MULTIPOINT TEMPERATURE CONTROL UNIT

C SERIES

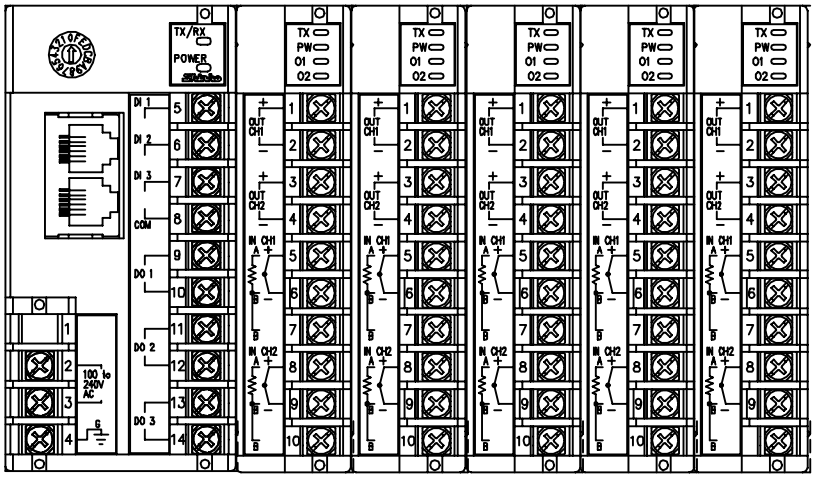
INSTRUCTION MANUAL

CPT-20A

CCT-235

CBT-200

CPM, CPP



Shinko

PREFACE

Thank you for purchasing our Multi-point Temperature Control Unit **C series**.
This manual contains instructions for the mounting, functions, operations and notes when operating the **C series**.
For model confirmation and unit specifications, please read this manual carefully before starting operation.

To prevent accidents arising from the use of the C series, please ensure the operator receives this manual.

Notes

- This instrument should be used in accordance with to the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.
- Specifications of the C series and the contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform us or the shop you purchased the unit.
- The C series is designed to be mounted on a DIN rail. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO.,LTD. is not liable for any damages or secondary damages incurred as a result of using this manual, including any indirect damages.

SAFETY PRECAUTIONS

(**Be sure to read these precautions before using our products**.)
The safety precautions are classified into two categories: “Warning” and “Caution”.
Depending on circumstances, procedures indicated by ⚠ Caution may be linked to serious results and make sure to follow the directions for usage.

⚠ Warning

Procedures which may lead to a dangerous condition and cause death or serious injury, if not carried out properly.

⚠ Caution

Procedures which may lead to a dangerous condition and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

⚠ Warning

- To prevent an electric shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to instrument, parts replacement may only be undertaken by Shinko or qualified service personnel.

⚠ SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

1. Installation precautions

Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1):
Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:
(1) A minimum of dust, and an absence of corrosive gases
(2) No flammable, explosive gases
(3) No mechanical vibrations or shocks
(4) No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to122℉) that does not change suddenly
(5) An ambient non-condensing humidity of 35 to 85%RH
(6) No large capacity electromagnetic switches or cables through which large current is flowing
(7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

Note: Although the case of this instrument is made of flame resistant resin, do not install this instrument near flammable material.
Avoid setting this instrument directly on flammable material.

2. Wiring precautions

Caution

- Do not leave bits of wire in the CPT-20A and CCT-235, because they could cause fire or malfunction.
- Insert the connecting cable into the designated connector securely to prevent malfunction.
- Connect the wire for AC power source with its designated terminal as described in this instruction manual.
  The C series will be damaged if the AC power source wire is connected to a different terminal.
- For the grounding terminal of the CPT-20A, use 2mm^2 or more of thick wire and type 3 grounding.
  However, avoid grounding in conjunction with the power line.
- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring terminal blocks of CPT-20A and CCT-235.
- The terminal block of the CPT-20A and CCT-235 are designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw with the specified torque.
  If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- Do not apply a commercial power source to the sensor connected to the CCT-235 nor allow the power source to come into contact with the sensor, as the input circuit may be burnt out.
- With the relay contact output type of the CCT-235, externally use an auxiliary electromagnetic switch according to the capacity of the load to protect the built-in relay contact.
- To prevent the unit from harmful effects of unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- This controller has neither a built-in power switch nor a fuse. Therefore, it is necessary to install them in the circuit near the external controller.
  (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 3.15A)

3. Running and maintenance precautions

Caution

- Do not touch live terminals. It may cause electric shock or problems in operation.
- Turn the power supply to the instrument OFF before cleaning the module or retightening the screws.
  Doing this work while the power is ON may result in severe injury or death due to electric shock.
- Be sure to turn the power supply to the instrument OFF before cleaning this instrument.
- Wipe the instrument using a soft, dry cloth.
  (Alcohol based substances may tarnish or deface the unit.)

CONTENTS

1. Overview

1.1 Overview of C series

The Multi-point Temperature Control System C series consists of the Power source host link unit (hereafter CPT-20A) and 2-channel temperature control unit (hereafter CCT-235).

There are two types of Base unit, each with their own way of mounting.
CBT-205: A single CPT-20A and up to five CCT-235 units can be mounted.
CBT-210: A single CPT-20A and up to ten CCT-235 units can be mounted.
The Base unit can be mounted on the DIN rail.

1.2 Units and structure of C series

(1) Power source host link unit: CPT-20A

Link unit to supply the power to the CCT-235 and to communicate with the host unit.

(2) Temperature control unit: CCT-235

2-channel specification: CCT-235-2□/□

Independent temperature control unit with 2 channels
The input or output for 2 channels are of the same specification.

Heating/Cooling specification: CCT-235-□/□, D□

Heating/Cooling temperature control unit with 1 channel
Heating/cooling control can be carried out with 1 channel input.

(3) Base unit

CBT-205: Base unit for mounting the CPT-20A and CCT-235.
One CPT-20A is required to 1 base unit.
A maximum of five CCT-235 units can be mounted.

CBT-210: Base unit for mounting the CPT-20A and CCT-235.
One CPT-20A is required to 1 base unit.
A maximum of ten CCT-235 units can be mounted.

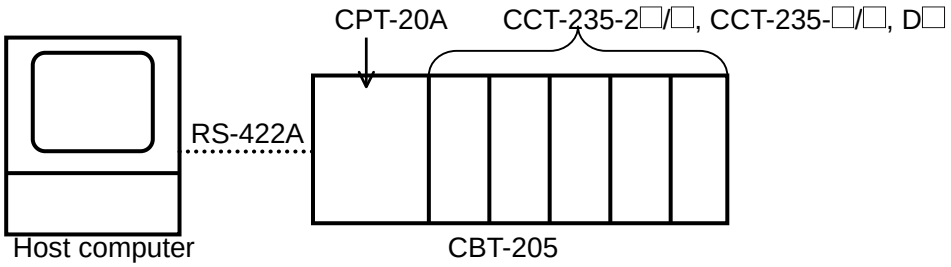
(4) Communication cable

CPM: Communication cable (3m) to connect between the CPT-20A and CMT-200 (Touch panel unit), between the CPT-20A and COT-200 (Console unit)
Modular jack is attached to one side of the cable and Y terminal is attached to the other side of the cable.

CPP: Communication cable (50cm) to connect between the CPT-20A units (for increasing the blocks)
Modular jack is attached to both end of the cable.

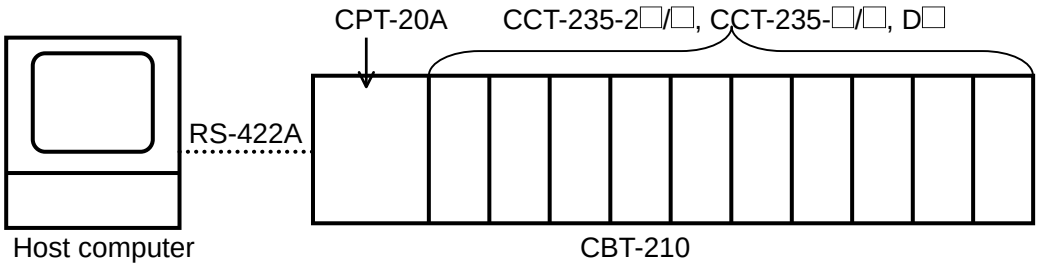
1.3 System configuration

- **When CBT-205 is used**



(Fig. 1.3-1)

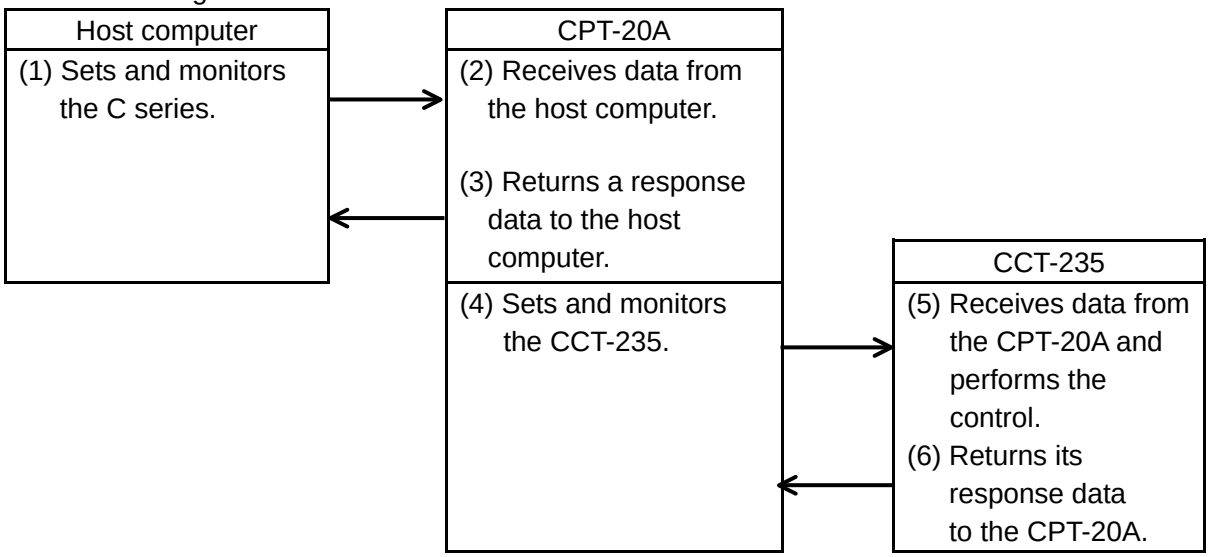
- **When CBT-210 is used**



(Fig. 1.3-2)

1.4 Parameter exchange

Parameter exchange is shown below.



CPT-20A does not manage the setting ranges of the CCT-235. Therefore, when the host computer sets the set value of the C series, the value should be within the setting range of the CCT-235.

2. Model name

2.1 Model name

(1) Power source host link unit: CPT-20A

(2) Temperature control unit: CCT-235

2-channel specification

C C T - 2	3	5 -	2	□ / □,	□	Series name: CCT-235
Control action	3					PID action (with auto-tuning)
Alarm action		5				Alarm 1 (A1): High limit, (*1) Alarm 2 (A2): Low limit
Control points			2			2 channels
Control output				R		Relay contact
				S		Non-contact voltage
				A		DC current
Input					E	Thermocouple
					R	RTD
					V	DC voltage
					A	DC current
Option					W(20A)	Heater burnout alarm (20A) (*2)
					W(50A)	Heater burnout alarm (50A) (*2)

Heating/Cooling specification

C C T - 2	3	5 -	□ / □, D□,	□	Series name: CCT-235
Control action	3				PID action (with auto-tuning)
Alarm action		5			Alarm 1 (A1): High limit, (*1) Alarm 2 (A2): Low limit
Control output			R		Relay contact
			S		Non-contact voltage
			A		DC current
Input				E	Thermocouple
				R	RTD
				V	DC voltage
				A	DC current
Cooling output				DR	Relay contact
				DS	Non-contact voltage
				DA	DC current
Option				W(20A)	Heater burnout alarm (20A) (*2)
				W(50A)	Heater burnout alarm (50A) (*2)

(*1) One alarm from12 types and No alarm can be selected by keypad from a choice of:
High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limit range alarm, Process high alarm and Process low alarm, and standby functions added to those alarms and No alarm action

(*2) Heater burnout alarm cannot be applied to DC current output type.

Note:

- The input or output for 2 channels are of the same specification. Different specifications are not allowed.
- 2-channel specification unit and Heating/Cooling specification unit can be used together.

(3) Base unit: CBT-205, CBT-210

(4) Communication cable: CPM, CPP

2.2 How to read model name label

> **Warning**
>
> **Turn the power supply to the instrument OFF before confirming the model name label.**
> **Working with the power switched ON may result in severe injury or death due to Electric Shock.**

(1) Power source host link unit: CPT-20A

Model name labels are attached to the case and inner assembly. See (Fig. 2.2-1).

[Example]

CPT–20A	Model name: CPT-20A
TC	Option: Terminal cover
No.xxxxxx	Serial number (indicated only on the inner assembly.)

(Fig. 2.2-1)

(2) Temperature control unit: CCT-235

2-channel specification

Model name labels are attached to the case and inner assembly. See (Fig. 2.2-2), (Fig. 2.2-3).

CCT–235-2R/E	Model name: CCT–235-2R/E
W (20A)	Option: Heater burnout alarm (20A)
No.xxxxxx	Serial number (indicated only on the inner assembly.)

(Fig. 2.2-2)

Heating/Cooling specification

CCT–235-2R/E, DR	Model name: CCT–235-2R/E, DR
W (20A)	Option: Heater burnout alarm (20A)
No.xxxxxx	Serial number (indicated only on the inner assembly.)

(Fig. 2.2-3)

(3) Base unit: CBT-205, CBT-210

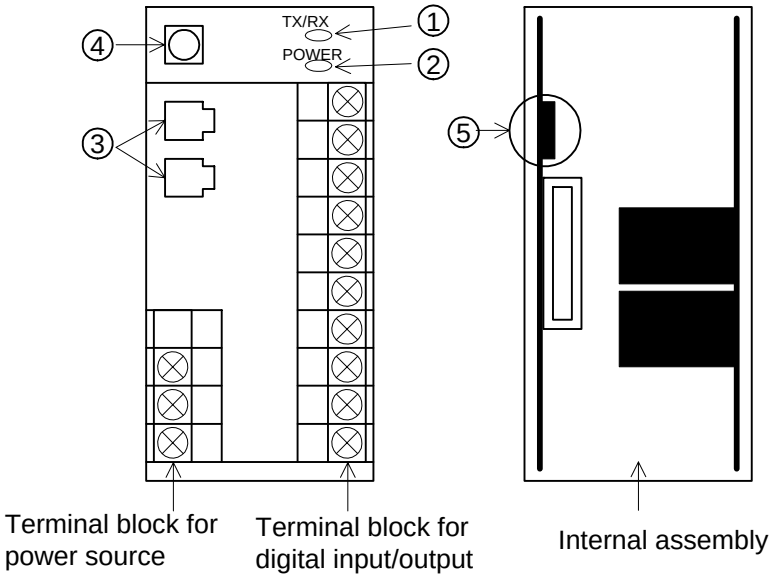
A model name label is attached to the left side of the socket for CPT-20A. See (Fig. 2.2-4).

CBT–210	Model name: CBT–210
No.xxxxxx	Serial number

(Fig. 2.2-4)

3. Name and functions of the sections

(1) Power source host link unit: CPT-20A



(Fig. 3-1)

① Communication indicator
When communicating between a host computer and CPT-20A, a yellow LED lights up.

② Instrument power indicator
When the power supply to the instrument is turned ON, a green LED lights up.

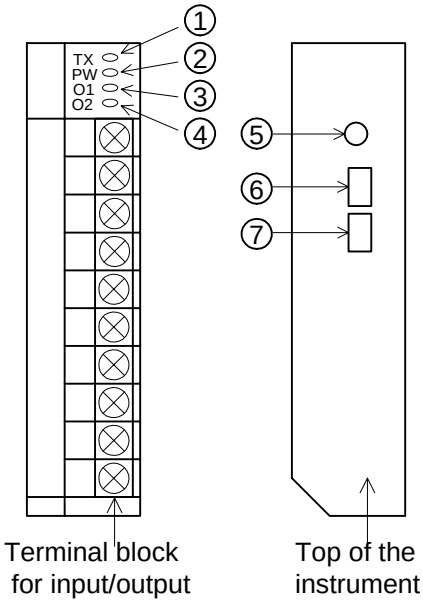
③ Modular jack
Connects the monitor, console or other CPT-20A units.

④ Rotary switch for instrument number setting
Sets the instrument number of the CPT-20A.

⑤ DIP switch for communication setting
Selects communication settings for the CPT-20A.

(2) Temperature control unit:

CCT-235-2□/□ (2-channel specification), CCT-235-□/□, D□ (Heating/Cooling specification)



(Fig. 3-2)

① **Communication indicator**
When communicating between the CCT and CPT, a yellow LED lights up.

② **Instrument power indicator**
While the power supply to the instrument is turned ON, a green LED lights up.

③ **OUT1 control output (Heating) indicator**
When OUT1 control output or Heating output (Heating/ Cooling specification) is ON, a green LED lights up. (For DC current output type, it flashes corresponding to the manipulated variable.)

④ **OUT2 control output (Cooling) indicator**
When OUT2 control output or Cooling output (Heating/ Cooling specification) is ON, a green LED lights up. (For DC current output type, it flashes corresponding to the manipulated variable.)

⑤ **Rotary switch for sensor selection**
Selects a sensor type.

⑥ **Socket to input Ch1 heater burnout alarm (CT)**
Connects Ch1 heater burnout alarm (CT) input.

⑦ **Socket to input Ch2 heater burnout alarm (CT)**
Connects Ch2 heater burnout alarm (CT) input. (Unavailable for Heating/Cooling specification)

4. Setup

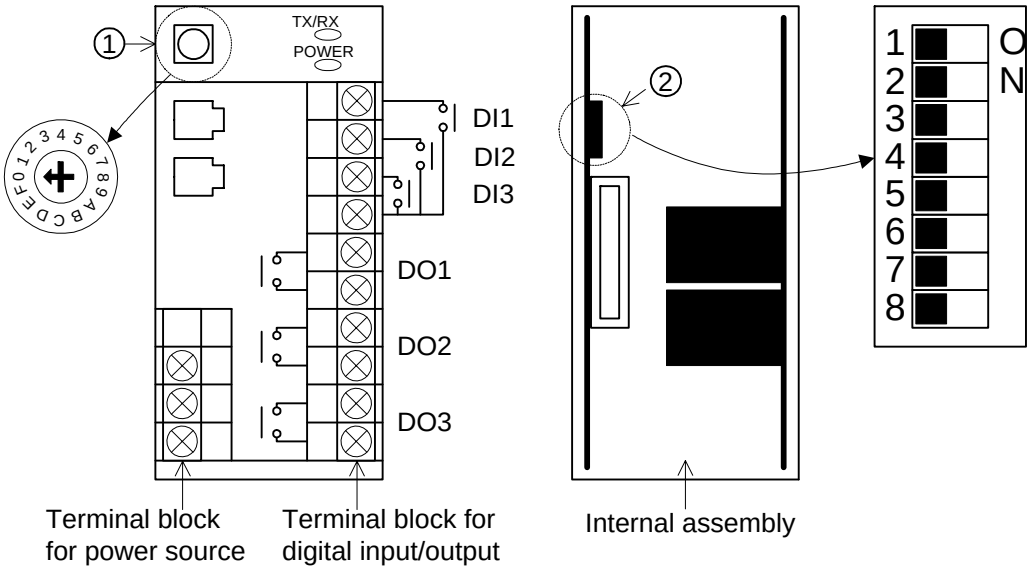
> **Warning**
>
> **Turn the power supply to the instrument OFF before performing the setup.**
> **Working with the power switched ON may result in severe injury or death due to Electric Shock.**

Note: • Set up the CPT-20A and CCT-235 first before inserting those units into the CBT-200 socket.
• The input or output for 2 channels are of the same specification.
Different specifications are not allowed.

(1) Power source host link unit: CPT-20A

● **Switch setting**

Using a small screwdriver (flat-blade or Philips head) or tweezers, set up the rotary and DIP switch of the CPT-20A.
See (Fig. 4-1).



(Fig. 4-1)

① Rotary switch for instrument number setting
Sets the instrument number of the CPT-20A.
Setting range: 0 to 15 (Rotary switch is represented by hexadecimal figures.)

② DIP switch for communication setting (Default value: OFF for all settings)

Communication speed and terminator setting

DIP switch No.	ON	OFF
No.1	19200bps	9600bps
No.2	Terminator ON	Terminator OFF

Communication form (DIP switch must be set as follows.)

DIP SW No.3	DIP SW No.4	DIP SW No.5	DIP SW No.6	Communication object or PLC	Protocol	Register	Command
OFF	OFF	OFF	OFF	CMT-200, COT-200, Programmable interface, Personal computer, etc.	Shinko protocol	—	—
ON	OFF	OFF	OFF	SYSMAC (Omron Corp.)	Host link unit	DM	RD/WR
OFF	ON	OFF	OFF	MELSEC (Mitsubishi Electric Corp.)	Host link unit Format 4	R	WR/WW
ON	ON	OFF	OFF	FX-2N (Mitsubishi Electric Corp.)	Host link unit Format 4	D	WR/WW
OFF	OFF	ON	OFF	MICREX-F (Fuji Electric CO., LTD.)	Host link unit	SI, W30	—
ON	OFF	ON	OFF	MELSEC (Mitsubishi Electric Corp.)	Host link unit Format 4	R	QR/QW
OFF	ON	ON	OFF	MELSEC (Mitsubishi Electric Corp.)	Host link unit Format 4	D	QR/QW
ON	ON	ON	ON	FA-M3 (Yokogawa Electric Corp.)	Host link unit	D	WRD/WWR
ON	ON	ON	ON	Modbus protocol compatible products	Modbus protocol	—	—

Compatible host link units and their manufacturers

PLC manufacturer	Model
Mitsubishi Electric Corp.	AJ71UC24, AJSJ71UC24-R2/R4/PRF, A1SJ71C24-R2/R4/PRF, QJ71C24
Omron Corp.	LK201-V1, LK202-V1, CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41
Fuji Electric CO., LTD.	NC1L-RS2, NC1L-RS4
Yokogawa Electric Corp.	F3LC11-1F, F3LC11-1N, F3LC12-1F, F3LC11-2N

Digital output setting (DIP switch)

DIP SW No.7	DIP SW No.8	Digital output function
OFF	OFF	ON or OFF with communication command (*)
ON	OFF	DO1: Alarm 1 DO2: Alarm 2 DO3: Heater burnout alarm
OFF	ON	DO1: Alarm 1 DO2: Alarm 2 DO3: Loop break alarm
ON	ON	DO1: Alarm 1 DO2: Heater burnout alarm DO3: Loop break alarm

(*) works only when data is sent to the CPT-20A data item [digital output (0041H)] using Shinko or Modbus protocol. (See pages 43, 77.)

Explanation of digital output setting

[Example 1] DIP switch No.7: OFF, 8:OFF

Any digital output (DO1 to DO3) of CPT-20A can be set.

[Example 2] DIP switch No.7: ON, 8: OFF

If Alarm 1, Alarm 2 or Heater burnout alarm occurs in any one of the channels of CCT-235, relay contact of DO1, DO2 or DO3 is turned ON.

[Example 3] DIP switch No.7: OFF, 8: ON

If Alarm 1, Alarm 2 or Loop break alarm occurs in any one of the channels of CCT-235, relay contact of DO1, DO2 or DO3 is turned ON.

[Example 4] DIP switch No.7: ON, 8: ON

If Alarm 1, Heater burnout alarm or Loop break alarm occurs in any one of the channels of CCT-235, relay contact of DO1, DO2 or DO3 is turned ON.

(2) Temperature control unit

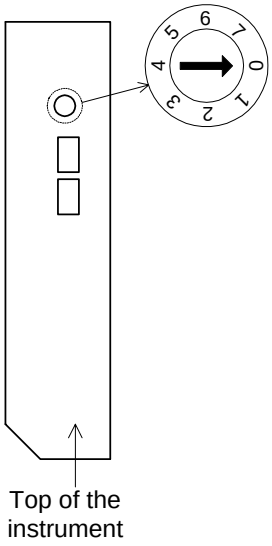
CCT-235-2□/□ (2-channel specification)

CCT-235-□/□, D□ (Heating/Cooling specification)

• Set up the Rotary switch.

Input type setting

Using a small flat-blade screwdriver or tweezers, set up the rotary switch of CCT-235 for input setting. See (Fig. 4-2).



(Fig. 4-2).

Rotary SW No.	TC input	RTD input	DC voltage input	DC current input
0	K	Pt100	—	—
1	J	JPt100	—	—
2	R	—	V DC (when input is disconnected: Output OFF)	—
3	B	—	—	mA DC (when input is disconnected: Output OFF)
4	PL-Ⅱ	—	V DC (when input is disconnected: Output ON)	—
5	N	—	—	mA DC (when input is disconnected: Output ON)
6	K (With a decimal point)	—	—	—
7	J (With a decimal point)	—	—	—

For the rated scale range of each input, refer to Section "11. Specifications" (Page 89).

For RTD input, be sure to set the rotary switch number to "0" or "1".

For DC voltage input, be sure to set the rotary switch number to "2" or "4".

For DC current input, be sure to set the rotary switch number to "3" or "5".

5. Mounting

5.1 Site selection

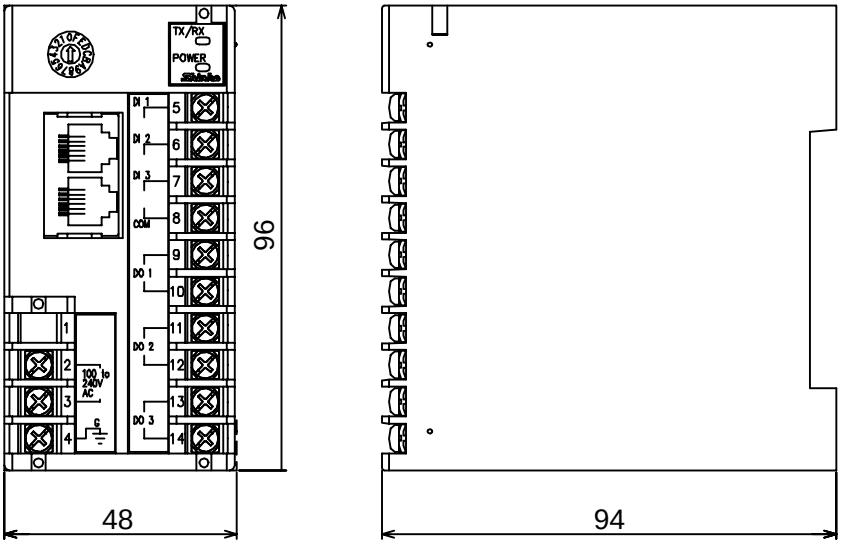
This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

(1) A minimum of dust, and an absence of corrosive gases
(2) No flammable, explosive gases
(3) No mechanical vibrations or shocks
(4) No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to122℉) that does not change rapidly
(5) An ambient non-condensing humidity of 35 to 85%RH
(6) No large capacity electromagnetic switches or cables through which large current is flowing
(7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

5.2 External dimensions (Unit: mm)

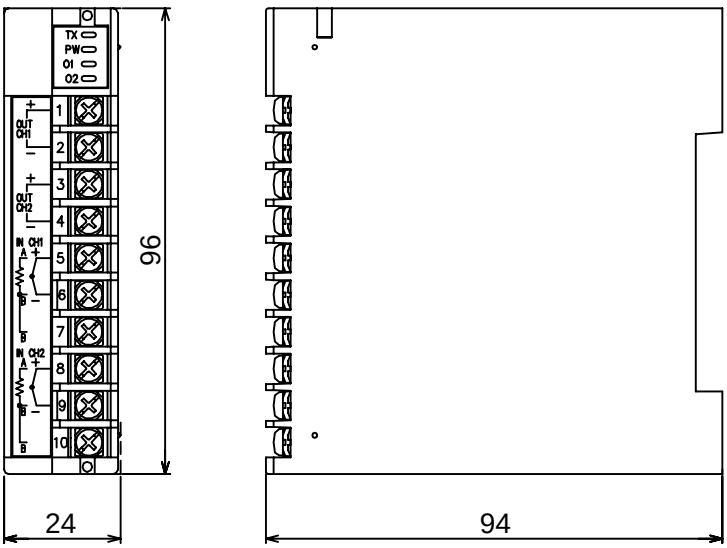
(1) Power source host link unit: CPT-20A



(Fig. 5.2-1)

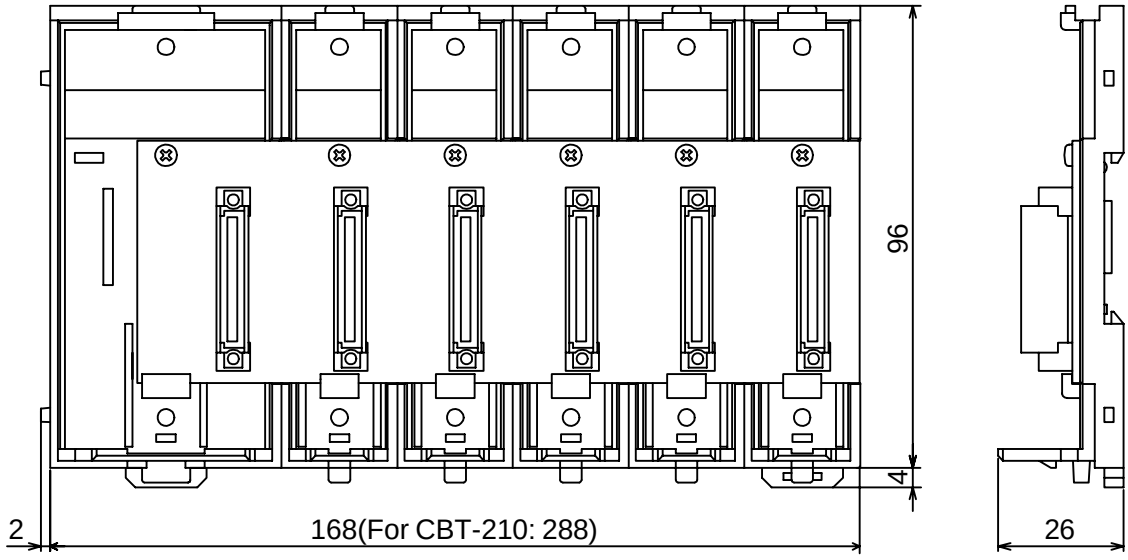
(2) Temperature control unit

CCT-235-2□/□ (2-channel specification), CCT-235-□/□, D□ (Heating/Cooling specification)



(Fig. 5.2-2)

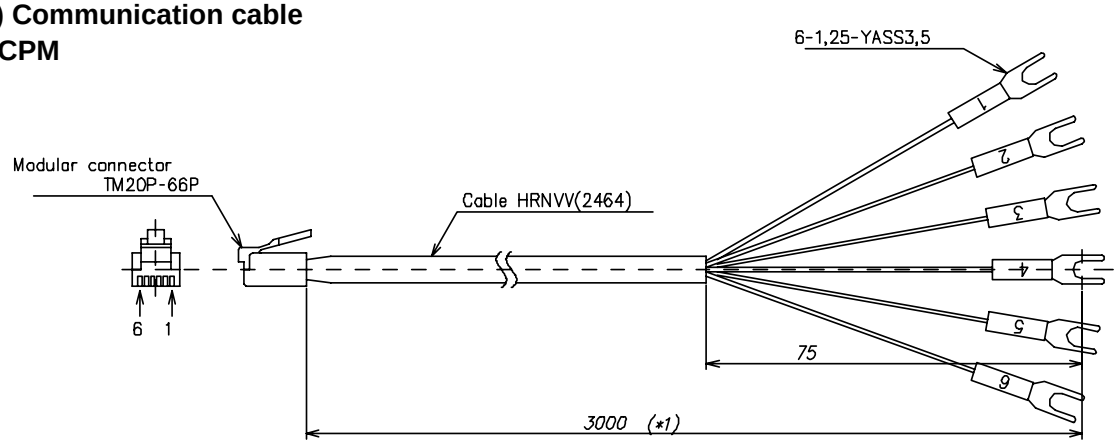
(3) Base unit: CBT-210, CBT-205



(Fig. 5.2-3)

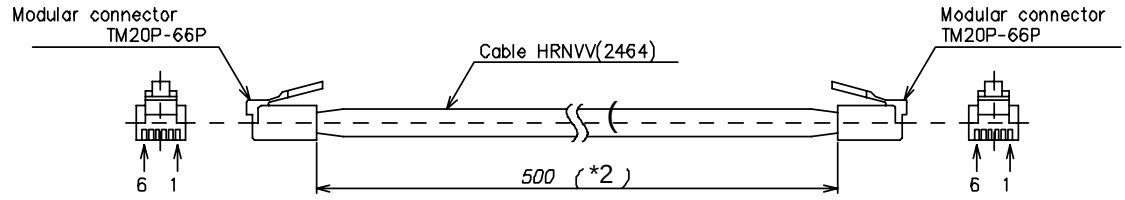
(4) Communication cable

CPM



(Fig. 5.2-4)

CPP



(Fig. 5.2-5)

(*1) Cable length can be extended by a meter each time.

(*2) Cable length can be extended by 500mm each time when cable length is 500mm or longer.
Cable length can be extended by 100mm each time when cable length is 500mm or less.

Pin No.	Wire color
1	Gray/Red
2	White/Red
3	Orange/Red
4	Orange/Black
5	White/Black
6	Gray/Black

5.3 Mounting

(1) How to mount the CBT-200 on the DIN rail

CBT-200 (CBT-205, CBT-210)

⚠ Caution

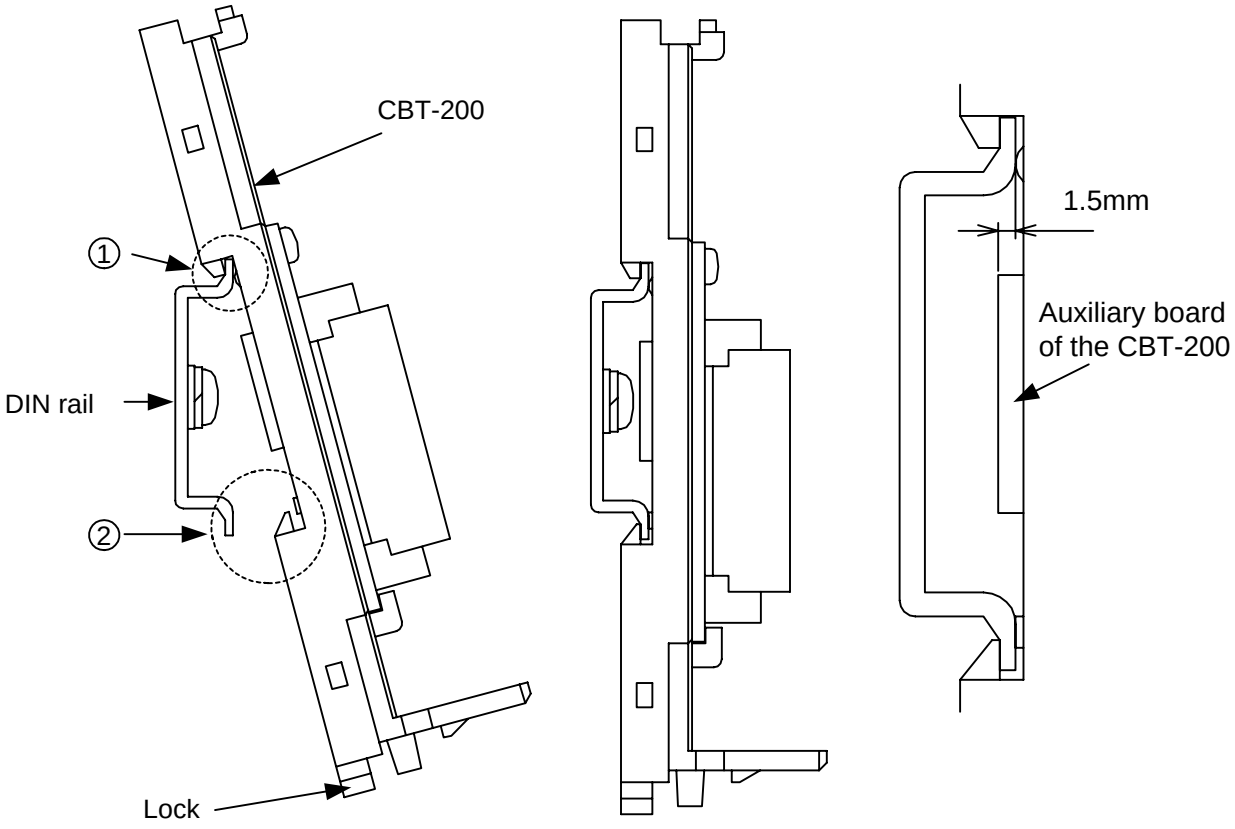
- Mount the DIN rail horizontally.
- If the DIN rail is mounted in a position susceptible to vibration or shock, be sure to use commercially available fastening plates at the end of CBT-200.

Fastening plates

Manufacturer	Model name	
Omron Corp.	End plate	PFP-M
IDEC Corp.	DIN rail stops	BNL6P, BNL8P
Matsushita Electric Works, Ltd.	Fastening plate	ATA4806

- Do not confuse the top and bottom of the CBT-200.
- When mounting or removing the units (CPT-20A, CCT-235), the units have to be slanted a little. Therefore do not mount any other instruments within 10cm of space from the CBT-200 base unit.

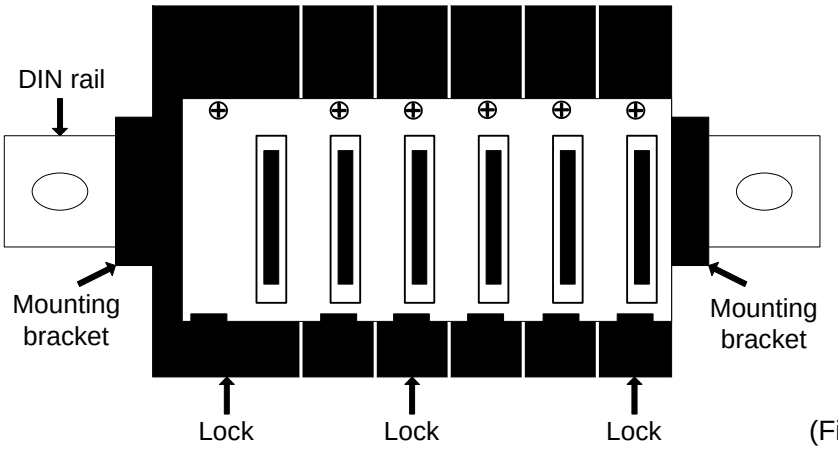
① Fit the upper dented part of the back of CBT-200 to one side of the DIN rail. See (Fig. 5.3-1).
② Fit the lower dented part of the back of CBT-200 to the other side of the DIN rail.
The CBT-200 will be fixed to the DIN rail with a clicking sound. See (Fig. 5.3-1).



(Fig. 5.3-1)

● **CBT-205**

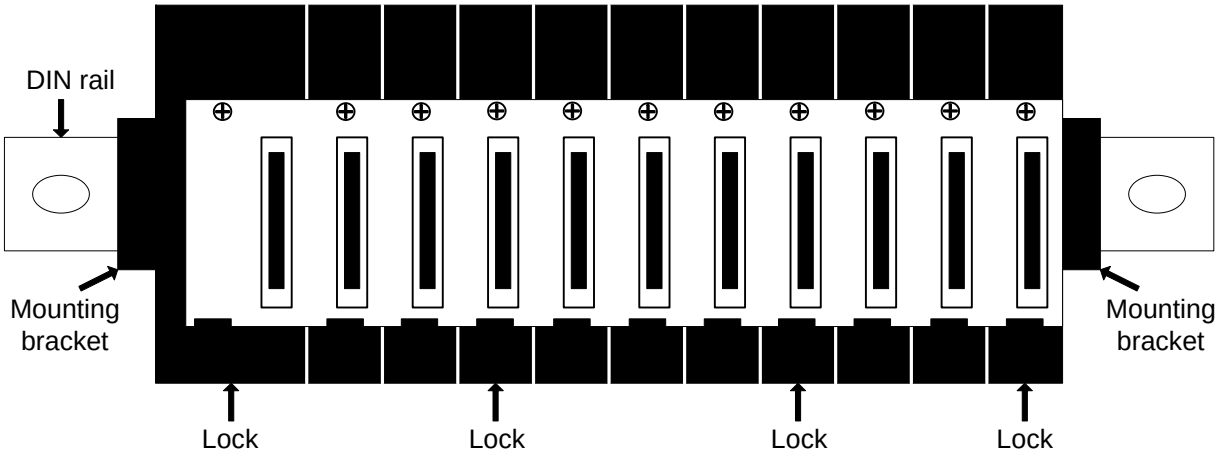
Three places to lock the CBT-205 and two places to mount the mounting bracket are shown below.



(Fig. 5.3-2)

● **CBT-210**

Four places to lock the CBT-210 and two places to mount the mounting bracket are shown below.

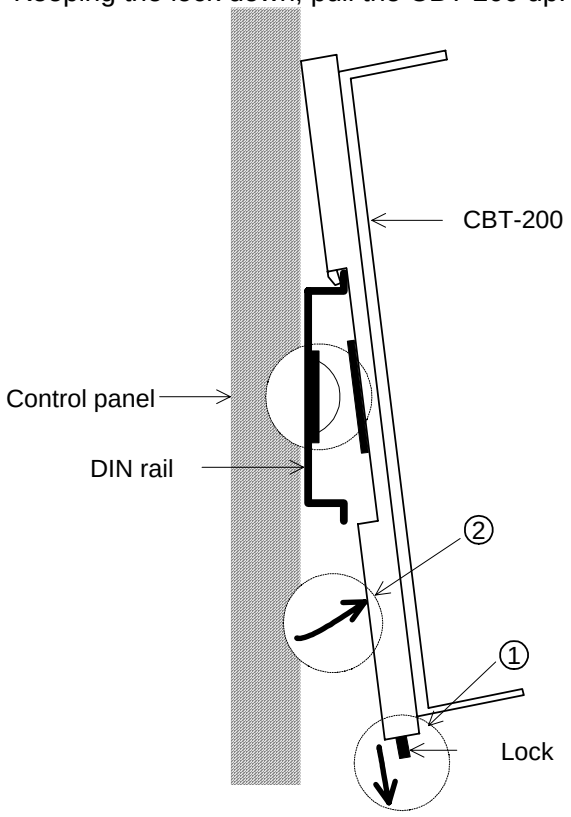


(Fig. 5.3-3)

(2) How to remove the CBT-200 from the DIN rail

① By using a flat-blade screwdriver, pull down the lock of the lower part of the CBT-200 See (Fig. 5.3-4).

② Keeping the lock down, pull the CBT-200 up. See (Fig. 5.3-4).



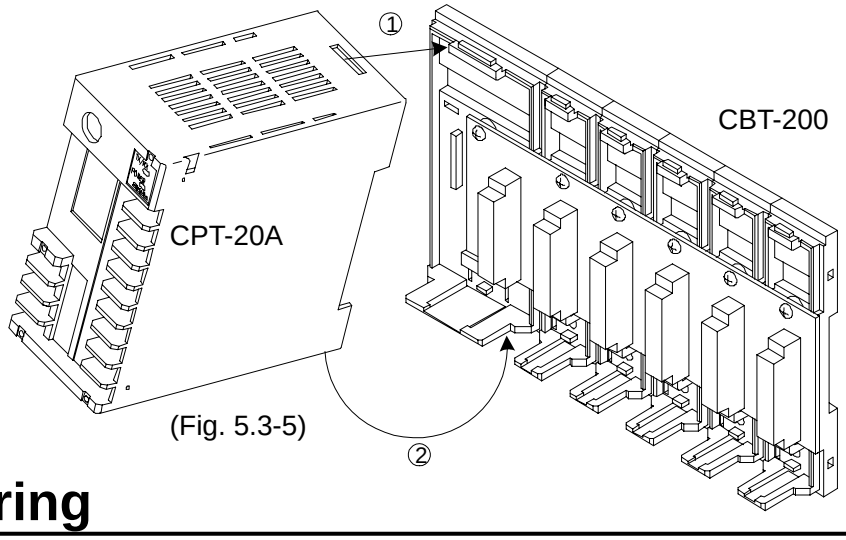
(Fig. 5.3-4)

(3) How to mount the CPT-20A and CCT-235 to the CBT-200

Caution

Do not confuse the top and bottom of each unit (CPT-20A, CCT-235).
If force is applied to the unit in the wrong direction, the PCB may be damaged.

① Hook the upper part of the CPT-20A unit to the upper part of the CBT-200 base unit to be mounted. See (Fig. 5.3-5).
② Using the mounted part as the support, fit the lower part of the CPT-20A unit to the base unit. The CPT-20A will be completely fixed to the CBT-200 base unit with a clicking sound. See (Fig. 5.3-5).



(Fig. 5.3-5)

6. Wiring

Warning

Turn the power supply to the instrument OFF before wiring.
Working with the power switched ON may result in severe injury or death due to Electric Shock. Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

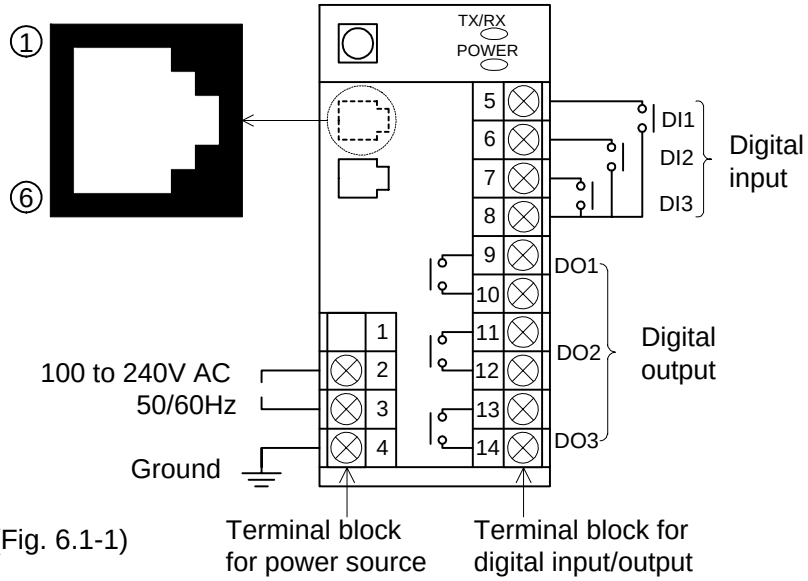
Caution

- Do not leave bits of wire in the instrument (CPT-20A, CCT-235), because they could cause fire or malfunction.
- Insert the connecting cable into the designated connector securely to prevent malfunction.
- Connect the wire for AC power source with its designated terminal as described in this instruction manual. The CPT-20A will be damaged if the AC power source wire is connected to a different terminal.
- For the ground terminal of the CPT-20A, use 2mm^2 or more of thick wire. However, avoid grounding in conjunction with the power line.
- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the CPT-20A terminals.
- The terminal block of the CPT-20A is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Tighten the terminal screw with the specified torque. If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- Do not apply a commercial power source to the sensor connected to the CCT-235 input terminal nor allow the power source to come into contact with the sensor, as the input circuit may be burnt out.
- Use a thermocouple, compensating lead wire and the 3-wire RTD corresponding to the input specification of the CCT-235.
- When using a relay contact output type CCT-235, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires.
- To prevent the unit from harmful effects of unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- Externally install a protecting circuit in case there is unexpected trouble due to the environment, aging, etc.
- The C series has neither a built-in power switch nor a fuse. Therefore, it is necessary to install them in the circuit near the external controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 3.15A)

6.1 Terminal arrangement

(1) Power source host link unit: CPT-20A

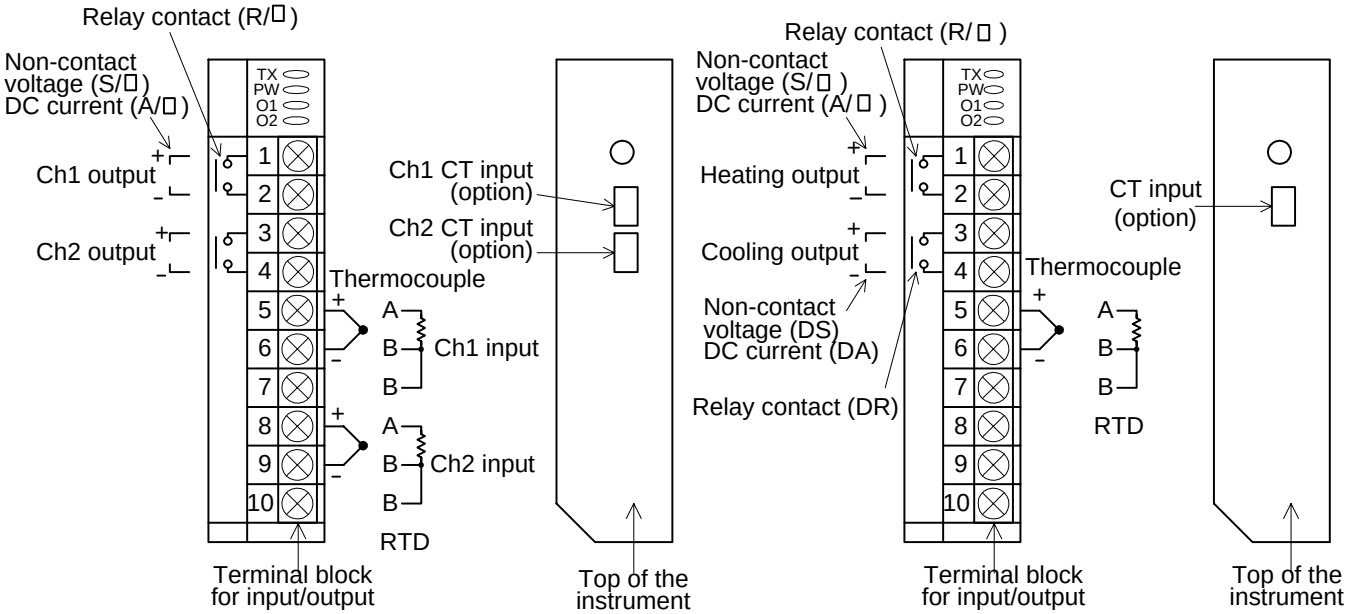
①	SG
②	RXB
③	TXB
④	TXA
⑤	RXA
⑥	SG



(Fig. 6.1-1)

(2) Temperature control unit

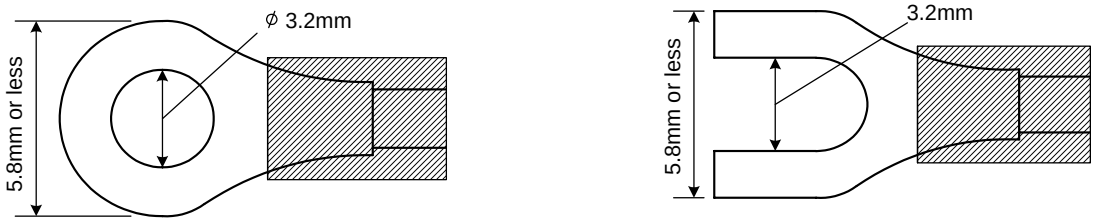
CCT-235-2□/□ (2-channel specification) **CCT-235-□/□, D□ (Heating/Cooling specification)**



(Fig. 6.1-2)

6.2 Solderless terminal

Use a solderless terminal with an insulation sleeve in which the M3 screw fits as shown below.

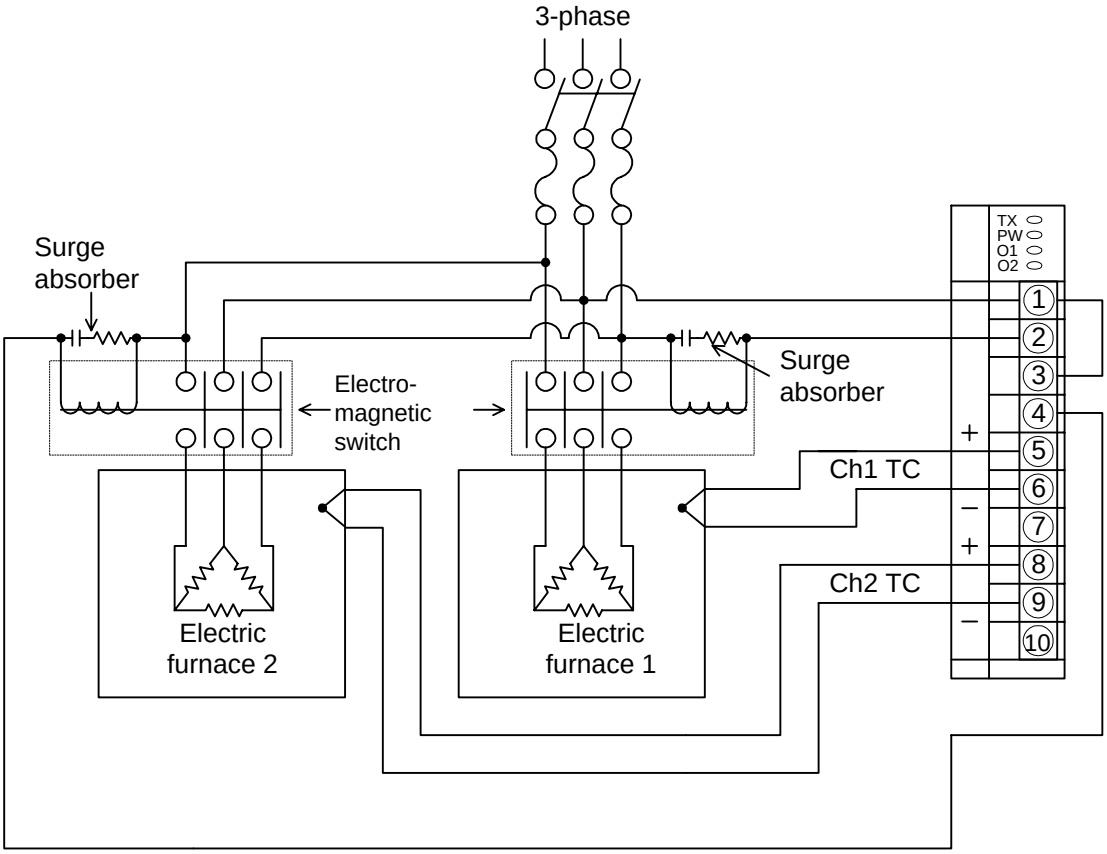


(Fig. 6.2-1)

Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N・m Max. 1.0N・m
	Japan Solderless Terminal MFG CO., LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO., LTD.	V1.25-3	

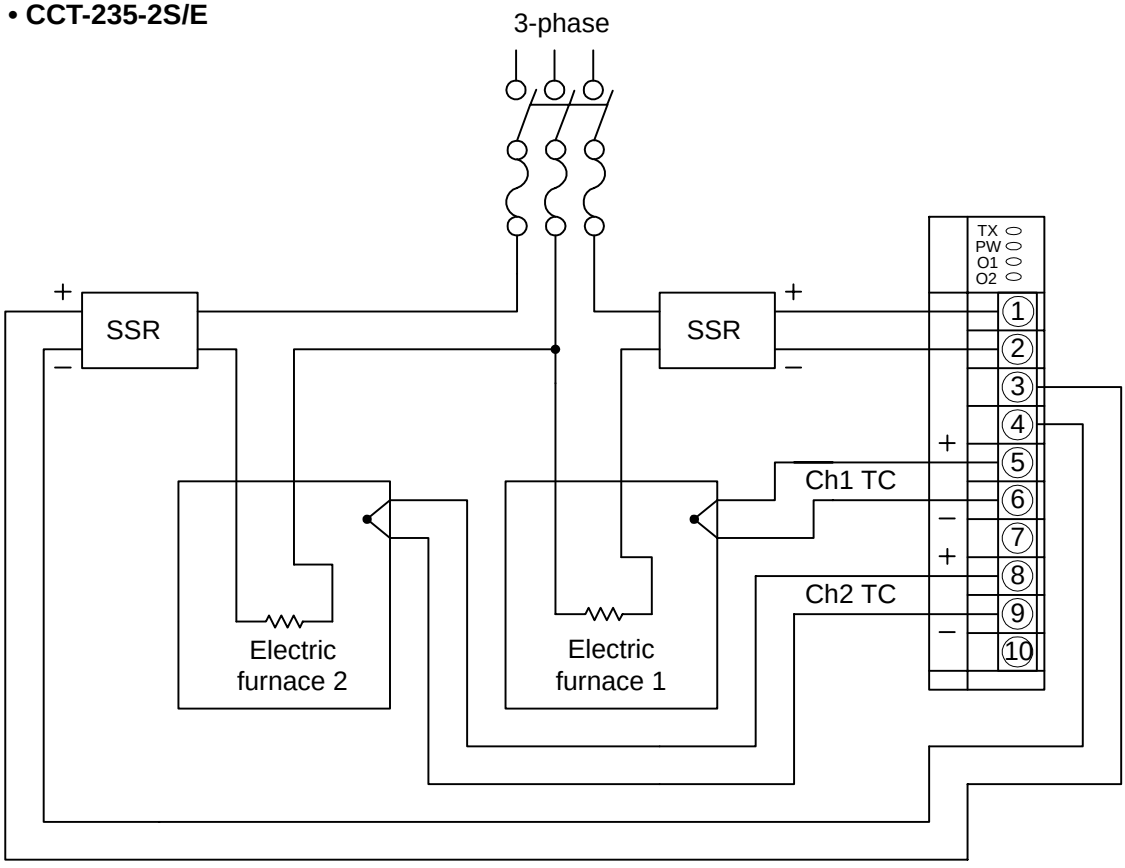
6.3 Wiring example

- **CCT-235-2R/E**



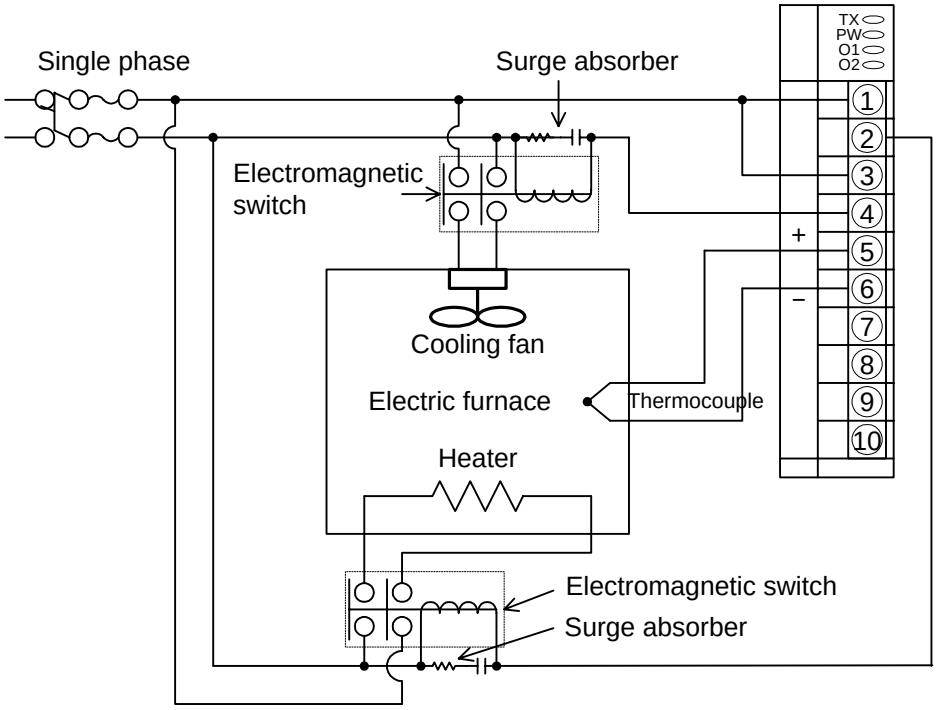
(Fig. 6.3-1)

- **CCT-235-2S/E**



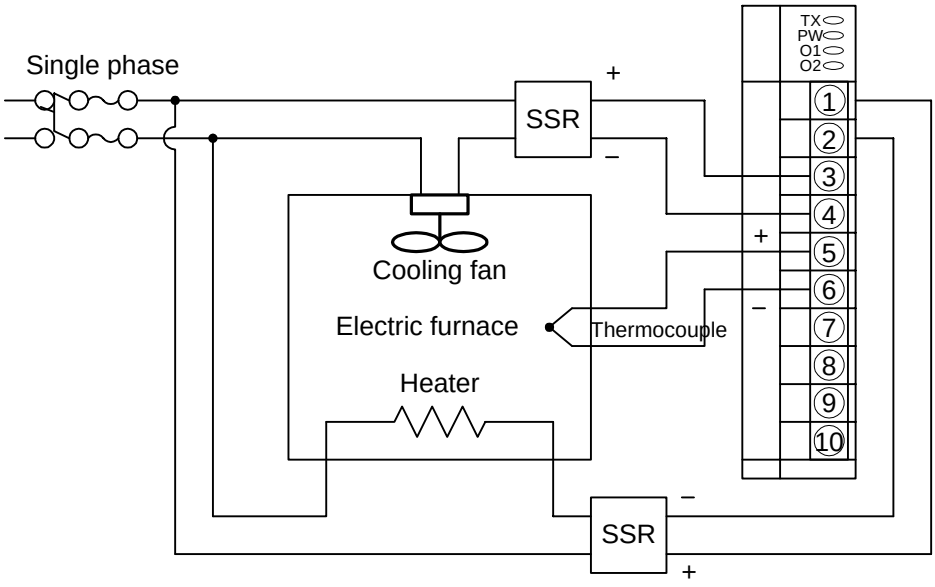
(Fig. 6.3-2)

• CCT-235-R/E, DR



(Fig. 6.3-3)

• CCT-235-S/E, DS



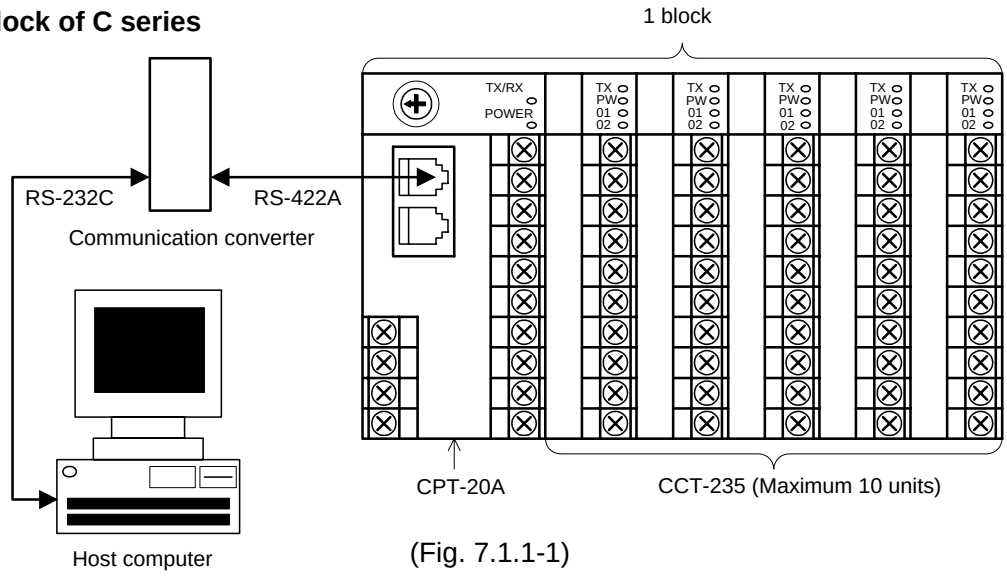
(Fig. 6.3-4)

7. Connection with a personal computer and PLC

7.1 Connection with a personal computer

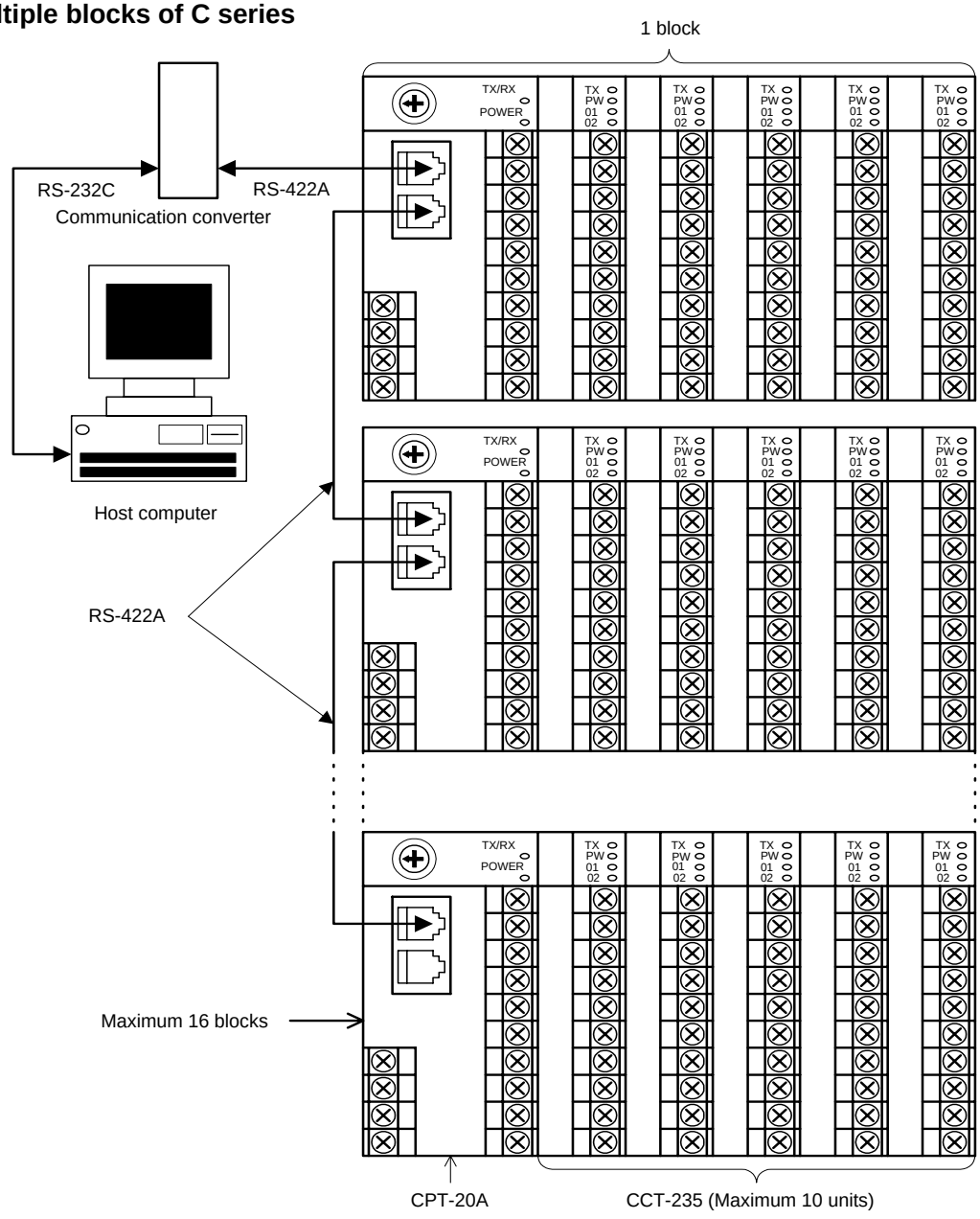
7.1.1 Application example

● **1 block of C series**



(Fig. 7.1.1-1)

● **Multiple blocks of C series**



(Fig. 7.1.1-2)

7.1.2 Setup

● **When the communication speed is 9600bps between a host computer and CPT-20A, and 1 block of C series is connected**

- Set the instrument number of CPT-20A to “0”. (See page 10.)
- Set the DIP switch for communication of CPT-20A. (See pages 10 and 11.)

  Switch No.1 : OFF (Communication speed: 9600bps)
  Switch No.2 : ON (Terminator: ON)
  Switch No.3 to 6 : OFF (Communication form: SHINKO protocol)
  Switch No.7 and 8 : OFF (Digital output: OFF)
- Set the communication speed of the host computer to 9600bps.

  As to the communication speed setting, refer to the Instruction manual for the host computer.

● **When communication speed is 19200bps between a host computer and CPT-20A, and 10 blocks of C series are connected**

- Set the instrument number of CPT-20A connected with the host computer first to “0”. Then, give a number in order (1 to 9) to other CPT-20A units to be connected. See page 10.
- Set the DIP switch for communication of CPT-20A. See pages 10 and 11.

  Switch No.1 : ON (Communication speed: 19200bps)
  [Turn the switch No.1 of 10 units to ON.]
  Switch No.2 : OFF (Terminator: OFF)
  [Turn the switch No.2 of the last unit to ON.]
  Switch No.3 to 6 : OFF (Communication form: SHINKO protocol)
  [Turn the switches No.3 to 6 of 10 units to OFF.]
  Switch No.7 and 8 : OFF (Digital output: OFF)
  [Turn the switches No.7 and 8 of 10 units to OFF.]
- Set the communication speed of the host computer to 19200bps.

  As to the communication speed setting, refer to the Instruction manual for the host computer.

7.1.3 Wiring

● **Terminal arrangement of a personal computer connector**

[D sub 9-pin connector]

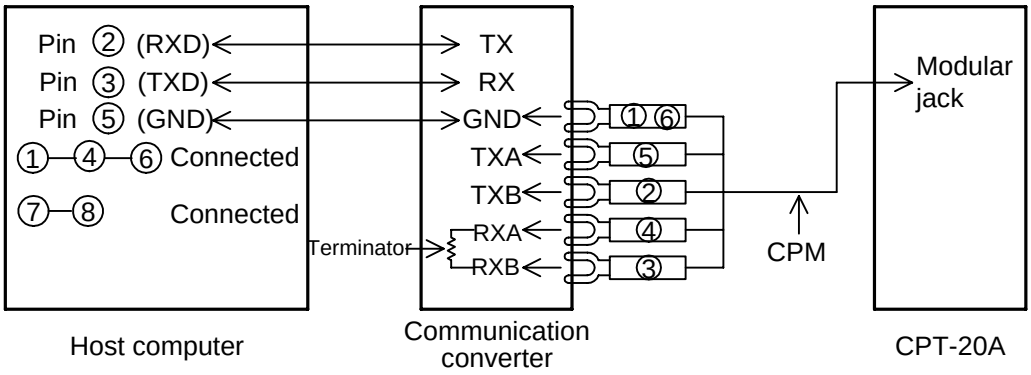
Pin No.	Code
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

[D sub 25-pin connector]

Pin No.	Code
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	GND
8	DCD
20	DTR
22	RI

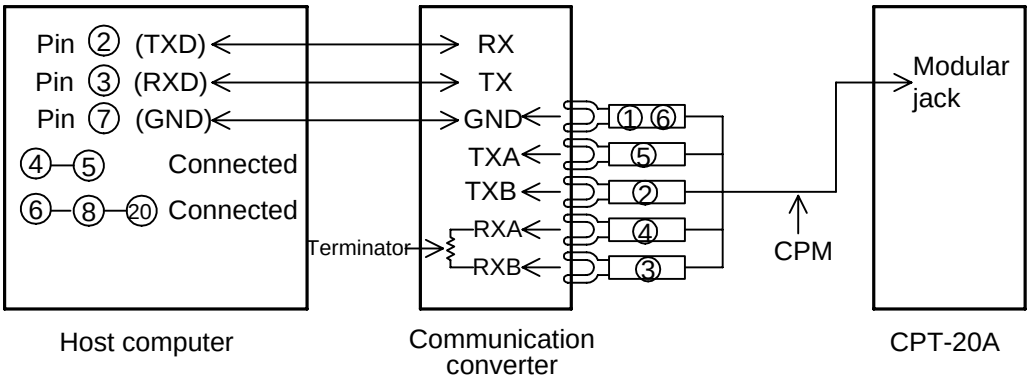
● **Wiring example**

• D sub 9-pin connector



(Fig.7.1.3-1)

• D sub 25-pin connector



(Fig.7.1.3-2)

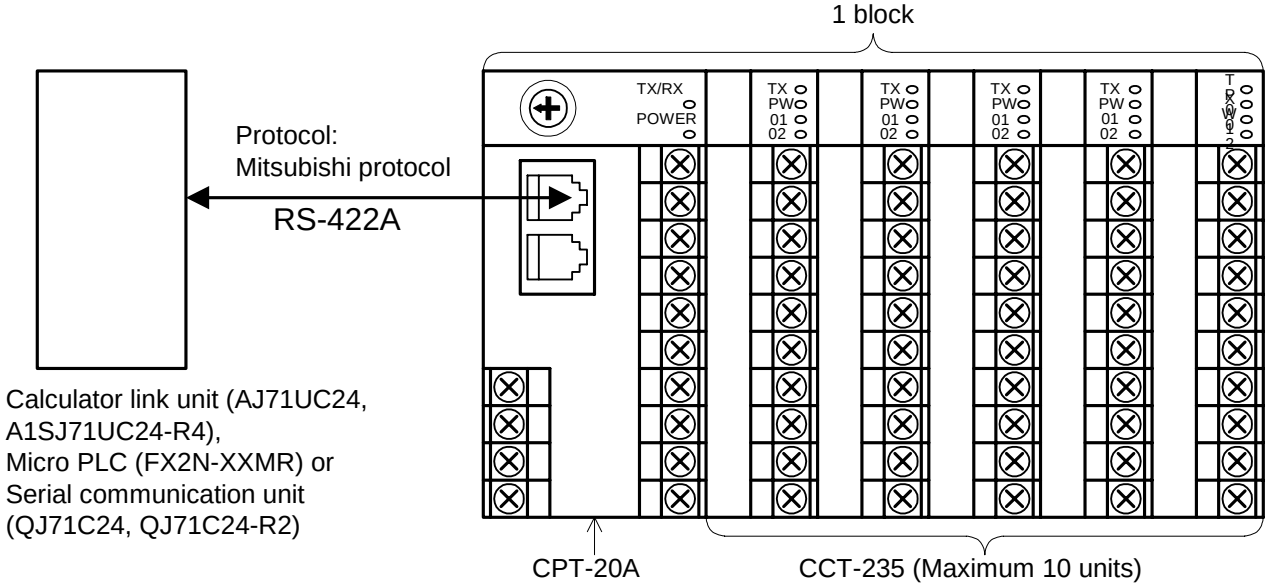
• For the wiring of the communication converter, refer to the instruction manual for each converter.

• Use 120Ω, 1/2W or more of terminator.

7.2 Connection with a Mitsubishi PLC

7.2.1 Application example

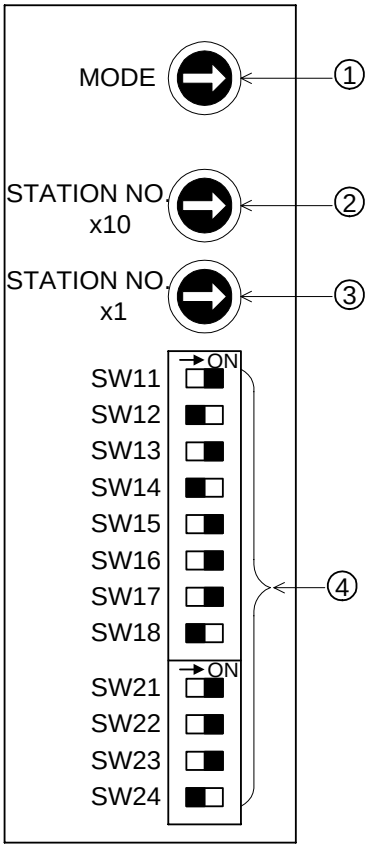
● **Mitsubishi Calculator link unit (AJ71UC24, A1SJ71UC24-R4)**
Micro PLC (FX2N-XXMR)
Serial communication unit (QJ71C24, QJ71C24-R2)



(Fig. 7.2.1-1)

7.2.2 Setup

● **Setup of Mitsubishi Calculator link unit (AJ71UC24)**



(Fig. 7.2.2-1)

① Sets the transmission control procedure (protocol) and control procedure of RS-422 or RS-232C.
Set to 8 (Format 4).

② Sets the instrument number of the double digit (x10).
Set the number to 0.

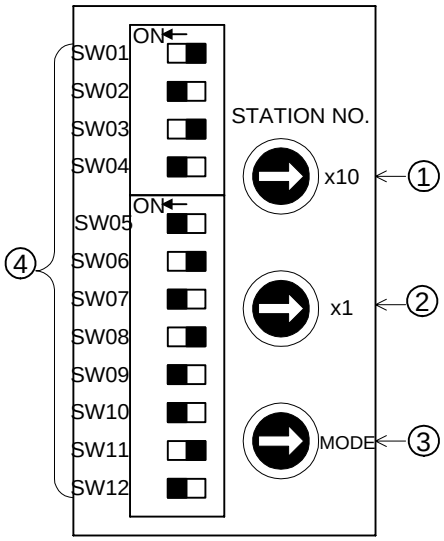
③ Sets the instrument number of the single digit (x1).
Set the number to 0.

④ Sets the transmission specifications.
See (Table 7.2.2-1).
Set the items except baud rate to .

(Table 7.2.2-1)

Setting switch	Setting item	Setting switch ON	Setting switch OFF
SW11	Main channel setting	RS-422	RS-232C
SW12	Data bit setting	8 bits	7 bits
	Baud rate	9600bps	19200bps
SW13	Communication speed setting	ON	OFF
SW14		OFF	ON
SW15		ON	ON
SW16	Parity setting	Yes	No
SW17	Even/Odd parity setting	Even	Odd
SW18	Stop bit setting	2 bits	1 bit
SW21	Checksum setting	Yes	No
SW22	Writing during RUN	Possible	Impossible
SW23	Calculator link/multi-drop link selection	Calculator link	Multi-drop link
SW24	Not used	——	——

● **Setup of Mitsubishi Calculator link unit (A1SJ71UC24-R4)**



(Fig. 7.2.2-2)

① Sets the instrument number of the double digit (x10).
Set the number to 0.

② Sets the instrument number of the single digit (x1).
Set the number to 0.

③ Sets the transmission control procedure (protocol) and control procedure of RS-422 or RS-232C.
Set to 8 (Format 4).

④ Sets the transmission specifications.
See (Table 7.2.2-2).
Set the items except for the baud rate to .

(Table 7.2.2-2)

Setting switch	Setting item	Setting switch ON	Setting switch OFF
SW01	Not used	——	——
SW02	Calculator link/multi-drop link selection	Calculator link	Multi-drop link
SW03	Not used	——	——
SW04	Writing during run setting	Possible	Impossible
	Baud rate	9600bps	19200bps
SW05	Communication speed setting	ON	OFF
SW06		OFF	ON
SW07		ON	ON
SW08	Data bit setting	8 bits	7 bits
SW09	Parity setting	Yes	No
SW10	Even/Odd parity setting	Even	Odd
SW11	Stop bit setting	2 bits	1 bit
SW12	Checksum setting	Yes	No

● **Setup of Mitsubishi Micro PLC (FX2N-XXMR)**

Set up the station number (0) and communication of no procedure or communication of the calculator link (communication format D8120) which uses designated protocol in the program.

● **Specification of communication format D8120** (Set the items to ▭ except the baud rate.) (Table 7.2.2-3)

Bit No.	Name	Contents	
		0 (Bit OFF)	1 (Bit ON)
b0	Data length	7 bits	8 bits
b1 b2	Parity	b2, b1 (1, 1): Even	
b3	Stop bit	1 bit	2 bits
b4 b5 b6 b7	Baud rate (bps)	b7, b6, b5, b4 (1, 0, 0, 0): 9600bps (1, 0, 0, 1): 19200bps } Must be specified	
b8	Header	No	Yes
b9	Terminator	No	Yes
b10 b11	Control cable	b11, b10 (0, 0): RS-485 interface	
b12	Not available		
b13	Checksum	Not applied	Applied
b14	Protocol	Not used	Used
b15	Control procedure	Format 1	Format 4

Note

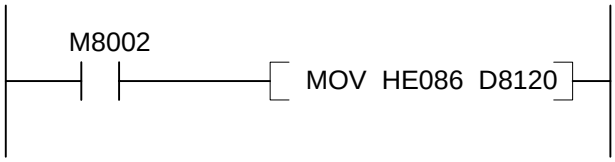
Communication format is used to decide the setting of the above (Table7.2.2-3) and can be set by programming to the special data memory (D8120) of the PLC.
When the setting is changed, be sure to turn the power supply to the PLC OFF and then ON again, otherwise the changed data will not be effective.

● **Communication format setting**

When setting the contents of (Table 7.2.2-3), set the program to the special data memory (D8120) of the PLC as follows. See page 30.

When the baud rate is 9600bps

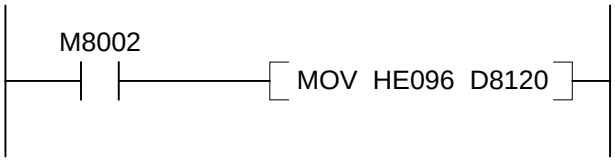
```
              b15                          b0
D8120 = [1110      0000      1000      0110 ]
           E         0         8         6
```



(Fig. 7.2.2-3)

When the baud rate is 19200bps

```
              b15                          b0
D8120 = [1110      0000      1001      0110 ]
           E         0         9         6
```

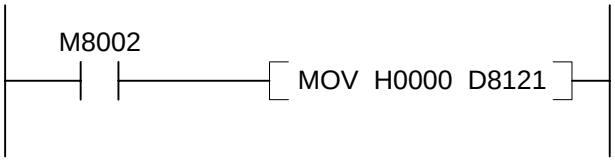


(Fig. 7.2.2-4)

● **Station number setting**

Be sure to set the station number to "0".

Set the program to the special data memory (D8121) of the PLC as follows.



(Fig. 7.2.2-5)

● **Setup of Serial communication unit (QJ71C24, QJ71C24-R2)**

Install the GX Developer to a host computer, perform settings such as communication speed, transmission specification and communication protocol, then set up the unit with PC writing function.

• Setting from the GX Developer:

(1) I/O allocation setting

Set the following items.

Type: “Intelligent”, Model name: QJ71C24, QJ71C24-R2, Number of points: 32

(2) Switch setting for I/O unit, Intelligent function unit

Set the following items.

• Transmission setting (Action setting: Independent, Data bit: 7, Parity bit: Yes (Even), Stop bit: 1, Checksum code: Yes, Writing during RUN: Allowed, Setting change: Allowed)

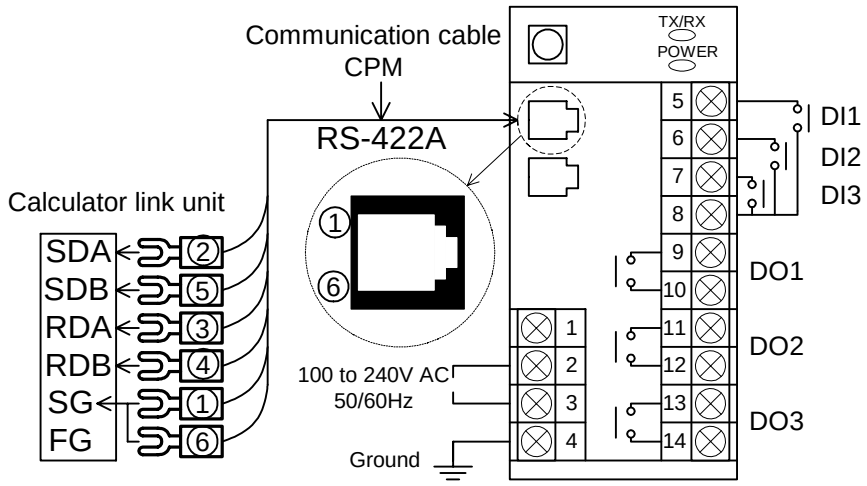
• Communication speed setting (9600bps or 19200bps)

• Communication protocol setting (Format 4)

For the setting method, refer to the User’s manual for Serial communication unit (Basic).

7.2.3 Wiring

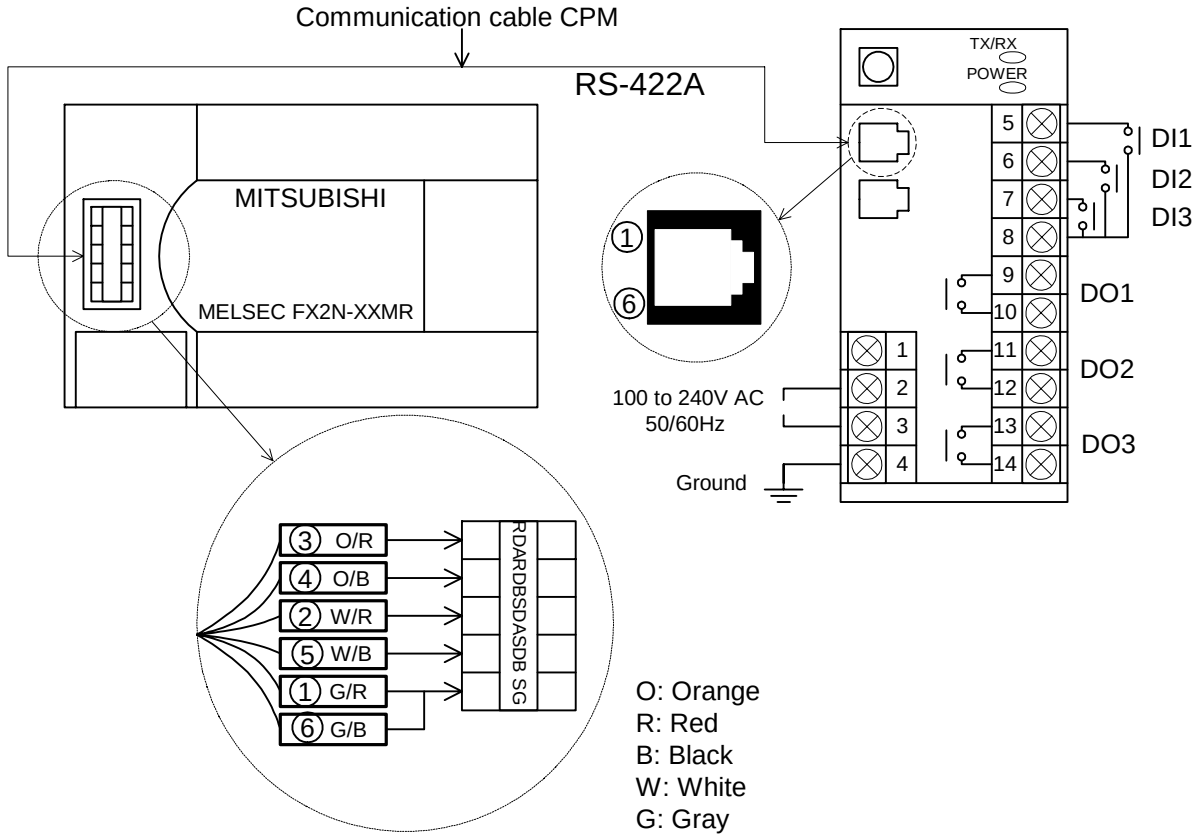
● **Connection between Mitsubishi Calculator link unit (AJ71UC24, A1SJ71UC24-R4) and CPT-20A**



(Fig. 7.2.3-1)

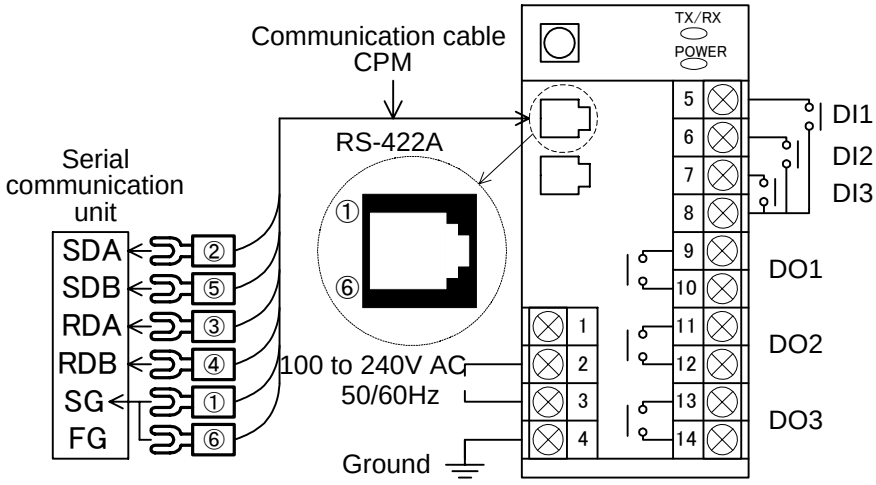
• For the communication line RS-422A, install a terminal resistor, referring to the Instruction manual for each PLC.

● **Connection between Mitsubishi Micro PLC (FX2N-XXMR) and CPT-20A**



(Fig. 7.2.3-2)

● **Connection between Serial communication unit (QJ71C24, QJ71C24-R2) and CPT-20A**



(Fig.7.2.3-3)

7.2.4 Initial setting

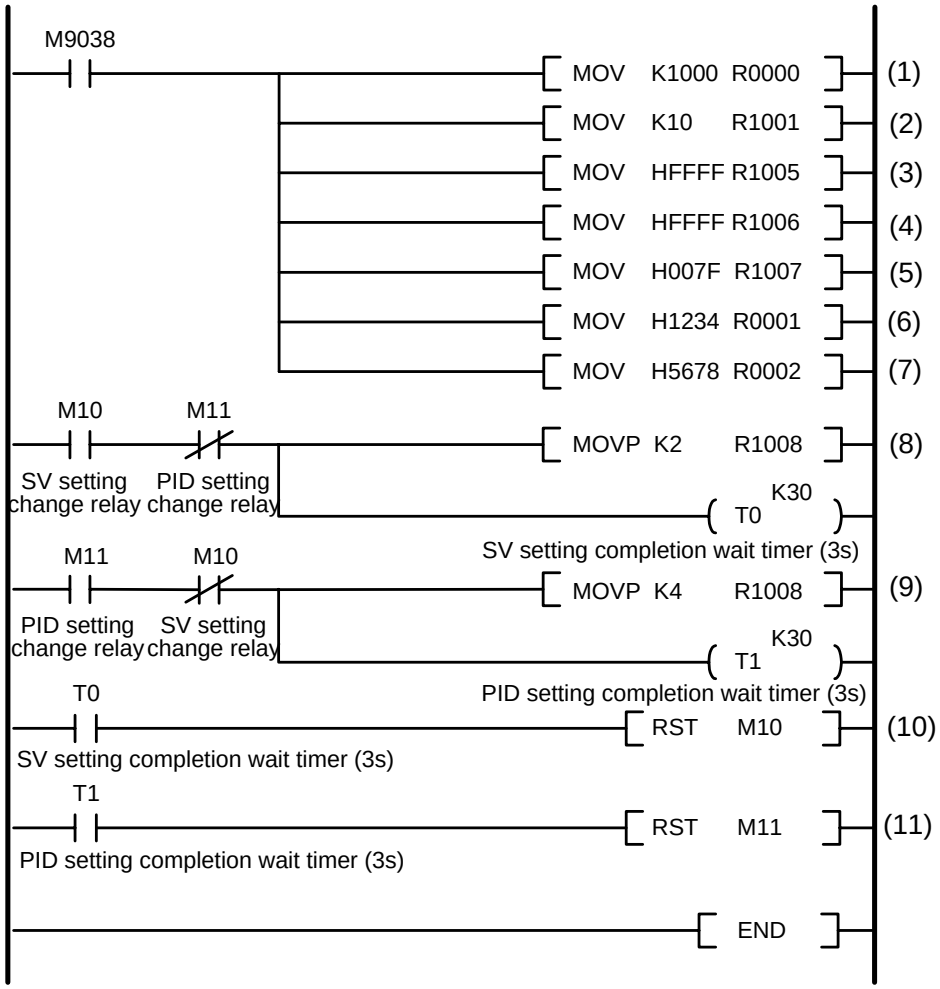
(1) Initial setting of Mitsubishi Calculator Link Unit (AJ71UC24, A1SJ71UC24-R4)

To communicate with the C series, set the address from the PLC in order to store the data of each set value of the C series when the power supply to the PLC is turned on.
Communication is impossible unless the address for storing the data of each set value of the C series is set.
Be sure to set the program to execute the sample program as follows.

Note

Do not use register addresses (R0000 to R0002) of the PLC when setting the program since the addresses (R0000 to R0002) are used for the top address and Communication parameter setting completion flag 1 and 2.

● **Sample program** (Initial setting and SV, PID setting change)



(Fig. 7.2.4-1)

● **Explanation of the sample program**

M9038 is a special relay that turns only one scan ON after RUN.
MOVP is a transmission command for executing 1 scan transmission.

(1) To the address R0000, set the top address of the register area which is used for the communication with the CPT-20A.
The top address is set to R1000 with the sample program.

(2) To the address R1001, set the number of CCT-235 units connected.
10 units of the CCT-235 connected are set with the sample program.

(3) To the address R1005, set Communication item Used/Not used selection flag.
See p.55 for the Communication item

(4) To the address R1006, set Communication item Used/Not used selection flag.
See p.55 for the Communication item.

(5) To the address R1007, set Communication item Used/Not used selection flag.
See p.55 for the Communication item.

(6) To the address R0001, set Communication parameter setting completion flag 1 [Fixed value 4660 (1234H)].

(7) To the address R0002, set Communication parameter setting completion flag 2 [Fixed value 22136 (5678H)].

(8) After SV setting has been changed, set Set value change flag 2 (main set value change) to the address R1008. See p.56.

(9) After PID setting has been changed, set the Set value change flag 4 (PID parameter change) to the address R1008. See p.64.
(10) After SV setting change completion wait timer (3sec.) has expired, reset the SV setting change relay.
(11) After PID setting change completion wait timer (3sec.) has expired, reset the PID setting change relay.

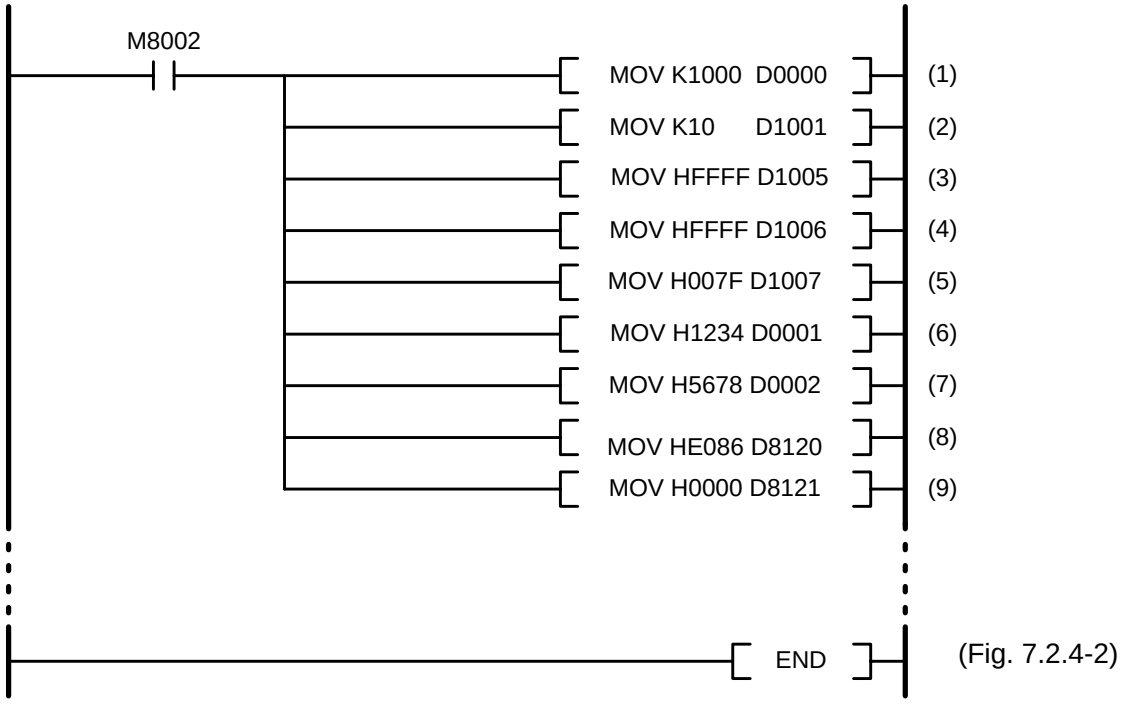
(2) Initial setting of Mitsubishi Micro PLC (FX2N-XXMR)

To communicate with the C series, set the address from the PLC for storing the data of each set value of the C series when the power supply to the PLC is turned on.
Communication is impossible unless the address for storing the data of each set value of the C series is set.
Be sure to set the program to execute the sample program as follows.

Note

Do not use register addresses (D0000 to D0002) of the PLC when setting the program since the addresses (D0000 to D0002) are used for the top address and Communication parameter setting completion flag 1 and 2.

● **Sample program** (See p.29 for the setting change)



(Fig. 7.2.4-2)

● **Explanation of the sample program**

M8002 is a special relay that turns only one scan ON after RUN.
(1) To the D0000 address, set the top address of the register area which is used for the communication with the CPT-20A.
The top address is set to R1000 with the sample program.
(2) To the address D1001, set the number of CCT-235 connected.
10 units of the CCT-235 connected are set with the sample program.
(3) To the address D1005, set Communication item Used/Not used selection flag.
See page 59 for the communication item.
(4) To the address D1006, set Communication item Used/Not used selection flag.
See page 59 for the communication item.
(5) To the address D1007, set Communication item Used/Not used selection flag.
See page 60 for the communication item.
(6) To the address D0001, set Communication parameter setting completion flag 1 [Fixed value 4660 (1234H)].
(7) To the address D0002, set Communication parameter setting completion flag 2 [Fixed value 22136 (5678H)].
(8) To the address D8120, set the communication format. See page 26.
(9) To the address D8121, set the station number. See page 26.

• For more information, refer to the User's manual (FX communication RS232C, RS485) for Mitsubishi Micro PLC (MELSEC-F).

(3) Initial setting of Serial communication unit (QJ71C24)

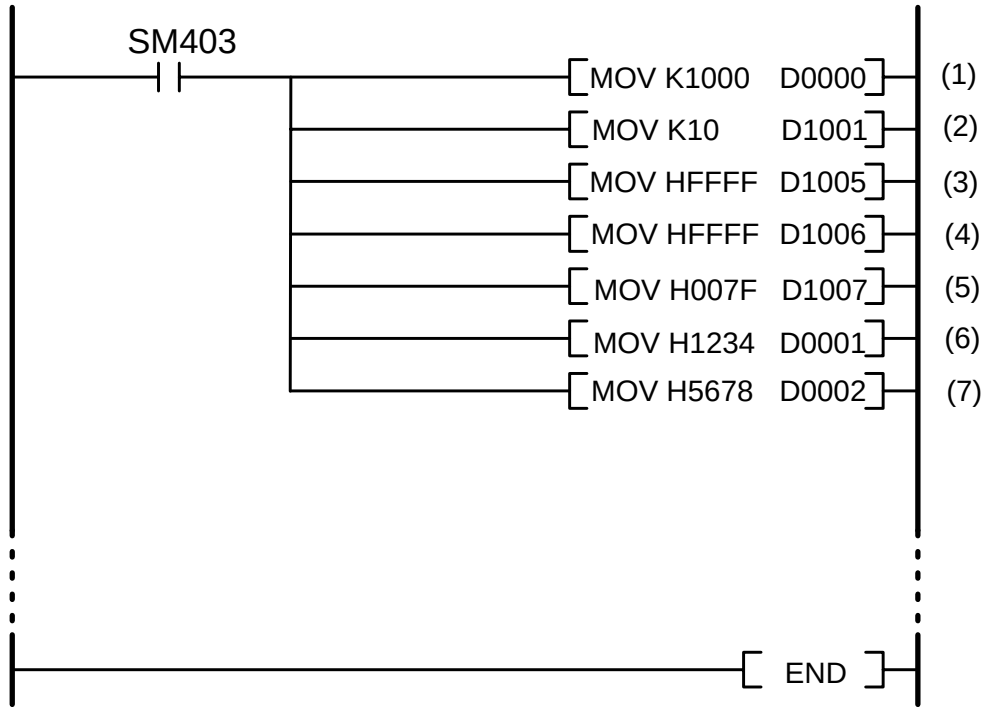
To communicate with the C series, set the address from the PLC for storing data of each set value of the C series when the power supply to the PLC is turned on.
Communication is impossible unless the address for storing the data of each set value of the C series is set.
Be sure to set the program to execute the sample program as follows.

Note

Do not use register addresses (D0000 to D0002) of the PLC when setting the program since the addresses (D0000 to D0002) are used for the top address and Communication parameter setting completion flag 1 and 2**.**

● **Sample program (When D register is used)**

See page 30 for the setting change.



(Fig. 7.2.4-3)

● **Explanation of the sample program**

SM403 is a special relay that turns only one scan ON after RUN.

(1) To the D0000 address, set the top address of the register area which is used for the communication with the CPT-20A.
The top address is set to R1000 with the sample program.

(2) To the address D1001, set the number of CCT-235 connected.
10 units of the CCT-235 connected are set with the sample program.

(3) To the address D1005, set Communication item Used/Not used selection flag.
See page 59 for the Communication item.

(4) To the address D1006, set Communication item Used/Not used selection flag.
See page 59 for the Communication item.

(5) To the address D1007, set Communication item Used/Not used selection flag.
See page 60 for the Communication item.

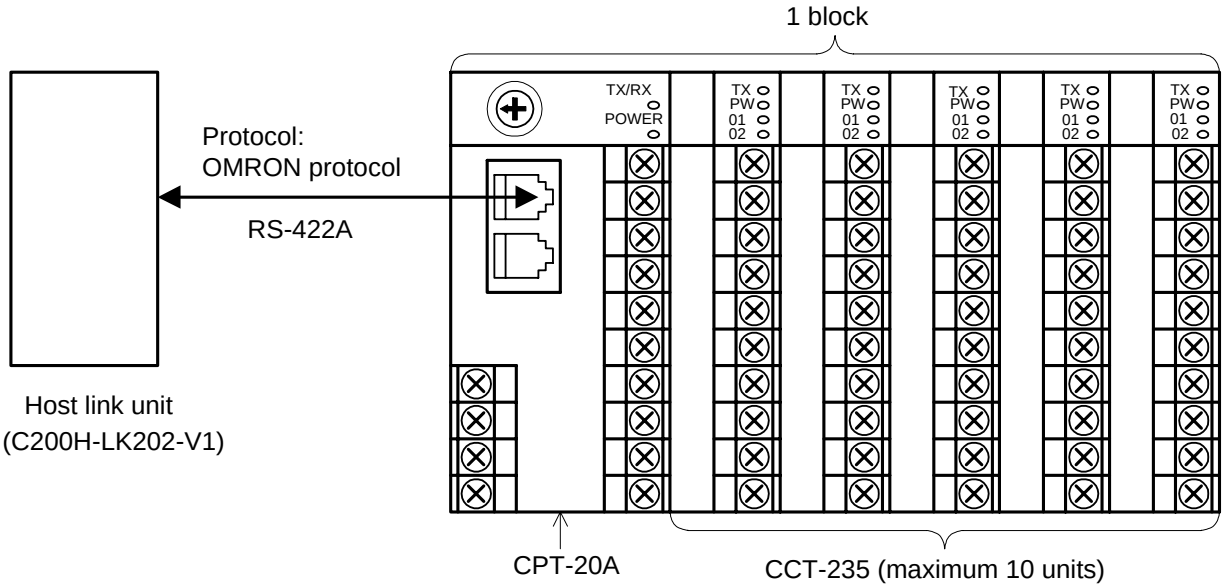
(6) To the address D0001, set Communication parameter setting completion flag 1 [Fixed value 4660 (1234H)].

(7) To the address D0002, set Communication parameter setting completion flag 2 [Fixed value 22136 (5678H)].

7.3 Connection with an Omron PLC

7.3.1 Application example

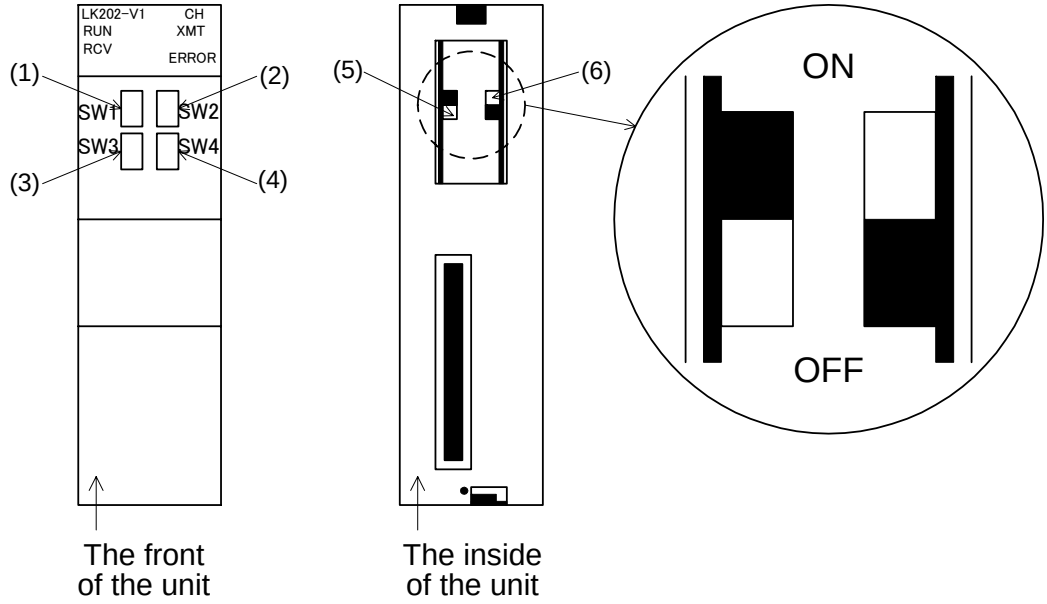
● **Omron Host link unit (C200H-LK202-V1)**
Omron Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41)



(Fig. 7.3.1-1)

7.3.2 Setup

● **Setup of Omron Host link unit (C200H-LK202-V1)**



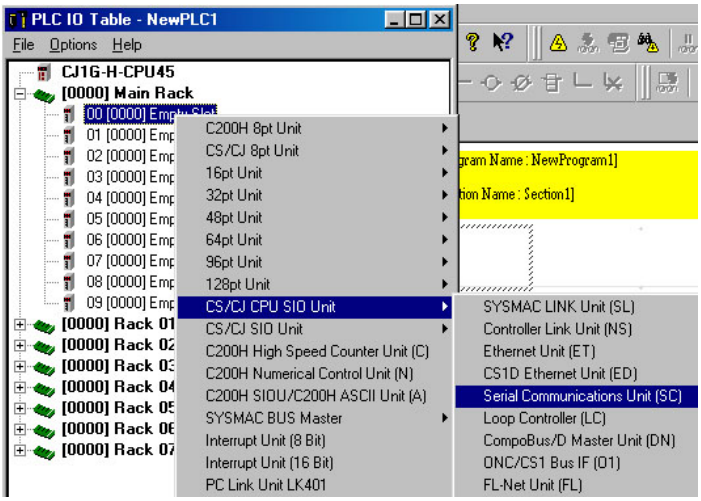
(Fig. 7.3.2-1)

(1) Sets the instrument number of the double digit (x10). Set the number to 0.
(2) Sets the instrument number of the single digit (x1). Set the number to 0.
(3) Sets the communication speed.
Set the communication speed to switch No.5 (9600bps) or No.6 (19200bps).
(4) Sets the command level, parity and transmission code.
Select the switch No.2 to set them.
(5) Sets the terminator Connected or Not connected.
Set the terminator to Connected (ON).
(6) Sets the procedure of 1:1 or 1:N.
Set to 1:N procedure (OFF).

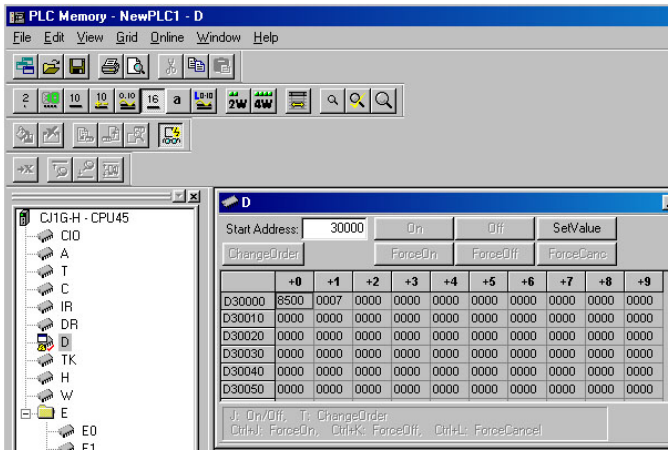
● **Setup of Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41)**

(1) Turn “TERM” (terminator ON/OFF switch) ON, and set “WIRE” (2-wire/4-wire switch) to “4”.
This setting is for the “CJ1W-SCU41”.
For the CS1W-SCU21-V1, CJ1W-SCU21, go to step (2).

(2) Connect a personal computer, and start CX-Programmer.
(3) Create I/O table of the PC while off-line (Fig. 7.3.2-2).
Select [CS/CJ/CPU SIO unit] – [Serial Communication Unit] – [Unit number].
(4) Set allocation DM area of the serial communication unit.
Set allocation DM area by programming on-line connection and action mode (Fig. 7.3.2-3).
(e.g.) When installing the serial communication unit next to the CPU unit, and when UNIT No. is set to "0":
Set D30000 to 8500H (random setting, host link communication, Data length: 7, Stop bit: 2, Parity: Yes/Even), and set D30001 to 0000H (9600bps) or to 0007H (19200bps).



(Fig.7.3.2-2)



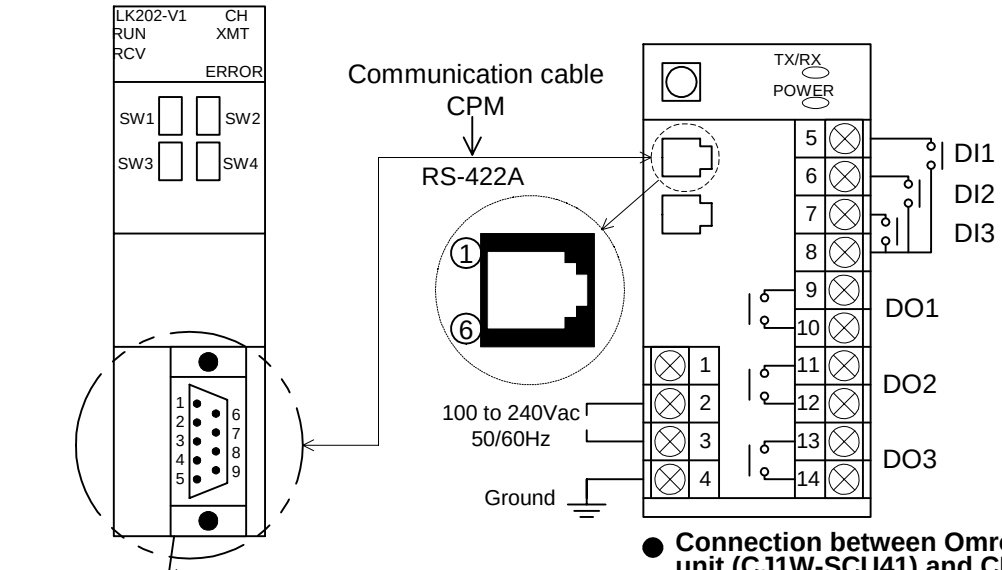
(Fig.7.3.2-3)

(5) Transmit the following to CPU unit.
Transmit the program, PC system setting and I/O table by clicking "Transmit [PC →PC]" on the menu bar.

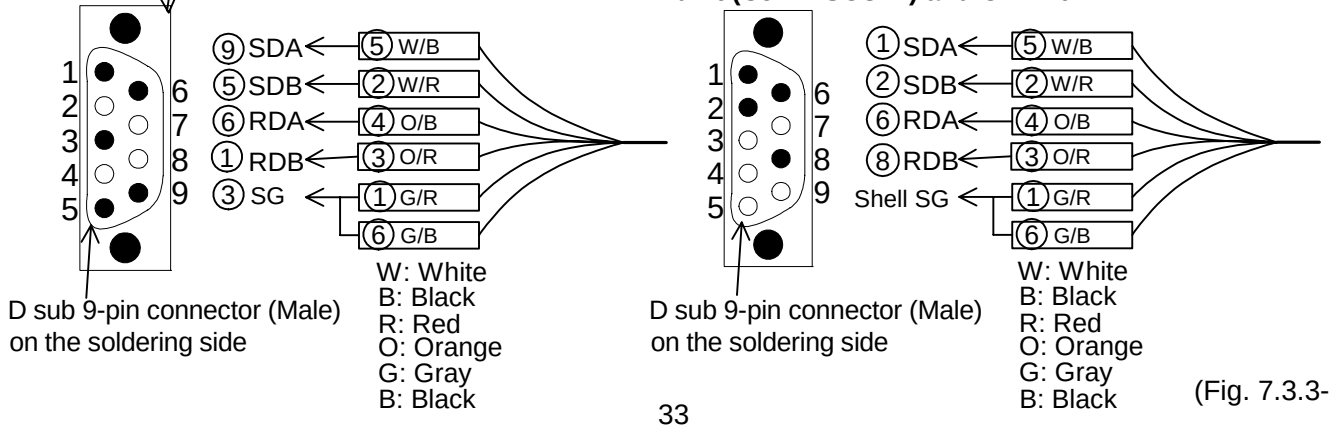
Refer to User's manual (Man. No. SBCD-300G) for Serial communication unit for details.

7.3.3 Wiring

● **Connection between Omron Host link unit (C200H-LK202-V1) and CPT-20A**
Connection between Omron Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41) and CPT-20A



● **Connection between Omron Serial communication unit (CJ1W-SCU41) and CPT-20A**



(Fig. 7.3.3-1)

7.3.4 Initial setting

● **Initial setting of Omron Host link unit (C200H-LK202-V1) and Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41)**

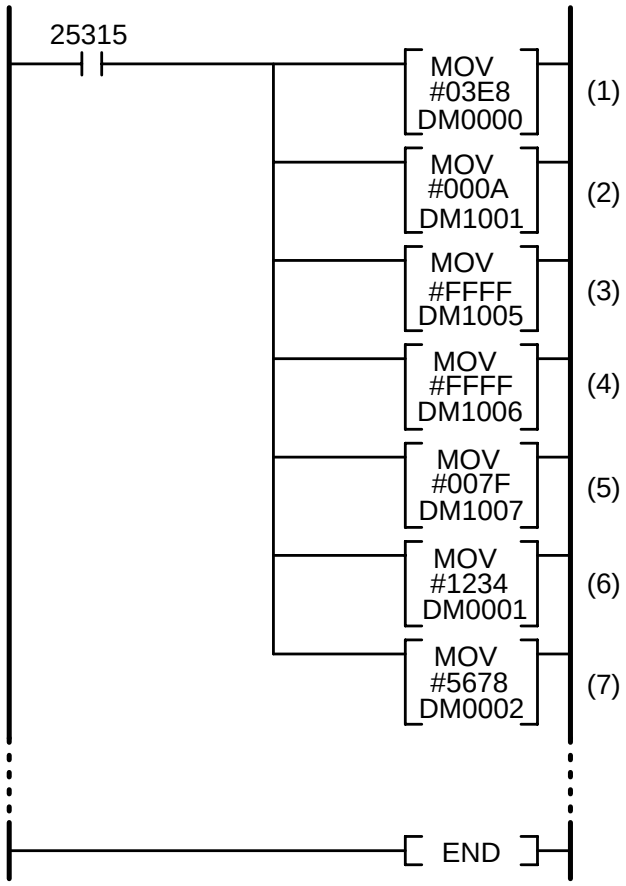
To communicate with the C series, set the address from the PLC for storing the data of each set value of the C series when the power supply to the PLC is turned on.
Communication is impossible unless the address for storing the data of each set value of the C series is set.
Be sure to set the program to execute the sample program as follows. (Execute only the first scan of the following program.)

Note

Do not use register addresses (DM0000 to DM0002) of the PLC when setting the program since the addresses (DM0000 to DM0002) are used for the top address and Communication parameter setting completion flag 1 and 2.

● **Sample program**

See page 29 for the setting change example.



(Fig. 7.3.4-1)

● **Explanation of the sample program**

25315 is a special auxiliary relay that turns only one scan ON after RUN.

(1) To the address DM0000, set the top address in the memory area which is used for the communication with the CPT-20A.
DM1000 is set as a top address during the sample program.

(2) To the address DM1001, set the number of CCT-235 connected.
Ten units (the number of the CCT-235 connected) are set with the sample program.

(3) To the address DM1005, set Communication item Used/Not used selection flag.
See page 64 for the communication item.

(4) To the address DM1006, set Communication item Used/Not used selection flag.
See page 64 for the communication item.

(5) To the address DM1007, set Communication item Used/Not used selection flag.
See page 64 for the communication item.

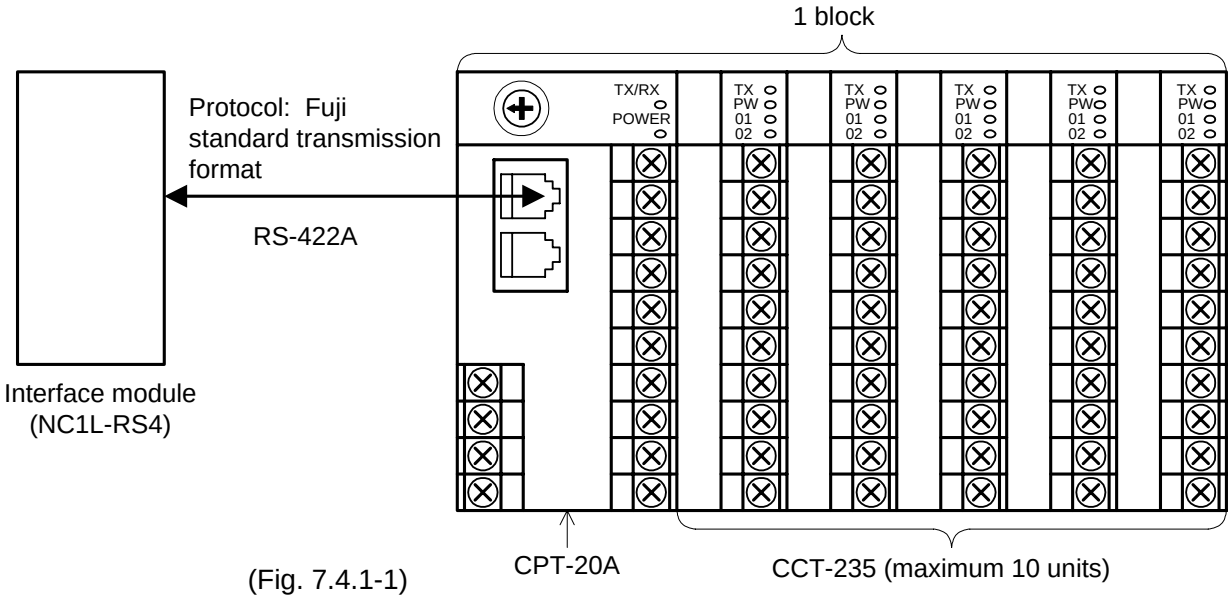
(6) To the address DM0001, set Communication parameter setting completion flag 1 [Fixed value 4660 (1234H)].

(7) To the address DM0002, set Communication parameter setting completion flag 2 [Fixed value 22136 (5678H)].

7.4 Connection with a Fuji PLC

7.4.1 Application example

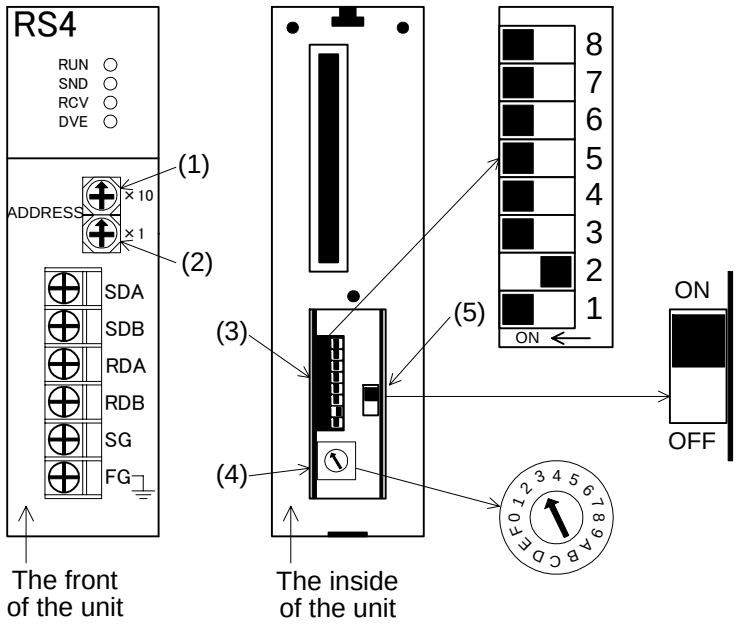
● **Fuji Interface module (NC1L-RS4)**



(Fig. 7.4.1-1)

7.4.2 Setup

● **Setup of Fuji Interface module (NC1L-RS4)**



(Fig. 7.4.2-1)

(1) Sets the instrument number of the double digit (x10).
Set the number to 0.

(2) Sets the instrument number of the single digit (x1).
Set the number to 0.

(3) Sets the communication speed.
Refer to the (Table 7.4.2-1). (p.37)
Set the baud rate to either 9600bps or 19200bps (Example above: 9600bps).
Set to ▭ except for the baud rate.

(4) Sets the transmission mode.
Select the switch No.3 to set.

(5) Sets the terminator Connected (ON) or Not connected (OFF).
Set the terminator to Connected (ON).

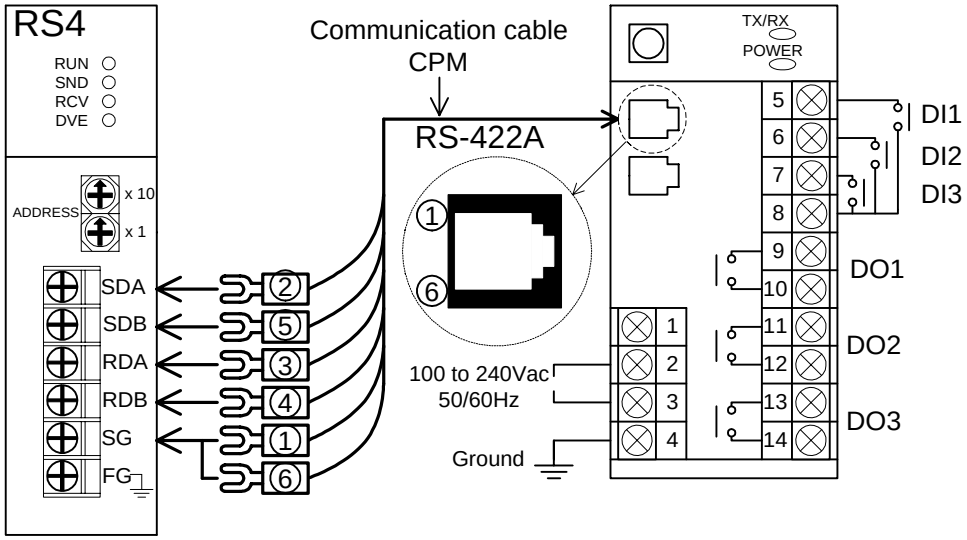
(Table 7.4.2-1)

Baud rate / SW No.	300bps	600bps	1200bps	2400bps	4800bps	9600bps	19200bps	Not used
1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
3	OFF	OFF	OFF	OFF	ON	ON	ON	ON

SW No.	Setting item	Setting switch ON	Setting switch OFF
4	Stop bit	1 bit	2 bits
5	Data length	7 bits	8 bits
6	Even/Odd parity	Even	Odd
7	Parity	Yes	No
8	Initial setting	SW setting valid	Initial file

7.4.3 Wiring

● **Connection between Fuji Interface module (NC1L-RS4) and CPT-20A**



(Fig. 7.4.3-1)

7.4.4 Initial setting

● **Initial setting of Fuji Interface module (NC1L-RS4)**

(1) Define the user file area during system definition (File number: W30, File range: the number of data necessary for the communication, Data format: SI).
For more details, refer to the User's manual [Command] for Fuji Program controller (MICREX-F).

(2) When communicating with the C series, set the program for the PLC to execute the first scan of the initial setting (every C series data storage address) when the power supply to the PLC is turned on.
Communication is impossible unless the initial setting (every C series data storage address) is performed.

Note

Do not use register addresses (W30.0000 to W30.0002) of the PLC when setting the program since the addresses (W30.0000 to W30.0002) are used for the top address and Communication parameter setting completion flag 1 and 2.

7.5 Connection with a Yokogawa PLC

For setup and wiring, refer to the Instruction Manual for Personal computer Link Module.

7.5.1 Setup

● **Setup of Yokogawa Personal computer link module (F3LC11-2N)**

(1) Sets the station number setting switch (double digits). Set it to “0”.

(2) Sets the station number setting switch (single digit). Set it to “1”.

(3) Sets the terminator switch. Select “4-WIRE”.

(4) Sets the transmission speed setting switch. For baud rate, set it to 9600bps or 19200bps.

(5) Sets the data setting switch. Refer to (Table 7.5.1-1).

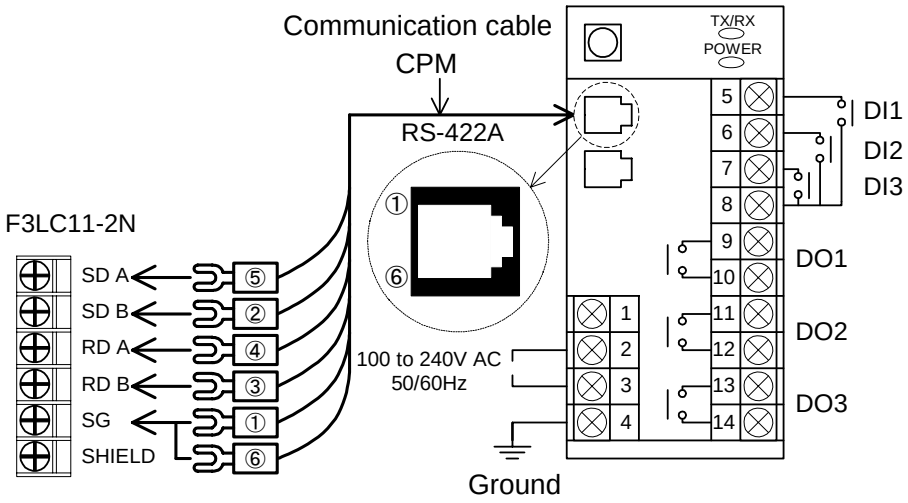
Set to ▭ .

(Table 7.5.1-1)

Number	Function	Setting switch OFF	Setting switch ON
1	Data length	7 bits	8 bits
2	Parity bit	No	Yes
3	Odd/Even parity	Odd	Even
4	Stop bit	1 bit	2 bits
5	Checksum	No	Yes
6	End of text (CR)	No	Yes
7	Protection function	No	Yes
8	OFF		

7.5.2 Wiring

● **Between Personal computer link module (F3LC11-2N) and CPT-20A**



(Fig. 7.5.2)

7.5.3 Initial setting

● **Initial setting of Personal computer link module (F3LC11-2N)**

When communicating with the C series, be sure to set the program on the PLC side so that initial setting (address for storing C series data) of only one scan can be performed.

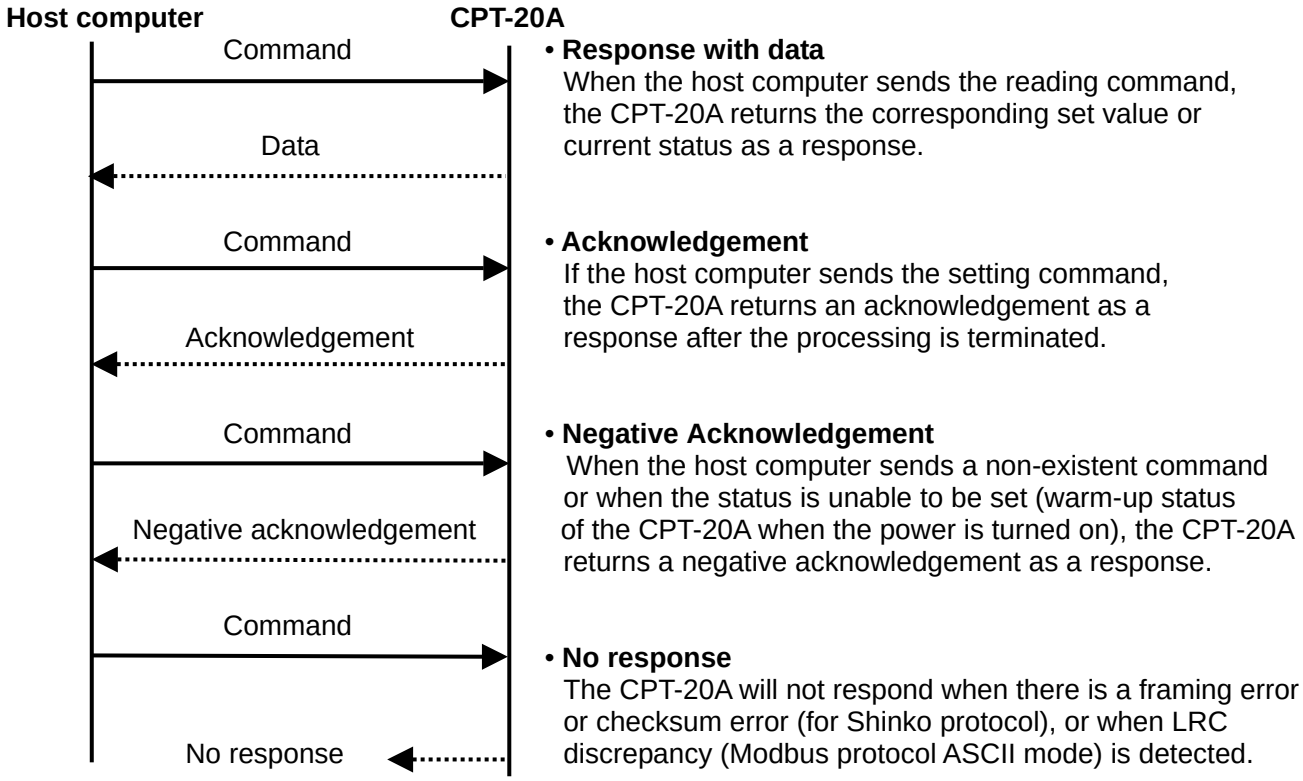
It is impossible to communicate if initial setting is not conducted.

8. Communication procedure

8.1 Communication procedure

● Between a host computer and the CPT-20A

Communications between a host computer and the CPT-20A are started by sending the command from the host computer, and terminated by receiving the response from the CPT-20A.



• **Response with data**
When the host computer sends the reading command, the CPT-20A returns the corresponding set value or current status as a response.

• **Acknowledgement**
If the host computer sends the setting command, the CPT-20A returns an acknowledgement as a response after the processing is terminated.

• **Negative Acknowledgement**
When the host computer sends a non-existent command or when the status is unable to be set (warm-up status of the CPT-20A when the power is turned on), the CPT-20A returns a negative acknowledgement as a response.

• **No response**
The CPT-20A will not respond when there is a framing error or checksum error (for Shinko protocol), or when LRC discrepancy (Modbus protocol ASCII mode) is detected.

● Communication timing

● CPT-20A side

When the CPT-20A starts transmission through the RS-422A communication line, the CPT-20A is arranged so as to provide an idle status (mark status) **transmission period of one or more characters** before sending the response to ensure the synchronization on the receiving side.

The CPT-20A is arranged so as to disconnect the transmitter off from the communication line **within a one character transmission period** after sending the response.

● Host computer side

Set the program so that the host computer can provide **one or more character transmission periods** of idle status (mark status) before sending the command in order to check the synchronization on the receiving side when the host computer starts transmission to the RS-422A communication line.

Set the program so that the host computer can disconnect the transmitter from the communication line **within a one character transmission period** after sending the command in preparation for reception of the response from the CPT-20A.

To avoid the collision of transmissions between the host computer and CPT-20A, set the program so that the host computer can send the next command after carefully checking that the host computer has received the response.

8.2 Communication with Shinko protocol

8.2.1 Command structure

All commands are composed of ASCII.
The set value is represented by hexadecimal figures and the negative number is represented by 2's complement.

(1) Setting command

Header (02H)	Address	Sub address (20H)	Command type (52H)	Data item	Ch1 data	-----	Ch20 data	Check-sum	Delimiter (03H)
1	1	1	1	4	4		4	2	1 ← Number of characters

(Fig. 8.2.1-1)

(2) Reading command

Header (02H)	Address	Sub address (20H)	Command type (22H)	Data item	Check-sum	Delimiter (03H)
1	1	1	1	4	2	1 ← Number of characters

(Fig. 8.2.1-2)

(3) Response with data

Header (06H)	Address	Sub address (20H)	Command type (22H)	Data item	Ch1 data	-----	Ch20 data	Check-sum	Delimiter (03H)
1	1	1	1	4	4		4	2	1 ← Number of characters

(Fig. 8.2.1-3)

(4) Acknowledgement

Header (06H)	Address	Check-sum	Delimiter (03H)
1	1	2	1 ← Number of characters

(Fig. 8.2.1-4)

(5) Negative acknowledgement

Header (15H)	Address	Error code	Check-sum	Delimiter (03H)
1	1	1	2	1 ← Number of characters

(Fig. 8.2.1-5)

Header : Control code that represents the beginning of the command or response
ASCII code is used.
Setting command, Reading command : (02H) fixed
Response with data, Acknowledgement : (06H) fixed
Negative acknowledgement : (15H) fixed

Address (instrument number):
Numbers by which the host computer discerns each CPT-20A
Instrument number 0 to 15 (00H to 0FH)
The numbers are used by giving 20H of bias (20H to 2FH).

Sub address : (20H) fixed

Command type : Code to discern Setting command (52H) and Reading command (22H)

Data item : Data classification of the command object
Composed of hexadecimal 4 digits (Refer to the Command table, page 42 to 45)

Data : The contents of Data (set value) depends on the setting command.
Composed of hexadecimal 4 digits (Refer to the Command table, page 42 to 45).
Data is set for 20 channels.
However, if the number of channels is 20 or less (10 units or less of CCT-235), set the data as follows.
For example, if the number of channels is 16 (8 units of CCT-235), set the data from Ch17 to Ch20 to “0”.
The reading command has no data.
For the CCT-235 with Heating/Cooling specification, it is impossible to set Ch2 because only one channel is available.

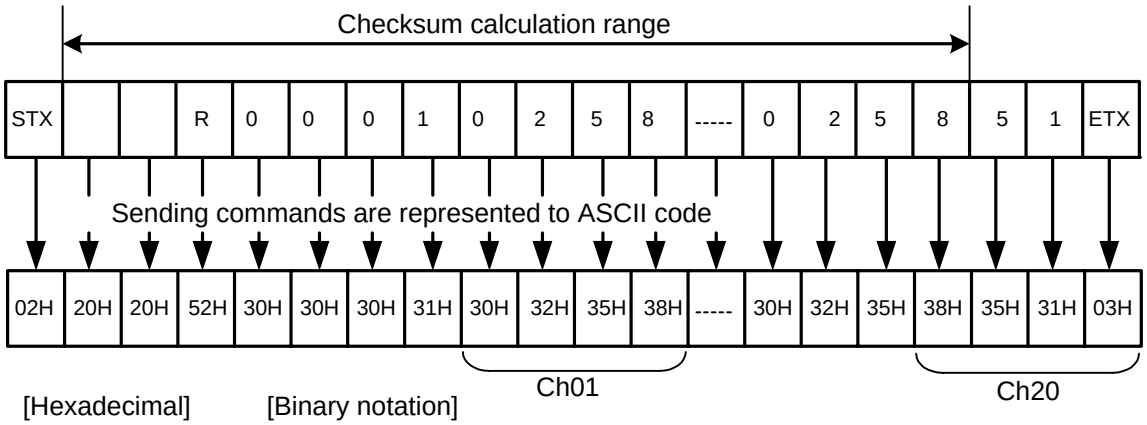
Checksum : 2-character data to detect communication errors
Delimiter : Control code to indicate the end of command
(03H) fixed
Error code : Indicates an error type.
Composed of hexadecimal 1 digit.
0 (30H): Unknown error
1 (31H): Non-existent command
2 (32H): Not used
3 (33H): Not used
4 (34H): Unsettable status (warm-up status of the CPT-20A when the power is turned on)

8.2.2 Checksum calculation

Checksum is used to detect receiving errors in the command or data.
Set the program for the host computer side to calculate the checksum of the response data from the CPT-20A so that the communication errors can be checked.

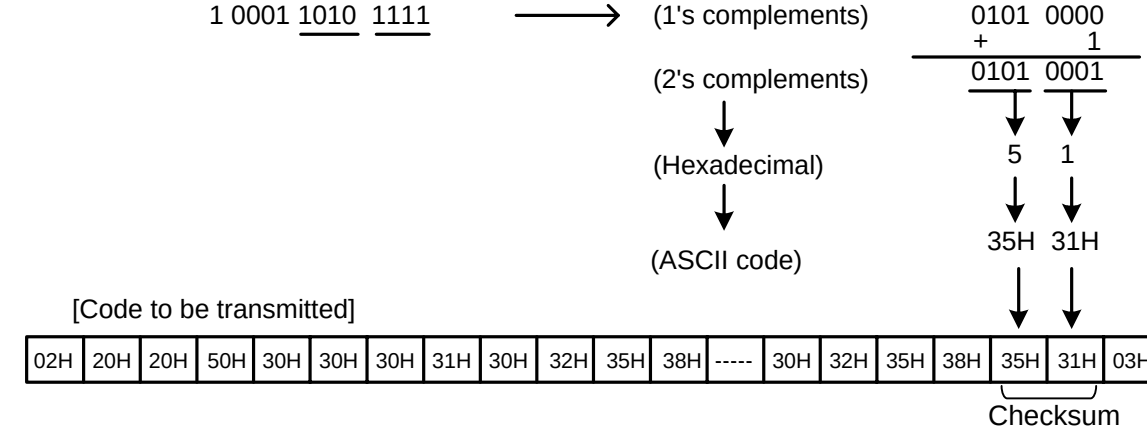
The ASCII code (hexadecimal) corresponding to the characters which range from the address to that before the checksum is converted to binary notation, and the total value is calculated.
The lower 2-digit of the total value are converted to 2's complements, and then to hexadecimal figures, that is, ASCII code for the checksum.

● Checksum calculation example
Main set value: 600℃ (0258H) for Ch1 to Ch20 (Fixed value control)
Address (instrument number): 0 (20H)



[Hexadecimal]	[Binary notation]
20H	0010 0000
20H	0010 0000
52H	0101 0000
30H	0011 0000
.	.
.	.
.	.
30H	0011 0000
32H	0011 0010
35H	0011 0101
+ 38H	0011 1000
1 0001 1010 1111	→ (1's complements)

1's complements:
Reverse each binary bit. 0 will become 1 and vice versa.
2's complements:
Add 1 to 1's complements.



8.2.3 Contents of the command

● **Notes on setting command and reading command**

- Although the options are not applied, setting the optional items is possible by the setting command. However, they will not function.
- For the CCT-235 with Heating/cooling specification, only 1 channel is used, which means no data can be set to Ch2.
  For the reading command, control output MV (cooling output MV) reading and b0 (cooling output status) in Current status 1 and 2 reading can be read in the Ch2 data. For other reading data, 0 is returned as a data.
- If power failure occurs during communication, the data during communication cannot be guaranteed.

● **Setting command**

- For the settable range, see Chapter “11. Specifications”.
- For the communication command, see the Command table (pages 42 to 45).
- All commands are composed of ASCII code.
- Data (set value, decimal) is converted to hexadecimal figures and ASCII code are used.
  Negative numbers are represented by 2's complement.
  When a set value has a decimal point, make the value 10 times higher than the set value and convert to hexadecimal figures to input.

[Example 1] Main set value is 1000℃ Decimal Hexadecimal
In the case of positive (+) number, convert the number to hexadecimal figures. : 1000 → 03E8H

[Example 2] Main set value: -10℃
In the case of negative (-) number, the number is represented by 2’s complement, then converted to hexadecimal figures. : -10 → FFF6H

[Example 3] Main control output proportional band: 2.5%
When the number has a decimal point, ignore the decimal point and convert to hexadecimal figures. : 25 → 0019H

● **Reading command**

- For the communication command, see the Command table (pages 42 to 45).
- All commands are composed of ASCII code.
- Data (set value, decimal) is converted to hexadecimal figures and ASCII codes are used.
  Negative numbers are represented by 2's complement.
  When data (set value) range has a decimal point, the response is returned as a whole number without the decimal point.

8.2.4 Command table (Shinko protocol)

Command Type	Data Item	Data
22H/52H	0001H: Main set value (SV)	Set value
22H/52H	0002H: Main proportional band	Set value
22H/52H	0003H: Integral time	Set value
22H/52H	0004H: Derivative time	Set value
22H/52H	0005H: Alarm 1 (High limit)	Set value
22H/52H	0006H: Alarm 2 (Low limit)	Set value
22H/52H	0007H: Main output proportional cycle	Set value
22H/52H	0008H: Heater burnout alarm	Set value
22H/52H	0009H: Control action Perform/Stop	0: Stop 1: Perform
22H/52H	000AH: PID Auto-tuning Perform/ Cancel	0: Cancel 1: Perform
22H/52H	000BH: Alarm 1 (High limit) hysteresis	Set value
22H/52H	000CH: Alarm 2 (Low limit) hysteresis	Set value
22H/52H	000DH: Control output ON/OFF action hysteresis	Set value
22H/52H	000EH: Control output high limit	Set value
22H/52H	000FH: Control output low limit	Set value
22H/52H	0010H: PV filter time constant	Set value
22H/52H	0011H: Temperature unit	0: ℃ 1: ℉
22H/52H	0012H: Control action	0: Heating (Reverse action) 1: Cooling (Direct action)
22H/52H	0013H: Alarm 1 action	0: No alarm action 1: High limit alarm 2: High limit with standby 3: Low limit alarm 4: Low limit with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
22H/52H	0014H: Alarm 2 action	The same as Alarm 1 action
22H/52H	0015H: Loop break alarm 1 span	Set value
22H/52H	0016H: Loop break alarm 1 time	Set value
22H/52H	0017H: Anti-reset windup (ARW)	Set value
22H/52H	0018H: PD (Manual) reset	Set value
22H/52H	0019H: Sensor correction	Set value
22H/52H	001AH: Loop break alarm 2 span	Set value
22H/52H	001BH: Loop break alarm 2 time	Set value
22H/52H	001CH: Cooling proportional band	Set value
22H/52H	001DH: Cooling proportional cycle	Set value

22H/52H	001EH: Overlap band/Dead band	Set value
22H/52H	001FH: Cooling action mode selection	0: Air cooling 1: Oil cooling 2: Water cooling
22H/52H	0020H: Cooling output ON/OFF action hysteresis	Set value
52H	0040H: Data initialization Perform/Cancel	0: Cancel 1: Perform (*1)
52H	0041H: Digital output	Digital output status (*2, *3) Channel 1 0000 0000 0000 0000 b^{15} to b^0
22H	0042H: Digital input	Digital input status (*3, *4) Channel 1 0000 0000 0000 0000 b^{15} to b^0
22H	0080H: Current PV (input value) reading	Current PV
22H	0081H: Current control output MV (manipulated variable) reading	Current control output MV (*5)
22H	0082H: Heater current (ampere) value reading	Heater current value when control output is ON.

(*1) When initializing the data, set the odd number of channel of the unit (CCT-235) to be initialized to "0001". The data of the unit (CCT-235) to be set to “0001” will be initialized.

(*2) To turn digital output ON, set “1” to the digital output bit of Ch 1 data to be ON.
Digital output data is assigned as b^0 to DO1, b^1 to DO2 and b^2 to DO3.
For the contents of digital output, see page 11.

[Example of Digital output status]

b^0: 1	b^1: 1	b^2: 1	b^0, b^1: 1	b^0, b^2: 1	b^1, b^2: 1
0001	0010	0100	0011	0101	0110
DO1: ON	DO2: ON	DO3: ON	DO1, DO2: ON	DO1, DO3: ON	DO2, DO3: ON

(*3) Digital output and input operation in communication is effective only when both DIP switch No.7 and 8 of the CPT-20A are in OFF status. See page 11.

(*4) Digital input data is assigned as b^0 to DI1, b^1 to DI2 and b^2 to DI3.
Digital input status is returned to the Ch1 reading data.
[Example]
When both DI1 and DI3 are closed, the Ch1 data becomes "0005".

(*5) For the CCT-235 with Heating/Cooling specification, even number channels indicate cooling output MV (manipulated variable).

Command Type	Data Item	Data
22H	0083H: Current status 1 reading	0000 0000 0000 0000 b^{15} to b^0 b^0 : Main output 0: OFF 1: ON (*6) b^1 : Alarm 1 (High limit) 0: OFF 1: ON b^2 : Alarm 2 (Low limit) 0: OFF 1: ON b^3 : Heater burnout alarm 0: OFF 1: ON b^4 : Overscale 0: Normal 1: Over b^5 : Underscale 0: Normal 1: Under b^6 : —— b^7 : Auto-tuning 0: Cancel 1: Perform b^8 : Initial communication 0: Communicated 1: Not communicated b^9 : Control action 0: Heating (Reverse) 1: Cooling (Direct) b^{10}: Control action status 0: Stop 1: Perform b^{11}: Heater burnout alarm applied or not 0: Not applied 1: Applied b^{12}: Data update request 0:Not requested 1:Requested (*7) b^{13}: Loop break alarm 1 0: OFF 1: ON b^{14}: Temperature 0: Normal 1: Abnormal (*8) b^{15}: Instrument 0: Normal 1: Abnormal (*9)
22H	0084H: Current status 2 reading	0000 0000 0000 0000 b^{15} to b^0 b^0: Main output 0: OFF 1: ON (*6) b^1: Control action status 0: Stop 1: Perform b^2: Alarm 1 (High limit) 0: OFF 1: ON b^3: Alarm 2 (Low limit) 0: OFF 1: ON b^4: Overscale 0: Normal 1: Over b^5: Heater burnout alarm 0: OFF 1: ON b^6: Auto-tuning 0:Cancel 1: Perform b^7: Underscale 0:Normal 1: Under b^8: Loop break alarm 2 0: OFF 1: ON b^9: Temperature 0: Normal 1: Abnormal (*8) b^{10} to b^{15}: ——

(*6) For the CCT-235 with Heating/Cooling specification, even number channel b^0 indicates cooling output status (0: OFF, 1: ON).
For b^1 to b^{15}, "0" is always returned.

(*7) If CCT-235's set value is changed via CLT-200, b^{12} (Data update request in Current status 1 reading) becomes "1" (Requested).
Finding this status, the host computer starts to read all set values from the CPT-20A.
After the value of changed items are read, CPT-20A sets b^{12} (Data update request in Current status 1 reading) to "0" (Not requested).

(*8) B^{14} (Temperature in Current status 1 reading) and b^9 (Temperature in Current status 2 reading) become 1 (Abnormal) on the condition that:
SV + 20℃<PV and PV>80℃
After that, if the PV falls as much as 5℃, they become 0 (Normal).

(*9) As to the b^{15} (Instrument in Current status 1 reading):
When the CPT-20A cannot communicate with CCT-235, the b^{15} is turned to "1" (Abnormal).
If the instrument is abnormal, the CPT-20A sets other data to the initial value (0) and returns it to the host computer.

Command Type	Data Item	Data
22H	00A0H: CPU version number reading	CPU version number of each CCT-235 is read from the channel of odd number (1, 3, 5…).
22H	00A1H: Instrument status reading	The sensor range of each CCT-235 is read from the channel of odd number (1, 3, 5…). 0: K -200 to 1370℃, -320 to 2500℉ 1: J -200 to 1000℃, -320 to 1800℉ 2: R 0 to1760℃, 0 to 3200℉ 3: B 0 to 1820℃, 0 to 3300℉ 4: PL-Ⅱ 0 to 1390℃, 0 to 2500℉ 5: N 0 to 1300℃, 0 to 2300℉ 6: K 0.0 to 600.0℃, 0.0 to 999.9℉ 7: J 0.0 to 600.0℃, 0.0 to 999.9℉ 8: Pt100 -199.9 to 850.0℃, -199.9 to 999.9℉ 9: JPt100 -199.9 to 500.0℃, -199.9 to 900.0℉ 10: V DC 0 to 10000 (Output OFF when input is disconnected) 11: A DC 0 to 10000 (Output OFF when input is disconnected) 12: V DC 0 to 10000 (Output ON when input is disconnected) 13: A DC 0 to 10000 (Output ON when input is disconnected) The option and output status of each CCT-235 are read from the channel of even number (2, 4, 6…). b^0: Heater burnout alarm 0: Not applied 1: Applied b^1: Heater burnout alarm rating 0: 20A 1: 50A b^2: Ch1 control output (Current) b^3: Ch1 control output (Relay contact) b^4: Ch1 control output (Non-contact voltage) b^5: Ch2 control output (Current) b^6: Ch2 control output (Relay contact) b^7: Ch2 control output (Non-contact voltage) b^8: —— b^9: —— b^{10}: Cooling control output function 0: Not applied 1: Applied b^{11} to b^{15}: ——

8.3 Communication with a PLC

After power is turned on, the PLC sets address 0 to top address in the register area which is used for communication with CPT-20A, then sets the number of CCT-235 units and items necessary for the communication to the addresses (top address to top address + 19).
After that, the PLC sets address 1 to 4660 (1234H) and address 2 to 22136 (5678H).

CPT-20A keeps reading the address (0 to 2) of PLC after power is turned on.
After confirming that address 1 is 4660 (1234H) and address 2 is 22136 (5678H), CPT-20A reads data of the addresses (top address to top address + 19) which have been set to the address 0.

Note

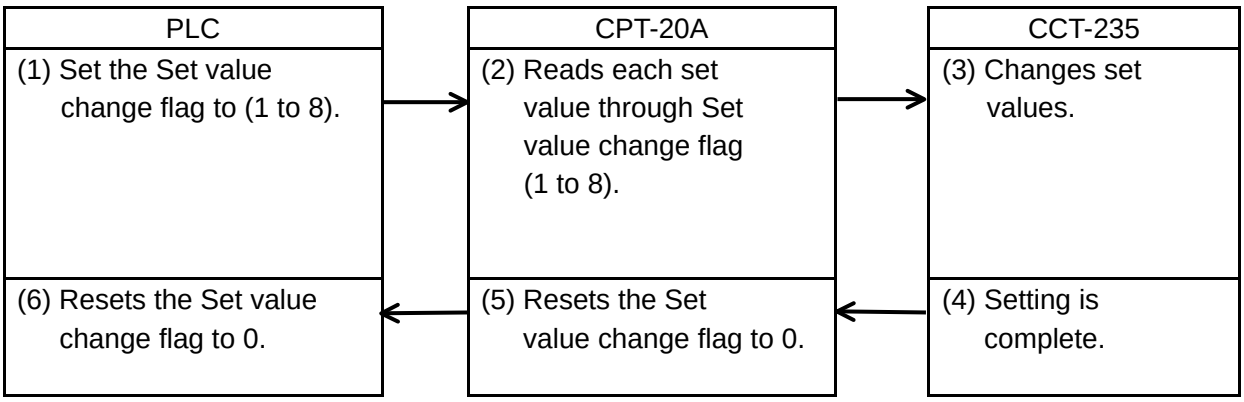
Register type is decided beforehand depending on the PLC selected by the DIP switch (page 10).
To address 0 (1) of the predetermined register, set the top address in the register area which is used for communication with CPT-20A.
For the Yokogawa PLC, use address (1).

● **Processing in the PLC**

When changing the set value of CCT-235, the PLC sets the value from 1 to 8 to the set value change flag area of data memory.
When the PLC writes items (1 to 8) listed below to the set value change flag area, the CPT-20A reads the item from each area by the number, and sets the value to the CCT-235.
After that, the CPT-20A sets the Set value change flag to 0. See (Fig. 8.3-1).

1: All setting items
2: Main set value
3: Alarm 1 and 2, Heater burnout alarm
4: Main proportional band, Integral time, Derivative time, Cooling proportional band, Overlap band/Dead band
5: Auto-tuning
6: Control action (Perform/Stop)
7: Alarm 1 and 2 action designation, Main proportional cycle, Cooling proportional cycle
8: Control output high limit and low limit

The CPT-20A does not manage the setting range of the CCT-235.
Therefore, the setting data should be set within the setting range of the CCT-235 when setting from the PLC.



(Fig. 8.3-1)

[Example 1]

The top address in the register area is set to 1000.
10 units of CCT-235 are used.
All communication items are used.

Address
1000 : Not used
1001, 16^0 (low 4 bits): Set the number of CCT-235 units connected to the CPT-20A.
1001, 16^1, 16^2, 16^3
1002 to 1004 } Not used
1005 to 1007 : Select a communication item Used or Not used.
1008 : Set the signal (Set value change flag) when sending the set value from the PLC to CCT-235.
1009 to 1019 : Spare
1020 or higher : Assign an address for the necessary channels in sequence (from main setting) to the communication item set at addresses 1005 to 1007.
However, the item which is not set at addresses 1005 to 1007 has no address.
For example, if the communication item PV (input value) reading (address 1007) is not used and the other items are used, MV reading will be set to address 1660 to 1679, and Instrument status reading will be set to address 1760 to 1779.

Address	Contents	Setting range, Status
0 **(1)**	Top address in the register area used for communications is set.	e.g. 1000 (Example 1)
1 **(2)**	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
2 **(3)**	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

For the Yokogawa PLC, use addresses (1), (2) and (3).

Address	Contents	Setting range, Status
1000	Not used	——
1001	The number of CCT-235 units connected to the CPT-20A. Determines every 4 bits of word data. (0 is regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
1002 to 1004	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
1005	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High limit) setting 2^5: Alarm 2 (Low limit) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning 2^{10}: Alarm 1 (High limit) hysteresis 2^{11}: Alarm 2 (Low limit) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV (input) filter time constant

1006	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span 2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span 2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap band/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
1007	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ———
1008	Determines a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2, Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control output Perform/Stop change 7: Alarm 1 and 2 action, Main proportional cycle and Cooling proportional cycle change 8: Control output high limit and low limit value change
1009 to 1019	Spare	
1020 to 1039	Main set value (SV)	Main set value from Ch1 to Ch20 Setting range: See “Rated scale” in Chapter 11. Specifications. (P.91)
1040 to 1059	Main proportional band	Main proportional band from Ch1 to Ch20 Setting range: 0.0 to 100.0%
1060 to 1079	Integral time	Integral time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
1080 to 1099	Derivative time	Derivative time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
1100 to 1119	Alarm 1 (High limit)	Alarm 1 (High limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93)
1120 to 1139	Alarm 2 (Low limit)	Alarm 2 (Low limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93)
1140 to 1159	Main output proportional cycle	Main output proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.

1160 to 1179	Heater burnout alarm	Heater burnout alarm set value from Ch1 to Ch20 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]
1180 to 1199	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
1200 to 1219	Auto-tuning Perform/Cancel	AT designation from Ch1 to Ch20 0: Cancel 1: Perform
1220 to 1239	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1240 to 1259	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1260 to 1279	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1280 to 1299	Control output high limit	Control output high limit value from Ch1 to Ch20 Setting range: Control output low limit value to 105%
1300 to 1319	Control output low limit	Control output low limit value from Ch1 to Ch20 Setting range: -5% to Control output high limit value
1320 to 1339	PV filter time constant	PV filter time constant value from Ch1 to Ch20 Setting range: 0.0 to10.0 sec.
1340 to 1359	Temperature unit	Temperature unit from Ch1 to Ch20 0: ℃ 1: ℉
1360 to 1379	Control action	Control action setting from Ch1 to Ch20 0: Heating action 1: Cooling action
1380 to 1399	Alarm 1 action selection	Alarm 1 action selection from Ch1 to Ch20 0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
1400 to 1419	Alarm 2 action selection	Alarm 2 action selection from Ch1 to Ch20 For the action selection, it is the same as Alarm 1 action selection
1420 to 1439	Loop break alarm 1 span	Loop break alarm 1 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1440 to 1459	Loop break alarm 1 time	Loop break alarm 1 time from Ch1 to Ch20 Setting range: 200 minutes.

1460 to 1479	Anti-reset windup (ARW)	Anti-reset windup value from Ch1 to Ch20 Setting range: 0 to 100%
1480 to 1499	PD (manual) reset	PD (manual) reset value from Ch1 to Ch20 Setting range: ±Proportional band converted value, however, in the range of -199.9 to 999.9℃
1500 to 1519	Sensor correction	Sensor correction value from Ch1 to Ch20 Setting range: -100.0 to 100.0℃ (TC, RTD) -1000 to 1000 (DC voltage, DC current)
1520 to 1539	Loop break alarm 2 span	Loop break alarm 2 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1540 to 1559	Loop break alarm 2 time	Loop break alarm 2 time from Ch1 to Ch20 Setting range: 200 minutes.
1560 to 1579	Cooling proportional band	Cooling proportional band from Ch1 to Ch20 Setting range: Multiplying factor to the heating side proportional band, 0.0 to 10.0 (ON/OFF action when set to 0.0)
1580 to 1599	Cooling proportional cycle	Cooling proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
1600 to 1619	Overlap band/Dead band	Overlap band/Dead band value from Ch1 to Ch20 Setting range: ±100.0℃ (TC, RTD) ±1000 (DC voltage, DC current)
1620 to 1639	Cooling action mode selection	Cooling action mode from Ch1 to Ch20 0: Air cooling (linear characteristic) 1: Oil cooling (1.5th power of the linear characteristic) 2: Water cooling (2nd power of the linear characteristic)
1640 to 1659	Cooling output ON/OFF action hysteresis	Cooling output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
1660 to 1679	PV reading	PV reading from Ch1 to Ch20
1680 to 1699	MV reading	MV reading from Ch1 to Ch20
1700 to 1719	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch20
1720 to 1739	Current status 1 reading	Current status 1 reading from Ch1 to Ch20
1740 to 1759	Current status 2 reading	Current status 2 reading from Ch1 to Ch20
1760 to 1779	CPU version number reading	CPU version number reading from Ch1 to Ch20
1780 to 1799	Instrument status reading	Instrument status reading from Ch1 to Ch20

[Example 2]

The top address in the register area is set to 100.
5 units of CCT-235 are used.
All functions of communication item (address 106) are not used and the other items are used.

Address
100 : Not used
101, 16^0 (low 4 bits) : Set the number of CCT-235 units connected to the CPT-20A.
101, 16^1, 16^2, 16^3 } Not used
102 to 104 }
105 to 107 : Select a communication item Used or Not used.
108 : Set the signal (Set value change flag) sending the set value from the PLC to CCT-235.
109 to 119 : Spare
120 or higher : Assign an address for the necessary channels in sequence (from main set value) to the communication item set at address 105 to 107. However, the item which has not been set at address 105 to 107 has no address.

Address	Contents	Setting range, Status
0 **(1)**	Top address in the register area used for communications is set	e.g. 100 (Example 2)
1 **(2)**	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
2 **(3)**	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

For the Yokogawa PLC, use addresses (1), (2) and (3).

Address	Contents	Setting range, Status
100	Not used	——
101	The number of CCT-235 units connected to the CPT-20A. Determines every 4 bits of word data. (0 is regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
102 to 104	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
105	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High) setting 2^5: Alarm 2 (Low) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning 2^{10}: Alarm 1 (High) hysteresis 2^{11}: Alarm 2 (Low) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV filter time constant
106	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span 2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span

		2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap band/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
107	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ——
108	Determines a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2 and Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control output Perform/Stop change 7: Alarm action 1 and 2, Main proportional cycle and Cooling proportional cycle change 8: Control output high and low limit value change
109 to 119	Spare	
120 to 129	Main set value (SV)	Main set value from Ch1 to Ch10 Setting range: See “Rated scale” in Chapter 11. Specifications (Page.91)
130 to 139	Main proportional band	Main proportional band from Ch1 to Ch10 Setting range: 0.0 to 100.0%
140 to 149	Integral time	Integral time from Ch1 to Ch10 Setting range: 0 to 3600 sec.
150 to 159	Derivative time	Derivative time from Ch1 to Ch10 Setting range: 0 to 3600 sec.
160 to 169	Alarm 1 (High limit)	Alarm 1 (High limit) set value from Ch1 to Ch10 Setting range: See “Temperature alarm” in Chapter 11. Specifications (Page.93)
170 to 179	Alarm 2 (Low limit)	Alarm 2 (Low limit) set value from Ch1 to Ch10 Setting range: See “Temperature alarm” in Chapter 11. Specifications (Page.93)
180 to 189	Main output proportional cycle	Main output proportional cycle setting from Ch1 to Ch10 Setting range: 1 to 120 sec.
190 to 199	Heater burnout alarm	Heater burnout alarm setting from Ch1 to Ch10 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]

200 to 209	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
210 to 219	Auto-tuning Perform/Cancel	AT designation from Ch1 to Ch10 0: Cancel 1: Perform
220 to 229	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch10 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
230 to 239	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch10 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
240 to 249	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch10 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
250 to 259	Control output high limit	Control output high limit value from Ch1 to Ch10 Setting range: Control output low limit value to 105%
260 to 269	Control output low limit	Control output low limit value from Ch1 to Ch10 Setting range: -5% to Control output high limit value
270 to 279	PV filter time constant	PV filter time constant from Ch1 to Ch10 Setting range: 0.0 to 10.0 sec.
280 to 289	PV reading	PV reading from Ch1 to Ch10
290 to 299	MV reading	MV reading from Ch1 to Ch10
300 to 309	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch10
310 to 319	Current status 1 reading	Current status 1 reading from Ch1 to Ch10
320 to 329	Current status 2 reading	Current status 2 reading from Ch1 to Ch10
330 to 339	CPU version number reading	CPU version number reading from Ch1 to Ch10
340 to 349	Instrument status reading	Instrument status reading from Ch1 to Ch10

Notes

- When auto-tuning is performed and completed, CPT-20A reads the values (proportional band, integral time, derivative time, ARW, cooling proportional band) from the CCT-235, writes them to the PLC register, then sets the AT value to “0” (AT cancel).
- Before changing the Set value change flag to “1”, be sure to confirm that the flag is “0”.
- The setting data should be within the range of the CCT-235, since CPT-20A does not check whether the value is within the range or not.

8.3.1 Communication details between a Mitsubishi PLC and CPT-20A

● **Mitsubishi Calculator link unit (AJ71UC24, A1SJ71UC24-R4), Micro PLC (FX2N-XXMR) and Serial communication unit (QJ71C24, QJ71C24-R2)**

The CPT-20A sets the parameters to the CCT-235 after reading the data memory of the PLC via the Calculator link unit (AJ71UC24, A1SJ71UC24-R4), Micro PLC (FX2N-XXMR) or Serial communication unit (QJ71C24, QJ71C24-R2).

The CPT-20A constantly monitors the CCT-235 and writes the status to the data memory of the PLC.

● **How to communicate with the PLC**

After the power to the PLC is turned on, the PLC sets the top address in the register area used for communication with the CPT-20A to address 0. PLC sets the number of CCT-235 units and communication items to the set addresses (top address to top address +19).
After that, PLC sets address 1 to 4660 (1234H) and address 2 to 22136 (5678H).

After the power to the CPT-20A is turned on, the CPT-20A continues to read the PLC addresses (0 to 2).
After confirming that address 1 is 4660 and address 2 is 22136, the CPT-20A reads the data of the addresses which have been set to address 0 (top address to top address +19).

Notes

- Register type is decided beforehand depending on the PLC selected by the DIP switch. (p.11) To address 0 of the predetermined register, set the top address in the register area which is used for communications with the CPT-20A.
- The CPT-20A directly reads from and writes to the data memory of the PLC, therefore the PLC does not need to manage the communication procedure, and the program can be simplified.
- With writing to and reading from the PLC, the amount of data processed at a time is 20 channels per item.
- Communication protocol is Format 4, Word unit (command W).

● **Data memory structure of the PLC**

● **Mitsubishi Calculator link unit (AJ71UC24, A1SJ71UC24-R4), Serial communication unit (QJ71C24, QJ71C24-R2)**

(e.g.) Top address in the register area is set to R1000.
Ten CCT-235 units are used.
Communication items are all used.

Address
R1000 : Not used
R1001, 16^0 (low 4 bits) : Set the number of CCT-235 units connected to the CPT-20A.
R1001, 16^1, 16^2, 16^3 } Not used
R1002 to R1004 }
R1005 to R1007 : Select a communication item Used or Not used.
R1008 : Set the signal (Set value change flag) sending the set value from the PLC to CCT-235.
R1009 to R1019 : Spare
R1020 and above : Assign an address for the necessary channels in sequence (from main set value) to the item set at addresses R1005 to R1007.
Addresses will not be assigned to the communication items which have not been set at addresses R1005 to R1007.

Address	Contents	Setting range, Status
R0000	Top address in the register area used for communication is set.	e.g. 1000
R0001	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
R0002	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

Address	Contents	Setting range, Status
R1000	Not used	
R1001	The number of CCT-235 units connected to the CPT-20A. Determines every 4 bits of word data. (0 units are regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
R1002 to R1004	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
R1005	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High limit) setting 2^5: Alarm 2 (Low limit) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning Perform/Cancel 2^{10}: Alarm 1 (High limit) hysteresis 2^{11}: Alarm 2 (Low limit) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV filter time constant
R1006	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span 2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span 2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
R1007	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ——

R1008	Determines a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2, Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control action (Perform/Stop) change 7: Alarm 1 and 2 action, Main proportional cycle and Cooling proportional cycle change 8: Control output high and low limit value change
R1009 to R1019	Spare	
R1020 to R1039	Main set value (SV)	Main set value from Ch1 to Ch20 Setting range: See “Rated scale” in Chapter 11. Specifications (P.91).
R1040 to R1059	Main proportional band	Main proportional band from Ch1 to Ch20 Setting range: 0.0 to 100.0%
R1060 to R1079	Integral time	Integral time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
R1080 to R1099	Derivative time	Derivative time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
R1100 to R1119	Alarm 1 (High limit)	Alarm 1 (High limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93).
R1120 to R1139	Alarm 2 (Low limit)	Alarm 2 (Low limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93).
R1140 to R1159	Main output proportional cycle	Main output proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
R1160 to R1179	Heater burnout alarm	Heater burnout alarm value from Ch1 to Ch20 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]
R1180 to R1199	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
R1200 to R1219	Auto-tuning Perform/Cancel	AT designation from Ch1 to Ch20 0: Cancel 1: Perform
R1220 to R1239	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1240 to R1259	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1260 to R1279	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1280 to R1299	Control output high limit	Control output high limit value from Ch1 to Ch20 Setting range: Control output low limit value to 105%

R1300 to R1319	Control output low limit	Control output low limit value from Ch1 to Ch20 Setting range: -5% to Control output high limit value
R1320 to R1339	PV filter time constant	PV filter time constant value from Ch1 to Ch20 Setting range: 0.0 to10.0 sec.
R1340 to R1359	Temperature unit	Temperature unit from Ch1 to Ch20 0: ℃ 1: ℉
R1360 to R1379	Control action	Control action from Ch1 to Ch20 0: Heating action 1: Cooling action
R1380 to R1399	Alarm 1 action selection	Alarm 1 action selection from Ch1 to Ch20 0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
R1400 to R1419	Alarm 2 action selection	Alarm 2 action selection from Ch1 to Ch20 For the action selection, it is the same as Alarm 1 action selection
R1420 to R1439	Loop break alarm 1 action span	Loop break alarm 1 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1440 to R1459	Loop break alarm 1 action time	Loop break alarm 1 time from Ch1 to Ch20 Setting range: 200 minutes
R1460 to R1479	Anti-reset windup (ARW)	Anti-reset windup value from Ch1 to Ch20 Setting range: 0 to 100%
R1480 to R1499	PD (manual) reset	PD (manual) reset value from Ch1 to Ch20 Setting range: ±Proportional band converted value, however in the range of –199.9 to 999.9℃
R1500 to R1519	Sensor correction	Sensor correction value from Ch1 to Ch20 Setting range: -100.0 to 100.0℃ (TC, RTD) -1000 to 1000 (DC voltage, DC current)
R1520 to R1539	Loop break alarm 2 action span	Loop break alarm 2 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1540 to R1559	Loop break alarm 2 action time	Loop break alarm 2 time from Ch1 to Ch20 Setting range: 200 minutes

R1560 to R1579	Cooling proportional band	Cooling proportional band from Ch1 to Ch20 Setting range: Multiplying factor to the heating side proportional band 0.0 to 10.0 (ON/OFF action when set to 0.0)
R1580 to R1599	Cooling proportional cycle	Cooling proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
R1600 to R1619	Overlap band/Dead band	Overlap band/Dead band value from Ch1 to Ch20 Setting range: ±100.0 (TC, RTD) ±1000 (DC voltage, DC current)
R1620 to R1639	Cooling action mode selection	Cooling action mode from Ch1 to Ch20 0: Air cooling (Linear characteristic) 1: Oil cooling (1.5^{th} power of the linear characteristic) 2: Water cooling (2^{nd} power of the linear characteristic)
R1640 to R1659	Cooling output ON/OFF action hysteresis	Cooling output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
R1660 to R1679	PV reading	PV reading from Ch1 to Ch20
R1680 to R1699	MV reading	MV reading from Ch1 to Ch20
R1700 to R1719	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch20
R1720 to R1739	Current status 1 reading	Current status 1 reading from Ch1 to Ch20
R1740 to R1759	Current status 2 reading	Current status 2 reading from Ch1 to Ch20
R1760 to R1779	CPU version number reading	CPU version number reading from Ch1 to Ch20
R1780 to R1799	Instrument status reading	Instrument status reading from Ch1 to Ch20

- **Mitsubishi Micro PLC (FX2N-XXMR)**

  Serial communication unit (QJ71C24, QJ71C24-R2)

  (e.g.) Top address in the register area is set to D1000.
  Ten CCT-235 units are used.
  Communication items are all used.

Address

D1000 : Not used

D1001, 16^0 (low 4 bits) : Set the number of CCT-235 units connected to the CPT-20A.

D1001, 16^1, 16^2, 16^3
D1002 to D1004 } Not used

D1005 to D1007 : Select a communication item Used or Not used.

D1008 : Set the signal (Set value change flag) sending the set value from the PLC to CCT-235.

D1009 to D1019 :Spare

D1020 or higher : Assign an address for necessary channels in sequence (from main set value) to the item set at addresses D1005 to D1007.
Addresses will not be assigned to the communication items which have not been set at addresses D1005 to D1007.

Address	Contents	Setting range, Status
D0000	Top address in register area used for communication is set.	e.g. 1000
D0001	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
D0002	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

Address	Contents	Setting range, Status
D1000	Not used	——
D1001	The number of CCT-235 units connected to the CPT-20A Determines every 4 bits of word data. (0 units are regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
D1002 to D1004	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
D1005	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High limit) setting 2^5: Alarm 2 (Low limit) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning 2^{10}: Alarm 1 (High limit) hysteresis 2^{11}: Alarm 2 (Low limit) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV filter time constant
D1006	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span

		2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span 2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
D1007	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ——
D1008	Designates a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2, Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control action (Perform/Stop) change 7: Alarm 1 and 2 action, Main proportional cycle and Cooling proportional cycle change 8: Control output high and low limit value change
D1009 to D1019	Spare	
D1020 to D1039	Main set value (SV)	Main set value from Ch1 to Ch20 Setting range: See “Rated scale” in Chapter 11. Specifications (P.91).
D1040 to D1059	Main proportional band	Main proportional band from Ch1 to Ch20 Setting range: 0.0 to 100.0%
D1060 to D1079	Integral time	Integral time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
D1080 to D1099	Derivative time	Derivative time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
D1100 to D1119	Alarm 1 (High limit)	Alarm 1 (High limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93).
D1120 to D1139	Alarm 2 (Low limit)	Alarm 2 (Low limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93).
D1140 to D1159	Main output proportional cycle	Main output proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
D1160 to D1179	Heater burnout alarm	Heater burnout alarm value from Ch1 to Ch20 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]

D1180 to D1199	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
D1200 to D1219	Auto-tuning Perform/Cancel	AT designation from Ch1 to Ch20 0: Cancel 1: Perform
D1220 to D1239	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1240 to D1259	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1260 to D1279	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1280 to D1299	Control output high limit	Control output high limit value from Ch1 to Ch20 Setting range: Control output low limit value to 105%
D1300 to D1319	Control output low limit	Control output low limit value from Ch1 to Ch20 Setting range: -5% to Control output high limit value
D1320 to D1339	PV filter time constant	PV filter time constant value from Ch1 to Ch20 Setting range: 0.0 to10.0 sec.
D1340 to D1359	Temperature unit	Temperature unit from Ch1 to Ch20 0: ℃ 1: ℉
D1360 to D1379	Control action	Control action from Ch1 to Ch20 0: Heating action 1: Cooling action
D1380 to D1399	Alarm 1 action selection	Alarm 1 action selection from Ch1 to Ch20 0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
D1400 to D1419	Alarm 2 action selection	Alarm 2 action selection from Ch1 to Ch20 For the action selection, it is the same as Alarm 1 action selection
D1420 to D1439	Loop break alarm 1 span	Loop break alarm 1 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1440 to D1459	Loop break alarm 1 time	Loop break alarm 1 time from Ch1 to Ch20 Setting range: 200 minutes
D1460 to D1479	Anti-reset windup (ARW)	Anti-reset windup value from Ch1 to Ch20 Setting range: 0 to 100%

D1480 to D1499	PD (manual) reset	PD (manual) reset value from Ch1 to Ch20 Setting range: ±Proportional band converted value, however in the range of -199.9 to 999.9℃
D1500 to D1519	Sensor correction	Sensor correction value from Ch1 to Ch20 Setting range: -100.0 to 100.0℃ (TC, RTD) -1000 to 1000 (DC voltage, DC current)
D1520 to D1539	Loop break alarm 2 span	Loop break alarm 2 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1540 to D1559	Loop break alarm 2 time	Loop break alarm 2 time from Ch1 to Ch20 Setting range: 200 minutes
D1560 to D1579	Cooling proportional band	Cooling proportional band from Ch1 to Ch20 Setting range: Multiplying factor to the heating side proportional band 0.0 to 10.0 (ON/OFF action when set to 0.0)
D1580 to D1599	Cooling proportional cycle	Cooling proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
D1600 to D1619	Overlap band/Dead band	Overlap band/Dead band value from Ch1 to Ch20 Setting range: ±100.0 (TC, RTD) ±1000 (DC voltage, DC current)
D1620 to D1639	Cooling action mode selection	Cooling action mode from Ch1 to Ch20 0: Air cooling (linear characteristic) 1: Oil cooling (1.5th power of the linear characteristic) 2: Water cooling (2nd power of the linear characteristic)
D1640 to D1659	Cooling output ON/OFF action hysteresis	Cooling output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
D1660 to D1679	PV reading	PV reading from Ch1 to Ch20
D1680 to D1699	MV reading	MV reading from Ch1 to Ch20
D1700 to D1719	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch20
D1720 to D1739	Current status 1 reading	Current status 1 reading from Ch1 to Ch20
D1740 to D1759	Current status 2 reading	Current status 2 reading from Ch1 to Ch20
D1760 to D1779	CPU version number reading	CPU version number reading from Ch1 to Ch20
D1780 to D1799	Instrument status reading	Instrument status reading from Ch1 to Ch20

[Example]

Set the proportional band value of Ch1 to the data memory address D1040.

Set the Heater burnout alarm value of Ch20 to the data memory address D1179.

8.3.2 Communication details between an Omron PLC and CPT-20A

● **Host link unit (C200H-LK202-V1)**
Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41)

The CPT-20A sets the parameters to the CCT-235 after reading the data memory of the PLC via the Host link unit (C200H-LK202-V1) or Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41).

The CPT-20A constantly monitors the CCT-235 and writes the status to the data memory of the PLC.

● **How to communicate with the PLC**

After the power to the PLC is turned on, the PLC sets the top address in the register area used for communication with the CPT-20A to address 0. The PLC sets the number of CCT-235 units and communication items to the set addresses (top address to top address +19).
After that, PLC sets address 1 to 4660 (1234H) and address 2 to 22136 (5678H).

After the power to the CPT-20A is turned on, the CPT-20A continues to read the PLC addresses (0 to 2). After confirming that address 1 is 4660 (1234H) and address 2 is 22136 (5678H), CPT-20A reads the data of the addresses which are set to address 0 (top address to top address +19).

Notes

- Register type is decided beforehand depending on the PLC selected by the DIP switch. (p.11) To the address 0 of the predetermined register, set the top address in the register area which is used for communication with the CPT-20A.
- The CPT-20A directly reads from and writes to the data memory of the PLC, therefore the PLC does not need to manage the communication procedure, and the program can be simplified.
- When writing to and reading from the PLC, the amount of data processed at a time is 20 channels per item.

● **Data memory structure of the PLC**

● **Omron Host link unit (C200H-LK202-V1)**
Omron Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41)

(e.g.) Top address in the register area is set to DM1000.
Ten CCT-235 units are used.
Communication items are all used.

Address
DM1000 : Not used
DM1001, 16^0 (low 4 bits) : Set the number of CCT-235 units connected to the CPT-20A.
DM1001, 16^1, 16^2, 16^3 } Not used
DM1002 to DM1004 }
DM1005 to DM1007 : Select a communication item Used or Not used.
DM1008 : Set the Set value change flag.
DM1009 to DM1019 : Spare
DM1020 or higher : Assign an address for the necessary channels in sequence (from main set value) to the item set at addresses DM1005 to DM1007. Addresses will not be alloted to the communication items which have not been set at addresses DM1005 to DM1007.

Address	Contents	Setting range, Status
DM0000	Top address in the register area used for communications is set.	e.g. 1000
DM0001	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
DM0002	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

Address	Contents	Setting range, Status
DM1000	Not used	——
DM1001	The number of CCT-235 units connected to the CPT-20A. Determines every 4 bits of word data. (0 units are regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
DM1002 to DM1004	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
DM1005	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High limit) setting 2^5: Alarm 2 (Low limit) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning 2^{10}: Alarm 1 (High limit) hysteresis 2^{11}: Alarm 2 (Low limit) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV filter time constant
DM1006	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span 2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span 2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
DM1007	Communication item Used/Not used selection flag Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ——

DM1008	Designates a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2, Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control action (Perform/Stop) change 7: Alarm 1 and 2 action, Main proportional cycle and Cooling proportional cycle change 8: Control output high and low limit value change
DM1009 to DM1019	Spare	
DM1020 to DM1039	Main set value (SV)	Main set value from Ch1 to Ch20 Setting range: See “Rated scale” in Chapter 11. Specifications (P.91).
DM1040 to DM1059	Main proportional band	Main proportional band from Ch1 to Ch20 Setting range: 0.0 to 100.0%
DM1060 to DM1079	Integral time	Integral time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
DM1080 to DM1099	Derivative time	Derivative time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
DM1100 to DM1119	Alarm 1 (High limit)	Alarm 1 (High limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93)
DM1120 to DM1139	Alarm 2 (Low limit)	Alarm 2 (Low limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (P.93)
DM1140 to DM1159	Main output proportional cycle	Main output proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
DM1160 to DM1179	Heater burnout alarm	Heater burnout alarm value from Ch1 to Ch20 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]
DM1180 to DM1199	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
DM1200 to DM1219	Auto-tuning Perform/Cancel	AT designation from Ch1 to Ch20 0: Cancel 1: Perform
DM1220 to DM1239	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1240 to DM1259	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1260 to DM1279	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1280 to DM1299	Control output high limit	Control output high limit value from Ch1 to Ch20 Setting range: Control output low limit value to 105%

DM1300 to DM1319	Control output low limit	Control output low limit value from Ch1 to Ch20 Setting range: -5% to Control output high limit value
DM1320 to DM1339	PV filter time constant	PV filter time constant value from Ch1 to Ch20 Setting range: 0.0 to10.0 sec.
DM1340 to DM1359	Temperature unit	Temperature unit from Ch1 to Ch20 0: ℃ 1: ℉
DM1360 to DM1379	Control action selection	Control action from Ch1 to Ch20 0: Heating action 1: Cooling action
DM1380 to DM1399	Alarm 1 action selection	Alarm 1 action selection from Ch1 to Ch20 0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
DM1400 to DM1419	Alarm 2 action selection	Alarm 2 action selection from Ch1 to Ch20 For the action selection, it is the same as Alarm 1 action selection
DM1420 to DM1439	Loop break alarm 1 action span	Loop break alarm 1 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1440 to DM1459	Loop break alarm 1 action time	Loop break alarm 1 time from Ch1 to Ch20 Setting range: 200 minutes
DM1460 to DM1479	Anti-reset windup (ARW)	Anti-reset windup value from Ch1 to Ch20 Setting range: 0 to 100%
DM1480 to DM1499	PD (manual) reset	PD (manual) reset value from Ch1 to Ch20 Setting range: ±Proportional band converted value, however in the range of -199.9 to 999.9℃
DM1500 to DM1519	Sensor correction	Sensor correction value from Ch1 to Ch20 Setting range: -100.0 to 100.0℃ (TC, RTD) -1000 to 1000 (DC voltage, DC current)
DM1520 to DM1539	Loop break alarm 2 action span	Loop break alarm 2 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1540 to DM1559	Loop break alarm 2 action time	Loop break alarm 2 time from Ch1 to Ch20 Setting range: 200 minutes

DM1560 to DM1579	Cooling proportional band	Cooling proportional band from Ch1 to Ch20 Setting range: Multiplying factor to the heating side proportional band 0.0 to 10.0 (ON/OFF action when set to 0.0)
DM1580 to DM1599	Cooling proportional cycle	Cooling proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
DM1600 to DM1619	Overlap band/Dead band	Overlap band/Dead band value from Ch1 to Ch20 Setting range: ±100.0℃ (TC, RTD) ±1000 (DC voltage, DC current)
DM1620 to DM1639	Cooling action mode selection	Cooling action mode from Ch1 to Ch20 0: Air cooling (Linear characteristic) 1: Oil cooling (1.5th power of the linear characteristic) 2: Water cooling (2nd power of the linear characteristic)
DM1640 to DM1659	Cooling output ON/OFF action hysteresis	Cooling output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
DM1660 to DM1679	PV reading	PV reading from Ch1 to Ch20
DM1680 to DM1699	MV reading	MV reading from Ch1 to Ch20
DM1700 to DM1719	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch20
DM1720 to DM1739	Current status 1 reading	Current status 1 reading from Ch1 to Ch20
DM1740 to DM1759	Current status 2 reading	Current status 2 reading from Ch1 to Ch20
DM1760 to DM1779	CPU version number reading	CPU version number reading from Ch1 to Ch20
DM1780 to DM1799	Instrument status reading	Instrument status reading from Ch1 to Ch20

[Example]

Set the Proportional band value of Ch1 to the data memory address DM1040.

Set the Heater burnout alarm value of Ch20 to the data memory address DM1179.

8.3.3 Communication details between a Fuji PLC and CPT-20A

● **Fuji interface module (NC1L-RS4)**

The CPT-20A sets the parameters to the CCT-235 after reading the data memory of the PLC via the Interface module (NC1L-RS4).

The CPT-20A constantly monitors the CCT-235 and writes the status to the data memory of the PLC.

● **How to communicate with the PLC**

After the power to the PLC is turned on, the PLC sets the top address in the register area used for communication with the CPT-20A to address 0. The PLC sets the number of CCT-235 units and communication items to the set addresses (top address to top address +19).
After that, PLC sets address 1 to 4660 (1234H) and address to 222136 (5678H).

After the power to the CPT-20A is turned on, the CPT-20A continues to read the PLC addresses (0 to 2). After confirming that address 1 is 4660 (1234H) and address 2 is 22136 (5678H), CPT-20A reads the data of the addresses (top address to top address +19) which have been set to address 0.

File memory “W30.xxxx” area is used for data reading and writing.
(File memory area should be set in the PLC.)

For more details, refer to the User’s manual [Command] for Fuji Program controller (MICREX-F).

Notes

- Register type is decided beforehand depending on a PLC selected by the DIP switch (p.11). To the address 0 of the predetermined register, set the top address in the register area which is used for communication with the CPT-20A.
- The CPT-20A directly reads from and writes to the data memory of the PLC, therefore the PLC (CPU) does not need to manage the communication procedure, and the program can be simplified.
- When writing to and reading from the PLC, the amount of data processed at a time is 20 channels per item.

● **Data memory structure of the PLC**

● **Interface module (NC1L-RS4)**

(e.g.) Top address in the register area is set to W30.1000.
Ten CCT-235 units are used.
Communication items are all used.

Address	
W30.1000	: Not used
W30.1001, 16^0 (low 4 bits)	: Set the number of CCT-235 units connected to the CPT-20A.
W30.1001, 16^1, 16^2, 16^3	: Not used
W30.1002 to W30.1004	
W30.1005 to W30.1007	: Select a communication item Used or Not used.
W30.1008	: Set the signal (Set value change flag) sending the set value from the PLC to CCT-235.
W30.1009 to W30.1019	: Spare
W30.1020 or higher	: Assign an address for the necessary channels in sequence (from main set value) to the item set at addresses W30.1005 to W30.1007. Addresses will not be assigned to the communication items which have not been set at addresses W30.1005 to W30.1007.

Address	Contents	Setting range, Status
W30.0000	Top address in the register area used for communications is set.	e.g. 1000
W30.0001	Communication parameter setting completion flag 1	Fixed value 4660 (1234H)
W30.0002	Communication parameter setting completion flag 2	Fixed value 22136 (5678H)

Address	Contents	Setting range, Status
W30.1000	Not used	——
W30.1001	The number of CCT-235 units connected to the CPT-20A. Determines every 4 bits of word data. (0 units are regarded as 1 unit.)	16^0: The number of CCT-235 units 16^1: —— 16^2: —— 16^3: —— Setting range: 1 to AH
W30.1002 to W30.1004	Not used	16^0: —— 16^1: —— 16^2: —— 16^3: ——
W30.1005	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Main set value 2^1: Main proportional band 2^2: Integral time 2^3: Derivative time 2^4: Alarm 1 (High limit) setting 2^5: Alarm 2 (Low limit) setting 2^6: Main proportional cycle 2^7: Heater burnout alarm 2^8: Control action status 2^9: Auto-tuning 2^{10}: Alarm 1 (High limit) hysteresis 2^{11}: Alarm 2 (Low limit) hysteresis 2^{12}: Control output ON/OFF action hysteresis 2^{13}: Control output high limit 2^{14}: Control output low limit 2^{15}: PV filter time constant
W30.1006	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: Temperature unit 2^1: Control action (Heating/Cooling) 2^2: Alarm 1 action 2^3: Alarm 2 action 2^4: Loop break alarm 1 span 2^5: Loop break alarm 1 time 2^6: ARW 2^7: PD (manual) reset 2^8: Sensor correction 2^9: Loop break alarm 2 span 2^{10}: Loop break alarm 2 time 2^{11}: Cooling proportional band 2^{12}: Cooling proportional cycle 2^{13}: Overlap/Dead band 2^{14}: Cooling action mode 2^{15}: Cooling output ON/OFF action hysteresis
W30.1007	Communication item Used/Not used selection flag. Determines every 1 bit of word data. (1: Used, 0: Not used)	2^0: PV reading 2^1: MV reading 2^2: Heater current value reading 2^3: Current status 1 reading 2^4: Current status 2 reading 2^5: CPU version number reading 2^6: Instrument status reading 2^7 to 2^{15}: ——

W30.1008	Designates a Set value change flag.	0: No change 1: All setting items change 2: Main set value change 3: Alarm 1 and 2, Heater burnout alarm value change 4: Main proportional band, Integral time, Derivative time, Cooling proportional band and Overlap band/Dead band change 5: Auto-tuning change 6: Control action (Perform/Stop) change 7: Alarm 1 and 2 action, Main proportional cycle and Cooling proportional cycle change 8: Control output high and low limit value change
W30.1009 to W30.1019	Spare	
W30.1020 to W30.1039	Main set value (SV)	Main set value from Ch1 to Ch20 Setting range: See “Rated scale” in Chapter 11. Specifications. (p.91)
W30.1040 to W30.1059	Main proportional band	Main proportional band from Ch1 to Ch20 Setting range: 0.0 to 100.0%
W30.1060 to W30.1079	Integral time	Integral time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
W30.1080 to W30.1099	Derivative time	Derivative time from Ch1 to Ch20 Setting range: 0 to 3600 sec.
W30.1100 to W30.1119	Alarm 1 (High limit)	Alarm 1 (High limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (p.93)
W30.1120 to W30.1139	Alarm 2 (Low limit)	Alarm 2 (Low limit) value from Ch1 to Ch20 Setting range: See “Temperature alarm” in Chapter 11. Specifications (p.93)
W30.1140 to W30.1159	Main output proportional cycle	Main output proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
W30.1160 to W30.1179	Heater burnout alarm	Heater burnout alarm value from Ch1 to Ch20 Setting range: 0.0 to 20.0A [W(20A)] 0.0 to 50.0A [W(50A)]
W30.1180 to W30.1199	Control action Perform/Stop	Control action Perform/Stop from Ch1 to Ch20 0: Stop 1: Perform
W30.1200 to W30.1219	Auto-tuning Perform/Cancel	AT designation 0: Cancel 1: Perform
W30.1220 to W30.1239	Alarm 1 (High limit) hysteresis	Alarm 1 (High limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
W30.1240 to W30.1259	Alarm 2 (Low limit) hysteresis	Alarm 2 (Low limit) hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
W30.1260 to W30.1279	Control output ON/OFF action hysteresis	Control output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)

W30.1280 to W30.1299	Control output high limit	Control output high limit value from Ch1 to Ch20 Setting range: Control output low limit value to 105%
W30.1300 to W30.1319	Control output low limit	Control output low limit value from Ch1 to Ch20 Setting range: -5% to Control output high limit value
W30.1320 to W30.1339	PV filter time constant	PV filter time constant value from Ch1 to Ch20 Setting range: 0.0 to10.0 sec.
W30.1340 to W30.1359	Temperature unit	Temperature unit from Ch1 to Ch20 0: ℃ 1: ℉
W30.1360 to W30.1379	Control action	Control action from Ch1 to Ch20 0: Heating action 1: Cooling action
W30.1380 to W30.1399	Alarm 1 action selection	Alarm 1 action selection from Ch1 to Ch20 0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
W30.1400 to W30.1419	Alarm 2 action selection	Alarm 2 action selection from Ch1 to Ch20 For the action selection, it is the same as Alarm 1 action selection
W30.1420 to W30.1439	Loop break alarm 1 action span	Loop break alarm 1 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
W30.1440 to W30.1459	Loop break alarm 1 action time	Loop break alarm 1 time from Ch1 to Ch20 Setting range: 200 minutes
W30.1460 to W30.1479	Anti-reset windup (ARW)	Anti-reset windup value from Ch1 to Ch20 Setting range: 0 to 100%
W30.1480 to W30.1499	PD (manual) reset	PD (manual) reset value from Ch1 to Ch20 Setting range: ±Proportional band converted value, however in the range of -199.9 to 999.9℃
W30.1500 to W30.1519	Sensor correction	Sensor correction value from Ch1 to Ch20 Setting range: -100.0 to 100.0℃ (TC, RTD) -1000 to 1000 (DC voltage, DC current)
W30.1520 to W30.1539	Loop break alarm 2 span	Loop break alarm 2 span from Ch1 to Ch20 Setting range: 0.0 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
W30.1540 to W30.1559	Loop break alarm 2 time	Loop break alarm 2 time from Ch1 to Ch20 Setting range: 200 minutes

W30.1560 to W30.1579	Cooling proportional band	Cooling proportional band from Ch1 to Ch20 Setting range: Multiplying factor to the heating side proportional band 0.0 to 10.0 (ON/OFF action when set to 0.0)
W30.1580 to W30.1599	Cooling proportional cycle	Cooling proportional cycle from Ch1 to Ch20 Setting range: 1 to 120 sec.
W30.1600 to W30.1619	Overlap band/Dead band	Overlap band/Dead band value from Ch1 to Ch20 Setting range: ±100.0 (TC, RTD) ±1000 (DC voltage, DC current)
W30.1620 to W30.1639	Cooling action mode selection	Cooling action mode from Ch1 to Ch20 0: Air cooling (linear characteristic) 1: Oil cooling (1.5th power of the linear characteristic) 2: Water cooling (2nd power of the linear characteristic)
W30.1640 to W30.1659	Cooling output ON/OFF action hysteresis	Cooling output ON/OFF action hysteresis value from Ch1 to Ch20 Setting range: 0.1 to 100.0℃ (TC, RTD) 1 to 1000 (DC voltage, DC current)
W30.1660 to W30.1679	PV reading	PV reading from Ch1 to Ch20
W30.1680 to W30.1699	MV reading	MV reading from Ch1 to Ch20
W30.1700 to W30.1719	Heater current (ampere) value reading	Heater current value reading from Ch1 to Ch20
W30.1720 to W30.1739	Current status 1 reading	Current status 1 reading from Ch1 to Ch20
W30.1740 to W30.1759	Current status 2 reading	Current status 2 reading from Ch1 to Ch20
W30.1760 to W30.1779	CPU version number reading	CPU version number reading from Ch1 to Ch20
W30.1780 to W30.1799	Instrument status reading	Instrument status reading from Ch1 to Ch20

[Example]

Set the proportional band value of Ch1 to the data memory address W30.1040.

Set the Heater current value of Ch20 to the data memory address W30.1179.

8.4 Communication with Modbus protocol

8.4.1 Message structure

Modbus protocol has 2 transmission modes (ASCII mode and RTU mode).
The CPT-20A (slave) works in ASCII mode, and therefore all commands are composed of ASCII code.
The data (set value, decimal) is converted to hexadecimal figures and ASCII code is used.
The negative number is represented by 2's complement.
In ASCII mode, messages start with a colon (:) character (3AH) and ends with CR (carriage return, 0DH) + LF (linefeed, 0AH).
An interval between characters is 1 second. If a greater interval occurs, the receiving device assumes an error has occurred.
A typical message frame is shown (Fig. 8.4.1-1) below.

Header (:)	Slave address	Function code	Address	Number of data	Number of bytes	Ch1 data	-----	Ch20 data	LRC	Delimiter (CR•LF)
			Data field							

(Fig. 8.4.1-1)

● **Slave address**

Slave address (instrument number) is 0 to 15, and is represented by two ASCII characters.
Slave address (instrument number) can be set by the front rotary switch of the CPT-20A in the range of 0 to 15.
The host computer (hereafter master) designates a slave by placing the slave address in the message.
When the slave is responding, the slave places its own address in the response message and informs the master which slave is responding at that time.
Since the slave is not available for the broadcast address, instrument number 0 slave receives the message and returns the response message.

● **Function code**

Function code tells the slave what kind of action to perform, and is represented by two ASCII characters.
Also when the master sends the message to the slave, the function code commands the slave to undertake the following action types.

Function code	Contents
03 (03H)	Reading the set value and status of the slave (Max. 20 data can be read at a time)
16 (16H)	Setting to the slave (Only 1 piece of data can be written.)

When the slave responds to the master, the function code is used to discern whether the response is normal or if any error is occurred. When the response is normal, the slave simply echoes the original function code.
When the response is abnormal, a value of 1 is added to the most significant bit of the function code and is returned as a response. At this time, the slave places an error code in the message.
This tells the master what kind of error is occurred.

Error code	Contents of the error
0 (00H)	Reserve (Not used)
1 (01H)	Illegal function (non-existent function)
2 (02H)	Illegal data address (non-existent data address)

● **Data field**

Data field includes slave address, the number of data, the number of bytes as well as data.
The slave address, the number of data and data are represented by four ASCII characters respectively (within the range of –32768 to 32767).
The number of bytes is represented by two ASCII characters.
The request from the master is composed of the slave address, the number of data, the number of bytes and data.
The response from the slave is composed of data requested by the master.
The message data sent from the master to the slave contains additional information which the slave must use to take the action defined by the function code.

● Error check

Error check is represented by two ASCII characters.
Error check characters are the result of a Longitudinal Redundancy Check (LRC) calculation that is performed on the message which starts with (:) and ends with (CR•LF).
The LRC characters are appended to the message preceding the CR•LF characters.

Error checking methods

LRC is applied to the entire message.
Both the character check and message frame check are generated in the master and applied to the message contents before transmission. (The slave checks each character and the entire message frame during receipt.)
The master is configured by the user to wait for a predetermined timeout interval before aborting the transaction. This interval is set to be long enough for any slave to respond normally. If the slave detects a transmission error, the message will not be acted upon. The slave will not respond to the master. (After time passes, the master handles the error.)
A message addressed to a non-existent slave device will also cause a timeout.

LRC check

The LRC character checks the message contents, excluding the beginning colon and the terminating CR•LF characters.
The LRC character is 1 byte, containing an 8-bit binary value.
The LRC value is calculated by the slave, which appends the LRC to the message.
The slave calculates an LRC during receipt of the message, and compares the calculated value to the actual value it received in the LRC field. If the two values are not equal, an error results.
The LRC is calculated by adding together successive 8-bit bytes of the message, discarding any carries, and then two's complementing the result, excluding the beginning colon character and terminating CR•LF characters.

How to calculate LRC

All characters except for header (:) and delimiter (CR•LF) are added with a carry being discarded.
Total value is converted to binary notation, is converted to 2's complements, then to hexadecimal figures, that is, LRC.

(e.g.) Address: 1 (01H), Main set value reading for all channels

Message (request) from the master

Header (:)	Slave address (01H)	Function code (03H)	Address (0000H)	Number of data (0014H)	LRC	Delimiter (CR•LF)

LRC calculation range

01H + 03H + 00H + 00H + 00H + 14H = 18H
↓ Binary notation
0001 1000
↓ 1's complement
1110 0111
↓ Add 1 to 1's complement
1110 1000
↓ Hexadecimal figures
E8H

Message (request) from the master

Header (:)	Slave address (01H)	Function code (03H)	Address (0000H)	Number of data (0014H)	LRC (E8H)	Delimiter (CR•LF)

- 1's complement: Reverse each binary bit. 0 will become 1 and vice versa.
- 2's complement: Add 1 to 1's complement.

8.4.2 Transmission message example

(1) Set value and status reading (Address 1, Main set value reading for all channels)

- **Message (request) from the master**

Header (:)	Slave address (01H)	Function code (03H)	Address (0000H)	Number of data (0014H)	LRC (E8H)	Delimiter (CR•LF)
1	2	2	4	4	2	2 ← Number of characters

(Fig. 8.4.2-1)

- **Normal message (response) from the slave**

This message is an example of main set value 100 (0064H) reading from Ch1 to Ch20.
The slave address, function code, the number of data, etc are represented by hexadecimal figures and placed in the message one character at a time.

One channel has 16 bits of data, therefore there are 2 response bytes.
One character of ASCII is expressed by the message which consists of 4 bits, therefore 4 times the amount of characters are needed.

Header (:)	Slave address (01H)	Function code (03H)	Number of response bytes (28H)	Ch1 data (0064H)	-----	Ch20 data (0064H)	LRC (04H)	Delimiter (CR•LF)
1	2	2	2	4		4	2	2 ← Number of characters

(Fig. 8.4.2-2)

- **Error message (response) from the slave**

This message is an example of that which occurs when the address of the item to be read is mistaken.
The error contents are returned to the master by adding a value of 1 to the most significant bit of the function code.

Header (:)	Slave address (01H)	Function code (83H)	Error code (02H)	LRC (7AH)	Delimiter (CR•LF)
1	2	2	2	2	2 ← Number of characters

(Fig. 8.4.2-3)

(2) Setting to the slave [Address 1, when the main set value for all channels is set to 100 (0064H)]

- **Message (request) from the master**

Header (:)	Slave address (01H)	Function code (10H)	Address (0000H)	Number of data (0014H)	Number of bytes (28H)	Ch1 data (0064H)	---	Ch20 data (0064H)	LRC (E3H)	Delimiter (CR•LF)
1	2	2	4	4	2	4		4	2	2 ← Number of characters

(Fig. 8.4.2-4)

- **Normal message (response) from the slave**

This message is an example of that which occurs when the main set value for address 1 is set to 100 (0064H).
The slave address, function code, the number of data, etc are represented by hexadecimal figures and placed in the message one character at a time.

Header (:)	Slave address (01H)	Function code (10H)	Address (0000H)	Number of data (0014H)	LRC (DBH)	Delimiter (CR•LF)
1	2	2	4	4	2	2 ← Number of characters

(Fig. 8.4.2-5)

- **Error message (response) of the slave**

This message is an example of that which occurs when the address of the item to be set is mistaken.
The error contents are returned to the master by adding a value of 1 to the most significant bit of the function code.

Header (:)	Slave address (01H)	Function code (90H)	Exception code (02H)	LRC (6DH)	Delimiter (CR•LF)
1	2	2	2	2	2 ← Number of characters

(Fig. 8.4.2-6)

8.4.3 Command table (Modbus protocol)

R: Read, W: Write (setting)

Address	Contents	Attribute	Data
0000H to 0013H	Main set value (SV)	R/W	Set value
0014H to 0027H	Main proportional band	R/W	Set value
0028H to 003BH	Integral time	R/W	Set value
003CH to 004FH	Derivative time	R/W	Set value
0050H to 0063H	Alarm 1 (High limit)	R/W	Set value
0064H to 0077H	Alarm 2 (Low limit)	R/W	Set value
0078H to 008BH	Main output proportional cycle	R/W	Set value
008CH to 009FH	Heater burnout alarm	R/W	Set value
00A0H to 00B3H	Control action Perform/Stop	R/W	0: Stop 1: Perform
00B4H to 00C7H	Auto-tuning Perform/Cancel	R/W	0: Cancel 1: Perform
00C8H to 00DBH	Alarm 1 (High limit) hysteresis	R/W	Set value
00DCH to 00EFH	Alarm 2 (Low limit) hysteresis	R/W	Set value
00F0H to 0103H	Control output ON/OFF action hysteresis	R/W	Set value
0104H to 0117H	Control output high limit	R/W	Set value
0118H to 012BH	Control output low limit	R/W	Set value
012CH to 013FH	PV filter time constant	R/W	Set value
0140H to 0153H	Temperature unit	R/W	0: ℃ 1: ℉
0154H to 0167H	Control action	R/W	0: Heating (Reverse action) 1: Cooling (Direct action)
0168H to 017BH	Alarm 1 action selection	R/W	0: No alarm action 1: High limit alarm 2: High limit alarm with standby 3: Low limit alarm 4: Low limit alarm with standby 5: High/Low limits alarm 6: High/Low limits alarm with standby 7: High/Low limit range alarm 8: High/Low limit range alarm with standby 9: Process high alarm 10: Process high alarm with standby 11: Process low alarm 12: Process low alarm with standby
017CH to 018FH	Alarm 2 action selection	R/W	The same as Alarm 1 action selection
0190H to 01A3H	Loop break alarm 1 span	R/W	Set value
01A4H to 01B7H	Loop break alarm 1 time	R/W	Set value
01B8H to 01CBH	Anti-reset windup (ARW)	R/W	Set value
01CCH to 01DFH	PD (manual) reset	R/W	Set value
01E0H to 01F3H	Sensor correction	R/W	Set value
01F4H to 0207H	Loop break alarm 2 span	R/W	Set value
0208H to 021BH	Loop break alarm 2 time	R/W	Set value
021CH to 022FH	Cooling proportional band	R/W	Set value
0230H to 0243H	Cooling proportional cycle	R/W	Set value
0244H to 0257H	Overlap band/Dead band	R/W	Set value
0258H to 026BH	Cooling action mode selection	R/W	0: Air cooling 1: Oil cooling 2: Water cooling
026CH to 027FH	Cooling output ON/OFF action hysteresis	R/W	Set value
0280H to 0293H	Data initialization Perform/Cancel	W	0: Cancel 1: Perform (*1)

0294H to 02A7H	Digital output	W	Digital output status (*2, *3) Ch1 0000 0000 0000 0000 b^{15} to b^0
02A8H to 02BBH	Digital input	R	Digital input status (*3, *4) Ch1 0000 0000 0000 0000 b^{15} to b^0
02BCH to 02CFH	Current PV (input value) reading	R	Current PV (input value)
02D0H to 02E3H	Current MV (control output manipulated variable) reading	R	Current MV (*5)
02E4H to 02F7H	Heater current (ampere) value reading	R	Heater current value when control output is on

(*1) When initializing the data, set the odd number of channel of the unit (CCT-235) to be initialized to "0001". The data of the unit (CCT-235) set to “0001” will be initialized.

(*2) To turn the digital output ON, set “1” to the digital output bit of Ch 1 data to be ON.
Digital output data is assigned as b^0 to DO1, b^1 to DO2 and b^2 to DO3.
For the contents of digital output, see page 11.

[Example of Digital output status]

b^0: 1	b^1: 1	b^2: 1	b^0, b^1: 1	b^0, b^2: 1	b^1, b^2: 1
0001	0010	0100	0011	0101	0110
DO1: ON	DO2: ON	DO3: ON	DO1, DO2: ON	DO1, DO3: ON	DO2, DO3: ON

(*3) Digital output and input operation in communication is effective only when both DIP switch No.7 and 8 are in OFF status. See page 11.

(*4) Digital input data is assigned as b^0 to DI1, b^1 to DI2 and b^2 to DI3.
Digital input status is returned to the Ch1 of reading data.
[Example]
When both DI1 and DI3 are closed, the Ch1 data becomes "0005".

(*5) For the CCT-235 with Heating/Cooling specification, the cooling output manipulated variable (MV) is indicated in the odd number channel.

Address	Contents	Attribute	Data
02F8H to 030BH	Current status 1 reading	R	0000 0000 0000 0000 b^{15} to b^0 b^0 : Main output 0: OFF 1: ON (*6) b^1 : Alarm 1 (High limit) 0: OFF 1: ON b^2 : Alarm 2 (Low limit) 0: OFF 1: ON b^3 : Heater burnout alarm 0: OFF 1: ON b^4 : Overscale 0: Normal 1: Over b^5 : Underscale 0: Normal 1: Under b^6 : —— b^7 : Auto-tuning 0: Cancel 1: Perform b^8 : Initial communication 0: Communicated 1: Not communicated b^9 : Control action 0: Heating (Reverse) 1: Cooling (Direct) b^{10}: Control output Perform/Stop 0: Stop 1: Perform b^{11}: Heater burnout alarm applied or not 0: Not applied 1: Applied b^{12}: Data update request 0:Not requested 1:Requested (*7) b^{13}: Loop break alarm 1 0: OFF 1: ON b^{14}: Temperature 0: Normal 1: Abnormal (*8) b^{15}: Instrument 0: Normal 1: Abnormal (*9)
030CH to 031FH	Current status 2 reading	R	0000 0000 0000 0000 b^{15} to b^0 b^0 : Main output 0: OFF 1: ON (*6) b^1 : Control output Perform/Stop 0: Stop 1: Perform b^2 : Alarm 1 (High limit) 0: OFF 1: ON b^3 : Alarm 2 (Low limit) 0: OFF 1: ON b^4 : Overscale 0: Normal 1: Over b^5 : Heater burnout alarm 0: OFF 1: ON b^6 : Auto-tuning 0: Cancel 1: Perform b^7 : Underscale 0: Normal 1: Under b^8 : Loop break alarm 2 0: OFF 1: ON b^9 : Temperature 0: Normal 1: Abnormal (*8) b^{10} to b^{15}: ——

(*6) For the CCT-235 with Heating/Cooling specification, b^0 of even number address indicates Cooling output status (0: OFF, 1: ON).
B^1 to b^{15}: Always “0”

(*7) When the set value of the CCT-235 is changed via CLT-200, b^{12} [Data update request in Current status 1 reading] becomes 1 (Requested).
Finding this status, the master starts to read all set values of the CPT-20A.
After all data of the setting items are read, the CPT-20A sets b^{12} [Data update request in Current status 1 reading] to 0 (Not requested).

(*8) B^{14} [Temperature in Current status 1 reading] and b^9 [Temperature in Current status 2 reading] become 1 (Abnormal) on the condition that:
SV + 20℃<PV and PV>80℃
After that, if the PV falls as much as 5℃, they become 0 (Normal).

(*9) If the CPT-20A cannot communicate with the CCT-235, b^{15} [Instrument in Current status 1 reading] becomes 1 (Abnormal).
If the instrument is abnormal, the CPT-20A sets other data to the initial value (0) and returns them to the master.

0320H to 0333H	CPU version number reading	R	CPU version number of each CCT-235 is read from the channel of odd number (1, 3, 5…).
0334H to 0347H	Instrument status reading	R	The sensor range of each CCT-235 is read from the channel of odd number (1, 3, 5…). 0: K -200 to 1370℃, -320 to 2500℉ 1: J -200 to 1000℃, -320 to 1800℉ 2: R 0 to1760℃, 0 to 3200℉ 3: B 0 to 1820℃, 0 to 3300℉ 4: PL-Ⅱ 0 to 1390℃, 0 to 2500℉ 5: N 0 to 1300℃, 0 to 2300℉ 6: K 0.0 to 600.0℃, 0.0 to 999.9℉ 7: J 0.0 to 600.0℃, 0.0 to 999.9℉ 8: Pt100 -199.9 to 850.0℃, -199.9 to 999.9℉ 9: JPt100 -199.9 to 500.0℃, -199.9 to 900.0℉ 10: V DC 0 to 10000 (Output OFF when input burnout) 11: A DC 0 to 10000 (Output OFF when input burnout) 12: V DC 0 to 10000 (Output ON when input burnout) 13: A DC 0 to 10000 (Output ON when input burnout) The option and output status of each CCT-235 are read from the channel of even number (2, 4. 6…). b^0: Heater burnout alarm applied or not 0: Not applied 1: Applied b^1: Heater burnout alarm rating 0: 20A 1: 50A b^2: Ch1 control output (Current) b^3: Ch1 control output (Relay contact) b^4: Ch1 control output (Non-contact voltage) b^5: Ch2 control output (Current) b^6: Ch2 control output (Relay contact) b^7: Ch2 control output (Non-contact voltage) b^8: —— b^9: —— b^{10}: Cooling control output function 0: Not applied 1: Applied b^{11} to b^{15}: Ignored

Note:

- Address 02A8H and those which follow it are for reading only.
  If the setting message is transmitted to these areas, Error code 2 is returned.
- Address 0348H and those which follow it are not used.
  If the setting or reading message is transmitted to these areas, Error code 2 is returned.
- If the designated address range is incorrect, and the setting or reading message is transmitted, Error code 2 is returned.

9. Action explanation

9.1 P, I, D and ARW

Each value of P, I, D and ARW is automatically set by performing PID auto-tuning.

- **Proportional band (P)**

  Proportional action is the action during which the control output varies in proportion to the deviation between the set value and the process variable.
  If the proportional band is narrowed, even if the output changes by a slight variation of the processing value, better control results can be obtained as the offset decreases.
  However, if the proportional band is narrowed too much, even slight disturbance may cause variation in the processing value, and control action changes to ON/OFF action and the so-called hunting phenomenon occurs.
  Therefore, when the processing value comes to the balanced position near the set value and a constant value is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

- **Integral time (I)**

  Integral action is used to eliminate offset. When the integral time is shortened, the returning speed to the set point is accelerated. However, the cycle of oscillation is also accelerated and stability becomes unfavorable.

- **Derivative time (D)**

  Derivative action is used to restore the change in the processing value according to the rate of change. It reduces the amplitude of overshoot and undershoot width.
  If the derivative time is shortened, restoring value becomes small, and if the derivative time is adjusted to be longer, an excessive returning phenomenon may occur and the control system may be oscillated.

- **Anti-reset windup (ARW)**

  ARW prevents overshoot (undershoot) caused by the integral action.
  The less ARW value, the less excess integral action is at the point when PV reaches the set value. However, it takes time until stabilization.
  Use the control duty factor for setting ARW.

How to get the duty factor for the ARW with a manual setting

• For the Relay contact output or Non-contact voltage output (for SSR drive)

$$\text{Duty factor (\%)} = \frac{\text{ON action time}}{\text{Proportional cycle}} \times 100$$

• For the current output

$$\text{Duty factor (\%)} = \frac{\text{Output current value (mA)} - 4}{16} \times 100$$

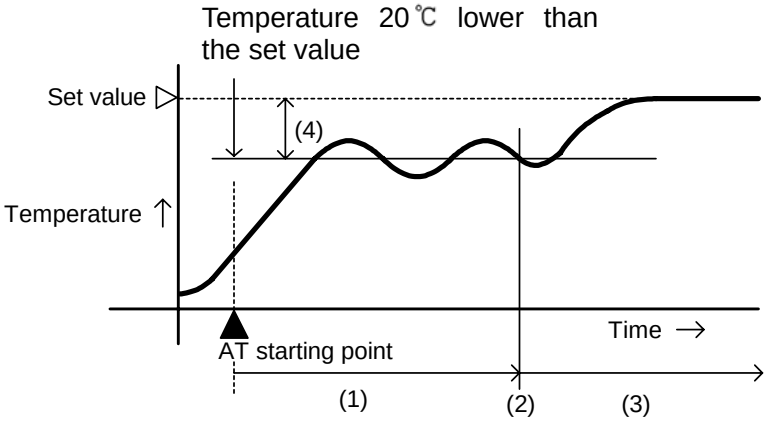
• Set to 50% (the same as the default value) for trial run, if duty factor is unknown.

9.2 PID auto-tuning

In order to set each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value. One type is automatically selected from 3 types as shown below.

(A) In the case of a large difference between the set value and processing temperature as the temperature is rising

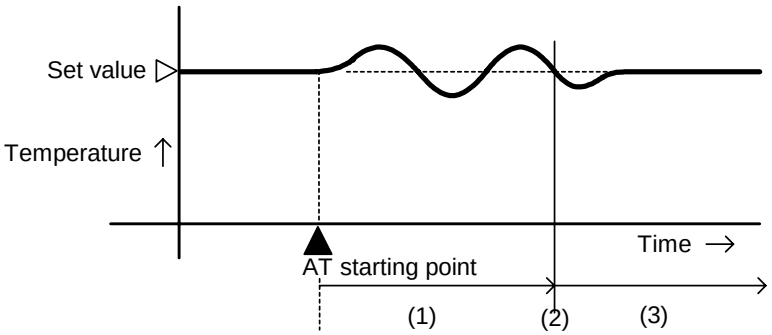
When AT bias is set to 20℃, the AT process will fluctuate at the temperature 20℃ lower than the set value.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

(B) In the case of a stable control

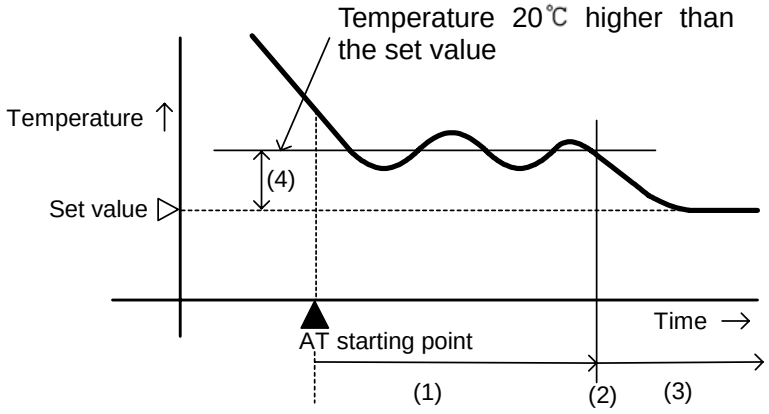
The AT process will fluctuate around the set value.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.

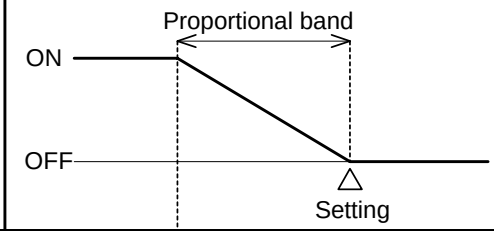
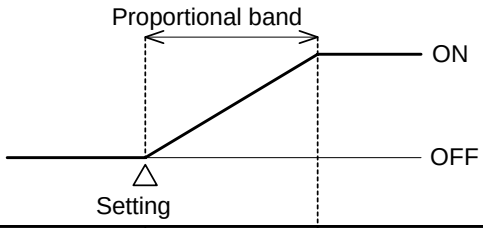
(C) In the case of a large difference between the set value and processing temperature as the temperature is falling

When AT bias is set to 20℃, the AT process will fluctuate at the temperature 20℃ higher than the set value.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning.
(4) AT bias value

9.3 Control action

<table>
<tr><th>Action</th><th>Heating (reverse) action</th><th>Cooling (direct) action</th></tr>
<tr><td>Control action</td><td> 
</td><td> 
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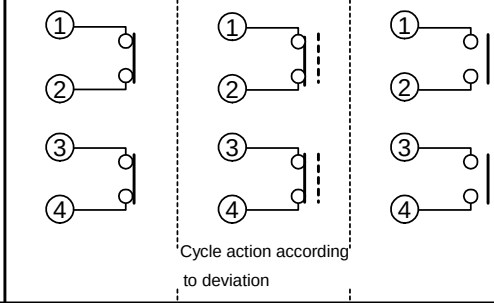
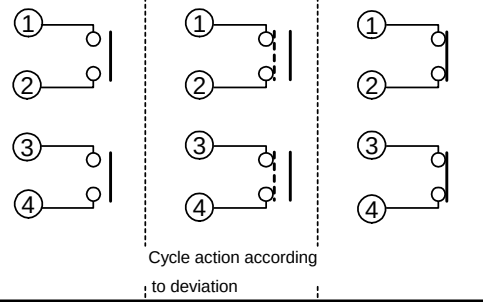
<tr><td>Relay contact output Ch1
Relay contact output Ch2</td><td> 
</td><td> 
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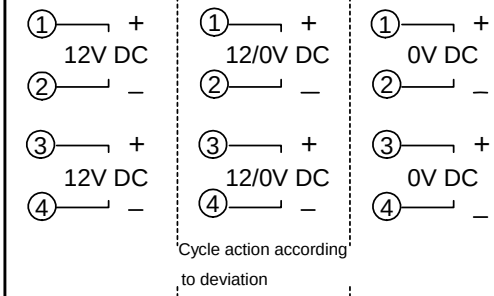
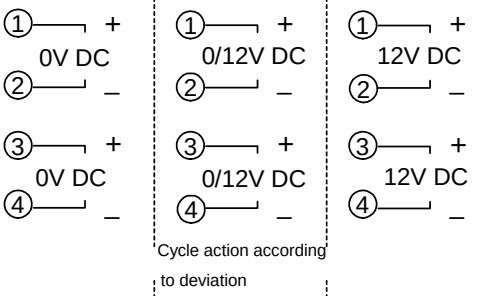
<tr><td>Non-contact voltage output Ch1
Non-contact voltage output Ch2</td><td> 
</td><td> 
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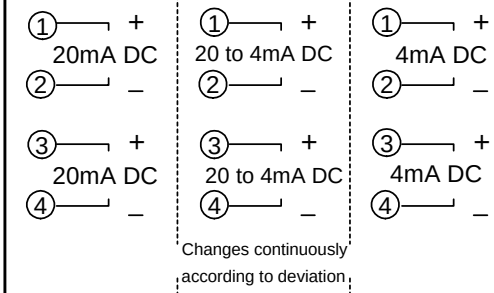
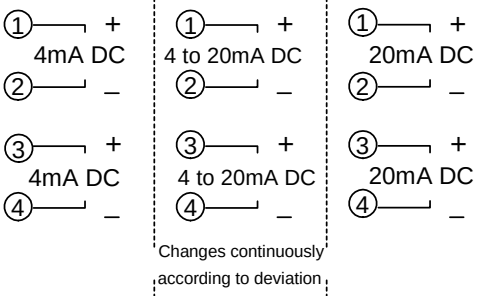
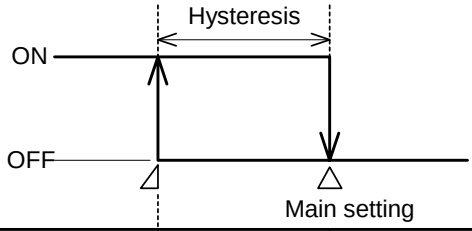
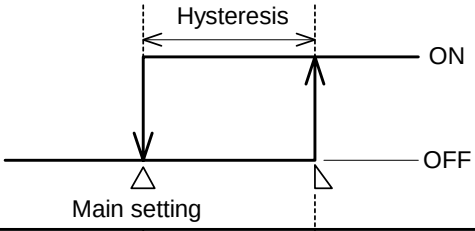
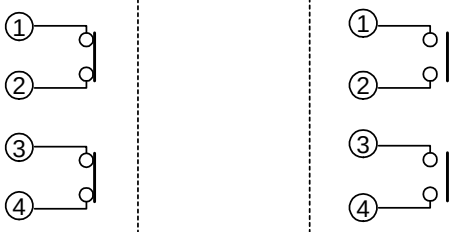
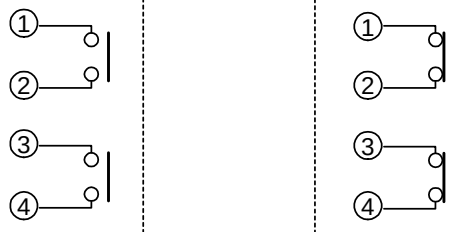
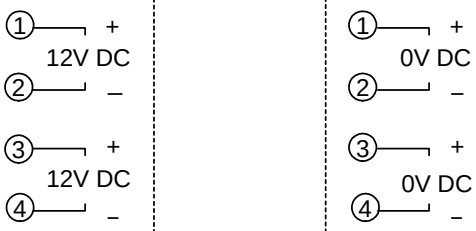
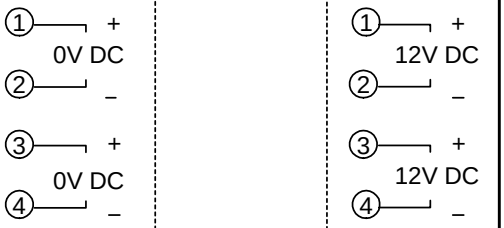
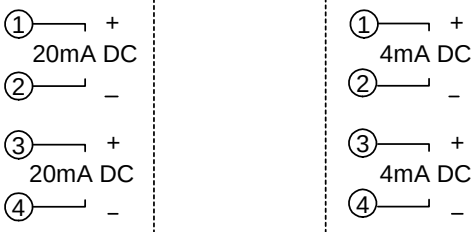
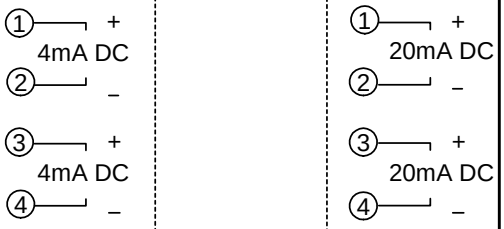
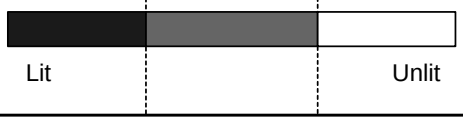
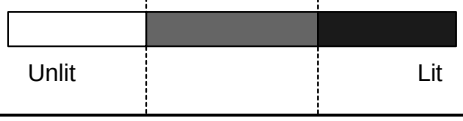
<tr><td>Current output Ch1
Current output Ch2</td><td> 
</td><td> 
</td></tr>
<tr><td>Indicators O1, O2 Green</td><td> 
</td><td> 
</td></tr>
</table>

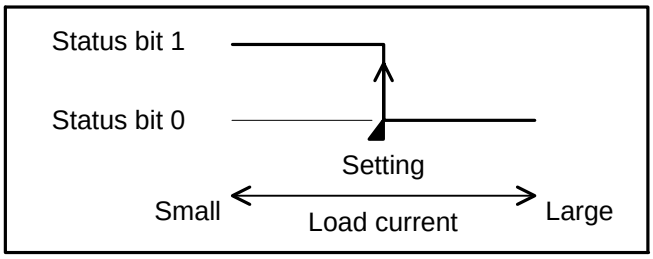
: Alternates between ON and OFF.

9.4 ON/OFF action

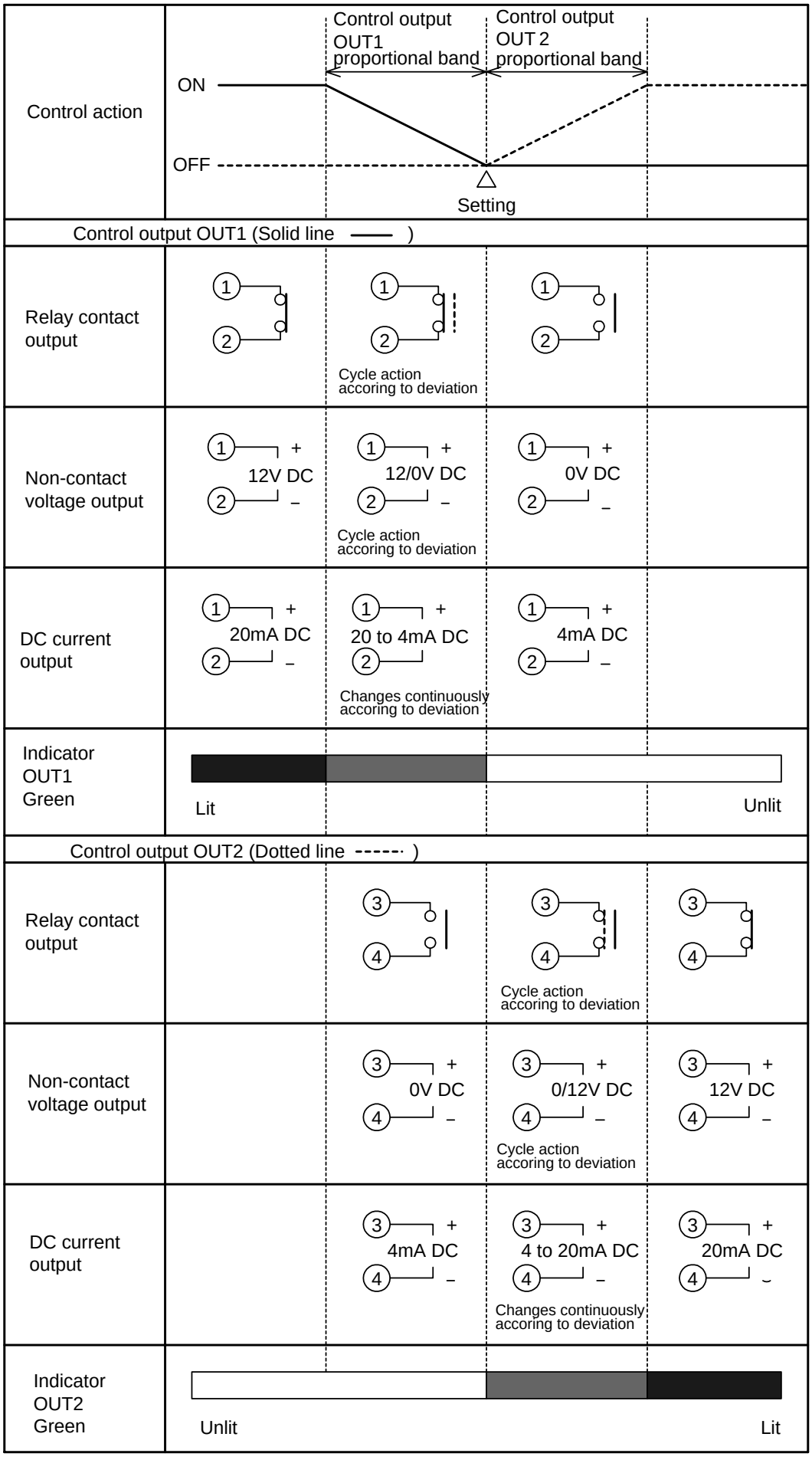
Action	Heating (reverse) action	Cooling (direct) action
Control action		
Relay contact output Ch1 **Relay contact output Ch2**		
Non-contact voltage output Ch1 **Non-contact voltage output Ch2**		
DC current output Ch1 **DC current output Ch2**		
Indicators O1, O2 Green		

: Acts either ON or OFF.

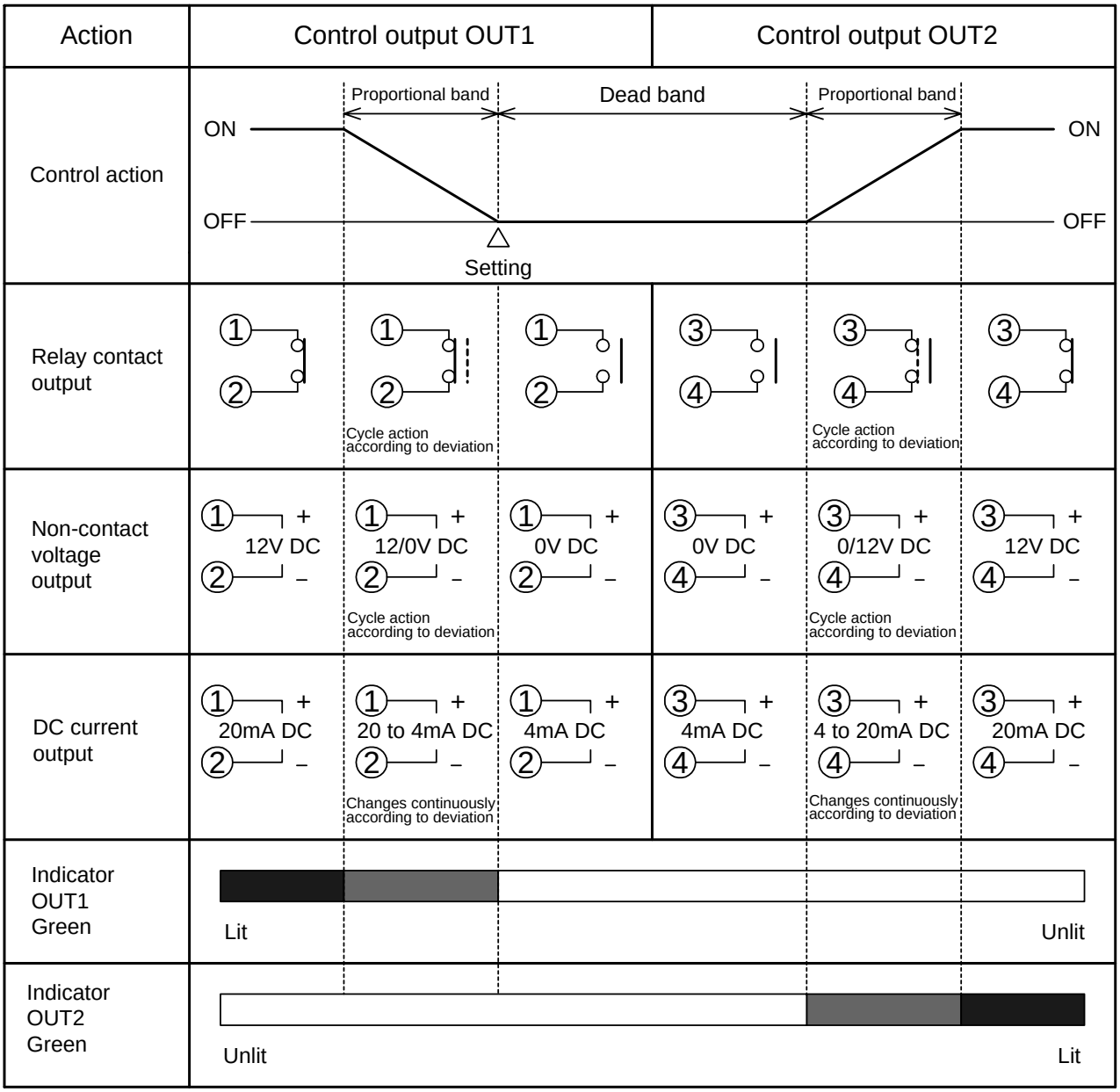
9.5 Heater burnout alarm action



9.6 Heating/Cooling action

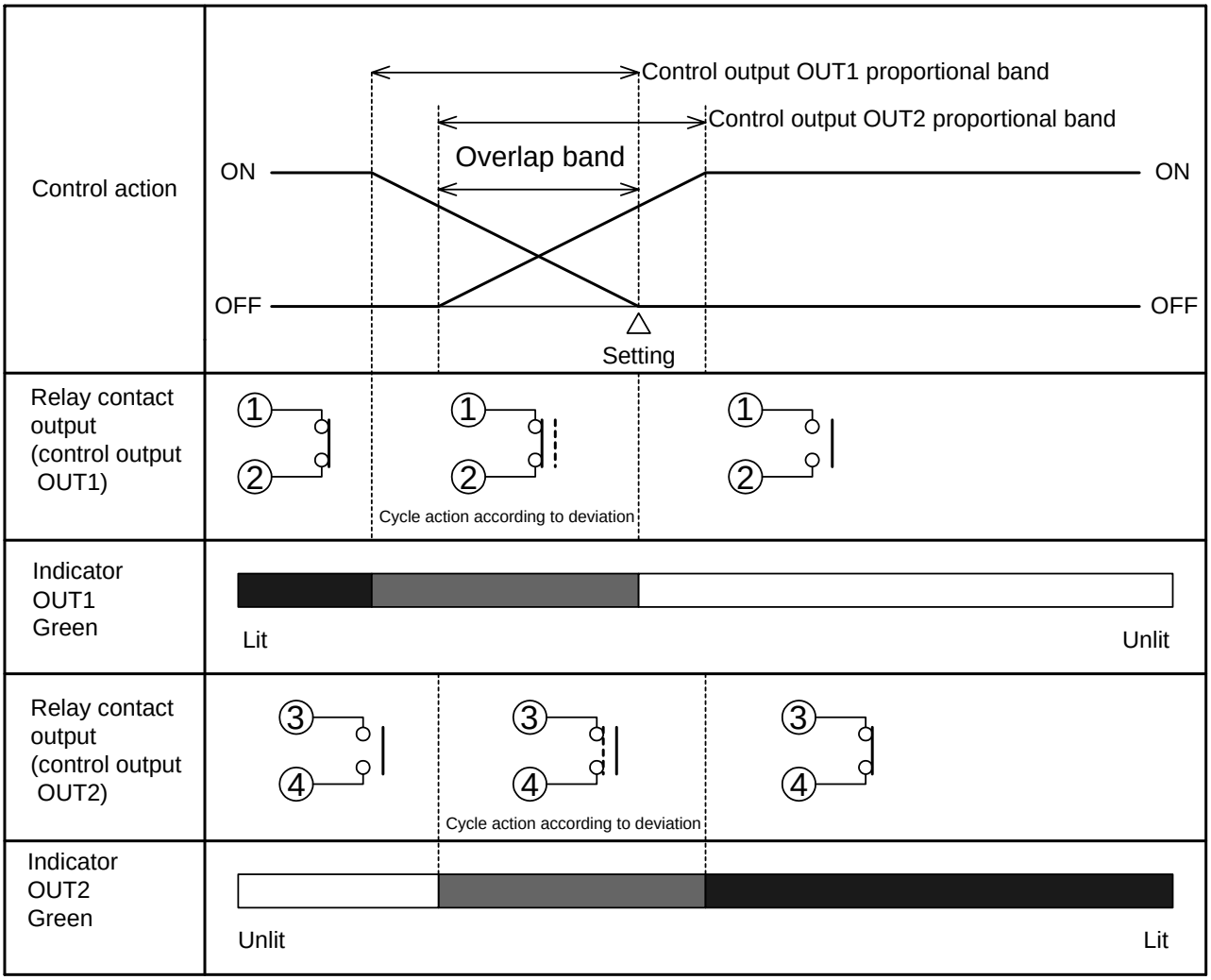


9.7 Heating/cooling action (when setting dead band)



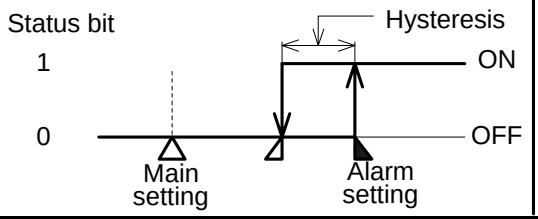
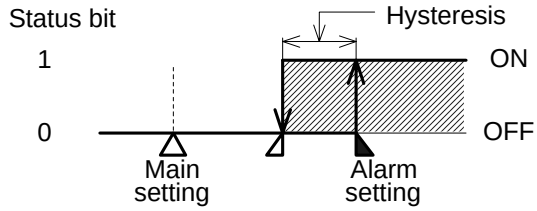
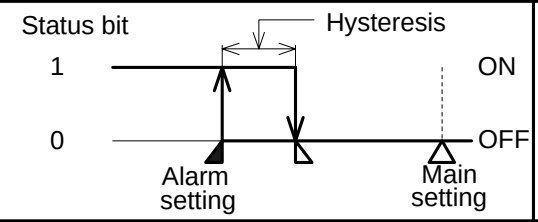
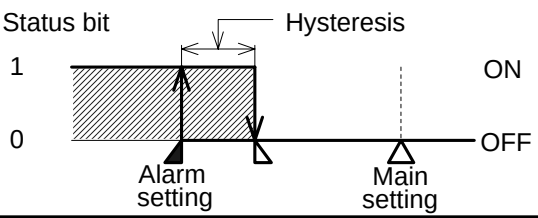
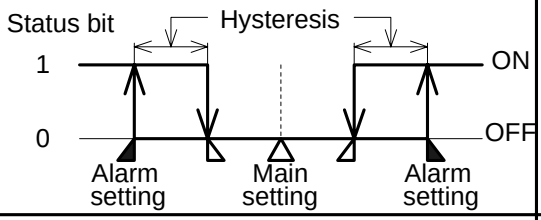
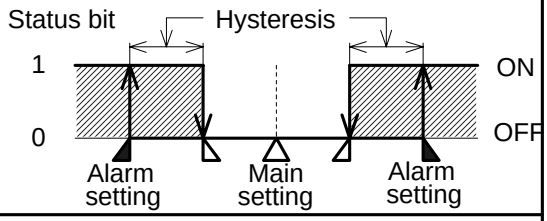
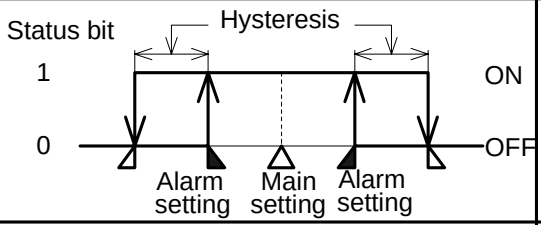
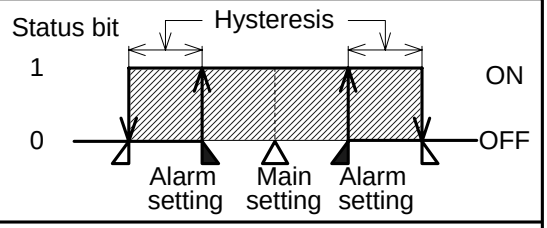
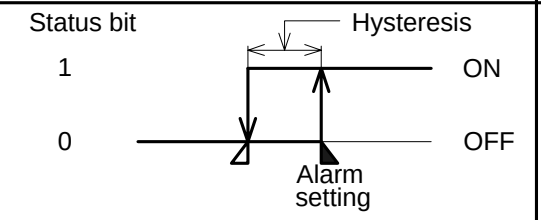
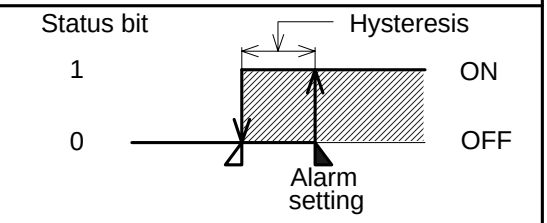
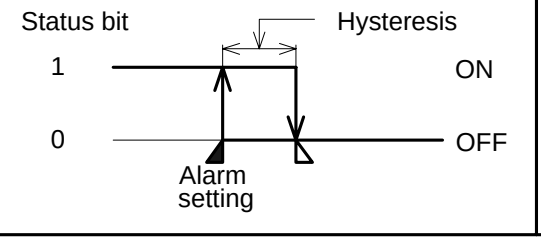
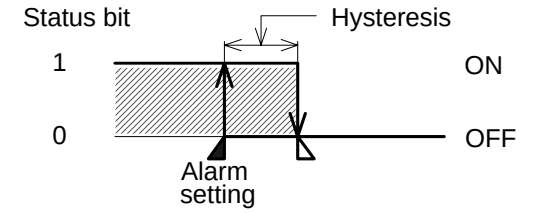
: Alternates between ON and OFF.

9.8 Heating/cooling action (when setting overlap band with relay contact output)



: Alternates between ON and OFF.

9.9 Alarm 1 (A1), Alarm 2 (A2) action

High limit alarm action	High limit alarm with standby
	
Low limit alarm action	Low limit alarm with standby
	
High/Low limits alarm action	High/Low limits alarm with standby
	
High/Low limit range alarm action	High/Low limit range alarm with standby
	
Process high alarm	Process high alarm with standby
	
Process low alarm	Process low alarm with standby
	

 part: The standby functions.

◢ or ◣ is the action point that alarm is turned on.

● **Explanation of the alarm action with standby function**

When the power is initially supplied to the controller, the function disables alarm action even if the input value is in the range in which the alarm action works, and this also prevents the alarm even if the alarm action point enters the above range as a result of the main set value change during control.

Once the input value exceeds the alarm action point continuing the control, the standby function will be released and when the input value reaches the point again, the alarm action output will work.

10. Other functions

• **Power failure countermeasure**
If the power failure time exceeds 30ms, the setting data is backed up in non-volatile memory.

• **Self-diagnosis**
The CPU is monitored by a watchdog timer, and when any abnormal status is found on the CPU, the controller is switched to warm-up status.

• **Automatic cold junction temperature compensation** (for the thermocouple input type)
This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains it at the same status as when the reference junction is located at 0℃ (32℉).

• **Sensor burnout alarm** [Overscale]
When the thermocouple or RTD is burnt out, the control output is turned off (for DC current output, control output low limit value) and the overscale status bit becomes “1”.

• **Input burnout**
[TC, RTD input]
If input value rises to [rated scale maximum value + 5% of rated scale span] or more, the control output is turned off (for DC current output, control output low limit value) and the overscale status bit becomes “1”.
If input value falls to [rated scale minimum value – 50℃ (℉)] or less, the control output is turned off (for DC current output, control output low limit value) and the underscale status bit becomes “1”.

[DC voltage and DC current input]
If [Output status selection when input abnormal: OFF] is selected, and if input value rises to [rated scale maximum value + 10% of rated scale span] or more, or falls to [rated scale minimum value –10% of rated scale span] or less, the control output is turned off (for DC current output, control output low limit value) and the overscale or underscale status bit becomes “1”.

If [Output status selection when input abnormal: ON] is selected, even if the input value rises to [rated scale maximum value + 10% of rated scale span] or more, or falls to [rated scale minimum value –10% of rated scale span] or less, the control output is not turned off. The control keeps performing.
However, the overscale or underscale status bit becomes “1”.

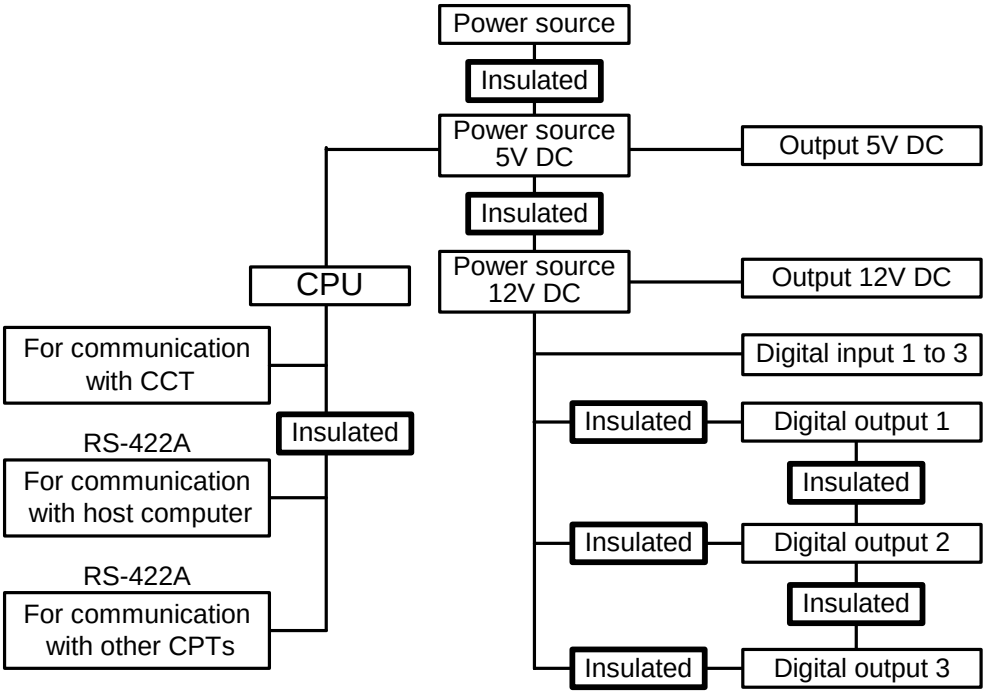
11. Specifications

11.1 Power source host link unit (CPT-20A)

(1) Standard specifications

Name	Power source host link unit
Model	CPT-20A
Supply voltage	100 to 240V AC, 50/60Hz
Allowable voltage fluctuation	85 to 264V AC
Power output for CCT and CLT	2.0A 5±0.2V DC 0.8A 12^{+2}_{0}V DC
External dimensions	48 x 96 x 100mm (W x H x D)
Mounting method	Base unit (CBT-2□□) mounting
Case	Flame-resistant resin, Black
Action indicator	While the power is turned ON, a green LED (POWER) lights up. While communicating with the host computer, a yellow LED (TX/RX) lights up.
Setting	
Instrument number setting	Rotary switch
Communication setting	
	DIP switch No.1 : Communication speed between CPT and host computer (P.10)
	DIP switch No.2 : Terminator ON/OFF (p. 10)
	DIP switch No.3 to No.6 : Communication form (p.11)
	DIP switch No.7 and No.8: Digital output (p.11)
Digital input	Contact input
	Between terminal 5 and 8, Closed: DI1 ON Open: DI1 OFF
	Between terminal 6 and 8, Closed: DI2 ON Open: DI2 OFF
	Between terminal 7 and 8, Closed: DI3 ON Open: DI3 OFF
Digital output	Relay contact : 1a
	Contact capacity: 3A 250V AC (resistive load)
	1A 250V AC (Inductive load cosø=0.4)
	Between terminal 9 and 10 : DO1
	Between terminal 11 and 12 : DO2
	Between terminal 13 and 14 : DO3
Host communication function	
Communication line	Based on RS-422A (RS-485)
Communication method	Half-duplex communication start-stop synchronous
Communication speed	19200bps, 9600bps (Selectable by DIP switch.) (Default value: 9600bps)
Data format	Start bit : 1 Data length : 7 Parity : Even Stop bit : 1

Circuit insulation configuration



Insulation resistance

Between power terminal and grounding terminal ·: 10MΩ or more, at 500V DC
Between power terminal and digital output ·····: 10MΩ or more, at 500V DC
Between power terminal and digital input ·····: 10MΩ or more, at 500V DC
Between digital output and grounding terminal ··: 10MΩ or more, at 500V DC
Between digital input and grounding terminal ···: 10MΩ or more, at 500V DC

Dielectric strength

Between power terminal and grounding terminal ·: 1.5kV AC for 1 minute
Between power terminal and digital output ·····: 1.5kV AC for 1 minute
Between power terminal and digital input ·····: 1.5kV AC for 1 minute
Between digital output and grounding terminal ··: 1.5kV AC for 1 minute
Between digital input and grounding terminal ·: 1.5kV AC for 1 minute

Power consumption : Approx. 28VA (When connecting 8 units of CCT-235 and one CLT-200)
Ambient temperature : 0 to 50℃ (32 to 122℉)
Ambient humidity : 35 to 85%RH (Non-condensing)
Weight : Approx. 290g
Accessories : Dust-proof cover for modular jack, 1 piece
Instruction manual, 1 copy
Terminal cover (when the TC option is applied), 2 pieces

(2) Optional specifications

Terminal cover [TC]
Electrical shock protection terminal cover

11.2 Temperature control unit (CCT-235)

(1) Standard specifications

Model name: Temperature control unit (2-channel specification): CCT-235-2□/□
Temperature control unit (Heating/Cooling specification): CCT-235-□/□, D□

Rated scale

Input	Scale Range		Resolution
K	-200 to 1370 ℃	-320 to 2500 ℉	1℃ (℉)
J	-200 to 1000 ℃	-320 to 1800 ℉	1℃ (℉)
R	0 to 1760 ℃	0 to 3200 ℉	1℃ (℉)
B	0 to 1820 ℃	0 to 3300 ℉	1℃ (℉)
PL-Ⅱ	0 to 1390 ℃	0 to 2500 ℉	1℃ (℉)
N	0 to 1300 ℃	0 to 2300 ℉	1℃ (℉)
K	0.0 to 600.0 ℃	0.0 to 999.9 ℉	0.1℃ (℉)
J	0.0 to 600.0 ℃	0.0 to 999.9 ℉	0.1℃ (℉)
Pt100	-199.9 to 850.0℃	-199.9 to 999.9℉	0.1℃ (℉)
JPt100	-199.9 to 500.0℃	-199.9 to 900.0℉	0.1℃ (℉)
DC voltage	0 to 10000		1
DC current	0 to 10000		1

Input

Thermocouple : K, J, R, B [JIS, IEC], PL-Ⅱ [NBS], N [IEC]
External resistance 100Ω or less
Multi-range (Selectable by the rotary switch)

RTD : Pt100 [JIS, IEC], JPt100 3-wire system
Resistance, 10Ω or less per wire

DC voltage : 0 to 1V DC, Input impedance 1MΩ or more
Allowable input voltage 5V DC or less
Allowable signal source resistance 2kΩ or less

DC current : 4 to 20mA DC, Input impedance 50Ω

Input burnout status : Overscale (TC, RTD and DC voltage input)
Underscale (DC current input)

Input sampling period: 0.25 sec. (When heater burnout alarm is applied: 0.5 sec.)

Supply voltage

5±0.2V DC, Maximum 100mA
12^{+2}_{0}V DC, Maximum 50mA
} The power is supplied by the CPT-20A.

External dimensions : 24 x 96 x 100mm (W x H x D)

Mounting method : Base unit (CBT-2□□) mounting

Case : Flame-resistant resin, Color: Black

Action indicator

PW (Power) : A green LED lights up when power supply to the unit is turned on.

O1 (OUT1) : A green LED lights up when control output is on (relay contact output, non-contact voltage output type).
A green LED keeps flashing during the control (DC current output type).

O2 (OUT2) : A green LED lights up when control output is on (relay contact output, non-contact voltage output type).
A green LED keeps flashing during the control (DC current output type).

TX : A yellow LED lights up when the CCT transmits data to the CPT-20A.

Setting

Input type : Rotary switch

Instrument number : Automatic
Numbers are given to the unit (1 to 10) automatically in sequence from the right side of the CPT-20A (Power source host link unit).

Other set values : Received from the host computer via CPT-20A (Power source host link unit).

Setting accuracy

Within ±0.3% of input span ±1 digit

[2-channel specification: CCT-235-2□/□]

Control action

Common to Ch1 and Ch2
Cooling (direct), Heating (reverse) action: Selectable by the command.
PID (with auto-tuning), PD or ON/OFF action: Selectable by the command.

PID action (With auto-tuning)

Proportional band (P): 0.0 to 100.0% (ON/OFF action when set to 0.0)
(Default value: 2.5%)
Integral time (I) : 0 to 3600s (Off when set to 0.) (Default value: 200s)
Derivative time (D) : 0 to 3600s (Off when set to 0.) (Default value: 50s)
ARW : 0 to 100% (Default value: 0%)
Proportional cycle : 1 to 120s
(Default value: 30s for relay contact output,
3s for Non-contact voltage output and
Not available for DC current output type)

PD action

Proportional band (P): 0.0 to 100.0% (ON/OFF action when set to 0.0)
Derivative time (D): 0 to 3600s (Off when set to 0.)
Proportional cycle : 1 to 120s
Reset : ±Proportional band converted value
[However, within -199.9 to 999.9℃ (℉)]

ON/OFF action

Hysteresis : Thermocouple, RTD input: 0.1 to 100.0℃ (℉) (Default value: 1.0℃)
DC voltage, DC current input: 1 to 1000 (Default value: 10)

Control output

Same specification for Ch1 and Ch2
Relay contact : 1a
3A 250V AC (resistive load)
1A 250V AC (inductive load cosø =0.4)
Non-contact voltage (For SSR drive) : 12^{+2}_{0}V DC, Maximum 20mA (short circuit protected)
DC current : 4 to 20mA DC (load resistance, maximum 550Ω)

[Heating/Cooling specification: CCT-235-□/□, D□]

Control action

If Heating/Cooling control output is applied, all Ch2 functions become invalid.
PID (with auto-tuning), PD or ON/OFF action can be selected by the command.

PID action (with auto-tuning)

Heating side (main control): The same control action as the 2-channel specification
Cooling side (sub control)
Proportional band : Multiplying factor to the Heating side proportional band, 0.0 to 10.0
(ON/OFF action when set to 0.0)
Proportional cycle : 1 to 120s
Default value: 30s for relay contact output (DR),
3s for Non-contact voltage output (DS),
Not available for DC current output type (DA)]
Overlap band/Dead band setting:
Setting range: ±100.0℃ (℉) (TC, RTD input)
±1000 (DC voltage, DC current input)
Cooling action mode:
Air cooling (linear characteristic) (Default value: Air cooling)
Oil cooling (1.5th power of the linear characteristic)
Water cooling (2nd power of the linear characteristic)

PD action

Heating side (main control): The same control action as the 2-channel specification
Cooling side (sub control)
Proportional band : Multiplying factor to the Heating side proportional band, 0.0 to 10.0
(ON/OFF action when set to 0.0)

Proportional cycle : 1 to 120s
[Default value: 30s for relay contact output (DR),
3s for Non-contact voltage output (DS),
Not available for DC current output type (DA)]
Overlap band/Dead band setting:
Setting range: ±100.0℃ (℉) (TC, RTD input)
±1000 (DC voltage, DC current input)
Cooling action mode:
Air cooling (linear characteristic) (Default value: Air cooling)
Oil cooling (1.5th power of the linear characteristic)
Water cooling (2nd power of the linear characteristic)

ON/OFF action

Heating side (main control) : The same control action as the 2-channel specification
Cooling side (sub control) : The same control action as the 2-channel specification
Overlap band, dead band setting:
Setting range: ±100.0℃ (℉) (TC, RTD input)
±1000 (DC voltage, DC current input)

Control output

The same control output as the 2-channel specification
[Ch2 is used for cooling (sub control) output.]

Temperature alarm

Alarm 1: High limit alarm, Alarm 2: Low limit alarm
One alarm can be selected from 13 types of alarm by the command.
(If an alarm is activated, the temperature alarm status bit becomes 1.)

No alarm	
High limit alarm	-200 to 200℃ (-200 to 200℉)(Off when set to 0) (Deviation setting)
High limit w/standby	-200 to 200℃ (-200 to 200℉)(Off when set to 0) (Deviation setting)
Low limit alarm	-200 to 200℃ (-200 to 200℉)(Off when set to 0) (Deviation setting)
Low limit w/standby	-200 to 200℃ (-200 to 200℉)(Off when set to 0) (Deviation setting)
High/Low limits alarm	0 to 200℃ (0 to 200℉)(Off when set to 0) (Deviation setting)
H/L limits alarm w/standby	0 to 200℃ (0 to 200℉)(Off when set to 0) (Deviation setting)
High/Low limit range alarm	0 to 200℃ (0 to 200℉)(Off when set to 0) (Deviation setting)
H/L limit range alarm w/standby	0 to 200℃ (0 to 200℉)(Off when set to 0) (Deviation setting)
Process high alarm	Input range minimum to input range maximum value
Process high alarm w/standby	Input range minimum to input range maximum value
Process low alarm	Input range minimum to input range maximum value
Process low alarm w/standby	Input range minimum to input range maximum value

However, if input range has a decimal point, the setting range is as follows
(except Process high and Process low alarm).
-199.9 to 200.0℃ (-199.9 to 200.0℉) or 0.0 to 200.0℃ (0.0 to 200.0℉)
For DC input range: -2000 to 2000 or 0 to 2000

Setting accuracy : Within ±0.3% of input span ±1digit
Action : ON/OFF action
Hysteresis : Thermocouple, RTD input: 0.1 to 100.0℃ (℉) (Default value: 1.0℃)
DC voltage, DC current input: 1 to 1000 (Default value: 10)

Loop break alarm

Detects Heater burnout, Sensor burnout and actuator trouble.
(When any burnout above is detected, the status bit of loop break alarm becomes 1.)
Setting range:
Loop break alarm time setting: 0 to 200 minutes (Off when set to 0)
Loop break alarm span setting: Thermocouple, RTD input-- 0.0 to 100.0℃ (℉)
DC voltage, DC current----- 0 to 1000
(Off when set to 0 or 0.0.)

Sensor correction

Shifts the input value.

Correction range TC, RTD input: -100.0 to 100.0℃ (℉)
DC input : -1000 to 1000

PV filter time constant

Setting range: 0.0 to 10.0 seconds

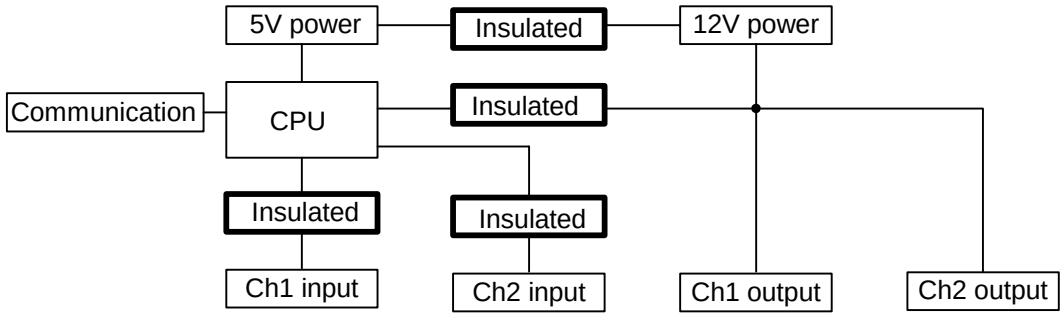
Multi-range function (Ch1 and Ch2 input are of the same specification.)

Can be selected by the Rotary switch.

Thermocouple : K, J, R, B, N, PL-Ⅱ, N
RTD : Pt100, JPt100
DC voltage : 0 to 1V DC
DC current : 4 to 20mA DC

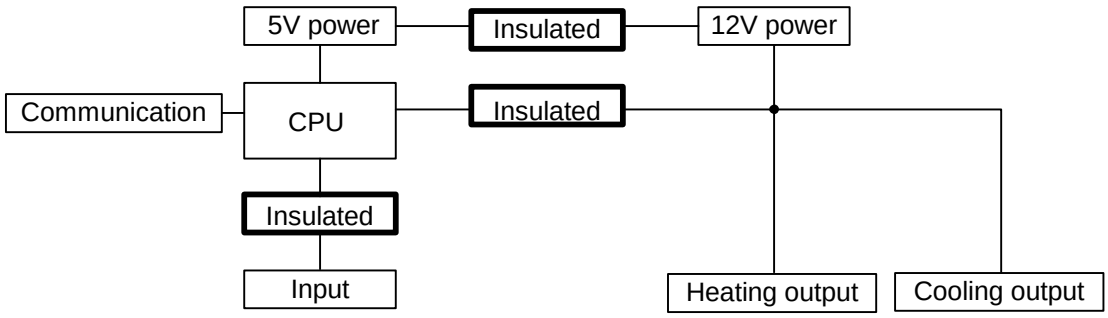
Circuit insulation configuration

[2-channel specification: CCT-235-2□/□]



For the relay contact output, Ch1 output is insulated from Ch2 output.

[Heating/Cooling specification: CCT-235-□/□, D□]



If Heating or Cooling output is relay contact output, Heating output is insulated from Cooling output.

Insulation resistance

2-channel specification (CCT-235-2□/□)	
Between Ch1 input and Ch2 input,	10MΩ or more, at 500V DC
Between Ch1 input and Ch1 output,	10MΩ or more, at 500V DC
Between Ch1 input and Ch2 output,	10MΩ or more, at 500V DC
Between Ch2 input and Ch1 output,	10MΩ or more, at 500V DC
Between Ch2 input and Ch2 output,	10MΩ or more, at 500V DC
Heating/Cooling specification (CCT-235-□/□, D□)	
Between input and heating output,	10MΩ or more, at 500V DC
Between input and cooling output,	10MΩ or more, at 500V DC

Dielectric strength

2-channel specification (CCT-235-2□/□)	
Between Ch1 input and grounding,	1.5kV AC for 1 minute
Between Ch2 input and grounding,	1.5kV AC for 1 minute
Between Ch1 output and grounding,	1.5kV AC for 1 minute
Between Ch2 output and grounding,	1.5kV AC for 1 minute
Heating/Cooling specification (CCT-235-□/□, D□)	
Between input and grounding,	1.5kV AC for 1 minute
Between heating output and grounding,	1.5kV AC for 1 minute
Between cooling output and grounding,	1.5kV AC for 1 minute

Attached functions : Power failure countermeasure
Self-diagnosis
Automatic cold junction temperature compensation (TC input type)
Input burnout
Overscale, underscale

Power consumption : Approx. 3VA

Instantaneous power failure : Within 30ms

Ambient temperature : 0 to 50℃ (32 to 122℉)

Ambient humidity : 35 to 85%RH (Non-condensing)

Weight : Approx. 110g

Accessories : Instruction manual 1 copy
Joint spacer 1 piece
Terminal cover 1 piece, when TC option is applied

[2-channel specification CCT-235-2□/□]
Wire harness 3m, 2 lengths, when W option is applied
Current transformer (CTL-6-S) 2 pieces, when W(20A) option is applied
Current transformer (CTL-12-S36-10L1) 2 pieces, when W(50A) option is applied

[Heating/Cooling specification CCT-235-□/□, D□]
Wire harness 3m, 1 length, when W option is applied.
Current transformer (CTL-6-S) 1 piece, when W(20A) option is applied
Current transformer (CTL-12-S36-10L1) 1 piece, when W(50A) option is applied

(2) Optional specifications

Heater burnout alarm output [Option code: W]

Monitors the heater current with the CT (current transformer) and detects the burnout.
However, this option cannot be applied to the DC current output type.

Rating 20A [When W (20A) option is applied.]
50A [When W (50A) option is applied.]
} Must be specified when ordering.

Setting range Rating 20A: 0.0 to 20.0A
Rating 50A: 0.0 to 50.0A
} Off when set to 0.0.

Setting accuracy ±5%

Action point Set value

Action ON/OFF action
(When heater burnout is detected, status bit of heater burnout alarm becomes 1.)

Terminal cover [Option code: TC]

Electric shock protection terminal cover

12. Troubleshooting

If any malfunctions occur, check if the power is supplied to the host computer and C series.
When the power is supplied to the C series, the green LED of Power indicator (PW) lights.
Check the following when the C series does not work even if its indicator lights.

> ⚠ **Warning**
>
> **Turn the power supplied to the instrument OFF before wiring or checking.**
> **Working with the power switched ON may result in severe injury or death due to Electric Shock.**

● **Problem: The control output of CCT-235 cannot be turned on. (The temperature does not rise.)**
When the control output is on, the green indicator of OUT1 or OUT2 (O1 or O2) of the CCT-235 lights up.

Presumed cause	Solution
• Input (sensor) burnout or imperfect connection between cable and terminal	• Change the sensor or securely connect the cable to the terminal.
• The set value has not been set yet.	• Set the set value from the host computer.
• Control action is set to “Stop”.	• Set the control action to “Perform”.
• Control output OUT1 or OUT2 (O1 or O2) high limit value is set to 0%.	• Set the control output OUT1 or OUT2 (O1 or O2) high limit value to a suitable value.

● **Problem: The control output of CCT-235 cannot be turned off. (The temperature rises too much.)**
When the control output is off, the indicator for OUT1 or OUT2 (O1 or O2) of CCT-235 is turned off as well.

Presumed cause	Solution
• The polarity of Sensor and terminal does not agree with each other.	• For wiring, refer to Chapter 6. Wiring (p.18).
• Control output OUT1 or OUT2 (O1 or O2) low limit value is set to 100%.	• Set the control output OUT1 or OUT2 (O1 or O2) low limit value to a suitable value.

● **Problem: The temperature displayed on the host computer is abnormal or unstable.**

Presumed cause	Solution
• The input (sensor) setting is mistaken.	• Set the input (sensor) of the CCT-235 properly (P.12).
• Temperature unit (℃/℉) is incorrect.	• Set it to a suitable unit (℃/℉).
• Sensor correction value is not proper.	• Set it to a suitable value.
• The AC leaks into the sensor.	• The sensor should be non-grounded type.
• There may be equipment that interferes with or makes noise near the C series.	• Keep equipment that interferes with or makes noise, away from the C series

● **Problem: The temperature displayed on the host computer is “0”.**

Presumed cause	Solution
• The CCT-235 is out of order.	• Please contact us.

● **Problem: The temperature displayed on the host computer is sometimes “0”, and returns to normal approx. 5 minutes later.**

Presumed cause	Solution
• The data outside of the setting range is sent.	• Check the setting range and set it to a suitable value again.
• There may be equipment that interferes with or makes noise near the C series.	• Keep equipment that interferes with or makes noise, away from the C series.

● **Problem: Communication failure between host computer and CPT-20A.**

Presumed cause	Solution
• The communication connector or modular jack is disconnected.	• Check the connection.
• The break of communication cable or imperfect contact of the connector.	• Change the cable, or check the connection.
• The wiring of communication cable (connector) is not correct.	Wire it properly. • Host computer (Personal computer): pp.22, 23 • Calculator link unit (AJ71UC24): p.27 • Calculator link unit (A1SJ71UC24-R4): p.27 • Micro PLC (FX2N-XXMR): p.28 • Serial communication unit (QJ71C24, QJ71C24-R2): p.29 • Host link unit (C200H-LK202-V1): p.33 • Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41): p.33 • Interface module (NC1L-RS4): p.36 • Personal computer link module (F3LC11-2N): p.37
• Setup of the host computer and CPT-20A is mistaken.	Set up the units properly. • Host computer (Personal computer): p.22 • Calculator link unit (AJ71UC24): p.24 • Calculator link unit (A1SJ71UC24-R4): p.25 • Micro PLC (FX2N-XXMR): p.26 • Serial communication unit (QJ71C24, QJ71C24-R2): p.27 • Host link unit (C200H-LK202-V1): p.32 • Serial communication unit (CS1W-SCU21-V1, CJ1W-SCU21, CJ1W-SCU41): pp.32, 33 • Interface module (NC1L-RS4): p.35 • Personal computer link module (F3LC11-2N): p.37
• When using multiple blocks of C series, the instrument number of the CPT-20A is duplicated.	• Change the instrument number (p.10).

● **Problem: Though it is able to communicate between host computer and CPT-20A, the response is "NAK".**

Presumed cause	Solution
• Non-existent command code is sent. • The unsettable status (The CPT-20A is in warm-up mode when the power is turned on).	• Send proper command. • Perform the setting after the warm-up status of the CPT-20A ends.

● For all other malfunctions, please contact our main office or dealers.

13. ASCII table

b7	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1

b4	b3	b2	b1	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE (TC7)	SP	0	@	P	`	p
0	0	0	1	1	SOH (TC1)	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX (TC2)	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX (TC3)	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT (TC4)	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ (TC5)	NAK (TC8)	%	5	E	U	e	u
0	1	1	0	6	ACK (TC6)	SYN (TC9)	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB (TC10)	'	7	G	W	g	w
1	0	0	0	8	BS (FE0)	CAN	(	8	H	X	h	x
1	0	0	1	9	HT (FE1)	EM	)	9	I	Y	i	y
1	0	1	0	A	LF (FE2)	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT (FE3)	ESC	+	;	K	[	k	{
1	1	0	0	C	FF (FE4)	FS (IS4)	,	<	L	\	l	|
1	1	0	1	D	CR (FE5)	GS (IS4)	-	=	M	]	m	}
1	1	1	0	E	SO	RS (IS4)	.	>	N	^	n	¯
1	1	1	1	F	SI	US (IS4)	/	?	O	_	o	DEL

14. Default value of the CCT-235

The default values are shown below when thermocouple input (K: -200 to 1370℃) is used.

Setting item	Default value	Remarks
Main set value (SV)	0℃	
Proportional band	2.5%	
Integral time	200 seconds	
Derivative time	50 seconds	
Alarm 1 (High limit) value	0℃	
Alarm 2 (Low limit) value	0℃	
Proportional cycle	Relay contact output: 30 seconds Non-contact voltage output: 3 seconds DC current output: Not available	
Heater burnout alarm value	0.0A	
Control action Perform/Stop	Control action Perform	
Auto-tuning Perform/Cancel	Auto-tuning Cancel	
Alarm 1 (High limit) hysteresis	1.0℃	
Alarm 2 (Low limit) hysteresis	1.0℃	
Control output ON/OFF action hysteresis	1.0℃	
Control output high limit	100%	
Control output low limit	0%	
PV filter time constant	0.0 seconds	
Temperature unit	℃	
Control action	Heating (reverse) action	
Alarm 1 type	High limit alarm	
Alarm 2 type	Low limit alarm	
Loop break alarm 1 span	0.0℃	
Loop break alarm 1 time	0 minutes	
Anti-reset windup (ARW)	0%	
PD (manual) reset	0.0℃	
Sensor correction	0.0℃	
Loop break alarm 2 span	0.0℃	
Loop break alarm 2 time	0 minutes	
Cooling proportional band	1.0	
Cooling proportional cycle	Relay contact output: 30 seconds Non-contact voltage output: 3 seconds DC current output: Not available	
Overlap band/Dead band	0.0℃	
Cooling action mode	Air cooling	
Cooling output ON/OFF action hysteresis	1.0℃	

********* Inquiry *********

For any inquiry about this unit, please contact the shop where you purchased the unit or our agency after checking the following.

- Model name ---------- CCT-235-2R/E
- Input type ---------- K: -200 to 1370℃
- Option ---------- W (20A)
- Serial number ---------- No. xxxxxx

In addition to the above, please let us know the details of malfunction, if any, and the operating conditions.

SHINKO TECHNOS CO.,LTD.
OVERSEAS DIVISION

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