MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-R series

MELSEC iQ-R Temperature Control Module User's Manual (Startup)

-R60TCTRT2TT2
-R60TCTRT2TT2BW
-R60TCTRT2TT2-TS
-R60TCRT4
-R60TCRT4BW
-R60TCRT4-TS

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions for the programmable controller system, refer to MELSEC iQ-R Module Configuration Manual.

In this manual, the safety precautions are classified into two levels: " ⚠ WARNING" and " ⚠ CAUTION".

⚠ **WARNING**	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 minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under " ⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
    - Turned OFF if the overcurrent or overvoltage protection of the power supply module is activated.
    - Held or turned OFF according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
  (4) Outputs may remain ON or OFF due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- Configure a circuit so that the external power supply is turned OFF first and then the programmable controller. If the programmable controller is turned off first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals for the network used. For the manuals, please consult your local Mitsubishi representative. Incorrect output or malfunction due to a communication failure may result in an accident.
- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents. When a Safety CPU is used, data cannot be modified while the Safety CPU is in SAFETY MODE.

[Design Precautions]

⚠WARNING

- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used. For areas used for safety communications, they are protected from being written by users, and thus safety communications failure caused by data writing does not occur.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Incorrect output or malfunction due to a communication failure may result in an accident. When safety communications are used, an interlock by the safety station interlock function protects the system from an incorrect output or malfunction.

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to electromagnetic interference. Keep a distance of 100mm or more between those cables.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from OFF to ON. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered ON or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power OFF the programmable controller or do not reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM or SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM or the SD memory card again. Doing so may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not Open by Program" for "Opening Method" of "Module Parameter". If "Open by Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.

[Security Precautions]

⚠WARNING

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets general specifications written in Safety Guidelines included in the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction. For the specified torque range, refer to MELSEC iQ-R Module Configuration Manual.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette or a battery-less option cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Beware that the module could be very hot while power is on and immediately after power-off.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, battery-less option cassette, or connector. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After installation and wiring, attach a blank cover module (RG60) to each empty slot and an included extension connector protective cover to the unused extension cable connector before powering on the system for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to noise. Keep a distance of 100mm or more between those cables.
- Place the cables in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in malfunction or damage to modules or cables.
  In addition, the weight of the cables may put stress on modules in an environment of strong vibrations and shocks.
  Do not clamp the extension cables with the jacket stripped. Doing so may change the characteristics of the cables, resulting in malfunction.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.

[Wiring Precautions]

⚠CAUTION

- Individually ground the shielded cables of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury or fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not perform each of the following operations more than 50 times (IEC 61131-2/JIS B 3502 compliant).
  Exceeding the limit may cause malfunction.
  - Mounting/removing the module to/from the base unit
  - Inserting/removing the extended SRAM cassette or battery-less option cassette to/from the CPU module
  - Mounting/removing the terminal block to/from the module
  - Connecting/disconnecting the extension cable to/from the base unit
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette or a battery-less option cassette. Doing so may cause malfunction or failure of the module.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Wearing a grounded antistatic wrist strap is recommended. Failure to discharge the static electricity may cause the module to fail or malfunction.
- Use a clean and dry cloth to wipe off dirt on the module.

[Operating Precautions]

⚠CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power OFF the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM or SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM or SD memory card again. Doing so can cause malfunction or failure of the module.

[Computer Connection Precautions]

⚠CAUTION

- When connecting a personal computer to a module having a USB interface, observe the following precautions as well as the instructions described in the manual for the personal computer used. Failure to do so may cause the module to fail.
  (1) When the personal computer is AC-powered
  When the personal computer has a 3-pin AC plug or an AC plug with a grounding wire, connect the plug to a grounding receptacle or ground the grounding wire. Ground the personal computer and the module with a ground resistance of 100 ohms or less.
  When the personal computer has a 2-pin AC plug without a grounding wire, connect the computer to the module by following the procedure below. For power supplied to the personal computer and the module, using the same power source is recommended.
  1. Unplug the personal computer from the AC receptacle.
  2. Check that the personal computer is unplugged. Then, connect the personal computer to the module with a USB cable.
  3. Plug the personal computer into the AC receptacle.
  (2) When the personal computer is battery-powered
  The personal computer can be connected to the module without taking specific measures.
  For details, refer to the following:
  Cautions When Using Mitsubishi Electric Programmable Controllers or GOTs Connected to a Personal Computer With the RS-232/USB Interface(FA-D-0298)
  When the USB cable used is the GT09-C30USB-5P manufactured by Mitsubishi Electric, specific measures are not required to connect the AC-powered personal computer to the module. However, note that the signal ground (SG) is common for the module and its USB interface. Therefore, if an SG potential difference occurs between the module and the connected devices, it causes failures of the module and the connected devices.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

⚠CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

(1) MELSEC programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI ELECTRIC SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI ELECTRIC USER'S, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above restrictions, Mitsubishi Electric may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi Electric and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi Electric representative in your region.

(3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.
This manual describes the performance specifications, procedures before operation, wiring, and operation examples of the relevant products listed below.
Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.
When applying the program and circuit examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
Please make sure that the end users read this manual.

Point

Unless otherwise specified, this manual provides program examples in which the I/O numbers of X/Y0 to X/YF are assigned to the temperature control module. Assign I/O numbers when applying the program examples to an actual system. For I/O number assignment, refer to the following:
MELSEC iQ-R Module Configuration Manual

Relevant products

R60TCTRT2TT2, R60TCTRT2TT2BW, R60TCTRT2TT2-TS, R60TCRT4, R60TCRT4BW, R60TCRT4-TS

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- MELSEC iQ-R Module Configuration Manual
- Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the following manuals.

- MELSEC iQ-R Module Configuration Manual
- Safety Guidelines (This manual is included with the base unit.)

CONTENTS

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Temperature Control Module User's Manual (Startup) [SH-081535ENG] (this manual)	Specifications, procedures before operation, wiring, and operation examples of the temperature control module	Print book e-Manual PDF
MELSEC iQ-R Temperature Control Module User's Manual (Application) [SH-081536ENG]	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of the temperature control module	Print book e-Manual PDF
MELSEC iQ-R Module Configuration Manual [SH-081262ENG]	The combination of the MELSEC iQ-R series modules, common information on the installation/wiring in the system, and specifications of the power supply module, base unit, SD memory card, and battery	Print book e-Manual PDF
MELSEC iQ-R Temperature Control Module Function Block Reference [BCN-P5999-0565]	FBs of a Temperature control module	e-Manual PDF
GX Works3 Operating Manual [SH-081215ENG]	System configurations, parameter settings, and operation methods for the online function in GX Works3	e-Manual PDF

This manual does not include detailed information on the following:

- General specifications
- Applicable combinations of CPU modules and the other modules, and the number of mountable modules
- Applicable combinations of the remote head module and the other modules, and the number of mountable modules
- Installation

For details, refer to the following:

MELSEC iQ-R Module Configuration Manual

This manual does not include information on the module function blocks.

For details, refer to the Function Block Reference for the module used.

Point

e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- Hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.
- Sample programs can be copied to an engineering tool.

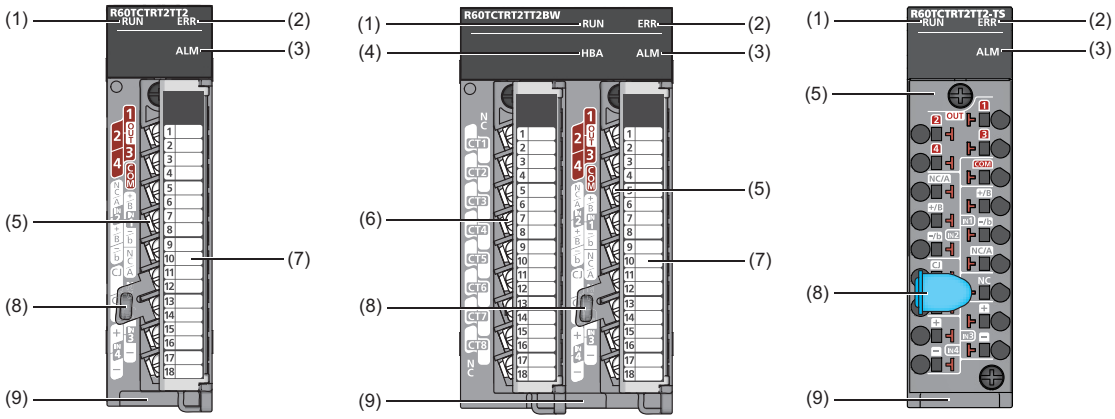
TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Buffer memory	The intelligent function module's memory where the data (such as setting values and monitored values) transferred from/to the CPU module is stored
Control method	The generic term of two-position control, P control, PI control, PD control, and PID control
Control mode	The generic term of standard control, heating-cooling control (normal mode), heating-cooling control (expanded mode), mix control (normal mode), mix control (expanded mode), position proportional control (normal mode), and position proportional control (expanded mode)
CPU module	The generic term of MELSEC iQ-R series CPU modules
Engineering tool	The product name of the MELSEC programmable controller software package
Fixed value action	The operating status of when a constant set value (SV) is kept
Global label	When multiple program data sets are created in a project, this label is valid for all the data sets. Global labels are classified into two types: Module-specific labels (module labels) that are automatically created by GX Works3 and labels that can be created for a specified device.
Module label	The memory areas that are defined by each module (I/O signals or buffer memory area) and expressed with character strings. GX Works3 automatically creates module labels from the module to be used. These labels can be used as global labels.
PID constants	The generic term of the proportional band (P), integral time (I), and derivative time (D)
Q compatible mode	The buffer memory map is converted into the one for the MELSEC-Q series to operate the module.
R mode	In this mode, the module operates with the buffer memory map that has been newly assigned for the MELSEC iQ-R series.
Ramp action	The operating status of when a set value (SV) always changes
Temperature sensor	The generic term of thermocouples and platinum resistance thermometers

1 PART NAMES

This chapter shows the part names of a temperature control module.



No.	Name	Description
(1)	RUN LED	Indicates the operating status of the temperature control module. ON: The module is operating normally. Flashing: The module is selected as a module for the online module change. OFF: 5V power OFF, watchdog timer error occurred, or module replacement is allowed in the process of the online module change.
(2)	ERR LED	Indicates the error status of the temperature control module. ON: An error has occurred. OFF: The module is operating normally.
(3)	ALM LED	Indicates the alarm status of the temperature control module. ON: An alert has occurred. Flashing: The temperature process value (PV) is out of the temperature measuring range, a loop disconnection is detected, or no temperature sensor is connected. OFF: No alert has occurred.
(4)	HBA LED	Indicates the heater disconnection detection status or the output off-time current error status of the R60TCTRT2TT2BW and R60TCRT4BW. ON: The heater disconnection status or the output off-time current error is detected. OFF: The heater disconnection or the output off-time current error is not detected.
(5)	Terminal block for I/O	Used for temperature sensor input and transistor output.
(6)	Terminal block for CT	Used for current sensor (CT) input.
(7)	Terminal block cover	Prevents electric shock when current is applied.
(8)	Cold junction temperature compensation resistor	Used when cold junction temperature compensation is executed for the R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS.
(9)	Production information marking	Displays the module production information (16 digits).

MEMO

2 SPECIFICATIONS

This chapter describes the performance specifications.

2.1 Performance Specifications

The following table lists the performance specifications of a temperature control module.

Screw terminal block type

Item			R60TCTRT2TT2	R60TCRT4	R60TCTRT2TT2BW	R60TCRT4BW
Control output			Transistor output			
Number of temperature input points			4 channels/module			
Applicable thermocouple/platinum resistance thermometer			Refer to the following: ☞ Page 23 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance			
Accuracy*1	Indication accuracy	Ambient temperature: 25±5℃	Full scale × (±0.3%)			
		Ambient temperature: 0 to 55℃	Full scale × (±0.7%)			
	Cold junction temperature compensation accuracy (Ambient temperature: 0 to 55℃)	Temperature process value: -100℃ or higher	Within ±1.0℃	—	Within ±1.0℃	—
		Temperature process value: -150 to -100℃	Within ±2.0℃		Within ±2.0℃	
		Temperature process value: -200 to -150℃	Within ±3.0℃		Within ±3.0℃	
Sampling cycle			Switchable between 250 ms/4 channels and 500 ms/4 channels			
Control output cycle			0.5 to 100.0 s			
Input impedance			1 MΩ			
Input filter			0 to 100 s (0: Input filter OFF)			
Sensor correction value setting			■In the R mode (-(full scale of input range)) to full scale of input range ■In the Q compatible mode -50.00 to 50.00%			
Operation at a sensor input disconnection			Upscale processing			
Temperature control method			PID ON/OFF pulse or two-position control			
PID constants range	PID constants setting		Setting by auto tuning is available.			
	Proportional band (P)		■In the R mode 0 (0.0) to full scale of input range (depending on the decimal point position) (0: Twoposition control) ■In the Q compatible mode 0.0 to 1000.0% (0: Two-position control)			
	Integral time (I)		0 to 3600 s (Set 0 for P control and PD control.)			
	Derivative time (D)		0 to 3600 s (Set 0 for P control and PI control.)			
Set value setting range			Within the temperature range set in the thermocouple/platinum resistance thermometer to be used			
Dead band setting range			■In the R mode 0 (0.0) to full scale of input range (depending on the decimal point position) ■In the Q compatible mode 0.1 to 10.0%			
Transistor output	Output signal		ON/OFF pulse			
	Rated load voltage		10 to 30 VDC			
	Maximum load current		0.1 A/point, 0.4 A/common			
	Maximum inrush current		0.4 A, 10 ms			
	Leakage current at OFF		0.1 mA or lower			
	Maximum voltage drop at ON		1.0 VDC (TYP) 0.1 A, 2.5 VDC (MAX) 0.1 A			
	Response time		OFF→ON: 2 ms or less, ON→OFF: 2 ms or less			

Item		R60TCTRT2TT2	R60TCRT4	R60TCTRT2TT2BW	R60TCRT4BW
Number of accesses to non-volatile memory		10^{12} times maximum			
Insulation method		Between the input terminal and PLC power supply: Transformer Between input channels: Transformer			
Withstand voltage		Between input terminals and programmable controller power supply: 500 VAC, 1 minute Between input channels: 500 VAC, 1 minute			
Insulation resistance		Between input terminals and programmable controller power supply: 500 VDC, 20 MΩ or higher Between input channels: 500 VDC, 20 MΩ or higher			
Heater disconnection detection specifications	Current sensor	—		Refer to the following: ☞ Page 30 Current sensor for heater disconnection detection	
	Input accuracy			Full scale × (±1.0%)	
	Number of alert delay			3 to 255 times	
Number of occupied I/O points		16 points, 1 slot (I/O assignment: intelligent 16 points)		32 points, 2 slots (I/O assignment: empty 16 points + intelligent 16 points)	
External connection system		18-point terminal block		18-point terminal block × 2	
Applicable wire size		0.3 to 0.75 mm^2 (22 to 18 AWG)			
Applicable solderless terminal		R1.25-3 (The solderless terminal with an insulation sleeve cannot be used.)			
Internal current consumption		0.28 A		0.31 A	
Weight		0.23 kg		0.35 kg	
External dimensions	Height	106mm (Base unit mounting part: 98mm)		106mm (Base unit mounting part: 98mm)	
	Width	27.8mm		56mm	
	Depth	131mm		131mm	

*1 Except for the conditions under noise influence.

How to calculate the accuracy

Calculate the accuracy in the following method.

Accuracy (℃) = (indication accuracy) + (cold junction temperature compensation accuracy)

Ex.

Accuracy at the input range set to "38: Thermocouple K Measured Temperature Range (-200.0 to 400.0℃)", operating ambient temperature of 35℃, and the temperature process value (PV) of 300℃

(indication accuracy) + (cold junction temperature compensation accuracy)

= (400.0℃ - (-200.0℃)) × (±0.007) + (±1.0℃)

= ±5.2℃

Spring clamp terminal block type

Item			R60TCTRT2TT2-TS	R60TCRT4-TS
Control output			Transistor output	
Number of temperature input points			4 channels/module	
Applicable thermocouple/platinum resistance thermometer			Refer to the following: ☞ Page 23 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance	
Accuracy*1	Indication accuracy	Ambient temperature: 25±5℃	Full scale × (±0.3%)	
		Ambient temperature: 0 to 55℃	Full scale × (±0.7%)	
	Cold junction temperature compensation accuracy (Ambient temperature: 0 to 55℃)	Temperature process value: -100℃ or higher	Within ±1.0℃	—
		Temperature process value: -150 to -100℃	Within ±2.0℃	
		Temperature process value: -200 to -150℃	Within ±3.0℃	
Sampling cycle			Switchable between 250 ms/4 channels and 500 ms/4 channels	
Control output cycle			0.5 to 100.0 s	
Input impedance			1 MΩ	
Input filter			0 to 100 s (0: Input filter OFF)	
Sensor correction value setting			(-(full scale of input range)) to full scale of input range	
Operation at a sensor input disconnection			Upscale processing	
Temperature control method			PID ON/OFF pulse or two-position control	
PID constants range	PID constants setting		Setting by auto tuning is available.	
	Proportional band (P)		0 (0.0) to full scale of input range (depending on the decimal point position) (0: Twoposition control)	
	Integral time (I)		0 to 3600 s (Set 0 for P control and PD control.)	
	Derivative time (D)		0 to 3600 s (Set 0 for P control and PI control.)	
Set value setting range			Within the temperature range set in the thermocouple/platinum resistance thermometer to be used	
Dead band setting range			0 (0.0) to full scale of input range (depending on the decimal point position)	
Transistor output	Output signal		ON/OFF pulse	
	Rated load voltage		10 to 30 VDC	
	Maximum load current		0.1 A/point, 0.4 A/common	
	Maximum inrush current		0.4 A, 10 ms	
	Leakage current at OFF		0.1 mA or lower	
	Maximum voltage drop at ON		1.0 VDC (TYP) 0.1 A, 2.5 VDC (MAX) 0.1 A	
	Response time		OFF→ON: 2 ms or less, ON→OFF: 2 ms or less	
Number of accesses to non-volatile memory			10^{12} times maximum	
Insulation method			Between the input terminal and PLC power supply: Transformer Between input channels: Transformer	
Withstand voltage			Between input terminals and programmable controller power supply: 500 VAC, 1 minute Between input channels: 500 VAC, 1 minute	
Insulation resistance			Between input terminals and programmable controller power supply: 500 VDC, 20 MΩ or higher Between input channels: 500 VDC, 20 MΩ or higher	
Number of occupied I/O points			16 points, 1 slot (I/O assignment: intelligent 16 points)	
External connection system			18-point terminal block	
Applicable wire size			0.3~2.00 mm^2(AWG22~15)	
Applicable solderless terminal			Refer to the following: ☞ Page 32 Spring clamp terminal block	
Internal current consumption			0.28 A	
Weight			0.24 kg	
External dimensions	Height		106mm (Base unit mounting part: 98mm)	106mm (Base unit mounting part: 98mm)
	Width		27.8mm	27.8mm
	Depth		141mm	130mm

*1 Except for the conditions under noise influence.

How to calculate the accuracy

Calculate the accuracy in the following method.

Accuracy (℃) = (indication accuracy) + (cold junction temperature compensation accuracy)

Ex.

Accuracy at the input range set to "38: Thermocouple K Measured Temperature Range (-200.0 to 400.0℃)", operating ambient temperature of 35℃, and the temperature process value (PV) of 300℃

(indication accuracy) + (cold junction temperature compensation accuracy)

= (400.0℃ - (-200.0℃)) × (±0.007) + (±1.0℃)

= ±5.2℃

2.2 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance

This section describes the types of temperature sensors that can be used with the temperature control module, the temperature measuring range, the resolution, and the effect from wiring resistance of 1Ω.

Thermocouple

The following table lists the types of thermocouples that can be used with the R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS, the temperature measuring range, the resolution, and the effect from wiring resistance of 1Ω.

Thermocouple type	℃			℉		
	Temperature measuring range	Resolution	Effect from wiring resistance of 1Ω (℃/Ω)*1	Temperature measuring range	Resolution	Effect from wiring resistance of 1Ω (℉/Ω)*1
R	0 to 1700	1	0.030	0 to 3000	1	0.054
K	0 to 500 0 to 800 0 to 1300	1	0.005	0 to 1000 0 to 2400	1	0.008
	-200.0 to 400.0 0.0 to 400.0 0.0 to 500.0 0.0 to 800.0 -200.0 to 1300.0	0.1		0.0 to 1000.0	0.1	
J	0 to 500 0 to 800 0 to 1200	1	0.003	0 to 1000 0 to 1600 0 to 2100	1	0.006
	0.0 to 400.0 0.0 to 500.0 0.0 to 800.0 -200.0 to 1000.0	0.1		0.0 to 1000.0	0.1	
T	-200 to 400 -200 to 200 0 to 200 0 to 400	1	0.004	0 to 700 -300 to 400	1	0.008
	-200.0 to 400.0 0.0 to 400.0	0.1		0.0 to 700.0	0.1	
S	0 to 1700	1	0.030	0 to 3000	1	0.054
B	0 to 1800*2	1	0.038	0 to 3000*2	1	0.068
E	0 to 400 0 to 1000	1	0.003	0 to 1800	1	0.005
	0.0 to 700.0 -200.0 to 1000.0	0.1		—	—	—
N	0 to 1300	1	0.006	0 to 2300	1	0.011
	0.0 to 1000.0	0.1		—	—	—
U	0 to 400 -200 to 200	1	0.004	0 to 700 -300 to 400	1	0.009
	0.0 to 600.0	0.1		—	—	—
L	0 to 400 0 to 900	1	0.003	0 to 800 0 to 1600	1	0.006
	0.0 to 400.0 0.0 to 900.0	0.1		—	—	—
PLⅡ	0 to 1200	1	0.005	0 to 2300	1	0.010
W5Re/W26Re	0 to 2300	1	0.017	0 to 3000	1	0.021

*1 Means temperature error per Ω of wiring resistance of the thermocouple. The error varies depending on measured temperature or ambient temperature. The temperature error can be corrected by the sensor correction function. (📖 MELSEC iQ-R Temperature Control Module User's Manual (Application))

*2 Although a temperature lower than 400℃ or lower than 800℉ can be measured, the accuracy cannot be guaranteed.

Platinum resistance thermometer

The following table lists the types of platinum resistance thermometers that can be used with the temperature control module and the temperature measuring range.

Platinum resistance thermometer type	℃		℉	
	Temperature measuring range	**Resolution**	**Temperature measuring range**	**Resolution**
Pt100	-200.0 to 600.0 -200.0 to 200.0 -200.0 to 850.0	0.1	-300 to 1100	1
			-300.0 to 300.0	0.1
JPt100	-200.0 to 500.0 -200.0 to 200.0 -200.0 to 640.0	0.1	-300 to 900	1
			-300.0 to 300.0	0.1

Restriction

For the R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS, only CH1 and CH2 can be used.

3 FUNCTION LIST

The following table lists the functions of the temperature control module. For details on each function, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)
○: Available, ×: Not available

Item		Description	Availability		
			Standard control	Heating-cooling control	Position proportional control
Control mode selection function		A control mode can be selected from the following modes: • Standard control • Heating-cooling control (normal mode) • Heating-cooling control (expanded mode) • Mix control (normal mode) • Mix control (expanded mode) • Position proportional control (normal mode) • Position proportional control (expanded mode)	○	○	○
Control method	Two-position control	By the settings of proportional band (P), integral time (I), and derivative time (D), each control method can be performed.	○	○	○
	P control		○	○	×
	PI control		○	○	○
	PD control		○	○	×
	PID control		○	○	○
Sampling cycle switching function		A sampling cycle can be selected from the following: • 500 ms • 250 ms	○	○	○
Control output cycle unit selection function		A unit for the control output cycle can be switched between 1 s and 0.1 s.	○	○	×
HOLD/CLEAR function		Whether to clear or hold the transistor output status when a CPU module stop error occurs or when a CPU module is turned from RUN to STOP can be selected.	○	○	○
Overlap/dead band function		By changing the temperature at which the cooling transistor output is started, whether control stability is prioritized or energy saving is prioritized can be selected.	×	○	×
Manual reset function		A stable position in the P control or PD control can be moved manually.	○	○	×
Cooling method setting function		At the execution of auto tuning, an auto tuning operational expression is automatically selected according to a selected cooling method and an operation can be started.	×	○	×
Temperature conversion function (using unused channels)		In the heating-cooling control (normal mode), mix control (normal mode), or position proportional control (normal mode), only the temperature measurement can be performed using unused temperature input terminals.	×	○	○
Manual control		A manipulated value (MV) can be set manually by users without being automatically calculated by the PID control.	○	○	×
Auto tuning function		Suitable PID constants can be set automatically.	○	○	○
Self-tuning function		The temperature control module constantly monitors the control state, and PID constants can be changed automatically when the control system is oscillatory just after the control start, owing to the set value (SV) change or fluctuation of characteristics of a controlled object.	○	×	×
Direct/reverse action selection function		Whether to execute a PID operation with a direct action or a reverse action can be selected.	○	×	○
RFB limiter function		When deviation (E) continues for a long period of time, the PID operation results (manipulated value (MV)) calculated by integral actions can be prevented from exceeding the effective range of the manipulated value (MV).	○	○	○
Derivative action selection function		Dynamic characteristics can be improved by selecting a suitable derivative action for fixed value actions or ramp actions.	○	○	×

Item	Description	Availability		
		Standard control	Heating-cooling control	Position proportional control
Simple two-degree-of-freedom	In addition to the PID control, a suitable response speed for the set value (SV) change can be selected from three levels to simply achieve the two-degree-offreedom PID control.	○	○	○
Auto-setting at input range change	When the input range is changed, the related buffer memory data is automatically changed to prevent the values in those buffer memory areas from being out of the setting range.	○	○	○
Setting variation rate limiter setting function	Setting change rate limiters for the temperature rise and the temperature drop can be set in a batch or individually.	○	○	○
Sensor correction function	When there is an error between the temperature process value (PV) and actual temperature due to measurement conditions, the error can be corrected. Select one of the following two correction methods: • Normal sensor correction (one-point correction) function: Corrects the error using a set value as the error correction value. • Sensor two-point correction function: Sets two points (correction offset value, correction gain value) to correct the error.	○	○	○
Primary delay digital filter	By setting the primary delay digital filter, a temperature process value (PV) with smoothed transient noise can be output.	○	○	○
Moving average processing	Moving average processing can be set to a temperature process value (PV). With this function, the fluctuation of temperature process values (PV) can be reduced in electrically noisy environments or in the environments where temperature process values (PV) fluctuate greatly. The moving average processing can be disabled to hasten the response to the change of temperature process values (PV).	○	○	○
Scaling function	Temperature process values (PV) can be converted into the set width to import them in the buffer memory.	○	○	○
ON delay output function	Settings considering the delay time (response/scan time delay) of an actual transistor output can be configured.	○	○	○
Input/output (with another analog module) function	Input and output data can be performed with other analog modules (including A/D converter module and D/A converter module) on the system. The position proportional control can use input only.	○	○	○
Alert function	An alert is issued when a temperature process value (PV) or deviation (E) meets the condition set in advance.	○	○	○
Rate alarm function	The temperature process value (PV) is monitored every rate alarm alert detection cycle. When the variation from the previously monitored value is greater than the rate alarm upper limit value or smaller than the rate alarm lower limit value, an alert occurs.	○	○	○
Heater disconnection detection function	The current which flows in the heater main circuit can be measured and disconnections can be detected.	○	○	×
Output off-time current error detection function	An error of when the transistor output is off can be detected.	○	○	×
Loop disconnection detection function	The current which flows in the heater main circuit can be measured and disconnections can be detected.	○	×	×
Loop disconnection detection during AT function	Loop disconnections can be detected during AT (auto tuning).	○	×	×
Peak current suppression function	The peak current can be suppressed by automatically changing the values of the upper limit output limiter of each channel and dividing the timing of the transistor output.	○	×	×
Simultaneous temperature rise function	The time of multiple loops to reach the set value (SV) can be aligned.	○	×	×

Item		Description	Availability		
			Standard control	Heating-cooling control	Position proportional control
Inter-module link function	Inter-module peak current suppression function	The peak current can be suppressed by linking multiple modules, and automatically changing the values of the upper limit output limiter of each channel, and dividing the timing of the transistor output.	○	×	×
	Inter-module simultaneous temperature rise function	The time of multiple loops to reach the set value (SV) can be aligned by linking multiple modules.	○	×	×
Proportional band setting function		The proportional bands (P) for heating and cooling can be set individually.	×	○	×
Disturbance suppression function		The temperature change caused by disturbance can be damped quickly.	○	○	×
Buffer memory data backup function		A set value in a buffer memory area can be backed up in the non-volatile memory.	○	○	○
Overshoot control function		The overshoot at start-up and at set value (SV) change can be controlled. This function and setting of control response parameter allow high-speed temperature rise.	○	○	○
Error history function		Up to 16 errors and alarms that occur in a temperature control module are stored in the buffer memory as history.	○	○	○
Event history function		The errors or alarms occurred and operations executed on the temperature control module are collected as event information into the CPU module.	○	○	○
Interrupt function		An interrupt program of the CPU module is started when an interrupt factor such as alarm output is detected.	○	○	○
Online module change		A module can be changed without stopping the system. For the procedure of the online module change, refer to the following: MELSEC iQ-R Online Module Change Manual	○	○	○
Q compatible mode function (R60TCTRT2TT2, R60TCTRT2TT2BW, R60TCRT4, R60TCRT4BW only)		The buffer memory addresses of the temperature control module can be arranged to become equivalent to the ones of a MELSEC-Q series module. Programs proven with the MELSEC-Q series module can be used.	○	○	○

4 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation.

1. Mounting modules

Mount the temperature control module in a desired configuration.

☞ Page 30 SYSTEM CONFIGURATION

2. Wiring

Wire external devices to the temperature control module.

☞ Page 32 INSTALLATION AND WIRING

3. Addition of modules

Use an engineering tool to add the temperature control module to the module configuration. For details, refer to the following:

📖GX Works3 Operating Manual

4. Setting parameters

Use an engineering tool to set the parameters of the temperature control module. For details, refer to the following:

📖MELSEC iQ-R Temperature Control Module User's Manual (Application)

5. Execution of auto tuning

To execute the auto tuning, set PID constants with the auto tuning function. For details, refer to the following:

📖MELSEC iQ-R Temperature Control Module User's Manual (Application)

Perform a warm-up operation for about 15 minutes before executing the auto tuning.

6. Programming

Create a program. For details, refer to the following:

☞ Page 53 OPERATION EXAMPLES

7. Warm-up operation

Perform a warm-up operation for about 15 minutes before operation.

Point

To prevent operations of the temperature control module from being affected by the temperature rise inside the module just after the power-on, perform a warm-up operation for about 15 minutes before the auto tuning or the operation.

MEMO

5 SYSTEM CONFIGURATION

This chapter describes the system configuration.

Point

For applicable CPU modules and the number of mountable modules, refer to the following:
MELSEC iQ-R Module Configuration Manual

Temperature sensor

For usable temperature sensors, refer to the following:
Page 23 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance

Current sensor for heater disconnection detection

The following table lists current sensors for heater disconnection detection available with the R60TCTRT2TT2BW or R60TCRT4BW.

Model	Manufacturer
CTL-12-S36-10(0.0 to 100.0A)	U.R.D.Co., LTD.
CTL-12-S56-10(0.0 to 100.0A)	
CTL-6-P-H(0.00 to 20.00A)	
CTL-6-S-H(0.00 to 20.00A)	
CTL-12L-8(0.0 to 100.0A)	

For how to select current sensors for heater disconnection detection, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)

5.1 Precautions for System Configuration

The R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS measure temperatures based on the temperature of the terminal block. Thus, depending on the system configuration used (especially when two or more of the R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS modules are connected next to each other, or the R60TCTRT2TT2, R60TCTRT2TT2BW, or R60TCTRT2TT2-TS is mounted next to the power supply module or CPU module), the temperature distribution of the terminal block is not uniform due to the effects of heat generated from modules, and the measured temperature may greatly differ from the actual temperature.
In this case, the error between the measured value and actual temperature can be corrected by the following methods.

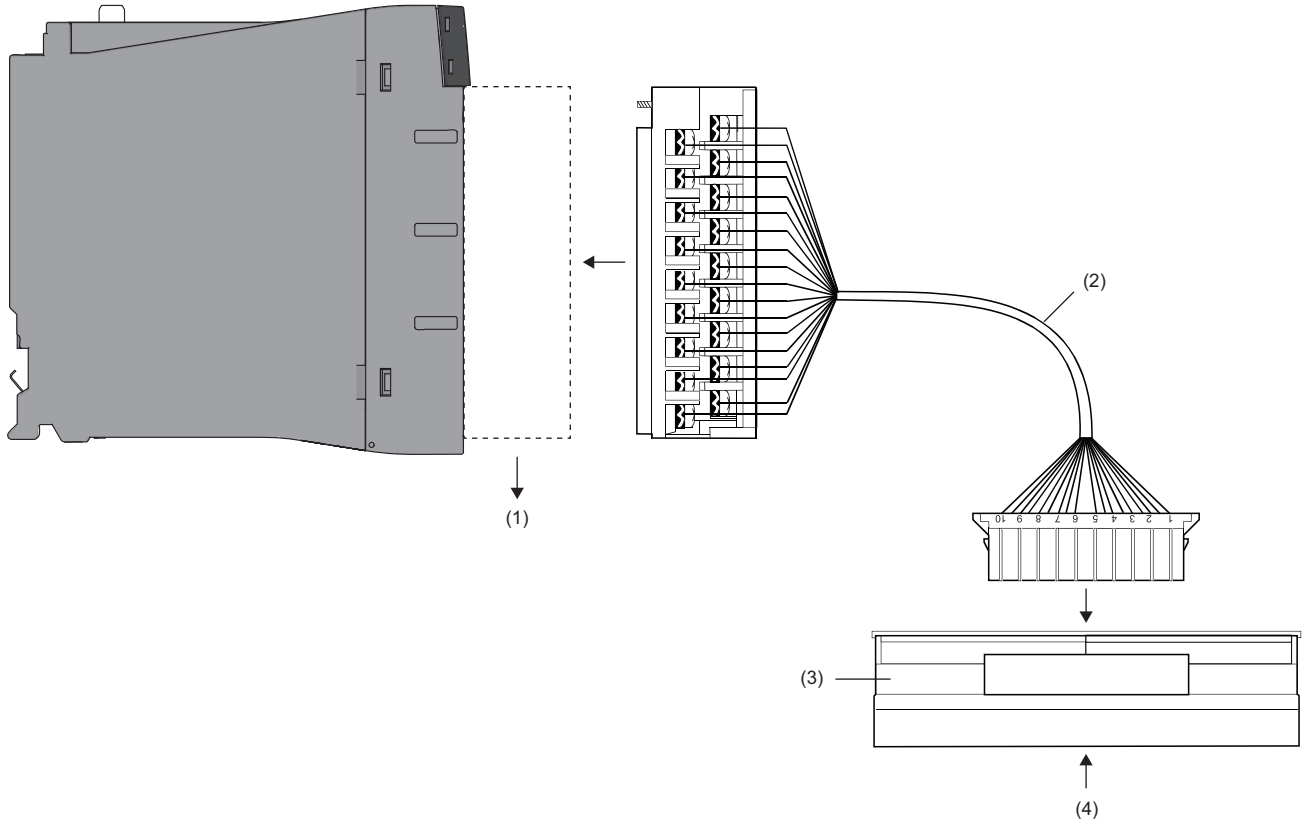
Using the sensor correction function

The measured temperature can be corrected to the actual temperature with this function. For details on the sensor correction function, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)

Using terminal block converter module and dedicated cables

The temperature control module measures temperatures based on the temperature of the terminal block. Thus, depending on the system configuration used, the temperature distribution of the terminal block is not uniform due to the effects of heat generated from modules, and the measured temperature may greatly differ from the actual temperature. (especially when two or more temperature control modules are connected next to each other or the temperature control module is mounted next to the power supply module or CPU module).

In such cases, using the following terminal block converter module and dedicated cables reduces an error caused by the heat generated.



(1): Remove the provided terminal block, and install the terminal block of the dedicated cable instead.
(2): Temperature control dedicated cable with Q terminal block
(3): Terminal block converter module for temperature control
(4): Thermocouple or compensation conductor

Item	Model	Manufacturer
Temperature control dedicated cable with Q terminal block	FA-CBLQ64TC** (**: Cable length)	Your local Mitsubishi Electric sales office or representative
Terminal block converter module for temperature control	FA-TB20TC	

Precautions

When using the terminal block converter module for temperature control and the temperature control dedicated cable with Q terminal block, set a thermocouple type for input ranges of all channels.

6 INSTALLATION AND WIRING

This chapter describes the installation and wiring of the temperature control module.

6.1 Terminal Block

Tighten the terminal block mounting screws within the following specified tightening torque range.

Screw	Tightening torque range
Terminal block mounting screw (M3.5 screw)	0.66 to 0.89N·m

Point

For the procedure for mounting and removing a terminal block and the method for wiring to a terminal block, refer to the following:
MELSEC iQ-R Module Configuration Manual

Precautions

Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.

Screw terminal block

The following table shows the applicable solderless terminal installed to the terminal block. For wiring, use the wire applicable to the following wire and mount with the applicable tightening torque. Use a UL-approved solderless terminal and tools recommended by the manufacturer of the solderless terminal. The solderless terminal with an insulation sleeve cannot be used.

Solderless terminal		Wire			
Model	Applicable tightening torque	Wire diameter	Type	Material	Temperature rating
R1.25-3	0.42 to 0.58N·m	22 to 18 AWG	Stranded wire	Copper wire	75℃

Spring clamp terminal block

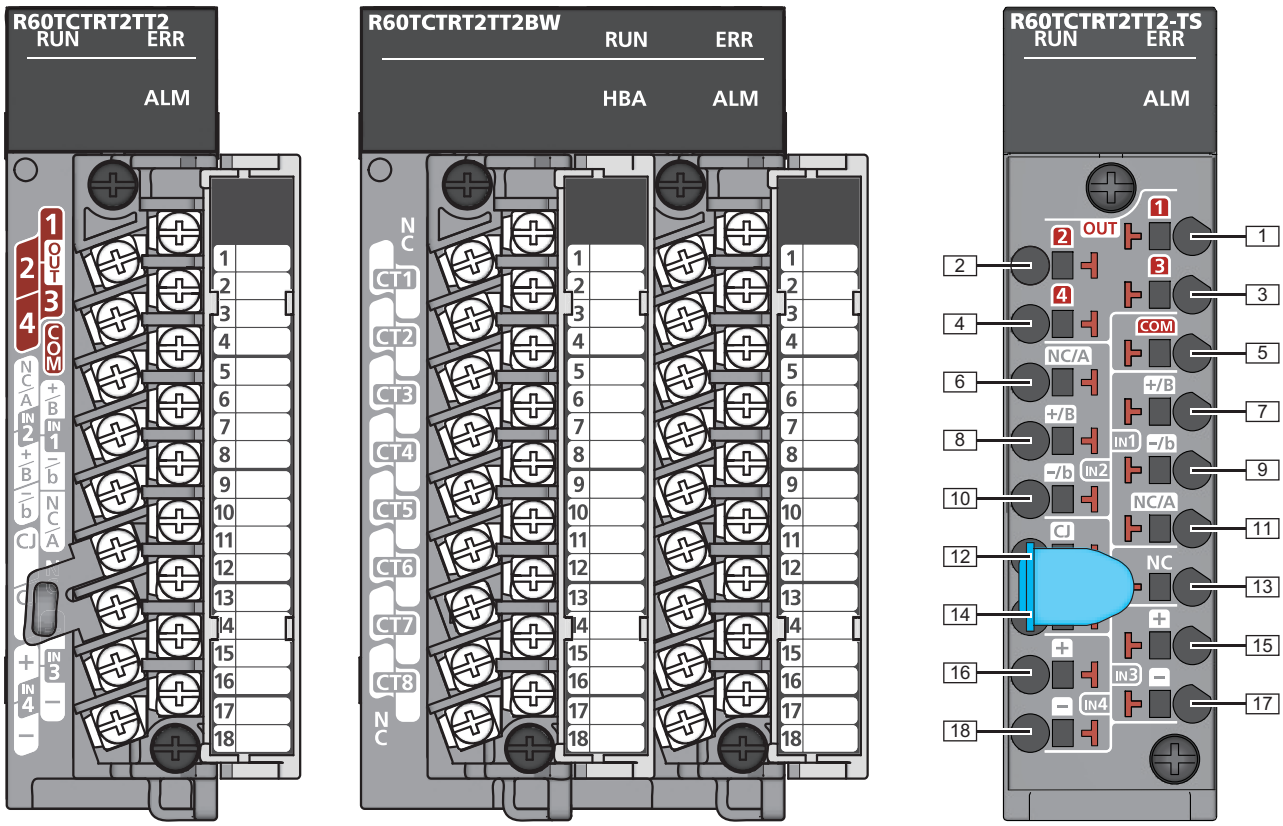
For wiring to a temperature control module, use a wire ferrule.
The following table shows the applicable wire ferrules.

Solderless terminal	Wire	Specialized tool	Manufacturer
Model	Size		
NF 0.5-8/10	0.3 to 0.5mm²	NH79A	NICHIFU TERMINAL INDUSTRIES CO., LTD.
NF 0.75-8/10	0.75mm²		
NF 1.0-8/10	0.9 to 1.0mm²		
NF 1.5-8/10	1.25 to 1.5mm²		
TGVTC-1.25-9T	0.3 to 1.65mm²	NH 65B	
TGWVTC-1.25-9T	0.3 to 1.65mm²		
AI 0.34-8TQ	0.34mm²	CRIMPFOX 6	PHOENIX CONTACT GmbH & Co. KG
AI 0.5-8WH/10WH	0.5mm²		
AI 0.75-8GY/10GY	0.75mm²		
AI 1-8RD/10RD	1.0mm²		
AI 1.5-8BK/10BK	1.5mm²		
AI 2.5-8BU/10BU	2.0 to 2.5mm²*1		

*1 The applicable wire size for a temperature control module is 2.0mm² only.

Signal names of terminal blocks

R60TCTRT2TT2, R60TCTRT2TT2BW, and R60TCTRT2TT2-TS(Terminal block for I/O)



• Standard control, heating-cooling control (normal mode), mix control (normal mode), and position proportional control (normal mode)

Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
1	L1	CH1 Output	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L2	CH2 Output	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L3	CH3 Output	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L4	CH4 Output	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common	COM-	Output common
6	NC/CH2A	Not used/CH2 Resistance thermometer A	NC/CH2A	Not used/CH2 Resistance thermometer A	NC/MT2A	Not used/Monitor 2 resistance thermometer A	NC/CH2A	Not used/CH2 Resistance thermometer A
7	CH1+/CH1B	CH1 Thermocouple +/ CH1 Resistance thermometer B	CH1+/CH1B	CH1 Thermocouple +/ CH1 Resistance thermometer B	CH1+/CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/CH1B	CH1 Thermocouple +/ CH1 Resistance thermometer B
8	CH2+/CH2B	CH2 Thermocouple +/ CH2 Resistance thermometer B	CH2+/CH2B	CH2 Thermocouple +/ CH2 Resistance thermometer B	MT2+/MT2B	Monitor 2 thermocouple +/ Monitor 2 resistance thermometer B	CH2+/CH2B	CH2 Thermocouple +/ CH2 Resistance thermometer B
9	CH1-/CH1b	CH1 Thermocouple -/ CH1 Resistance thermometer b	CH1-/CH1b	CH1 Thermocouple -/ CH1 Resistance thermometer b	CH1-/CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/CH1b	CH1 Thermocouple -/ CH1 Resistance thermometer b
10	CH2-/CH2b	CH2 Thermocouple -/ CH2 Resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/ CH2 Resistance thermometer b	MT2-/MT2b	Monitor 2 thermocouple -/ Monitor 2 resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/ CH2 Resistance thermometer b
11	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A
12	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
13	NC	Not used	NC	Not used	NC	Not used	NC	Not used
14	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
15	CH3+	CH3 Thermocouple +	MT3+	Monitor 3 thermocouple +	CH3+	CH3 Thermocouple +	MT3+	Monitor 3 thermocouple +
16	CH4+	CH4 Thermocouple +	MT4+	Monitor 4 thermocouple +	CH4+	CH4 Thermocouple +	MT4+	Monitor 4 thermocouple +
17	CH3-	CH3 Thermocouple -	MT3-	Monitor 3 thermocouple -	CH3-	CH3 Thermocouple -	MT3-	Monitor 3 thermocouple -
18	CH4-	CH4 Thermocouple -	MT4-	Monitor 4 thermocouple -	CH4-	CH4 Thermocouple -	MT4-	Monitor 4 thermocouple -

• Heating-cooling control (expanded mode), mix control (expanded mode), and position proportional control (expanded mode)

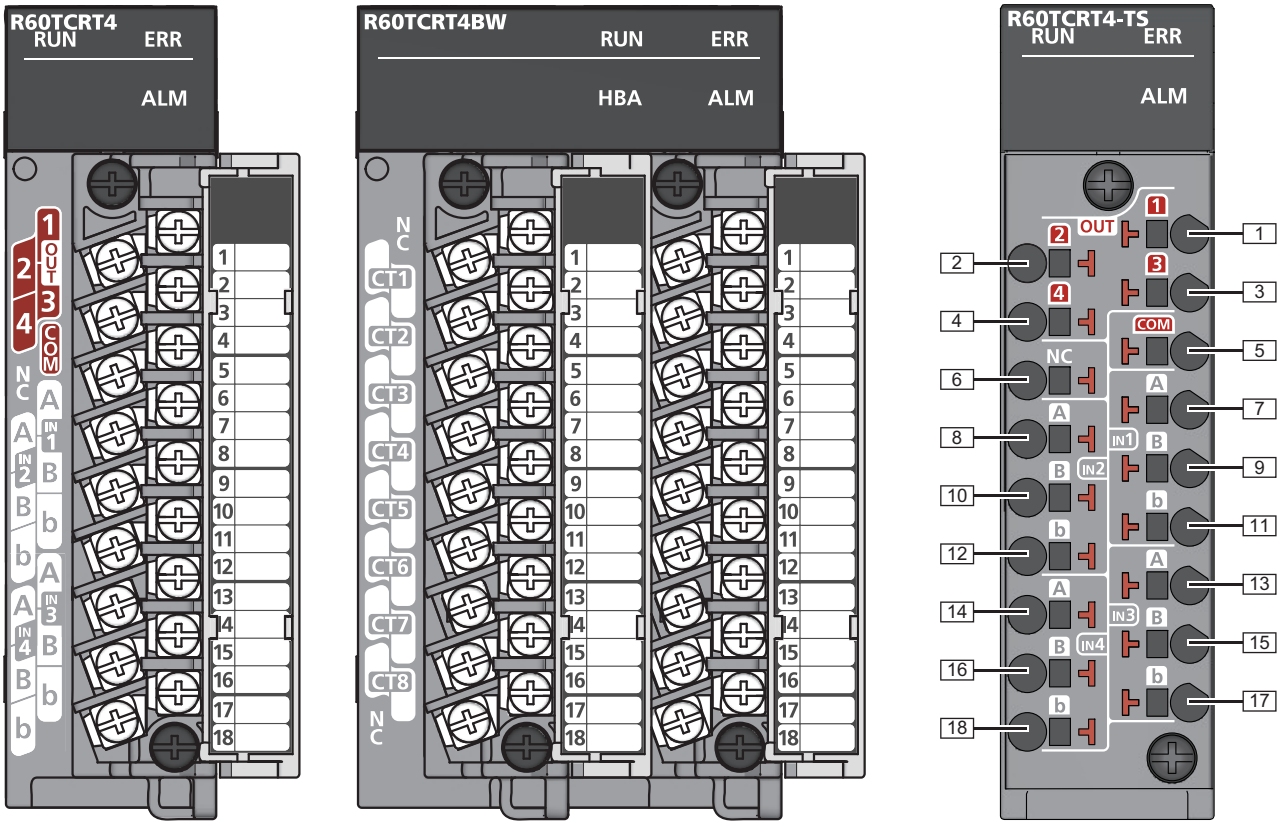
Terminal No.	Heating-cooling control (expanded mode)		Mix control (expanded mode)		Position proportional control (expanded mode)	
	Symbol	Name	Symbol	Name	Symbol	Name
1	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output

Terminal No.	Heating-cooling control (expanded mode)		Mix control (expanded mode)		Position proportional control (expanded mode)	
	Symbol	Name	Symbol	Name	Symbol	Name
4	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common
6	NC/CH2A	Not used/CH2 Resistance thermometer A	NC/CH2A	Not used/CH2 Resistance thermometer A	NC/CH2A	Not used/CH2 Resistance thermometer A
7	CH1+/CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B
8	CH2+/CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	CH2+/CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	CH2+/CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B
9	CH1-/CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b
10	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b
11	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A	NC	Not used
12	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
13	NC	Not used	NC	Not used	NC	Not used
14	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
15	CH3+	CH3 Thermocouple +	CH3+	CH3 Thermocouple +	CH3+	CH3 Thermocouple +
16	CH4+	CH4 Thermocouple +	CH4+	CH4 Thermocouple +	CH4+	CH4 Thermocouple +
17	CH3-	CH3 Thermocouple -	CH3-	CH3 Thermocouple -	CH3-	CH3 Thermocouple -
18	CH4-	CH4 Thermocouple -	CH4-	CH4 Thermocouple -	CH4-	CH4 Thermocouple -

Point

Do not remove the cold junction temperature compensation resistor from the terminal block.

R60TCRT4, R60TCRT4BW, and R60TCRT4-TS(Terminal block for I/O)



- Standard control, heating-cooling control (normal mode), mix control (normal mode), and position proportional control (normal mode)

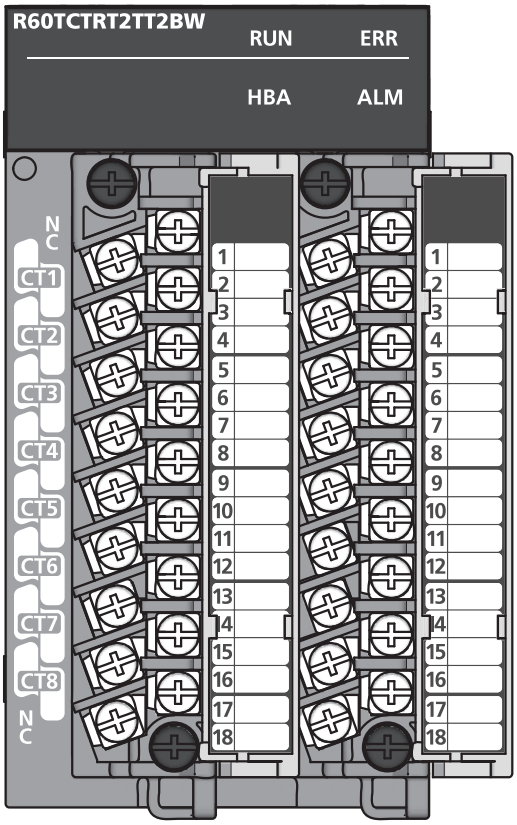
Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
1	L1	CH1 Output	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L2	CH2 Output	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L3	CH3 Output	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L4	CH4 Output	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common	COM-	Output common
6	NC	Not used	NC	Not used	NC	Not used	NC	Not used
7	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A
8	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A	MT2A	Monitor 2 resistance thermometer A	CH2A	CH2 Resistance thermometer A
9	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B
10	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B	MT2B	Monitor 2 resistance thermometer B	CH2B	CH2 Resistance thermometer B
11	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b
12	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b	MT2b	Monitor 2 resistance thermometer b	CH2b	CH2 Resistance thermometer b
13	CH3A	CH3 Resistance thermometer A	MT3A	Monitor 3 resistance thermometer A	CH3A	CH3 Resistance thermometer A	MT3A	Monitor 3 resistance thermometer A
14	CH4A	CH4 Resistance thermometer A	MT4A	Monitor 4 resistance thermometer A	CH4A	CH4 Resistance thermometer A	MT4A	Monitor 4 resistance thermometer A

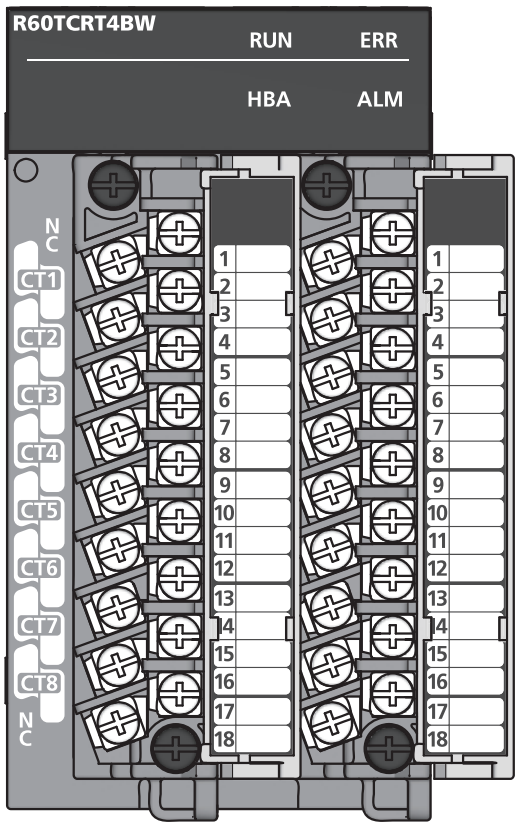
Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
15	CH3B	CH3 Resistance thermometer B	MT3B	Monitor 3 resistance thermometer B	CH3B	CH3 Resistance thermometer B	MT3B	Monitor 3 resistance thermometer B
16	CH4B	CH4 Resistance thermometer B	MT4B	Monitor 4 resistance thermometer B	CH4B	CH4 Resistance thermometer B	MT4B	Monitor 4 resistance thermometer B
17	CH3b	CH3 Resistance thermometer b	MT3b	Monitor 3 resistance thermometer b	CH3b	CH3 Resistance thermometer b	MT3b	Monitor 3 resistance thermometer b
18	CH4b	CH4 Resistance thermometer b	MT4b	Monitor 4 resistance thermometer b	CH4b	CH4 Resistance thermometer b	MT4b	Monitor 4 resistance thermometer b

• Heating-cooling control (expanded mode), mix control (expanded mode), and position proportional control (expanded mode)

Terminal No.	Heating-cooling control (expanded mode)		Mix control (expanded mode)		Position proportional control (expanded mode)	
	Symbol	Name	Symbol	Name	Symbol	Name
1	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common
6	NC	Not used	NC	Not used	NC	Not used
7	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A
8	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A
9	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B
10	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B
11	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b
12	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b
13	CH3A	CH3 Resistance thermometer A	CH3A	CH3 Resistance thermometer A	CH3A	CH3 Resistance thermometer A
14	CH4A	CH4 Resistance thermometer A	CH4A	CH4 Resistance thermometer A	CH4A	CH4 Resistance thermometer A
15	CH3B	CH3 Resistance thermometer B	CH3B	CH3 Resistance thermometer B	CH3B	CH3 Resistance thermometer B
16	CH4B	CH4 Resistance thermometer B	CH4B	CH4 Resistance thermometer B	CH4B	CH4 Resistance thermometer B
17	CH3b	CH3 Resistance thermometer b	CH3b	CH3 Resistance thermometer b	CH3b	CH3 Resistance thermometer b
18	CH4b	CH4 Resistance thermometer b	CH4b	CH4 Resistance thermometer b	CH4b	CH4 Resistance thermometer b

R60TCTRT2TT2BW (for CT input) and R60TCRT4BW (for CT input)





Terminal No.	Standard control and heating-cooling control	
	Symbol	Name
1	NC	Not used
2	CT1	CT input 1
3	CT1	CT input 1
4	CT2	CT input 2
5	CT2	CT input 2
6	CT3	CT input 3
7	CT3	CT input 3
8	CT4	CT input 4
9	CT4	CT input 4
10	CT5	CT input 5
11	CT5	CT input 5
12	CT6	CT input 6
13	CT6	CT input 6
14	CT7	CT input 7
15	CT7	CT input 7
16	CT8	CT input 8
17	CT8	CT input 8
18	NC	Not used

6.2 Wiring Precautions

External wiring that is less likely to be affected by noise is one of the conditions for a highly reliable system that fully utilizes the temperature control module.

This section describes wiring precautions.

- Use separate cables for the AC control circuit and the temperature control module's external I/O signals to avoid influence of AC side surges and induction.
- Do not locate external wires near the main circuit line, high-voltage circuit lines, and load circuit lines of devices other than programmable controllers such as an inverter. Also, do not bunch external wires with these lines. Otherwise, the external wires are more likely to be affected by noise, surges, and induction.
- Ground shielded cables at one end on the programmable controller side. However, depending on the external noise condition, it should be grounded on the other side.
- To ensure that this product maintains EMC and Low Voltage Directives, refer to the following:

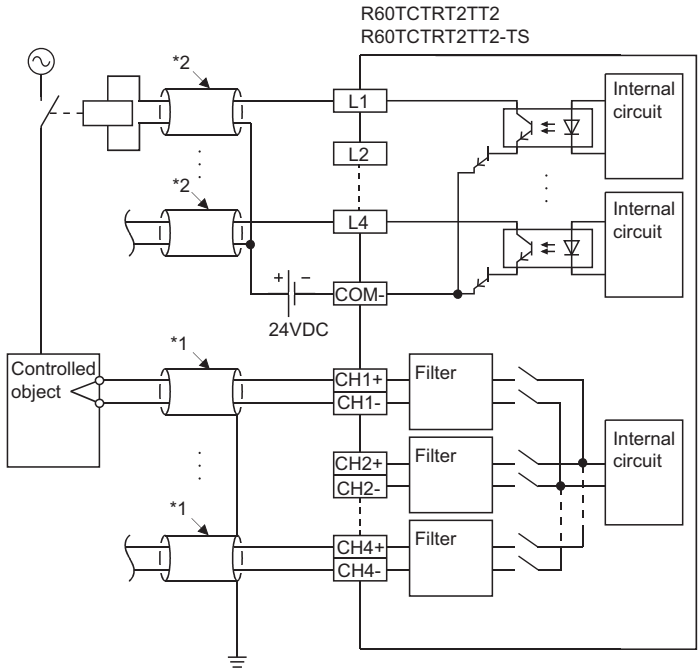
MELSEC iQ-R Module Configuration Manual
Safety Guidelines (This manual is included with the base unit.)

6.3 External Wiring

The following figure shows the external wiring.

R60TCTRT2TT2, R60TCTRT2TT2-TS

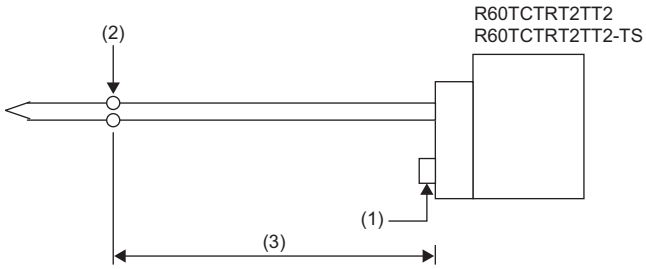
Standard control



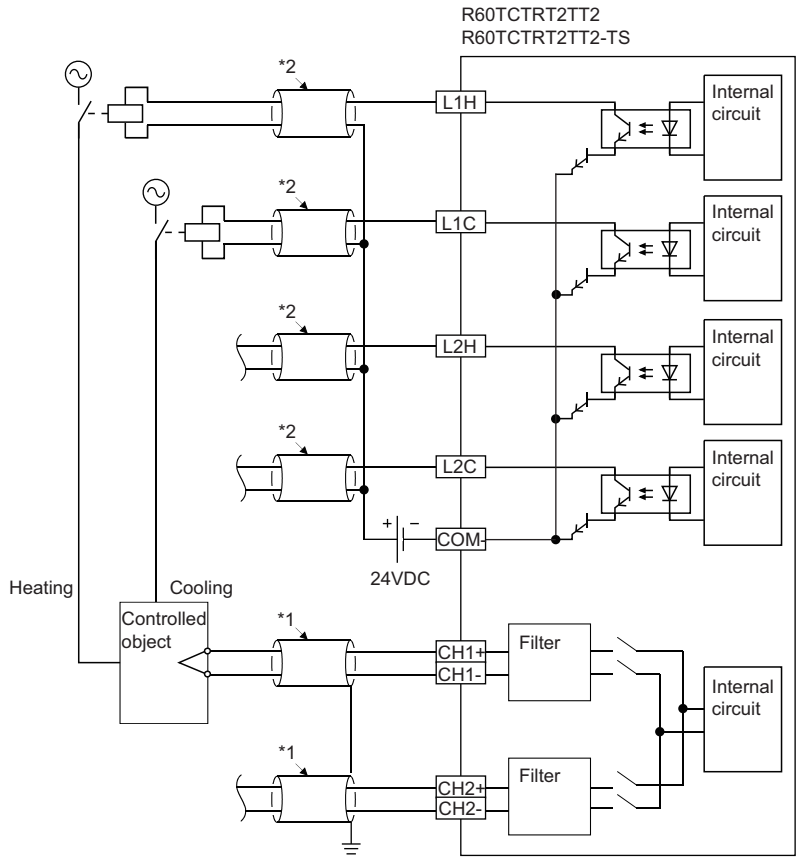
*1 Use the shielded compensation lead wire.
*2 Use the shielded cable.

Point

Use the compensation lead wire for the cable of a thermocouple. The shielded cable cannot be used. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor (1) is away from the end tip (2) of a thermocouple, the (ambient) temperature (3) difference may lead to a faulty temperature process value (PV).



Heating-cooling control

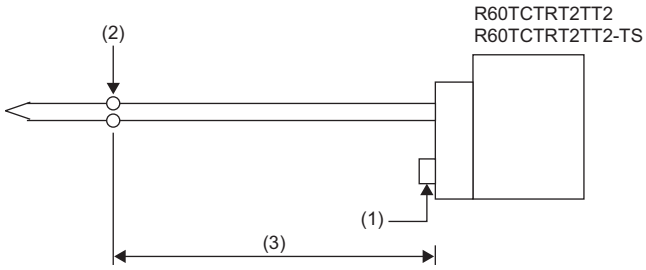


*1 Use the shielded compensation lead wire.

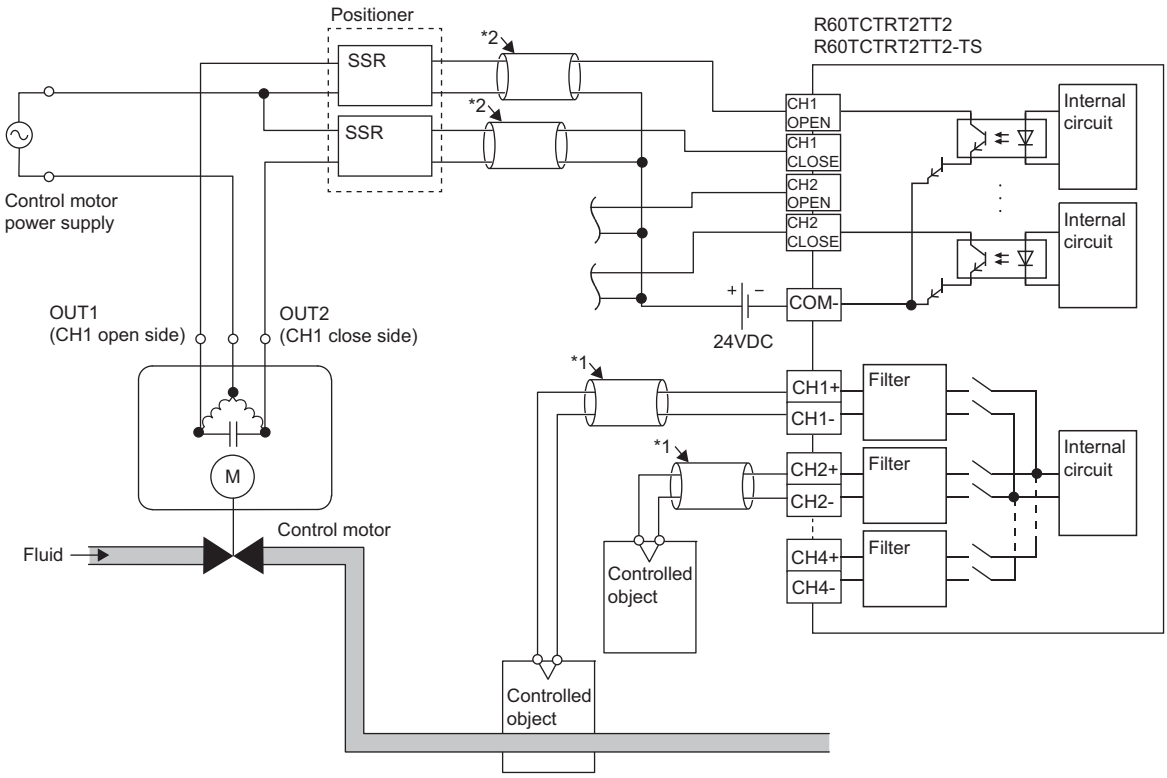
*2 Use the shielded cable.

Point

Use the compensation lead wire for the cable of a thermocouple. The shielded cable cannot be used. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor (1) is away from the end tip (2) of a thermocouple, the (ambient) temperature (3) difference may lead to a faulty temperature process value (PV).



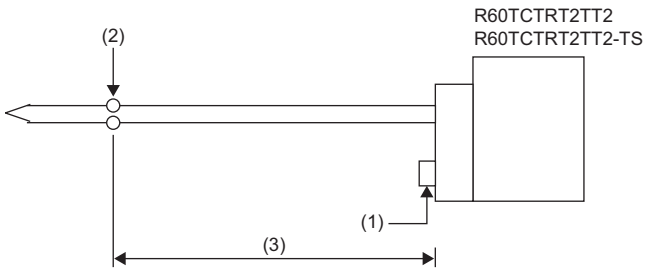
Position proportional control



*1 Use the shielded compensation lead wire.
*2 Use the shielded cable.

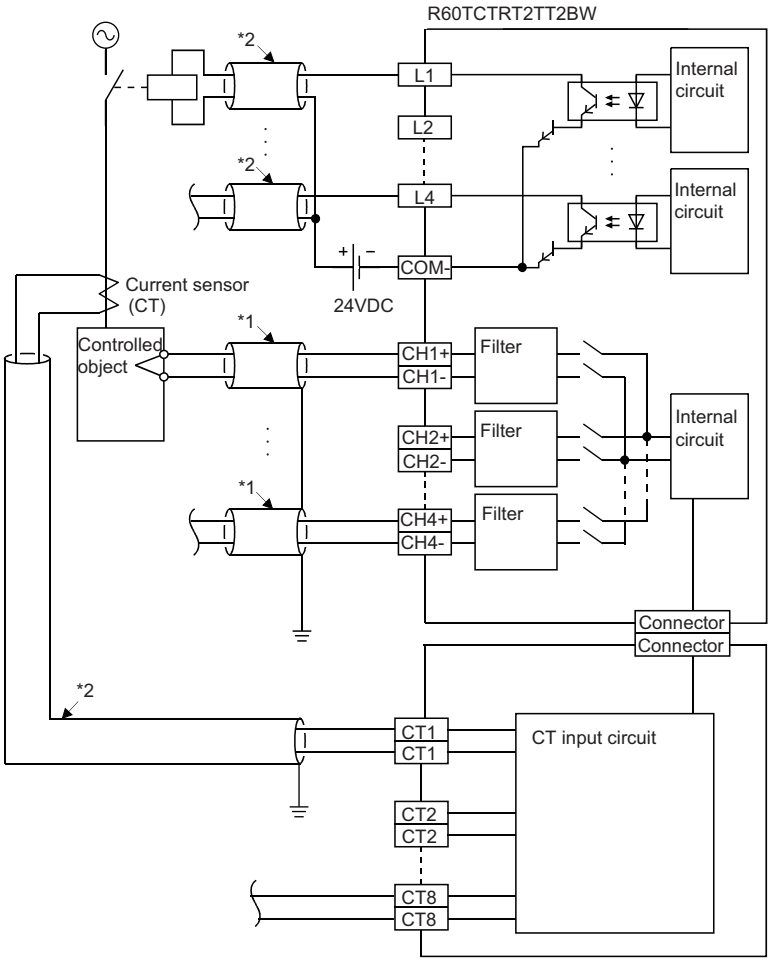
Point

Use the compensation lead wire for the cable of a thermocouple. The shielded cable cannot be used. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor (1) is away from the end tip (2) of a thermocouple, the (ambient) temperature (3) difference may lead to a faulty temperature process value (PV).



R60TCTRT2TT2BW

Standard control

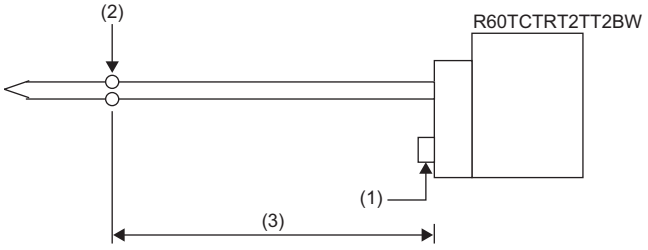


*1 Use the shielded compensation lead wire.

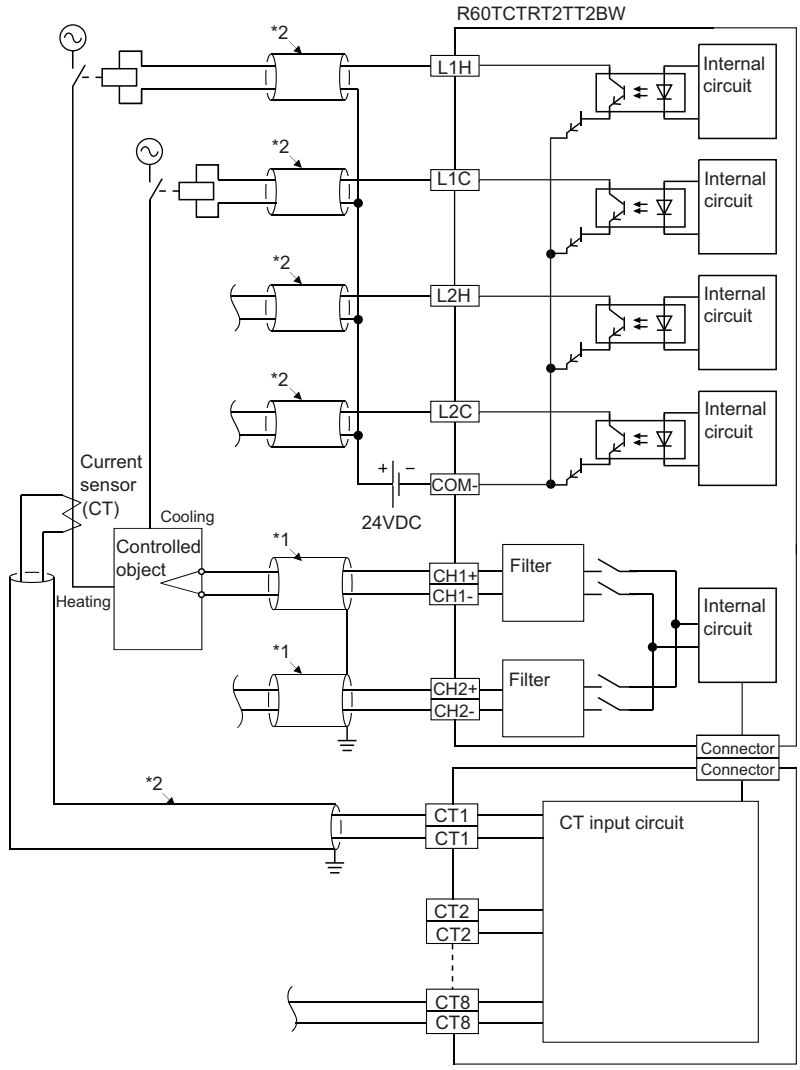
*2 Use the shielded cable.

Point

- To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.
- Use the compensation lead wire for the cable of a thermocouple. The shielded cable cannot be used. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor (1) is away from the end tip (2) of a thermocouple, the (ambient) temperature (3) difference may lead to a faulty temperature process value (PV).



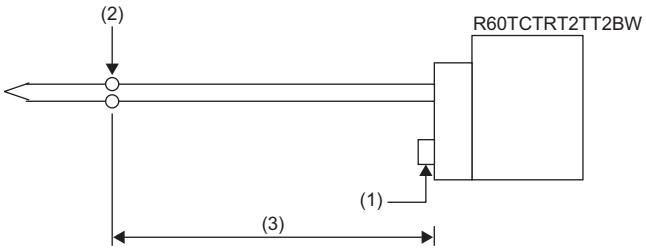
Heating-cooling control



*1 Use the shielded compensation lead wire.
*2 Use the shielded cable.

Point

- To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.
- Use the compensation lead wire for the cable of a thermocouple. The shielded cable cannot be used. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor (1) is away from the end tip (2) of a thermocouple, the (ambient) temperature (3) difference may lead to a faulty temperature process value (PV).

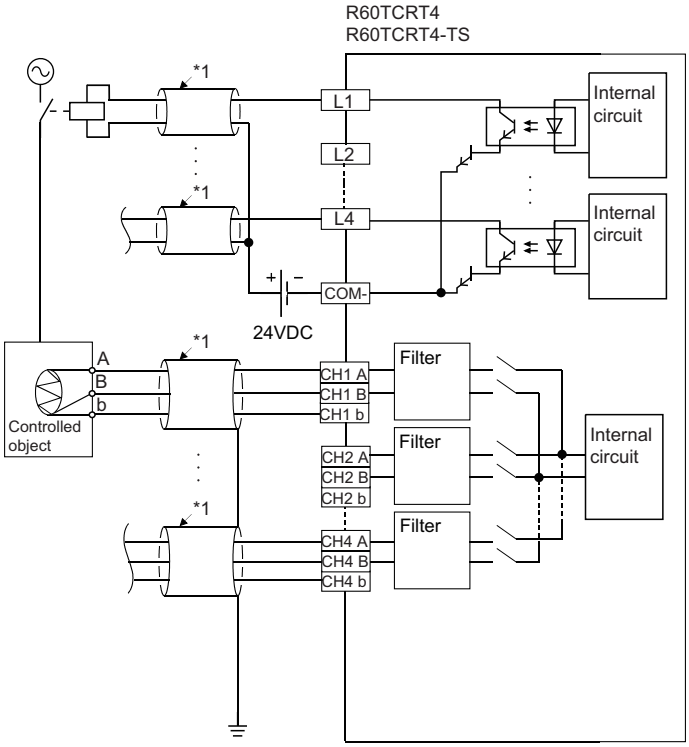


Position proportional control

The CT input is invalid in the position proportional control. For wiring examples, refer to the following:

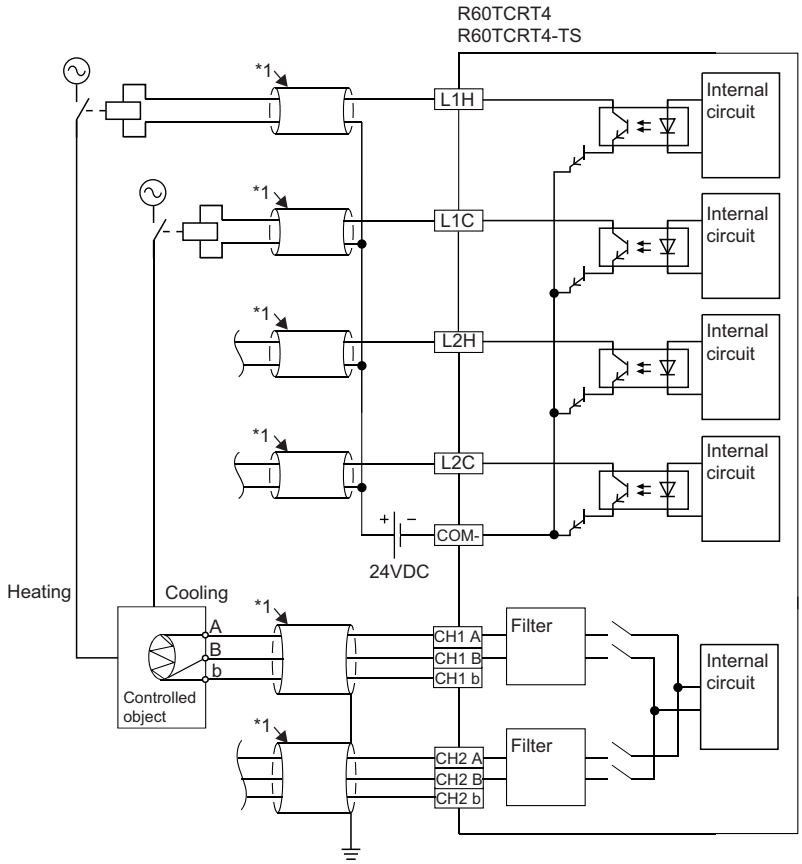
☞ Page 43 Position proportional control

Standard control



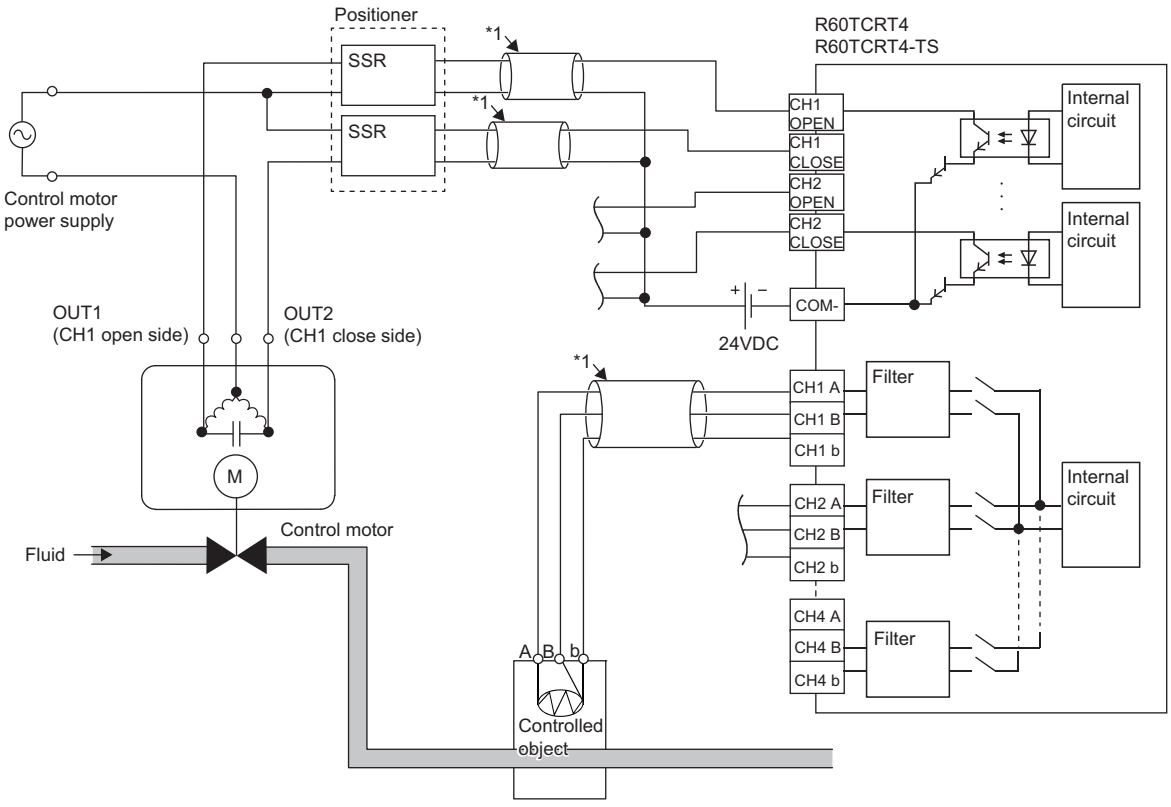
*1 Use the shielded cable.

Heating-cooling control



*1 Use the shielded cable.

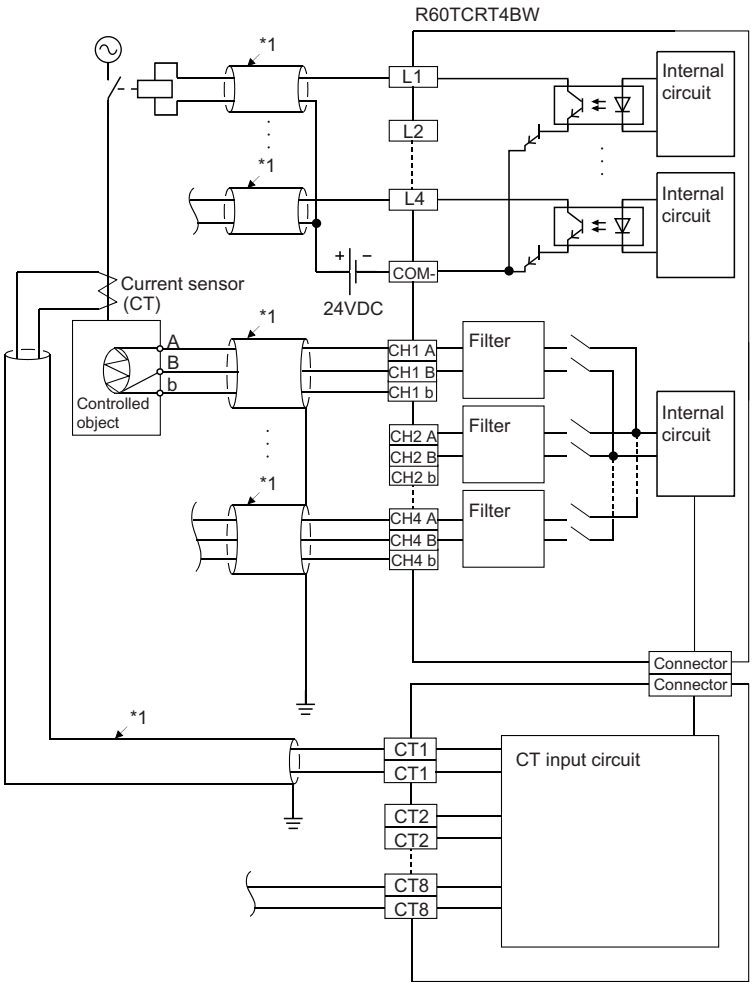
Position proportional control



*1 Use the shielded cable.

R60TCRT4BW

Standard control

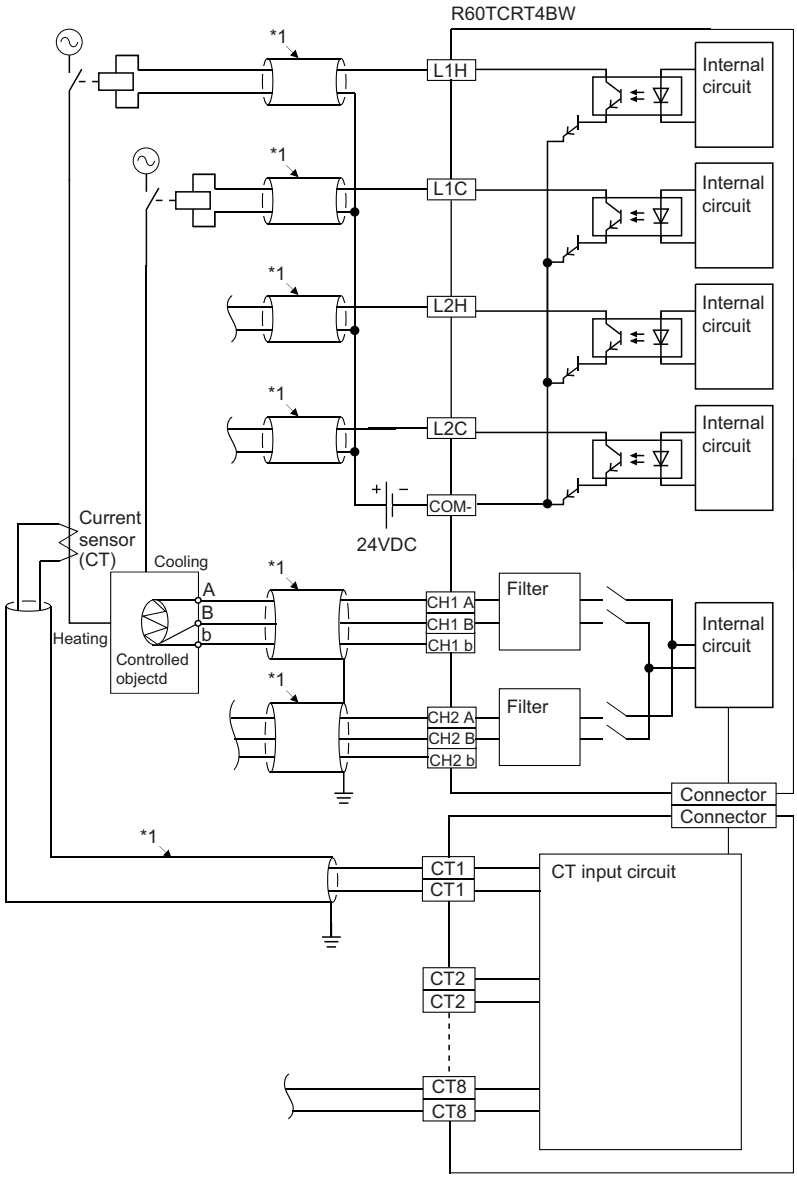


*1 Use the shielded cable.

Point

To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.

Heating-cooling control



*1 Use the shielded cable.

Point

To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.

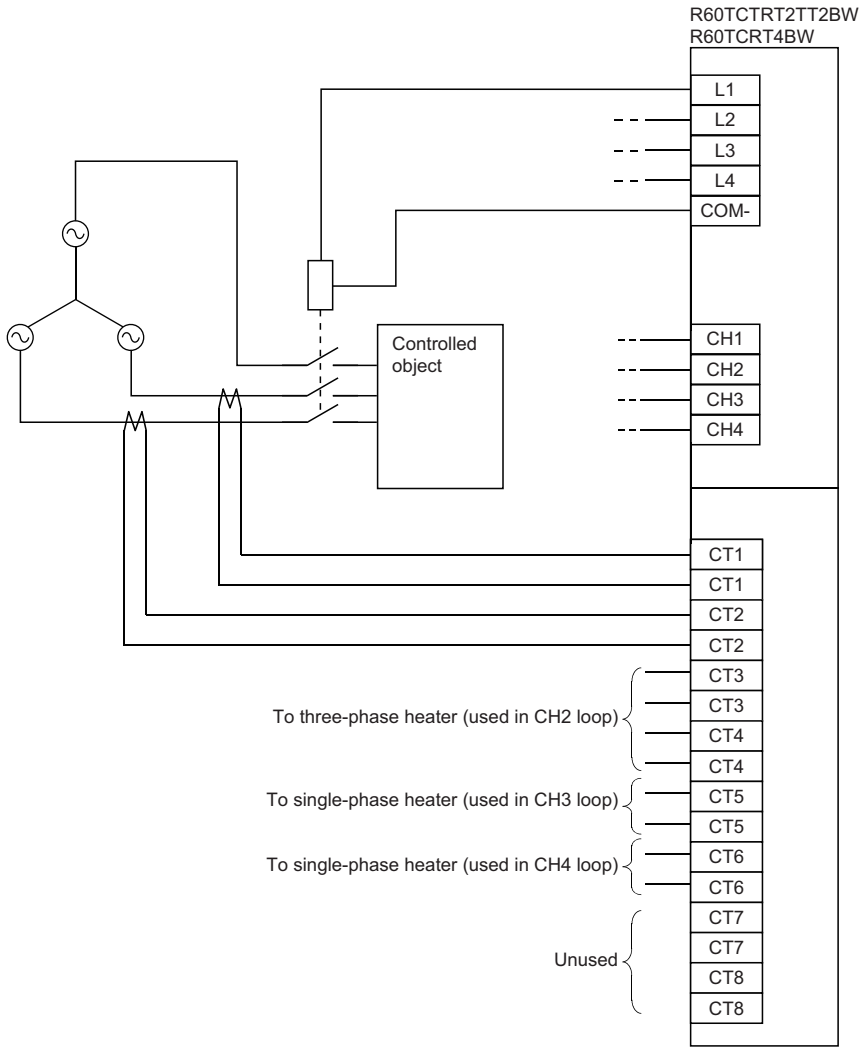
Position proportional control

The CT input is invalid in the position proportional control. For wiring examples, refer to the following:

☞ Page 48 Position proportional control

6.4 Heater Disconnection Detection Wiring and Setting Example for Three-phase Heater

The following shows the wiring and setting examples to detect a disconnection of a three-phase heater with the heater disconnection detection function.



The disconnection of the three-phase heater is detected by measuring the currents of two of the three cables.
In the above wiring example, set "CT input channel assignment setting" of "CT setting" as indicated below.

Item	Setting value
CT1	CH1 (1)
CT2	CH1 (1)
CT3	CH2 (2)
CT4	CH2 (2)
CT5	CH3 (3)
CT6	CH4 (4)
CT7	Unused (0)
CT8	Unused (0)

6.5 Unused Channel Setting

When no temperature sensor is connected to a channel, the temperature control module performs upscale processing for the channel. Therefore, when no temperature sensor has not been connected to a channel where no temperature control is to be performed, the module determines that the temperature process value (PV) has exceeded the temperature measuring range for the input range, and the ALM LED blinks.
Setting unused channels can prevent faulty alert detection because the PID control, temperature judgment, and alert judgment are not executed on the set channels.

Setting method

Set a value in "Unused channel setting" of "Control basic parameters" of "Application Setting". The following table shows the relation between each setting value and control status.

Setting value	Control status		
	PID control	Temperature judgment	Alert judgment
Used (0)	Performed (However, it depends on other setting status.)		
Unused (1)	Not performed		

Point

Setting unused channels does not change the sampling cycle.

7 OPERATION EXAMPLES

This chapter describes the programming procedure and basic program of the temperature control module.

7.1 Programming Procedure

Create a program that operates the temperature control module using the following procedure.

1. Set parameters.
2. Create a program.

Point

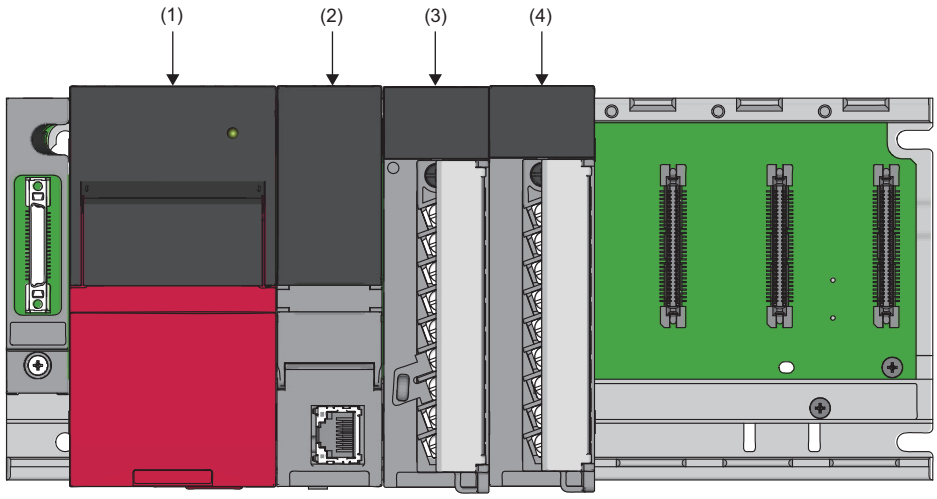
Using function blocks (FBs) can reduce the load at programming and improve the readability of a program.
For details on the function blocks, refer to the following:
MELSEC iQ-R Temperature Control Module Function Block Reference

7.2 Program Examples

Standard control

System configuration

The following shows a system configuration example.



(1) Power supply module (R61P)
(2) CPU module (R120CPU)
(3) Temperature control module (R60TCTRT2TT2)
(4) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.

Point

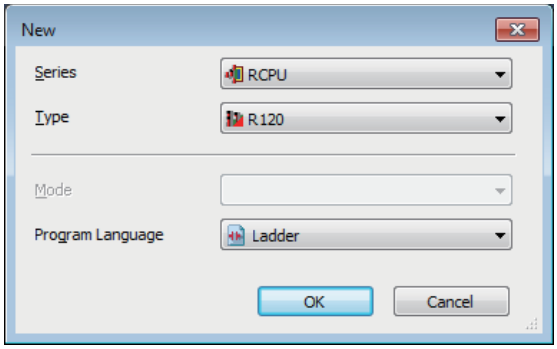
In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following:

MELSEC iQ-R Temperature Control Module User's Manual (Application)

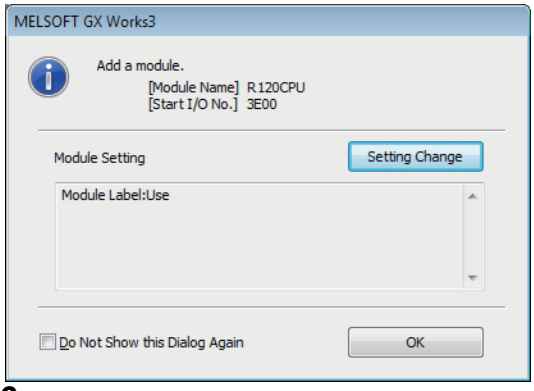
■Setting modules

1. Set the CPU module as follows.

[Project] ⇨ [New]

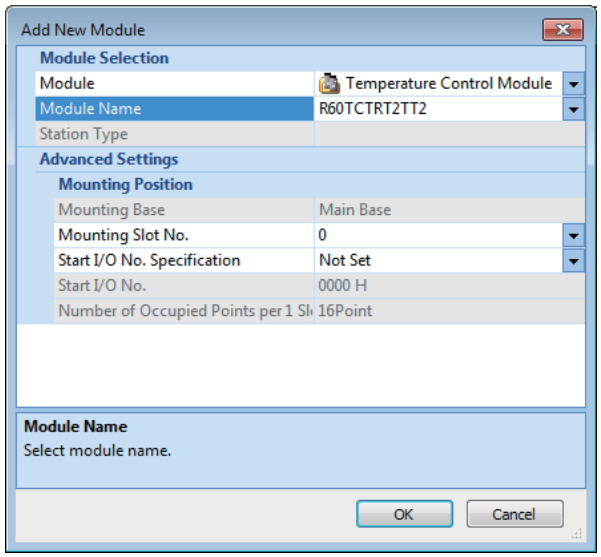


2. Click the [OK] button and add labels of the CPU module.

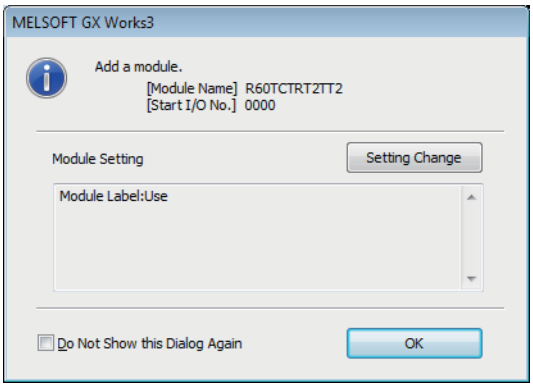


3. Set the R60TCTRT2TT2 as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]



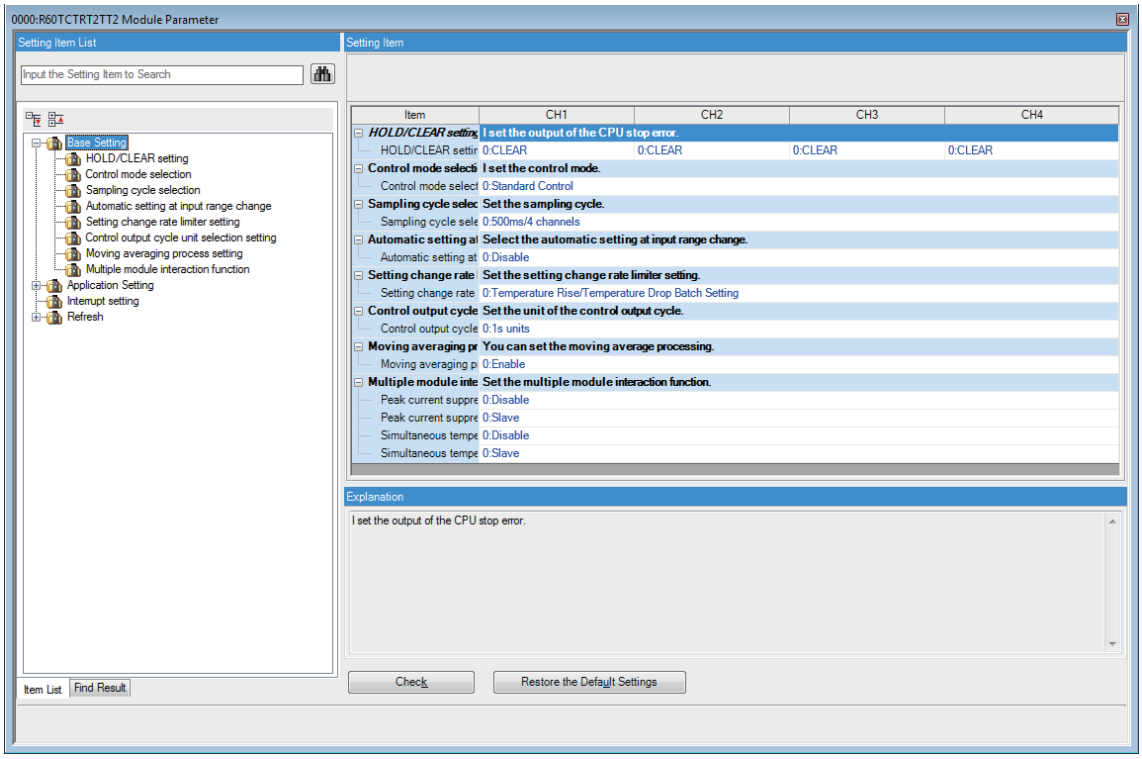
4. Click the [OK] button and add labels of the R60TCTRT2TT2.



■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 to CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	200 ℃	0 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	1:Unused	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 ℃	1300 ℃	1300 ℃	1300 ℃
Lower Limit Setting Limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter (Temperature drop)	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 ℃	0 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

• "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 as shown below.

Auto tuning setting	Set the auto tuning.			
Auto tuning mode selection	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 ℃	0 ℃	0 ℃	0 ℃
Automatic backup setting after auto tuning of PID constants	1:ON	0:OFF	0:OFF	0:OFF

Point

Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

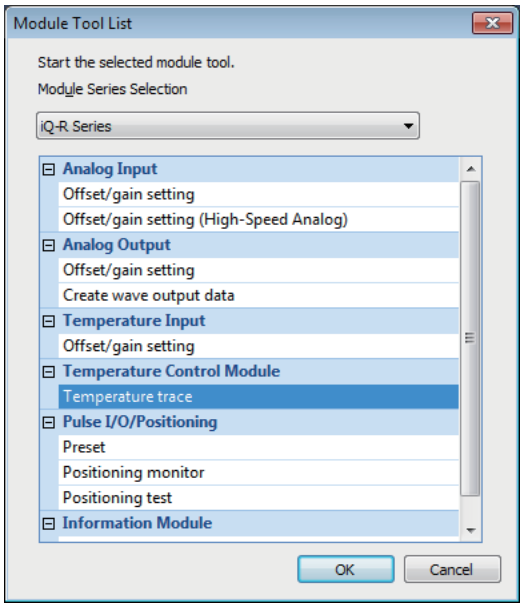
1. Write the set parameters to the CPU module, reset the CPU module, and turn OFF and ON the power supply.

[Online] ⇨ [Write to PLC]

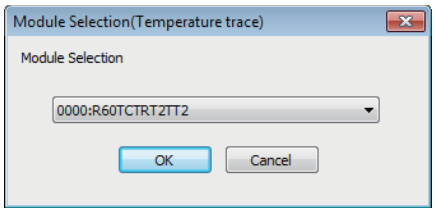
Auto tuning

Perform auto tuning.

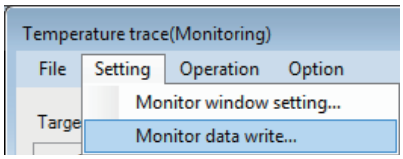
[Tool] ⇨ [Module Tool List]



1. Select "Temperature trace" of "Temperature Control Module" and click the [OK] button.

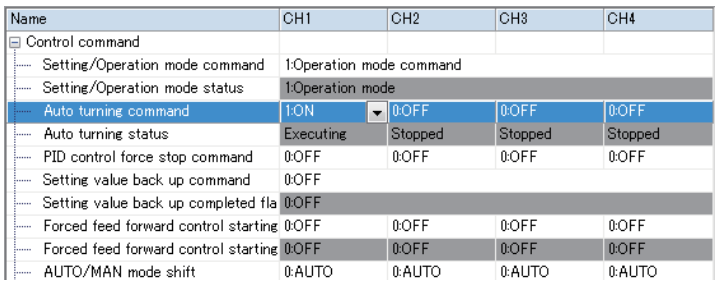


2. Select the module to configure the temperature trace and click the [OK] button.



3. Select "Monitor data write" from the following.

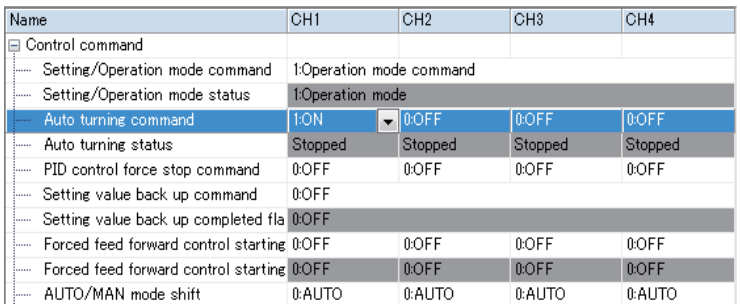
[Setting] ⇨ [Monitor data write]



4. Set "Setting/Operation mode command" to "1:Operation mode command".

5. Set "Auto tuning command" to "1:ON".

6. Then, "Auto tuning status" is set to "Executing", and auto tuning is started.



7. When auto tuning is completed, "Auto tuning status" is set to "Stopped".

8. Temperature control is performed by set PID constants.

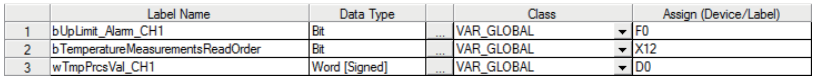
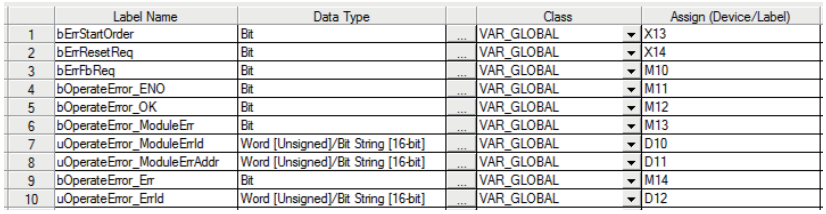
Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

Do not change the settings of the module labels. For details on global labels, refer to the following:

MELSEC iQ-R Programming Manual (Program Design)

Classification	Label name	Description	Device
Module label	R60TC_1.bModuleREADY	Module READY flag	X0
	R60TC_1.bSettingChangeCommand	Setting change command	YB
	R60TC_1.bSettingOperationModeCommand	Setting/operation mode command	Y1
	R60TC_1.stMonitor.uTemperatureConversionCompletionFlag.0	CH1 Temperature conversion completion flag	—
	R60TC_1.stnMonitor_Ch[0].wTemperatureProcessValue	CH1 Temperature process value (PV)	—
	R60TC_1.stnMonitor_Ch[0].uAlertDefinition.8	CH1 Alert definition	—
Label to be defined	Define global labels as follows. • Program that changes the setting/operation mode  • Program that processes data when the upper limit input alert occurs  • Program that displays and clears an error code 		

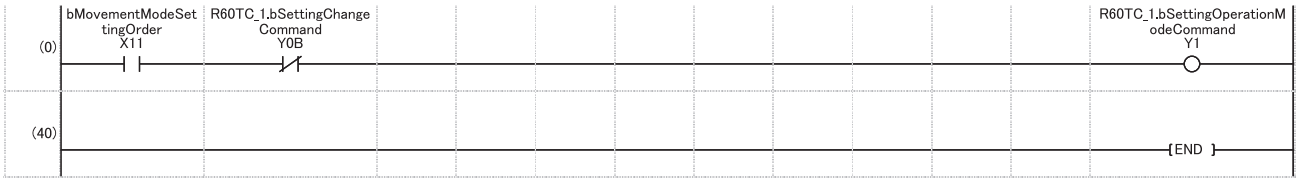
	Label Name	Data Type		Class	Assign (Device/Label)
1	bMovementModeSettingOrder	Bit	...	VAR_GLOBAL	X11

	Label Name	Data Type		Class	Assign (Device/Label)
1	bUpLimit_Alarm_CH1	Bit	...	VAR_GLOBAL	F0
2	bTemperatureMeasurementsReadOrder	Bit	...	VAR_GLOBAL	X12
3	wTmpPrcsVal_CH1	Word [Signed]	...	VAR_GLOBAL	D0

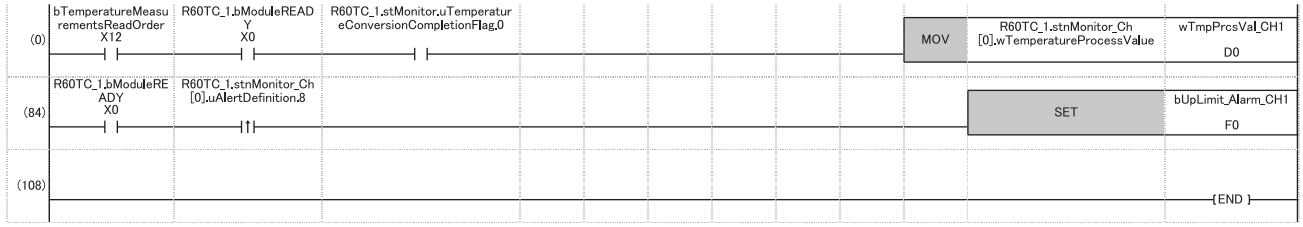
	Label Name	Data Type		Class	Assign (Device/Label)
1	bErrStartOrder	Bit	...	VAR_GLOBAL	X13
2	bErrResetReq	Bit	...	VAR_GLOBAL	X14
3	bErrFbReq	Bit	...	VAR_GLOBAL	M10
4	bOperateError_ENO	Bit	...	VAR_GLOBAL	M11
5	bOperateError_OK	Bit	...	VAR_GLOBAL	M12
6	bOperateError_ModuleErr	Bit	...	VAR_GLOBAL	M13
7	uOperateError_ModuleErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D10
8	uOperateError_ModuleErrAddr	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D11
9	bOperateError_Err	Bit	...	VAR_GLOBAL	M14
10	uOperateError_ErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D12

Program examples

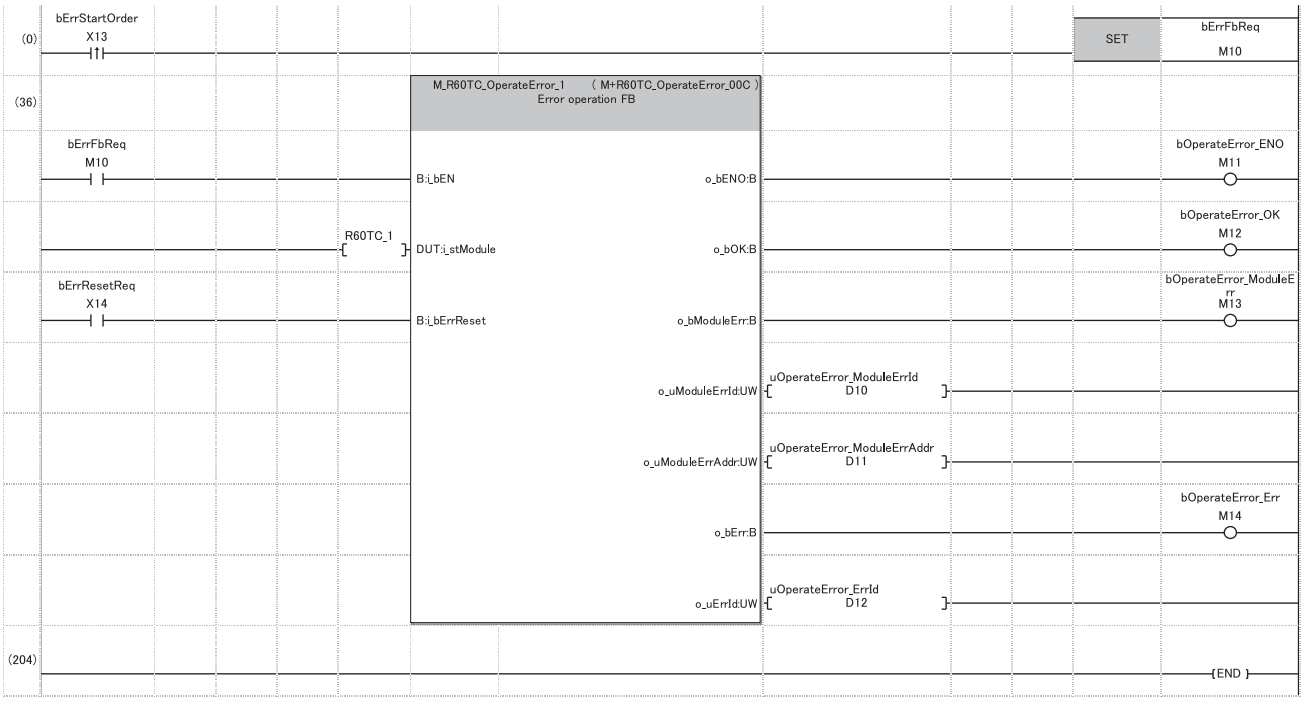
■Program that changes the setting/operation mode



■Program that processes data when the upper limit input alert occurs



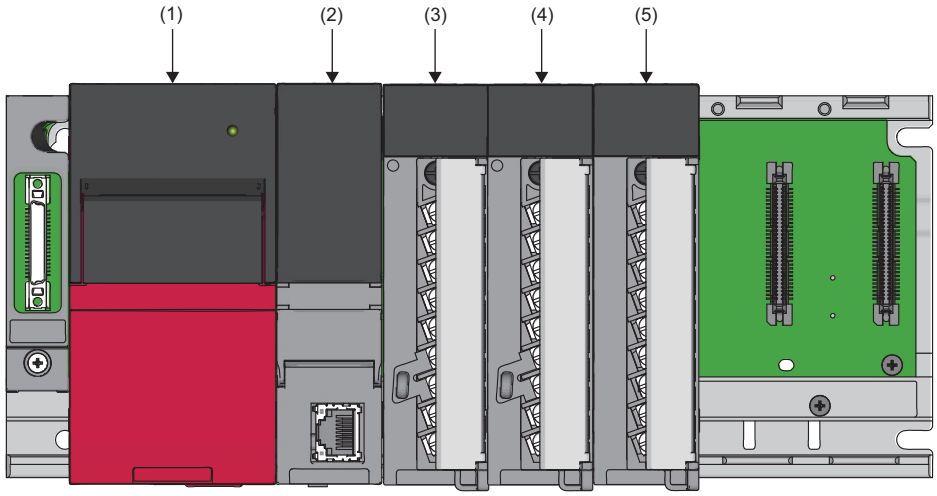
■Program that displays and clears an error code



Standard control (When using the inter-module simultaneous temperature rise function)

System configuration

The following shows a system configuration example.



(1) Power supply module (R61P)
(2) CPU module (R120CPU)
(3) Temperature control module 1 (R60TCTRT2TT2)
(4) Temperature control module 2 (R60TCTRT2TT2)
(5) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.

Point

In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following:

MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following:

☞ Page 54 Setting modules

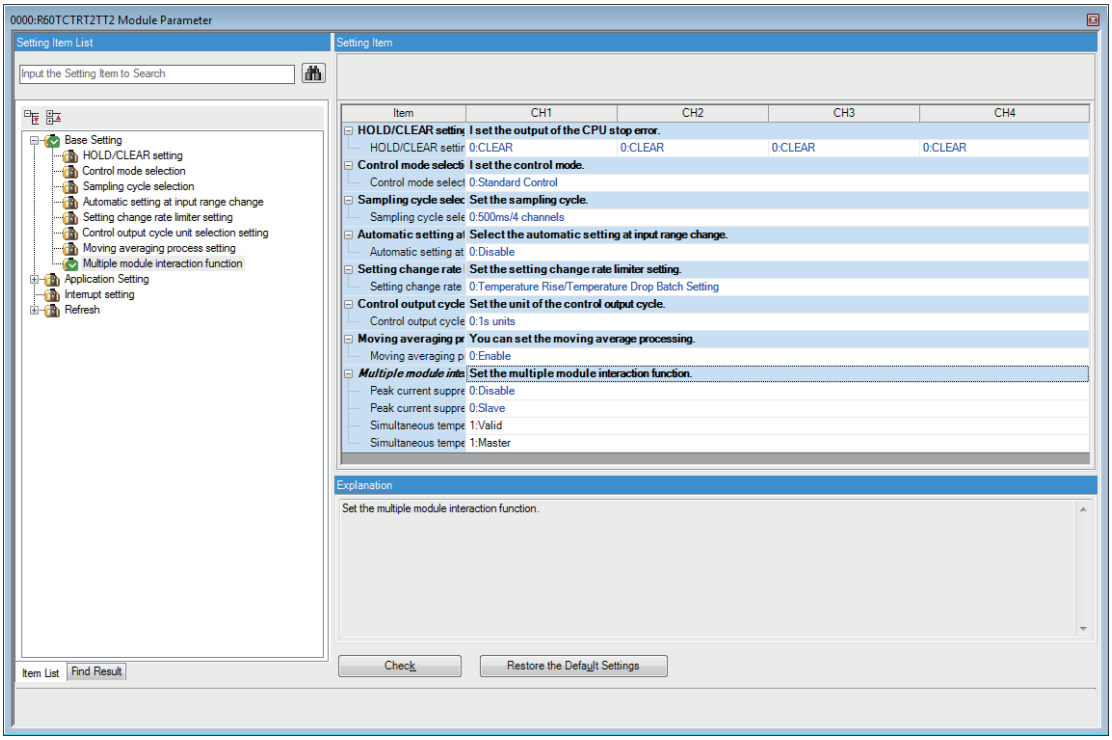
■Setting parameters of the temperature control module 1

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

• "Multiple module interaction function"

Set "Simultaneous temperature rise function enable/disable between multiple module" and "Simultaneous temperature rise function master/slave selection between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	200 ℃	250 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 ℃	500 ℃	1300 ℃	1300 ℃
Lower Limit Setting Limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter (Temperature drop)	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

• "Simultaneous temperature rise setting"

Set "Simultaneous temperature rise group setting" and "Simultaneous temperature rise AT mode setting" of CH1 and CH2 as shown below.

Simultaneous temperature rise setting	Set the simultaneous temperature rise function.			
Simultaneous temperature rise group setting	1:Group 1	1:Group 1	0:Do not rise temperature	0:Do not rise temperature
Simultaneous temperature rise AT mode setting	1:AT for Simultaneous Te	1:AT for Simultaneous Te	0:Conventional AT	0:Conventional AT

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 ℃	300 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

• "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Auto tuning setting	Set the auto tuning.			
Auto tuning mode selection	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 ℃	0 ℃	0 ℃	0 ℃
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF

Point

Use the default values for the parameters other than the parameters shown above.

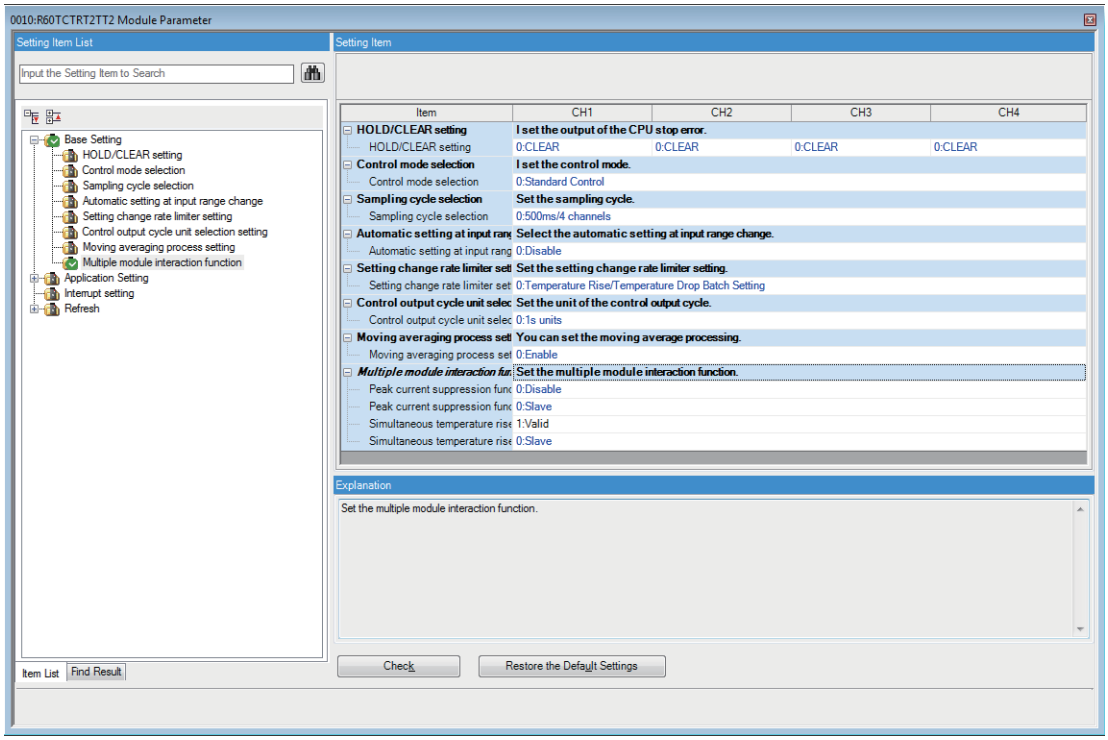
■Setting parameters of the temperature control module 2

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

- "Multiple module interaction function"

Set "Simultaneous temperature rise function enable/disable between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	150 °C	100 °C	0 °C	0 °C
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	300 °C	200 °C	1300 °C	1300 °C
Lower Limit Setting Limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter (Temperature drop)	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

• "Simultaneous temperature rise setting"

Set "Simultaneous temperature rise group setting" and "Simultaneous temperature rise AT mode setting" of CH1 and CH2 as shown below.

Simultaneous temperature rise setting	Set the simultaneous temperature rise function.			
Simultaneous temperature rise group setting	1:Group 1	1:Group 1	0:Do not rise temperature	0:Do not rise temperature
Simultaneous temperature rise AT mode setting	1:AT for Simultaneous Te	1:AT for Simultaneous Te	0:Conventional AT	0:Conventional AT

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	200 °C	150 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times

• "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Auto tuning setting	Set the auto tuning.			
Auto tuning mode selection	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 °C	0 °C	0 °C	0 °C
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF

Point

Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following:

☞ Page 56 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following:

☞ Page 57 Auto tuning

Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

Do not change the settings of the module labels. For details on global labels, refer to the following:

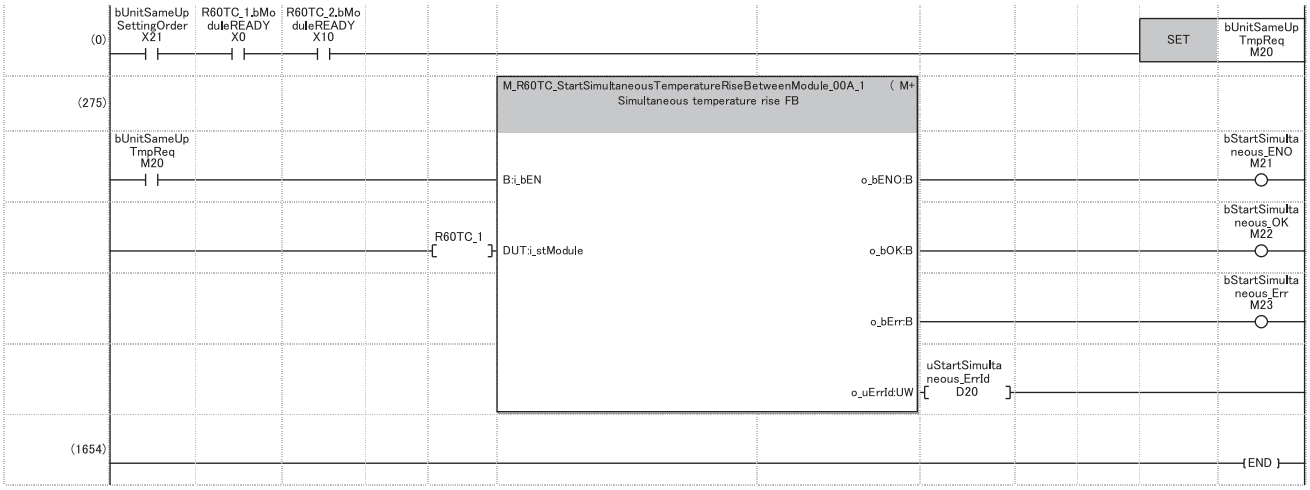
MELSEC iQ-R Programming Manual (Program Design)

Classification	Label name	Description	Device
Module label	R60TC_1.bModuleREADY	Module READY flag	X0
	R60TC_2.bModuleREADY	Module READY flag	X10
Label to be defined	Define global labels as follows.		

	Label Name	Data Type		Class	Assign (Device/Label)
1	bUnitSameUpSettingOrder	Bit	...	VAR_GLOBAL	X21
2	bUnitSameUpTmpReq	Bit	...	VAR_GLOBAL	M20
3	bStartSimultaneous_ENO	Bit	...	VAR_GLOBAL	M21
4	bStartSimultaneous_OK	Bit	...	VAR_GLOBAL	M22
5	bStartSimultaneous_Err	Bit	...	VAR_GLOBAL	M23
6	uStartSimultaneous_ErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D20

Program examples

■Program example of the inter-module simultaneous temperature rise



■Program that processes data when the upper limit input alert occurs

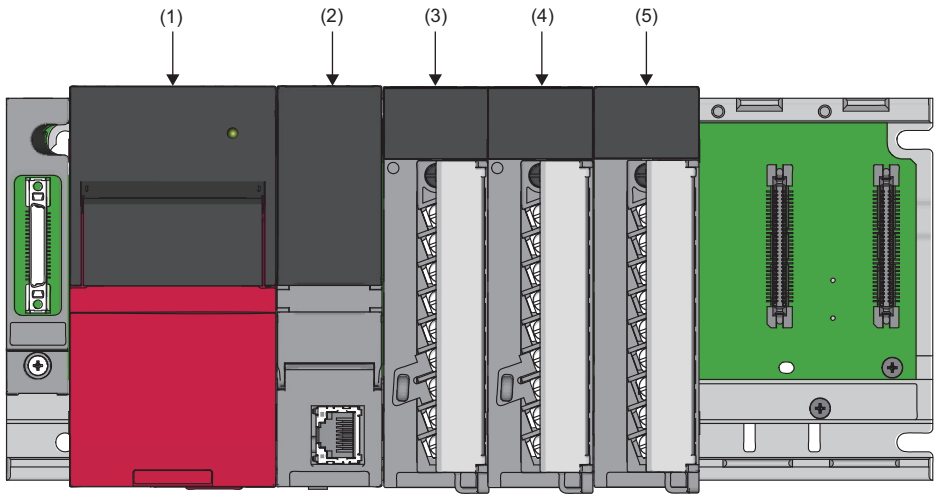
For the program that is processed when the upper limit input alert occurs, refer to the following:

☞ Page 59 Program that processes data when the upper limit input alert occurs

Standard control (When using the inter-module peak current suppression function)

System configuration

The following shows a system configuration example.



(1) Power supply module (R61P)
(2) CPU module (R120CPU)
(3) Temperature control module 1 (R60TCTRT2TT2)
(4) Temperature control module 2 (R60TCTRT2TT2)
(5) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.

Point

In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following:
☞ Page 54 Setting modules

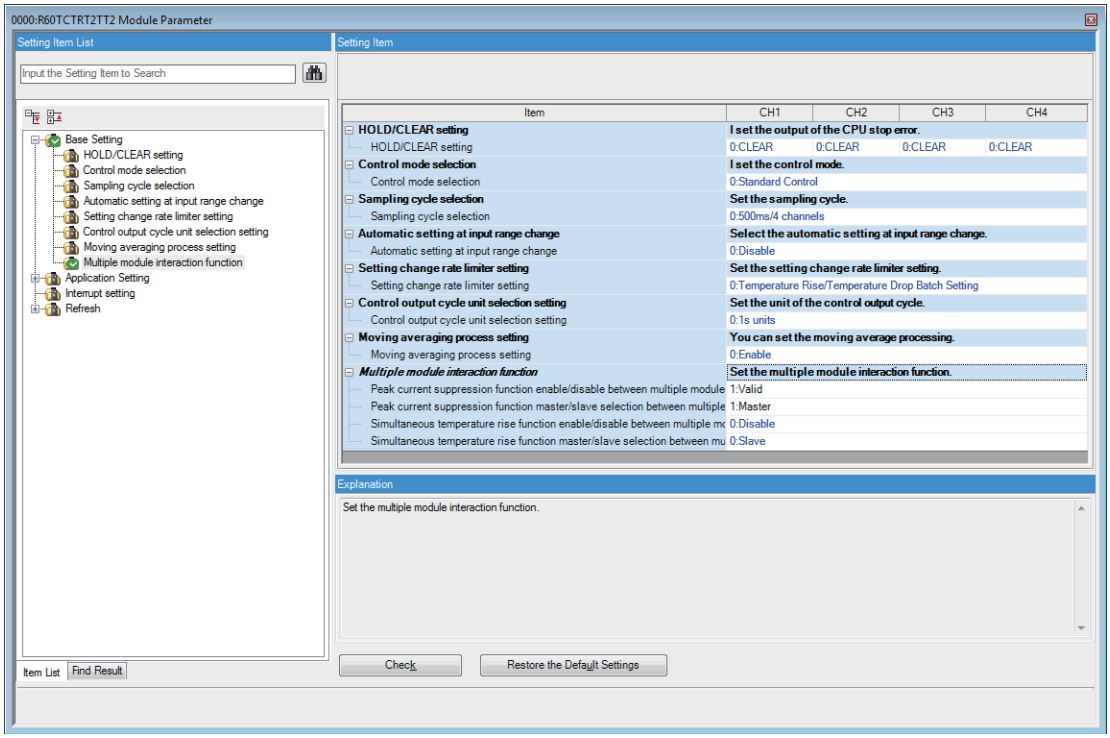
■Setting parameters of the temperature control module 1

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

• "Multiple module interaction function"

Set "Peak current suppression function enable/disable between multiple module" and "Peak current suppression function master/slave selection between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	200 ℃	250 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 ℃	500 ℃	1300 ℃	1300 ℃
Lower Limit Setting Limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter (Temperature drop)	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

• "Peak current suppression setting"

Set "Peak current suppression control group setting" of CH1 and CH2 as shown below.

Peak current suppression setting	Set the peak current suppression function.			
Peak current suppression control group setting	1:Group 1	2:Group 2	0:Not Divided	0:Not Divided

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 ℃	300 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

• "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Auto tuning setting	Set the auto tuning.			
Auto tuning mode selection	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 ℃	0 ℃	0 ℃	0 ℃
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF

Point

Use the default values for the parameters other than the parameters shown above.

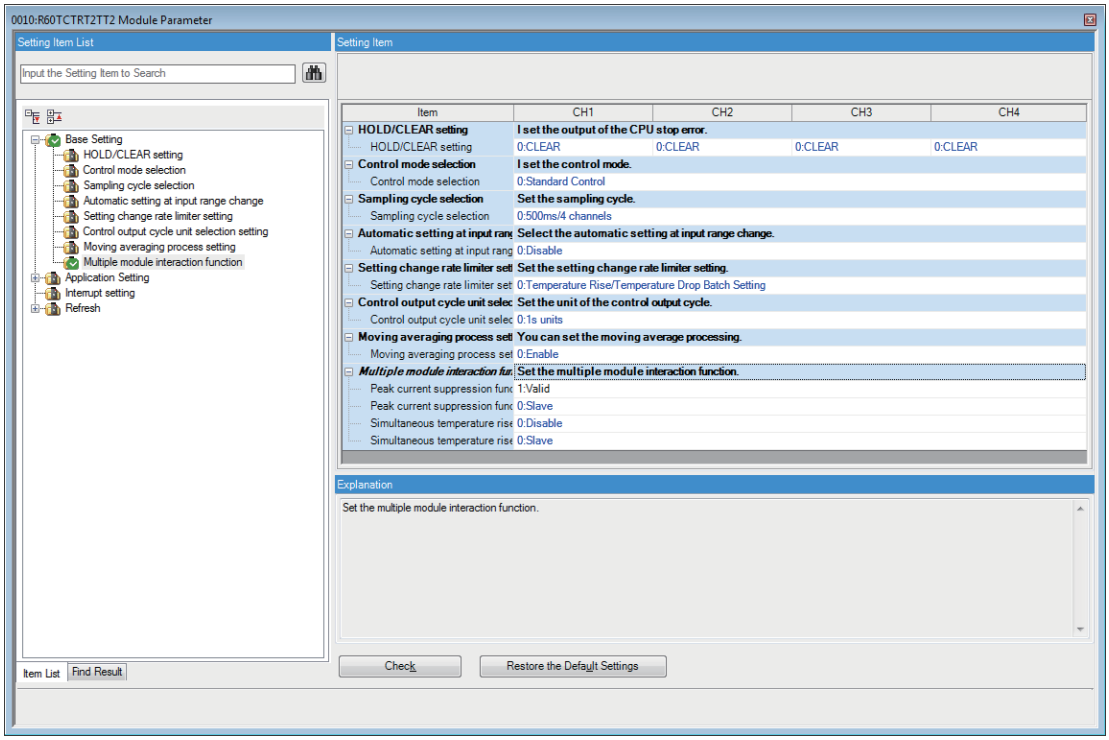
■Setting parameters of the temperature control module 2

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

- "Multiple module interaction function"

Set "Peak current suppression function enable/disable between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	150 ℃	100 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	300 ℃	200 ℃	1300 ℃	1300 ℃
Lower Limit Setting Limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter (Temperature drop)	0 ℃	0 ℃	0 ℃	0 ℃
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

• "Peak current suppression setting"

Set "Peak current suppression control group setting" of CH1 and CH2 as shown below.

Peak current suppression setting	Set the peak current suppression function.			
Peak current suppression control group setting	3:Group 3	4:Group 4	0:Not Divided	0:Not Divided

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	200 ℃	150 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

• "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Auto tuning setting	Set the auto tuning.			
Auto tuning mode selection	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 ℃	0 ℃	0 ℃	0 ℃
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF

Point

Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following:

☞ Page 56 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following:

☞ Page 57 Auto tuning

Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

Do not change the settings of the module labels. For details on global labels, refer to the following:

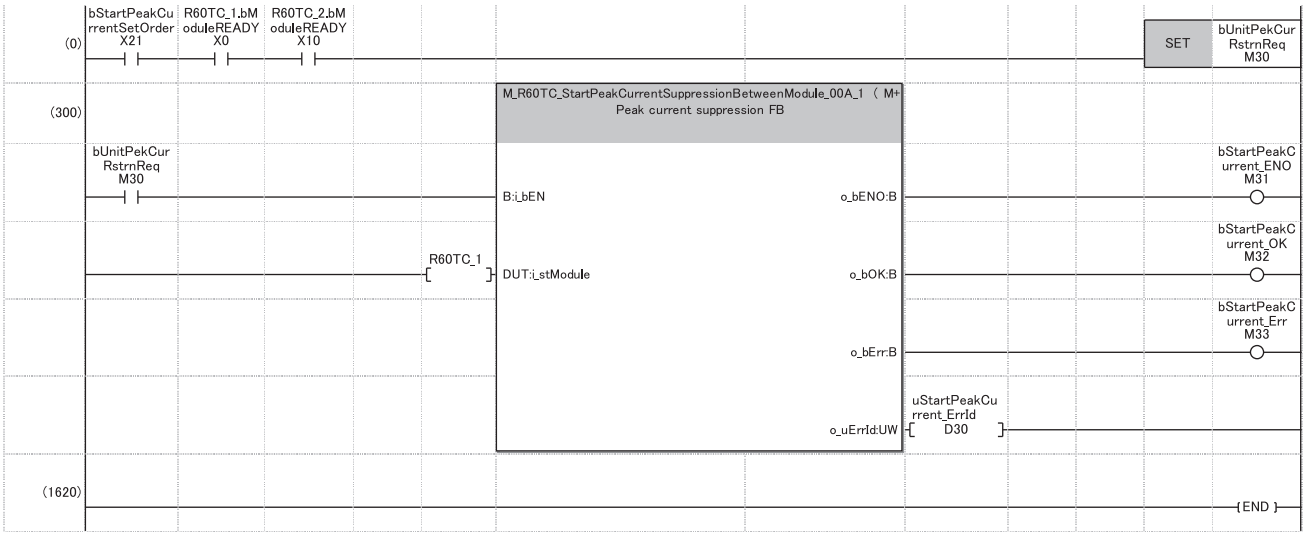
MELSEC iQ-R Programming Manual (Program Design)

Classification	Label name	Description	Device
Module label	R60TC_1.bModuleREADY	Module READY flag	X0
	R60TC_2.bModuleREADY	Module READY flag	X10
Label to be defined	Define global labels as follows.		

	Label Name	Data Type		Class	Assign (Device/Label)
1	bStartPeakCurrentSetOrder	Bit	...	VAR_GLOBAL	X21
2	bUnitPekCurRstrnReq	Bit	...	VAR_GLOBAL	M30
3	bStartPeakCurrent_ENO	Bit	...	VAR_GLOBAL	M31
4	bStartPeakCurrent_OK	Bit	...	VAR_GLOBAL	M32
5	bStartPeakCurrent_Err	Bit	...	VAR_GLOBAL	M33
6	uStartPeakCurrent_ErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D30

Program examples

■Program example of the inter-module peak current suppression



■Program that processes data when the upper limit input alert occurs

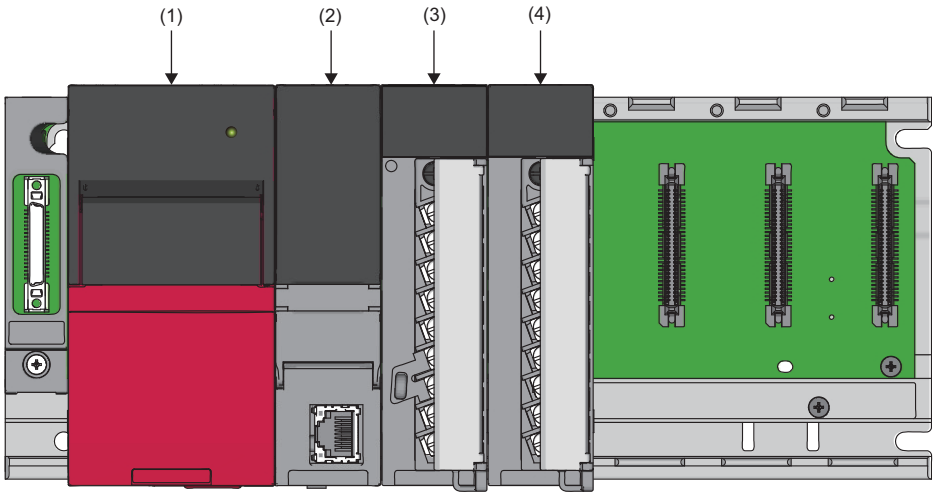
For the program that is processed when the upper limit input alert occurs, refer to the following:

☞ Page 59 Program that processes data when the upper limit input alert occurs

Heating-cooling control

System configuration

The following shows a system configuration example.



(1) Power supply module (R61P)
(2) CPU module (R120CPU)
(3) Temperature control module (R60TCTRT2TT2)
(4) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.

Point

In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following:

☞ Page 54 Setting modules

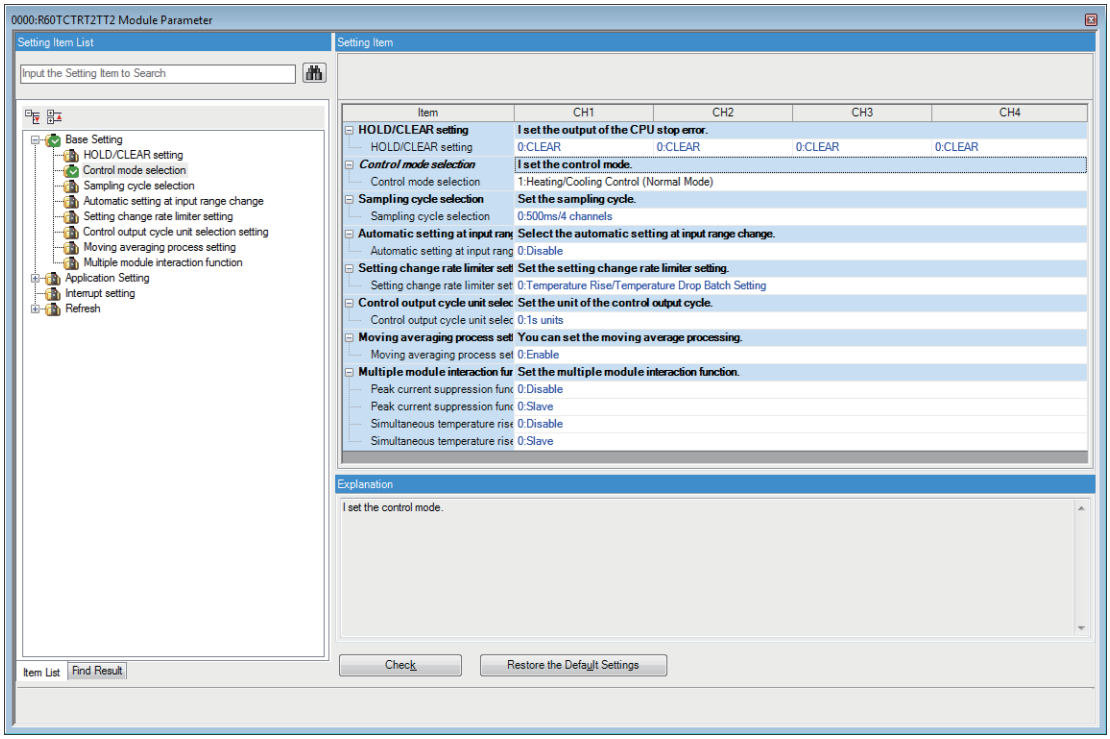
■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

- "Control mode selection"

Set "Control mode selection" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measu	2:Thermocouple K Measu	2:Thermocouple K Measu	2:Thermocouple K Measu
Target Value(SV) Setting	200 ℃	0 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	1:Unused	0:Used	0:Used
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Heating/cooling control setting"

Set "Overlap/dead band setting" of CH1 as shown below.

Heating/cooling control setting	Set this when using the heating/cooling control.			
Temperature conversion setting		0:Not Used	0:Not Used	0:Not Used
Cooling upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Cooling control output cycle setting	30 s	30 s	30 s	30 s
Cooling method setting	0:Air Cooled	0:Air Cooled	0:Air Cooled	0:Air Cooled
Overlap/dead band setting	-5 ℃	0 ℃	0 ℃	0 ℃

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 ℃	0 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

Point

Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following:

☞ Page 56 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following:

☞ Page 57 Auto tuning

Setting labels

Fort how to set labels, refer to the following:

☞ Page 58 Setting labels

Program examples

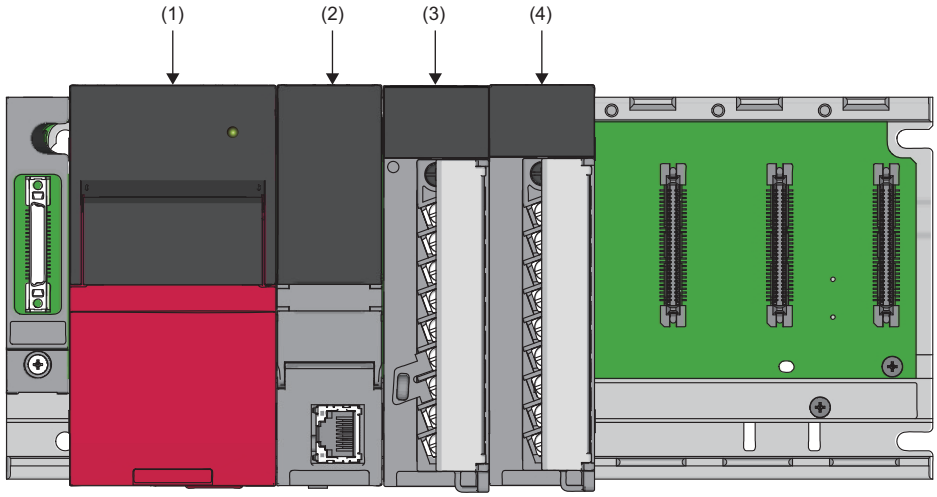
For the program examples, refer to the following:

☞ Page 59 Program examples

Position proportional control

System configuration

The following shows a system configuration example.



(1) Power supply module (R61P)
(2) CPU module (R120CPU)
(3) Temperature control module (R60TCTRT2TT2)
(4) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.

Point

In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following:
MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following:

☞ Page 54 Setting modules

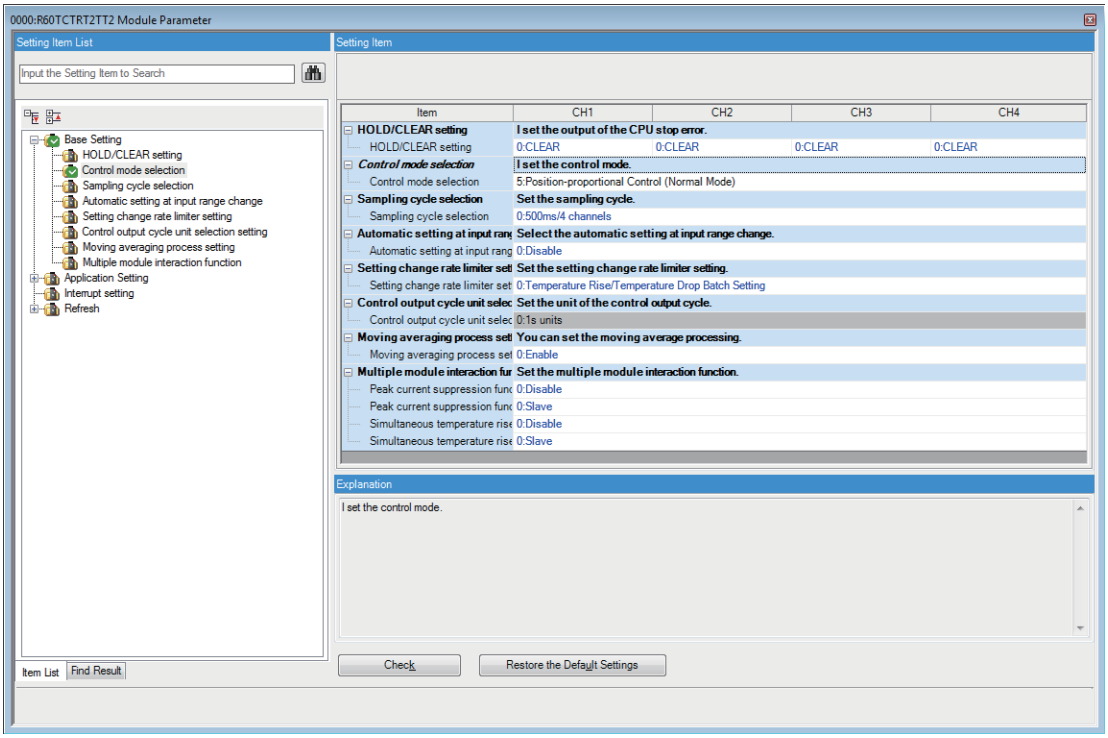
■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

- "Control mode selection"

Set "Control mode selection" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Application Setting]

• "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measu	2:Thermocouple K Measu	2:Thermocouple K Measu	2:Thermocouple K Measu
Target Value(SV) Setting	200 ℃	0 ℃	0 ℃	0 ℃
Unused channel setting	0:Used	1:Unused	0:Used	0:Used
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

• "Position-proportional control setting"

Set "Control motor time" and "Addition output limiter setting" of CH1 as shown below.

Position-proportional control setting	Set this when using the position-proportional control.			
Open/close output neutral setting	2.0 %	2.0 %	2.0 %	2.0 %
Control motor time	1000 s	10 s	10 s	10 s
Addition output limiter setting	100.0 %	150.0 %	150.0 %	150.0 %
Valve operation setting (When CPU stop)	0:Closed-side Output, Ope	0:Closed-side Output, Ope	0:Closed-side Output, Ope	0:Closed-side Output, Ope

• "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 ℃	0 ℃	0 ℃	0 ℃
Alert set value 2	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 3	0 ℃	0 ℃	0 ℃	0 ℃
Alert set value 4	0 ℃	0 ℃	0 ℃	0 ℃
Alert dead band setting	5 ℃	5 ℃	5 ℃	5 ℃
Number of alert delay	0 Times	0 Times	0 Times	0 Times

Point

Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following:

☞ Page 56 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following:

☞ Page 57 Auto tuning

Setting labels

Fort how to set labels, refer to the following:

☞ Page 58 Setting labels

Program examples

For the program examples, refer to the following:

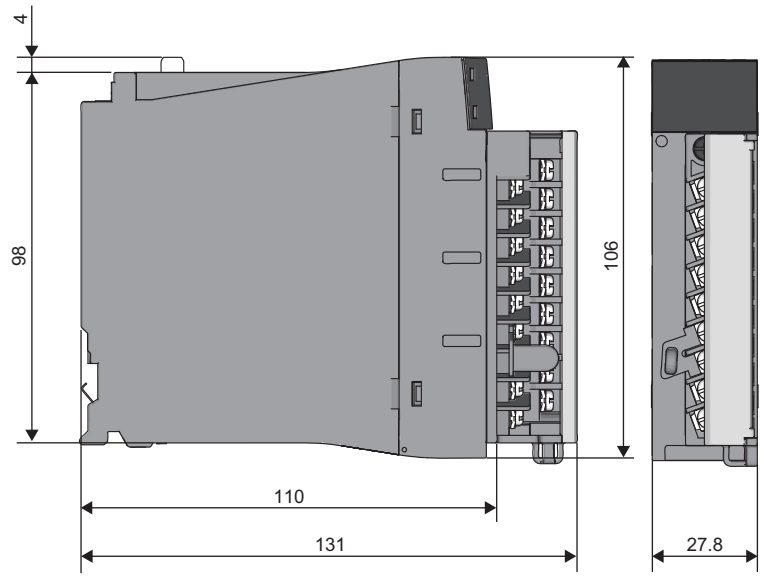
☞ Page 59 Program examples

APPENDIX

Appendix 1 External Dimensions

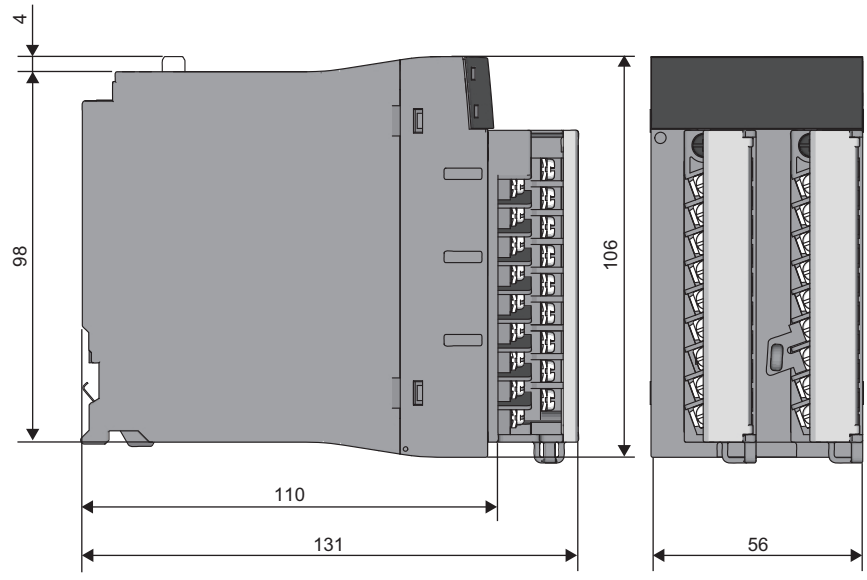
The following shows the external dimensions of the temperature control module.

R60TCTRT2TT2, R60TCRT4



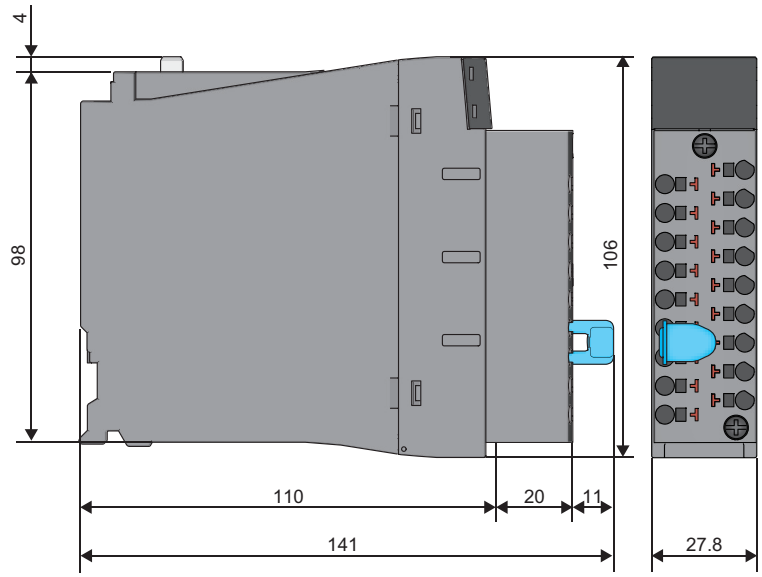
(unit: mm)

R60TCTRT2TT2BW, R60TCRT4BW



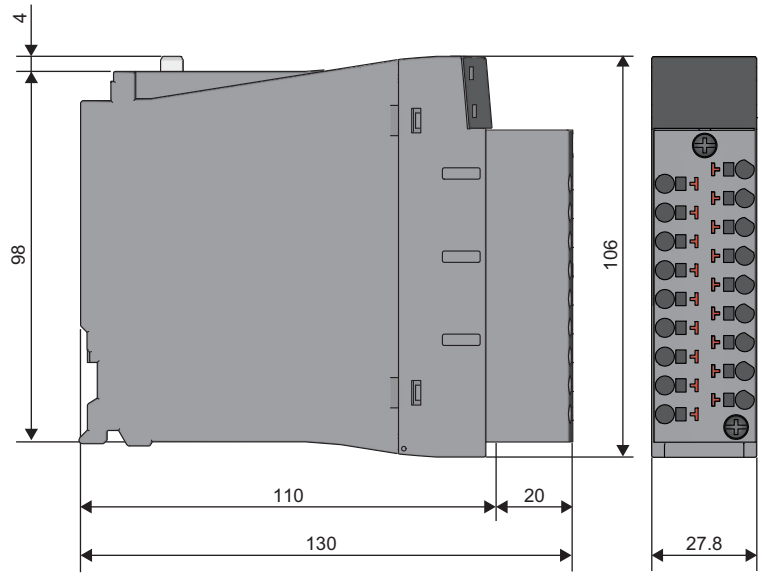
(unit: mm)

R60TCTRT2TT2-TS



(unit: mm)

R60TCRT4-TS



(unit: mm)

A

INDEX

MEMO

REVISIONS

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

Revision date	*Manual number	Description
July 2015	SH(NA)-081535ENG-A	First edition
May 2016	SH(NA)-081535ENG-B	■Added or modified parts RELEVANT MANUALS, Chapter 4, Section 5.1, 6.3, 6.4, 7.2
July 2018	SH(NA)-081535ENG-C	Error correction
April 2021	SH(NA)-081535ENG-D	■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, Chapter 1, Section 2.1, Section 2.2, Section 5.1, Section 6.1, Section 6.3, Appendix 1

Japanese manual number SH-081533-C

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 to:

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) 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.

TRADEMARKS

The company names, system names and product names mentioned in this manual are either registered trademarks or trademarks of their respective companies.
In some cases, trademark symbols such as '™' or '®' are not specified in this manual.

SH(NA)-081535ENG-D(2104)KWIX
MODEL: R60TC-U-IN-E
MODEL CODE: 13JX38

MITSUBISHI ELECTRIC CORPORATION

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