH) | 719(2CFH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 464(1D0H) | 720(2D0H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 465(1D1H) | 721(2D1H) | | Segment 5 | Set value(SV) | Input range | 0 | — | ○ | — |
| 466(1D2H) | 722(2D2H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 467(1D3H) | 723(2D3H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 468(1D4H) | 724(2D4H) | | Segment 6 | Set value(SV) | Input range | 0 | — | ○ | — |
| 469(1D5H) | 725(2D5H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 470(1D6H) | 726(2D6H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 471(1D7H) | 727(2D7H) | | Segment 7 | Set value(SV) | Input range | 0 | — | ○ | — |
| 472(1D8H) | 728(2D8H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 473(1D9H) | 729(2D9H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

(To next page)

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.

(From previous page)

| Address (Decimal (Hexadecimal)) | | Settings | | | Range | Default value | Write condition *1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Always | Setting mode | Disabled |
| CH1 | CH2 | | | | | | | | |
| 474(1DAH) | 730(2DAH) | Program pattern 3 | Segment 8 | Set value(SV) | Input range | 0 | — | ○ | — |
| 475(1DBH) | 731(2DBH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 476(1DCH) | 732(2DCH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 477(1DDH) | 733(2DDH) | | Segment 9 | Set value(SV) | Input range | 0 | — | ○ | — |
| 478(1DEH) | 734(2DEH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 479(1DFH) | 735(2DFH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 480(1E0H) | 736(2E0H) | | Segment 10 | Set value(SV) | Input range | 0 | — | ○ | — |
| 481(1E1H) | 737(2E1H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 482(1E2H) | 738(2E2H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 483(1E3H) | 739(2E3H) | | Segment 11 | Set value(SV) | Input range | 0 | — | ○ | — |
| 484(1E4H) | 740(2E4H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 485(1E5H) | 741(2E5H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 486(1E6H) | 742(2E6H) | | Segment 12 | Set value(SV) | Input range | 0 | — | ○ | — |
| 487(1E7H) | 743(2E7H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 488(1E8H) | 744(2E8H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 489(1E9H) | 745(2E9H) | | Segment 13 | Set value(SV) | Input range | 0 | — | ○ | — |
| 490(1EAH) | 746(2EAH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 491(1EBH) | 747(2EBH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 492(1ECH) | 748(2ECH) | | Segment 14 | Set value(SV) | Input range | 0 | — | ○ | — |
| 493(1EDH) | 749(2EDH) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 494(1EEH) | 750(2EEH) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 495(1EFH) | 751(2EFH) | | Segment 15 | Set value(SV) | Input range | 0 | — | ○ | — |
| 496(1F0H) | 752(2F0H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 497(1F1H) | 753(2F1H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |
| 498(1F2H) | 754(2F2H) | | Segment 16 | Set value(SV) | Input range | 0 | — | ○ | — |
| 499(1F3H) | 755(2F3H) | | | Executing time | 0 to 30000 (×0.01s, ×0.1s, ×1s, ×1min) | 0 | — | ○ | — |
| 500(1F4H) | 756(2F4H) | | | Zone PID data No. | 0 to 8 (0: Specifies zones including current set value) | 0 | — | ○ | — |

*1: Reading is always available regardless of the write conditions. The item of which write condition is set to "Setting mode" is changeable on setting mode only. Note that changing items during the operation mode causes a write data error. In addition, it is necessary to turn on the setting change command (YnB) for changing the setting.


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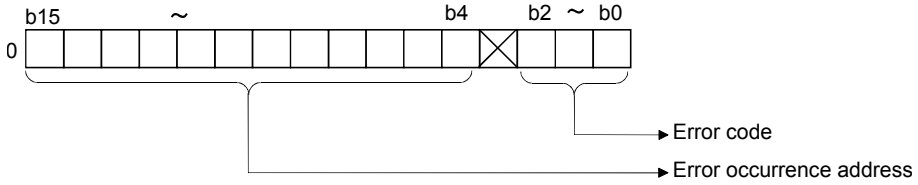
## 3.5.2 Error code (buffer memory address 0: Un\G0)

Error code is stored when an error of Q62HLC occurs.
When checking the error code on the system monitor of GX Developer, monitor with hexadecimal. The numeric value at the last digit shows the error code.




(1) When data is written from the programmable controller CPU, the Q62HLC checks:
• Whether write data range is proper or not

(2) The following processings are performed at error occurrence.
• Error code is stored (refer to Section 8.1).
• The buffer memory address is stored in the error occurrence factor, when a write data error occurs.
The factor code is stored in the error occurrence factor for AT error completion or hardware error.
• Error flag (Xn2) is ON.

(3) If more than one error has occurred, the error code and error occurrence address of the error having the highest priority are stored. (Refer to Section 8.1.)

(4) Refer to Section 8.1 for error resetting.

### 3.5.3 Alert definition (buffer memory address 5, 6: Un\G5, Un\G6)

(1) The bit associated with the alert detected on the corresponding channel turns to "1".
When the cause of the detected alert is removed, the corresponding bit turns to "0".

| Associated bit number | Alert definition |
|---|---|
| b0 | PV rose above the upper limit* of the preset input range. |
| b1 | PV fell below the upper limit* of the preset input range. |
| b2 to b7 | Unused |
| b8 | Alert 1 turned on. |
| b9 | Alert 2 turned on. |
| b10 | Alert 3 turned on. |
| b11 | Alert 4 turned on. |
| b12 | Unused |
| b13 | Loop disconnection was detected. |
| b14 | Unused |
| b15 | Unused |

(2) When each alert detects errors during control, the control is continued. Output does not turn OFF.

### 3.5.4 Measured value (PV value) (buffer memory address 9,10: Un\G9, Un\G10)

(1) Stores the Q62HLC-detected value on which the following processings have been performed:
• Linearization
• Sensor compensation

(2) This flag checks whether the measured value (PV) is within approach band.

(3) This flag turns to "1" when the measured value (PV) is within approach band. Setting the soak time criteria (buffer memory address:168) will cause this flag to turn to "1" when the measured value remains within approach band for the set time.

### 3.5.5 Manipulated value (MV value) (buffer memory address 13, 14: Un\G13, Un\G14)

(1) The result of PID operations, which are performed based on the measured value, is stored.

(2) The value stored is in the range -50 to 1050 (-5.0% to 105.0%).

(3) The manipulated value is % to full-scale (16mA) of output range (4 to 20mA). 0% outputs 4mA, 50% outputs 12mA and 100% outputs 20 mA.

### 3.5.6 Approach flag (buffer memory address 17, 18: Un\G17, Un\G18)

(1) This flag checks if the measured value (PV) is within approach band.

(2) When the measured value (PV) is within approach band, the flag is "1".
Also, when the soak time (buffer memory address: 168) is set and the measured value (PV) stays within approach band in the set time only, the flag is "1".

### 3.5.7 Set value (SV value) monitor (buffer memory address 25, 26: Un\G25, Un\G26)

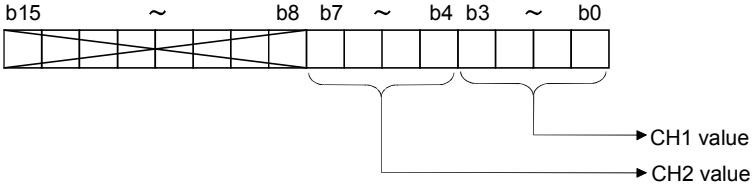
(1) The current value of set value monitor is stored.
The transitional change of set value during the program control is monitored when setting the setting change rate limiter (buffer memory address: 52, 84).

### 3.5.8 Cold junction temperature measured value (buffer memory address 29: Un\G29)

(1) The measured temperature of cold junction temperature compensation resistor mounted on Q62HLC is stored.
The value to be stored is in the range of –10 to 100 (-10 to 100°C).

### 3.5.9 Control mode monitor (buffer memory address 30: Un\G30)

(1) When control mode, the switching value of control mode is stored after the completion of shifting.
The value is configured with data of each channel 4 bits and stored in the lower 8 bits of buffer memory address 30.
The value of channel 1 is stored in 0 to 3 bits, and the value of channel 2 is stored in 4 to 7 bits.




(2) The following describes the values to be stored.

| Control mode | Stored value |
|---|---|
| Normal control mode | 0 |
| Manual control mode | 1 |
| Program control mode | 2 |
| Manual control mode | 3 |

(3) Set the manipulated value (MV) in manual control mode 1 and manual control mode 2 after checking that the stored value is changed to 1 or 3.

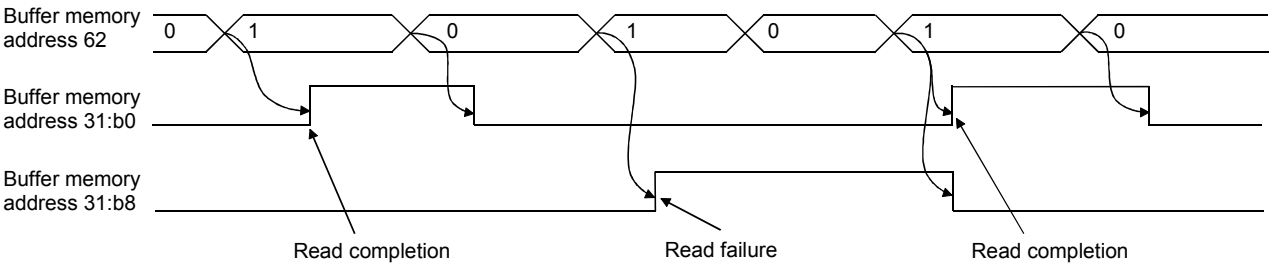
### 3.5.10 FeRAMs PID constant read/write completion flag (buffer memory address 31: Un\G31)

(1) This flag indicates a normal completion or failure of the following functions.
- FeRAMs PID constant read command (buffer memory address: 62, 94)
- Automatic backup setting after auto tuning of PID constants (buffer memory address: 63, 95)

The following table indicates the definitions of the bits.

| Bit number | Flag definition | Bit number | Flag definition |
|---|---|---|---|
| b0 | Channel 1 read completion | b8 | Channel 1 read failure |
| b1 | Channel 2 read completion | b9 | Channel 2 read failure |
| b2 | Unused | b10 | Channel 3 read failure |
| b3 | Unused | b11 | Channel 4 read failure |
| b4 | Channel 1 write completion | b12 | Channel 1 write failure |
| b5 | Channel 2 write completion | b13 | Channel 2 write failure |
| b6 | Unused | b14 | Channel 3 write failure |
| b7 | Unused | b15 | Channel 4 write failure |

(2) The following chart shows the ON/OFF timings of this flag relative to the FeRAMs PID constant read command (buffer memory address: 62, 94). (For channel 1)




The read failure flag (b8, b9) turns off on normal completion of read on the corresponding channel.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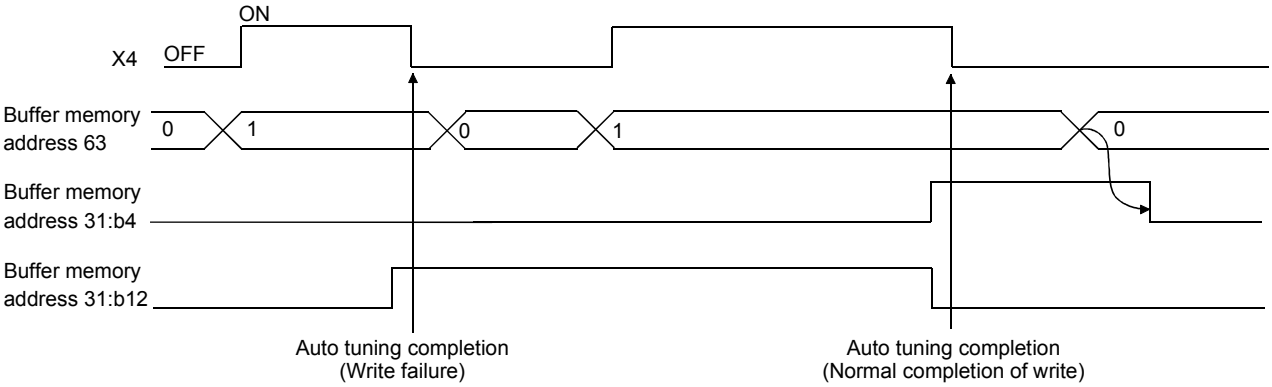
(3) The following chart shows the ON/OFF timings of this flag relative to the automatic backup setting after auto tuning of PID constants.
(For channel 1)




Browsing this flag on completion of auto tuning allows you to check whether automatic backup was completed normally or failed.
The write failure flag (b12, b13) turns off on normal completion of write on the corresponding channel.

After checking the write flag, always set 0 (OFF) to the automatic backup setting after auto tuning of PID constants (buffer memory address: 63, 95).
If auto tuning is executed while 1 (ON) is set, even if internal processing of auto tuning is completed and PID constant is stored, the auto tuning status flag (Xn4, Xn5) does not turn OFF and auto tuning is not completed normally.

## 3.5.11 Input range (buffer memory address 32, 64: Un\G32, Un\G64)

(1) Set the input range setting value according to the sensor and measuring range used. The following table indicates the types and input range settings of input sensor connected to the Q62HLC.

| Input | | Input range | Setting range |
|---|---|---|---|
| Thermocouples | K | -200 to 1372℃ | 0 (default value) |
| | J | -200 to 1200℃ | 1 |
| | T | -200 to 400℃ | 2 |
| | S | -50 to 1768℃ | 3 |
| | R | -50 to 1768℃ | 4 |
| | N | 0 to 1300℃ | 5 |
| | E | -200 to 1000℃ | 6 |
| | B | 0 to 1800℃ | 7 |
| | PL II | 0 to 1390℃ | 8 |
| | W5Re/ W26Re | 0 to 2300℃ | 9 |
| Micro voltage | | 0 to 10mV | 10 |
| | | 0 to 100mV | 11 |
| | | -10 to 10mV | 12 |
| | | -100 to 100mV | 13 |
| Voltage | | 0 to 1V | 14 |
| | | 1 to 5V | 15 |
| | | 0 to 5V | 16 |
| | | 0 to 10V | 17 |
| | | -1 to 1V | 18 |
| | | -5 to 5V | 19 |
| | | -10 to 10V | 20 |
| Current | | 4 to 20mA | 21 |
| | | 0 to 20mA | 22 |

(2) Be sure to set the input range in the setting mode (Yn1: OFF).
To determine the set value change, you must turn on the setting change command (YnB).

(3) After the input range setting is changed, the measured value (PV) (buffer memory address: 32, 64) turns to "0" for about 5 seconds and then the control is resumed.

(4) As setting range of the following setting items is changed by changing the input range, the previous setting value may be out of the setting range after changing the input range.
In this case, the setting items which have been out of the setting range detect a write data error. Changing of the input range should be executed after having set the value of the following items within the input range.
• Set value (SV) setting (buffer memory address: 34, 66)
• Proportional band (P) setting (buffer memory address: 35, 67)
• Alert set value 1 to 4 (buffer memory address: 38 to 41, 70 to 73)
• AT bias (buffer memory address: 53, 85)
• Upper limit setting limiter (buffer memory address: 55, 87)
• Lower limit setting limiter (buffer memory address: 56, 88)
• Loop disconnection detection dead band (buffer memory address: 60, 92)
• Scaling range upper limit value (buffer memory address: 197, 213)
• Scaling range lower limit value (buffer memory address: 198, 214)
• Zone 1 to 8 proportional band (P) setting *1
• Segment 1 to 16 set value (SV) setting*2
*1: Set by buffer memory address: 282 to 313, 538 to 569. (Refer to Section 3.5.1)
*2: Set by buffer memory address: 320 to 372, 576 to 628, 384 to 436, 640 to 692, 448 to 500, 704 to 756. (Refer to Section 3.5.1)

(Example) When changing the input range from thermocouple K to J at the set value (SV) 1300℃.

| Thermocouple | Write data error |
|---|---|
| K | As the set value (1300℃) is within the input range (-200 to 1372℃), a write data error is not detected. |
| J | As the set value (1300℃) is outside the input range (-200 to 1200℃), a write data error is detected. |

### 3.5.12 Stop mode setting (buffer memory address 33, 65: Un\G33, Un\G65)

(1) Set the mode when the PID operation is stopped by the forced PID control stop command (YnC, YnD). The default value is set to "monitor".

(2) Operation varies with the mode setting made as indicated below.

| Setting mode | Set value | Operation | | |
|---|---|---|---|---|
| | | PID operation | Temperature judgment | Alert judgment |
| Stop | 0 | × | × | × |
| Monitor | 1 | × | ○ | × |
| Alert | 2 | × | ○ | ○ |

○: Executed
×: Not executed

Operation is governed by the unused channel setting, setting/operation mode status setting, PID continuation flag, PID control forced stop command and CPU error stop-time control output setting. (Refer to Section 3.2.16.)

(a) Measured value judgment: Measured value checks whether it is within the input range setting.
(b) Alert judgment: Alert checks 1 to 4 are made.

**POINT**

The default value (initial value) of the stop mode is set to "monitor".
Hence, the channel without a temperature sensor connected results in a sensor input disconnection and the "ALM" LED is flicker.
For the channel to which a temperature sensor is not connected, set "1 (unused)" to the unused channel setting (buffer memory address: 61, 93).

### 3.5.13 Set value (SV) setting (buffer memory address 34, 66: Un\G34, Un\G66)

(1) Sets the set value of PID operation.
(2) The setting range is within the input range specified in the input range setting (refer to Section 3.1.1 (1), 3.5.11).
(3) Setting a value outside the setting range will result in a write error, turn on the error flag (Xn2), and store the error code (4) to address 0 of the buffer memory.

### 3.5.14 PID constant setting (buffer memory address 35 to 37, 67 to 69: Un\G35 to Un\G37, Un\G67 to Un\G69)

(1) Sets the proportional band (P), integral time (I) and derivative time (D) with normal control for performing PID operation.

(2) For thermocouple input, set with temperature. For micro voltage, voltage and current, set with % for full-scale.

(3) As the proportional band (P), integral time (I) and derivative time (D), set values within the following ranges.

(a) For PI control, set the derivative time to "0".

(b) For PD control, set the integral time to "0".

(c) For P control, set the derivative time and the integral time to "0".

| Item | Addresses | | Default value | Setting range | |
|---|---|---|---|---|---|
| | CH1 | CH2 | | | |
| Proportional band (P) setting | 35 | 67 | 100 | Thermocouple | 1 to full scale (×0.1℃) |
| | | | | Micro voltage, voltage, current | 1 to 10000 (0.1 to 1000.0%) |
| Integral time (I) setting | 36 | 68 | 400 | 0 to 32767(0.0 to 3276.7s) | |
| Derivative time (D) setting | 37 | 69 | 100 | 0 to 32767(0.0 to 3276.7s) | |

### 3.5.15 Alert setting value 1 to 4 (buffer memory address 38 to 41, 70 to 73: Un\G38 to Un\G41, Un\G70 to Un\G73)

(1) Sets conditions to turn on alerts from 1 to 4.

(2) The setting value depends on alert type.

Before making this setting, refer to Section 3.2.10.

1) Input alert (upper limit input alert, lower limit input alert)
Setting value····Process value (PV)

2) Deviation alert (upper limit deviation alert, lower limit deviation alert)
Setting value····Deviation [Process value (PV) – Set value (SV)]

3) Deviation alert (upper/lower limit deviation alert, within-range alert)
Setting value····Absolute value of deviation [Process value (PV) – Set value (SV)][*1]

*1 A value less than 0 cannot be set to the Alert set value 1 to 4.

(3) The alert mode used in the alert 1 to 4 is set by mode setting of the alert 1 to 4 (buffer memory address: 192 to 195, 208 to 211).

(4) When setting a value out of the setting range or setting a value other than 0 as alert setting value when the alert is not used ("0" is set in the alert mode setting), a write error occurs, the error flag (Xn2) is turned on, and then the error code "4" is stored in error code (buffer memory address: 0).

### 3.5.16 Upper/lower output limiter (buffer memory address 42, 43, 74, 75: Un\G42, Un\G43, Un\G74, Un\G75)

(1) Sets the upper and lower limit values for actually outputting the manipulated value (MV) calculated by PID operation to an external device.

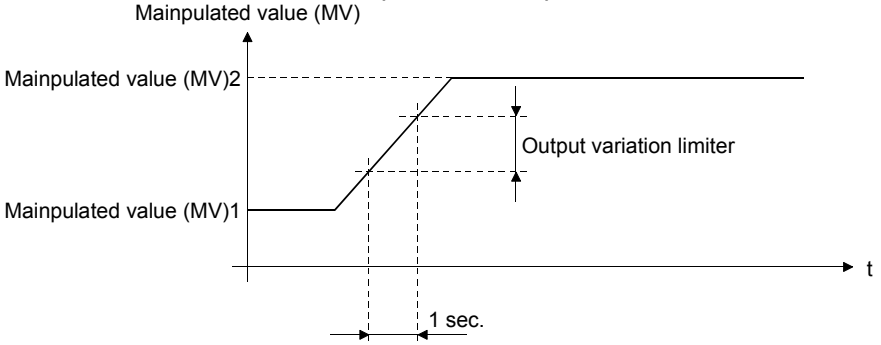
(2) The setting range is -50 to 1050 (-5.0% to 105.0%).
Make setting so that the (lower output limiter value) is less than the (upper output limiter value).

(3) The current value output, when output is off (PID control stop), depends on the lower output limiter

| Setting value | Current value |
|---|---|
| 1 to upper output limiter value | 4mA |
| -50 to 0 | 3.2 to 4 mA (depending on setting value) |
| -32768 to -51 | Near 0mA |

### 3.5.17 Output variation limiter (buffer memory address 44, 76: Un\G44, Un\G76)

(1) This function controls a sudden change in the manipulated value.
Set the variation of the manipulated value per second.




(2) The setting range is 0 to 1000 (0.1 to 100.0%).
For example, when the output variation limiter is set to 10 (1.0%), the output variation will be 1% per second at a sudden manipulated value change of 50%, and it will take 50 seconds until the output value changes to 50% actually.

(3) Setting default value of 0 the output variation limiter function.

### 3.5.18 Sensor compensation value setting (buffer memory address 45, 77: Un\G45, Un\G77)

(1) Sets the compensation value used when there is a difference between the measure temperature and the actual temperature due to measured temperature conditions, etc. (Refer to Section 3.2.5.)

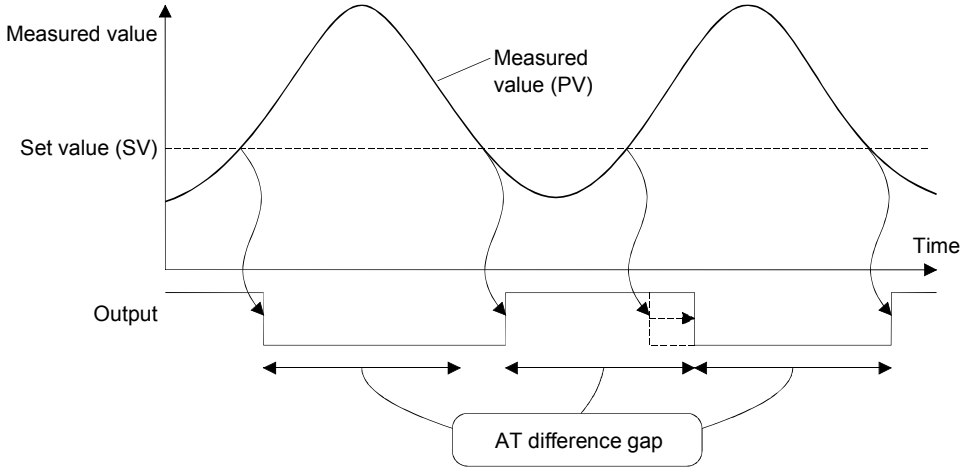
(2) Set the value within the range of -5000 to 5000 (-500.0 to 500.0 ℃) for thermocouple input.
For micro voltage, voltage and current input, set -5000 to 5000 (-50.00 to 50.00 %) for full-scale of the set input range.

### 3.5.19 AT differential gap (buffer memory address 46, 78: Un\G46, Un\G78)

(1) Set the waiting time needed for next switching of output ON/OFF status from the previous switching at auto tuning.

(2) The setting range is 0 to 10000 (0.00 to 100.00s).

(3) The target of setting value for standard mode is 10 (0.1s), for fast response mode is 1 (0.01s).

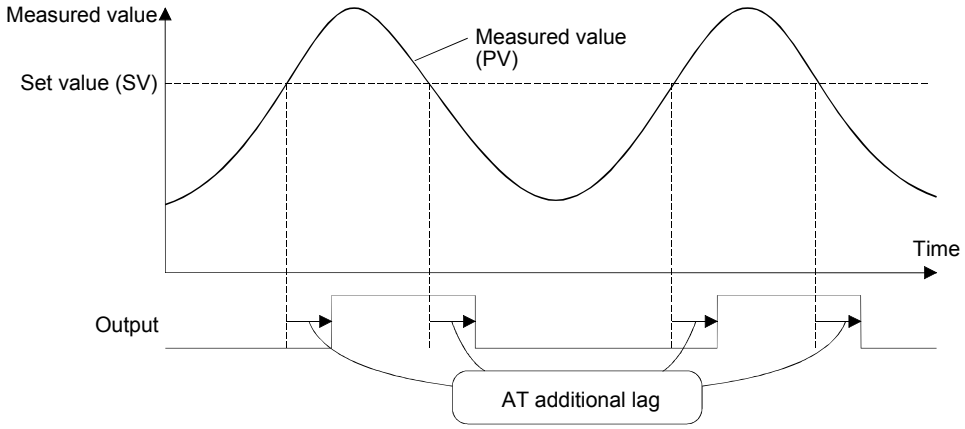



### 3.5.20 AT additional lag (buffer memory address 47, 79: Un\G47, Un\G79)

(1) Set the waiting time for switching the output ON/OFF status after the measured value (PV) has passed the set value (SV) at auto tuning.

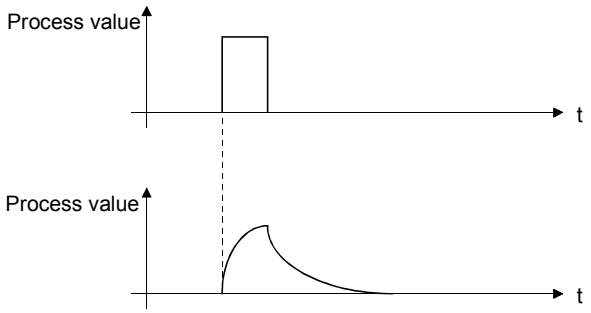
(2) The setting range is 0 to 1000 (0.00 to 10.00s).

(3) The target of setting value for standard mode is 10 (0.1s), for fast response mode is 1 (0.01s).

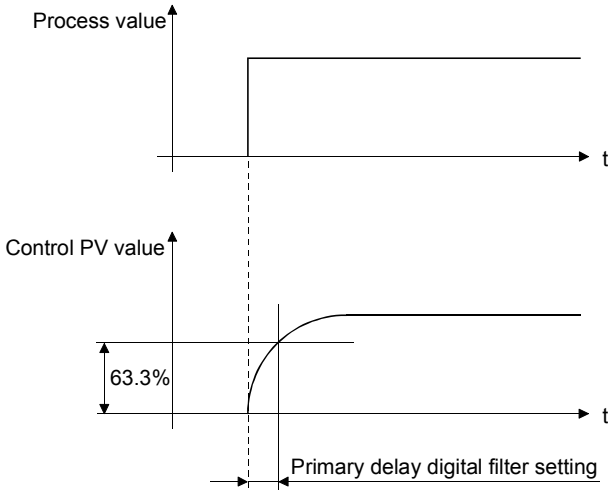


### 3.5.21 Primary delay digital filter setting (buffer memory address 48, 80: Un\G48, Un\G80)

(1) The primary delay digital filter is designed to absorb sudden changes when the process value (PV) is input in a pulse format.




(2) As the primary delay digital filter setting (filter setting time), specify the time for the PV value to change 63.3%.
When setting 0, the primary delay digital filter turns OFF.



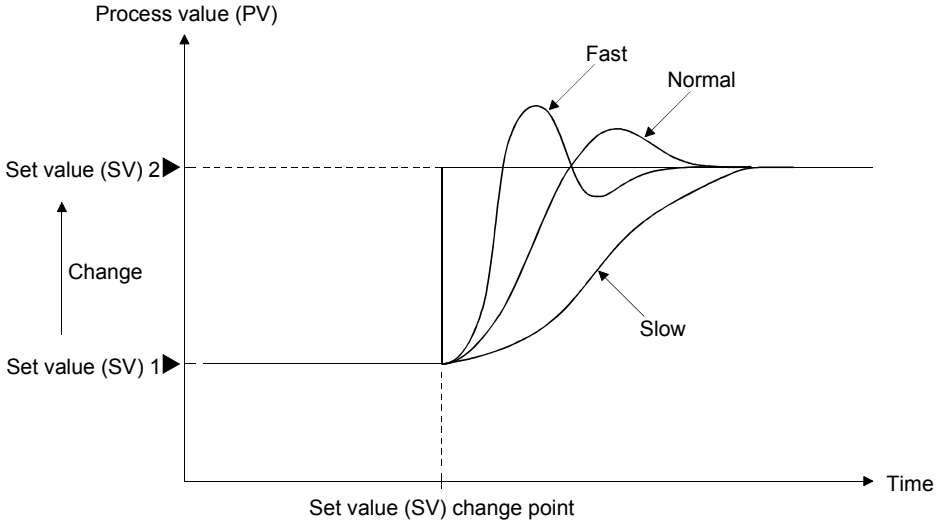
### 3.5.22 Control response parameter (buffer memory address 49, 81: Un\G49, Un\G81)

(1) The control response parameter is used to set the response to a PID control set value (SV) change in any of three levels (fast, normal and slow).

(a) Fast : sets 0.
Choose this level to give faster response to a set value change. Note that the setting of "Fast" will increase overshooting.

(b) Slow : sets 1.
Choose this level to suppress the overshooting of a set value change. Note that this will increase the settling time.

(c) Normal: sets 2.
Provides the intermediate characteristic between "Fast" and "Slow".



## 3.5.23 Control mode (buffer memory address 50, 82: Un\G50, Un\G82)

(1) This setting selects a mode for the normal control mode, manual control mode and program control mode.

- Normal control mode : sets 0.
  The manipulated value calculated in PID operations is used for the control output. The set value (SV) is changed manually.
- Manual control mode 1 : sets 1.*1
  The manipulated value written in MAN output setting (buffer memory address: 51, 83) is used for the control output. *1
- Program control mode : sets 2.
  The control is performed changing the set values automatically, following the set program pattern. The manipulated value calculated in PID operations is used for the control output.
- Manual control mode 2 : sets 3. *1
  The manipulated value written in MAN output setting (buffer memory address: 51, 83) is used for the control output. *1

*1: The manual control modes 1 and 2 have different setting ranges and settings for the MAN output setting. (Refer to Section 3.2.24)

(2) The mode switching completion can be confirmed with the control mode monitor (buffer memory address: 30).

(3) When switching normal control/program control to manual control, the manipulated value calculated in PID operations is transferred to the MAN output setting (buffer memory address: 51, 83) to prevent a sudden change of the manipulated value. (Bumpless switching)
After completing the manual control switching, the value of the control mode (buffer memory address: 30) is updated.
The manipulated value of manual control mode 1 and 2 should be set after confirming the control mode value.

(4) Select "Normal control mode" at auto tuning execution.
If other mode is selected, auto tuning is not executed.

### 3.5.24 MAN output setting (buffer memory address 51, 83: Un\G51, Un\G83)

(1) This area is used to set the manipulated value in the manual control mode.

(2) MAN output setting is valid for the manual control mode 1 and 2 only.
The changed setting value is not output in the normal control mode and the program control mode even if the setting value has been changed, as the system overwrites it with the manipulated value calculated in PID operations.

(3) The manual control modes 1 and 2 have different setting ranges and settings for the MAN output setting.

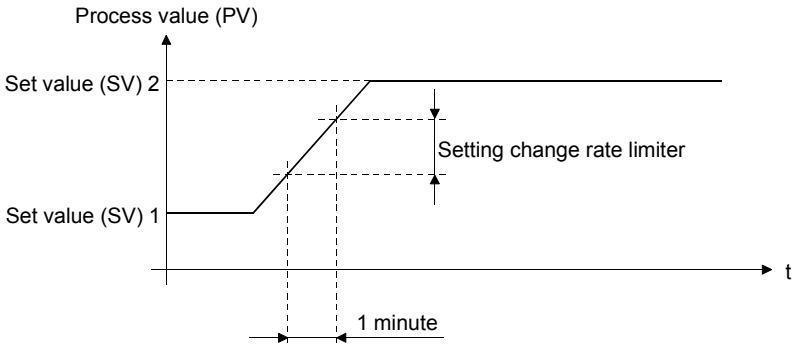
| Mode | Setting range | Settings |
|---|---|---|
| Manual mode1 | -50 to 1050 (-5.0 to 105.0%) *1 | Set the manipulated value for manual control with %. |
| Manual mode2 | 0 to 4000 *2 | Set the analog output for using the simplified analog I/O function with digital value. |

*1: -50 to 0 is output as 3.2 to 4 mA, and 1000 to 1050 as 20 to 20.8 mA. Set the value within -32768 to -51 to turn off the output. In this case, the output is near 0mA.

*2: Set the value within -32768 to -1 to turn off the output. In this case, the output is near 0mA.

### 3.5.25 Setting change rate limiter (buffer memory address 52, 84: Un\G52, Un\G84)

(1) This setting is made to set the variation of the set value per minute to a set value (SV) change. This will suppress a derivative kick (sudden change in the manipulated value).




(2) For thermocouple input, set with temperature.
For micro voltage, voltage and current, set with % for full-scale.
The following shows the setting range.

| Input | Setting S |
|---|---|
| Thermocouples | 0 to 10000 (0.0 to 1000.0°C /min) |
| Micro voltage/ Voltage/ Current | 0 to 1000 (0 to 100.0%/min) |

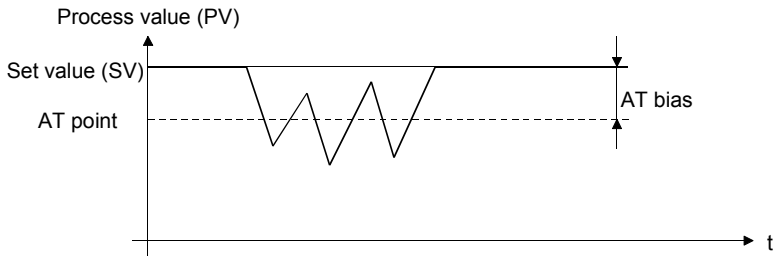
### 3.5.26 AT bias (buffer memory address 53, 85: Un\G53, Un\G85)

(1) The auto tuning decides each PID constant by executing the ON/OFF operation of control output and hunching the measured value.
Set the AT bias, if the overshoot of this hunching is not suitable for the control target.

(2) This setting is made to perform auto tuning centering on a shifted point (AT point).
Make this setting when shifting the point of the set value (SV) for auto tuning.

(3) Set the range which has minimal PID operation fluctuations and will not affect the control results.
Otherwise, exact PID constants may not be provided depending on the object to be controlled.

[Setting of AT bias on negative side (for reverse action)]




(4) The setting range is ± full-scale.

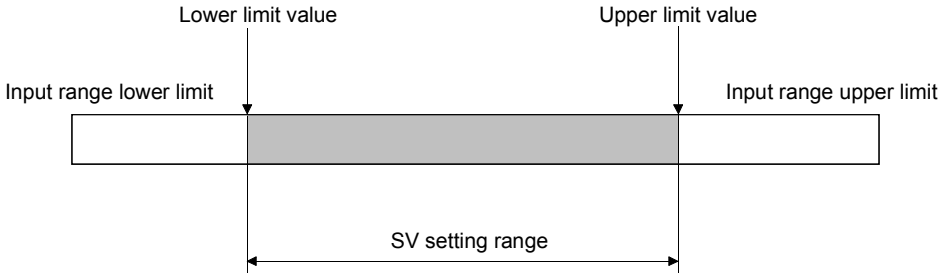
### 3.5.27 Forward/reverse action setting (buffer memory address 54, 86: Un\G54, Un\G86)

(1) Sets whether each channel of the Q62HLC will be used for forward or reverse action.
- Forward action (cooling control): 0
- Reverse action (heating control): 1

### 3.5.28 Upper/lower setting limiter (buffer memory address 55, 56, 87, 88: Un\G55, Un\G56, Un\G87, Un\G88)

(1) Sets the upper and lower limits of the set value (SV).

(2) Set a value within the input range specified for the input range.
Make setting so that the (lower output limiter value) is less than the (upper output limiter value).




(3) When the setting value is wrong, a write error occurs, the error flag (Xn2) turns on, and then the error code is stored in the error code (buffer memory address: 0).

| Error code | Description |
|---|---|
| 4 | A value out of the setting range is set. |
| 5 | The setting value is within (lower setting limiter value) ≧ (upper setting limiter value). |

### 3.5.29 Program control RUN/RESET (buffer memory address 57, 89: Un\G57, Un\G89)

(1) Sets the program control to RUN or RESET.
- Reset : sets 0.
  The program control is stopped. The measured value judgment is only executed when control stops and the output is turned OFF when the pattern end output is executed.
- RUN : sets 1.
  The program control is executed.

(2) When a mode other than the program control mode is switched to the program control mode at "RUN" status, the program control starts immediately after switching the control mode.

### 3.5.30 Loop disconnection detection judgment time (buffer memory address 59, 91: Un\G59, Un\G91)

(1) The loop disconnection detection function detects errors in the control system due to a load disconnection, external operation device fault, sensor disconnection and the like.
No temperature change of greater than 2°C for thermocouple input and greater than 0.2% of full-scale for micro voltage, voltage and current within the loop disconnection detection judgment time is judged as a loop disconnection.

(2) As the loop disconnection detection judgment time, set a value longer than the time taken to vary the temperature 2°C (2°F) or that of 0.2%.

(3) Performing auto tuning automatically sets a value twice longer than the integral time as the loop disconnection detection judgment time.
However, if the loop disconnection detection judgment time was set to 0 at the auto tuning, the loop disconnection detection judgment time is not stored.

(4) The setting range is 0 to 7200 (0 to 7200s)

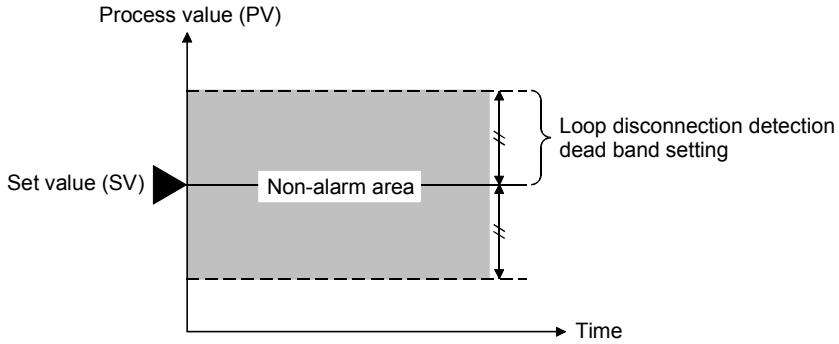
**POINT**

If loop disconnection alert occurs frequently despite the normal operation of sensor and external operation device, confirm whether the capacity of external operation device (heater, cooling fan, etc) is enough.
If they are deficient, make the setting value of loop disconnection detection judgment time longer than time required for varying 2°C or 0.2% with manipulated value 100%.

### 3.5.31 Loop disconnection detection dead band (buffer memory address 60, 92: Un\G60, Un\G92)

(1) To prevent the false alarm of loop disconnection detection, set the non-alarm area (width where loop disconnection will not be detected) around the set value.

(2) The setting range is ± full-scale



### 3.5.32 Unused channel setting (buffer memory address 61, 93: Un\G61, Un\G93)

(1) This setting is used for making unused channels where the PID control will not be performed and sensors will not be connected.
- Used : sets 0 (default value).
- Unused : sets 1.

(2) For the channels set as unused, the ALM LED will not be flicker even if a sensor is not connected.

(3) Making default setting registration (Yn9: ON) turns the unused channel setting into the default value (used).
When there are channels where the PID control is not performed and sensors are not connected, make unused channel setting again after the completion of default setting registration.

### 3.5.33 FeRAMs PID constant read command (buffer memory address 62, 94: Un\G62, Un\G94)

(1) This command reads PID constants from FeRAM to buffer memory.
Set this command to "1" (With command) to read FeRAM values to the following buffer memory addresses.

| Buffer memory address name | Addresses | |
|---|---|---|
| | CH1 | CH2 |
| Proportional band (P) setting | 35 | 67 |
| Integral time (I) setting | 36 | 68 |
| Derivative time (D) setting | 37 | 69 |
| Loop disconnection detection judgment time | 59 | 91 |

(2) This function is the most suitable for use when you want to use the initial settings of the utility and the PID constants backed up on FeRAM together.
If you want to change afterwards the items set in the initial setting of GX Configurator-TC at Q62HLC startup, reading from FeRAM with this command can correspond to it.

(3) When this command is set to "1" (With command), do not perform a set value change, FeRAM backup and default setting registration.

(4) When executing auto tuning, set 0 (Without command) to this command. If auto tuning is executed while setting 1 (With command) to the command, even if internal processing of auto tuning is completed and PID constant is stored, the auto tuning status flag (Xn4, Xn5) does not turn OFF and auto tuning is not completed.

### 3.5.34 Automatic backup setting after auto tuning of PID constants (buffer memory address 63, 95: Un\G63, Un\G95)

(1) With this function, the PID constants set at completion of auto tuning are backed up automatically by FeRAM.
When 1 is written to this setting and auto tuning then started, data at the following buffer memory addresses are automatically backed up by FeRAM on completion of auto tuning.

| Buffer memory address name | Addresses | |
|---|---|---|
| | CH1 | CH2 |
| Proportional band (P) setting | 35 | 67 |
| Integral time (I) setting | 36 | 68 |
| Derivative time (D) setting | 37 | 69 |
| Loop disconnection detection judgment time | 59 | 91 |

Auto tuning status flag (Xn4, Xn5) turns off at the completion of auto tuning.
Write "0" in this setting with OFF of auto tuning status flag (Xn4, Xn5).

(2) Do not change this setting during execution of auto tuning.

(3) While auto tuning is being executed with this setting valid, do not make a set value change, FeRAM backup and default setting registration.

### 3.5.35 Alert dead band setting (buffer memory address 164: Un\G164)

(1) Sets the dead band for alerts. Refer to Section 3.2.10 for details.
(2) For thermocouple input, set with 0 to 1000 (0.0 to 100.0℃).
For micro voltage, voltage and current input, set with 0 to 1000 (0.00 to 10.00%) for full-scale of the input range.

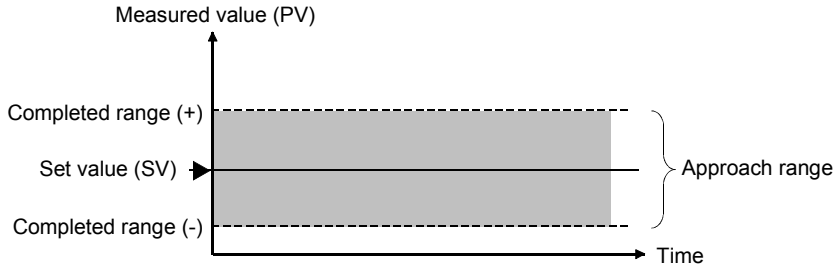
### 3.5.36 Alert delay count (buffer memory address 165: Un\G165)

(1) Sets the sampling count for judging an alert.
When the number of alert delay times has been set, the system is placed in an alert status if the sampling count remains within the alert range between when the process value (PV) has fallen within the alert range and when the sampling count reaches or exceeds the number of alert delay times.
Refer to Section 3.2.10 for details.

(2) The setting range is 0 to 255 (0 to 255 times).

### 3.5.37 Approach range setting (buffer memory address 167: Un\G167)

(1) Sets the rise/fall values for thermocouple, the rise/fall % of full-scale for micro voltage, voltage and current, at which a rise will be judged as completed, relative to the set value.




(2) For thermocouple input, set with 0 to 100(0.0 to 10.0℃).
For micro voltage, voltage and current input, set with 0 to 100(0.0 to 10.0%) for full-scale of the input range.

### 3.5.38 Approach soak time setting (buffer memory address 168: Un\G168)

(1) Sets a delay time from when a set value is completed until the approach flag (buffer memory address: 17, 18) is turned on.

(2) The setting range is 0 to 32767 (0.0 to 3276.7s).

### 3.5.39 PID continuation flag (buffer memory address 169: Un\G169)

(1) Sets the setting and operation mode command to be entered when the setting mode/operation mode command (Yn1) turns off.
- Stop : Set 0 (default value)
- Continue : Set 1

(2) Refer to Section 3.2.16 for the control status governed by ON/OFF of the PID continuation flag.

### 3.5.40 Cascade ON/OFF (buffer memory address 176: Un\G176)

(1) Sets ON/OFF of cascade control.
- Cascade OFF : sets 0 (default value).
- Cascade ON : sets 1.

(2) Refer to Section 3.2.13 for the cascade control.

### 3.5.41 Cascade gain (buffer memory address 177: Un\G177)

(1) This is a gain for converting to the cascade signal after adding cascade bias in manipulated value of master and converting to full-scale of slave input range on the cascade control.

Example: When manipulated value of master is 10%, slave input is set to T thermocouple (-200 to 400℃), cascade bias is set to -8% and cascade gain is set to 1.5.

Cascade signal = ((Manipulated value) - (Cascade bias)) × (Full-scale of input range) × (Cascade gain)
= (0.1 - 0.08) × 600 × 1.5
= 18℃

The cascade signal added to the set value of slave is 18℃.

(2) The setting range is -10000 to 10000 (-10.000 to 10.000).

(3) Refer to Section 3.2.13 for the cascade control.

### 3.5.42 Cascade bias (buffer memory address 178: Un\G178)

(1) This is a bias to be added in the manipulated value of master on the cascade control.

(2) The setting range is -1000 to 1000 (-100.0 to 100.0%).

(3) Refer to Section 3.2.13 for the cascade control.

### 3.5.43 Cascade monitor (buffer memory address 179: Un\G179)

(1) The manipulated value (cascade signal) of master, which is added in the set value of slave on the cascade control and converted with the cascade gain and cascade bias, is stored.

(2) Refer to Section 3.2.13 for the cascade control.

(3) When setting value of the cascade ON/OFF (buffer memory address: 176) is 0, 0 is stored in the cascade monitor.

### 3.5.44 Mode setting of Alert 1 to 4 (buffer memory address 192 to 195, 208 to 211: Un\G192 to Un\G195, Un\G208 to Un\G211)

This setting is available in the setting mode only.
For confirming the change, it is necessary to turn on the setting change command (YnB).

(1) Sets the alert mode which gives an alarm.

(2) The alert values of alert alarms 1 to 4 are set to the following buffer memory addresses.
- Channel 1: 38 to 41
- Channel 2: 70 to 73

(3) The correspondences between buffer memory addresses and channels are listed below.

| Mode setting item | CH1 | CH2 |
|---|---|---|
| Alert 1 | 192 | 208 |
| Alert 2 | 193 | 209 |
| Alert 3 | 194 | 210 |
| Alert 4 | 195 | 211 |

(4) The following table indicates the alert modes and set values.
Refer to Section 3.2.10 for the alert functions of the Q62HLC.

| Alert mode | Setting | Alert mode | Setting | Alert mode | Setting |
|---|---|---|---|---|---|
| Upper limit input alert | 1 | Upper limit input alert with wait | 7 | — | — |
| Lower limit input alert | 2 | Lower limit input alert with wait | 8 | — | — |
| Upper limit deviation alert | 3 | Upper limit deviation alert with wait | 9 | Upper limit deviation alert with re-wait | 12 |
| Lower limit deviation alert | 4 | Lower limit deviation alert with wait | 10 | Lower limit deviation alert with re-wait | 13 |
| Upper/lower limit deviation alert | 5 | Upper/lower limit deviation alert with wait | 11 | Upper/lower limit deviation alert with re-wait | 14 |
| Within-range alert | 6 | — | — | — | — |

(5) The alert function is not executed with the default value "0"

### 3.5.45 Scaling value (buffer memory address 196, 212: Un\G196, Un\G212)

(1) The value which scaled the measured value (PV) is stored.

(2) The scaling method differs depending on thermocouple input or micro voltage/voltage/current input.
For details of the scaling function, refer to Section 3.2.14.

### 3.5.46 Scaling range upper limit • lower limit (buffer memory address 197, 198, 213, 214: Un\G197, Un\G198, Un\G213, Un\G214)

(1) Setting the upper limit value and lower limit value of the scaling range.
The setting range is within the input range.

(a) Thermocouple input
Set the scaling range of measured temperature value.
When the upper limit value is set equal to the lower limit value, the scaling is not performed.

(b) Micro voltage, voltage, current input
Set the digital value corresponding to the upper and lower limit values of the input range.
However, the full-scale of the setting value is 20000.

(2) The following shows the setting range.
• Thermocouple input : within the input range
• Micro voltage, voltage, current input : -32768 to 32767
(However, the full-scale is 20000.)

(3) The scaling is not performed with the default value set to "0".

(4) For details of the scaling function, refer to Section 3.2.14.

### 3.5.47 Scaling width upper limit • lower limit (buffer memory address 199, 200, 215, 216: Un\G199, Un\G200, Un\G215, Un\G216)

(1) Setting the upper limit value and lower limit value of the scaling width.

(a) Thermocouple input
Set the scaling width of measured temperature value.

(b) Micro voltage, voltage, current input
Not used.
If the setting is made, it is ignored.

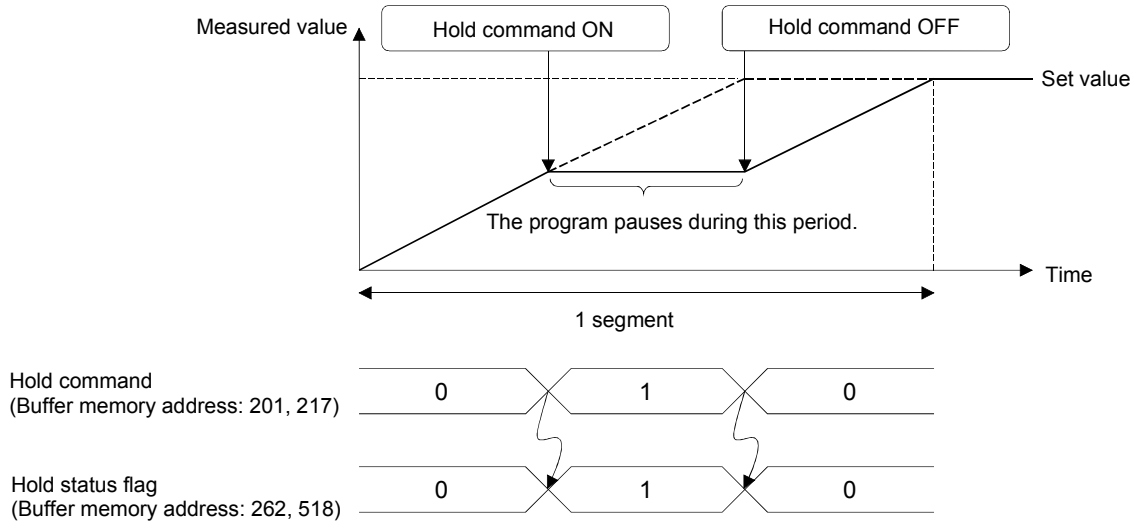
(2) The following shows the setting range.
• Thermocouple input : -32768 to 32767
• Micro voltage, voltage, current input : - (The setting is ignored.)

(3) The scaling is not performed with the default value set to "0".

(4) For details of the scaling function, refer to Section 3.2.14.

## 3.5.48 Hold command (buffer memory address 201, 217: Un\G201, Un\G217)

(1) This is the command to pause and restart the program control.
- Hold OFF : Set 0 (default value).
  When the program control has paused, it restarts from the set value at the point where it paused.
- Hold ON : Set 1.
  The program control pauses and becomes a hold status.

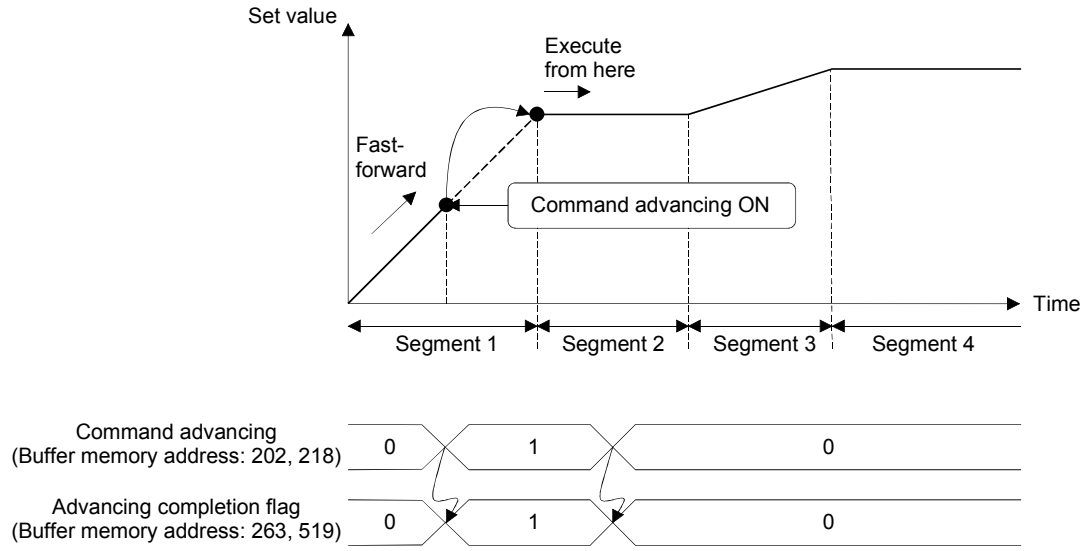



(2) The confirmation of the hold status is performed by the hold status flag (buffer memory address: 262, 518).

(3) This command is valid for the program control mode only.

## 3.5.49 Command advancing (buffer memory address 202, 218: Un\G202, Un\G218)

(1) This is the command of the advancing operation to carry the progress of the program control forward to the next segment.
- Advancing OFF : Set 0 (default value).
  The advancing operation is not performed.
- Advancing ON : Set 1.
  After performing the advancing operation and carrying the progress of the program forward by one segment, this command executes the program from the next segment.




(2) The completion confirmation of the advancing operation is performed by the advancing completion flag (buffer memory address: 263, 519).

(3) This command is invalid at the hold status.

## 3.5.50 Segment monitor (buffer memory address 256, 512: Un\G256, Un\G512)

(1) The currently operated segment No. is stored.
The stored values are 1 to 16.

## 3.5.51 Segment remaining time (buffer memory address 257, 513: Un\G257, Un\G513)

(1) The remaining time of the currently operated segment is stored.

(2) The time scale of the segment remaining time is the scale set by the time scale (buffer memory address: 274, 530). (Refer to Section 3.5.62)

### 3.5.52 Execution times monitor (buffer memory address 258, 514: Un\G258, Un\G514)

(1) Execution times of the currently executed program pattern are stored.

(2) Execution times are updated at the pattern end.
When the program pattern is linked, they are updated at the pattern end of the final program pattern.

(3) Upper limit of the storage value is 30000. Bigger than this, the monitor goes back to 0 and starts to count again.

### 3.5.53 Pattern end output flag (buffer memory address 259, 515: Un\G259, Un\G515)

(1) This flag confirms the pattern end output status at the completion of the program control of the final segment.
• Pattern end output OFF: 0 is stored.
• During pattern end output: 1 is stored.

### 3.5.54 End status flag (buffer memory address 260, 516: Un\G260, Un\G516)

(1) This is the flag to notify the completion of the program control.

(2) This flag is turned on (the stored value is 1) at the completion of the program control.
When turned on, this flag is kept ON until the program control is executed again (set 1 to (the program control RUN/RESET) (buffer memory address: 57, 89)).

### 3.5.55 Wait status flag (buffer memory address 261, 517: Un\G261, Un\G517)

(1) This is the flag to confirm the wait status of the program control.
• Canceling wait status: 0 is stored.
• Wait status: 1 is stored.

### 3.5.56 Hold status flag (buffer memory address 262, 518: Un\G262, Un\G518)

(1) This is the flag to confirm if the program control is in hold status.

(2) This flag will be 1 when the program control is in hold status by a hold command (buffer memory address: 201, 217).
• Cancel hold status: 0 is stored.
• In hold status: 1 is stored.

### 3.5.57 Advancing completion flag (buffer memory address 263, 519: Un\G263, Un\G519)

(1) This flag confirms if the advancing operation by the command advancing (buffer memory address: 202, 218) is completed in the program control.
• Advancing operation uncompleted, or no command: 0 (default value) is stored.
• Advancing operation completed : 1 is stored.

(2) This flag is reset to 0 by turning off the command advancing.

### 3.5.58 Execution pattern monitor (buffer memory address 264, 520: Un\G264, Un\G520)

(1) The program pattern No. in execution is stored in the program control.
- Pattern 1: 1 is stored.
- Pattern 2: 2 is stored.
- Pattern 3: 3 is stored.

### 3.5.59 Zone PID monitor (buffer memory address 265, 521: Un\G265, Un\G521)

(1) The zone No. of the zone PID data used for the control in the program control is stored.
- Zone 1: 1 is stored.
- Zone 2: 2 is stored.
- Zone 3: 3 is stored.
- Zone 4: 4 is stored.
- Zone 5: 5 is stored.
- Zone 6: 6 is stored.
- Zone 7: 7 is stored.
- Zone 8: 8 is stored.

### 3.5.60 Execution pattern (buffer memory address 272, 528: Un\G272, Un\G528)

This setting is available only in the setting mode.
For confirming the change, it is needed to turn on the setting change command (YnB).

(1) This setting specifies the program to be executed in the program control.

(2) The following shows the setting value.
- Program pattern 1: Set 1 (default value).
- Program pattern 2: Set 2.
- Program pattern 3: Set 3.

## 3.5.61 Start mode (buffer memory address 273, 529: Un\G273, Un\G529)

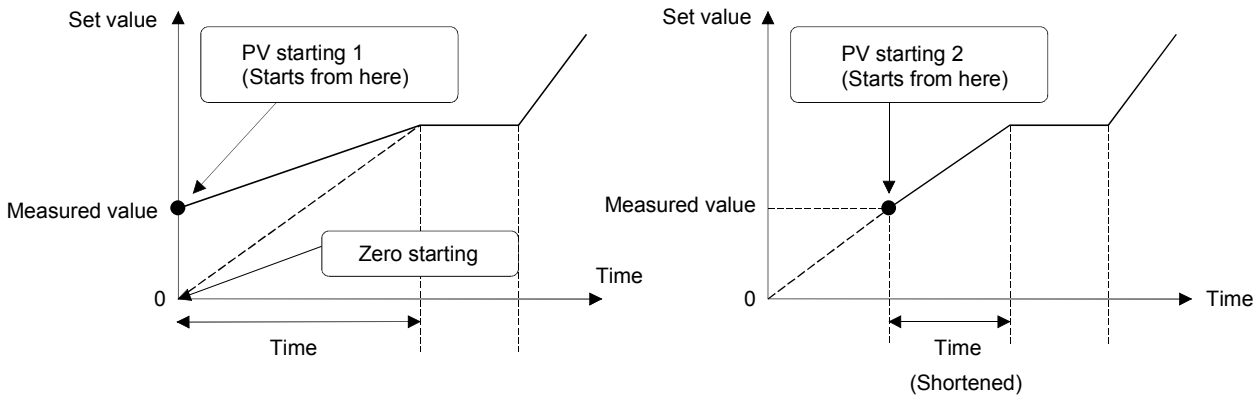
This setting is available only in the setting mode.
For confirming the change, it is needed to turn on the setting change command (YnB).

(1) The starting method of the set value (SV) can be selected from the following modes at the start of program control.

(a) Zero starting : Set 0 (default value).
Set the set value (SV) to 0 and start.

(b) PV starting 1 (Time fixed) : Set 1.
Set the set value (SV) to the measured value (PV) and start.
When the measured value (PV) is 0 or less, it will be the zero starting.

(c) PV starting 2 (Time shortened) : Set 2.
Set the set value (SV) to the measured value (PV) and start.
When the measured value (PV) is 0 or less, it will be the zero starting.
With the PV starting 2, the time for reaching the measured value, which is set from 0, is canceled and the segment time is shortened.



### 3.5.62 Time scale (buffer memory address 274, 530: Un\G274, Un\G530)

This setting is available only in the setting mode.
For confirming the change, it is necessary to turn on the setting change command (YnB).

(1) The time scale sets the scales for the set value of the time scale for each segment and for the stored value of the segment remaining time (buffer memory address: 257,513) and for the output time scale of the pattern END for each program pattern.

(2) The following shows the setting value.
- 0.01s: Set 0 (default value).
- 0.1s: Set 1.
- 1s: Set 2.
- 1min: Set 3.

### 3.5.63 Zone setting (buffer memory address 275 to 313, 531 to 569: Un\G275 to Un\G313, Un\G531 to Un\G569)

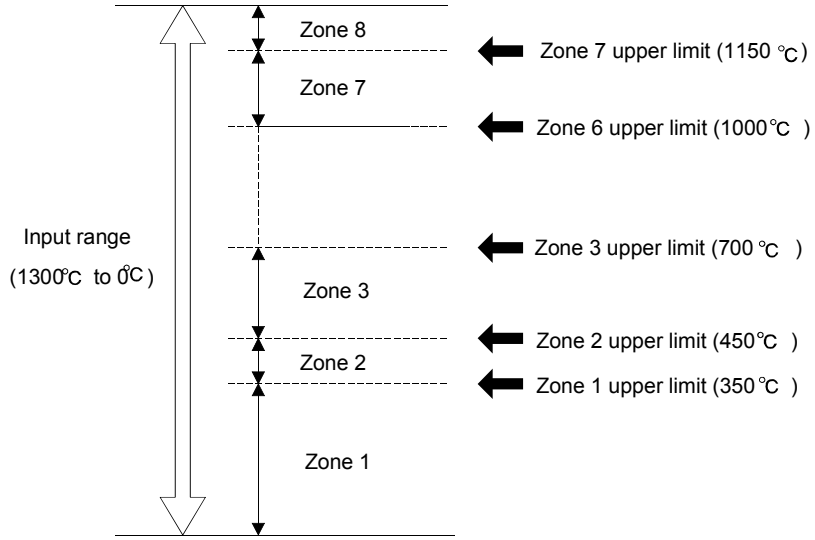
This setting sets the zone to be used for the program control function.
The zone sets the following 3 items. For the buffer memory address for each item, refer to Section 3.5.1. For details of the program control function, refer to Section 3.2.12.

This setting is available only in the setting mode.
For confirming the change, it is necessary to turn on the setting change command (YnB).

(1) Zone 1 to 7 upper limit
(a) The zone upper limit sets the upper limit for each zone to divide input range into zones.
(b) By this setting, the input range can be divided into up to 8 zones
(c) For the program control, the PID constant and control response parameters are set for each zone. When they are within the range of the zone having the measured value, the control is executed by the PID constant and control response parameter set for the zone.
(d) The following shows the setting range.
The default value is the upper limit of the input range.
- Zone 1 upper limit: Lower limit of the input range to upper limit of the input range
- Zone 2 upper limit: Zone 1 upper limit to upper limit of the input range
- Zone 3 upper limit: Zone 2 upper limit to upper limit of the input range
- Zone 4 upper limit: Zone 3 upper limit to upper limit of the input range
- Zone 5 upper limit: Zone 4 upper limit to upper limit of the input range
- Zone 6 upper limit: Zone 5 upper limit to upper limit of the input range
- Zone 7 upper limit: Zone 6 upper limit to upper limit of the input range

Make the setting in the order of zone 1 → zone 2 → • • • → zone8 allocating from the lower limit of the input range.

(Example) Thermocouple input




| POINT |
|---|
| When dividing a zone into four, set the upper limit for the zone 1 to 3 upper limit, and set the upper limit (default value) of the input range for the zone 4 to 7 upper limit. |

(2) Zone 1 to 7 PID constant setting

(a) This setting sets the PID constants of proportional band (P), integral time (I) and derivative time (D) corresponding to each zone set by the zone 1 to 8 upper limit.

(b) For details of the setting range, refer to Section 3.5.14.

(3) Zone 1 to 7 PID control response parameters

(a) This setting sets the control response parameters corresponding to each zone set by the zone 1 to 8 upper limit.

(b) For details of the setting value, refer to Section 3.5.22.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### 3.5.64 Program pattern (buffer memory address 320 to 500, 576 to 756: Un\G320 to Un\G500, Un\G576 to Un\G756)

This setting sets the program pattern to be used for the program control function.
For the program pattern, there are 3 patterns of program pattern 1 to 3, and each program pattern sets the following 8 items.
For the buffer memory address for each item, refer to Section 3.5.1.
For details of the program control function, refer to Section 3.2.12.

This setting is available only in the setting mode.
For confirming the change, it is needed to turn on the setting change command (YnB).

(1) Program pattern final setting

(a) This setting specifies the final segment to complete the program pattern. At link setting, each program pattern execution will complete at the final segment.

(b) The default value is 16.
The setting range is 1 to 16.

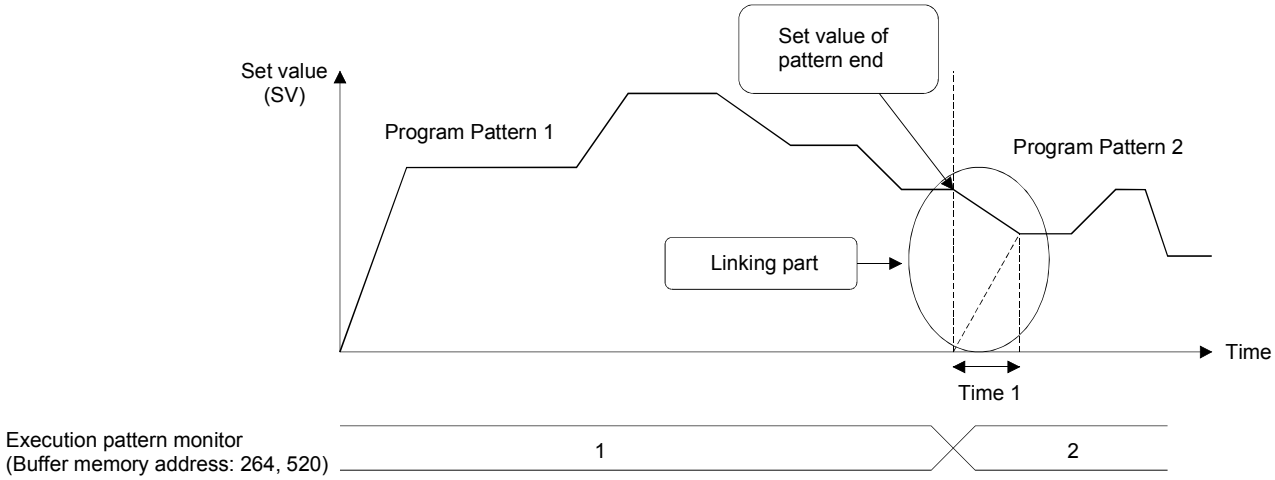
(2) Program pattern link setting

(a) The Q62HLC can link program patterns and make a setting of program pattern up to 48 segments. (One program pattern consists of 16 segments.) The pattern link specifies the program pattern of the link destination.

(b) When the program pattern has been linked, the program pattern of the link destination is executed in sequential order starting from segment 1. The link destination program pattern of the segment 1 set value starts from the set value at the pattern end of the link source.*1 The pattern end output of the link is not performed.

*1: The same operation as the PV starting 1 of Section 3.5.61 "Start mode"

Example: When specifying the program pattern 2 with the pattern link of the program pattern



(c) The following shows the setting range.
- No link: Set 0 (default value).
- Patten 1: Set 1.
- Patten 2: Set 2.
- Patten 3: Set 3.

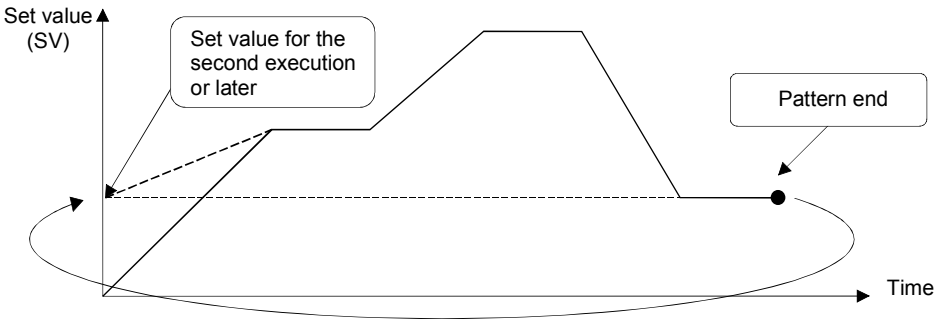
(d) The program pattern and segment No. in execution can be monitored on the execution pattern monitor (buffer memory address: 264, 520) and the segment monitor (buffer memory address: 256, 512).

(e) When setting the program pattern of the link source at link setting, it will endlessly repeat.

(3) Program pattern iteration

(a) This setting sets execution times (number of cycle) of the program control. The default value is 1.

(b) If setting 2 or more to the iteration, the Q62HLC executes the program pattern repeatedly.
When executing the program pattern iteratively, the set value of the segment 1 starts from the set value at the pattern end after the second execution or later.




(c) When the program pattern has been linked, all patterns are executed repeatedly.
In this case, the execution times setting of the program pattern specified at the execution pattern setting (buffer memory address: 272,528) is valid.

(d) The pattern end output is performed only for the final execution.

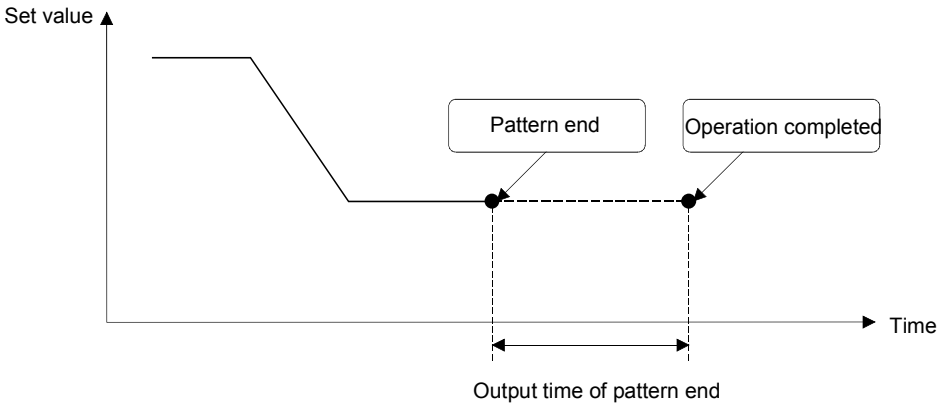
(e) Current execution times of the program pattern can be confirmed on the execution times mode monitor (buffer memory address: 258, 514).

(f) The setting range is 1 to 1000 (1 to 999 times, endless).
When 1000 is set, it will endlessly repeat the execution.

(4) Pattern end output time of program pattern

(a) This setting sets the time of the pattern end output at the completion of the program pattern.
The default value is 0.

(b) Q62HLC, when the program pattern is completed, keep the set value at the pattern end and continues the PID control only for the pattern end output time.




(c) The setting range is 0 to 30000.
When 0 is set, however, the output of pattern end continues until the program control is reset.

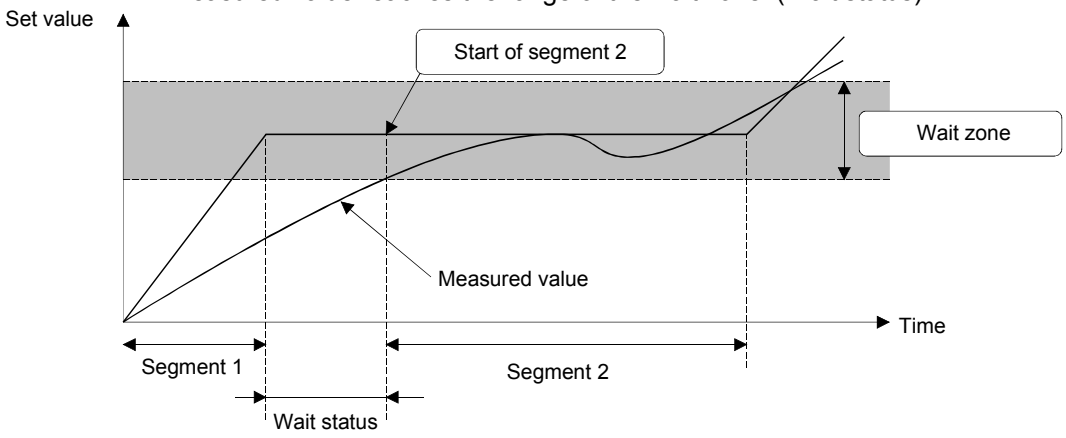
(d) The time scale is set by the time scale (buffer memory address: 274, 530).

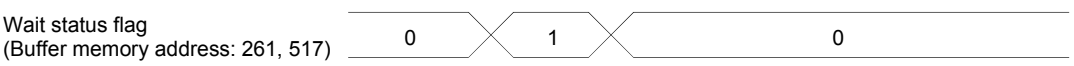
(e) When the program pattern has been linked, the program pattern setting, which is specified at the execution pattern setting (buffer memory address: 272, 528), is valid.

(5) Wait zone of program pattern

(a) If the measured value cannot reach the set value after the set time of the segment has passed, this setting sets a zone for the program to wait for shifting to the next segment.

(b) By setting the wait zone, the Q62HLC stops the progress of the program control per segment, and waits for moving to the next segment until the measured value reaches the range of the wait zone. (Wait status)



(c) The wait zone is set to the zone where the setting value of the wait zone is divided into the plus side and the minus side for the set value.
For example, in the case where the set value is 100℃ and the setting value of the wait zone is 10℃, the actual wait zone will be 90 to 110℃.

(d) If turning on the command advancing (buffer memory address: 202, 218) in wait status, this setting cancels the wait status and executes the control from the next segment after performing the advancing operation.

(e) The setting range is 0 to full-scale.
However, when 0 is set, it will be "No wait zone".

(f) When the program pattern has been linked, the wait zone of the executing program pattern is valid for the wait zone.

(g) Whether it is in wait status or not is confirmed by the wait status flag (buffer memory address: 261,517).

(6) Segment set value (SV) setting

(a) This setting sets the set value of the segment 1 to 16.
The default value is 0.

(b) The setting range is within the input range.

(7) Segment time scale

(a) This setting sets the time scale (execution time) of the segment 1 to 16.
The default value is 0.

(b) The time scale is set by the time scale (buffer memory address: 274, 530).

(c) The setting range is 0 to 30000.

(8) Segment Zone PID data No.

(a) This setting selects the zone PID data to be used in segment 1 to 16.
The default value is 0.

(b) The setting range is 0 to 8.
When 0 is set, however, the zone PID data of the zone including the current set value is automatically selected.

# 4 SETUP AND PROCEDURE BEFORE STARTING THE OPERATION

The following describes the procedure prior to the Q62HLC operation, the name and setting of each part of the Q62HLC, and wiring method.

## 4.1 Handling Precautions

The following are the precautions for handling the Q62HLC.

(1) Do not drop the module casing or connector, or do not subject it to strong impact.

(2) Do not remove the PCB of each module from its case. Doing so may cause breakdowns.

(3) Be careful not to let foreign particles such or wire chips get inside the module. These may cause fire, breakdowns and malfunctions.

(4) The top surface of the module is covered with a protective film to prevent foreign objects such as wire chips from entering the module when wiring. Do not remove this film until the wiring is complete.
Before operating the system, be sure to remove the film to provide adequate heat ventilation.

(5) Tighten the screws such as module fixing screws within the following ranges. Loose screws may cause short circuits, failures, or malfunctions.

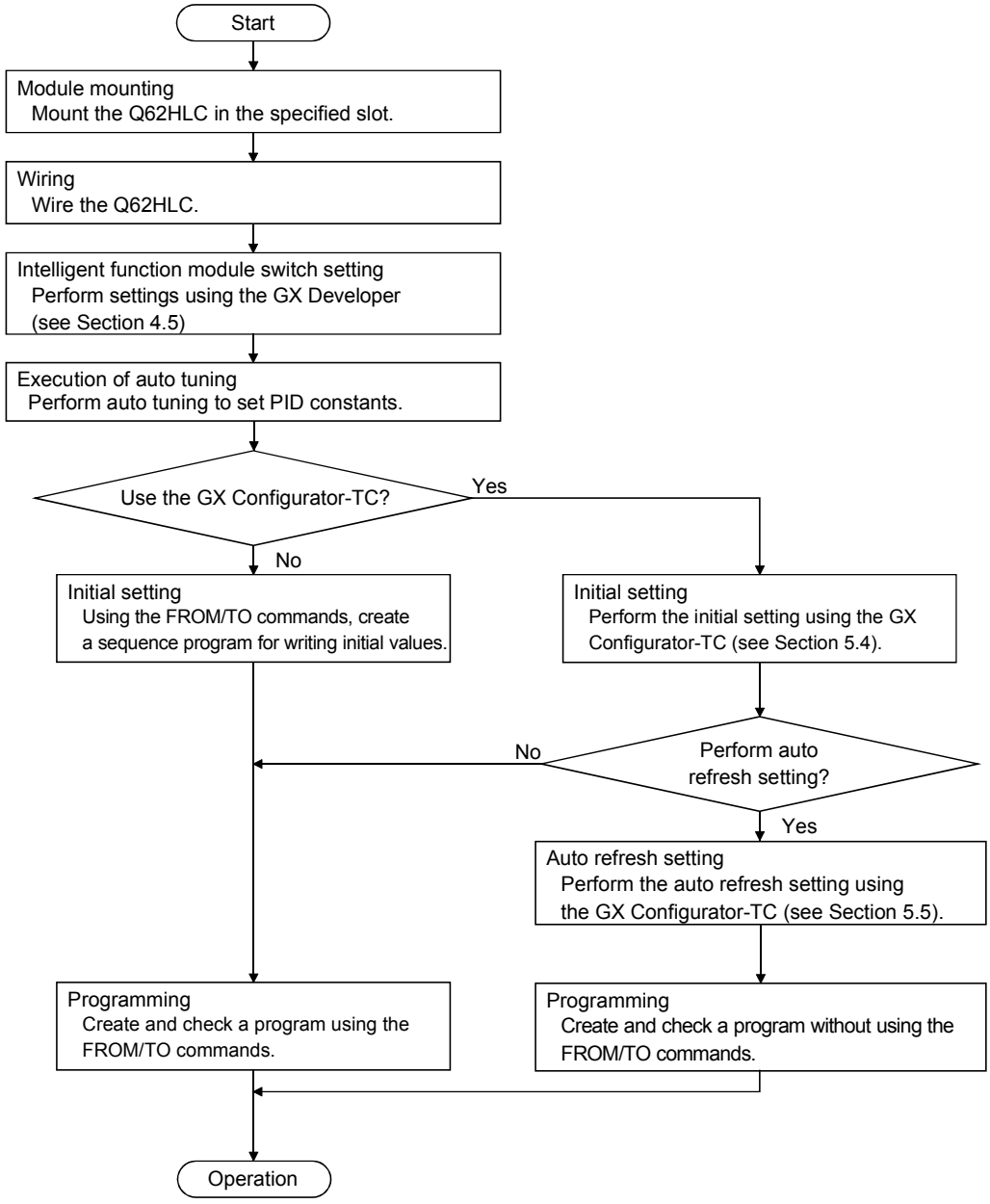
| Screw location | Tightening torque range |
|---|---|
| Module fixing screw*1 (M3 screw) | 0.36 to 0.48N·m |
| Terminal block screw (M3 screw) | 0.42 to 0.58N·m |
| Terminal block mounting screw (M3.5 screw) | 0.66 to 0.89N·m |
| FG terminal screw (M3 screw) | 0.42 to 0.58N·m |

*1: The module can be easily fixed onto the base unit using the hook at the top of the module.
However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration.

(6) To mount the module on the base unit, fully insert the module fixing latch into the fixing hole in the base unit and press the module using the hole as a fulcrum. Improper installation may result in a malfunction or breakdown of the module, or may cause the module to fall off.

## 4.2 Procedure before Starting the Operation

The figure below shows the steps that should be followed before starting the Q62HLC operation.

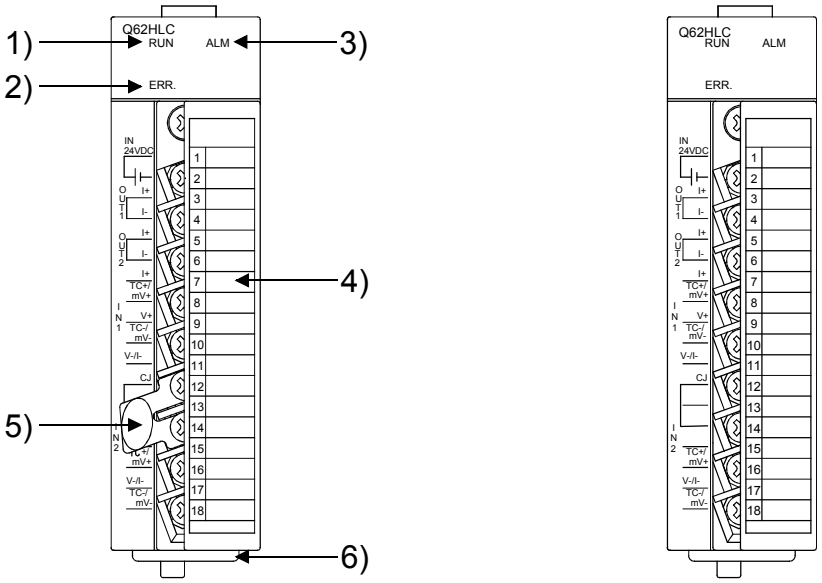



**POINT**

When executing temperature control as a temperature sensor, perform warmup operation about 5 minutes before starting operation to make temperature compensation properly.

## 4.3 Parts Identification

This section explains the names of the Q62HLC parts.




[Condition without temperature compensation resistor]

| Number | Name | Description |
|---|---|---|
| 1) | RUN LED | Indicates the operating status of the Q62HLC.<br>On: Operating normally.<br>Off: 5V power is off, watchdog timer error occurred, or changing online module is allowed. |
| 2) | ERR. LED | Indicates the error status of the Q62HLC.<br>On : Hardware fault (Includes the case of cold junction temperature compensation resistance is not connected)<br>Flicker : Write data error occurring ＊1<br>When auto tuning is abnormally completed<br>Off : Operating normally. |
| 3) | ALM LED | Indicates the alert status of the Q62HLC.<br>On : Alert occurring<br>Flicker : Process value (PV) came out of measured temperature range.<br>Loop disconnection was detected.<br>Sensor is not connected. ＊2<br>Off : Alert not occurring |
| 4) | Terminal block | Used for input to various sensors, current output, and external power supply. |
| 5) | Cold junction compensation resistor | Used when cold junction compensation is made. |
| 6) | FG terminal | Terminals for frame ground |

＊1: For details, check the error code. (Refer to Section 8.1)
＊2: It may not be detected depending on the input range used. For details, refer to Section 3.1.2.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(1) Terminal number and signal name

| Terminal number | Signal name | | Description | |
|---|---|---|---|---|
| 1 | 24VDC+ | | 24VDC+external power supply for current output | |
| 2 | 24VDC- | | 24VDC- external power supply for current output | |
| 3 | OUT1 | I + | CH1 | Current output+ |
| 4 | | I - | | Current output- |
| 5 | OUT2 | I + | CH2 | Current output+ |
| 6 | | I - | | Current output- |
| 7 | IN1 | I + | CH1 | Current input+ |
| 8 | | TC+/mV+ | | Thermocouple/micro voltage input+ |
| 9 | | V+ | | Voltage input+ |
| 10 | | TC-/mV- | | Thermocouple/micro voltage input- |
| 11 | | V-/I- | | Voltage/current input- |
| 12 | CJ | | Cold junction temperature compensation resistor | |
| 13 | IN2 | I+ | CH2 | Current input+ |
| 14 | CJ | | Cold junction temperature compensation resistor | |
| 15 | IN2 | V+ | CH2 | Voltage input+ |
| 16 | | TC/mV+ | | Thermocouple/micro voltage input+ |
| 17 | | V-/I- | | Voltage/current input- |
| 18 | | TC-/mV- | | Thermocouple/micro voltage input- |


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## 4.4 Wiring

This section provides wiring instructions and module connection examples.

### 4.4.1 Wiring precautions

External wiring must be noise-resistant as one of the conditions to fully exhibit the Q62HLC functions and configure a highly reliably system.
The instructions given below should be followed in wiring.

(1) Use separate cables with the AC control circuit and Q62HLC's external I/O signals to avoid the influence of AC side surges and induction.

(2) Do not run the cables close to, or bundle them with, the main circuit and high-voltage cables and the load cables from other than the programmable controller. Always keep thermocouple/micro voltage signal line at least 100mm(3.94inch) away from the main circuit cables and AC control circuit.
Fully keep them away from high-voltage cables and circuits which include high frequencies, e.g. inverter load's main circuit.
Failure to do so will make the cables susceptible to noise, surges and induction.

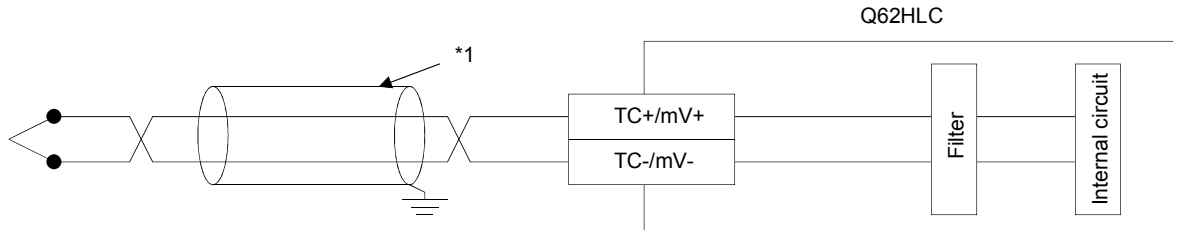
(3) Ground the shield wires or shield cables to FG of the programmable controller. Note that it may be better to establish a ground on the external side depending on the external noise conditions.

(4) When you want the equipment to conform with the EMC Directive/Low Voltage Directive, refer to "Conformance with the EMC Directive and Low Voltage Directive" in this manual and carry out wiring.

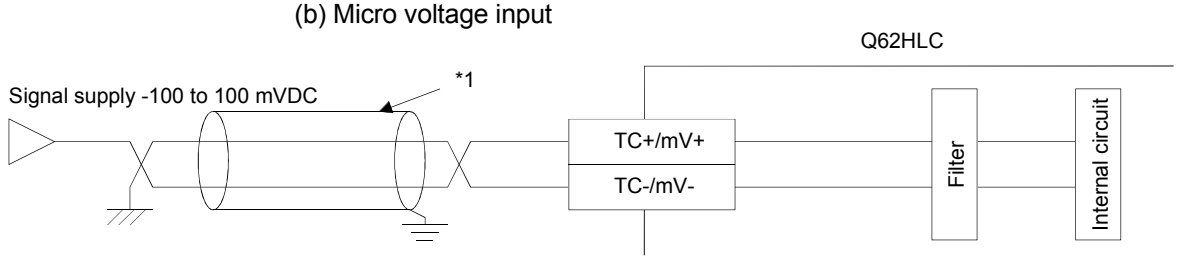
## 4.4.2 External wiring

### (1) Input

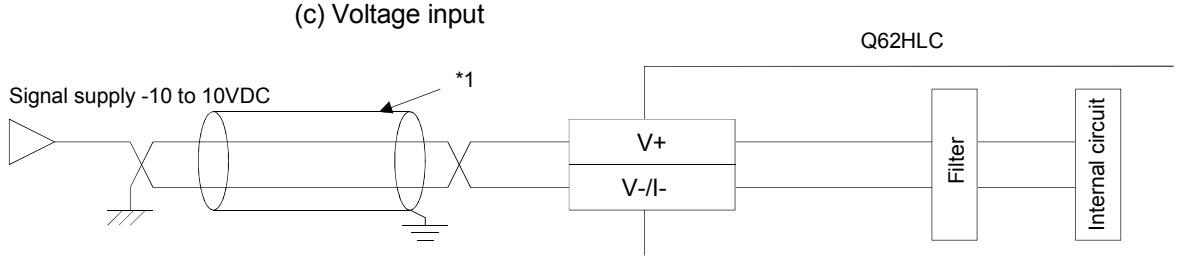
(a) Thermocouple input



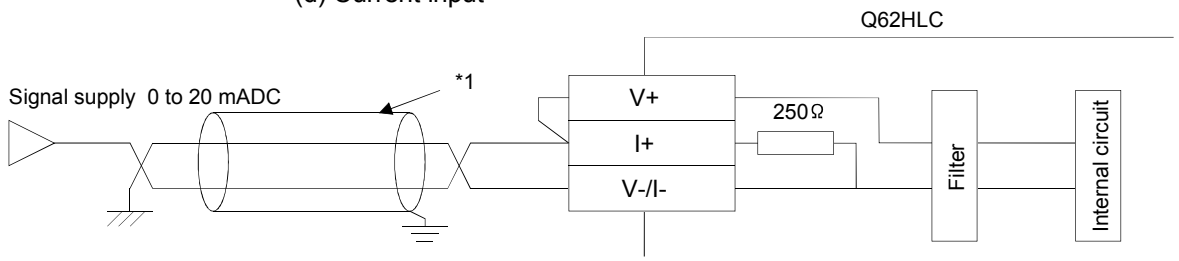

(b) Micro voltage input




(c) Voltage input

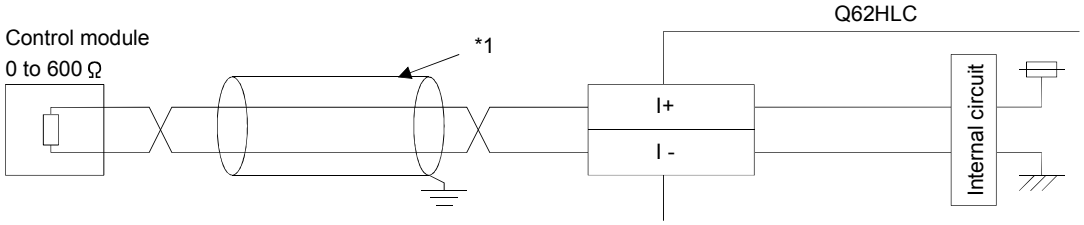



(d) Current input

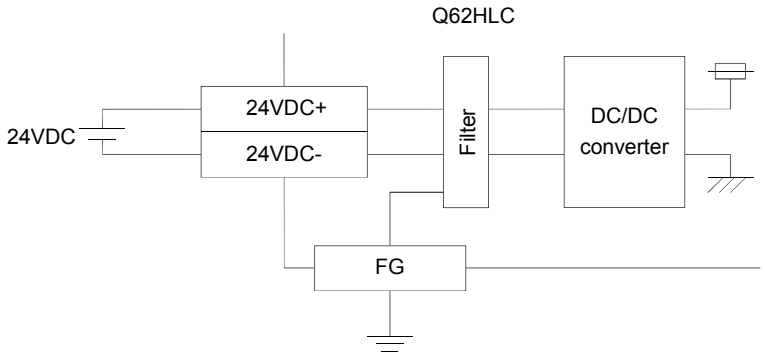



∗: Always use shielded cables.

(2) Output




(3) External power supply




*: Always use shielded cables.

REMARK

For saving an installation space, when wiring to a FG terminal is difficult, install L shaped fixtures in the FG terminal.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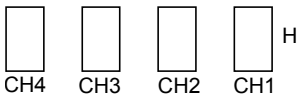
## 4.5 Switch Settings for the Intelligent Function Module

This section explains the intelligent function module switch settings.
Make intelligent function module switch settings in I/O assignment setting on GX Developer.
Making intelligent function module switch settings allows you to set to the Q62HLC the output status to be established when the programmable controller CPU has comes to an error stop.
Refer to Section 3.2.12 for setting details.

### (1) Setting items

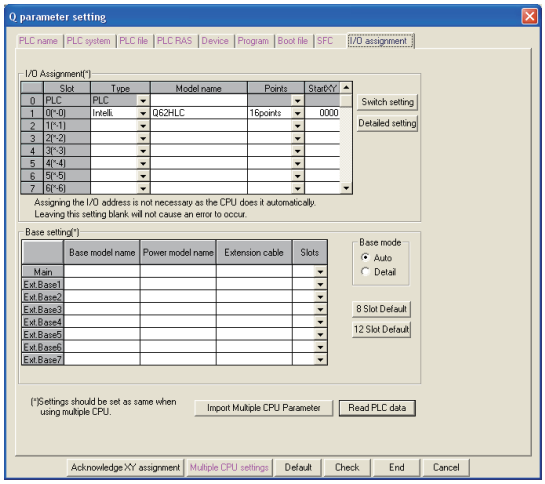
Five switches (switch numbers 1 to 5) are available for the intelligent function module and they are set with 16 bit data.
If the switches for the intelligent function module are not set, the default value of 0 is used for switches 1 to 5.

| | Setting items | |
|---|---|---|
| Switch 1 |  | Output setting for CPU stop error<br>0 : CLEAR<br>Other than 0 : HOLD |
| Switch 2[*1] | Control status when switching to program control<br>1 : Switch with executing control<br>Other than 1 : Switch with suspending control | |
| Switch 3 | Reserved (0 fixed) | |
| Switch 4 | Reserved (0 fixed) | |
| Switch 5 | Reserved (0 fixed) | |

∗1: Compatible with the Q62HLC of which the first five digits of the production information is "10022" or later or the first five digits of the product information is "10011" or later. (For the method of confirming the production information and product information, refer to Section 2.3.)
When using the Q62HLC which is not compatible with this setting, set 0.

## (2) Operating procedure

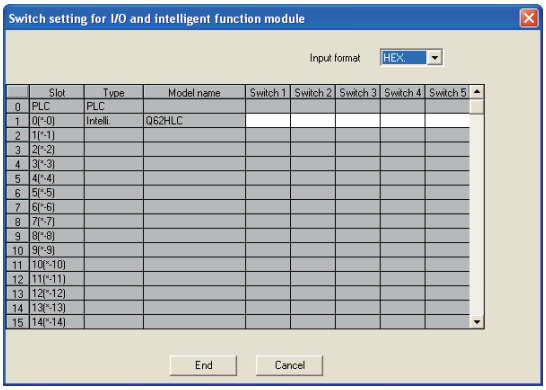
Perform settings, starting with the GX Developer I/O assignment screen.




(a) I/O assignment screen

Specify the following for the slot where the Q62HLC is mounted.

Type : Select "Intelli."
Model name : Enter the module's model name.
Points : Select 16 points.
Start XY : Enter the start I/O signal for the Q62HLC.




(b) Switch setting for I/O and intelligent function module

Click on Switch Setting on the I/O assignment screen to display the screen at left and set switches 1 to 5. The setting can easily be done if values are entered in hexadecimal. Change the input format to hexadecimal and enter values.

REMARK

You need not set the "error-time output mode" and "hardware error-time CPU operation mode" in the intelligent function module detailed setting as they are invalid for the Q62HLC.

# 5 UTILITY PACKAGE (GX Configurator-TC)

## 5.1 Utility Package Functions

Table 5.1 shows a list of the utility package functions.

Table 5.1 Utility Package (GX Configurator-TC) Function List

| Function | Description | Reference section |
|---|---|---|
| Initial setting | (1) Make initial setting for Q64HLC channel-by-channel.<br>Set the values of the items which require initial setting.<br>•CH□ Input Range<br>•CH□ Sensor compensation value setting<br>•CH□ Primary delay digital filter setting<br>•Cold junction temperature compensation mode setting<br>•CH□ Unused Channel Setting<br>•CH□ Upper Limit Setting Limiter<br>•CH□ Lower Limit Setting Limiter<br>•CH□ Setting Change rate Limiter<br>•CH□ Upper output limiter<br>•CH□ Lower output limiter<br>•CH□ Output variation limiter<br>•CH□ Alert 1 to 4 Mode Setting<br>•CH□ Alert Setting Value 1 to 4<br>•Alert dead band setting<br>•Alert delay count<br>•CH□ Loop disconnection detection judgment time<br>•CH□ Loop disconnection detection dead band<br>•CH□ Forward/Reverse Operation Setting<br>•CH□ Control mode<br>•Approach band<br>•Soak time criteria<br>•CH□ Stop mode setting<br>•PID continuation<br>•CH□ AT bias<br>•CH□ AT differential gap<br>•CH□ AT additional lag<br>•CH□ Set value (SV) setting<br>•CH□ Proportional band (P) setting<br>•CH□ Integral time (I) setting<br>•CH□ Derivative time (D) setting<br>•CH□ Control response parameter<br>•CH□ Program control RUN/RESET<br>•CH□ Execution pattern<br>•CH□ Start mode<br>•CH□ Time scale<br>•CH□ Zone 1 to 7 upper limit<br>•CH□ Zone 1 to 8 Proportional band (P) setting<br>Integral time (I) setting<br>Derivative time (D) setting<br>Control response parameter<br>•CH□ Program pattern 1 to 3<br>Final segment<br>Pattern link<br>Iteration<br>Output time of pattern end<br>Wait zone<br>Segment 1 to 16<br>Set value (SV) setting<br>Executing time<br>Zone PID data No.<br>•Cascade bias<br>•Cascade gain<br>•CH□ Scaling range upper limit value<br>•CH□ Scaling range lower limit value<br>•CH□ Scaling width upper limit value<br>•CH□ Scaling width lower limit value<br>(2) The initially set data are registered to the programmable controller CPU parameters, and when the programmable controller CPU is set to the RUN mode, they are written to the Q62HLC. | Section 5.4 |

(To next page)

| Function | Description | Reference section |
|---|---|---|
| Auto refresh | (1) Set the automatically refreshed Q62HLC buffer memory channel-by-channel.<br>•Error Code<br>•CH□ Measured value (PV)<br>•CH□ Manipulated value (MV)<br>•CH□ Set value monitor<br>•CH□ Approach flag<br>•CH□ Alert definition<br>•CH□ Alert Setting Value 1 to 4<br>•CH□ Set Value (SV) setting<br>•CH□ Proportional band (P) setting<br>•CH□ Integral time (I) setting<br>•CH□ Derivative time (D) setting<br>•CH□ Loop disconnection detection judgment time<br>•CH□ Execution times monitor<br>•CH□ Execution pattern monitor<br>•CH□ Segment monitor<br>•CH□ Segment remaining time<br>•CH□ Zone PID monitor<br>•CH□ Wait status flag<br>•CH□ Hold status flag<br>•CH□ Advancing completion flag<br>•CH□ Pattern end output flag<br>•CH□ End status flag<br>•CH□ Cascade monitor<br>•CH□ Scaling value<br>(2) The values stored in the Q62HLC buffer memory, where auto refresh setting was made, are automatically read when the END instruction of the programmable controller CPU is executed. | Section 5.5 |
| Monitor/test | Monitors and tests the buffer memory and I/O signals for the Q62HLC.<br>you can use the auto tuning function.<br>•Error code<br>•CH□ Measured value (PV)<br>•CH□ Manipulated value (MV)<br>•CH□ Set value monitor<br>•Cold junction process value<br>•CH□ Approach flag<br>•CH□ Input range<br>•CH□ Sensor compensation Value Setting<br>•CH□ Primary delay digital filter setting<br>•CH□ Unused channel setting<br>•CH□ PID constant read command from FeRAM<br>•CH□ PID constant read completion flag from FeRAM<br>•CH□ PID constant read failure completion flag from FeRAM<br>•X00: Watchdog timer error flag<br>•X01: Operation mode status<br>•X02: Error flag<br>•X03: Module ready flag<br>•X04:CH1 Auto tuning status<br>•X05:CH2 Auto tuning status<br>•X08: FeRAM write completion flag<br>•X09: Default value write completion flag<br>•X0A: FeRAM write failure flag<br>•X0B Setting change completion flag<br>•X0C CH1 alert flag<br>•X0D CH2 alert flag<br>•Y01 Operation mode command<br>•Y02 Error reset command<br>•Y04 CH1 Auto tuning command<br>•Y05 CH2 Auto tuning command<br>•Y08 FeRAM backup command<br>•Y09 Default setting registration command<br>•Y0B Setting change command<br>•Y0C CH1 Forced PID control stop command<br>•Y0D CH2 Forced PID control stop command<br>•CH□ Upper setting limiter<br>•CH□ Lower setting limiter<br>•CH□ Setting change rate limiter<br>•CH□ Upper output limiter<br>•CH□ Lower output limiter<br>•CH□ Output variation limiter<br>•CH□ Alert definition<br>PV is above upper limit of measurable range (up scale)<br>PV is above lower limit of measurable range (down scale)<br>Alert1<br>Alert2<br>Alert3<br>Alert4<br>Loop disconnection warning | Section 5.6 |

(To next page)

| Function | Description | Reference section |
|---|---|---|
| Monitor/test | •CH□ Alert 1 mode setting<br>•CH□ Alert set value 1<br>•CH□ Alert 2 mode setting<br>•CH□ Alert set value 2<br>•CH□ Alert 3 mode setting<br>•CH□ Alert 3 set value<br>•CH□ Alert 4 mode setting<br>•CH□ Alert 4 set value<br>•Alert dead band setting<br>•Alert delay count<br>•CH□ Loop disconnection detection judgment time<br>•CH□ Loop disconnection detection dead band<br>•CH□ Forward/reverse action setting<br>•CH□ Control mode<br>•CH□ Control mode monitor<br>•Approach band<br>•Soak time criteria<br>•CH□ Stop mode setting<br>•PID continuation flag<br>•Auto tuning<br>•Operation mode status<br>•Operation mode command<br>•CH□ Set value (SV) setting<br>•CH□ Proportional band (P) setting<br>•CH□ Integral time (I) setting<br>•CH□ Derivative time (D) setting<br>•CH□ Control response parameter<br>•CH□ MAN output setting<br>•CH□ Program control RUN/RESET<br>•CH□ Hold command<br>•CH□ Command advancing<br>•CH□ Execution times monitor<br>•CH□ Execution pattern monitor<br>•CH□ Segment monitor<br>•CH□ Segment remaining time<br>•CH□ Zone PID monitor<br>•CH□ Wait status flag<br>•CH□ Hold status flag<br>•CH□ Advancing completion flag<br>•CH□ Pattern end output flag<br>•CH□ End status flag<br>•Setting change command<br>•CH□ Execution pattern<br>•CH□ Start mode<br>•CH□ Time scale<br>•CH□ Zone □ Upper limit<br>Proportional band (P) setting<br>Integral time (I) setting<br>Derivative time (D) setting<br>Control response parameter<br>•CH□ Program pattern□<br>Final segment<br>Pattern link<br>Iteration<br>Output time of pattern end<br>Wait zone<br>Segment □<br>Set value (SV) setting<br>Executing time<br>Zone PID data No.<br>•Cascade monitor<br>•Cascade bias<br>•Cascade gain<br>•Cascade ON/OFF<br>•CH□ Scaling value<br>•CH□ Scaling range upper limit value<br>•CH□ Scaling range lower limit value<br>•CH□ Scaling width upper limit value<br>•CH□ Scaling width lower limit value | |

## 5.2 Installing and Uninstalling the Utility Package

For how to install or uninstall the utility package, refer to "Method of installing the MELSOFT Series" included in the utility package.

### 5.2.1 Handling precautions

The following explains the precautions on using the Utility package.

(1) For safety

Since Utility package is add-in software for GX Developer, read "Safety Precautions" and the basic operating procedures in the GX Developer Operating Manual.

(2) About installation

GX Configurator-TC is add-in software for GX Developer Version 4 or later. Therefore, GX Configurator-TC must be installed on the personal computer that has already GX Developer Version 4 or later installed.

(3) Screen error of Intelligent function module utility

Insufficient system resource may cause the screen to be displayed inappropriately while using the Intelligent function module utility.
If this occurs, close the Intelligent function module utility, GX Developer (program, comments, etc.), and other applications, and then start GX Developer and Intelligent function module utility again.

(4) To start the Intelligent function module utility

(a) In GX Developer, select "QCPU (Q mode)" for PLC series and specify a project. If any PLC series other than "QCPU (Q mode)" is selected, or if no project is specified, the Intelligent function module utility will not start.

(b) Multiple Intelligent function module utilities can be started.
However, [Open parameters] and [Save parameters] operations under [Intelligent function module parameter] are allowed for one Intelligent function module utility only. Only the [Monitor/test] operation is allowed for the other utilities.

(5) Switching between two or more Intelligent function module utilities

When two or more Intelligent function module utility screens cannot be displayed side by side, select a screen to be displayed on the top of others using the task bar.

### (6) Number of parameters that can be set in GX Configurator-TC

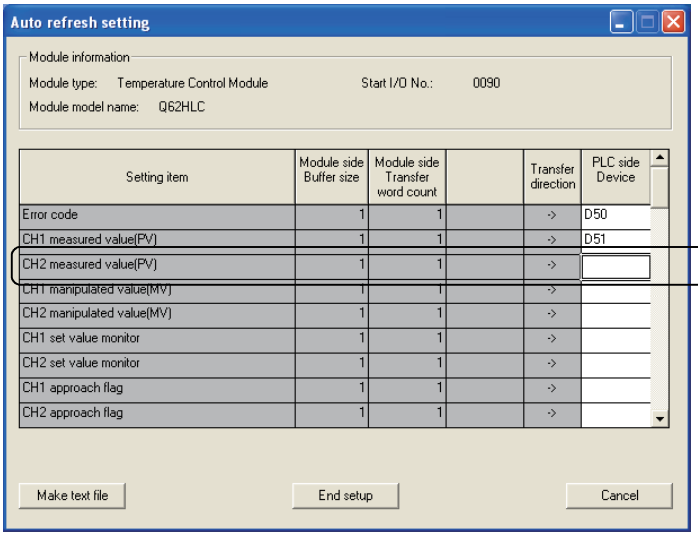
When multiple intelligent function modules are mounted, the number of parameter settings must not exceed the following limit.

| When intelligent function modules are installed to: | Maximum number of parameter settings | |
|---|---|---|
| | Initial setting | Auto refresh setting |
| Q00J/Q00/Q01CPU | 512 | 256 |
| Q02/Q02H/Q06H/Q12H/Q25HCPU | 512 | 256 |
| Q02PH/Q06PH/Q12PH/Q25PHCPU | 512 | 256 |
| Q12PRH/Q25PRHCPU | 512 | 256 |
| Q02UCPU | 2048 | 1024 |
| Q03UD/Q04UDH/Q06UDH/ Q13UDH/Q26UDH/Q03UDE/ Q04UDEH/Q06UDEH/Q13UDEH/ Q26UDEHCPU | 4096 | 2048 |
| MELSECNET/H remote I/O station | 512 | 256 |

For example, if multiple intelligent function modules are installed in the MELSECNET/H remote I/O station, configure the settings in GX Configurator so that the number of parameter settings for all the intelligent function modules does not exceed the limit of the MELSECNET/H remote I/O station. Calculate the total number of parameter settings separately for the initial setting and for the auto refresh setting.
The number of parameters that can be set for one module in GX Configurator-TC is as shown below.

| Target module | Initial setting | Auto refresh setting |
|---|---|---|
| Q62HLC | 22 (Fixed) | 52 (Max.) |

Example) Counting the number of parameter settings in Auto refresh setting




This one row is counted as one setting.
Blank rows are not counted.
Count up all the setting items on this screen, and add the total to the number of settings for other intelligent function modules to get a grand total.

## 5.2.2 Operating environment

This section explains the operating environment of the personal computer that runs GX Configurator-TC.

| Item | | Description |
|---|---|---|
| Installation (Add-in) target ＊1 | | Add-in to GX Developer Version 4 (English version) or later ＊2 |
| Computer | | Windows® -based personal computer |
| | CPU | Refer to the following table "Operating system and performance required for personal computer". |
| | Required memory | |
| Hard disk space ＊3 | For installation | 65 MB or more |
| | For operation | 10 MB or more |
| Display | | 800 × 600 dots or more resolution ＊4 |
| Operating system | | Microsoft® Windows® 95 Operating System (English version)<br>Microsoft® Windows® 98 Operating System (English version)<br>Microsoft® Windows® Millennium Edition Operating System (English version)<br>Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version)<br>Microsoft® Windows® 2000 Professional Operating System (English version)<br>Microsoft® Windows® XP Professional Operating System (English version)<br>Microsoft® Windows® XP Home Edition Operating System (English version)<br>Microsoft® Windows Vista® Home Basic Operating System (English version)<br>Microsoft® Windows Vista® Home Premium Operating System (English version)<br>Microsoft® Windows Vista® Business Operating System (English version)<br>Microsoft® Windows Vista® Ultimate Operating System (English version)<br>Microsoft® Windows Vista® Enterprise Operating System (English version) |

＊1: Install GX Configurator-TC in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-TC (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-TC (English version) cannot be used in combination.
＊2: GX Configurator-TC is not applicable to GX Developer Version 3 or earlier.
＊3: At least 15GB is required for Windows Vista®.
＊4: Resolution of 1024 × 768 dots or more is recommended for Windows Vista®.

Operating system and performance required for personal computer

| Operating system | Performance required for personal computer | |
|---|---|---|
| | CPU | Memory |
| Windows® 95 | Pentium® 133MHz or more | 32MB or more |
| Windows® 98 | Pentium® 133MHz or more | 32MB or more |
| Windows® Me | Pentium® 150MHz or more | 32MB or more |
| Windows NT® Workstation 4.0 | Pentium® 133MHz or more | 32MB or more |
| Windows® 2000 Professional | Pentium® 133MHz or more | 64MB or more |
| Windows® XP Professional (Service Pack 1 or later) | Pentium® 300MHz or more | 128MB or more |
| Windows® XP Home Edition (Service Pack 1 or later) | Pentium® 300MHz or more | 128MB or more |
| Windows Vista® Home Basic | Pentium® 1GHz or more | 1GB or more |
| Windows Vista® Home Premium | Pentium® 1GHz or more | 1GB or more |
| Windows Vista® Business | Pentium® 1GHz or more | 1GB or more |
| Windows Vista® Ultimate | Pentium® 1GHz or more | 1GB or more |
| Windows Vista® Enterprise | Pentium® 1GHz or more | 1GB or more |

POINT

- The functions shown below are not available for Windows® XP and Windows Vista® .
  If any of the following functions is attempted, this product may not operate normally.
  Start of application in Windows® compatible mode
  Fast user switching
  Remote desktop
  Large fonts (Details setting of Display Properties)
  Also, 64-bit version Windows® XP and Windows Vista® are not supported.
- Use a USER authorization or higher in Windows Vista® .

## 5.3 Utility Package Operation

### 5.3.1 Common utility package operations

#### (1) Control keys

Special keys that can be used for operations of the utility package and their applications are shown in the table below.

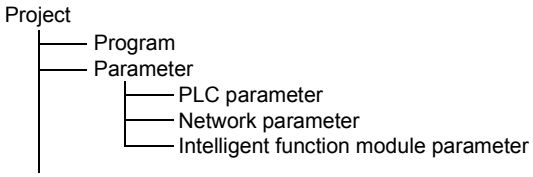
| Key | Application |
|---|---|
| Esc | Cancels the current entry in a cell.<br>Closes the window. |
| Tab | Moves between controls in the window. |
| Ctrl | Used in combination with the mouse operation to select multiple cells for test execution. |
| Delete | Deletes the character where the cursor is positioned.<br>When a cell is selected, clears all of the setting contents in the cell. |
| Back space | Deletes the character where the cursor is positioned. |
| ↑ ↓ ← → | Moves the cursor. |
| Page Up | Moves the cursor one page up. |
| Page Down | Moves the cursor one page down. |
| Enter | Completes the entry in the cell. |

#### (2) Data created with the utility package

The following data or files that are created with the utility package can be also handled in GX Developer. Figure 5.1 shows respective data or files are handled in which operation.

<Intelligent function module parameter>

(a) This represents the data created in Auto refresh setting, and they are stored in an intelligent function module parameter file in a project created by GX Developer.




(b) Steps 1) to 3) shown in Figure 5.1 are performed as follows:

1) From GX Developer, select:
[Project] → [Open project] / [Save] / [Save as]
2) On the intelligent function module selection screen of the utility, select:
[Intelligent function module parameter] → [Open parameters] / [Save parameters]

3) From GX Developer, select:
[Online] → [Read from PLC] / [Write to PLC] →"Intelligent function module parameters"
Alternatively, from the intelligent function module selection screen of the utility, select:
[Online] → [Read from PLC] / [Write to PLC]

<Text files>

A text file can be created by clicking the Make text file button on the initial setting, Auto refresh setting, or Monitor/Test screen.
Text files can be utilized to create user documents.

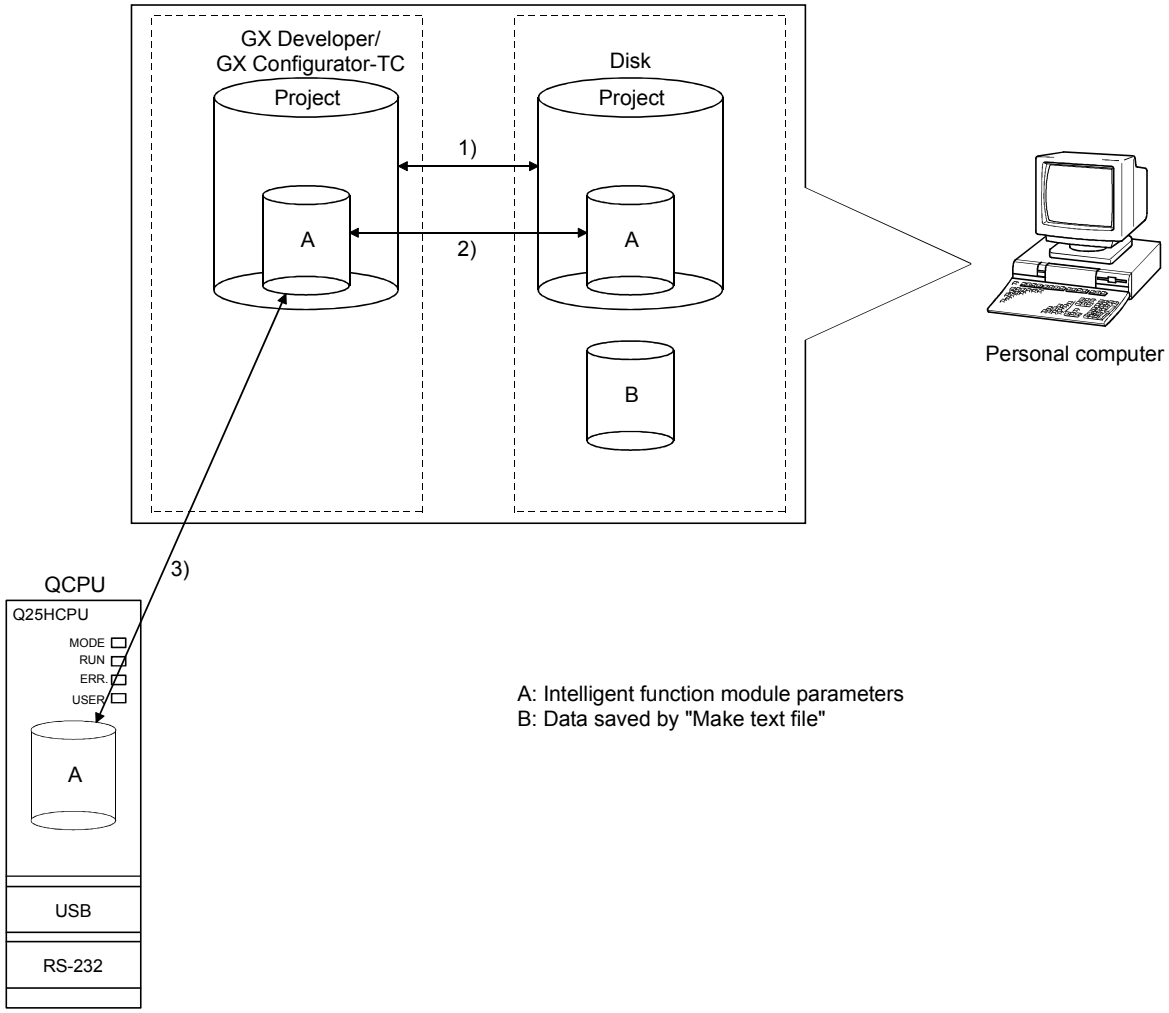
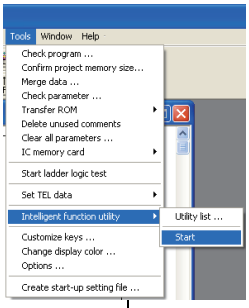



Figure 5.1 Correlation chart for data created with the utility package

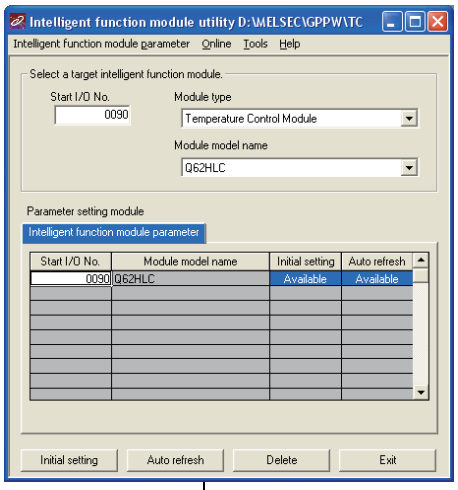
## 5.3.2 Operation overview

GX Developer screen




[Tools] – [Intelligent function utility] – [Start]

Screen for selecting a target intelligent function module




Refer to Section 5.3.3.

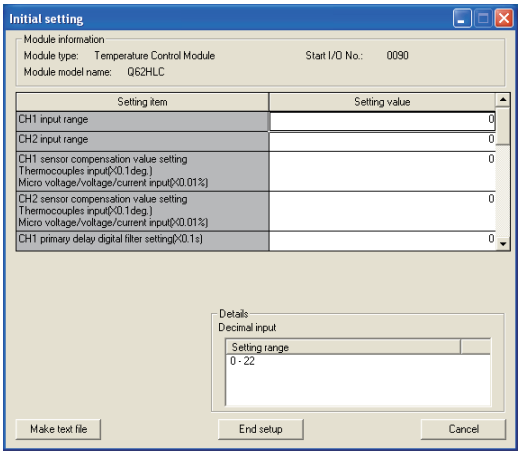
Enter "Start I/O No.", and select "Module type" and "Module model name".

1)

Initial setting

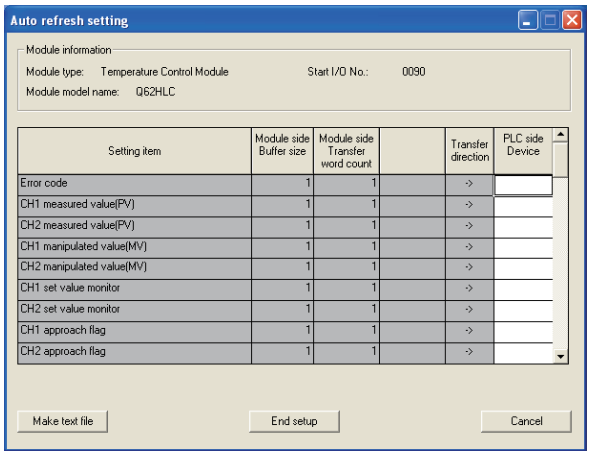
Auto refresh

Initial setting screen




Refer to Section 5.4.

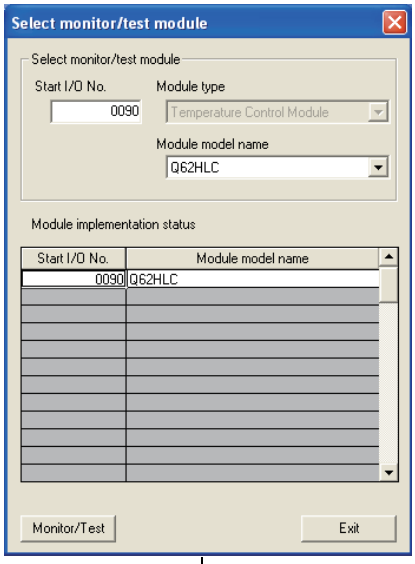
Auto refresh setting screen




Refer to Section 5.5.

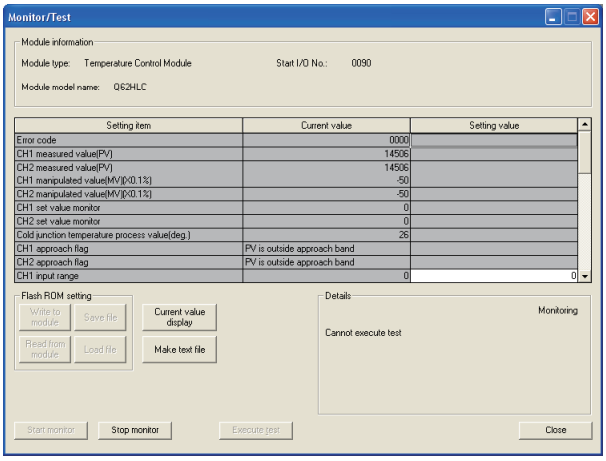
1) [Online] – [Monitor/Test]

Selecting monitor/test module screen




Monitor/Test — Select a module to be monitored/tested.

Monitor/Test screen



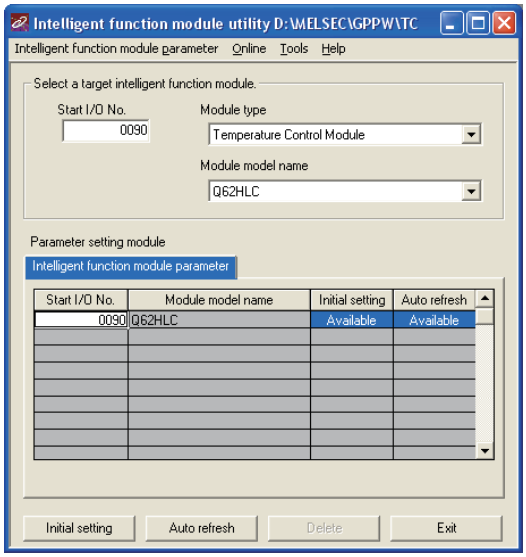

Refer to Section 5.6.

## 5.3.3 Starting the intelligent function module utility

### [Operating procedure]

Intelligent function module utility is started from GX Developer.
[Tools] → [Intelligent function utility] → [Start]

### [Setting screen]




### [Explanation of items]

#### (1) Activation of other screens

Following screens can be displayed from the intelligent function module utility screen.

(a) Initial setting screen
"Start I/O No. *1" → "Module type" → "Module model name" →
Initial setting

(b) Auto refresh setting screen
"Start I/O No. *1" → "Module type"→ "Module model name"→
Auto refresh

(c) Select monitor/test module screen
[Online] → [Monitor/Test]

*1 Enter the start I/O No. in hexadecimal.

#### (2) Command buttons

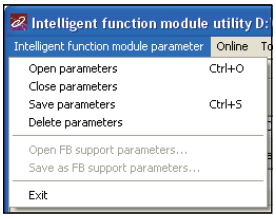
Delete — Deletes the initial settings and auto refresh setting of the selected module.

Exit — Closes this screen.

### (3) Menu bar

(a) Intelligent function module's parameter items

Intelligent function module parameters of the project opened by GX Developer are handled.




[Open parameters] : Reads a parameter file.

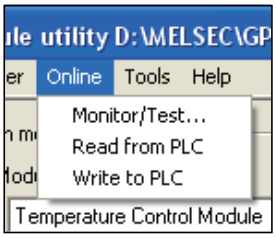
[Close parameters] : Closes the parameter file. If any data are modified, a dialog asking for file saving will appear.

[Save parameters] : Saves the parameter file.

[Delete parameters] : Deletes the parameter file.

[Exit] : Closes this screen.

(b) Online menu




[Monitor/Test] : Activates the Select monitor/test module screen.

[Read from PLC] : Reads intelligent function module parameters from the CPU module.

[Write to PLC] : Writes intelligent function module parameters to the CPU module.

POINT

(1) Saving intelligent function module parameters in a file

Since intelligent function module parameters cannot be saved in a file by the project saving operation of GX Developer, save them on the shown module selection screen.

(2) Reading/writing intelligent function module parameters from/to a programmable controller using GX Developer

(a) Intelligent function module parameters can be read from and written into a programmable controller after having been saved in a file.

(b) Set a target programmable controller CPU in GX Developer: [Online] → [Transfer setup].

(c) When mounting the Q62HLC on a remote I/O station, use [Read from PLC] and [Write to PLC] of GX Developer.

(3) Checking the required utility

While the start I/O is displayed on the Intelligent function module utility setting screen, "∗" may be displayed for the model name.

This means that the required utility has not been installed or the utility cannot be started from GX Developer.

Check the required utility, selecting [Tools] - [Intelligent function utility] - [Utility list...] in GX Developer.

## 5.4 Initial Settings

### [Purpose]

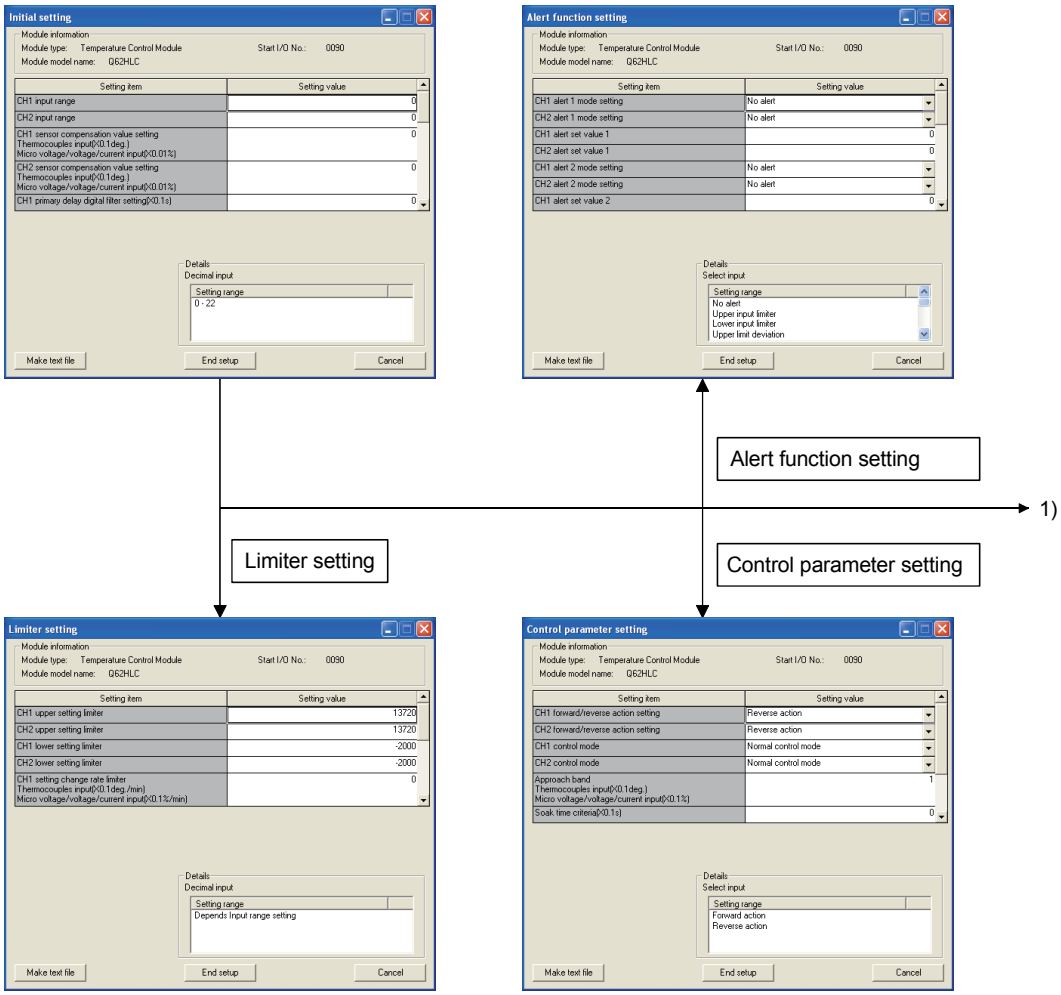
Make initial setting for operating Q62HLC channel-by-channel.
For the initial setting parameter types, refer to Section 5.1.
This initial setting eliminates the need for sequence program setting.

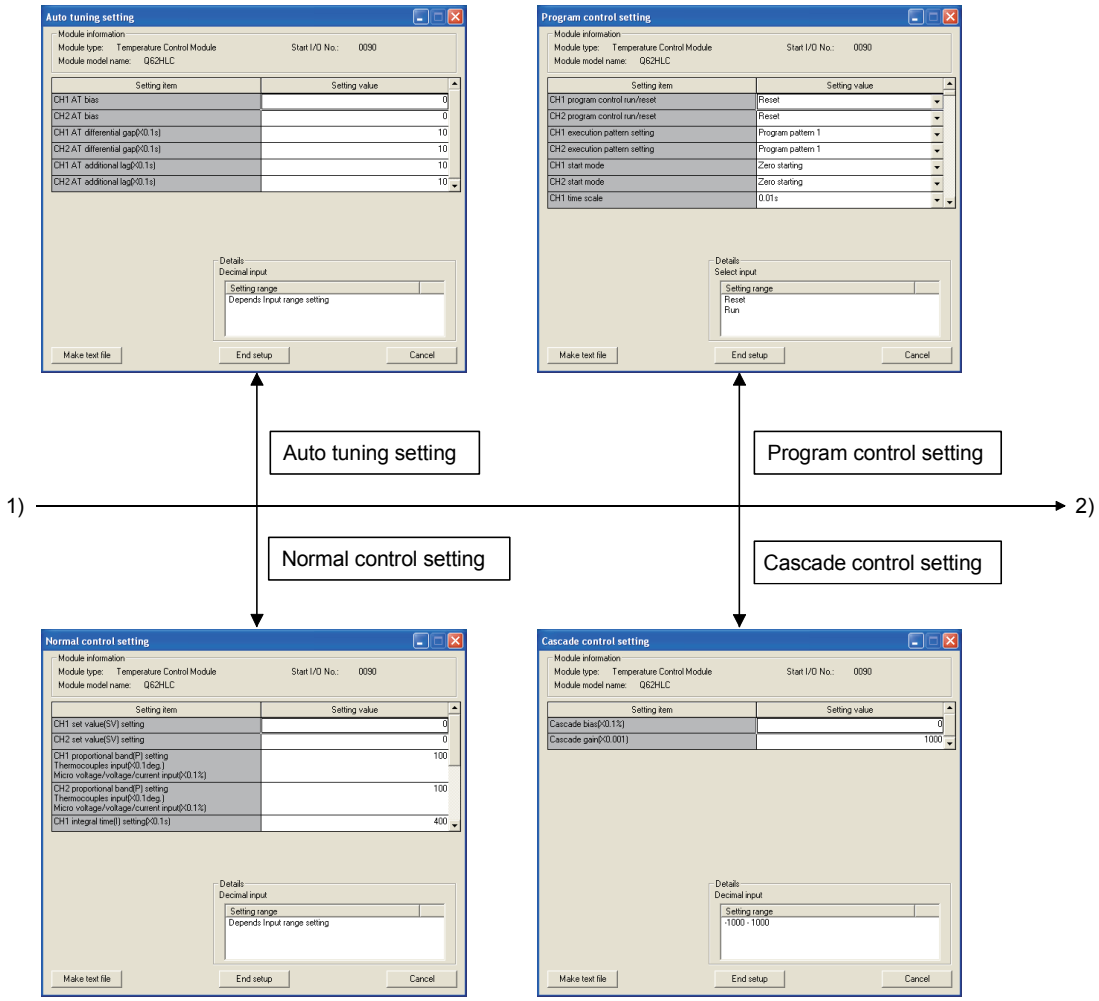
### [Operating procedure]

"Start I/O No. ＊" → "Module type" → "Module model name" → Initial setting

＊ Enter the start I/O No. in hexadecimal.

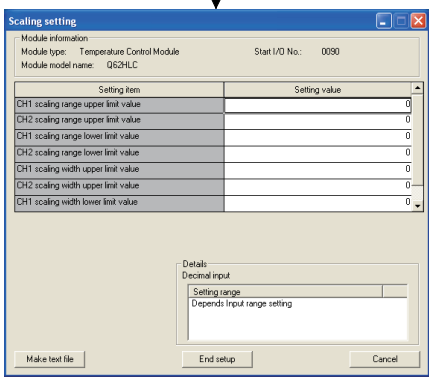
### [Setting screen]




Auto tuning setting
Program control setting
1)
2)
Normal control setting
Cascade control setting

2)

Scaling setting





5 - 16

[Explanation of items]

(1) Command buttons

| | |
|---|---|
| Make text file | Creates a file containing the screen data in the text file format. |
| End setup | Saves the set data and ends the operation. |
| Cancel | Cancels the setting and ends the operation. |

POINT

Initial settings are stored in the intelligent module parameters. After being written to the CPU module, the initial setting is made effective by either (1) or (2).

(1) Cycle the RUN/STOP switch of the CPU module: STOP → RUN → STOP → RUN.

(2) With the RUN/STOP switch set to RUN, turn off and then on the power or reset the CPU module.

If the initialization settings have been written by a sequence program, the initialization settings will be executed during the STOP → RUN of the CPU module. Arrange so that the initial settings written by the sequence program are re-executed during the STOP → RUN of the CPU module.

## 5.5 Auto Refresh

### [Purpose]

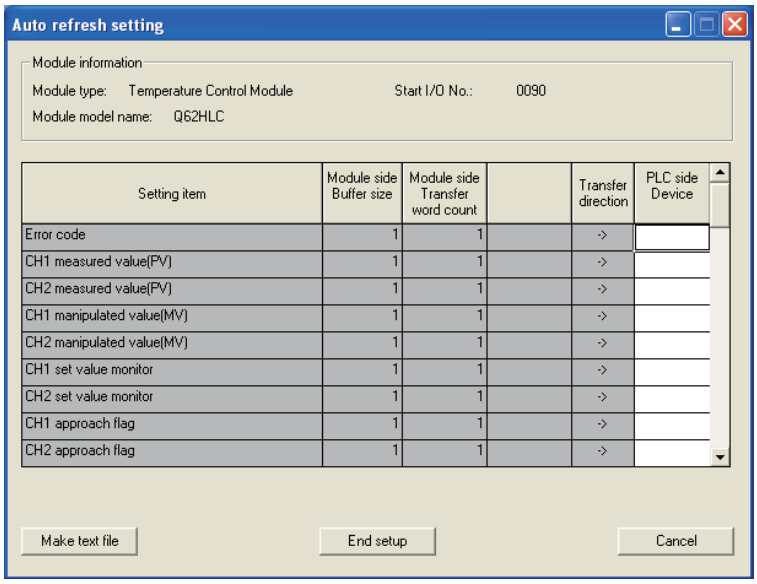
Configure the Q64HLC buffer memory for automatic refresh, for each channel.
For the automatic refresh setting types, refer to Section 5.1.
This auto refresh setting eliminates the need for reading and writing by sequence programs.

### [Operating procedure]

"Start I/O No.＊" → "Module type" → "Module model name" → Auto refresh

＊ Enter the start I/O No. in hexadecimal.

### [Setting screen]



[Explanation of items]

(1) Items

| | |
|---|---|
| Module side Buffer size | : Displays the buffer memory size of the setting item. |
| Module side Transfer word count | : Displays the number of words to be transferred. |
| Transfer direction | : "←" indicates that data are written from the programmable controller CPU to the buffer memory. "→" indicates that data are loaded from the buffer memory to the programmable controller CPU. |
| PLC side Device | : Enter a CPU module side device that is to be automatically refreshed. Applicable devices are X, Y, M, L, B, T, C, ST, D, W, R, and ZR. When using bit devices, X, Y, M, L or B, set a number that can be divided by 16 points (examples: X10, Y120, M16, etc.). Also, buffer memory data are stored in a 16-point area, starting from the specified device number. For example, if X10 is entered, data are stored in X10 to X1F. |

(2) Command buttons

| | |
|---|---|
| Make text file | Creates a file containing the screen data in the text file format. |
| End setup | Saves the set data and ends the operation. |
| Cancel | Cancels the setting and ends the operation. |

POINTS

- The auto refresh settings are stored in an intelligent function module parameter file. The auto refresh settings become effective by turning the power OFF and then ON or resetting the CPU module after writing the intelligent function module parameters to the CPU module.
- The auto refresh settings cannot be changed from sequence programs. However, processing equivalent to auto refresh can be added using the FROM/TO instruction in the sequence program.

## 5.6 Monitoring/Test

### [Purpose]

Start the buffer memory monitoring/testing and I/O signals monitoring/testing from this screen.

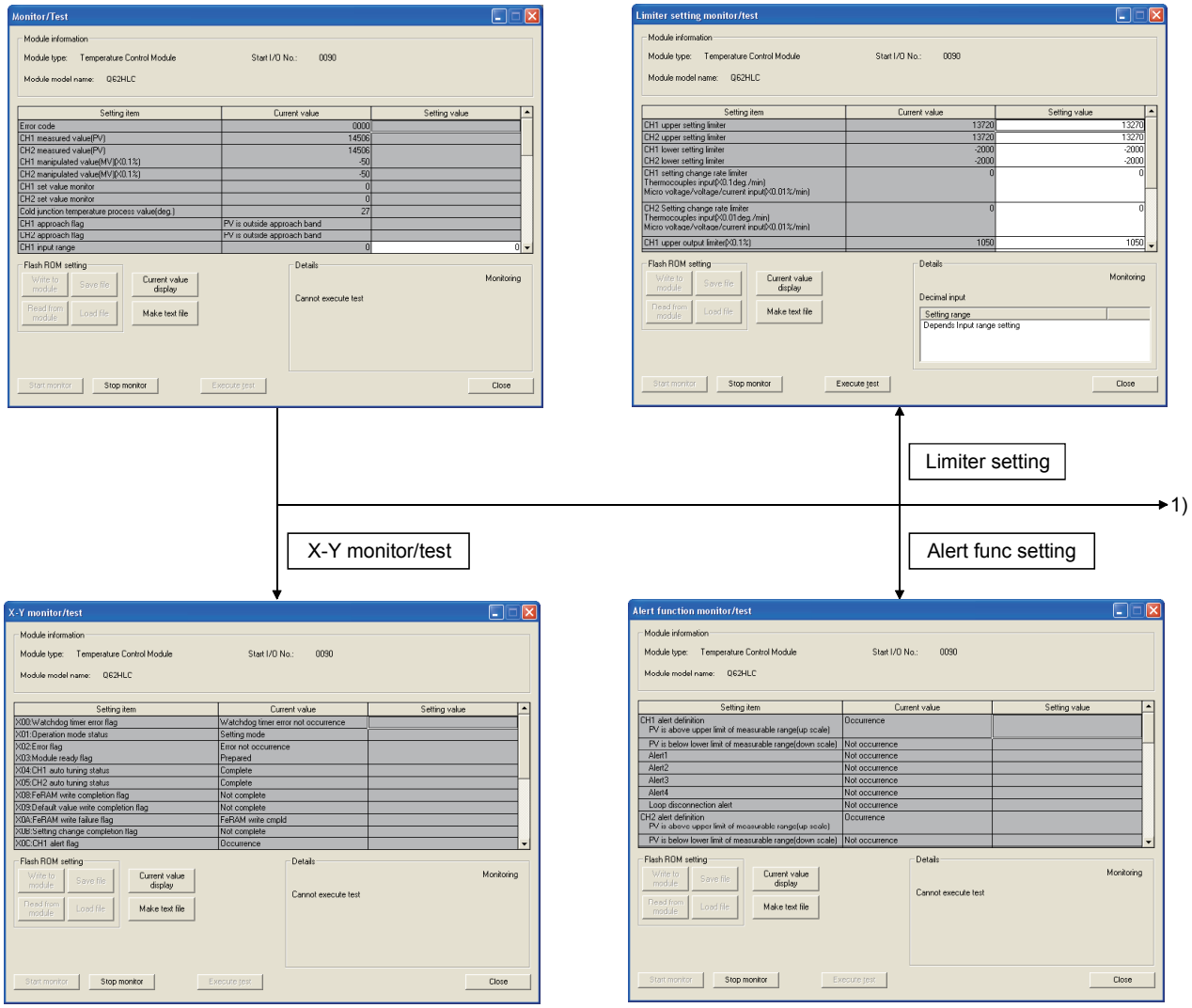
### [Operating procedure]

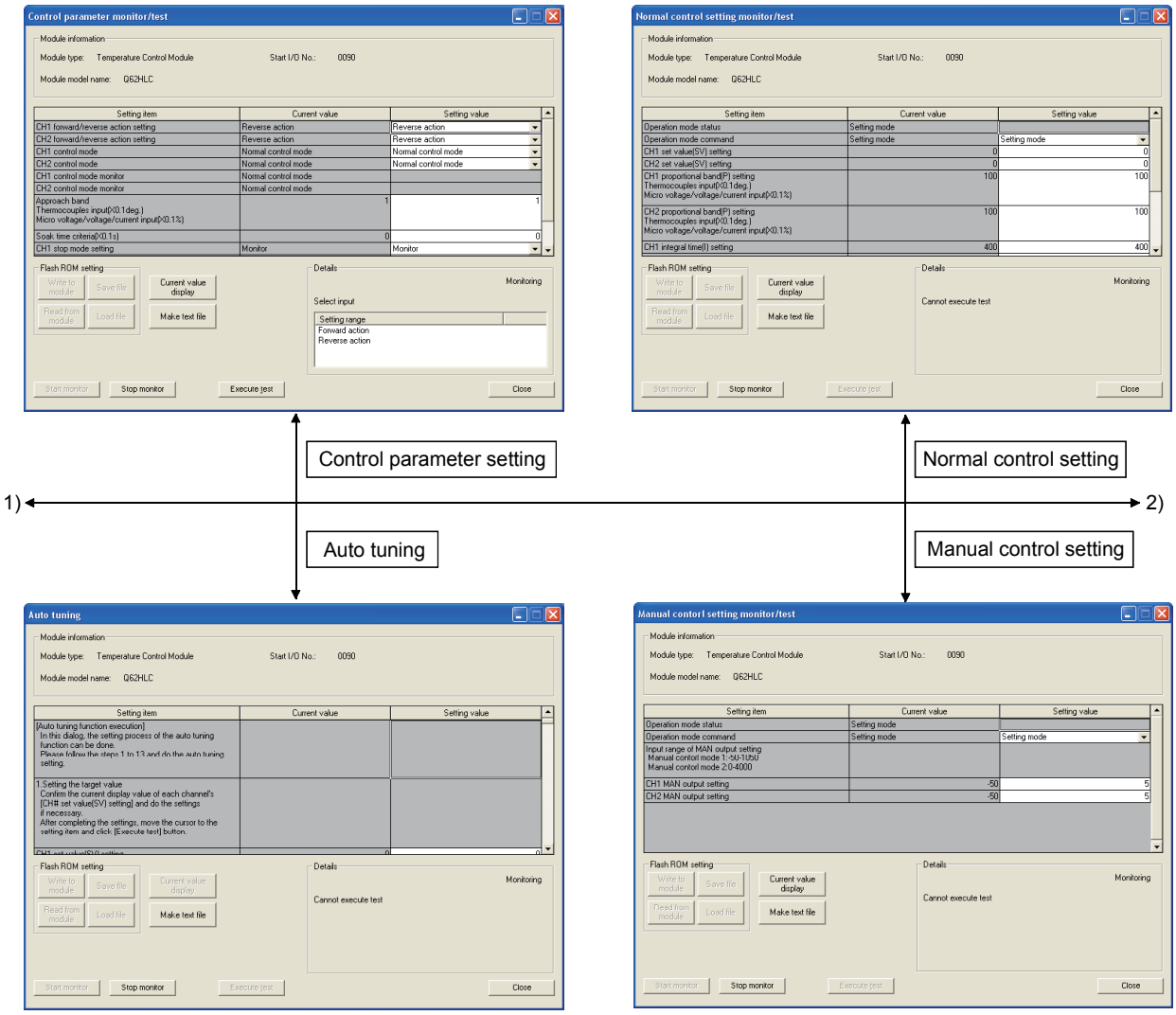
Select monitor/test module screen → "Start I/O No.＊" → "Module type" → "Module model name" → Monitor/test

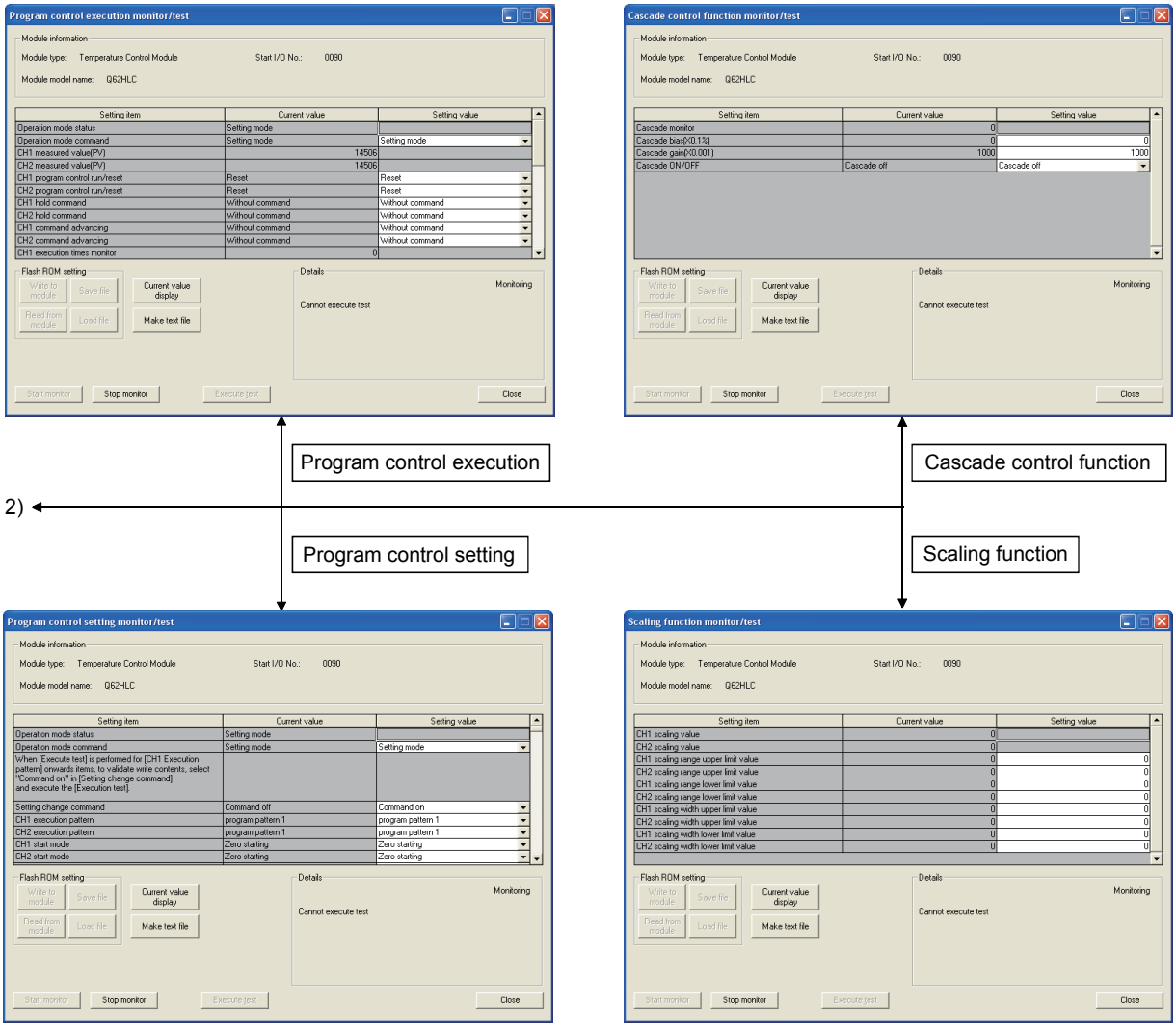
＊ Enter the start I/O No. in hexadecimal.

The screen can also be started from System monitor of GX Developer Version 6 or later.
Refer to the GX Developer Operating Manual for details.

### [Setting screen]




Control parameter monitor/test
Normal control setting monitor/test
Control parameter setting
Normal control setting
1)
2)
Auto tuning
Manual control setting
Auto tuning
Manual control setting monitor/test


Program control execution monitor/test
Cascade control function monitor/test
Program control execution
Cascade control function
2)
Program control setting
Scaling function
Program control setting monitor/test
Scaling function monitor/test

[Explanation of items]

(1) Items

Setting item : Displays I/O signals and buffer memory names.
Current value : Monitors the I/O signal states and present buffer memory values.
Setting value : Enter or select values to be written into the buffer memory for test operation.

(2) Command buttons

| | |
|---|---|
| Current value display | Displays the current value of the item selected. (This is used to check the text that cannot be displayed in the current value field. However, in this utility package, all items can be displayed in the display fields). |
| Make text file | Creates a file containing the screen data in the text file format. |
| Start monitor / Stop monitor | Selects whether or not to monitor current values. |
| Execute test | Performs a test on the selected items. To select more than one item, select them while holding down the Ctrl key. |
| Close | Closes the currently open screen and returns to the previous screen. |

REMARK

The "Execute test" operation is explained below, using an example of writing data to CH.1 set value (SV) setting.

(1) Click and choose the set value field of CH.1 set value (SV) setting.

(2) After entering a value, press the Enter key.
Nothing is written to the Q62HLC at this point.

(3) Click the setting value field for write to the Q62HLC to select.
To write more than one setting item at the same time, select the items while holding down the Ctrl key.

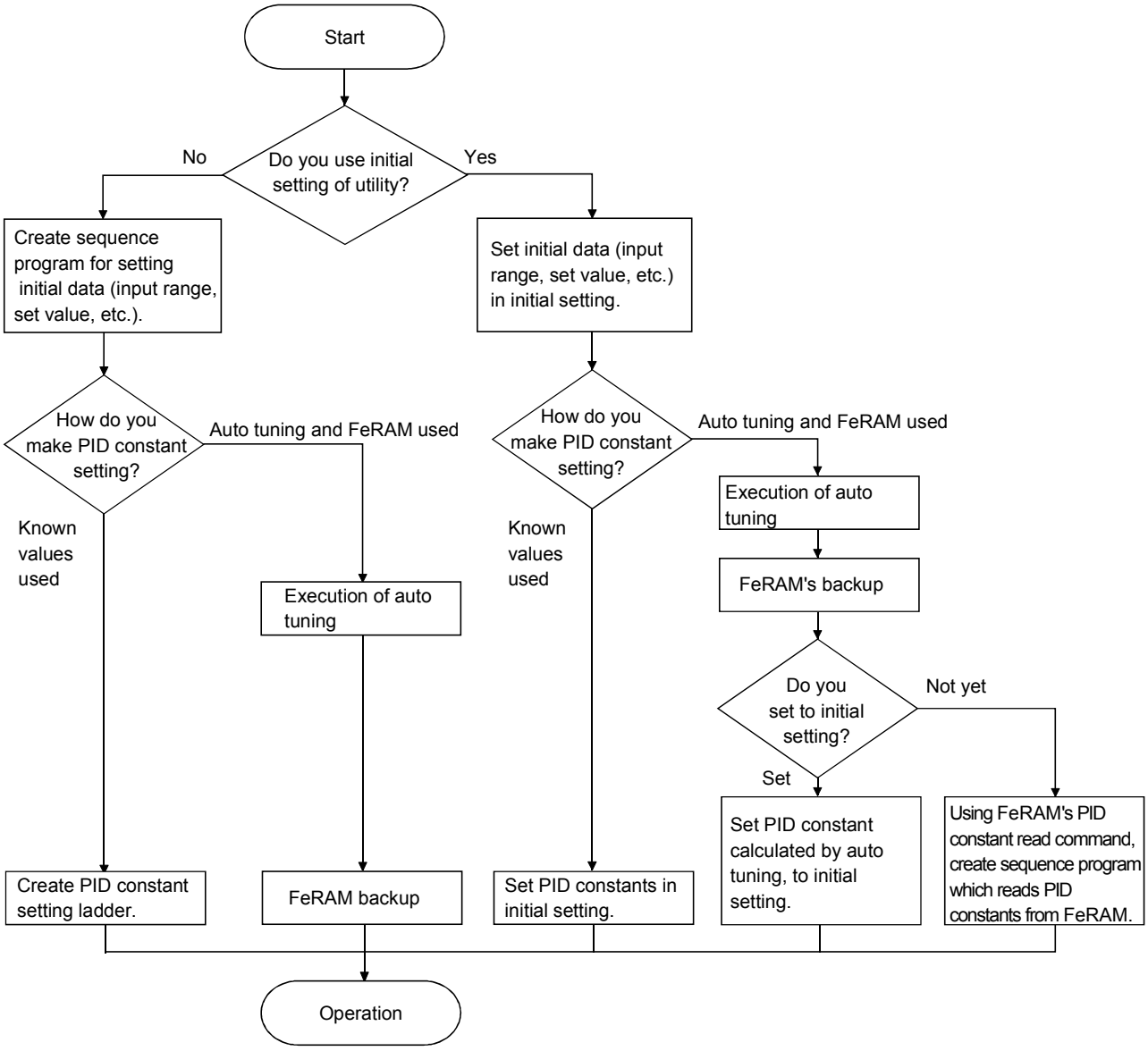
(4) Click Execute test to execute the write operation.
Upon completion of writing, the written value appears in the current value field.

# 6 PROGRAMMING

This chapter describes the programs of the Q62HLC.
When applying any of the program examples introduced in this chapter to the actual system, verify the applicability and confirm that no problems will occur in the system control.

## 6.1 Programming Procedure

Create the programs for various controls to be executed on Q62HLC in accordance with the following procedure.

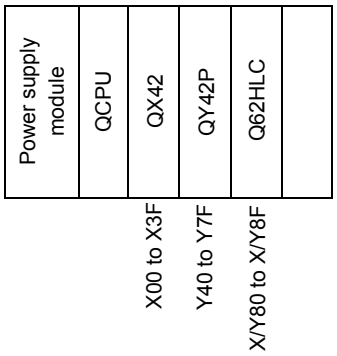



*1: If zone PID data are used for program control, execute the auto tuning for each zone.

## 6.2 For Use in Normal System Configuration

System configuration for program explanation

### (1) System configuration




### (2) Program conditions

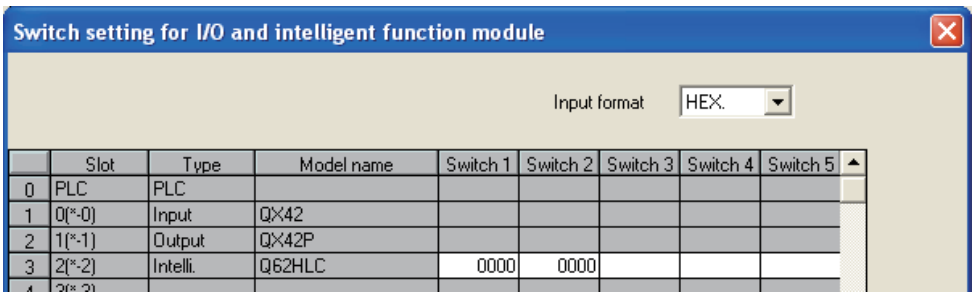
The programs are written to control the temperature measured by the thermocouple (K: -200 to 1372 ℃) connected to channel 1.

- According to input signals, normal control/program control/manual control 2 (simplified analog I/O)/cascade control is executed.
- They include write data error code reading and error code resetting programs.

### (3) Intelligent function module switch setting

Set the intelligent function module switch setting as follows.

For details of the intelligent function module switch setting, refer to Section 4.5.



(a) Devices used by user

| Device | Function | Description |
|---|---|---|
| X0 | Setting value write command | Sets the parameter to execute normal control and program control using CH 1 and writes into FeRAM. |
| X1 | PID constant read command from FeRAM (when GX Configurator-TC is used) | Reads PID constant set by auto tuning from FeRAM. |
| | Auto tuning execution command (when GX Configurator-TC is not used) | Executes auto tuning for the specified set value. Operates only in the normal control mode. |
| X2 | Error code reset command | Clears(0) error codes. |
| X3 | Setting mode switch command | Switches into the setting mode by setting from OFF to ON. |
| X4 | Normal control mode switching command | Switches into the normal control mode by setting from OFF to ON. Needs to set parameters for normal control before switching. |
| X5 | Program control mode switching command | Switches into the program control mode by setting from OFF to ON. Needs to set parameters for program control before switching. |
| X7 | Manual control mode 2 switching command | Switches into the manual control mode 2 by setting from OFF to ON. After the switching, the operation is performed by the values of manual output settings (X20 to X2F). |
| X8 | Cascade control switching command | Switches into the cascade control mode by setting from OFF to ON. Needs to set parameters for cascade control before switching. |
| X11 | Program control auto tuning execution command | Executes auto tuning for program control.*1 |
| X12 | Program control pattern data setting command | Sets the pattern data for executing program control.*2 |
| X15 | Cascade control setting command | Sets parameters for executing cascade control.*3 |
| X20 to X2F | Manual output setting | Specifies the manipulation value when manual control mode 2 is operated. |
| Y40 to Y4F | Error code output | Outputs error codes as BCD value. |
| Y50 to Y5F | Measured value output | Outputs measured value as BCD value. |
| Y60 | FeRAM read failure output (when GX Configurator-TC is used) | Outputs when reading from FeRAM has failed. |
| | FeRAM write failure output (when GX Configurator-TC is not used) | Outputs when writing into FeRAM has failed. |
| D50 | Error code | Stores error codes that are read out when the error has occurred. |
| D51 | Measured value | Stores measured values that are read out. |

When turning ON the setting value write command X0, the parameters, which are set in this program example, are as follows.

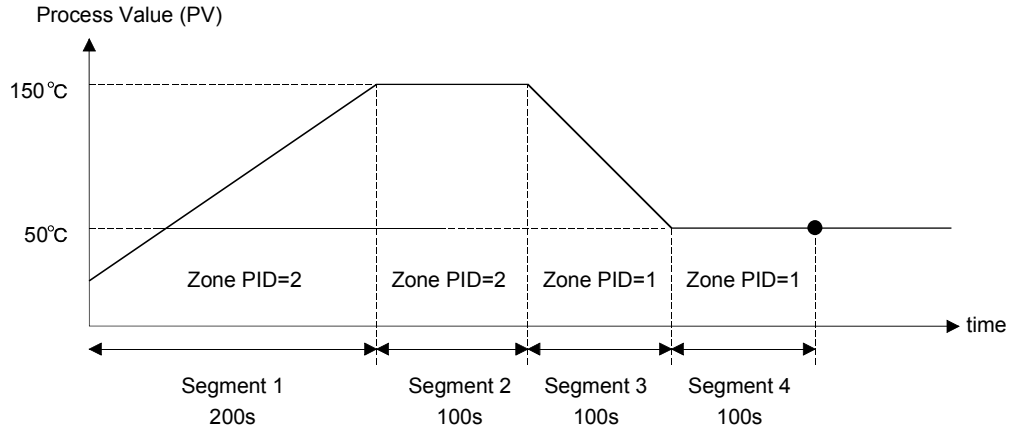
- CH2 Unused Channel Setting : 1(Unused. However, set "used" when used for cascade control. In this case, parameter is set to the same as CH1.)
- CH1 Input Range : 0 (K: -200 to 1372℃)
- CH1 Alert 1 Mode Setting : 1 (UprLmt Input Alert)
- CH1 Alert Set Value 1 : 1800 (180℃)
- CH1 Set Value Setting : 800 (80℃)
- CH1 Upper Setting Limiter : 2000 (200℃)
- CH1 Lower Setting Limiter : 0 (0℃)

When program control is used, first turn on X12 (program control pattern data setting command), and then turn on X0.

*1: PID constants of zone1 and zone2 that are used for program control are set.
By turning on X11, the auto tuning is executed after switching into normal control mode.
Then, PID constant of zone is set when the auto tuning ends.

*2: Before executing program control, the PID constants of zone1 and zone2 need to be set by the program control auto tuning (X11).
When program control is executed by the set pattern, it operates as follows.

| Segment number | Setting value | | |
|---|---|---|---|
| | Set value | Executing time | Zone PID data No. |
| Segment 1 | 1500 (150℃) | 200 (200s) | 2 (Zone 2) |
| Segment 2 | 1500 (150℃) | 100 (100s) | 2 (Zone 2) |
| Segment 3 | 500 (50℃) | 100 (100s) | 1 (Zone 1) |
| Segment 4 | 500 (50℃) | 100 (200s) | 1 (Zone 1) |




*3: After setting parameter by the cascade control setting command (X15), execute cascade control by turning on the cascade control switching command (X8).
In this program example, the parameter setting for cascade control and the other parameter settings (normal control, program control, and manual control2) cannot be set at the same time.
After setting the parameter for cascade control, do not use the normal control mode switching command (X4), program control mode switching command (X5), and manual control mode 2 switching command (X7).

### 6.2.1 Program example using the utility package

#### (1) Operation of utility package

(a) Initial setting (Refer to Section 5.4)

<When cascade control is not executed>
CH1 Input Range......"0"
CH2 Unused Channel Setting....."Not Used"

[Limiter setting]
CH1 Upper Setting Limiter....."2000"
CH1 Lower Setting Limiter....."0"

[Alert function setting]
CH1 Alert 1 Mode Setting....."UprLmt Input"
CH1 Alert Set Value 1....."1800"

[Normal control setting]
CH1 Set Value (SV) setting....."800"

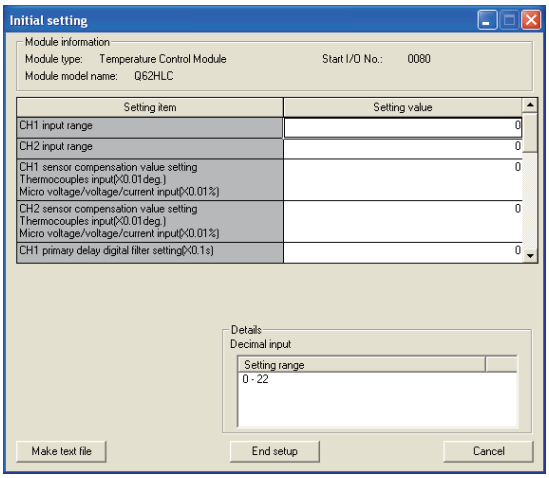
[Program control setting]
CH1 Execution Pattern....."Program Pattern 1"
CH1 Time Scale....."1s"
CH1 Program Pattern 1
Final Segment....."4"
Segment 1 Set Value (SV) setting....."1500"
Segment 1 Executing Time....."200"
Segment 1 Zone PID data No. ....."2"
Segment 2 Set Value (SV) setting....."1500"
Segment 2 Executing Time....."100"
Segment 2 Zone PID data No. ....."2"
Segment 3 Set Value (SV) setting....."500"
Segment 3 Executing Time....."100"
Segment 3 Zone PID data No. ....."1"
Segment 4 Set Value (SV) setting....."500"
Segment 4 Executing Time....."100"
Segment 4 Zone PID data No. ....."1"

<When cascade control is executed>
CH1 Input Range....."0"
CH2 Input Range....."0"
CH1 Unused Channel Setting....."Used"
CH2 Unused Channel Setting....."Used"

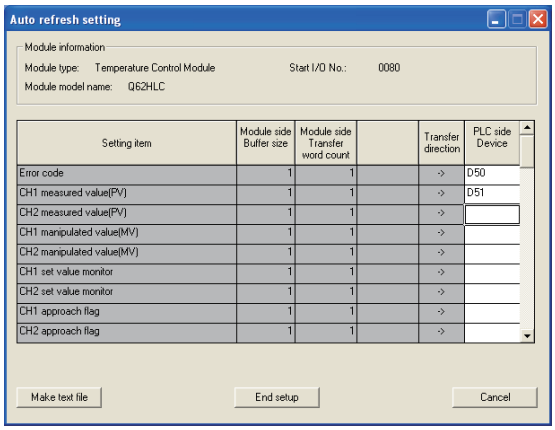
[Limiter setting]
CH1 Upper Setting Limiter....."2000"
CH1 Lower Setting Limiter....."0"
CH2 Upper Setting Limiter....."2000"
CH2 Lower Setting Limiter....."0"

[Normal control setting]
CH1 Set value (SV) setting....."1000"

[Cascade control setting]
Cascade Bias ......"-500"
Cascade Gain....."2000"




(b) Automatic refresh setting (Refer to Section 5.5)
Error code....."D50"
CH1 Measured Value (PV) setting ....."D51"

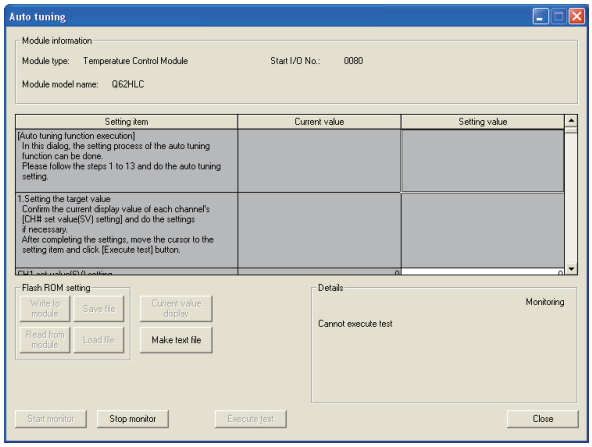



(c) Intelligent function module parameter write (Refer to Section 5.3.3)
Write the parameter values of the intelligent function module to the PLC CPU.
Perform this operation on the intelligent function module parameter setting module selection screen.

(d) Execution of auto tuning in the [Monitor/test] setting of [Online] menu (Refer to Section 5.6)

Auto tuning is executed in the procedure shown on the screen.

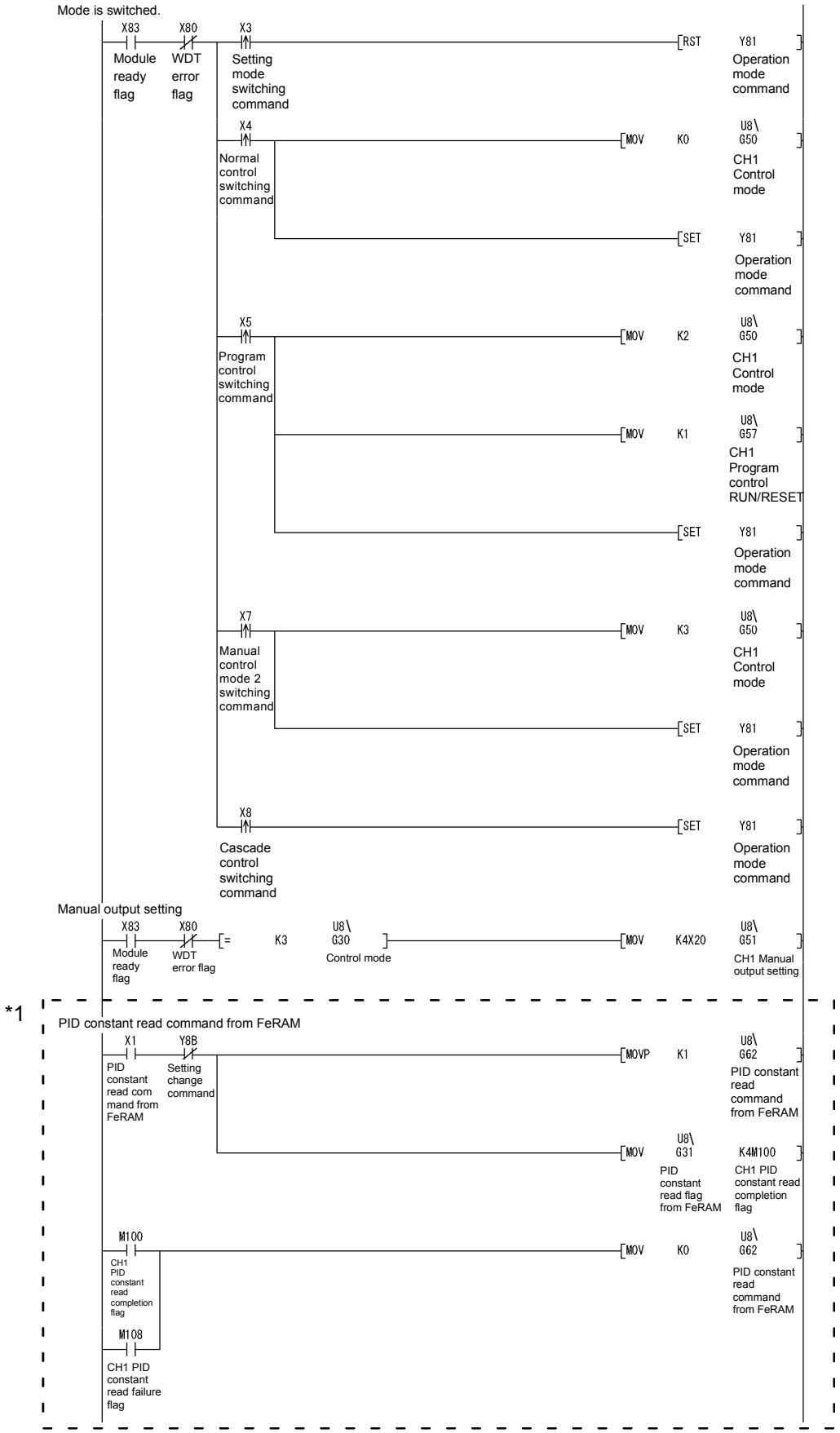
CH1 Automatic Backup Setting after AT of PID Constants ..... "Yes"

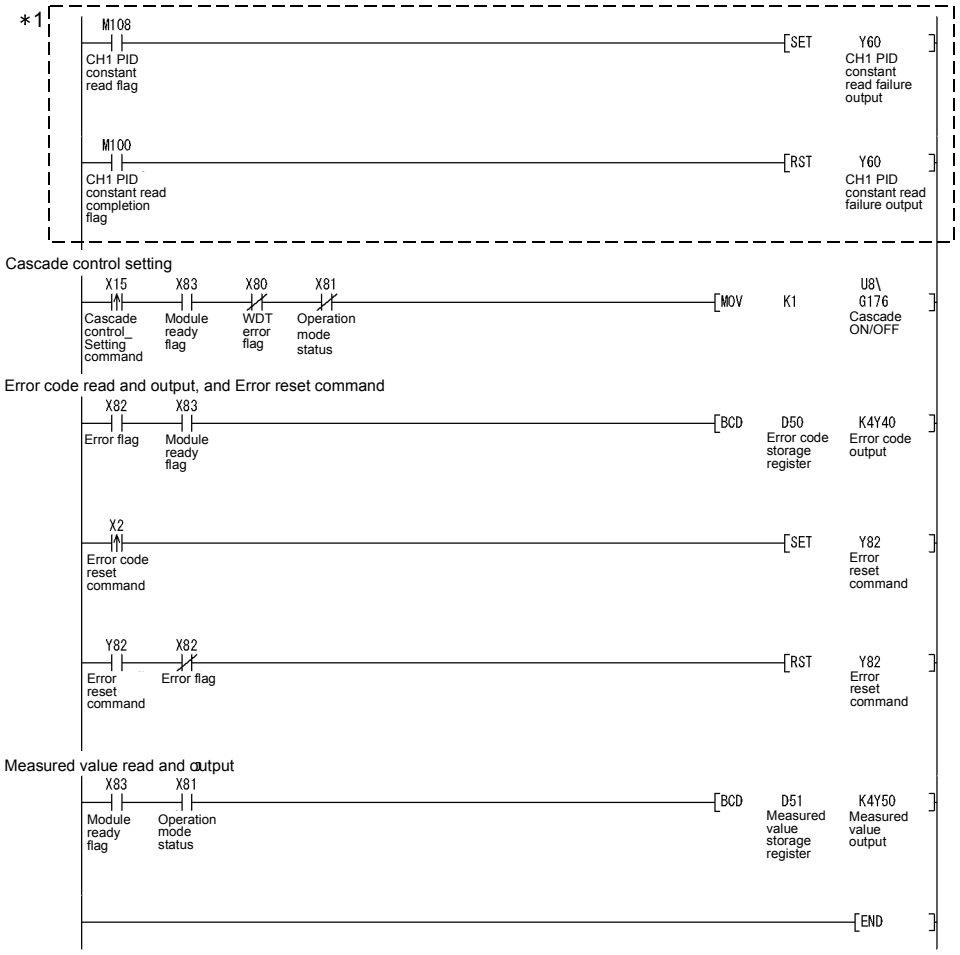



After completing auto tuning, change the following setting items.

- Operation mode command: [Operation mode] to [Setting mode]
- CH1 Auto tuning: [Start] to [Stop]

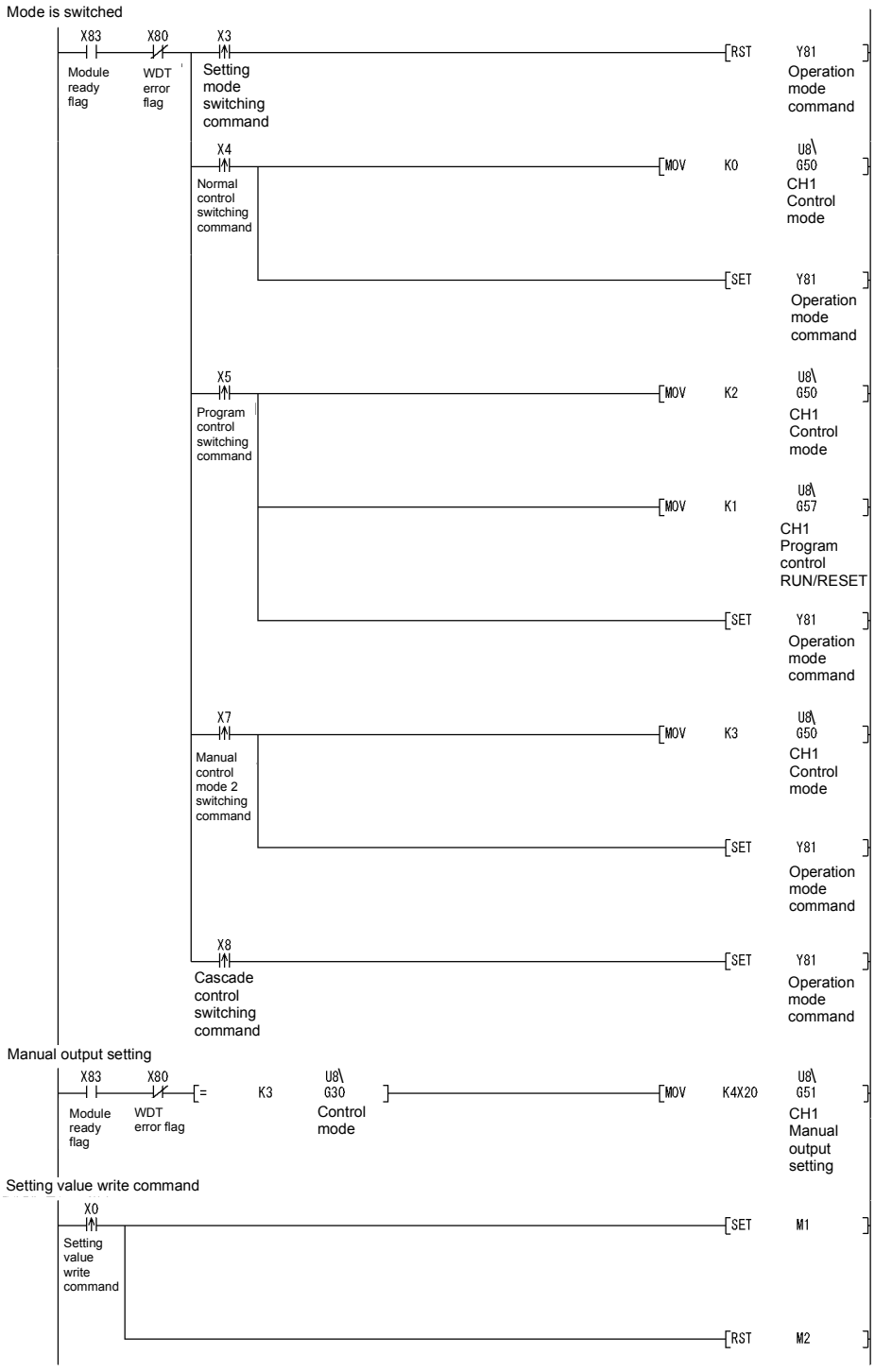
## (2) Program example

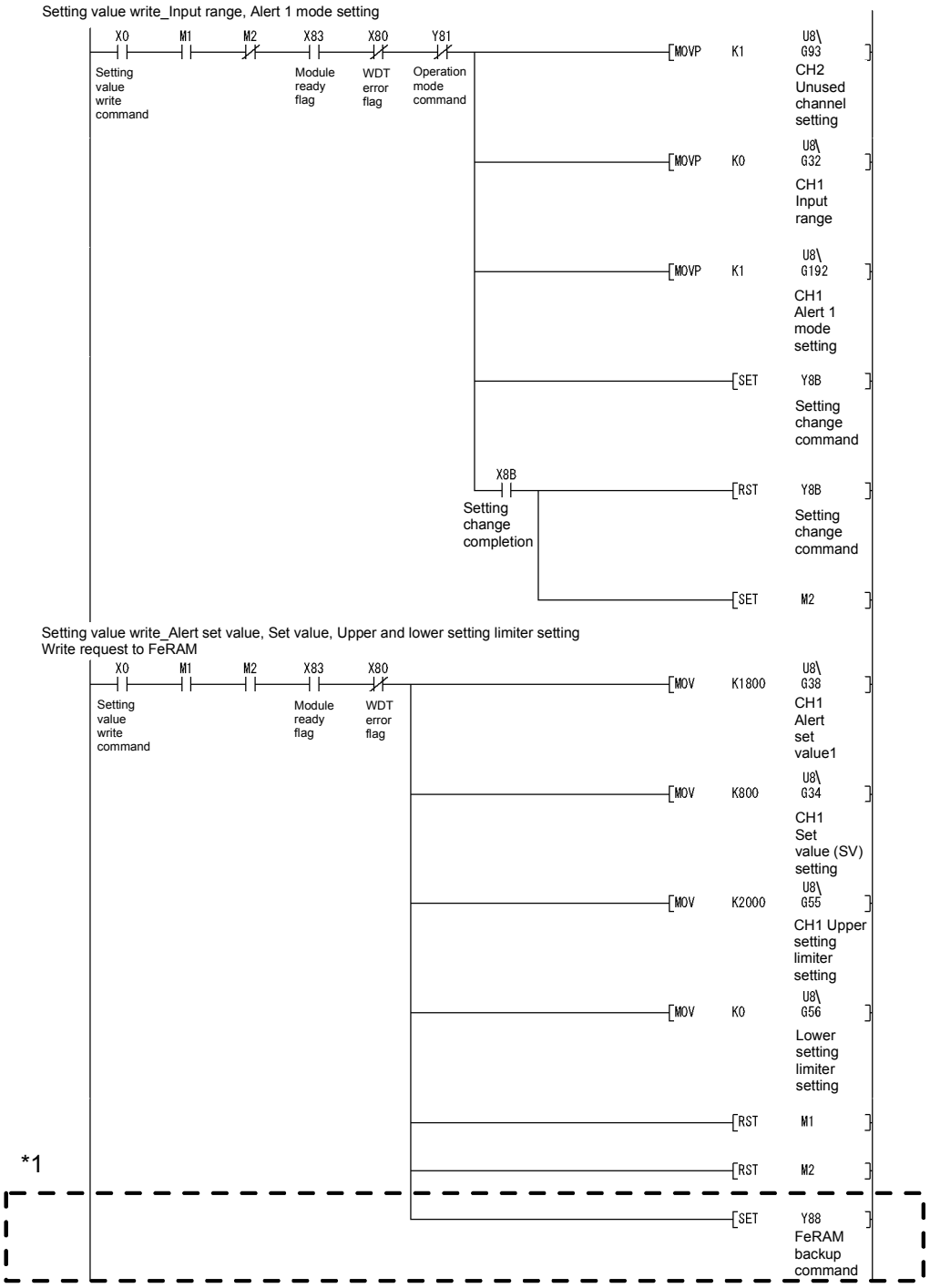




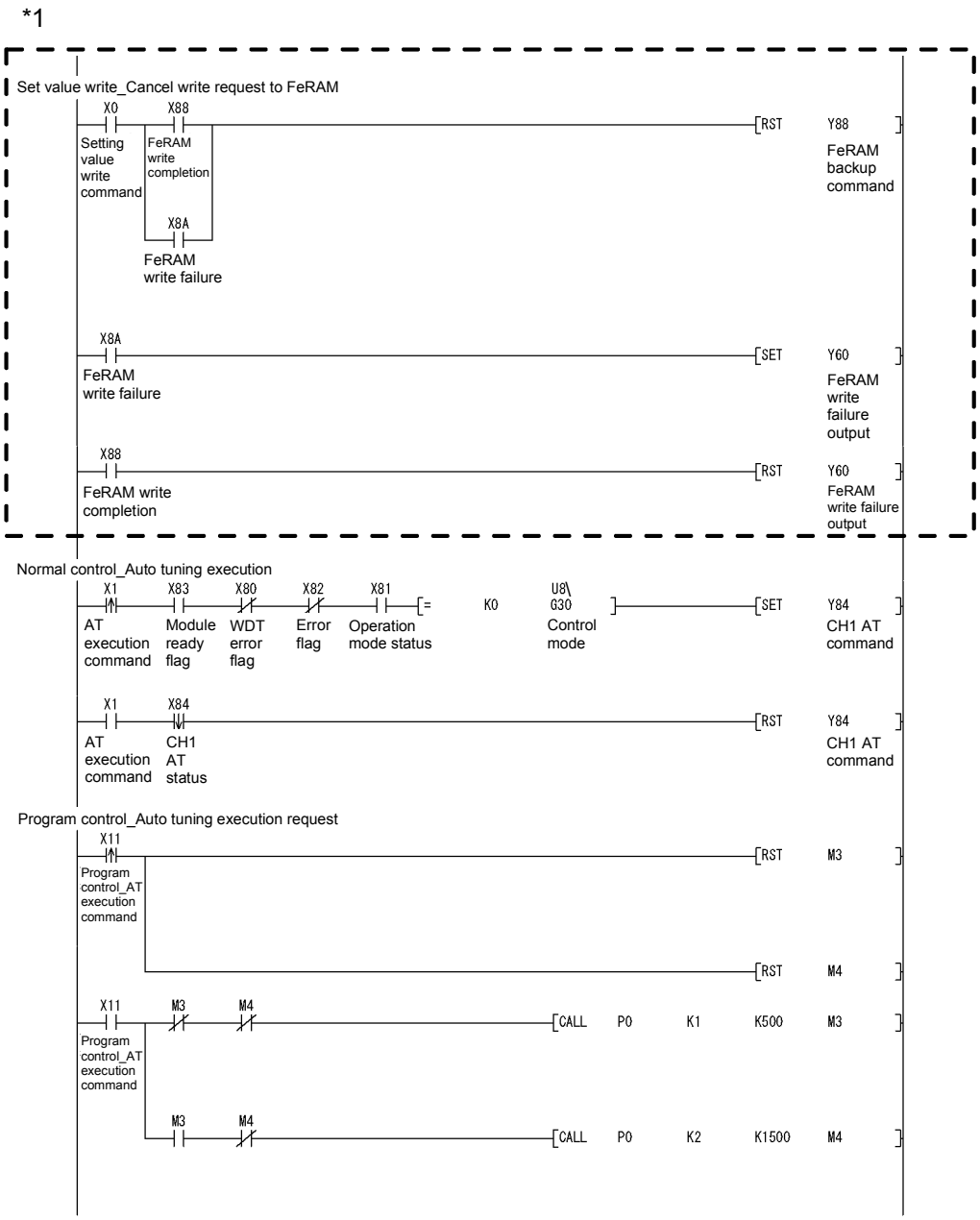

*1 Perform when the PID constant read from FeRAM is different from that of intelligent function module parameter.

## 6.2.2 Program example without using the utility package

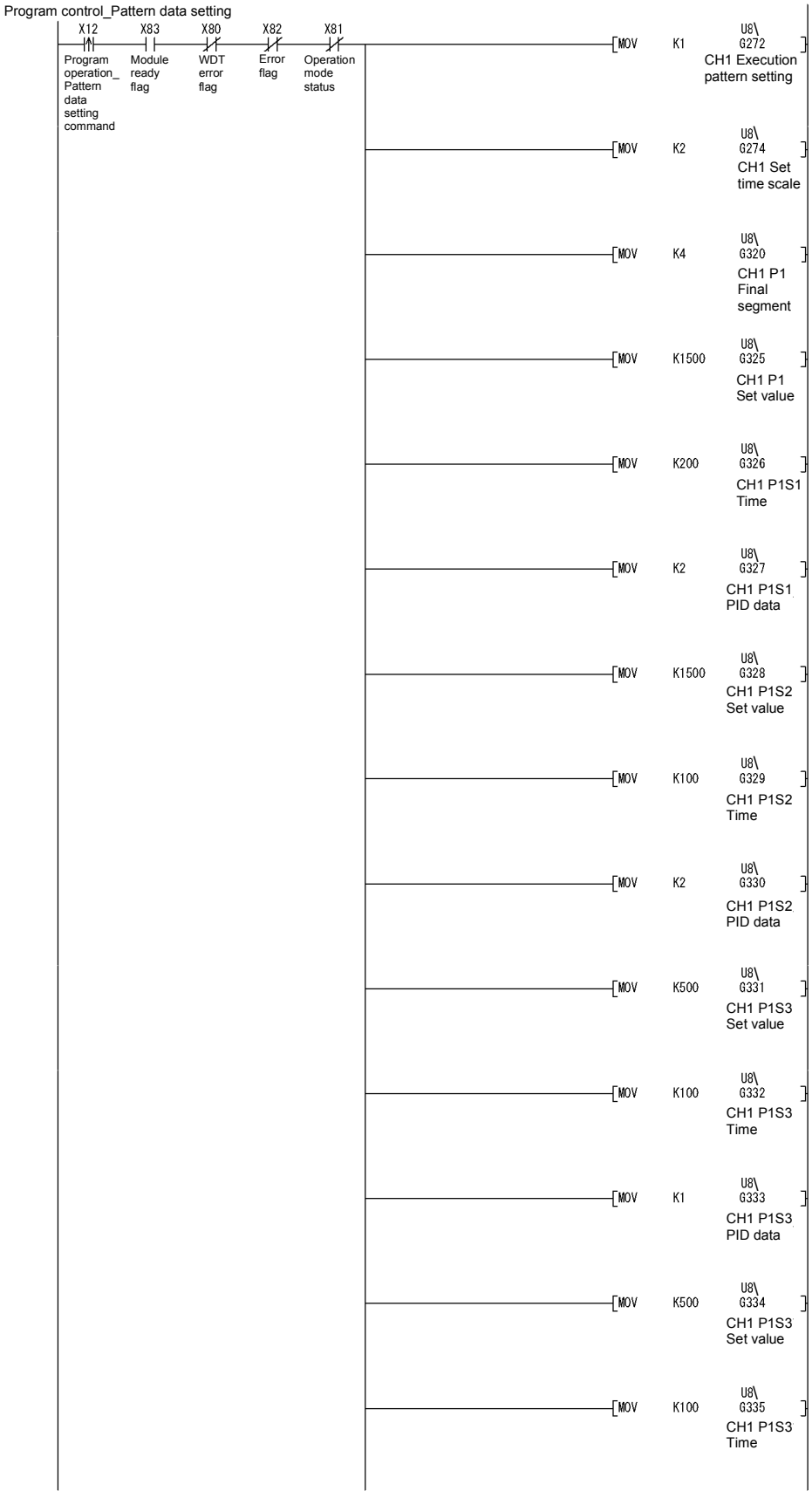


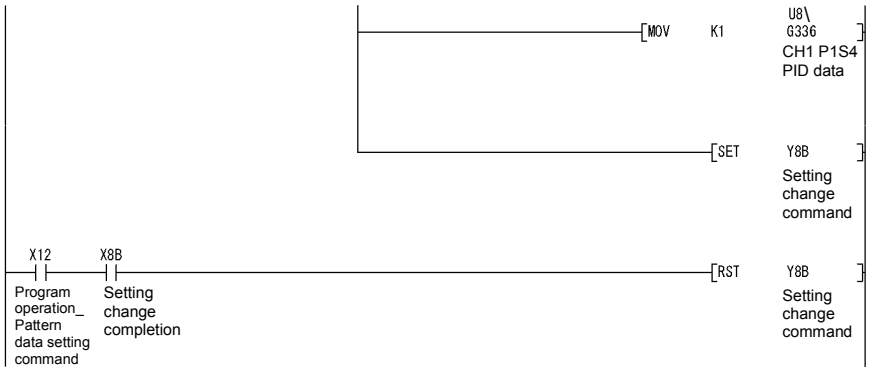


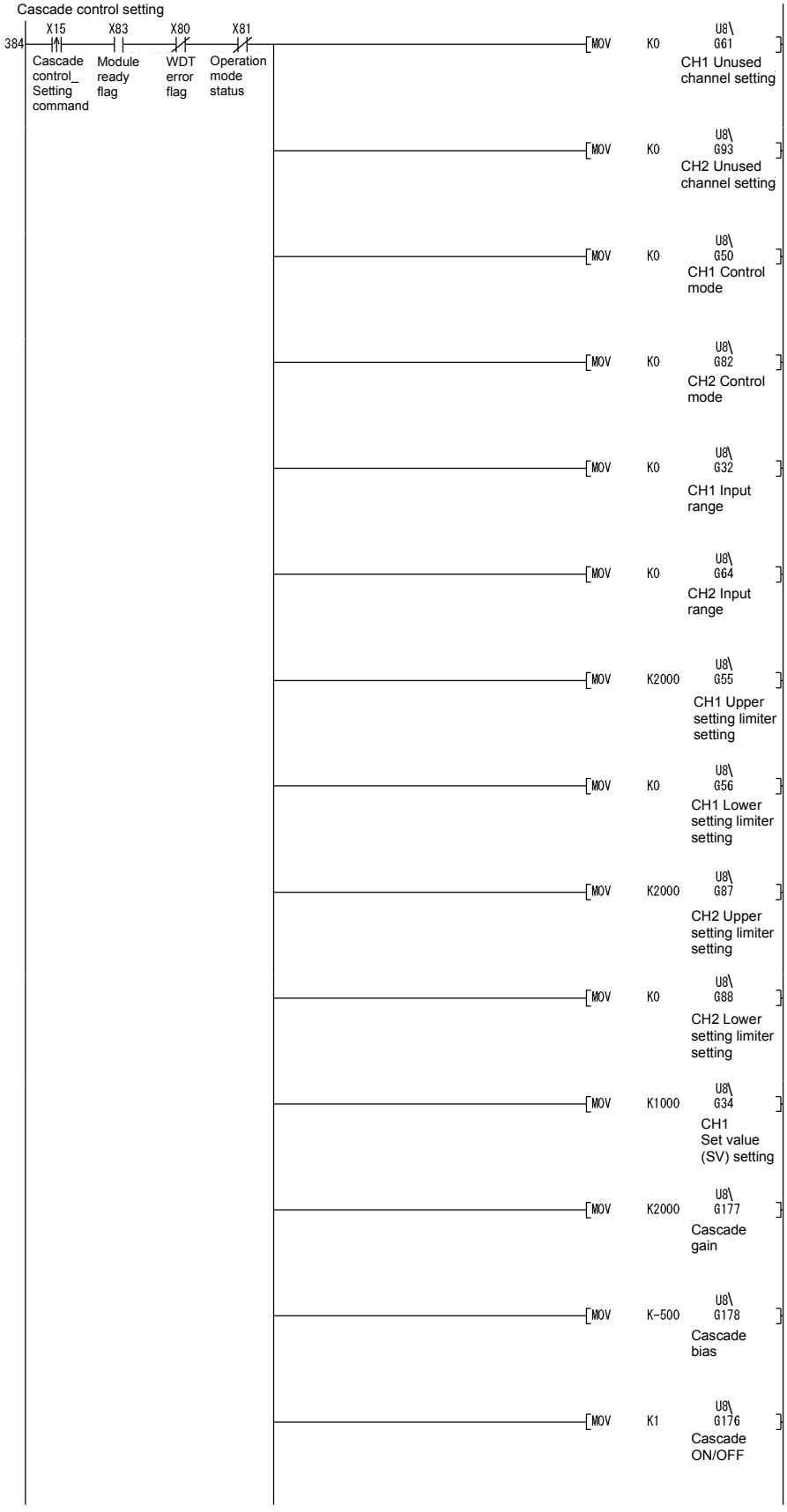

*1: Needed when registering the set input range, alert setting, set value and others to FeRAM. Write to FeRAM is not needed when using the GX Configurator-TC's initial setting or writing in the input range, alert setting, set value and others using sequence program at power-on.

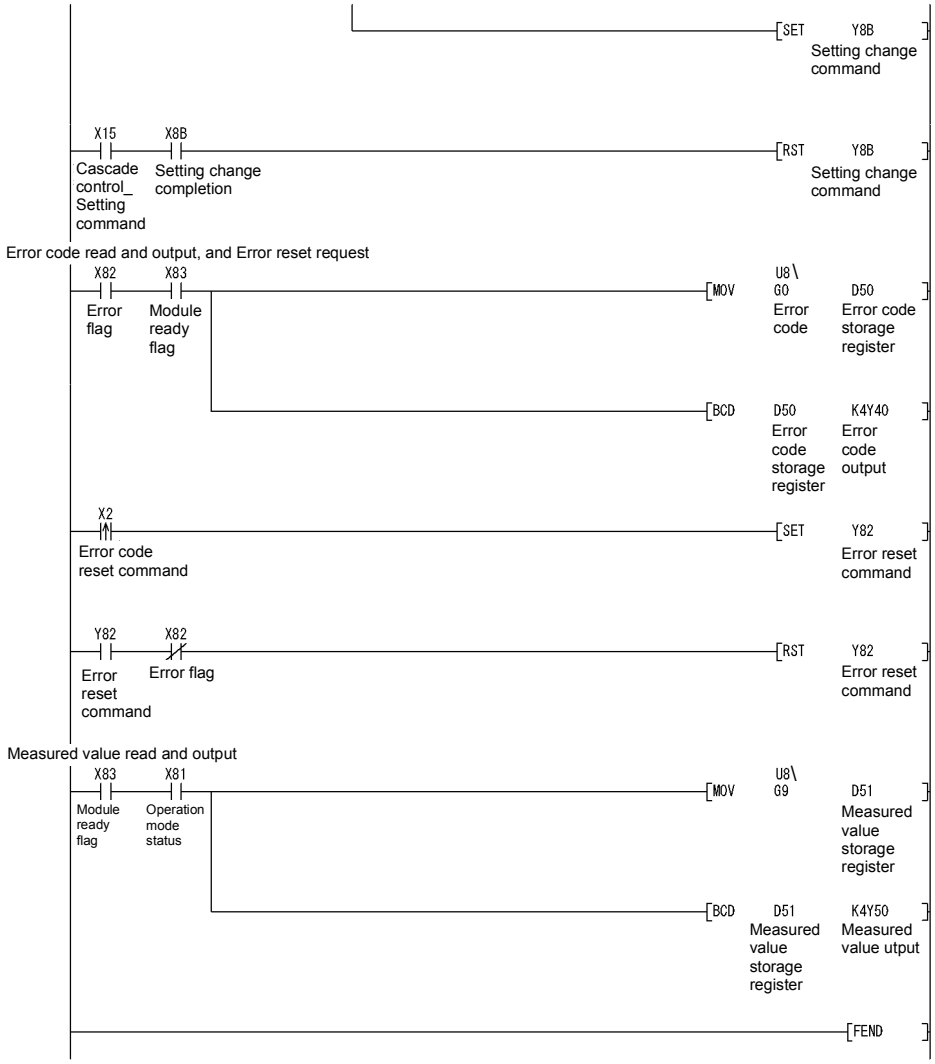


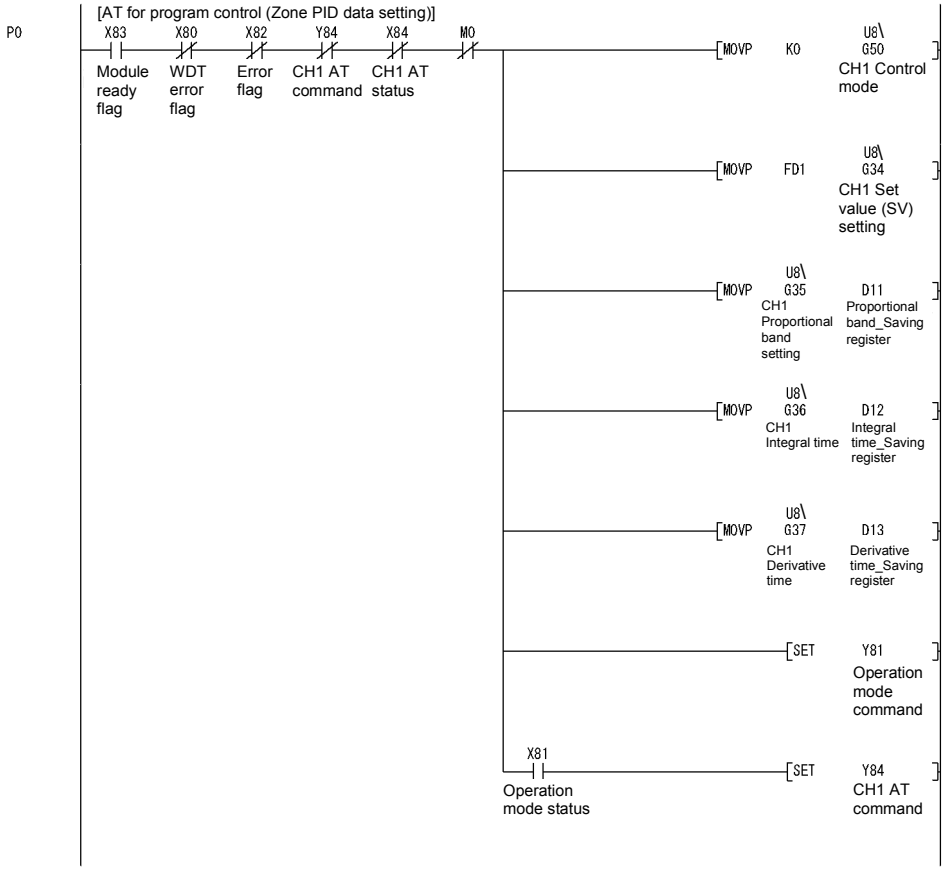

*1: Needed when registering the set input range, alert setting, set value and others to FeRAM. Write to FeRAM is not needed when using the GX Configurator-TC's initial setting or writing in the input range, alert setting, set value and others using sequence program at power-on.


Program control_Pattern data setting
X12
Program operation_ Pattern data setting command
X83
Module ready flag
X80
WDT error flag
X82
Error flag
X81
Operation mode status
MOV K1 U8\G272 CH1 Execution pattern setting
MOV K2 U8\G274 CH1 Set time scale
MOV K4 U8\G320 CH1 P1 Final segment
MOV K1500 U8\G325 CH1 P1 Set value
MOV K200 U8\G326 CH1 P1S1 Time
MOV K2 U8\G327 CH1 P1S1 PID data
MOV K1500 U8\G328 CH1 P1S2 Set value
MOV K100 U8\G329 CH1 P1S2 Time
MOV K2 U8\G330 CH1 P1S2 PID data
MOV K500 U8\G331 CH1 P1S3 Set value
MOV K100 U8\G332 CH1 P1S3 Time
MOV K1 U8\G333 CH1 P1S3 PID data
MOV K500 U8\G334 CH1 P1S3 Set value
MOV K100 U8\G335 CH1 P1S3 Time

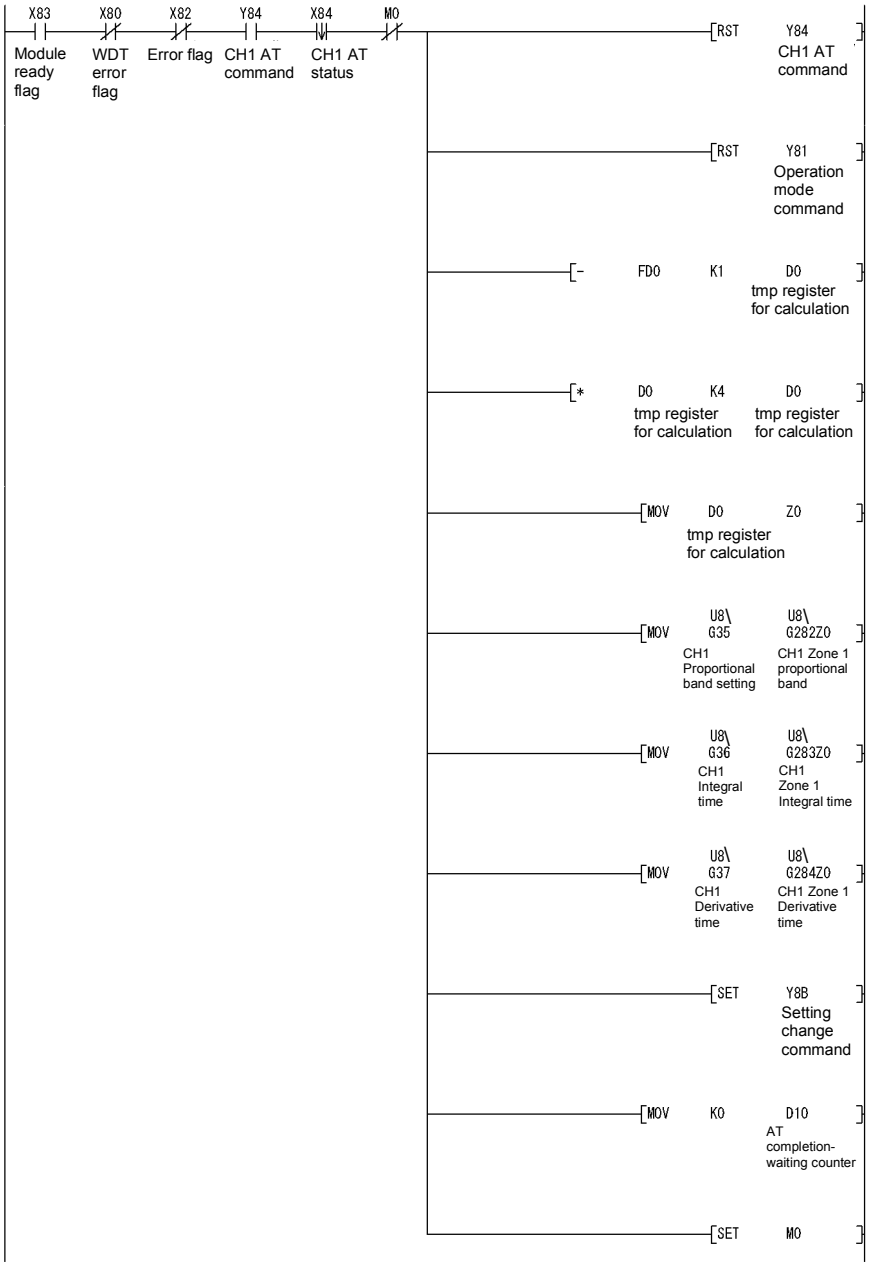

MOV
K1
U8\
G336
CH1 P1S4
PID data
SET
Y8B
Setting
change
command
X12
X8B
RST
Y8B
Program
operation_
Pattern
data setting
command
Setting
change
completion
Setting
change
command

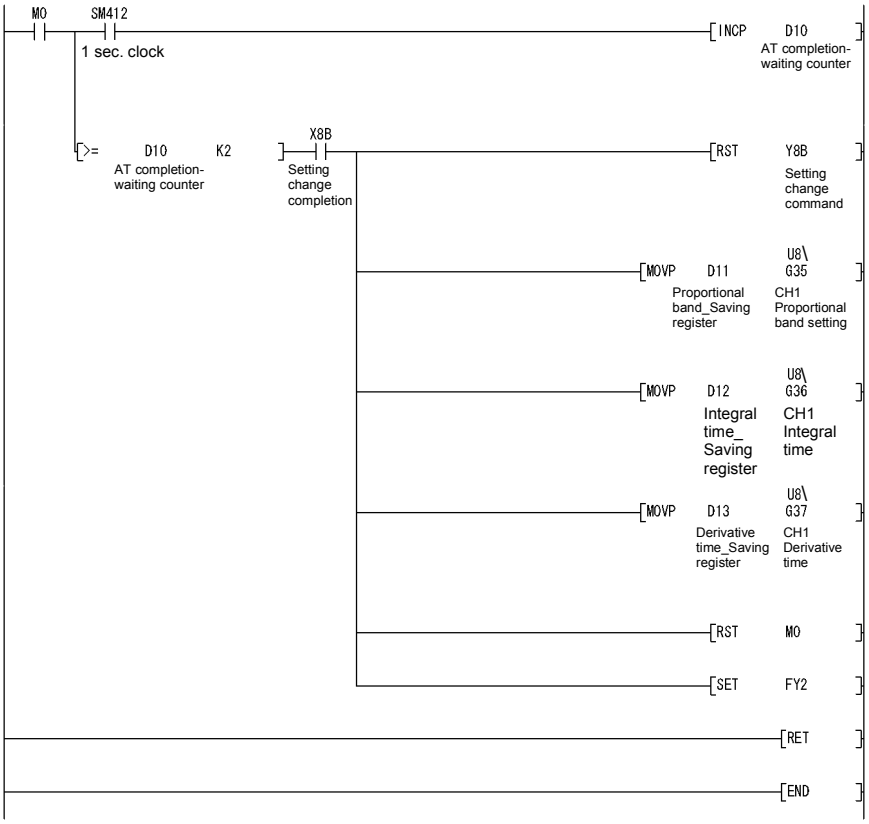

Cascade control setting
384
X15
Cascade control_ Setting command
X83
Module ready flag
X80
WDT error flag
X81
Operation mode status
MOV K0 U8\G61
CH1 Unused channel setting
MOV K0 U8\G93
CH2 Unused channel setting
MOV K0 U8\G50
CH1 Control mode
MOV K0 U8\G82
CH2 Control mode
MOV K0 U8\G32
CH1 Input range
MOV K0 U8\G64
CH2 Input range
MOV K2000 U8\G55
CH1 Upper setting limiter setting
MOV K0 U8\G56
CH1 Lower setting limiter setting
MOV K2000 U8\G87
CH2 Upper setting limiter setting
MOV K0 U8\G88
CH2 Lower setting limiter setting
MOV K1000 U8\G34
CH1 Set value (SV) setting
MOV K2000 U8\G177
Cascade gain
MOV K-500 U8\G178
Cascade bias
MOV K1 U8\G176
Cascade ON/OFF


SET Y8B
Setting change command
X15
Cascade control_ Setting command
X8B
Setting change completion
RST Y8B
Setting change command
Error code read and output, and Error reset request
X82
Error flag
X83
Module ready flag
MOV U8\G0 D50
Error code
Error code storage register
BCD D50 K4Y40
Error code storage register
Error code output
X2
Error code reset command
SET Y82
Error reset command
Y82
Error reset command
X82
Error flag
RST Y82
Error reset command
Measured value read and output
X83
Module ready flag
X81
Operation mode status
MOV U8\G9 D51
Measured value storage register
BCD D51 K4Y50
Measured value storage register
Measured value utput
FEND


P0
[AT for program control (Zone PID data setting)]
X83
Module ready flag
X80
WDT error flag
X82
Error flag
Y84
CH1 AT command
X84
CH1 AT status
M0
MOVP K0 U8\G50 CH1 Control mode
MOVP FD1 U8\G34 CH1 Set value (SV) setting
MOVP U8\G35 CH1 Proportional band setting D11 Proportional band_Saving register
MOVP U8\G36 CH1 Integral time D12 Integral time_Saving register
MOVP U8\G37 CH1 Derivative time D13 Derivative time_Saving register
SET Y81 Operation mode command
X81
Operation mode status
SET Y84 CH1 AT command


6 - 17

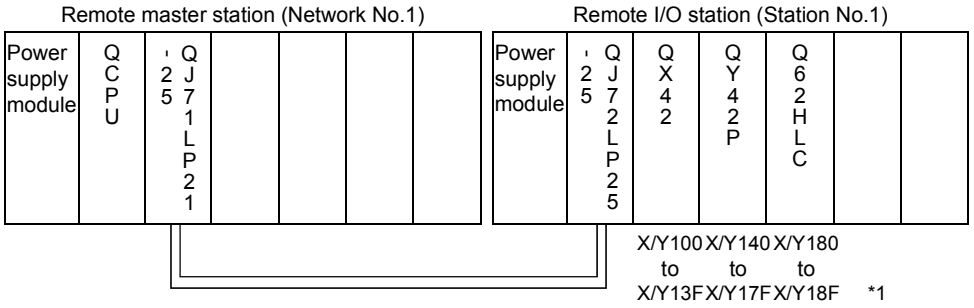

X83
Module ready flag
X80
WDT error flag
X82
Error flag
Y84
CH1 AT command
X84
CH1 AT status
M0
RST Y84
CH1 AT command
RST Y81
Operation mode command
- FD0 K1 D0
tmp register for calculation
* D0 K4 D0
tmp register for calculation
tmp register for calculation
MOV D0 Z0
tmp register for calculation
MOV U8\G35 U8\G282Z0
CH1 Proportional band setting
CH1 Zone 1 proportional band
MOV U8\G36 U8\G283Z0
CH1 Integral time
CH1 Zone 1 Integral time
MOV U8\G37 U8\G284Z0
CH1 Derivative time
CH1 Zone 1 Derivative time
SET Y8B
Setting change command
MOV K0 D10
AT completion-waiting counter
SET M0


M0
SM412
1 sec. clock
INCP
D10
AT completion-waiting counter
>=
D10
K2
AT completion-waiting counter
X8B
Setting change completion
RST
Y8B
Setting change command
MOVP
D11
Proportional band_Saving register
U8\G35
CH1 Proportional band setting
MOVP
D12
Integral time_ Saving register
U8\G36
CH1 Integral time
MOVP
D13
Derivative time_Saving register
U8\G37
CH1 Derivative time
RST
M0
SET
FY2
RET
END

## 6.3 For Use on Remote I/O Network

System configuration used in the program explanation

### (1) System configuration




*1: Device numbers are on the basis of the remote I/O master station.
The following table shows the device numbers on the basis of the remote station.

| Module | Device numbers on the basis of master station | Device numbers on the basis of remote station |
|---|---|---|
| QX42 | X100 to X13F | X0 to X3F |
| QY42P | X140 to Y17F | Y40 to Y7F |
| Q62HLC | X/Y180 to X/Y18F | X/Y80 to X/8F |

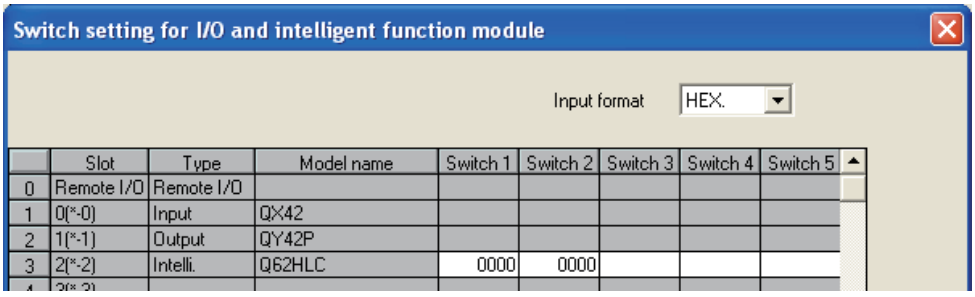
### (2) Program conditions

The programs are executed to control the temperature measured by the thermocouple (K: -200 to 1372℃) connected to channel 1.

- According to input signals, normal control/program control/manual control2 (simplified analog/digital conversion)/cascade control is executed.
- They include write data error code reading and error code resetting programs.

### (3) Intelligent function module switch setting

Set the intelligent function module switch setting as follows.
For details of the intelligent function module switch setting, refer to Section 4.5.



(a) Initial settings

| Device | Function | Description |
|---|---|---|
| X100 | Setting value write command | Sets the parameter to execute normal control and program control using CH 1 and writes into FeRAM. |
| X101 | PID constant read command from FeRAM (when GX Configurator-TC is used) | Reads PID constant set by auto tuning from FeRAM. |
| | Auto tuning execution command (when GX Configurator-TC is not used) | Executes auto tuning for the specified set value. Operates only in the normal control mode. |
| X102 | Error code reset command | Clears(0) error codes. |
| X103 | Setting mode switching command | Switches into the setting mode by setting from OFF to ON. |
| X104 | Normal control mode switching command | Switches into the normal control mode by setting from OFF to ON. Needs to set parameters for normal control before switching. |
| X105 | Program control mode switching command | Switches into the program control mode by setting from OFF to ON. Needs to set parameters for program control before switching. |
| X107 | Manual control mode 2 switching command | Switches into the manual control mode 2 by setting from OFF to ON. After the switching, the operation is performed by the values of manual output settings (X20 to X2F). |
| X108 | Cascade control switching command | Switches into the cascade control mode by setting from OFF to ON. Needs to set parameters for cascade control before switching. |
| X111 | Program control auto tuning execution command | Executes auto tuning for program control.*1 |
| X112 | Program control pattern data setting command | Sets the pattern data for executing program control.*2 |
| X115 | Cascade control setting command | Sets parameters for executing cascade control.*4 |
| X120 to X12F | Manual output setting | Specifies the manipulation value when manual control mode 2 is operated. |
| Y140 to Y14F | Error code output | Outputs error codes as BCD value. |
| Y150 to Y15F | Measured value output | Outputs measured value as BCD value. |
| Y160 | FeRAM read failure output (when GX Configurator-TC is used) | Outputs when reading from FeRAM has failed. |
| | FeRAM write failure output (when GX Configurator-TC is not used) | Outputs when writing into FeRAM has failed. |
| D50 | Error code | Stores error codes that are read out when the error has occurred. |
| D51 | Measured value | Stores measured values that are read out. |

When turning ON the setting value write command X100, the parameters, which are set in this program example, are as follows.

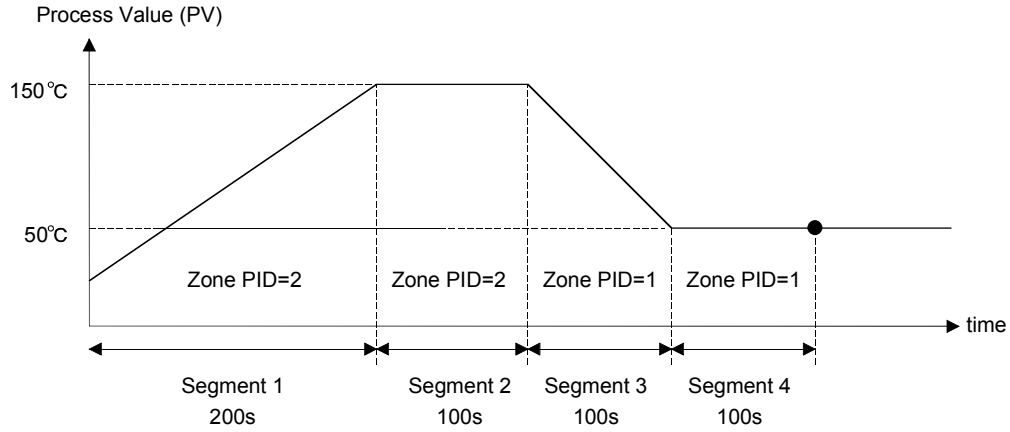
- CH2 Unused Channel Setting : 1 (Unused. However, set "used" when used for cascade control. In this case, parameter is set to the same as CH1.)
- CH1 Input Range : 0 (K: -200 to 1372℃)
- CH1 Alert 1 Mode Setting : 1 (UprLmt Input Alert)
- CH1 Alert Set Value 1 : 1800 (180℃)
- CH1 Set Value Setting : 800 (180℃)
- CH1 Upper Setting Limiter : 2000 (200℃)
- CH1 Lower Setting Limiter : 0 (0℃)

When program control is used, first turn on X112 (program control pattern data setting command), and then turn on X100.

*1: PID constants of zone1 and zone2 that are used for program control are set.
By turning on X111, switch into normal control mode, and then execute auto tuning.
Then, PID constant of zone is set when the auto tuning ends.

*2: Before executing program control, PID constants of zone1 and zone2 need to be set by the program control auto tuning execution command (X111).
When program control is executed by the set pattern, it operates as follows.

| Segment number | Setting value | | |
|---|---|---|---|
| | Set value | Executing time | Zone PID data No. |
| Segment 1 | 1500 (150℃) | 200 (200s) | 2 (Zone 2) |
| Segment 2 | 1500 (150℃) | 100 (100s) | 2 (Zone 2) |
| Segment 3 | 500 (50℃) | 100 (100s) | 1 (Zone 1) |
| Segment 4 | 500 (50℃) | 100 (200s) | 1 (Zone 1) |




*3: After setting parameter by the cascade control setting command (X115), execute cascade control by turning on the cascade control switching command (X108).
In this program example, the parameter setting for cascade control and the other parameter settings (normal control, program control, and manual control2) cannot be set at the same time.
After setting the parameter for cascade control, do not use the normal control mode switching command (X104), program control mode switching command (X105), and manual control mode 2 switching command (X107).

**POINT**

For details on the MELSECNET/H remote I/O network, refer to the Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network).

## 6.3.1 Program example using the utility package

### (1) Operating GX Developer

(a) Network parameter setting

- Network type : MNET/H (remote master)
- Head I/O No. : 0000H
- Network No. : 1
- Total number of (slave) stations : 1
- Mode : Online
- Network range assignment :

| StationNo. | M station -> R station | | | | | | M station <- R station | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Y | | | Y | | | X | | | X | | |
| | Points | Start | End | Points | Start | End | Points | Start | End | Points | Start | End |
| 1 | 256 | 0100 | 01FF | 256 | 0000 | 00FF | 256 | 0100 | 01FF | 256 | 0000 | 00FF |

| StationNo. | M station -> R station | | | M station <- R station | | | M station -> R station | | | M station <- R station | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | | | B | | | W | | | W | | |
| | Points | Start | End | Points | Start | End | Points | Start | End | Points | Start | End |
| 1 | | | | | | | | | | 256 | 0500 | 05FF |

- Refresh parameters :

| | Link side | | | | | PLC side | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dev. name | Points | Start | End | | Dev. name | Points | Start | End |
| Transfer SB | SB | 512 | 0000 | 01FF | ↔ | SB | 512 | 0000 | 01FF |
| Transfer SW | SW | 512 | 0000 | 01FF | ↔ | SW | 512 | 0000 | 01FF |
| Random cyclic | LB | | | | ↔ | | | | |
| Random cyclic | LW | | | | ↔ | | | | |
| Transfer1 | LX | 512 | 0000 | 01FF | ↔ | X | 512 | 0000 | 01FF |
| Transfer2 | LY | 512 | 0000 | 01FF | ↔ | Y | 512 | 0000 | 01FF |
| Transfer3 | LW | 256 | 0500 | 05FF | ↔ | W | 256 | 0500 | 05FF |
| Transfer4 | | | | | ↔ | | | | |
| Transfer5 | | | | | ↔ | | | | |
| Transfer6 | | | | | ↔ | | | | |

(2) Operating the utility package

(a) Initial setting (Refer to Section 5.4)

<When cascade control is not executed>
CH1 Input Range ..... "0"
CH2 Unused Channel Setting ..... "Not Used"

[Limiter setting]
CH1 Upper Setting Limiter ..... "2000"
CH1 Lower Setting Limiter ..... "0"

[Alert function setting]
CH1 Alert 1 Mode Setting ..... "UprLmt Input"
CH1 Alert Set Value 1 ..... "1800"

[Normal control setting]
CH1 Set value (SV) setting ..... "800"

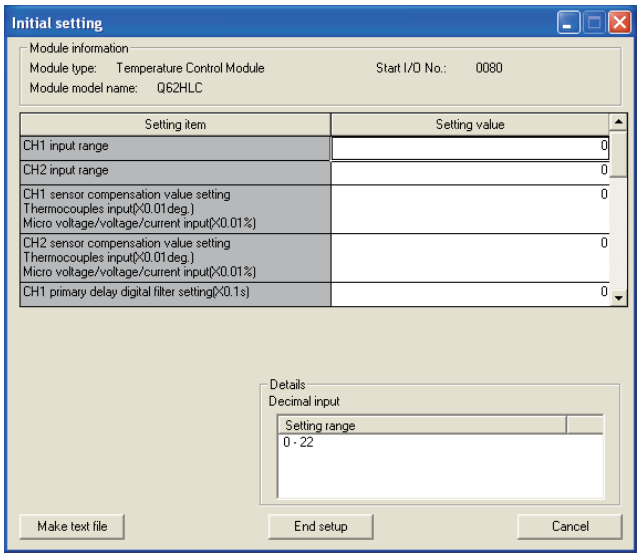
[Program control setting]
CH1 Execution Pattern ..... "Program Pattern 1"
CH1 Time Scale ..... "1s"
CH1 Program Pattern 1
Final Segment ..... "4"
Segment 1 Set Value (SV) setting ..... "1500"
Segment 1 Executing Time ..... "200"
Segment 1 Zone PID data No. ..... "2"
Segment 2 Set Value (SV) setting ..... "1500"
Segment 2 Executing Time ..... "100"
Segment 2 Zone PID data No. ..... "2"
Segment 3 Set Value (SV) setting ..... "500"
Segment 3 Executing Time ..... "100"
Segment 3 Zone PID data No. ..... "1"
Segment 4 Set Value (SV) setting ..... "500"
Segment 4 Executing Time ..... "100"
Segment 4 Zone PID data No. ..... "1"

<When cascade control is executed>
CH1 Input Range ..... "0"
CH2 Input Range ..... "0"
CH1 Unused Channel Setting ..... "Used"
CH2 Unused Channel Setting ..... "Used"

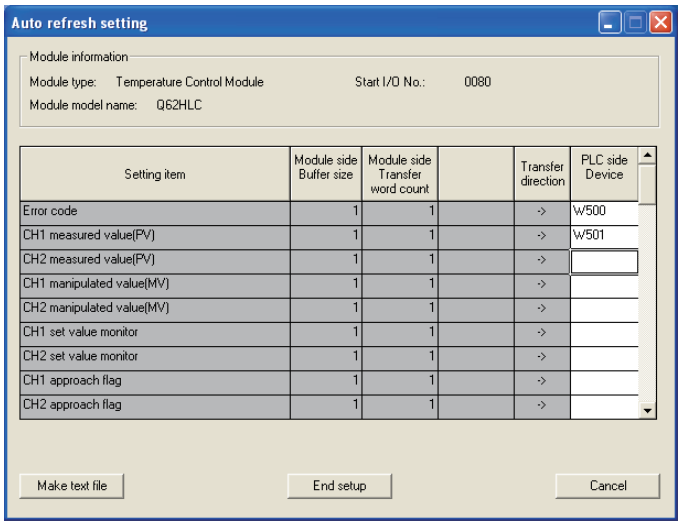
[Limiter setting]
CH1 Upper Setting Limiter ..... "2000"
CH1 Lower Setting Limiter ..... "0"
CH2 Upper Setting Limiter ..... "2000"
CH2 Lower Setting Limiter ..... "0"

[Normal control setting]
CH1 Set value (SV) setting ..... "1000"

[Cascade control setting]
Cascade Bias ..... "-500"
Cascade Gain ..... "2000"

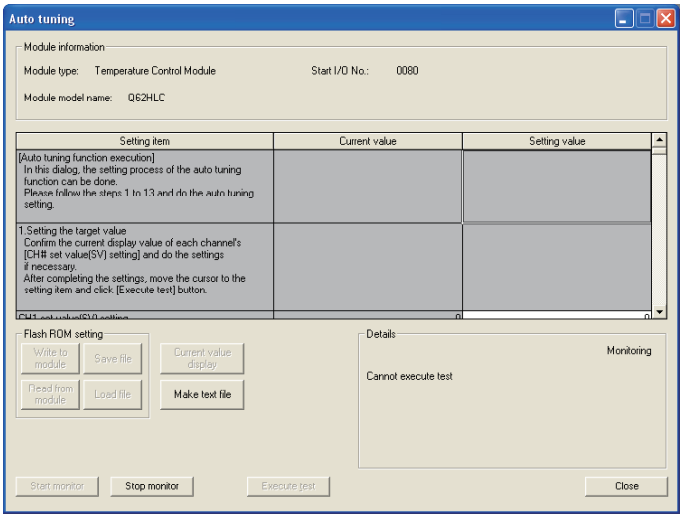



(b) Auto refresh setting (Refer to Section 5.5)
Error Code ..... "W500"
CH1 Measured Value (PV) ..... "W501"




(c) Intelligent function module parameter write (Refer to Section 5.3.3)
The intelligent function module parameters are written to the remote I/O station.
Perform this operation on the parameter setting unit selection screen on intelligent function module.

(d) Executes auto tuning at the monitor/test in the online menu.
(Refer to Section 5.6)
Executes auto tuning following the order described on the screen below.
CH1 Automatic Backup after AT of PID contents ....."Yes"




Change the items below after auto tuning has completed.
• Operation mode command: "Operation mode" to "Setting mode"
• CH1 Auto tuning: "Start" to "Stop"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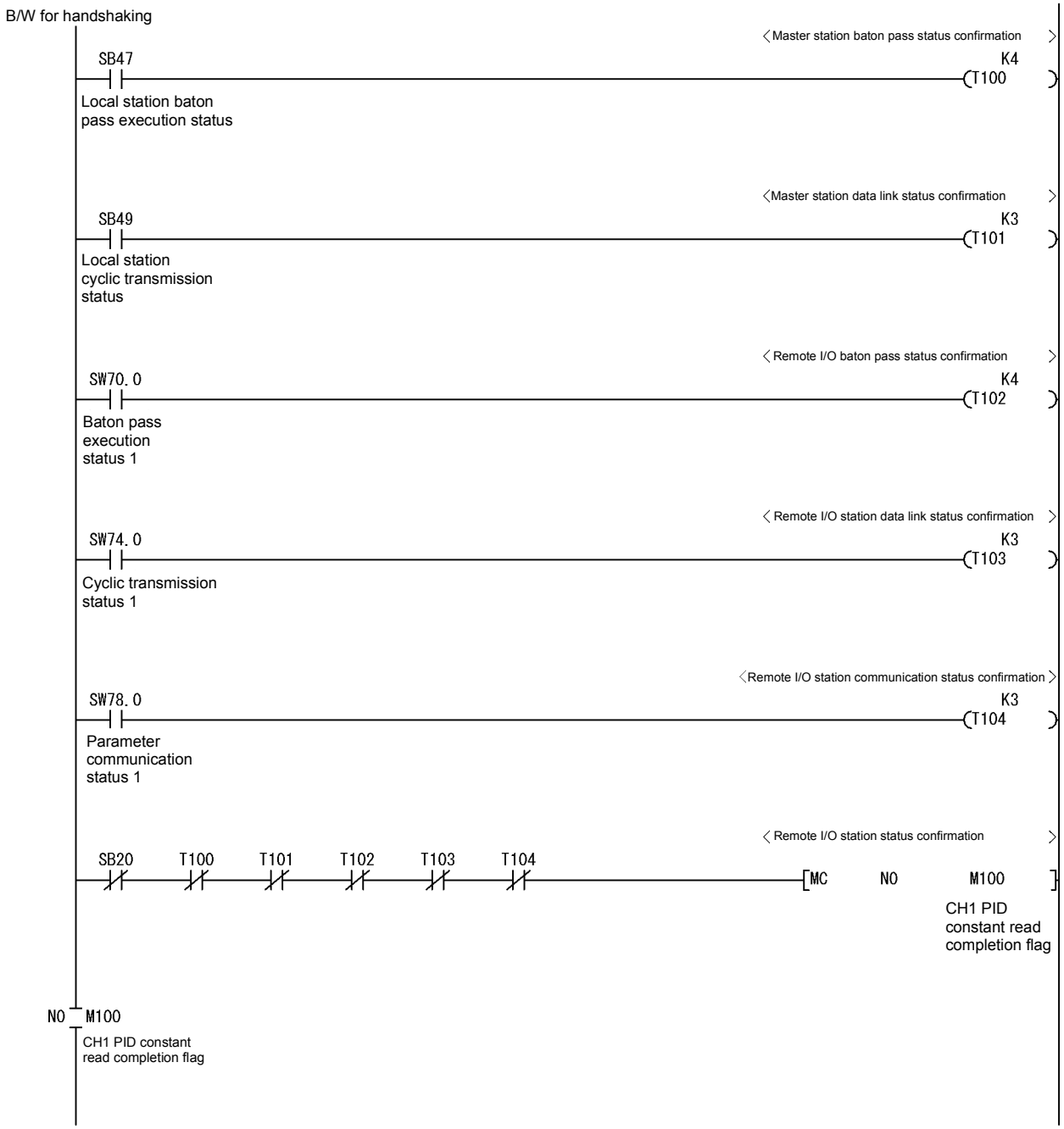
### (3) Program example





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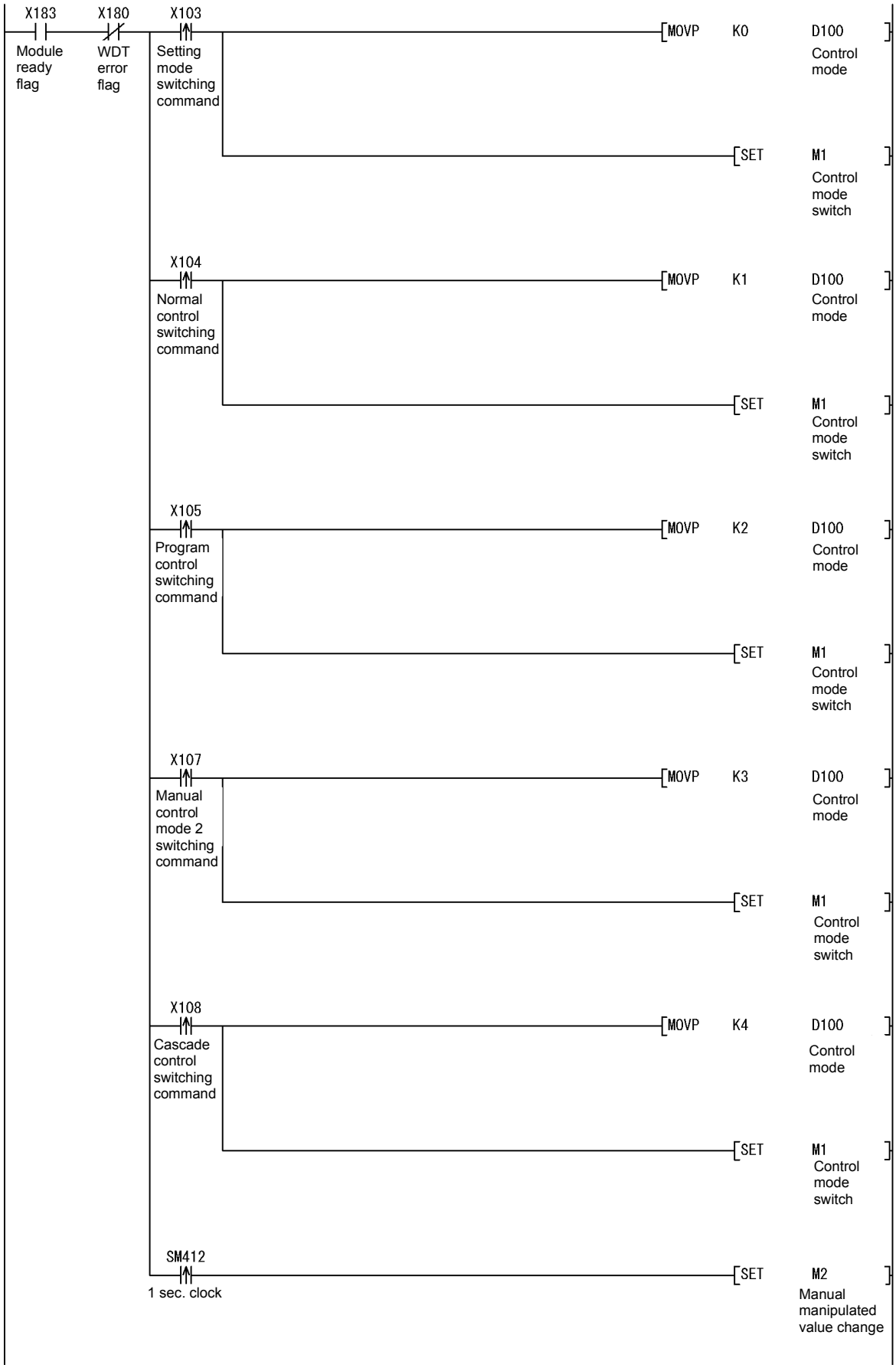
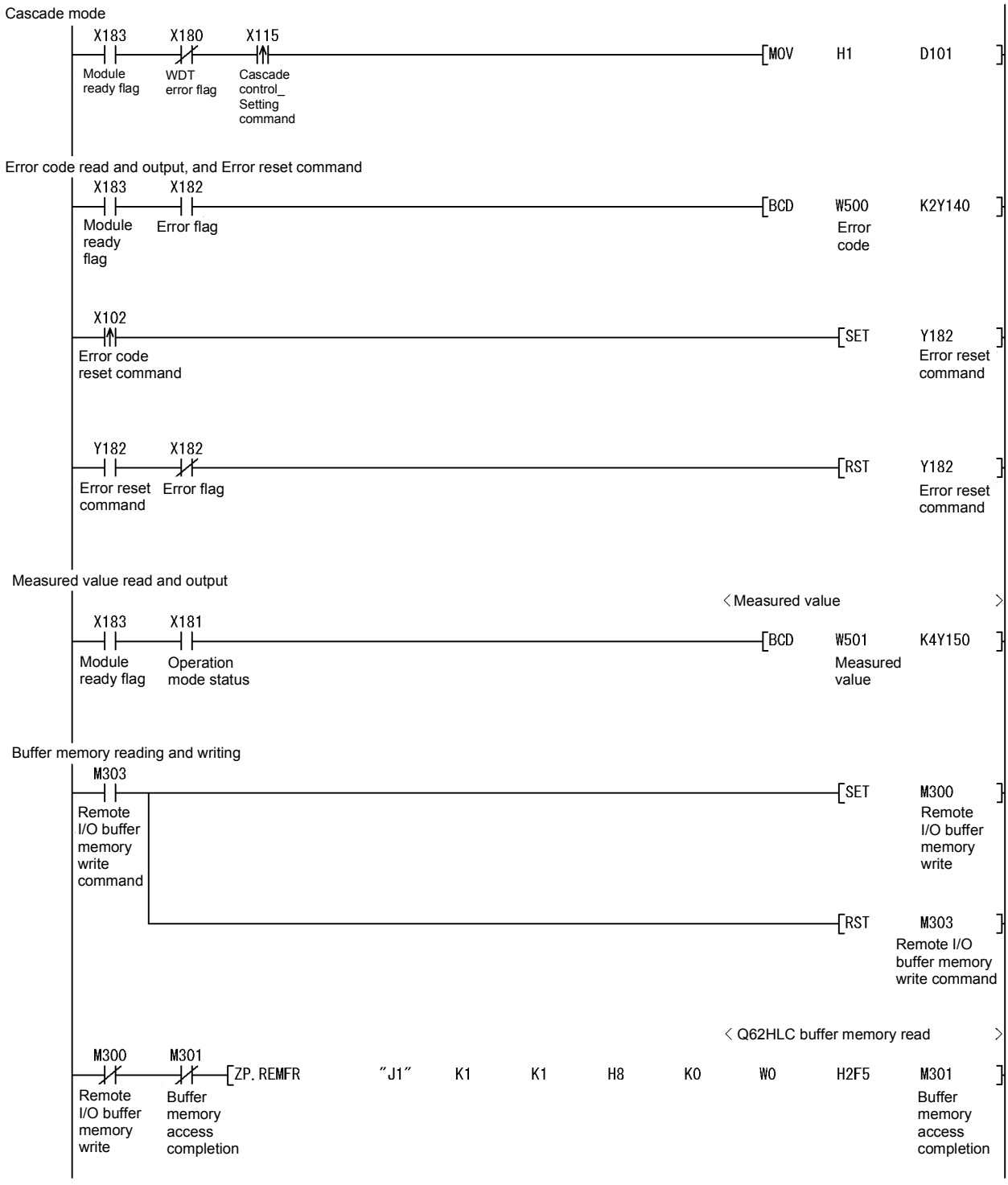

X183
Module ready flag
X180
WDT error flag
X103
Setting mode switching command
MOVP K0 D100
Control mode
SET M1
Control mode switch
X104
Normal control switching command
MOVP K1 D100
Control mode
SET M1
Control mode switch
X105
Program control switching command
MOVP K2 D100
Control mode
SET M1
Control mode switch
X107
Manual control mode 2 switching command
MOVP K3 D100
Control mode
SET M1
Control mode switch
X108
Cascade control switching command
MOVP K4 D100
Control mode
SET M1
Control mode switch
SM412
1 sec. clock
SET M2
Manual manipulated value change


Cascade mode
X183
Module ready flag
X180
WDT error flag
X115
Cascade control_ Setting command
MOV H1 D101
Error code read and output, and Error reset command
X183
Module ready flag
X182
Error flag
BCD W500 K2Y140
Error code
X102
Error code reset command
SET Y182
Error reset command
Y182
Error reset command
X182
Error flag
RST Y182
Error reset command
Measured value read and output
〈Measured value
X183
Module ready flag
X181
Operation mode status
BCD W501 K4Y150
Measured value
Buffer memory reading and writing
M303
Remote I/O buffer memory write command
SET M300
Remote I/O buffer memory write
RST M303
Remote I/O buffer memory write command
〈Q62HLC buffer memory read
M300
Remote I/O buffer memory write
M301
Buffer memory access completion
ZP. REMFR "J1" K1 K1 H8 K0 W0 H2F5 M301
Buffer memory access completion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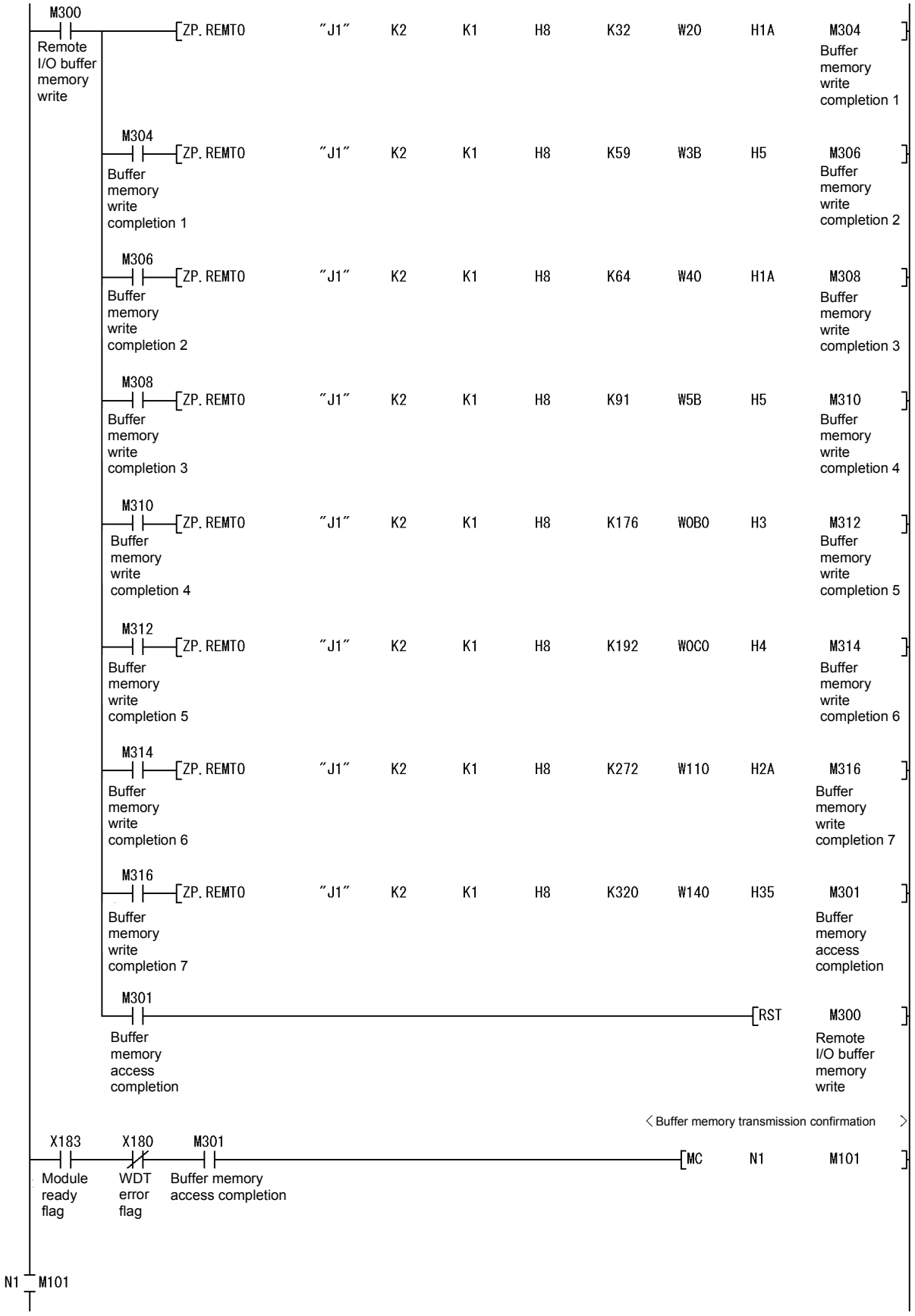
M300
Remote I/O buffer memory write
ZP.REMTO "J1" K2 K1 H8 K32 W20 H1A M304
Buffer memory write completion 1
M304
Buffer memory write completion 1
ZP.REMTO "J1" K2 K1 H8 K59 W3B H5 M306
Buffer memory write completion 2
M306
Buffer memory write completion 2
ZP.REMTO "J1" K2 K1 H8 K64 W40 H1A M308
Buffer memory write completion 3
M308
Buffer memory write completion 3
ZP.REMTO "J1" K2 K1 H8 K91 W5B H5 M310
Buffer memory write completion 4
M310
Buffer memory write completion 4
ZP.REMTO "J1" K2 K1 H8 K176 W0B0 H3 M312
Buffer memory write completion 5
M312
Buffer memory write completion 5
ZP.REMTO "J1" K2 K1 H8 K192 W0C0 H4 M314
Buffer memory write completion 6
M314
Buffer memory write completion 6
ZP.REMTO "J1" K2 K1 H8 K272 W110 H2A M316
Buffer memory write completion 7
M316
Buffer memory write completion 7
ZP.REMTO "J1" K2 K1 H8 K320 W140 H35 M301
Buffer memory access completion
M301
Buffer memory access completion
RST M300
Remote I/O buffer memory write
〈Buffer memory transmission confirmation〉
X183
Module ready flag
X180
WDT error flag
M301
Buffer memory access completion
MC N1 M101
N1 M101


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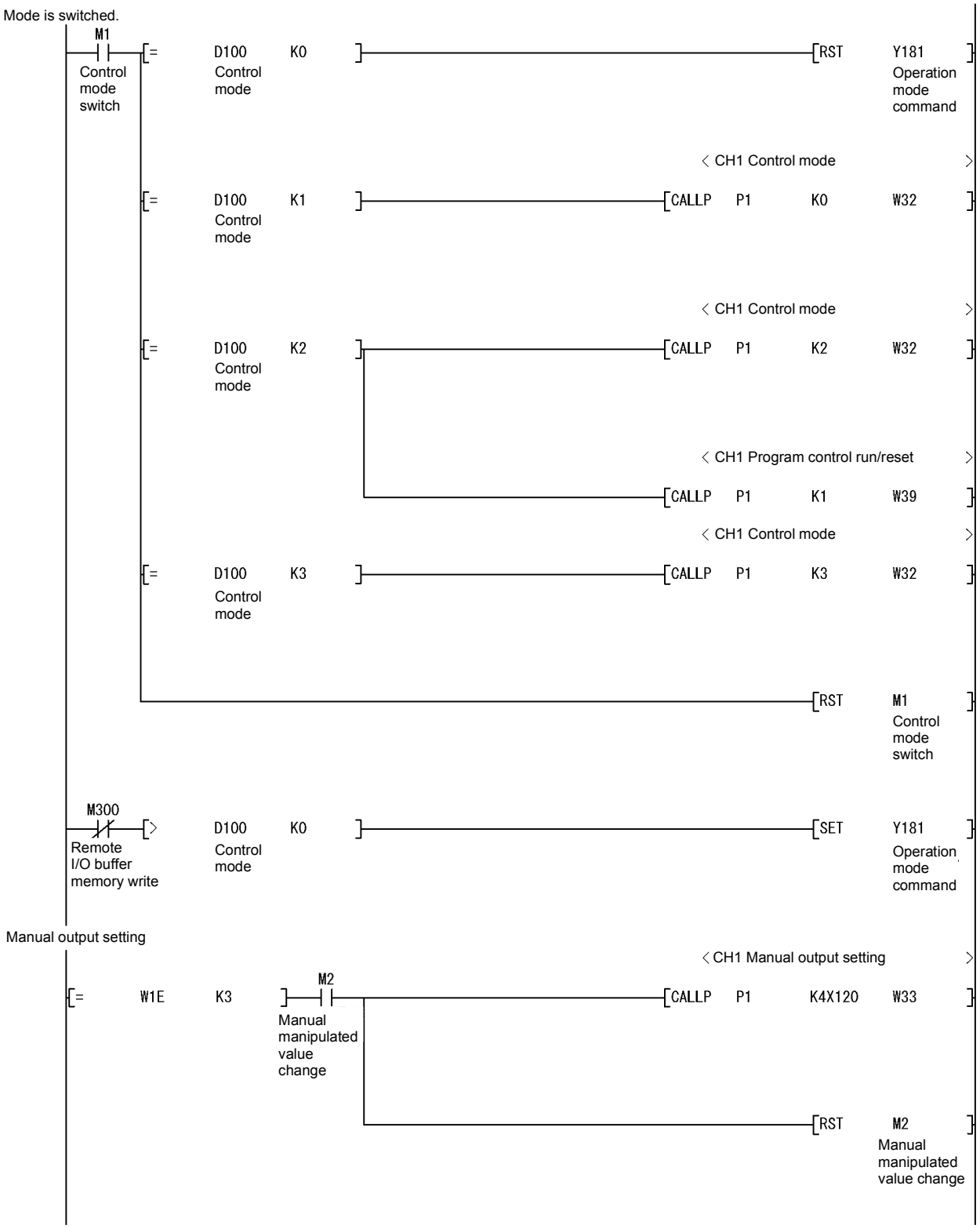
Mode is switched.
M1
Control mode switch
[= D100 K0
Control mode
[RST Y181
Operation mode command
< CH1 Control mode >
[= D100 K1
Control mode
[CALLP P1 K0 W32
< CH1 Control mode >
[= D100 K2
Control mode
[CALLP P1 K2 W32
< CH1 Program control run/reset >
[CALLP P1 K1 W39
< CH1 Control mode >
[= D100 K3
Control mode
[CALLP P1 K3 W32
[RST M1
Control mode switch
M300
Remote I/O buffer memory write
[> D100 K0
Control mode
[SET Y181
Operation mode command
Manual output setting
< CH1 Manual output setting >
[= W1E K3
M2
Manual manipulated value change
[CALLP P1 K4X120 W33
[RST M2
Manual manipulated value change


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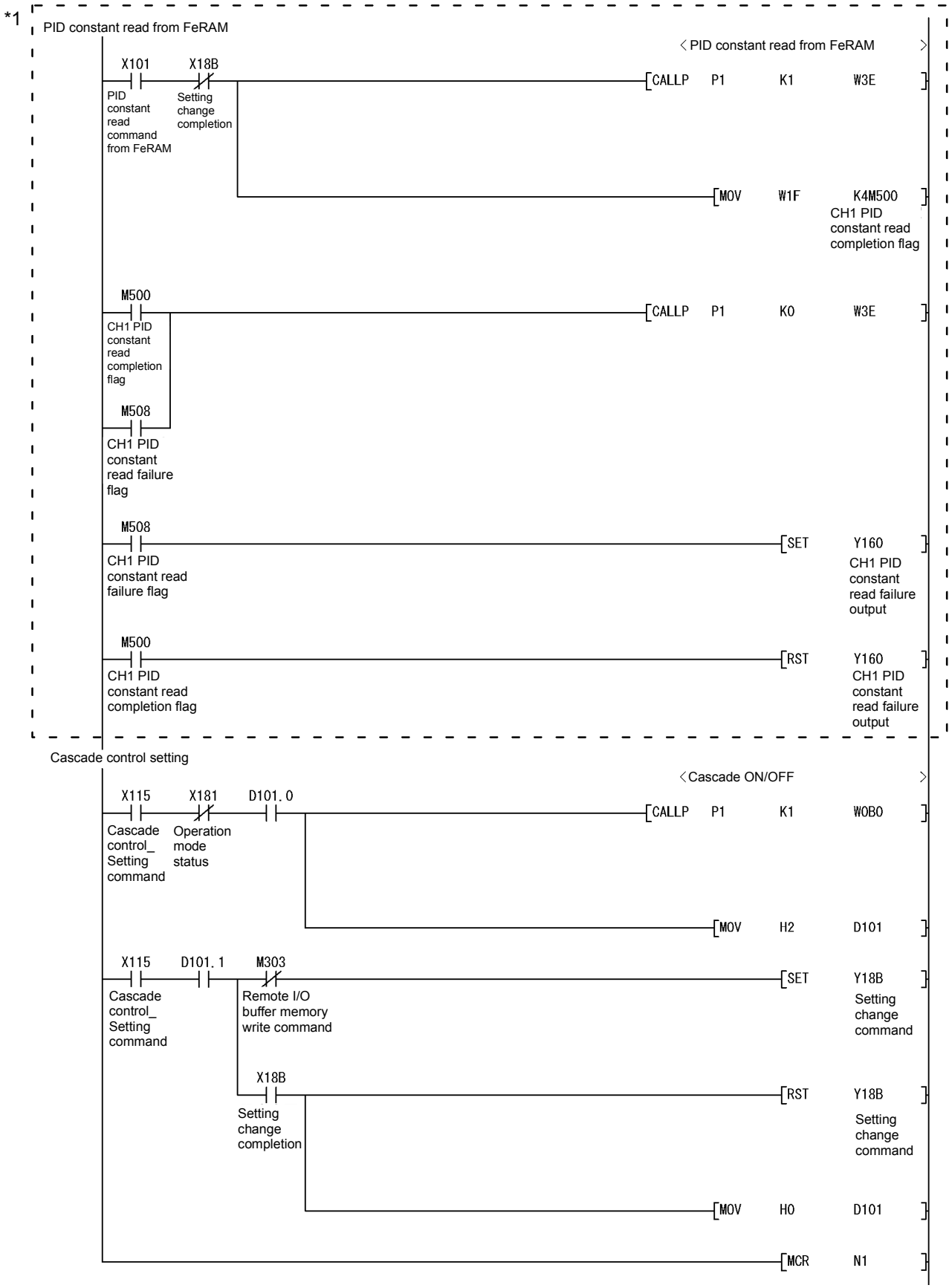
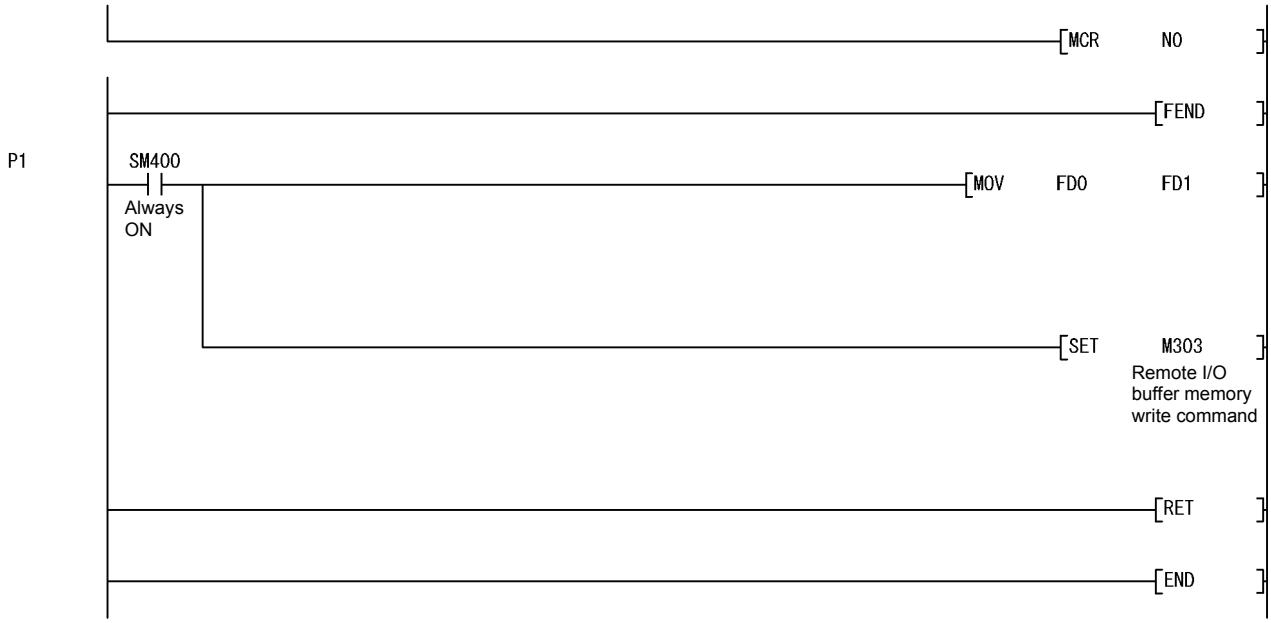



*1: Perform when the PID constant read from FeRAM is different from that of intelligent function module parameter.




| POINT |
|---|
| To write the intelligent function module parameters, set the target remote I/O station from [Online] - [Transfer setup] on GX Developer.<br>They can be written by:<br>• Directly connecting GX Developer to the remote I/O station.<br>• Connecting GX Developer to another device such as a CPU module and passing through the network. |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## 6.3.2 Program example without using the utility package

### (1) Operation of GX Developer (Network parameter setting)

- Network type : MNET/H (remote master)
- Head I/O No. : 0000H
- Network No. : 1
- Total number of (slave) stations : 1
- Mode : Online
- Network range assignment :

| StationNo. | M station -> R station | | | | | | M station <- R station | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Y | | | Y | | | X | | | X | | |
| | Points | Start | End | Points | Start | End | Points | Start | End | Points | Start | End |
| 1 | 256 | 0100 | 01FF | 256 | 0000 | 00FF | 256 | 0100 | 01FF | 256 | 0000 | 00FF |

- Refresh parameters :

| | Link side | | | | | PLC side | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dev. name | Points | Start | End | | Dev. name | Points | Start | End |
| Transfer SB | SB | 512 | 0000 | 01FF | ⇔ | SB | 512 | 0000 | 01FF |
| Transfer SW | SW | 512 | 0000 | 01FF | ⇔ | SW | 512 | 0000 | 01FF |
| Random cyclic | LB | | | | ⇔ | | | | |
| Random cyclic | LW | | | | ⇔ | | | | |
| Transfer1 | LX | 512 | 0000 | 01FF | ⇔ | X | 512 | 0000 | 01FF |
| Transfer2 | LY | 512 | 0000 | 01FF | ⇔ | Y | 512 | 0000 | 01FF |
| Transfer3 | | | | | ⇔ | | | | |
| Transfer4 | | | | | ⇔ | | | | |
| Transfer5 | | | | | ⇔ | | | | |
| Transfer6 | | | | | ⇔ | | | | |


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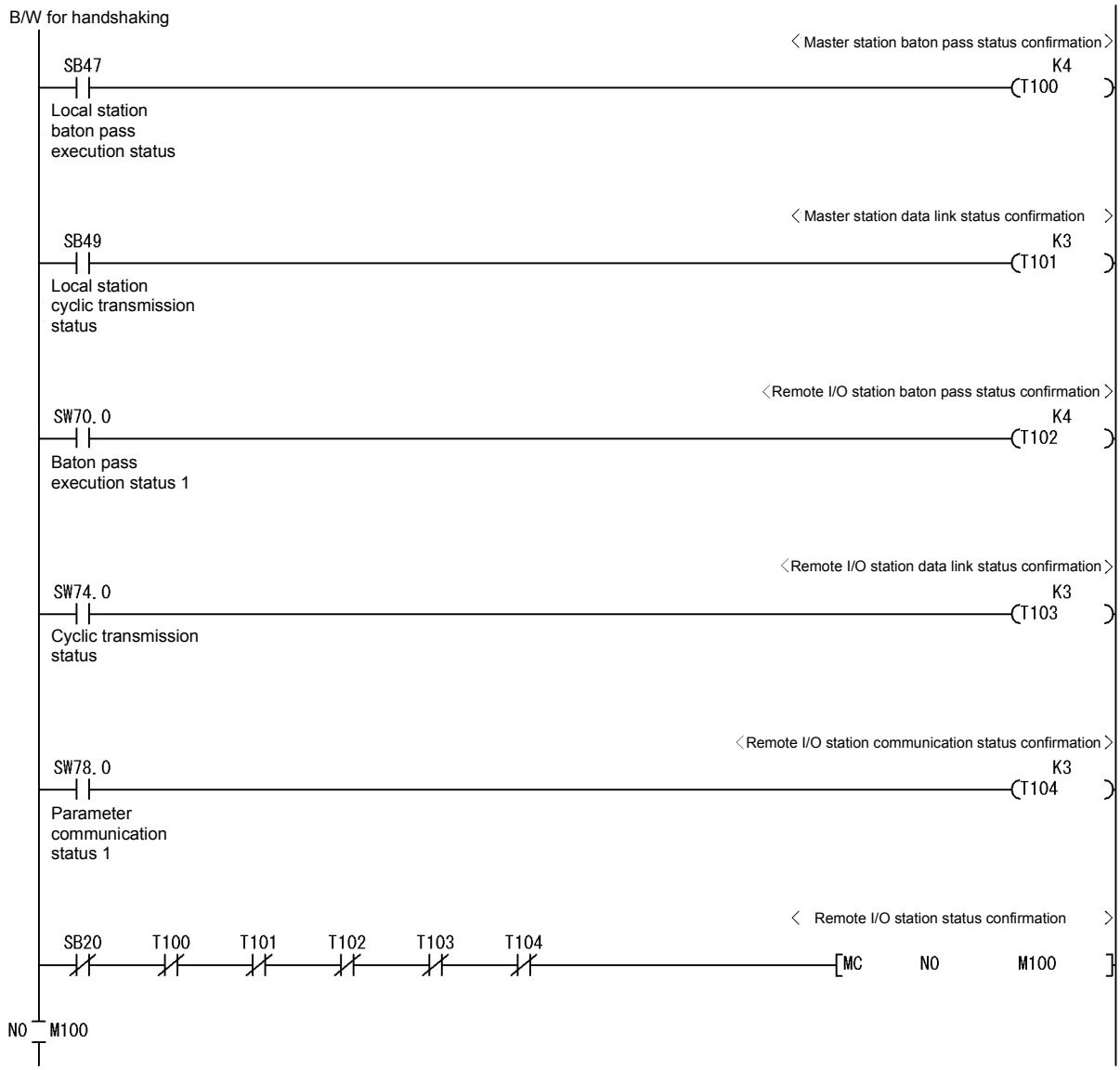
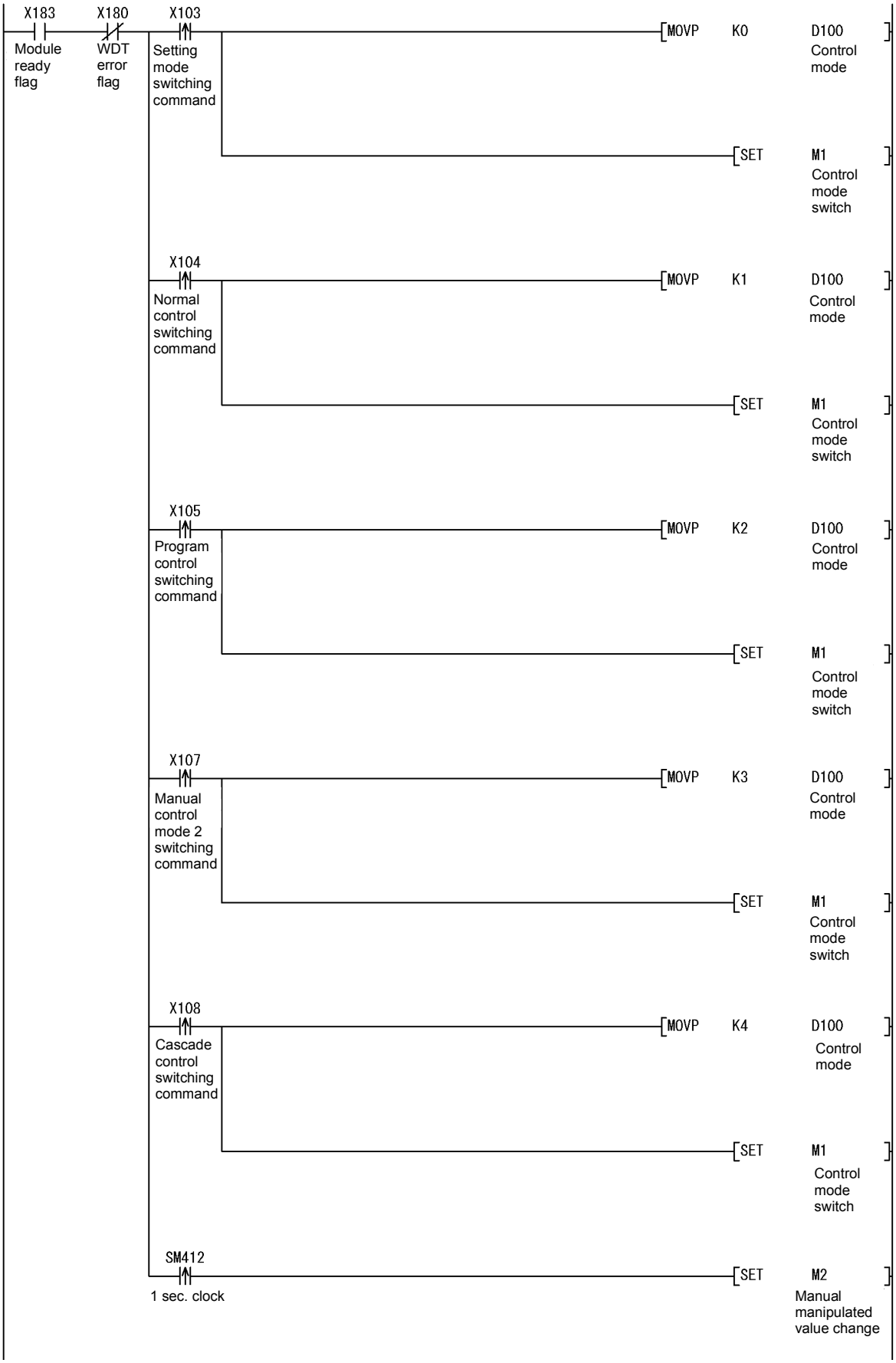
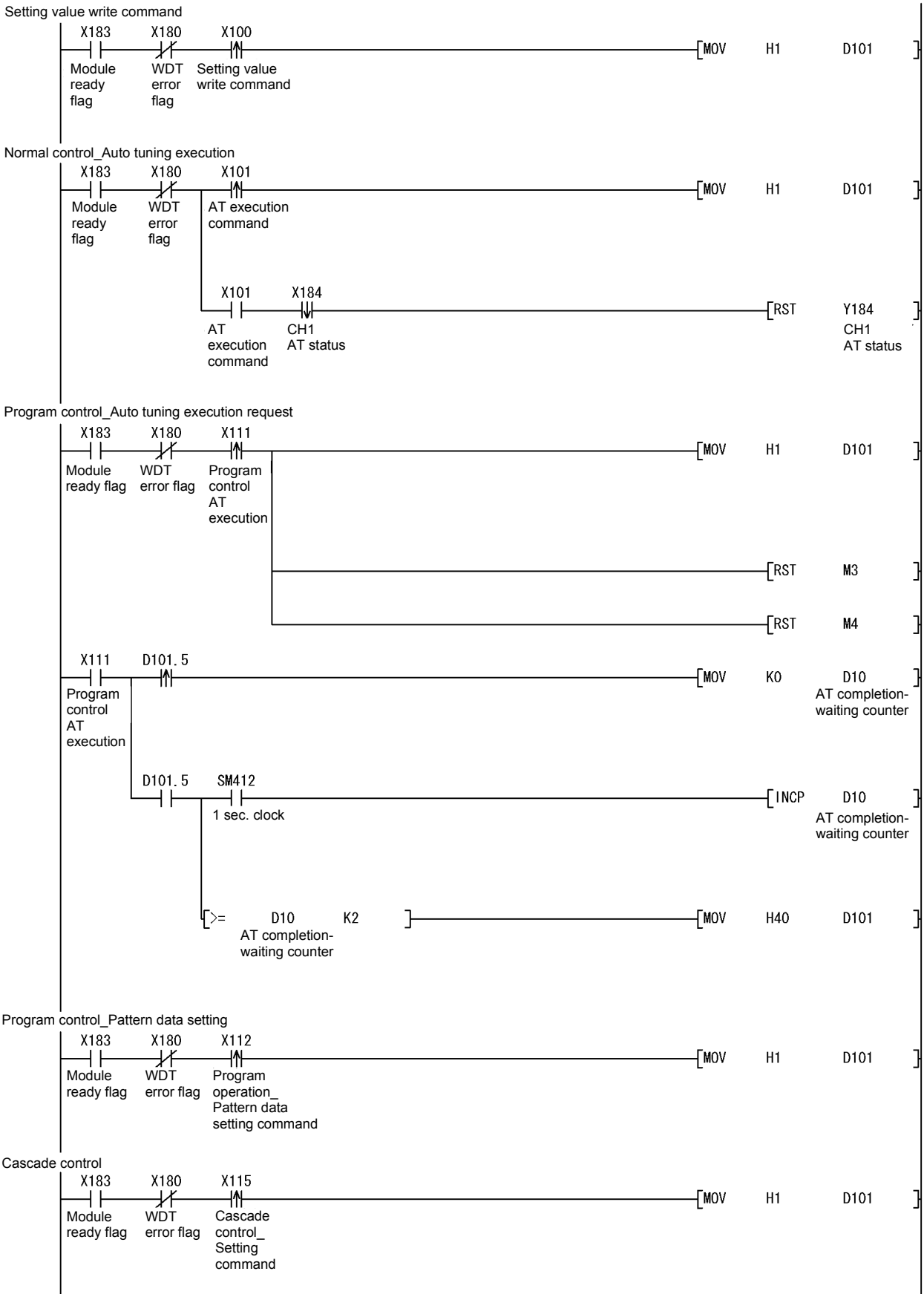
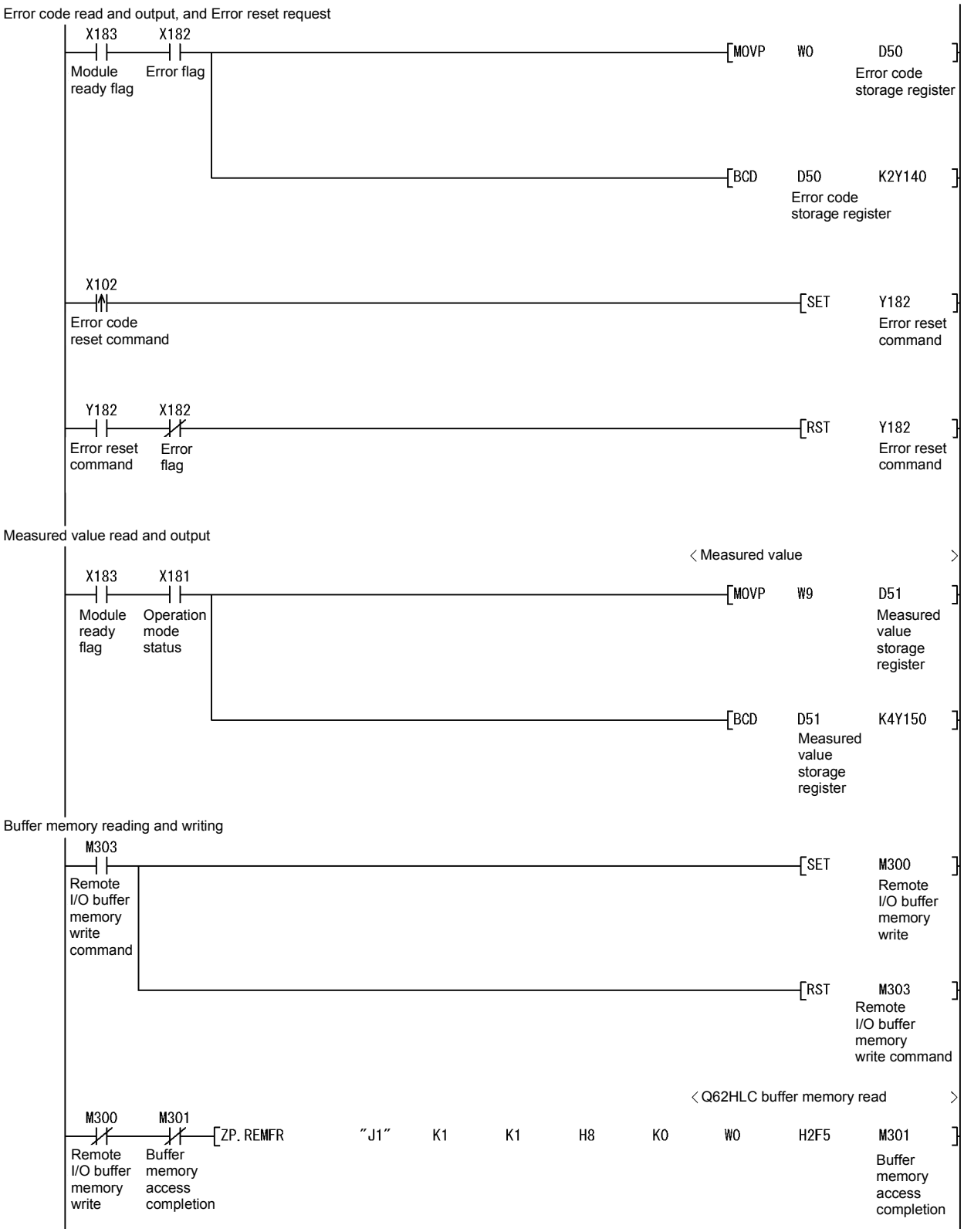
(2) Program example




X183
Module ready flag
X180
WDT error flag
X103
Setting mode switching command
MOVP K0 D100
Control mode
SET M1
Control mode switch
X104
Normal control switching command
MOVP K1 D100
Control mode
SET M1
Control mode switch
X105
Program control switching command
MOVP K2 D100
Control mode
SET M1
Control mode switch
X107
Manual control mode 2 switching command
MOVP K3 D100
Control mode
SET M1
Control mode switch
X108
Cascade control switching command
MOVP K4 D100
Control mode
SET M1
Control mode switch
SM412
1 sec. clock
SET M2
Manual manipulated value change


Setting value write command
X183
X180
X100
Module ready flag
WDT error flag
Setting value write command
MOV H1 D101
Normal control_Auto tuning execution
X183
X180
X101
Module ready flag
WDT error flag
AT execution command
MOV H1 D101
X101
X184
AT execution command
CH1 AT status
RST Y184
CH1 AT status
Program control_Auto tuning execution request
X183
X180
X111
Module ready flag
WDT error flag
Program control AT execution
MOV H1 D101
RST M3
RST M4
X111
D101.5
Program control AT execution
MOV K0 D10
AT completion-waiting counter
D101.5
SM412
1 sec. clock
INCP D10
AT completion-waiting counter
>= D10 K2
AT completion-waiting counter
MOV H40 D101
Program control_Pattern data setting
X183
X180
X112
Module ready flag
WDT error flag
Program operation_ Pattern data setting command
MOV H1 D101
Cascade control
X183
X180
X115
Module ready flag
WDT error flag
Cascade control_ Setting command
MOV H1 D101


Error code read and output, and Error reset request
X183
Module ready flag
X182
Error flag
MOVP W0 D50
Error code storage register
BCD D50 K2Y140
Error code storage register
X102
Error code reset command
SET Y182
Error reset command
Y182
Error reset command
X182
Error flag
RST Y182
Error reset command
Measured value read and output
〈Measured value〉
X183
Module ready flag
X181
Operation mode status
MOVP W9 D51
Measured value storage register
BCD D51 K4Y150
Measured value storage register
Buffer memory reading and writing
M303
Remote I/O buffer memory write command
SET M300
Remote I/O buffer memory write
RST M303
Remote I/O buffer memory write command
〈Q62HLC buffer memory read〉
M300
Remote I/O buffer memory write
M301
Buffer memory access completion
ZP. REMFR "J1" K1 K1 H8 K0 W0 H2F5 M301
Buffer memory access completion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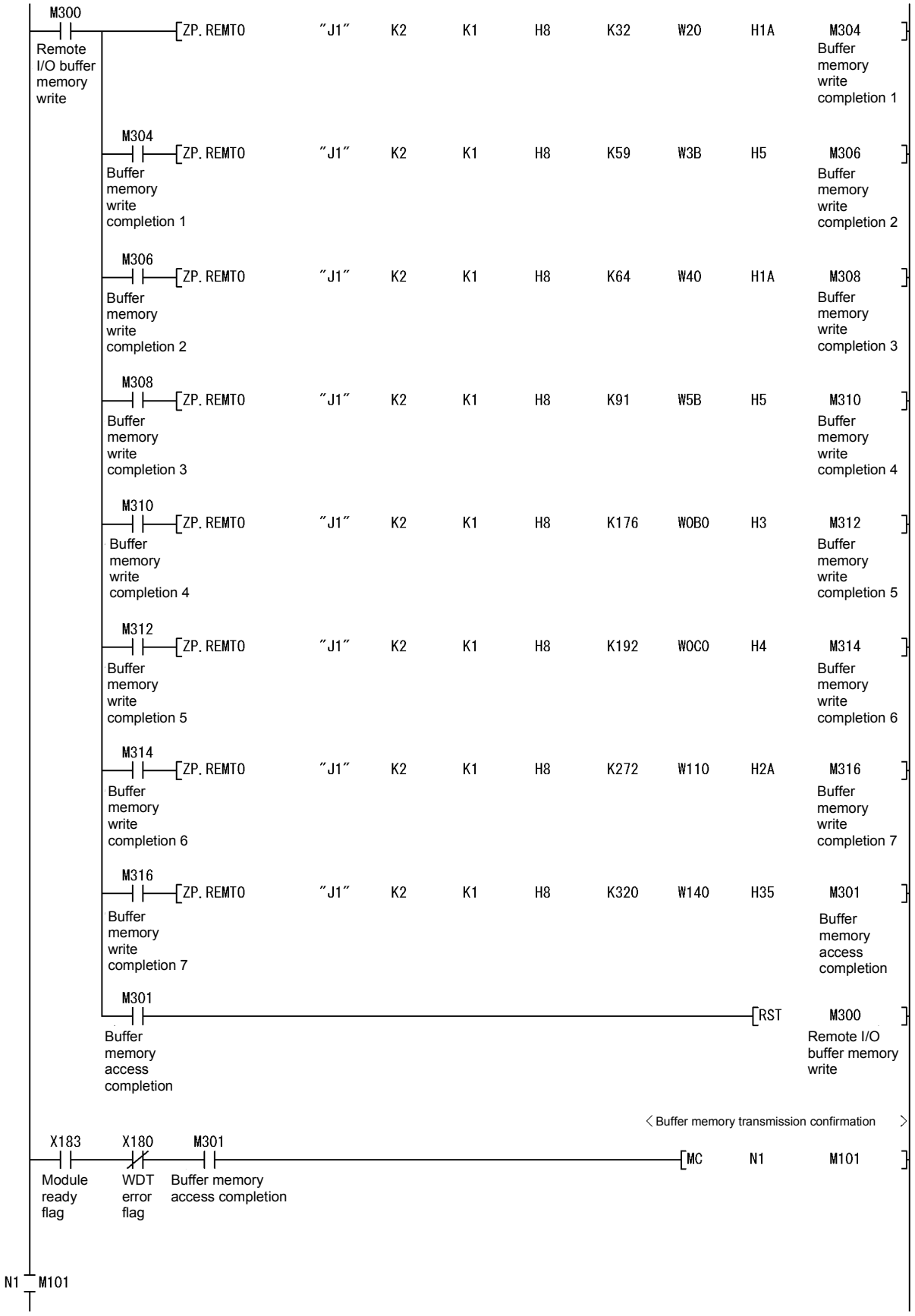
M300
ZP. REMTO "J1" K2 K1 H8 K32 W20 H1A M304
Remote I/O buffer memory write
Buffer memory write completion 1
M304
ZP. REMTO "J1" K2 K1 H8 K59 W3B H5 M306
Buffer memory write completion 1
Buffer memory write completion 2
M306
ZP. REMTO "J1" K2 K1 H8 K64 W40 H1A M308
Buffer memory write completion 2
Buffer memory write completion 3
M308
ZP. REMTO "J1" K2 K1 H8 K91 W5B H5 M310
Buffer memory write completion 3
Buffer memory write completion 4
M310
ZP. REMTO "J1" K2 K1 H8 K176 WOB0 H3 M312
Buffer memory write completion 4
Buffer memory write completion 5
M312
ZP. REMTO "J1" K2 K1 H8 K192 WOC0 H4 M314
Buffer memory write completion 5
Buffer memory write completion 6
M314
ZP. REMTO "J1" K2 K1 H8 K272 W110 H2A M316
Buffer memory write completion 6
Buffer memory write completion 7
M316
ZP. REMTO "J1" K2 K1 H8 K320 W140 H35 M301
Buffer memory write completion 7
Buffer memory access completion
M301
RST M300
Buffer memory access completion
Remote I/O buffer memory write
〈 Buffer memory transmission confirmation 〉
X183
X180
M301
MC N1 M101
Module ready flag
WDT error flag
Buffer memory access completion
N1 M101


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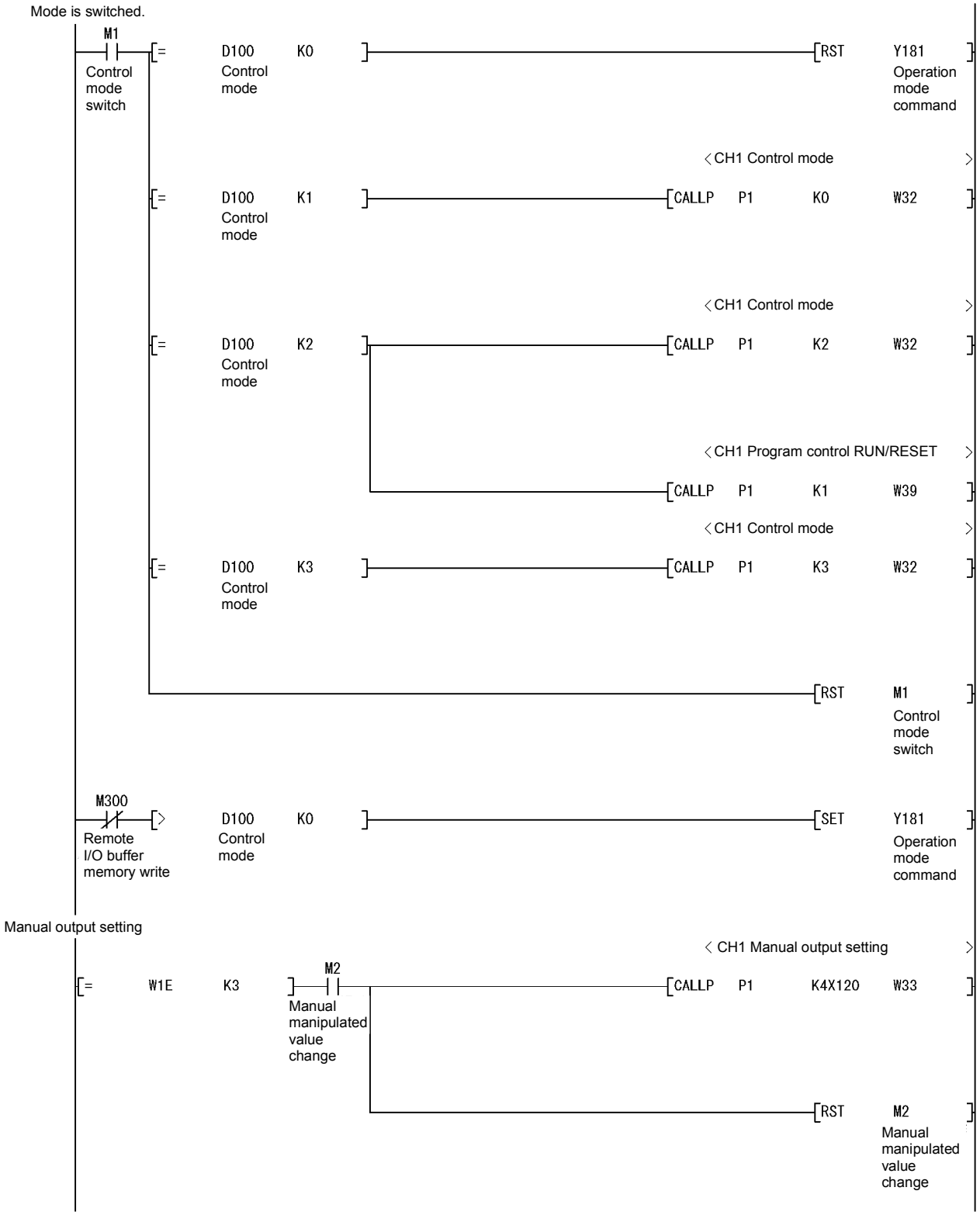
Mode is switched.
M1
Control mode switch
= D100 K0
Control mode
RST Y181
Operation mode command
〈CH1 Control mode
= D100 K1
Control mode
CALLP P1 K0 W32
〈CH1 Control mode
= D100 K2
Control mode
CALLP P1 K2 W32
〈CH1 Program control RUN/RESET
CALLP P1 K1 W39
〈CH1 Control mode
= D100 K3
Control mode
CALLP P1 K3 W32
RST M1
Control mode switch
M300
Remote I/O buffer memory write
> D100 K0
Control mode
SET Y181
Operation mode command
Manual output setting
〈CH1 Manual output setting
= W1E K3
M2
Manual manipulated value change
CALLP P1 K4X120 W33
RST M2
Manual manipulated value change


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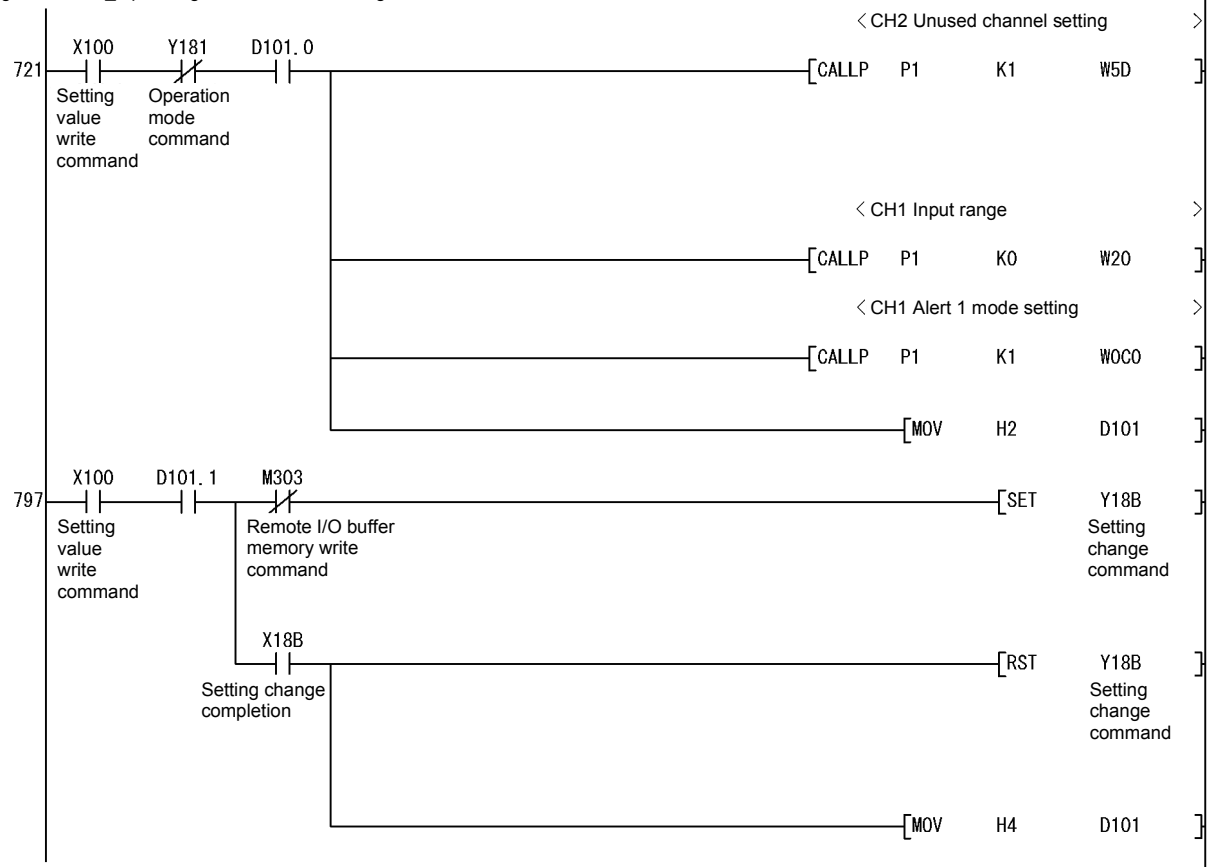
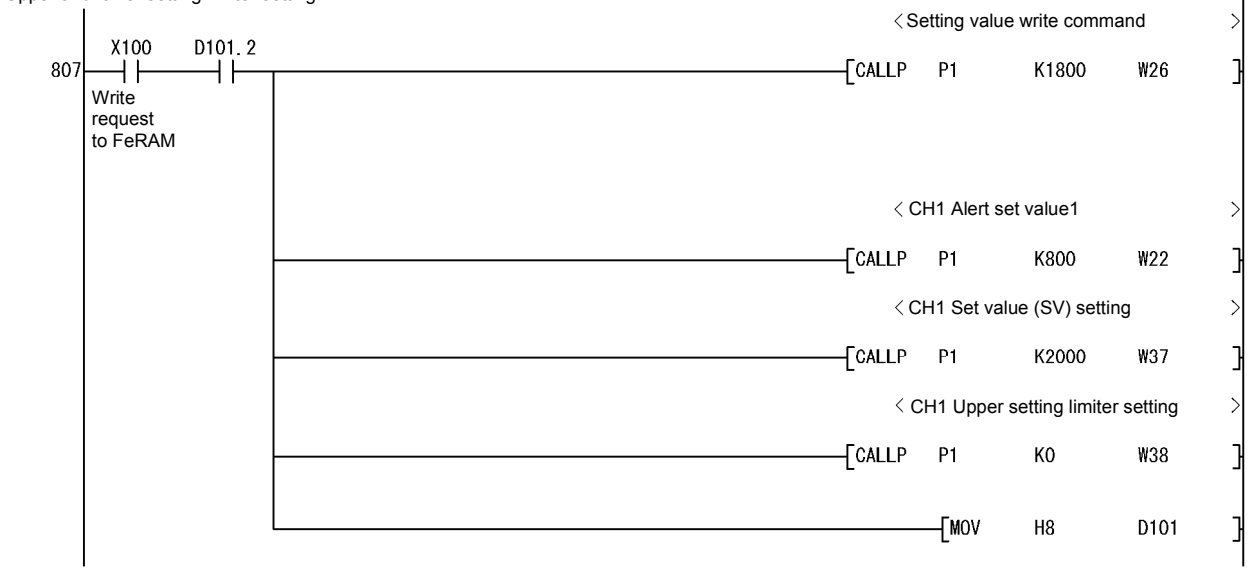
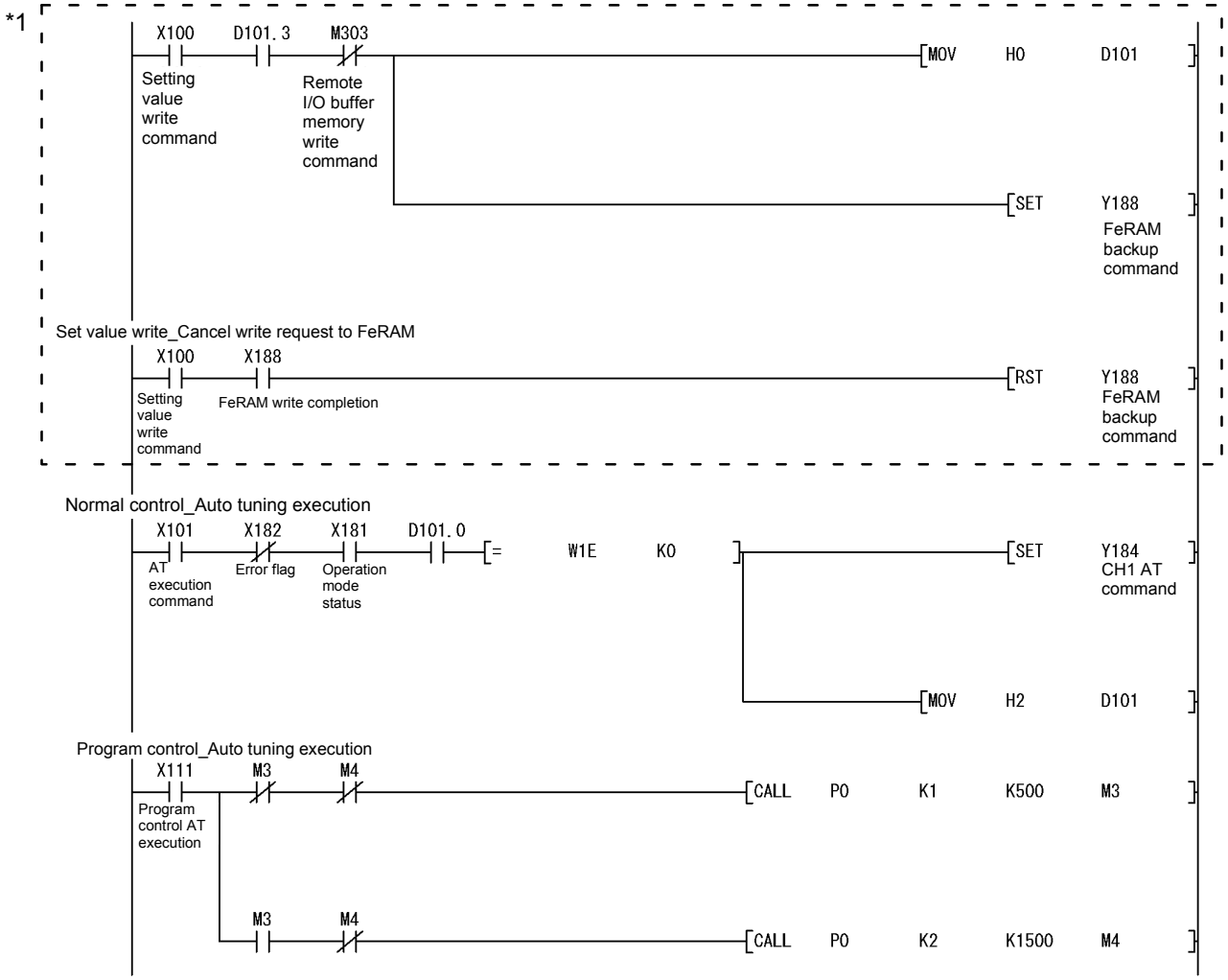
Setting value write_Input range, Alert 1 mode setting

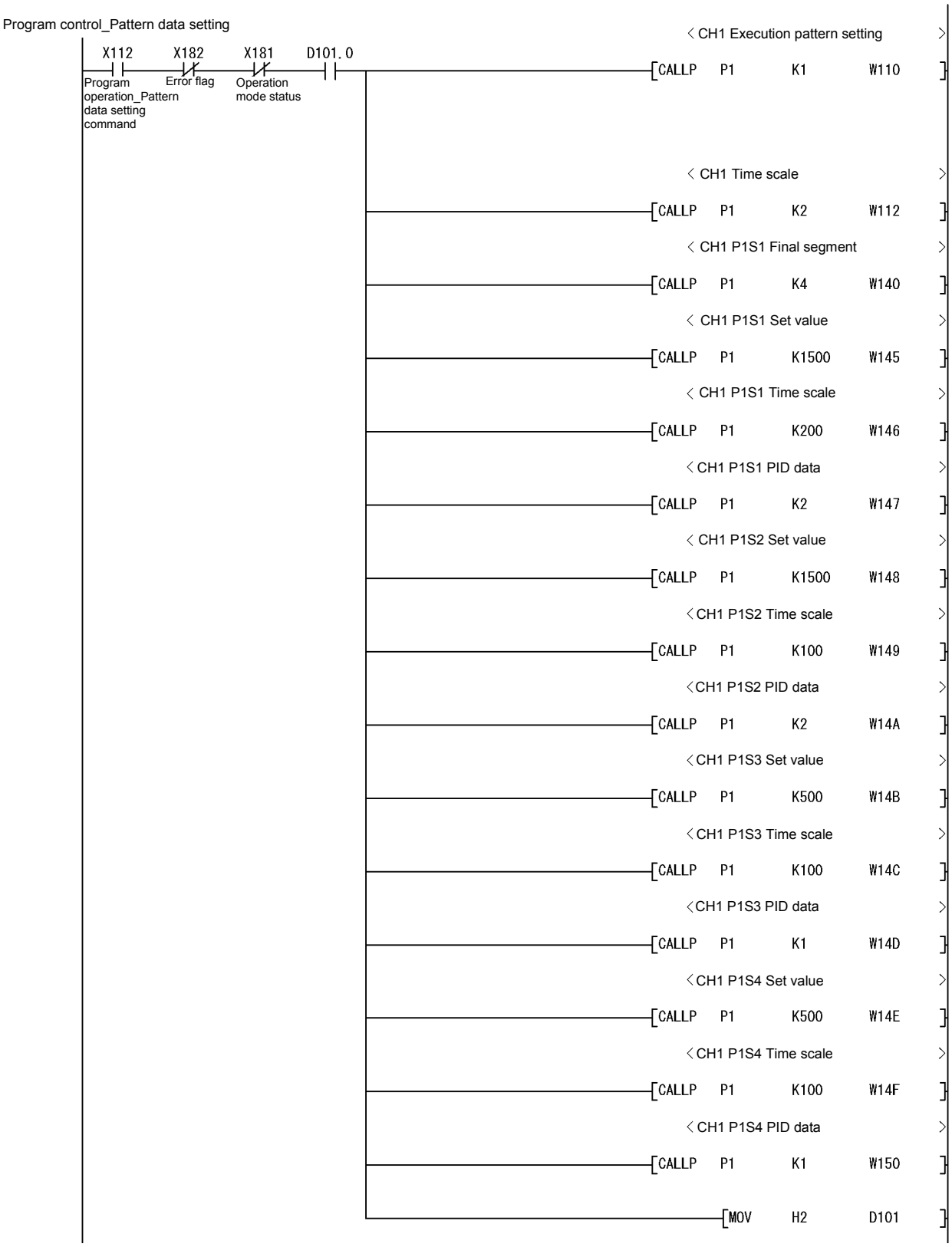



Setting value write_Alert set value, Set value, Upper and lower setting limiter setting

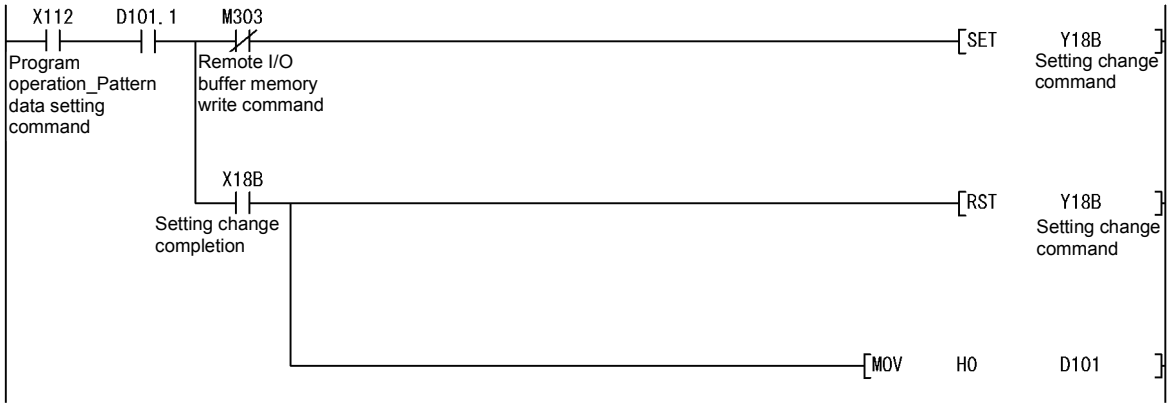


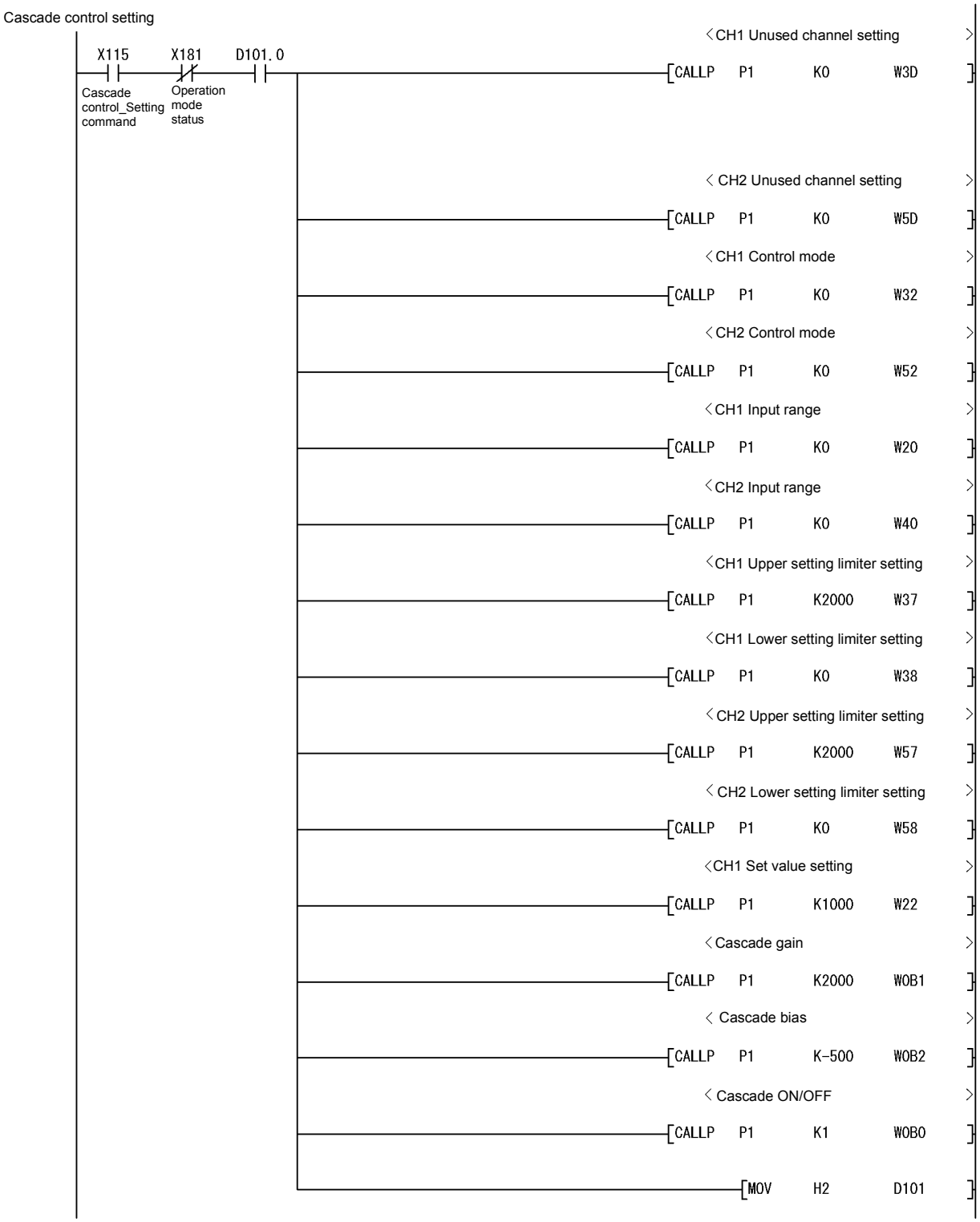



*1: Needed when registering the set input range, alert setting, set value and others to FeRAM.
Write to FeRAM is not needed when using the GX Configurator-TC's initial setting or writing in the input range, alert setting, set value and others using sequence program at power-on.

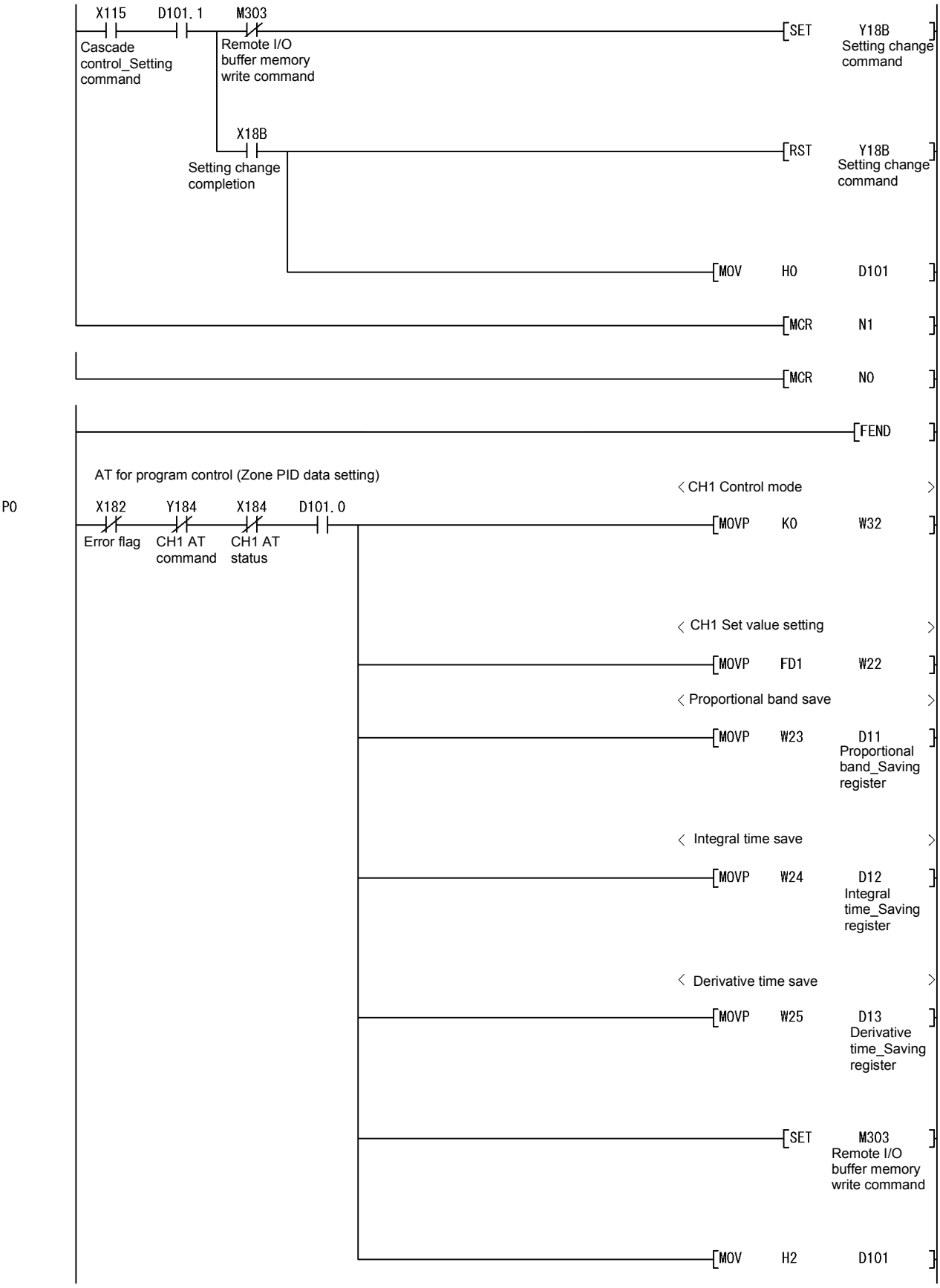

Program control_Pattern data setting
X112
X182
X181
D101.0
Program operation_Pattern data setting command
Error flag
Operation mode status
< CH1 Execution pattern setting
CALLP P1 K1 W110
< CH1 Time scale
CALLP P1 K2 W112
< CH1 P1S1 Final segment
CALLP P1 K4 W140
< CH1 P1S1 Set value
CALLP P1 K1500 W145
< CH1 P1S1 Time scale
CALLP P1 K200 W146
< CH1 P1S1 PID data
CALLP P1 K2 W147
< CH1 P1S2 Set value
CALLP P1 K1500 W148
< CH1 P1S2 Time scale
CALLP P1 K100 W149
< CH1 P1S2 PID data
CALLP P1 K2 W14A
< CH1 P1S3 Set value
CALLP P1 K500 W14B
< CH1 P1S3 Time scale
CALLP P1 K100 W14C
< CH1 P1S3 PID data
CALLP P1 K1 W14D
< CH1 P1S4 Set value
CALLP P1 K500 W14E
< CH1 P1S4 Time scale
CALLP P1 K100 W14F
< CH1 P1S4 PID data
CALLP P1 K1 W150
MOV H2 D101

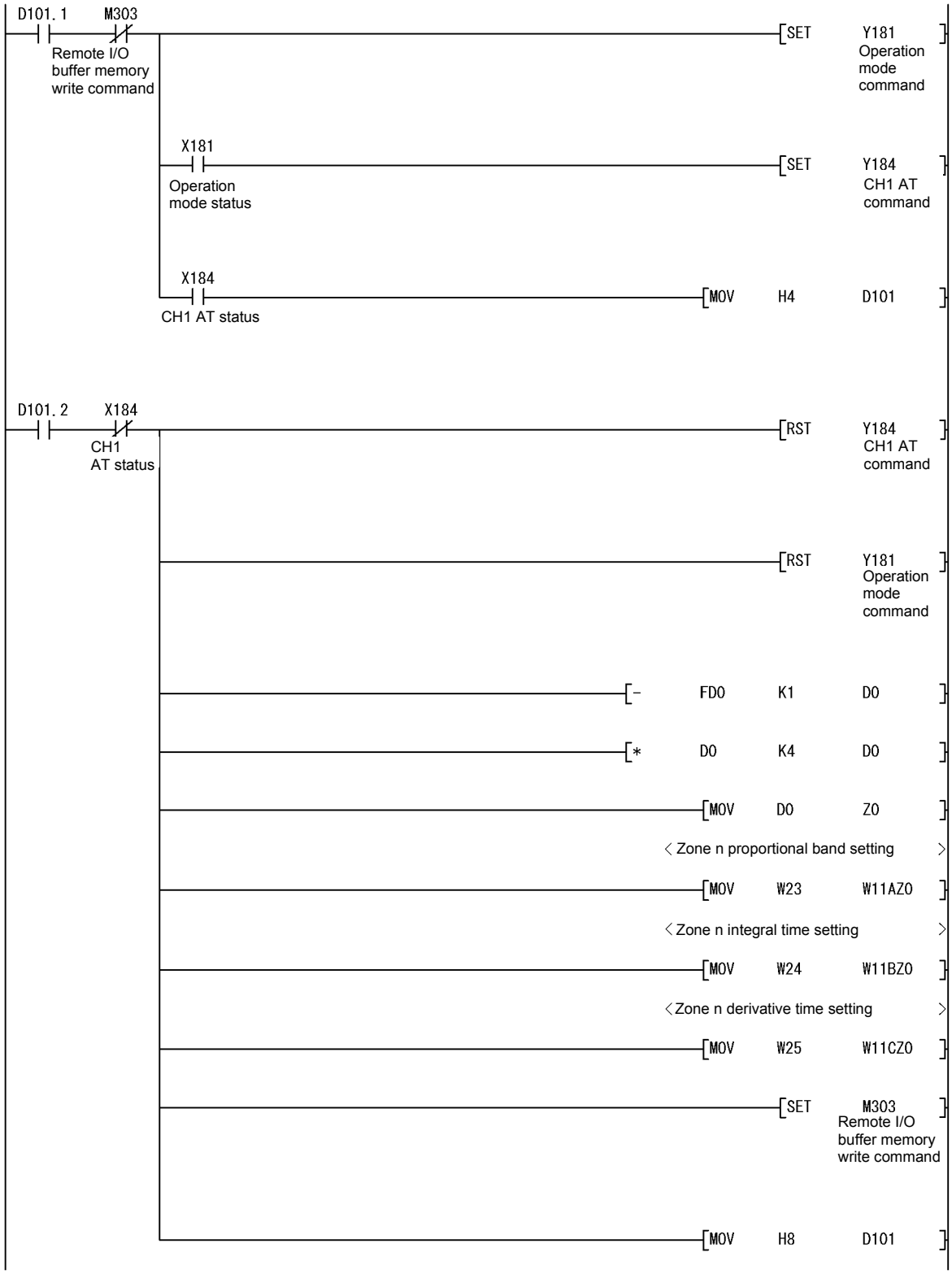

6 - 43


X112
D101.1
M303
Program operation_Pattern data setting command
Remote I/O buffer memory write command
SET
Y18B
Setting change command
X18B
Setting change completion
RST
Y18B
Setting change command
MOV
H0
D101


Cascade control setting
X115
X181
D101.0
Cascade control_Setting command
Operation mode status
〈CH1 Unused channel setting
CALLP P1 K0 W3D
〈CH2 Unused channel setting
CALLP P1 K0 W5D
〈CH1 Control mode
CALLP P1 K0 W32
〈CH2 Control mode
CALLP P1 K0 W52
〈CH1 Input range
CALLP P1 K0 W20
〈CH2 Input range
CALLP P1 K0 W40
〈CH1 Upper setting limiter setting
CALLP P1 K2000 W37
〈CH1 Lower setting limiter setting
CALLP P1 K0 W38
〈CH2 Upper setting limiter setting
CALLP P1 K2000 W57
〈CH2 Lower setting limiter setting
CALLP P1 K0 W58
〈CH1 Set value setting
CALLP P1 K1000 W22
〈Cascade gain
CALLP P1 K2000 W0B1
〈Cascade bias
CALLP P1 K-500 W0B2
〈Cascade ON/OFF
CALLP P1 K1 W0B0
MOV H2 D101


6 - 45


X115
D101.1
M303
Cascade control_Setting command
Remote I/O buffer memory write command
SET Y18B
Setting change command
X18B
Setting change completion
RST Y18B
Setting change command
MOV H0 D101
MCR N1
MCR N0
FEND
AT for program control (Zone PID data setting)
P0
X182
Y184
X184
D101.0
Error flag
CH1 AT command
CH1 AT status
< CH1 Control mode
MOVP K0 W32
< CH1 Set value setting
MOVP FD1 W22
< Proportional band save
MOVP W23 D11
Proportional band_Saving register
< Integral time save
MOVP W24 D12
Integral time_Saving register
< Derivative time save
MOVP W25 D13
Derivative time_Saving register
SET M303
Remote I/O buffer memory write command
MOV H2 D101


D101.1
M303
Remote I/O buffer memory write command
SET Y181 Operation mode command
X181
Operation mode status
SET Y184 CH1 AT command
X184
CH1 AT status
MOV H4 D101
D101.2
X184
CH1 AT status
RST Y184 CH1 AT command
RST Y181 Operation mode command
- FDO K1 D0
* D0 K4 D0
MOV D0 Z0
〈Zone n proportional band setting〉
MOV W23 W11AZ0
〈Zone n integral time setting〉
MOV W24 W11BZ0
〈Zone n derivative time setting〉
MOV W25 W11CZ0
SET M303 Remote I/O buffer memory write command
MOV H8 D101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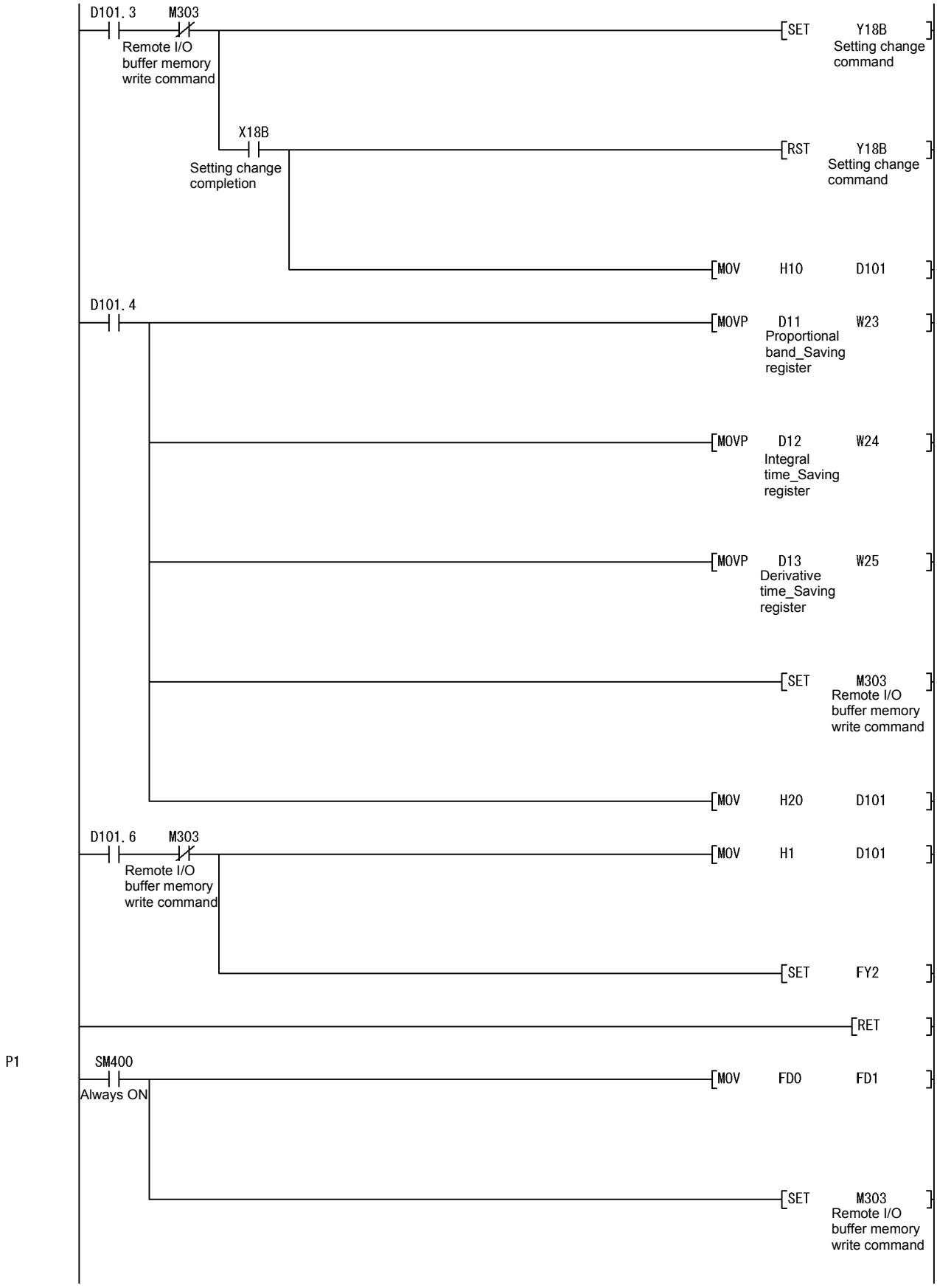
D101.3
M303
Remote I/O buffer memory write command
SET Y18B
Setting change command
X18B
Setting change completion
RST Y18B
Setting change command
MOV H10 D101
D101.4
MOVP D11 W23
Proportional band_Saving register
MOVP D12 W24
Integral time_Saving register
MOVP D13 W25
Derivative time_Saving register
SET M303
Remote I/O buffer memory write command
MOV H20 D101
D101.6
M303
Remote I/O buffer memory write command
MOV H1 D101
SET FY2
RET
P1
SM400
Always ON
MOV FD0 FD1
SET M303
Remote I/O buffer memory write command


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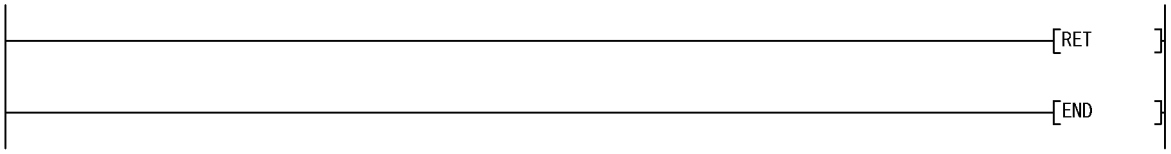



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# 7 ONLINE MODULE CHANGE

When changing a module online, carefully read the QCPU User's Manual (Hardware Design, Maintenance and Inspection), section 12.4.1 "Online module change".
This chapter describes the specifications of an online module change.

(1) Perform an online module change by operating GX Developer.

(2) When you want to continue the pre-change operation with the new module after an online module change, save/restore the buffer memory contents.

**POINT**

(1) Perform an online module change after making sure that the system outside the programmable controller will not malfunction.
(2) To prevent an electric shock and malfunction of operating modules, provide means such as switches for powering off each of the external power supply and external devices connected to the module to be replaced online.
(3) After the module becomes faulty, the data may not be saved properly.
Therefore, prerecord the data to be saved (the whole buffer memory contents that can be written, see Section 3.5.1).
(4) It is recommended to perform an online module change in the actual system in advance to ensure that it would not affect the other modules by checking the following:
• Means of cutting off the connection to external devices and its configuration are correct.
• Switching ON/OFF does not bring any undesirable effect.
(5) Do not install/remove the module to/from the base unit, or the terminal block to/from the module more than 50 times after the first use of the product. (IEC 61131-2 compliant)
Failure to do so may cause malfunction.




7 - 1

## 7.1 Online Module Change Conditions

The programmable controller CPU, MELSECNET/H remote I/O module, Q62HLC, GX Developer and base unit given below are needed to perform an online module change.

### (1) Programmable controller CPU

The Process CPU is required.
For precautions for multiple CPU system configuration, refer to the QCPU User's Manual (Multiple CPU System).

### (2) MELSECNET/H remote I/O module

The module of function version D or later is necessary.

### (3) Q62HLC

The module of function version C or later is necessary.

### (4) GX Developer

GX Developer of Version 7.10L or later is necessary.
GX Developer of Version 8.18U or later is required to perform an online module change on the remote I/O station.

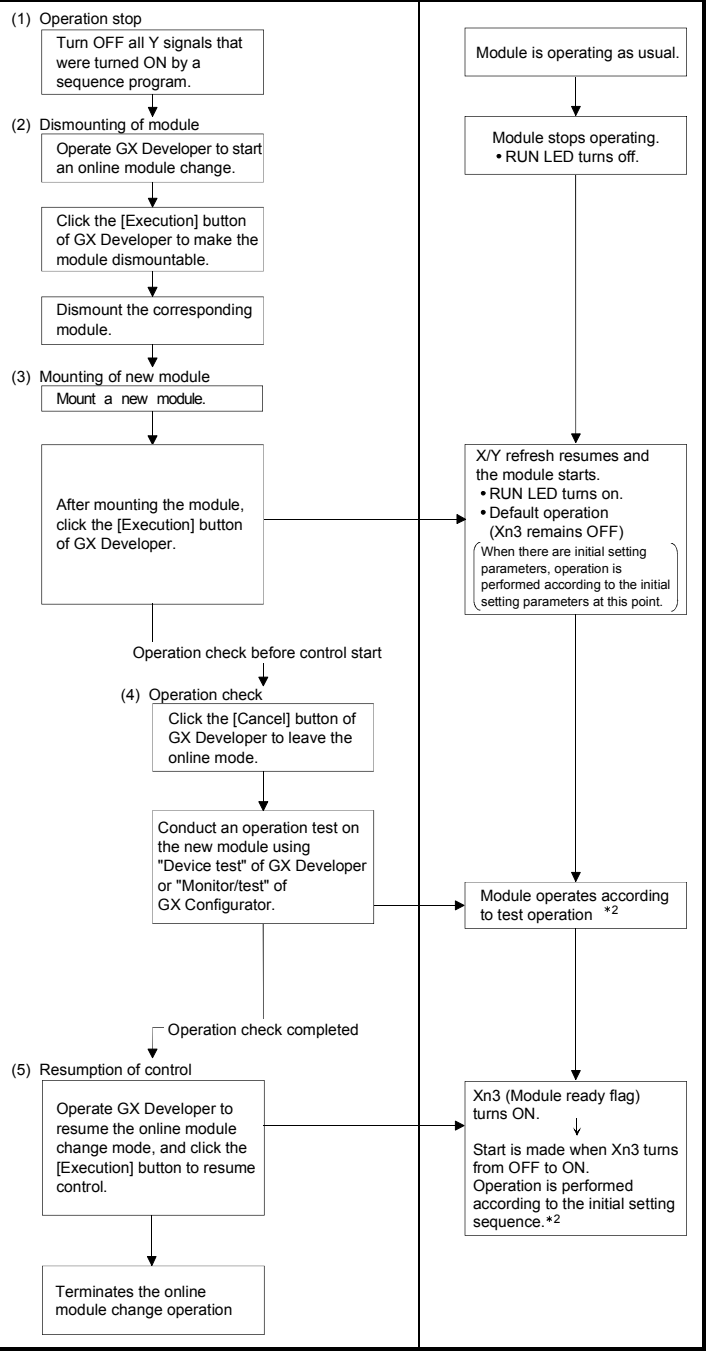
### (5) Base unit

1) When the slim type main base unit (Q3□SB) is used, an online module change cannot be performed.
2) When the power supply module unnecessary type extension base unit (Q5□B) is used, online module change cannot be performed for the modules on all the base units connected.

## 7.2 Online Module Change Operations

The following gives the operations performed for an online module change.

| PLC CPU operation ○: Executed ×: Not executed | | | | | (User operation) ＊3 | (Intelligent function module operation) |
|---|---|---|---|---|---|---|
| X/Y refresh | FROM/TO instruction ＊1 | Device test | GX Configurator: Initial setting parameter | GX Configurator: Monitor/test | | |
| ○ | ○ | ○ | × | ○ | | |
| × | × | × | × | × | | |
| ○ | × | × | ○ | × | | |
| ○ | × | ○ | × | ○ | | |
| ○ | ○ | ○ | × | ○ | | |




＊1: Access to the intelligent function module device (U□\G□) is included.

＊2: In the absence of the operation marked ＊2, the operation of the intelligent function module is the operation performed prior to that.

＊3: The item numbers (1) to (5) correspond to the operation step numbers of "Section 7.3 Online module change procedure".

## 7.3 Online Module Change Procedure

The online module change procedure is explained separately for the case where GX Configurator-TC was used for initial setting and for the case where a sequence program was used for initial setting.

### 7.3.1 GX Configurator-TC was used for initial setting

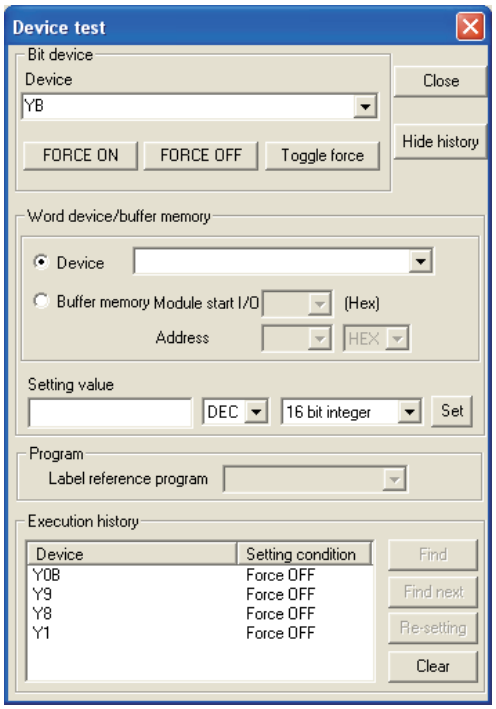
#### (1) Operation stop

(a) Turn off the following output signals to stop module operation.

| Device No. | Signal name |
|---|---|
| Yn1 | Setting/operation mode command |
| Yn8 | FeRAM backup command |
| Yn9 | Default setting registration command |
| YnB | Setting change command |

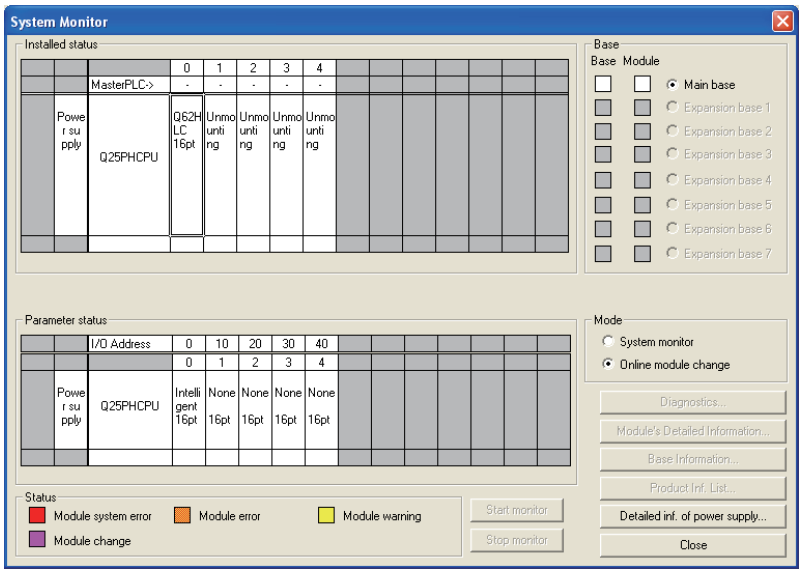
**POINT**

Control may not stop if only the setting/operation mode command (Yn1) is turned off.
To stop control without fail, set the PID continuation flag (buffer memory address: 169) for 0 (stop) and turn off the setting/operation mode command (Yn1).
To confirm that control has stopped, make sure that the setting/operation mode status (Xn1) is off.

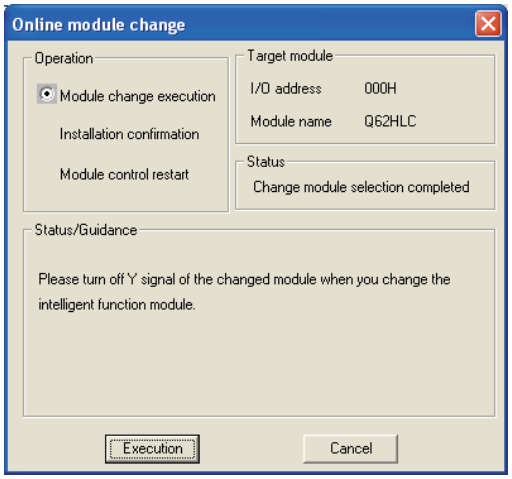


(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" screen.




(b) Click the "Execution" button to enable a module change.




If the following error screen appears, click the "OK" button and perform the operation in (2)(c) and later.


(c) After confirming that the RUN LED of the module has turned off, disconnect the external wiring and dismount the module.

POINT

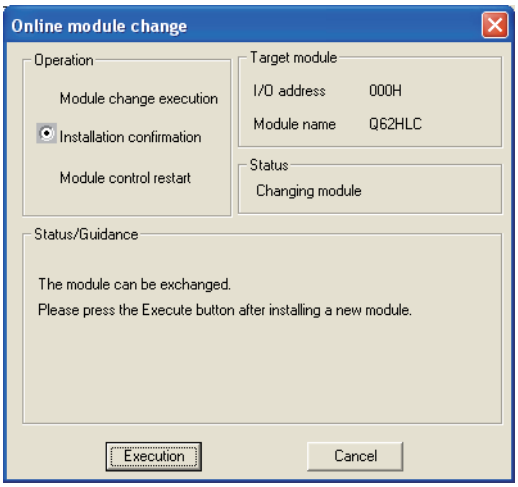
(1) If you have removed the wiring together with the terminal block, the temperature measurement values may vary within the accuracy range due to the error of the specific cold junction temperature compensation resistor. (Only when input range is thermocouple.)

(2) Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the RUN LED will not be lit.

### (3) Mounting of new module

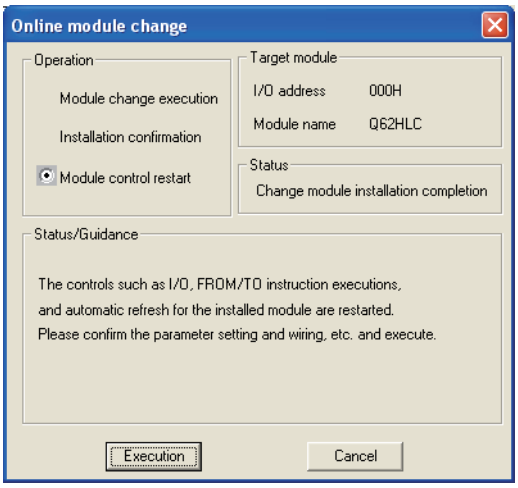
(a) Mount a new module to the same slot and connect the external wiring.

(b) After mounting the module, click the [Execution] button and make sure that the RUN LED is lit. Module Ready Flag (Xn3) remains OFF.

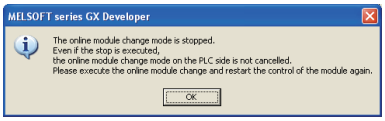



### (4) Operation check

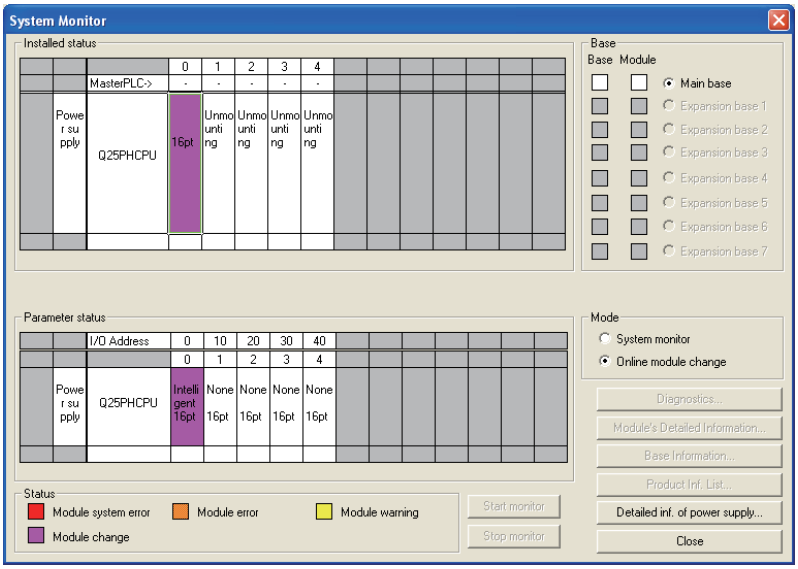
(a) To make an operation check, click the [Cancel] button to cancel control resumption.




(b) Click the [OK] button to leave the "Online module change" mode.



(c) Click the [Close] button to close the System monitor screen.

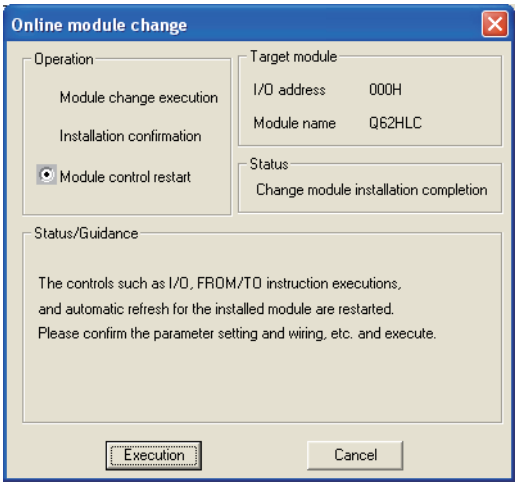



(d) Before resuming control, check the Q62HLC for the following items. If any fault is found, refer to Chapter 8 and take corrective action.

1) The RUN LED is on.
2) The ERR. LED is off.
3) The watchdog timer error flag (Xn0) is off.
4) The error flag (Xn2) is off.

(5) Resumption of control

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to redisplay the "Online module change" screen, click the [Execution] button to resume control. The FROM/TO instruction for the module resumes.




(b) The "Online module change completed" screen appears.

### 7.3.2 Sequence program was used for initial setting

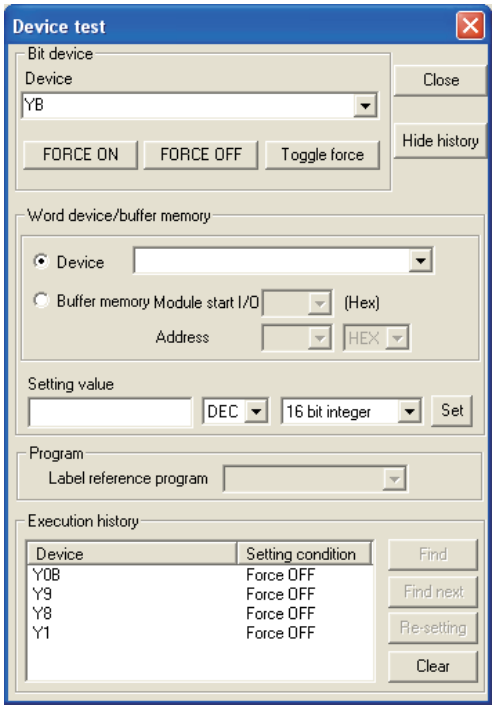
#### (1) Conversion disable

(a) Turn off the following output signals to stop module operation.

| Device No. | Signal name |
|---|---|
| Yn1 | Setting/operation mode command |
| Yn8 | $E^2$PROM backup command |
| Yn9 | Default setting registration command |
| YnB | Setting change command |

**POINT**

Control may not stop if only the setting/operation mode command (Yn1) is turned off.
To stop control without fail, set the PID continuation flag (buffer memory address: 169) for 0 (stop) and turn off the setting/operation mode command (Yn1).
To confirm that control has stopped, make sure that the setting/operation mode status (Xn1) is off.



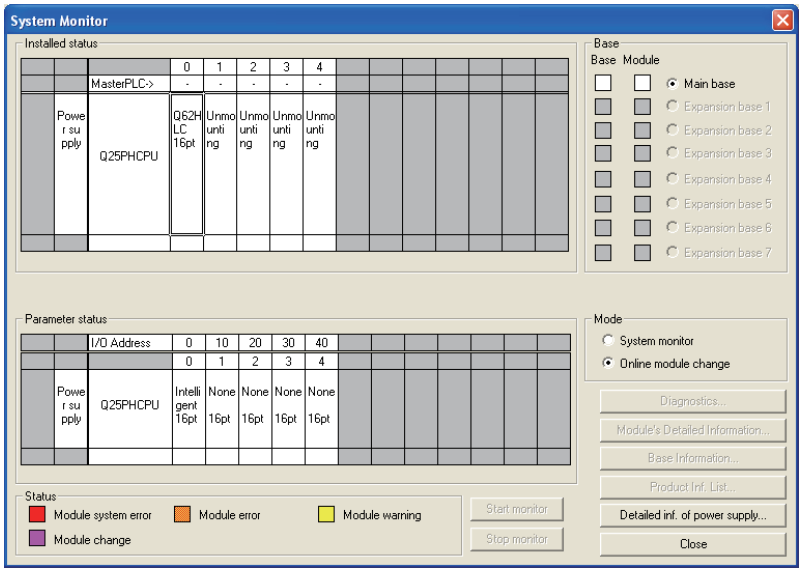

(b) If the buffer memory contents to be saved are not yet prerecorded, choose "Online" - "Monitor" - "" on GX Developer to monitor the buffer memory and record the values.

**POINT**

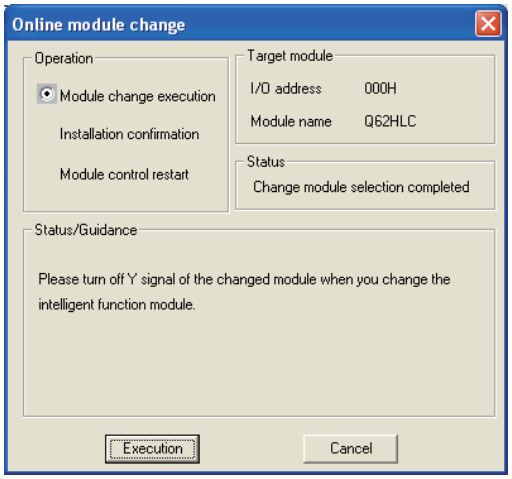
If a CPU continuation error (e.g. SP. UNIT DOWN, UNIT VERIFY ERR.) has occurred due to the fault of the module to be changed, the buffer memory contents cannot be saved.

(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" screen.




(b) Click the "Execution" button to enable a module change.




If the following error screen appears, click the [OK] button, dismount the module as-is, and mount a new module.

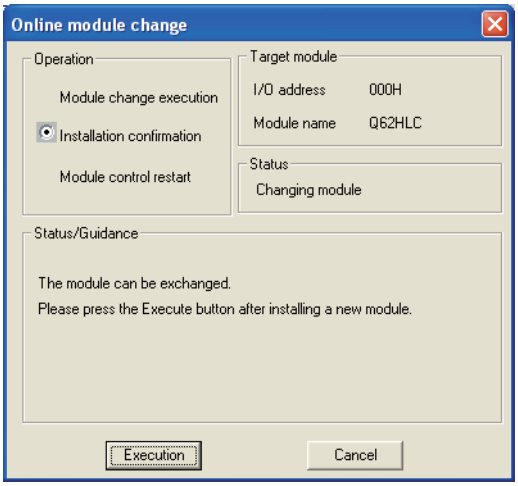
(c) After confirming that the RUN LED of the module has turned off, disconnect the external wiring and dismount the module.

| POINT |
|---|
| (1) If you have removed the wiring together with the terminal block, the temperature measurement values may vary within the accuracy range due to the error of the specific cold junction temperature compensation resistor. (Only when input range is thermocouple.)<br>(2) Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the RUN LED will not be lit. |

## (3) Mounting of new module

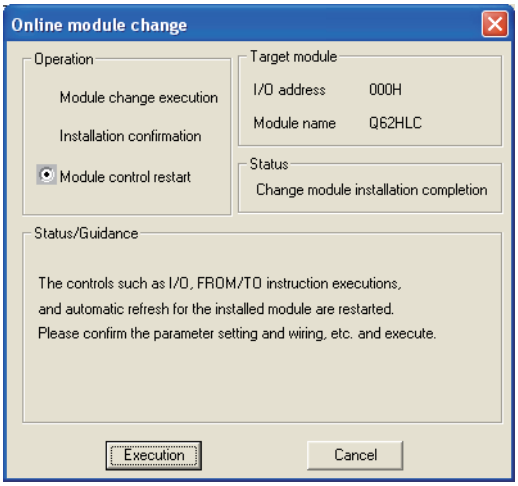
(a) Mount a new module to the same slot and connect the external wiring.

(b) After mounting the module, click the [Execution] button and make sure that the RUN LED is lit. Module Ready Flag (Xn3) remains OFF.

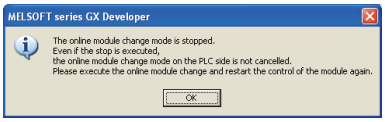


(4) Operation check

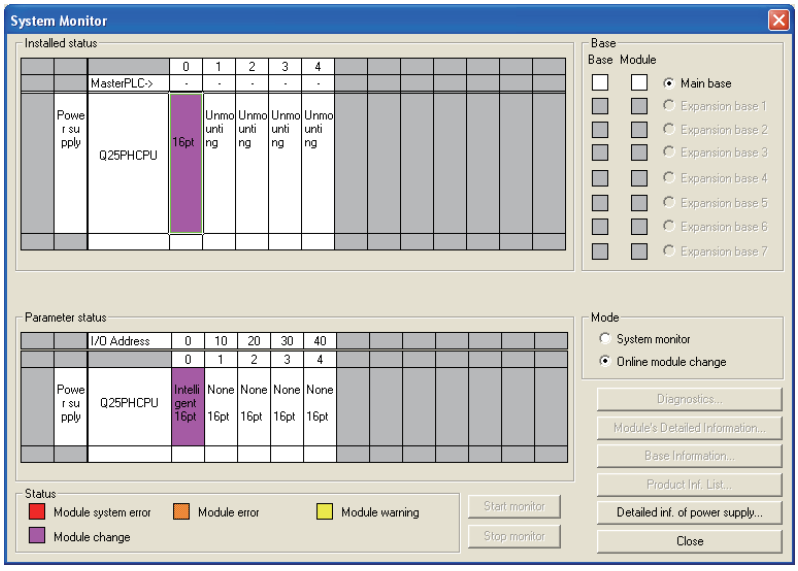
(a) To make an operation check, click the [Cancel] button to cancel control resumption.




(b) Click the [OK] button to leave the "Online module change" mode.




(c) Click the [Close] button to close the System monitor screen.




(d) Choose "Online" - "Debug" - "Device test" on GX Developer to set the prerecorded values to the buffer memory.

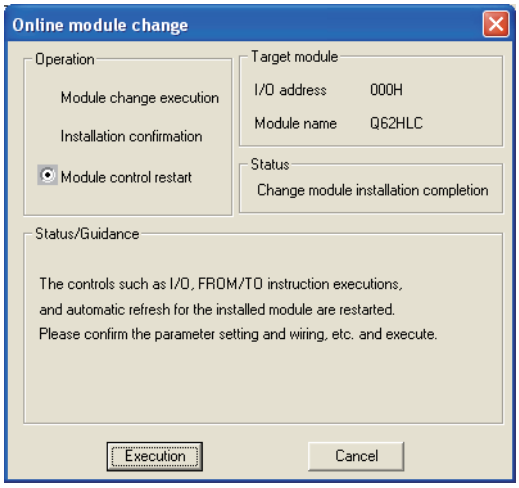
(e) To back up the data on the FeRAM, turn the FeRAM backup command (Yn8) from OFF to ON to write the buffer memory contents to the FeRAM.

(f) Before resuming control, check the Q62HLC for the following items. If any fault is found, refer to Chapter 8 and take corrective action.
1) The RUN LED is on.
2) The ERR. LED is off.
3) The watchdog timer error flag (Xn0) is off.
4) The error flag (Xn2) is off.

(g) Since the new module is in a default status, it must be initialized by a sequence program after control resumption.
Before performing initialization, check whether the contents of the initialization program are correct or not.
1) Normal system configuration
The sequence program should perform initialization on the leading edge of Module Ready Flag (Xn3) of the Q62HLC.
When control resumption is executed, Module Ready Flag (Xn3) turns ON and initialization is performed. (If the sequence program performs initialization only one scan after RUN, initialization is not performed.)
2) When used on remote I/O network
Insert a user device that will execute initialization at any timing (initialization request signal) into the sequence program. After control resumption, turn ON the initialization request signal to perform initialization. (If the sequence program performs initialization only one scan after a data link start of the remote I/O network, initialization is not performed.)

## (5) Resumption of control

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to redisplay the "Online module change" screen, click the [Execution] button to resume control. The FROM/TO instruction for the module resumes.




(b) The "Online module change completed" screen appears.

## 7.4 Precautions for Online Module Change

The following are the precautions for online module change.

(1) Always perform an online module change in the correct procedure. A failure to do so can cause a malfunction or failure.

(2) If you resume control after setting the prerecorded values to the buffer memory of the new module after an online module change, control cannot be resumed in the same control status since the manipulated values (MV) (buffer memory address: 13, 14) are cleared once at the point when control was stopped.

(3) If an alarm occurred before an online module change, the same alarm will not always occur at the resumption of control. For example, when a standby upper-limit alarm has been set, a standby status will be established and no alarm occur at the resumption of control after an online module change if the alarm occurred before the online module change.

### 7.4.1 Precautions before module change

#### (1) Operation stop

Turn off the following output signals to stop module operation before module change.

| Device No. | Signal name |
|---|---|
| Yn1 | Setting/operation mode command (refer to remarks below) |
| Yn8 | FeRAM backup command |
| Yn9 | Default setting registration command |
| YnB | Setting change command |

REMARK

Control may not stop if only the setting/operation mode command (Yn1) is turned off. To stop control without fail, set the PID continuation flag (buffer memory address: 169) to 0 (stop) and turn off the setting/operation mode command (Yn1). Turning the setting/operation mode status (Xn1) off can confirm that control has stopped.

#### (2) Control continuation

If you want to continue control at online module change, set the PID continuation flag (buffer memory address: 169) to 1 (continue) before online module change. This operation allows control to continue during online module change until the module has disconnected.
However, make sure to disconnect all external power supply before removing module and make safe to change it.

### (3) Data save

After module change, the buffer memory returns to default value (value read from FeRAM). Saving and recovering the buffer memory contents is necessary to continue previous operating states in changed module.
However, if recovery with sequence program or initial settings is possible, this operation is not necessary.
The whole buffer memory contents that can be written are required to continue the operating states. There are two following methods to save the buffer memory.

(a) Specify the buffer memory of module to be changed with [Read from PLC] - [Device data] on GX Developer to read it.

(b) Monitor the buffer memory of module to be changed with [Buffer memory batch monitor] on GX Developer and jot down the buffer memory contents.

Each operation should be performed before online module change, because they cannot be performed after online module change has started. For operating procedure, refer to Section 7.3.

### (4) Wiring

The wiring should be performed after making sure that all external power supply of current output has turned off.

## 7.4.2 Precautions after module change

### (1) Data recovery

Leaving from online module change mode once when changed module is normally recognized allows you to recover the data before resuming control.
As direct device access (MOV Un\G*), FROM/TO instruction and auto refresh setting by sequence program are invalid at this moment, perform data recovery with test operation of GX Developer or GX Configurator-TC manually. In addition, confirmation of control and writing to FeRAM are possible at this moment as necessary.
Also, if initial setting parameter is set on GX Configurator-TC, the initial setting contents are stored in the buffer memory when changed module is normally recognized.

### (2) Check before resuming control

Before resuming control, check the following items. If any fault is found, refer to Troubleshooting in Chapter 8 and take corrective action.

(a) The RUN LED is on.

(b) The ERR. LED is off.

(c) The watchdog timer error flag (Xn0) is off.

(d) The error flag (Xn2) is off.

REMARK

Note that module ready flag (Xn3) does not turns on just after mounted a module by online module change unlike in the case of usually starting up. Module ready flag (Xn3) turns on after resuming control. In consequence, sequence program, which sets the initial states by startup of module ready flag (Xn3), operates at resuming control.

## 7.4.3 List of precautions depending on parameter setting method

○ : Used, × : Not used

| Parameter setting method | | | Precautions for online module change | |
|---|---|---|---|---|
| FeRAM backup | GX Configurator-TC initial setting | Sequence program for writing initial values ∗1 | For executing save and recovery of buffer memory | For not executing save and recovery of buffer memory |
| × | × | × | No precaution | No precaution |
| × | × | ○ | ∗2 | No precaution |
| × | ○ | × | No precaution | No precaution |
| × | ○ | ○ | ∗2 | No precaution |
| ○ | × | × | ∗3 | No precaution |
| ○ | × | ○ | ∗2, ∗3 | No precaution |
| ○ | ○ | × | ∗2 | No precaution |
| ○ | ○ | ○ | ∗2, ∗3 | No precaution |

∗1: This indicates the sequence program that operates by startup of module ready flag (Xn3).

∗2: Even if the recovery of buffer memory has executed at the steps of "After mounting the module, click the [Execution] button of GX Developer" and "Operate GX Developer to resume the online module change mode, and click the [Execution] button to resume control" of user operation in Section 7.2, the buffer memory is overwritten by sequence program for writing initial values. The recovery of buffer memory should be executed after the step of "Operate GX Developer to resume the online module change mode, and click the [Execution] button to resume control".

∗3: Execute the recovery of FeRAM after the step "After mounting the module, click the [Execution] button of GX Developer" of user operation in Section 7.2 and then execute the recovery of buffer memory. Setting a data in the buffer memory and turning FeRAM backup command (Yn8) on recover FeRAM by test operation of GX Developer.

# 8 TROUBLESHOOTING

## 8.1 Error Code List

The error has the following three types.
• Write data error (□□□3H, □□□4H, □□□5H, □□□6H)*1
• AT error completion (001EH, 002EH, 003EH, 004EH, 005EH)
• Hardware error (001FH, 002FH, 003FH)

*1 The buffer memory address occurring write data error is displayed at "□□□" in hexadecimal.
Example) "0234H" expresses that data out of the range are written to proportional band (P) setting (buffer memory address: 35 (23H)).

The error code of the Q62HLC is stored into the buffer memory address 0.
Display it in hexadecimal for check.

### (1) Error code to be stored when multiple errors occur

(a) If higher priority error occurs during occurrence of lower priority error, the error code of the higher one is overwritten.

[Priority order]
High Hardware error ← AT error completion ← Write data error Low

(b) If multiple errors have been detected at hardware error/AT error completion, the error code of the first occurred error is retained.

(c) In write data error, if higher priority error occurs during occurrence of lower priority error, the error code of the higher one is overwritten.

[Priority order]
High □□□6H ← □□□3H ← □□□5H ← □□□4H Low

If the last one digits of the error codes are the same, the smallest buffer memory address among the ones where data were mistakenly written is stored by priority.
However, if error code is "□□□6H", the buffer memory address where data were mistakenly written first is held.

[Example of priority order of error code to be stored]
High 0A46H ← 0203H ← 0403H ← 0575H ← 0334H Low
"0A46H" is held even when "0346H" occurs.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## (2) Error Code List

| Error code (hexadecimal)*1 | Error type | Cause | Error-time operation | Corrective action |
|---|---|---|---|---|
| □□□3H | Write data error | • Write to the area write-enabled in the setting mode only was performed in the operation mode.<br>• Any of the following error codes occurred during setting mode; however, the mode is changed to operation mode without resetting the error.<br>• Write data error to input range (error code: 0204H, 0404H)<br>• Write error to alert mode setting (error code: 0C04H, 0C14H, 0C24H, 0C34H, 0D04H, 0D14H, 0D24H, 0D34H) | • The written data is held as is.<br>• If data are written to multiple write areas, the smallest buffer memory address among the ones where data were mistakenly written is stored by priority. | • Make error rest in the following procedure:<br>1) Choose the setting mode.<br>2) Set a correct value.<br>3) Make error reset.<br>• When changing from the operation mode to the setting mode, make sure that the PID continuation flag (buffer memory address: 169) is 0 (STOP), and turn off the setting/operation mode command (Yn1). |
| □□□4H | | • Data outside the setting range was written. | • The written data is held as is.<br>• When write area setting is over the upper and lower limit values, the upper and lower limit values are used to exercise the control.<br>• If multiple data outside the setting range were written, the smallest buffer memory address among the ones where data were mistakenly written is stored by priority. | • Set data within the range. |
| □□□5H | | • The setting of the upper/lower output limiter or upper/lower setting limiter is illegal. | • The written data is held as is.<br>• The upper and lower limit values that may be set are used to exercise control.<br>• If data are written to multiple limiter setting area, the smallest buffer memory address among the ones where data were mistakenly written is stored by priority. | • Make setting so that the upper limit value is greater than the lower limit value. |
| □□□6H | | • The set value was changed during default setting registration. | • The written data is ignored.<br>• Any set value cannot be changed until error reset is made.<br>• If another write error occurs, error code (the buffer memory address: 0) data does not change. | • After making error reset command (Yn2: ON), change the set value. |

*1 The buffer memory address occurring write data error is displayed at "□□□" in hexadecimal.
Example) "0234H" expresses that data out of the range are written to proportional band (P) setting (buffer memory address: 35 (23H)).




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| Error code (hexadecimal)*1 | Error type | Cause | Error-time operation | Corrective action |
|---|---|---|---|---|
| 001EH | AT error completion | • The measured value is out of the input range during AT. | • AT status (Xn4, Xn5) turns off.<br>• PID constants and loop disconnection detection judgment time do not change. | • Remove error factors after making error reset start command (Yn2: ON) and execute AT again. |
| 002EH | | • Control mode switched to the mode other than normal control mode during AT. | | |
| 003EH | | The following buffer memory of applicable channel is changed during AT.<br>• Set value (SV) setting<br>• Upper output limiter<br>• Lower output limiter<br>• Output variable limiter<br>• Sensor compensation value setting<br>• Primary delay digital filter setting<br>• Control mode<br>• AT bias<br>The following buffer memory of applicable channel is changed, and the set value is out of the range during AT.<br>• Upper setting limiter<br>• Lower setting limiter | | |
| 004EH | | • The half sine of data collection wave exceeded two hours during AT. | | |
| 005EH | | • PID constant calculated value exceeded the range. | | |
| 001FH | Hardware error | • Adjustment data error is detected. | • It depends on hardware error case. | • For temperature compensation error (Error code: 003FH), make sure that terminal block/cold junction temperature compensation resistor is not disconnected. If it is disconnected, connect correctly.<br>• Replace the module.<br>• Please consult your sales representative |
| 002FH | | • Analog/Digital conversion value error is detected. | | |
| 003FH | | • Temperature compensation error is detected. (Includes the case of cold junction temperature compensation resistance is not connected.) | | |

## 8.2 Processing Performed by Q62HLC at Error Occurrence

The Q62HLC performs processing as explained below if an error occurs in the Q62HLC/programmable controller CPU or when the programmable controller CPU is switched from RUN to STOP.

| Status | Processing | | | |
|---|---|---|---|---|
| Control output setting for CPU stop error | CLEAR | | HOLD | |
| PID continuation flag | Stop | Continue | Stop | Continue |
| At Q62HLC write error occurrence | Follows the operation to be performed at errors in Section 8.1 Error Code List. | | | |
| At Q62HLC AT error completion | | | | |
| At Q62HLC hardware error occurrence | | | | |
| At programmable controller CPU stop error occurrence | Stops the operation and turns off external output. | | Follows stop mode setting. | Continues the operation and performs external output. |
| When programmable controller CPU is switched from RUN to STOP | Follows stop mode setting. | Continues the operation and performs external output. | Follows stop mode setting. | Continues the operation and performs external output. |
| During programmable controller CPU reset | Does not perform external output, as module itself becomes inoperative. | | | |

**⚠DANGER**

- Do not write any data into the "read-only area" in the buffer memory of the intelligent function module. In addition, do not turn on/off the "reserved" signals among the I/O signals transferred to/from the programmable controller CPU.
  Doing so may cause malfunction of programmable controller system.
- Be extremely careful when setting the PID continuation flag which controls the external output.
- Abnormal output may be provided due to a failure of an output element or its internal circuit.
  Install an external monitoring circuit for the output signals which may lead to serious accidents.

## 8.3 If the RUN LED Has Flickered or Turned Off

| Check item | Corrective action |
|---|---|
| Is 5VDC supplied? | • Check the power supply module.<br>• Load the module securely. |
| Is the sum of current capacities of the modules loaded on the base unit equal to or less than the current capacity of the power supply module? | Make the sum of current capacities of the modules loaded on the base unit equal to or less than the current capacity of the power supply module. |
| Has a watchdog timer error occurred? | • Reset the programmable controller CPU or power it on again.<br>• Change the Q62HLC. |
| Is a module change enabled during an online module change? | Refer to Chapter 7 and handle it. |

## 8.4 If the ERR. LED Has Turned On or Flickered

### (1) If turned on

| Check item | Corrective action |
|---|---|
| Is cold junction temperature compensation resistance disconnected? | • Connect cold junction temperature compensation resistance. |
| — | • Q62HLC hardware fault.<br>Please consult your sales representative. |

### (2) If flickered

| Check item | Corrective action |
|---|---|
| Has a write data error occurred? | • Check the error code list in Section 8.1 and correct the sequence program. |

## 8.5 If the ALM LED Has Turned On or Flickered

### (1) If turned on

| Check item | Corrective action |
|---|---|
| Has the alert occurrence flag (XnC to XnD) turned on? | • Check the contents of the alert definition (buffer memory address: 5, 6) and take action for it. |

### (2) If flickered

| Check item | Corrective action |
|---|---|
| Is the process value beyond the measured range specified for the input range? | • Change the input range setting to the operating ambient range setting. |
| Is there any channel where a sensor is not connected? | • Set the channels, where the sensors are disconnected, to unused at the unused channel setting (buffer memory address: 61, 93). |
| Has a loop disconnection been detected? | • Check for a load disconnection, external operation device fault, sensor disconnector or the like. |

## 8.6 If the Watchdog Timer Error (Xn0) Has Turned ON

| Check item | Corrective action |
|---|---|
| — | • Reset the programmable controller CPU or power it on again.<br>If the watchdog timer error turned on again, it represents Q62HLC hardware fault.<br>Please consult your sales representative. |

## 8.7 If the Error Flag (Xn2) Has Turned ON

| Check item | Corrective action |
|---|---|
| Has a write data error occurred? | • Check the error code list in Section 8.1 and correct the sequence program. |
| Has AT error completion occurred? | • Check the error code list in Section 8.1 and correct the sequence program. |
| Has a hardware error occurred? | • When cold junction temperature compensation resistor is disconnected, connect it.<br>• It represents Q62HLC hardware fault.<br>Please consult your sales representative. |

## 8.8 If the Module READY Flag (Xn3) Does Not Turn ON

| Check item | Corrective action |
|---|---|
| Has an error occurred on the programmable controller? | • Q62HLC hardware fault.<br>Please consult your sales representative. |

## 8.9 If the FeRAM Write Failure Flag (XnA) Has Turned ON

| Check item | Corrective action |
|---|---|
| — | • Execute writing into FeRAM again.<br>If the FeRAM write failure flag (XnA) does not turn off, it represents Q62HLC hardware fault.<br>Please consult your sales representative. |

## 8.10 If Auto Tuning Does Not Start (If the Auto Tuning Status Flag (Xn4, Xn5) Does Not Turn ON)

| Check item | Corrective action |
|---|---|
| Are start conditions for auto tuning met? | • Check whether the all conditions are met with referring to Section 3.2.1 (2) (a). |
| Has auto tuning been completed abnormally? | • Check whether the auto tuning has completed abnormally with referring to Section 3.2.1 (2) (d). |

## 8.11 If Auto Tuning Does Not Complete (If the Auto Tuning Status Flag (Xn4, Xn5) Remains to Be ON and Does Not Turn OFF)

| Check item | Corrective action |
|---|---|
| Is the FeRAM's PID constant read/write flag (buffer memory address: 31) set to 1 (ON)? | • Set 0 (OFF) to the Automatic backup setting after auto tuning of PID constants (buffer memory address: 63, 95), and turn OFF the FeRAM's PID constant read/write flag (buffer memory address: 31). |
| Is the FeRAM's PID constant read command (buffer memory address: 62, 94) set to 1 (With command)? | • Set the FeRAM's PID constant read command (buffer memory address: 62, 94) to 0 (Without command). |
| Is the set value (SV) set correctly? (Does the manipulated value (MV) remain 0% since the set value (SV) is small?) | • Set arbitrary control value to the set value (SV). |

## 8.12 If the Alert Occurrence Flag (XnC to XnD) Has Turned ON

| Check item | Corrective action |
|---|---|
| Is the measured value error/alert set value beyond the range? | • Check the alert definition (buffer memory address: 5, 6) and take action for the alert that occurred. |
| Is a disconnection detected? | |

## 8.13 Checking the Q62HLC Status by System Monitoring of GX Developer

Choosing the detailed information of the Q62HLC in system monitoring of GX Developer allows you to check the error codes and LED lit-up states.

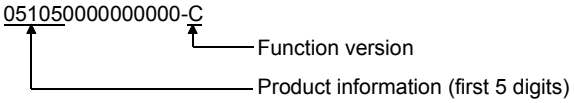
### (1) Operating GX Developer

[Diagnostics] → [System monitor] → "Select Q62HLC" → Module Detailed Information

### (2) Module Detail Information

#### (a) Checking the function version

The function version of the Q62HLC is displayed in the product information field.

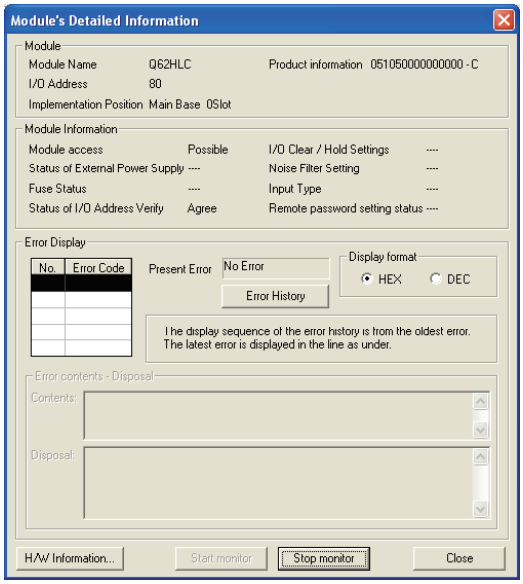



#### (b) Checking the error code

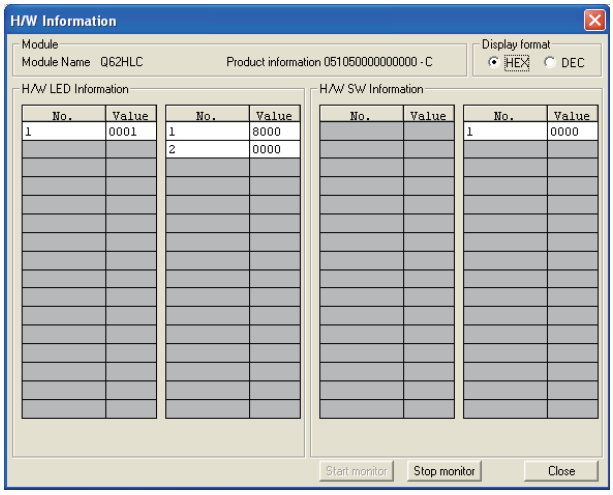
The error code stored in buffer memory address 0 of the Q62HLC is displayed in the latest error code field. (Refer to Section 8.1)
If the error code is indicated in hexadecimal, the last 1 digit indicates the error code and the last 2 to 4 digits indicate the error occurrence factor.
The error occurrence factor includes the following information.

- For write data error: buffer memory address that detected the error
- For AT error completion or hardware error: factor code

(When the Error History button is pressed, the contents displayed in the Present Error field are displayed in the No. 1 field.)



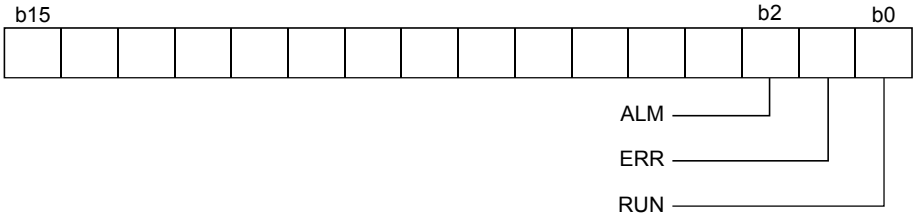
### (3) H/W Information



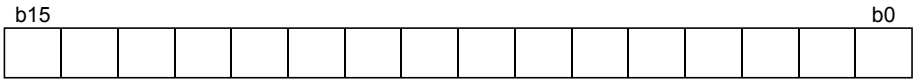

#### (a) Hardware LED information

The hardware LED information gives the following information.

##### 1) Actual LED information

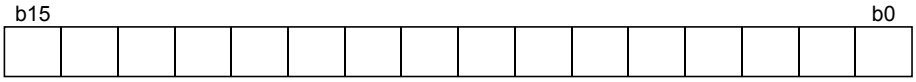



##### 2) LED1 information




| bit | Condition on which bit turns on | bit | Condition on which bit turns on |
|---|---|---|---|
| b0 | Unused | b8 | When CH1 loop disconnection is detected |
| b1 | When CH2 loop disconnection is detected | b9 | When CH1 alert 4 is on |
| b2 | When CH2 alert 4 is on | b10 | When CH1 alert 3 is on |
| b3 | When CH2 alert 3 is on | b11 | When CH1 alert 2 is on |
| b4 | When CH2 alert 2 is on | b12 | When CH1 alert 1 is on |
| b5 | When CH2 alert 1 is on | b13 | When CH1 PID control is exercised |
| b6 | When CH2 PID control is exercised | b14 | At write data error occurrence (Refer to 8.1) |
| b7 | Unused | b15 | Same as the one of the actual RUN LED |

3) LED2 information




| bit | Condition on which bit turns on | bit | Condition on which bit turns on |
|---|---|---|---|
| b0 | Unused | b8 | Unused |
| b1 | Unused | b9 | Unused |
| b2 | Unused | b10 | Unused |
| b3 | Unused | b11 | Unused |
| b4 | Unused | b12 | Unused |
| b5 | Unused | b13 | Unused |
| b6 | Unused | b14 | At hardware error occurrence |
| b7 | Unused | b15 | Unused |

(b) H/W Switch information

Shows the status of the intelligent function module switch setting (Switch 1).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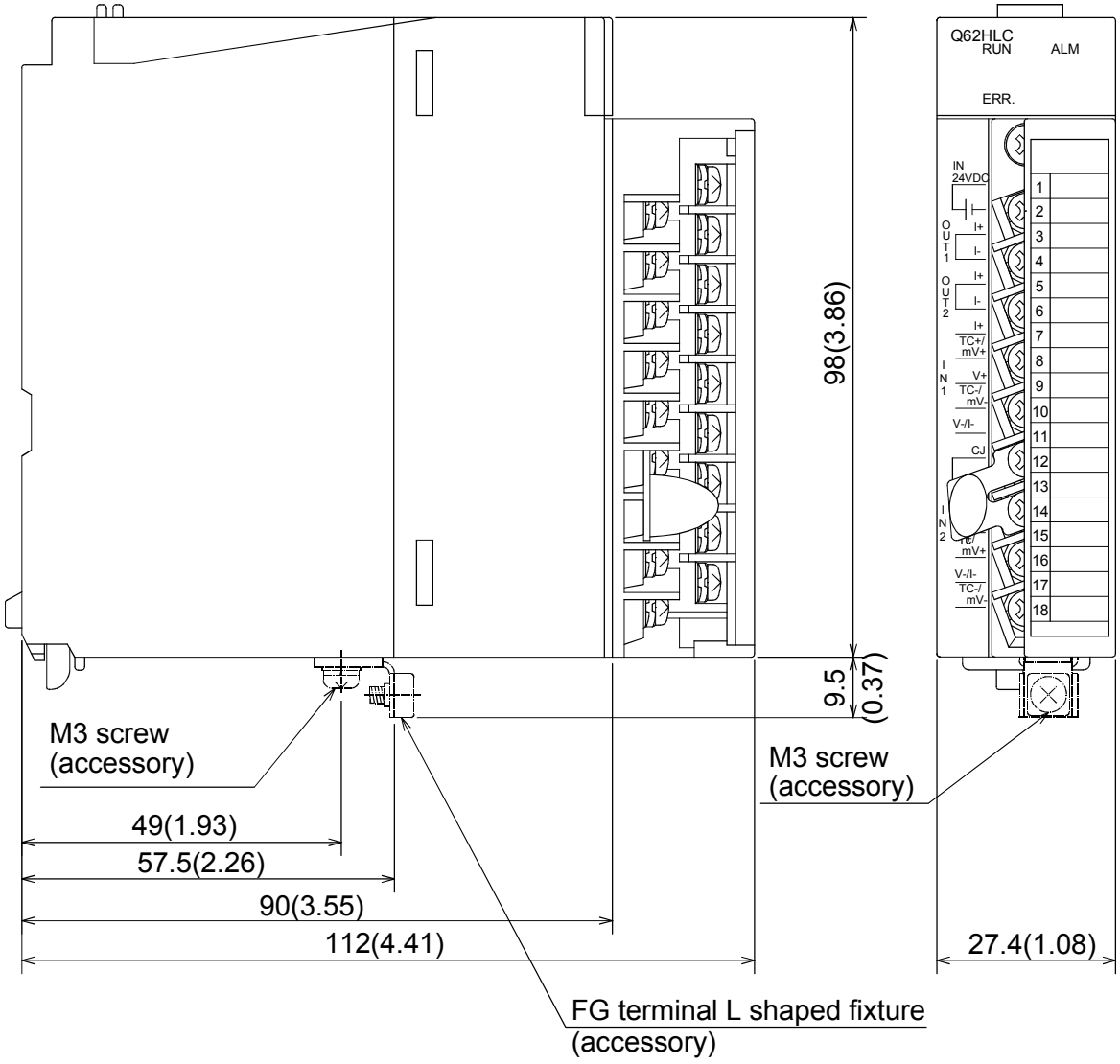
# APPENDIX

## Appendix 1 External Dimension Diagram




Unit : mm (inch)

App.


Appendix - 1

## Appendix 2 New Function of the Q62HLC

The following describes the new function of the Q62HLC.

| Item | Description | | Reference section |
|---|---|---|---|
| | Old model | Module of which the first five digits of the production information is "10022" or later or the first five digits of the product information is "10011" or later | |
| Intelligent function module switch setting (Switch 2) | Reserved (0 fixed) | Control status when switching to program control can be selected.<br>1: Switch with executing control<br>Other than 1: Switch with suspending control | Section 4.5 |
| Manipulated value (MV value) | The manipulated value (MV) becomes -50 for 25ms when switching to program control. (Suspends the PID control to switch into program control.) | The control status when switching to program control can be selected in the intelligent function module switch setting (Switch 2). | Section 3.2.16 |

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# MEMO


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# WARRANTY

Please confirm the following product warranty details before using this product.

## 1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

### [Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.
Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

### [Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

## 2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
(2) Product supply (including repair parts) is not available after production is discontinued.

## 3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

## 4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

## 5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

## 6. Product application

(1) In using the Mitsubishi MELSEC programmable controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
(2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

SH (NA)-080573ENG-D

# Loop Control Module

## User's Manual

| | |
|---|---|
| MODEL | Q62HLC-U-SY-E |
| MODEL CODE | 13JR85 |
| SH(NA)-080573ENG-D(0805)MEE | |

MITSUBISHI ELECTRIC CORPORATION

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