OPERATING MANUAL

TEMPERATURE CONTROL MODULE

MODEL **R8-TC2**

CONTENTS

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BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact our sales office or representatives.

■ PACKAGE INCLUDES:

Temperature control module .....(1)
CJC sensor.....(2)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ OPERATING MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and detailed operation about settings.

POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- The equipment must be mounted inside a panel.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures* to ensure the CE conformity.
  * For example, installation of noise filters and clamp filters for the power source, input and output connected to the unit, etc.

■ GENERAL PRECAUTIONS

- Before you remove or mount the unit, turn off the power supply and input signal for safety.
- Switches on the side of the module can be set for maintenance only while the power supply is off. Do not access them while the power is supplied.

■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

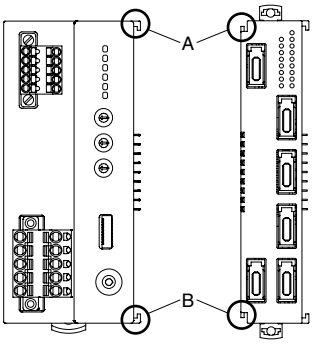
■ AND ....

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

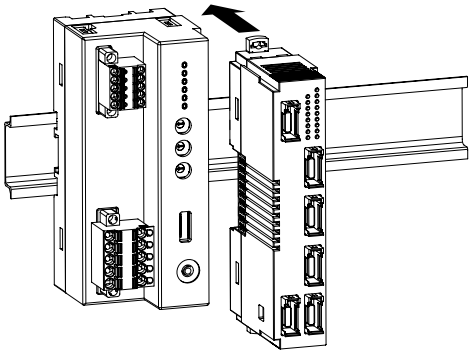
INSTALLATION

■ HOW TO MOUNT THE MODULE ON DIN RAIL

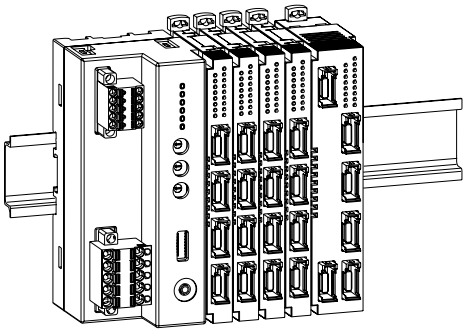
• I/O Module



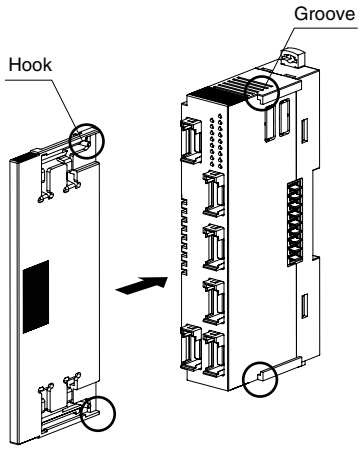
Confirm that the locking clamps of the I/O module are set. Insert the module in parallel to the next one while aligning the grooves of both modules (A & B in the above figure). Maintain it perpendicularly to the rail.



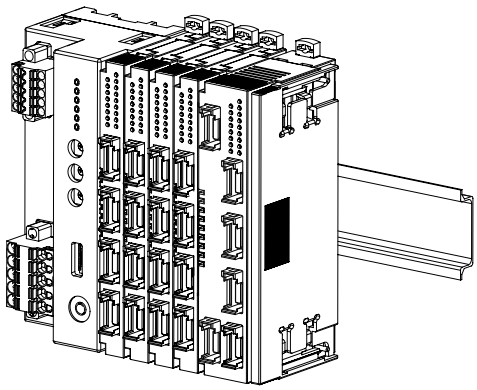
More I/O modules can be added in the same manner.



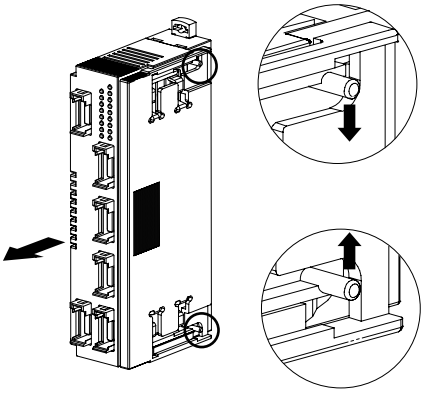
• Protective Cover



The protective cover is to be attached over the connected I/O module at the right end.
Align the hooks on the cover with the grooves of the module and slide it straight until the hooks are latched.

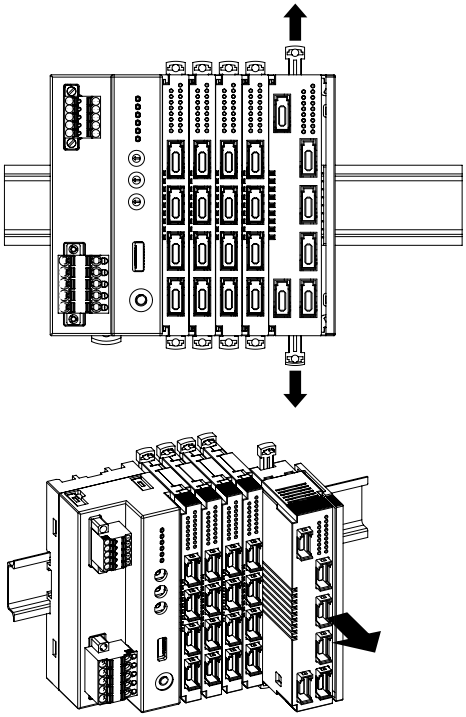


When removing the cover, pull it out while squeezing the hooks inward.

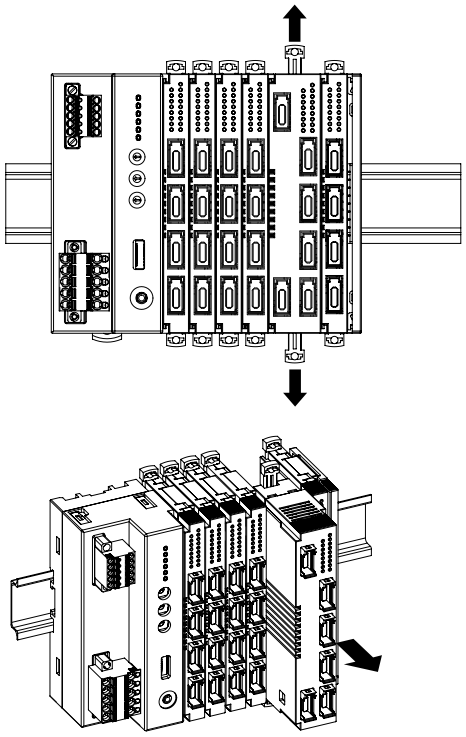


■ HOW TO UNMOUNT THE MODULE ON DIN RAIL

Release the locking clamps and pull out straight the module.



• Removing an intermediate module



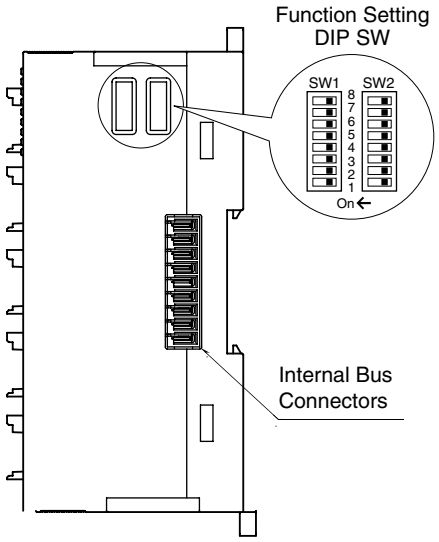
Caution !

1) Be careful not to hurt your hand by pointed edges of the internal bus connector.
2) I/O modules cannot hold tightly on the DIN rail by themselves without power/network module.

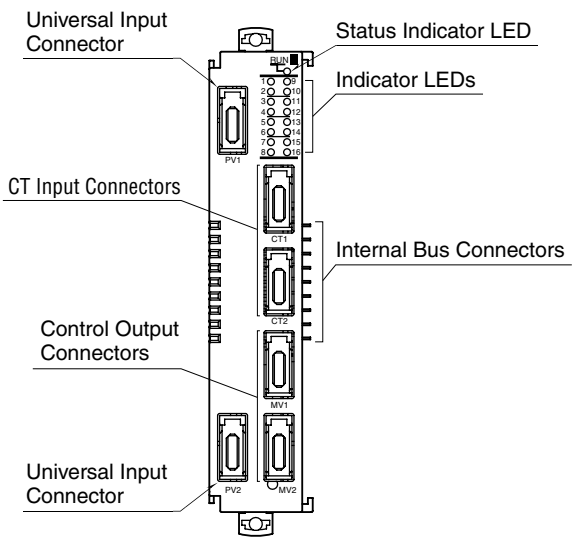
   Secure them to the position if necessary by using DIN rail end plates.

COMPONENT IDENTIFICATION

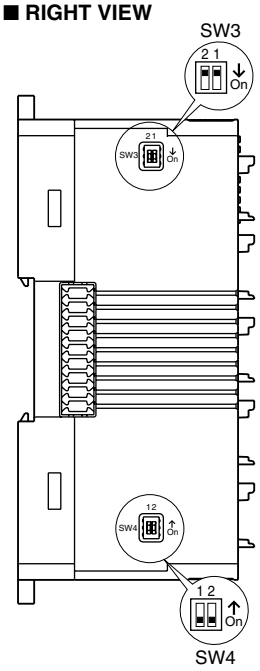
■ LEFT VIEW



■ FRONT VIEW



■ RIGHT VIEW



■ STATUS INDICATOR LED

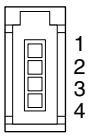
STATUS	COLOR	FUNCTION
OFF	—	Stopping
ON	Green	Valid host communication
Blinking	Green	Reading/writing configuration
ON	Red	Setting error
Blinking	Red	Parameter error

■ INDICATOR LED

NO.	FUNCTION
1	ON when loop 1 Run (Blinking at auto-tuning)
2	ON when loop 1 AUTO (Blinking at auto-tuning)
3	ON when loop 1 remote SP
4	ON when loop 1 alarm (1 to 3)
5	ON when loop 1 abnormal (input error/each alarm for CT input)
9	ON when loop 2 Run (Blinking at auto-tuning)
10	ON when loop 2 AUTO (Blinking at auto-tuning)
11	----
12	ON when loop 2 alarm (1 to 3)
13	ON when loop 2 abnormal (input error/each alarm for CT input)

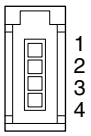
Note: No. 6 through 8, 11, 14 through 16 are unused.

■ UNIVERSAL INPUT CONNECTOR ASSIGNMENT



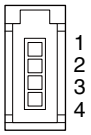
Refer to the "CONNECTION DIAGRAM" for function of each terminal.

■ CT INPUT CONNECTOR ASSIGNMENT



NO.	ID	FUNCTION
1	*k*	Power side
2	NC	No connection
3	NC	No connection
4	*l*	Load side

■ CONTROL OUTPUT CONNECTOR ASSIGNMENT



NO.	ID	FUNCTION
1	+	Output (+)
2	NC	No connection
3	NC	No connection
4	–	Output (–)

■ MODULE ADDRESS: SW1

SW1-1 through 1-4 determine the tenth place digit, while SW1-5 through 1-8 do the ones place digit of the module address.
Address is selected between 0 to 24.
(Factory setting: 0)

MODULE ADDRESS	SW1				
	×10	1	2	3	4
	×1	5	6	7	8
0		OFF	OFF	OFF	OFF
1		OFF	OFF	OFF	ON
2		OFF	OFF	ON	OFF
3		OFF	OFF	ON	ON
4		OFF	ON	OFF	OFF
5		OFF	ON	OFF	ON
6		OFF	ON	ON	OFF
7		OFF	ON	ON	ON
8		ON	OFF	OFF	OFF
9		ON	OFF	OFF	ON

■ OPERATING MODE

(*) Factory setting

• Input Selection: SW3, 4

INPUT SELECTION	UNIVERSAL INPUT 1		UNIVERSAL INPUT 2	
	SW3		SW4	
	1	2	1	2
DC Current (mV)*1	ON	OFF	ON	OFF
DC Voltage (V)*2	OFF	OFF	OFF	OFF
DC Voltage (mV)*3	OFF	ON	OFF	ON
Potentiometer	OFF	OFF	OFF	OFF
Resistor	OFF	OFF	OFF	OFF
T/C	OFF	ON	OFF	ON
RTD	OFF	OFF	OFF	OFF

*1. Input range: 0 – 20mA DC
*2. Input range: -10 – +10V DC
*3. Input range: -1000 – +1000mV DC

• Terminator DIP SW: SW2-6

TERMINATOR SW	SW2-6
Without (*)	OFF
With	ON

Note: Be sure to set unused SW 2-1 through 2-5, 2-7 and 2-8 to OFF.

PC CONFIGURATOR

The following parameter items can be configured with PC Configurator Software (model: R8CFG).
Refer to the users manual of the software for detailed operations.

- Loss of internal bus communication detection time: 0.0 to 99.9 (sec.) (factory setting 1.0 (sec.))

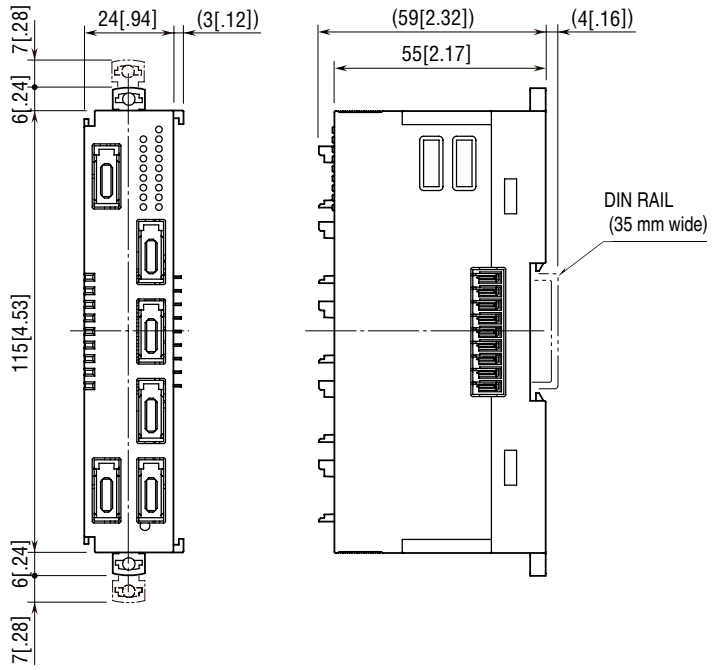
For other setting parameters than the above, please refer to the operating manual.
Note: Programming by the PC Configurator is available via the Power/Network Module.

TERMINAL CONNECTIONS

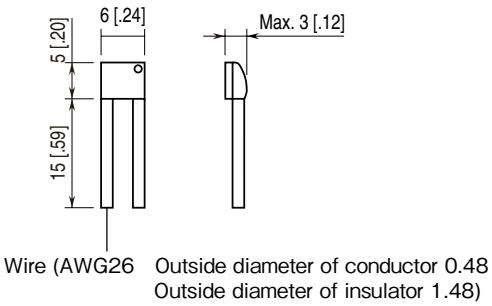
Connect the unit as in the diagram below.

■ EXTERNAL DIMENSIONS unit: mm [inch]

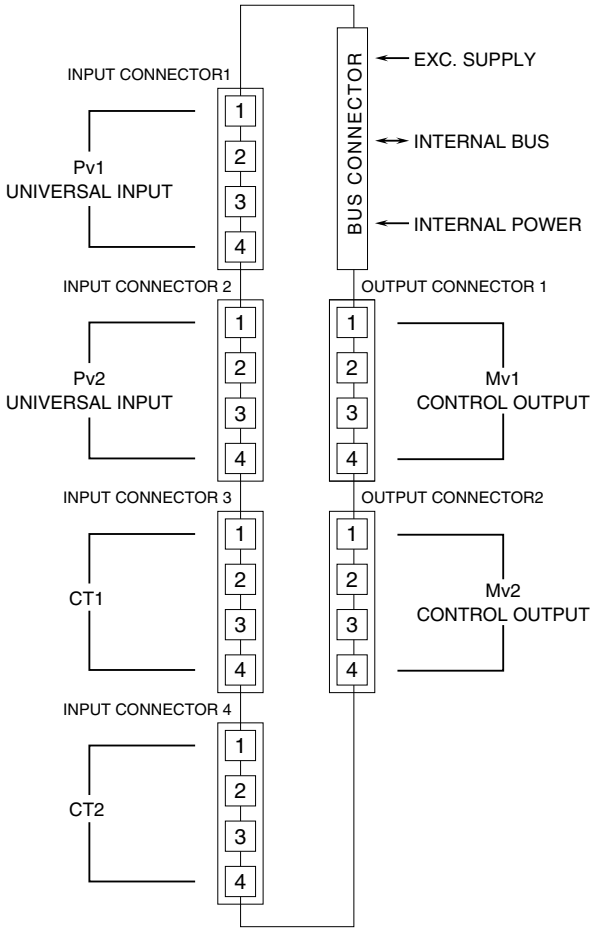
■ BODY



■ CJC SENSOR (CJM 2 pieces)

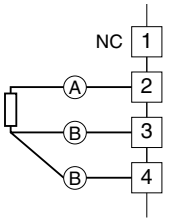


■ **CONNECTION DIAGRAM**

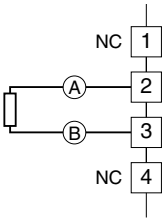


■ **UNIVERSAL INPUT (Pv1, Pv2) CONNECTION e.g.**

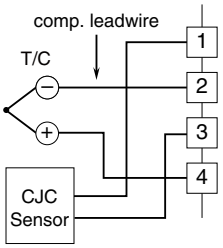
• RTD / Resistor (3-wire)



• RTD / Resistor (2-wire)

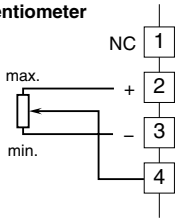


•Thermocouple

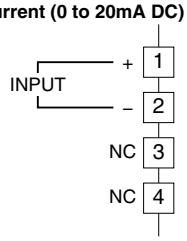


Note: No polarity for the CJC sensor.

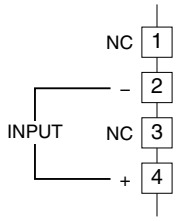
• Potentiometer



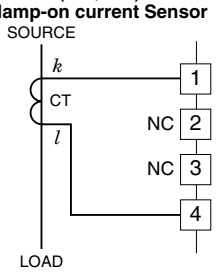
• DC Voltage (-10 to +10V DC)
• DC Current (0 to 20mA DC)



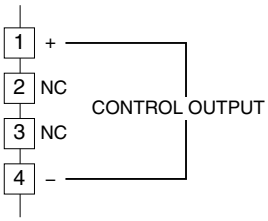
• DC Voltage (-1000 to +1000mV DC)



■ **CT INPUT (CT1, CT2) CONNECTION e.g.**
• Clamp-on current Sensor



■ **CONTROL OUTPUT (Mv1, Mv2) CONNECTION e.g.**



WIRING INSTRUCTIONS

■ **e-CON connector**

Unit side connector: XN2D-1474-S002 (Omron)
Recommended cable side connector: XN2A-1470 (Omron)*1
Applicable wire size: 0.08 to 0.5 mm² (AWG28 to 20)
Outer sheath diameter: max. 1.5 dia
*1. The cable side connector is not included in the package.
Refer to the specifications of the product.

FUNCTION DESCRIPTIONS

■ UNIVERSAL INPUT

• Input types

DC: 0 – 20mA/-1000 – +1000mV/-10 – +10V

Potentiometer: Max. total resistance 4000 Ω

Resistor: Max. 4000 Ω

RTD: Pt 100/Pt 500/Pt 1000/Pt 50 Ω/JPt 100/Ni 508.4 Ω/ Cu 10

Thermocouple: (PR)/K/E/J/T/B/R/S/C/N/U/L/P

- Two input points can be assigned respectively with one of the selections (1) through (5).
- Sampling cycle: 100 milliseconds.
- Burnout detection available for potentiometer, resistor, RTD and thermocouple inputs.
- Cold junction compensation sensors incorporated.
- Fine input adjustment available.
- DC, potentiometer and resistor inputs can be scaled into temperature ranges.
- First order lag filter for input signals.

■ CONTROL OUTPUT

• Output types

12V voltage pulse/0 – 20mA DC/0 – 10V DC selected by model number suffix code when ordering.

- Two output points by the selection (1) plus two output points with the selection (2).
- Control cycle 0.1 to 99.9 seconds. (100 msec. fixed for control output 0 – 20mA DC and 0 – 10V DC)
- Output resolution 1 millisecond.
- PV, SP and MV signals can be scaled and provided as duty ratio output; Alarm contact output (ON/OFF) also available.
- Minimum ON/OFF pulse width can be specified for relay life protection.

■ CONTROL LOOP

• Control strategies

1) Standard PID control

2) Heating-cooling PID control (independent PID operation for heating and cooling)

3) Heating-cooling ON/OFF control

- Two control loops can be assigned respectively to one of the selections (1), (2) and (3).
- Limit cycle method auto-tuning
- Direct/reverse action selectable for standard PID control.
- Input 2 can be cascaded to loop 1 as its SP (remote SP)
- MV tracking function: MV in manual mode is carried on into auto mode.
- High/low limits selectable for SP and MV values.
- Specific MV values applicable at STOP/abnormality.
- Three PV alarm modes selectable for each loop.
- Each loop setting
  SP/SP rise ramp/SP fall ramp/P/I/D/Cooling P/Cooling I/ Cooling D/Heating sensitivity/Cooling sensitivity/Deadband/PV alarm high/low limits.

■ CT INPUT

• Input type

Clamp-on current sensor (model: CLSE)

- Two input points can be assigned respectively to monitor specific control output status.
- One signal can watch heater wire break, SSR shortcircuit failure and overload at once.
- Control output must be turned on for at the minimum of 110 milliseconds to detect a heater wire break; must be turned off for at the minimum of 200 milliseconds to detect an SSR shortcircuit failure.

■ COMMUNICATION

- Monitoring and setting can be performed easily with PC Configurator Software (model: R8CFG).
- Various values such as PV, SP and MV can be read out via network communication. Also it is available to change PID parameter.

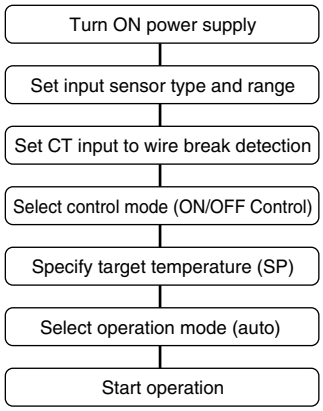
SYSTEM CONFIGURATIONS & CONTROL EXAMPLES

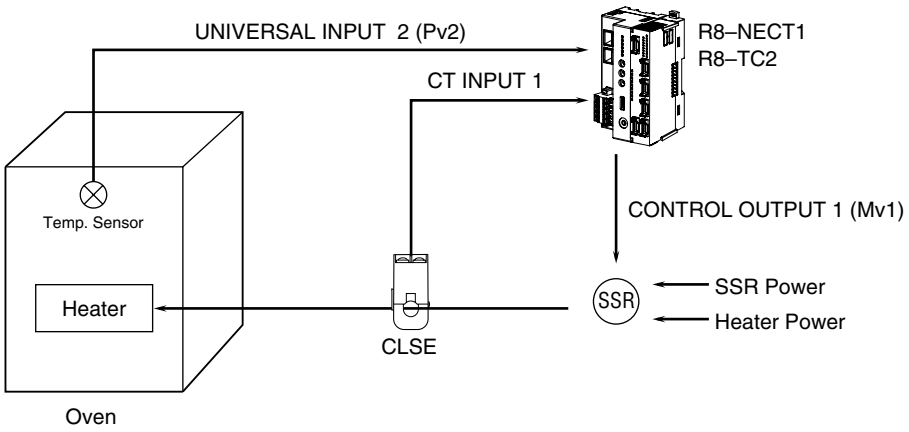
■ 1 loop heating ON/OFF control and heater wire break detection

1. Installation example:

- Power/Network Module (model: R8-NECT1)
- Temperature Control Module (model: R8-TC2)
- Clamp-on Current Sensor (model: CLSE)
- Oven
- Heater
- Relay
- Temperature sensor

2. Process until start operating:



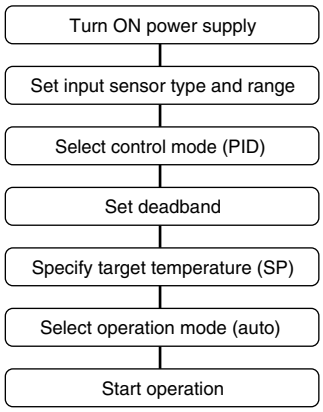


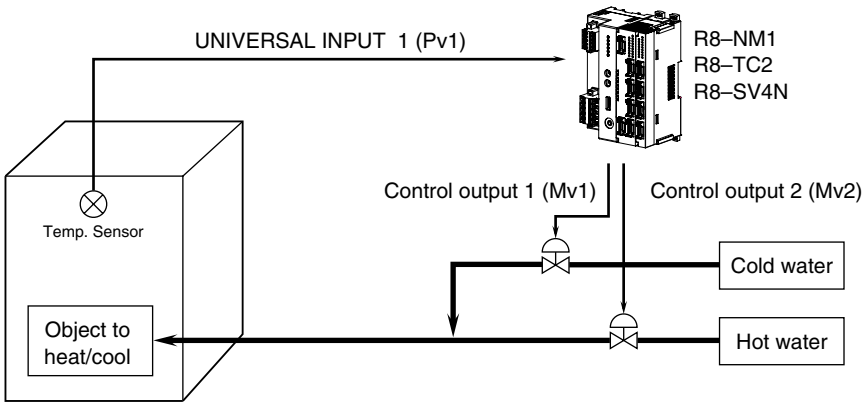
■ 1 loop heating and cooling control (PID)

1. Installation example:

- Power/Network Module (model: R8-NM1)
- Temperature Control Module (model: R8-TC2)
- DC Voltage Input Module (model: R8-SV4N other R8 modules also available)
- Object to heat/cool
- Temperature sensor

2. Process until start operating:





Note: The examples above are for single loop, however, dual loop control is also available using only one R8-TC2.

COMMUNICATION

R8-TC2 communicates each 16 words of I/O data with host via R8 network card. It is available to configure parameter of SP and PID. (Also it is available to configure with configurator software).

■ INPUT DATA

DATA NO.	PARAMETER
1	Loop 1, PV
2	Loop 1, SP (SP value when remote SP used)
3	Loop 1, Heating MV
4	Loop 1, Heating P
5	Loop 1, Heating I
6	Loop 1, Heating D
7	CT 1, Current value
8	Loop 1, Status
9	Loop 2, PV
10	Loop 2, SP
11	Loop 2, Heating MV (Loop 1, Cooling MV when Loop 1 is heating/cooling PID)
12	Loop 2, Heating P (Loop 1, Cooling P when Loop 1 is heating/cooling PID)
13	Loop 2, Heating I (Loop 1, Cooling I when Loop 1 is heating/cooling PID)
14	Loop 2, Heating D (Loop 1, Cooling D when Loop 1 is heating/cooling PID)
15	CT 2, Current value
16	Loop 2, Status

■ STATUS

BIT	PARAMETER	BIT = 0	BIT = 1
0	Loop operating condition	STOP	RUN
1	Loop control mode	MANUAL	AUTO
2	Local / Remote SP selection	Local SP	Remote SP
3	SP lamp operation	Not operating	Operating
4	Auto-tuning	Not running	Running
5	MV	OFF	ON
6	----	----	----
7	Input error	Normal	Error
8	Remote SP input error	Normal	Error
9	Heater wire break alarm	Normal	Alarm
10	SSR shortcircuit failure alarm	Normal	Alarm
11	Overload alarm	Normal	Alarm
12	PV alarm 1	Normal	Alarm
13	PV alarm 2	Normal	Alarm
14	PV alarm 3	Normal	Alarm
15	Command receiving flag	Waiting for command	Received command

■ OUTPUT DATA

To change SP, Manual MV and PID parameter, execute command after setting value in output data area.

DATA NO.	PARAMETER
1	----
2	Loop 1, SP
3	Loop 1, Heating MV
4	Loop 1, Heating P
5	Loop 1, Heating I
6	Loop 1, Heating D
7	----
8	Loop 1, Command
9	----
10	Loop 2, SP
11	Loop 2, Heating MV (Loop 1, Cooling MV when Loop 1 is heating/cooling PID)
12	Loop 2, Heating P (Loop 1, Cooling P when Loop 1 is heating/cooling PID)
13	Loop 2, Heating I (Loop 1, Cooling I when Loop 1 is heating/cooling PID)
14	Loop 2, Heating D (Loop 1, Cooling D when Loop 1 is heating/cooling PID)
15	----
16	Loop 2, Command

■ COMMAND

COMMAND	PARAMETER
0	Clear command
1	Set loop operation to RUN
2	Set loop operation to STOP
3	Set control mode to AUTO
4	Set control mode to MANUAL
8	Reset all latched alarms in the loop
9	Reset all latched PV alarms
10	Reset all latched CT alarms
24	Run auto-tuning (available when Run & Auto)
32	Change MV (available only when Manual)
40	Change SP setting (setting is not saved)
41	Change PID parameter setting (setting is not saved)
42	Change SP + PID parameter setting (setting is not saved)
48	Change SP setting (setting is saved)
49	Change PID parameter setting (setting is saved)
50	Change SP + PID parameter setting (setting is saved)

Note 1: Send the command when the command receive flag of status of input data is '0' (waiting for command). After sending the command, the command receive flag turns to '1' when device receives the command. After that, the command receive flag can be cleared by sending command '0'.

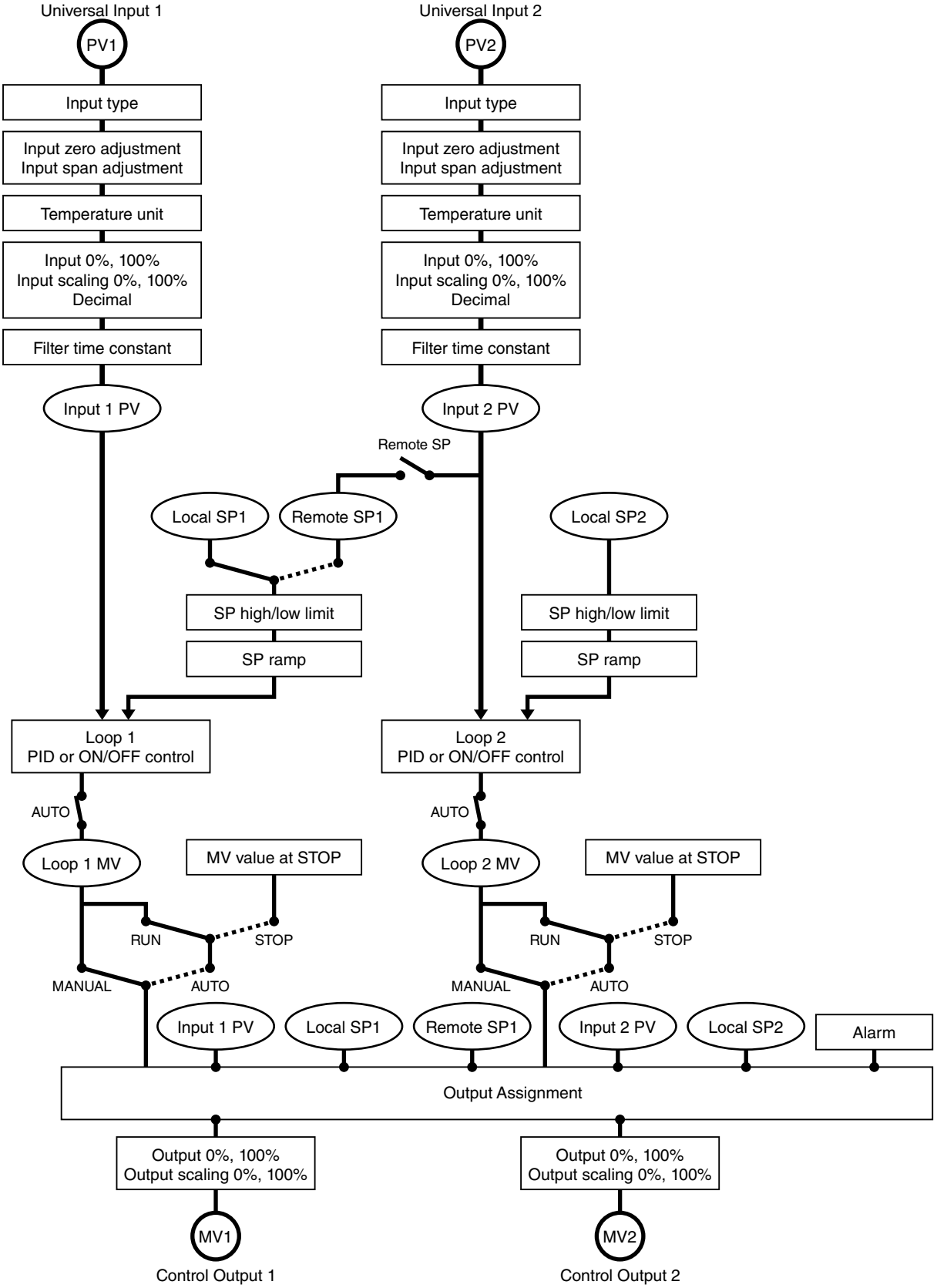
Note 2: There is a limit of 1000000 times to save setting in a non-volatile memory. Use 'setting is not saved' when SP and PID parameter is changed very often.

SETTING

It is available to configure detailed settings with Configurator software (model: R8CFG).
Refer to the users manual for the R8CFG for detailed operation of the software program.

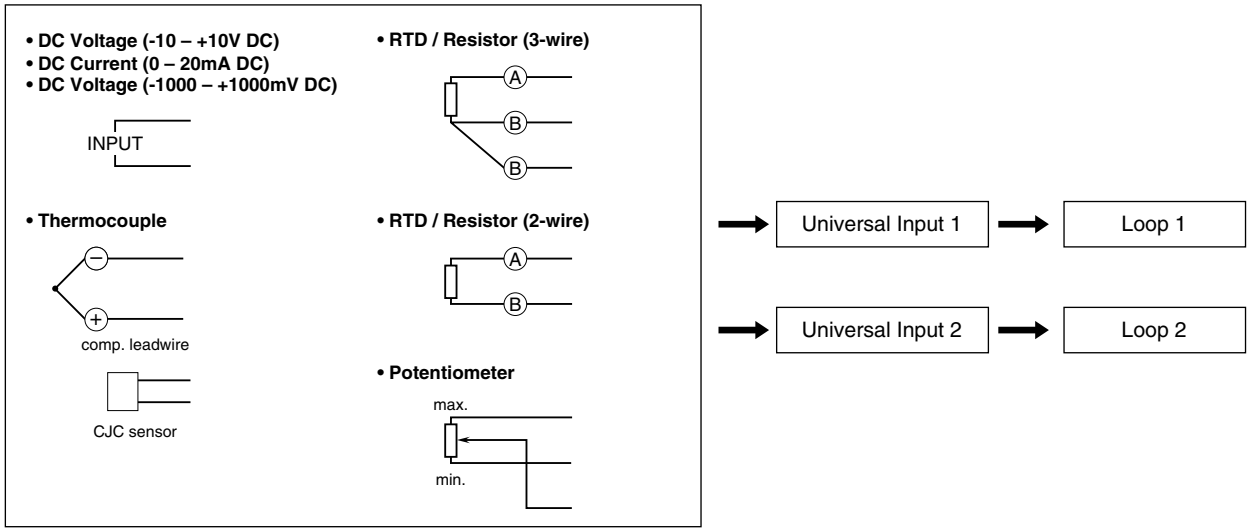
■ FUNCTION BLOCK DIAGRAM

The figure below is a simplified function block diagram showing relations between the I/O signal and the setting.



UNIVERSAL INPUT

The Controller has two universal inputs (universal input 1, universal input 2) which can be assigned independently for temperature inputs. In addition to RTD and thermocouples, resistor, DC and potentiometer inputs are also usable. The resistor, DC and potentiometer input is scaled into a temperature range.
Universal input 1 is usually assigned as PV input signal for loop 1, while universal input 2 is for loop 2. Universal input 2 signal can be cascaded into the loop 1 SP. Also it is available as input value of loop 2 in that condition.



■ INPUT TYPE

PARAMETER	RANGE	DEFAULT
Universal input 1, Input type	See the table below.	RTD Pt100
Universal input 2, Input type		

PARAMETER
DC 0 – 20 mA
DC -1000 – +1000 mV
DC -10 – +10 V
POT 0 – 4000 Ω
POT 0 – 2500 Ω
POT 0 – 1200 Ω
POT 0 – 600 Ω
POT 0 – 300 Ω
POT 0 – 150 Ω
Resistor 0 – 4000 Ω
RTD Pt 100
RTD Pt 500
RTD Pt 1000
RTD Pt 50 Ω
RTD JPt 100
RTD Ni 508.4 Ω
RTD Cu 10
TC (PR)
TC K
TC E
TC J
TC T
TC B
TC R
TC S
TC C
TC N
TC U
TC L
TC P

■ WIRING

Choose either 2 wires or 3 wires when the input type is set to RTD or resistor.

PARAMETER	RANGE	DEFAULT
Universal input 1, Wiring	2 wires 3 wires	3 wires
Universal input 2, Wiring		

■ BURNOUT

Choose burnout function when the input type is set to thermocouple, RTD, resistor or potentiometer.

PARAMETER	RANGE	DEFAULT
Universal input 1, Burnout	Disable Enable	Enable
Universal input 2, Burnout		

■ COLD JUNCTION COMPENSATION

Choose whether to perform cold junction compensation by the CJC sensor incorporated.
When the setting is disabled, the terminal temperature is assumed to show 0°C so that the measured emf is directly converted into temperature.

PARAMETER	RANGE	DEFAULT
Universal input 1, Cold junction compensation	Disable Enable	Enable
Universal input 2, Cold junction compensation		

■ TEMPERATURE UNIT

Choose temperature unit used for thermocouple or RTD input.
The setting is applied only to the unit, but not to the temperature values such as SP. If you have changed the unit setting, be sure to check and change all other temperature values.

PARAMETER	RANGE	DEFAULT
Universal input 1, Temperature unit	degC degF	degC
Universal input 2, Temperature unit		

■ INPUT ZERO ADJUSTMENT / INPUT SPAN ADJUSTMENT

Input signals can be finely adjusted.
The following equation is applied to the engineering unit value data.

[Adjusted value] = [input] × [input span adjustment] + [input zero adjustment]

PARAMETER	RANGE	DEFAULT
Universal input 1, Input zero adjustment	-300.00 to +300.00 (unit as in the table below)	0.00
Universal input 2, Input zero adjustment		
Universal input 1, Input span adjustment	0.8500 to 1.1500	1.0000
Universal input 2, Input span adjustment		

INPUT TYPE	UNIT
0 – 20 mA DC	mA
-1000 – +1000 mV DC	mV
-10 – +10 V DC	V
Thermocouple	mV
RTD, Resistor	Ω
Potentiometer	%

■ INPUT 0% / INPUT 100% / INPUT SCALING 0% / INPUT SCALING 100%

DC, resistor and potentiometer input signals can be converted into a temperature range.
Specify the original input range from INPUT 0% to INPUT 100%, and the converted range from INPUT SCALING 0% to INPUT SCALING 100%.

PARAMETER	RANGE	DEFAULT
Universal input 1, Input 0%	-1000.0 to +4000.0 *3 (unit as in the table below)	4.0
Universal input 1, Input 100%		20.0
Universal input 1, Input scaling 0%	-3200.0 to +3200.0 (decimal by input 1 decimal setting)	0.0
Universal input 1, Input scaling 100%		100.0
Universal input 2, Input 0%	-1000.0 to +4000.0 *3 (unit as in the table below)	4.0
Universal input 2, Input 100%		20.0
Universal input 2, Input scaling 0%	-3200.0 to +3200.0 (decimal by input 2 decimal setting)	0.0
Universal input 2, Input scaling 100%		100.0

*3. Signed words have the maximum range up to +32767. +32768 to +40000 is internally converted into -32768 to -25536 so that the entire range up to 40000 can be within the normal range limits.

INPUT TYPE	UNIT
0 – 20 mA DC	mA
-1000 – +1000 mV DC	mV
-10 – +10 V DC	V
Resistor	Ω
Potentiometer	%

■ FILTER TIME CONSTANT

First order lag filter can be applied to the input signal. Time constant setting is available from 0.5 to 60.0 seconds. Setting 0.0 disables the filter function.
The filter operates just like a typical CR filter. With a step input, the filter output takes the preset time constant time to reach 63% value.

PARAMETER	RANGE	DEFAULT
Universal input 1, Filter time constant	0.0, 0.5 to 60.0 seconds	0.0
Universal input 2, Filter time constant		

■ DECIMAL

Choose the number of decimal places for PV (input) signal.
The setting affects the input and relevant loop, and the output setting assigned to its loop's control output.
Those parameters affected by the setting are indicated with 'decimal by input 1 decimal setting' or 'decimal by input 2 decimal setting.'

PARAMETER	RANGE	DEFAULT
Universal input 1, Decimal	None, 1, 2, 3 (digits)	1
Universal input 2, Decimal		

PV and relevant ranges may be limited as shown in the table below depending upon the decimal setting.

DECIMAL	RANGE
0	-32000 – +32000
1	-3200.0 – +3200.0
2	-320.00 – + 320.00
3	-32.000 – +32.000

Related ranges are not automatically scaled when the setting is changed. Be sure to check and change all other values.

CONTROL OUTPUT

The Controller has two control outputs (control output 1 and 2) which are assigned to control output, alarm output and other outputs.
Basic output channel configuration is determined by the model number suffix codes as shown below.

Control output 1, Control output 2	R8-TC2A/A	0 – 20 mA DC output
	R8-TC2V/A	0 – 10 V DC output
	R8-TC2P/A	12 V voltage pulse output

Each output channel can be assigned with alarm output (ON/OFF) or with control output (continuous value) as explained in the table below.

OUTPUT	ON/OFF	CONTINUOUS VALUE
0 – 20 mA DC	ON at 100% scaled current; OFF at 0% scaled current	Scaled output range is converted into a proportional current range
0 – 10 V DC	ON at 100% scaled voltage; OFF at 0% scaled voltage	Scaled output range is converted into a proportional voltage range
12 V voltage pulse	ON at 12 V; OFF at 0 V	Scaled output range is converted into a proportional duty ratio output

■ OUTPUT ASSIGNMENT

PARAMETER	RANGE	DEFAULT
Control output 1, Output assignment	See the table below.	Loop 1, Heating control output
Control output 2, Output assignment		Loop 2, Heating control output

PARAMETER	TYPE	OUTPUT SCALING DECIMAL
Not assigned	----	----
Device error	ON/OFF	----
Alarm OR	ON/OFF	----
Alarm AND	ON/OFF	----
Input error, OR for all loops	ON/OFF	----
Loop 1, Heating control output	Continuous value	----
Loop 1, Cooling control output	Continuous value	----
Loop 1, PV	Continuous value	By input 1 decimal setting
Loop 1, Internal SP	Continuous value	By input 1 decimal setting
Loop 1, Local SP	Continuous value	By input 1 decimal setting
Loop 1, Remote SP	Continuous value	By input 1 decimal setting
Loop 1, Input error	ON/OFF	----
Loop 1, Remote SP input error	ON/OFF	----
Loop 2, Heating control output	Continuous value	----
Loop 2, Cooling control output	Continuous value	----
Loop 2, PV	Continuous value	By input 2 decimal setting
Loop 2, Internal SP	Continuous value	By input 2 decimal setting
Loop 2, Local SP	Continuous value	By input 2 decimal setting
Loop 2, Input error	ON/OFF	----

■ CONTROL CYCLE

Specify duty cycle for duty ratio output. Disregarded with DC signal output setting.

PARAMETER	RANGE	DEFAULT
Control output 1, Control cycle	1.0 to 99.9 seconds	2.0
Control output 2, Control cycle		

■ MINIMUM ON/OFF WIDTH

Specify the minimum pulse width for ON and OFF with duty ratio output.
For example, with 1% setting, the output below 1% is output as 0%, while the output above 99% is output as 100%.

PARAMETER	RANGE	DEFAULT
Control output 1, Minimum ON/OFF width	0.0 to 50.0 %	0.0
Control output 2, Minimum ON/OFF width		

■ OUTPUT SCALING 0% / OUTPUT SCALING 100% / OUTPUT 0% / OUTPUT 100%

Specify the internal temperature output range from OUTPUT SCALING 0% to OUTPUT SCALING 100%, and the converted output range from OUTPUT 0% to OUTPUT 100%.

PARAMETER	RANGE	DEFAULT
Control output 1, Output scaling 0%	-3200.0 to + 3200.0 (temperature unit)*4	0.0
Control output 1, Output scaling 100%		100.0
Control output 2, Output scaling 0%		0.0
Control output 2, Output scaling 100%		100.0
Control output 1, Output 0%	0.0 to 100.0	*5
Control output 1, Output 100%		
Control output 2, Output 0%		
Control output 2, Output 100%		

*4. Output scaling 0 to 100% is valid only when control output is assigned to PV, Internal SP, Local SP or Remote SP. Disregarded if it is assigned to others.
*5. Default value and engineering unit depends upon the model number suffix code as in the table below.

MODEL	OUTPUT 0%	OUTPUT 100%	UNIT
R8-TC2A/A	4.0	20.0	mA
R8-TC2V/A	0.0	10.0	V
R8-TC2P/A	0.0	100.0	%

■ OUTPUT INVERSION

Voltage pulse signal level can be inverted.

PARAMETER	RANGE	DEFAULT
Control output 1, Output inversion	Normal Inverted	Normal
Control output 2, Output inversion		

LOOP

The Controller has two control loops (loop 1, loop 2) which can be assigned independently with PID and ON/OFF control operations.
Each loop receives the relevant input to feedback and perform temperature control.

■ OPERATION AT STARTUP

Specify whether the Controller automatically starts operating (RUN) or not (STOP). With STOP setting, it outputs the pre-defined 'MV output at STOP status.'

PARAMETER	RANGE	DEFAULT
Loop 1, Operation at startup	STOP RUN	STOP
Loop 2, Operation at startup		

At startup means the timing when the power up.

■ CONTROL MODE AT STARTUP

Specify the control mode at the startup. In MANUAL mode, the control output can be manually manipulated. In AUTO mode, the Controller starts automatic control operations.

PARAMETER	RANGE	DEFAULT
Loop 1, Control mode at startup	MANUAL AUTO	MANUAL
Loop 2, Control mode at startup		

At startup means the timing when the power up.

■ CONTROL TYPE

Specify the control strategy for each loop.

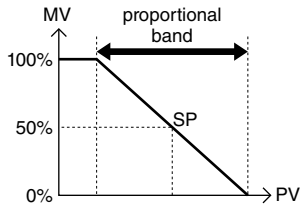
PARAMETER	RANGE	DEFAULT
Loop 1, Control type	Standard PID control Heating-cooling PID control Heating-cooling ON/OFF control	Standard PID control
Loop 2, Control type		

• Standard PID Control

Typical PID control operation is performed by PID1 P (proportional band), PID1 I (integral time) and PID1 D (derivative time). The Controller automatically adjusts the heating control output (MV) to match the setpoint value (SP) with the universal input value (PV).

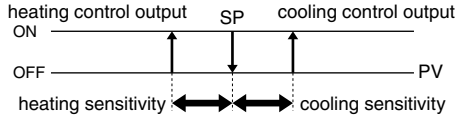
• Heating-Cooling PID Control

PID control is applied to both heating and cooling using PID parameters in PID1 (for heating) and PID2 (for cooling) parameters.

PARAMETER	DESCRIPTIONS	SMALLER SET VALUE	LARGER SET VALUE
P (proportional band)	P output is proportional to the deviation between the input (PV) and the setpoint (SP). 	• Takes shorter time to reach the target temperature • Overshooting or cycling may occur more frequently.	• Takes longer time to reach the target temperature • Overshooting is unlikely to occur.
I (integral time)	I output is proportional to the integrated deviation between PV and SP. It is used to automatically adjust offset by P output.	• Takes shorter time to reach the target temperature • Overshooting, undershooting, or cycling may occur to a greater degree.	• Takes longer time to reach the target temperature • Overshooting, undershooting, or cycling may be diminished.
D (derivative time)	D output is proportional to the derivative of deviation between PV and SP. It is used as a corrective action against changes in PV and SP.	• Overshooting or undershooting may occur to a greater degree.	• Overshooting or undershooting may be diminished. • Small hunting may occur.

• Heating-Cooling ON/OFF Control

The control output is turned on until the universal input (PV) matches the setpoint value (SP) and then turned off. Heating control is applied when the SP is greater than the PV, while cooling control is applied when the SP is smaller than the PV. The output is turned on again if the PV is deviated from the SP again, but the sensitivity to react to a deviation can be set for heating and cooling respectively.



■ DIRECT/REVERSE ACTION

Direct or reverse action can be specified for the standard PID control.
Choose 'reverse' action when the MV should be decreased with an increasing PV (typical heating control), and 'direct' action when the MV should be increased (typical cooling control).
Disregarded if the selected control strategy is other than the standard PID control.

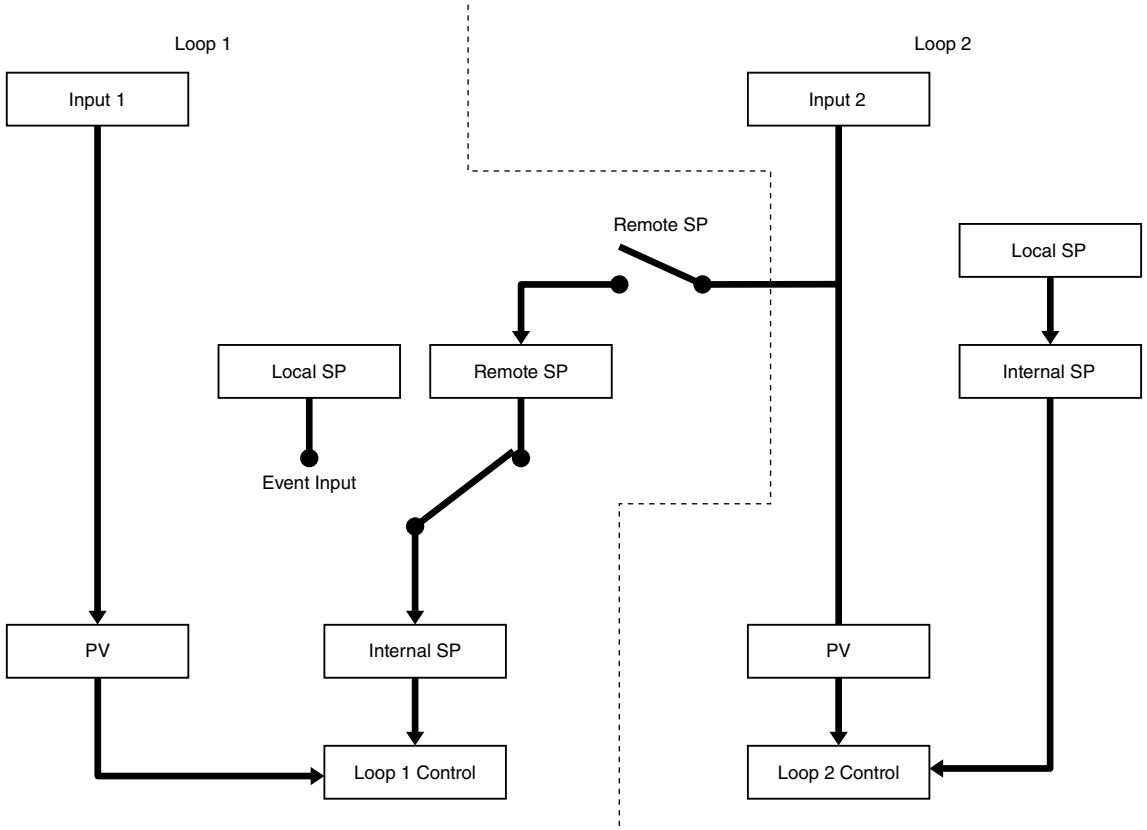
PARAMETER	RANGE	DEFAULT
Loop 1, Direct/reverse action	Reverse Direct	Reverse
Loop 2, Direct/reverse action		

■ REMOTE SP

Input 2 signal can be cascaded into Input 1 setpoint value as Remote SP.

PARAMETER	RANGE	DEFAULT
Loop 1, Remote SP	Disable Enable	Disable

Remote SP operates as in the function diagram below.
Local and remote SP are switched by an event input. If no event input is assigned, only the remote SP is used.



■ SP TRACKING

Specify whether the remote SP should be carried on when it is switched to the local SP mode.

PARAMETER	RANGE	DEFAULT
Loop 1, SP tracking	Disable Enable	Disable

■ SP LOW LIMIT / SP HIGH LIMIT

Specify the lower and the upper limits for the SP.
For example, if the SP range is set to 0.0 – 100.0, setting 100.0 is used for setting 200.0 automatically.

PARAMETER	RANGE	DEFAULT
Loop 1, SP low limit	-3200.0 to +3200.0 (decimal by input 1 decimal setting)	-3200.0
Loop 1, SP high limit		3200.0
Loop 2, SP low limit	-3200.0 to +3200.0 (decimal by input 2 decimal setting)	-3200.0
Loop 2, SP high limit		3200.0

■ MV AT STARTUP / MV AT STOP / MV AT ERROR

Specific MV values can be set for respective loop status.

PARAMETER	RANGE	DEFAULT
Loop 1, MV at startup	-105.00 to +105.00 %	0.00
Loop 1, MV at STOP		
Loop 1, MV at error		
Loop 2, MV at startup		
Loop 2, MV at STOP		
Loop 2, MV at error		

At startup means the timing when the power up.
At error means the input errors such as burnout.
With standard PID control, -5.00 is used for any value below -5.00.
With heating-cooling PID control, positive value is applied for heating control, negative value is applied for cooling control.
With ON/OFF control, cooling control is turned on at -100.00, both cooling and heating is off at 0.00, and heating is on at 100.00.
With MANUAL control mode, the MV at startup is applied at the startup, however, once the Controller transits from AUTO to MANUAL, the MV value at the moment of the transition is carried on.
The Controller's action is determined in the following priority order: MANUAL > STOP > Error.

■ MV LOW LIMIT / MV HIGH LIMIT

Specify the lower and the upper limits for the MV.
For example, if the MV range is set to 0.00 – 50.00, setting 50.00 is used for setting 70.00 automatically.

PARAMETER	RANGE	DEFAULT
Loop 1, MV low limit	-100.00 to +100.00	-100.00
Loop 1, MV high limit		100.00
Loop 2, MV low limit		-100.00
Loop 2, MV high limit		100.00

With heating-cooling control, when the MV value is positive, it means heating control, and when the MV value is negative, it means cooling control.
This setting will be ignored in manual mode.

■ ERROR ACTION

Specify the Controller's action in case of an input error (burnout) or an error in the remote SP input.

PARAMETER	RANGE	DEFAULT
Loop 1, Error action	Operation continued 'MV at error' output STOP	'MV at error' output
Loop 2, Error action		

With 'Operation continued' setting, the Controller continues operating.
With 'MV at error' output setting, it outputs the specified output value until the error is cancelled.
With STOP setting, the Controller stops operating. It does not restart automatically even when the error is cancelled.

■ CT ALARM ACTION

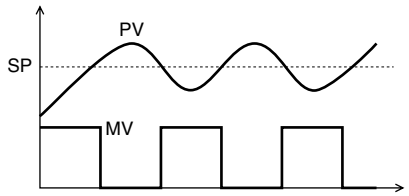
Specify the Controller's action in case of an alarm by CT input (heater wire break, SSR shortcircuit failure or overload).

PARAMETER	RANGE	DEFAULT
Loop 1, CT alarm action	Operation continued 'MV at error' output STOP	'MV at error' output
Loop 2, CT alarm action		

With 'Operation continued' setting, the Controller continues operating.
With 'MV at error' output setting, it outputs the specified output value until the error is cancelled.
With STOP setting, the Controller stops operating. It does not restart automatically even when the error is cancelled.

AUTO-TUNING

Limit cycle method auto-tuning is available for standard PID and heating-cooling PID control to automatically determine appropriate PID parameters by providing MV signal in steps as shown below and observing PV signal behavior.
Auto-tuning conditions should be set in advance. The Controller starts auto-tuning by a command with RUN and AUTO condition.



CAUTION In order to stop a running auto-tuning process, turn the power supply off or STOP the loop operation. Once STOP is applied, switch to RUN again to resume normal control, cancelling the auto-tuning.

■ AUTO-TUNING CONTROL TYPE

PARAMETER	RANGE	DEFAULT
Loop 1, Auto-tuning control type	See the table below.	Follow-up PI control
Loop 2, Auto-tuning control type		

AUTO-TUNING CONTROL TYPE
Follow-up PID control
Follow-up PI control
PID control with fixed setpoint
PI control with fixed setpoint

Follow-up control is suitable for a loop in which the setpoint changes according to the process status.

■ AUTO-TUNING HYSTERESIS (DEADBAND)

Specify hysteresis values to be applied when monitoring PV variation in the auto-tuning process.
If the PV fluctuates, set a larger value. Too large a value may result in tuning to inappropriate PID parameters.

PARAMETER	RANGE	DEFAULT
Loop 1, Auto-tuning hysteresis	0.0 to 999.9 (decimal by input 1/2 decimal setting)	0.8
Loop 1, Auto-tuning hysteresis		

■ AUTO-TUNING MV HIGH LIMIT / AUTO-TUNING MV LOW LIMIT

Specify the maximum range of MV applied in steps for auto-tuning.
With standard PID control, 0.00 is used for a negative range.
With heating-cooling PID control, a negative value is used for the cooling control.

PARAMETER	RANGE	DEFAULT
Loop 1, Auto-tuning MV high limit	-100.00 to +100.00	100.00
Loop 1, Auto-tuning MV low limit		-100.00
Loop 2, Auto-tuning MV high limit		100.00
Loop 2, Auto-tuning MV low limit		-100.00

PID

■ SP (SETPOINT VALUE)

Specify local SP.

PARAMETER	RANGE	DEFAULT
Loop 1, SP (setpoint value)	-3200.0 to +3200.0 (decimal by input 1/2 decimal setting)	25.0
Loop 2, SP (setpoint value)		

■ SP RAMP FALL RATE / SP RAMP RISE RATE

SP can be changed gradually in specified ramp rates when a new SP value is applied. SP ramp fall rate is applied with a decreasing SP, while SP rise rate is with an increasing SP. The unit is (set temperature/sec.).
The SP is instantly switched to a new value when '0.0' is set.
The setting is valid for all SP value changes except at STOP status and in error status.

PARAMETER	RANGE	DEFAULT
Loop 1, SP ramp fall rate	0.0 to 3200.0 per second (decimal by input 1 decimal setting)	0.0
Loop 1, SP ramp rise rate		
Loop 2, SP ramp fall rate	0.0 to 3200.0 per second (decimal by input 2 decimal setting)	0.0
Loop 2, SP ramp rise rate		

■ P (proportional band) / I (integral time) / D (derivative time)

PID parameters are used in standard and heating-cooling PID control.
Only PID1 is used for the standard PID. With the heating-cooling PID, PID1 is used for heating, while PID2 is for cooling.

PARAMETER	RANGE	DEFAULT
Loop 1, PID1 P (proportional band)	0.1 to 3200.0 (decimal by input 1 decimal setting) (unit is temperature)	8.0
Loop 1, PID1 I (integral time)	0 to 3999 seconds	200
Loop 1, PID1 D (derivative time)	0.0 to 999.9 seconds	40.0
Loop 1, PID2 P (proportional band)	0.1 to 3200.0 (decimal by input 1 decimal setting) (unit is temperature)	8.0
Loop 1, PID2 I (integral time)	0 to 3999 seconds	200
Loop 1, PID2 D (derivative time)	0.0 to 999.9 seconds	40.0
Loop 2, PID1 P (proportional band)	0.1 to 3200.0 (decimal by input 2 decimal setting) (unit is temperature)	8.0
Loop 2, PID1 I (integral time)	0 to 3999 seconds	200
Loop 2, PID1 D (derivative time)	0.0 to 999.9 seconds	40.0
Loop 2, PID2 P (proportional band)	0.1 to 3200.0 (decimal by input 2 decimal setting) (unit is temperature)	8.0
Loop 2, PID2 I (integral time)	0 to 3999 seconds	200
Loop 2, PID2 D (derivative time)	0.0 to 999.9 seconds	40.0

■ HEATING SENSITIVITY / COOLING SENSITIVITY

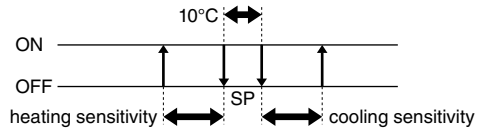
Sensitivity, a deadband between ON point and OFF point for heating/cooling control output, is used to prevent frequent ON/OFF operations (generally called 'chattering') of a control output device when the PV fluctuates around the setpoint.

PARAMETER	RANGE	DEFAULT
Loop 1, Heating sensitivity	0.0 to 999.9 (decimal by input 1 decimal setting)	0.0
Loop 1, Cooling sensitivity		
Loop 2, Heating sensitivity	0.0 to 999.9 (decimal by input 2 decimal setting)	0.0
Loop 2, Cooling sensitivity		

■ DEADBAND

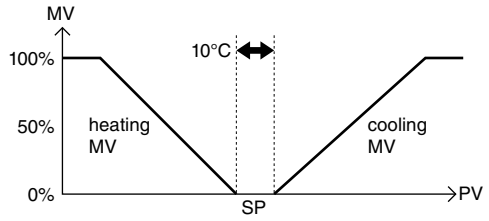
Deadband is a zone in which neither heating nor cooling control is performed.
Negative value setting means both heating and cooling control is performed in the zone.

The figure below shows an example of ON/OFF control with the deadband set to 10°C.

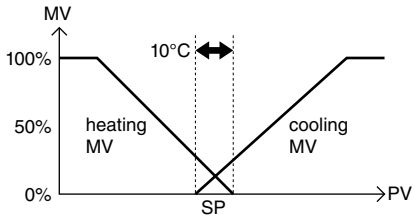


At PID control, deadband is enabled for P control. At P control (I = 0 and D = 0.0), with continuous value control, a zone in which both heating MV and cooling MV equal 0 is formed at ±5°C of the SP when the deadband is set to 10°C. With the setting to -10°C, the zone is with both heating MV and cooling MV.

• Deadband set to 10°C (at I=0, D=0.0)



• Deadband set to -10°C (at I=0, D=0.0)

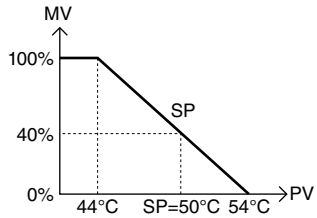


Note: In order to be intelligible, the graphs show MV at P control. However, in case that I and/or D are set, the graphs may be different from the avobe, since switching of heating MV / cooling MV does not match SP.

PARAMETER	RANGE	DEFAULT
Loop 1, Deadband	-999.9 to +999.9 (decimal by input 1/2 decimal setting)	0.0
Loop 2, Deadband		

■ MANUAL RESET

Manual reset is used to eliminate errors by offset generated by P control (I = 0, D = 0.0) or PD control (I = 0).
MV (control output) changes from 100% to 0% proportionally to the temperature range set with P value. The MV is converted so that the MV set with the manual reset value is equal to the SP.
The figure below shows an example of MV value transition against PV when SP is set to 50.0°C, the manual reset value to 40.00%, with P (proportional-only) control (P = 10.0, I = 0, D = 0.0).



PARAMETER	RANGE	DEFAULT
Loop 1, Manual reset	0.00 to 100.00 %	50.00
Loop 2, Manual reset		

ALARM

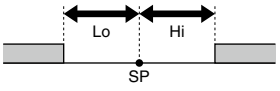
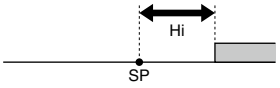
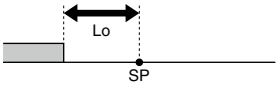
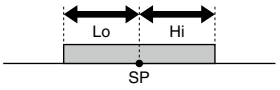
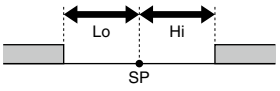
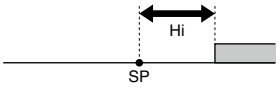
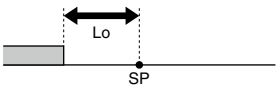
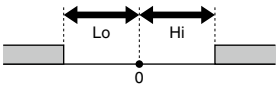
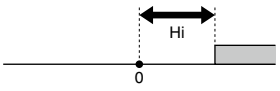
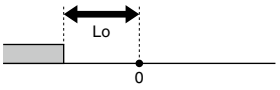
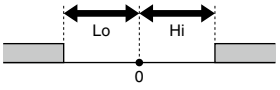
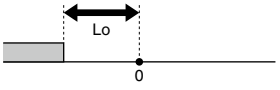
■ PV ALARM 1, PV ALARM 2, PV ALARM 3

The Controller monitors PV signal to trigger alarms in predefined conditions.
Three alarm conditions (PV ALARM 1 through 3) per loop can be specified.
High/low setpoint values can be specified together with other settings such as SP.

• ALARM TYPE

Specify conditions to be monitored for alarm trip.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 type	See the table below.	0
Loop 1, Alarm 2 type		
Loop 1, Alarm 3 type		
Loop 2, Alarm 1 type		
Loop 2, Alarm 2 type		
Loop 2, Alarm 3 type		

ALARM TYPE	ararm range
Disable	
Deviation Hi/Lo limit	
Deviation Hi limit	
Deviation Lo limit	
Deviation range	
Deviation Hi/Lo limit with standby sequence	
Deviation Hi limit with standby sequence	
Deviation Lo limit with standby sequence	
Absolute value Hi/Lo limit	
Absolute value Hi limit	
Absolute value Lo limit	
Absolute value Hi/Lo limit with standby sequence	
Absolute value Hi limit with standby sequence	
Absolute value Lo limit with standby sequence	

Standby sequence is a function to prevent unwanted alarm triggered at the startup or at an SP change. If the PV is in alarm range at the startup or at an SP change, no alarm is triggered until the PV is out of the range. Once it is out and then in the range again, normal alarm function starts functioning.

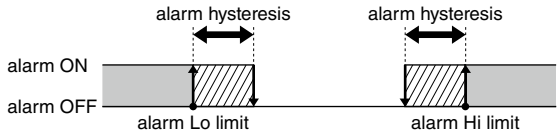
• ALARM HIGH SETPOINT / ALARM LOW SETPOINT

For the deviation alarm, specify offset values from the SP (positive value for a temperature value greater than the SP, negative value for one smaller).
For the absolute value alarm, specify absolute temperature values.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 low setpoint	-3200.0 to +3200.0 (decimal by input 1 decimal setting)	0.0
Loop 1, Alarm 1 high setpoint		
Loop 1, Alarm 2 low setpoint		
Loop 1, Alarm 2 high setpoint		
Loop 1, Alarm 3 low setpoint		
Loop 1, Alarm 3 high setpoint		
Loop 2, Alarm 1 low setpoint	-3200.0 to +3200.0 (decimal by input 2 decimal setting)	0.0
Loop 2, Alarm 1 high setpoint		
Loop 2, Alarm 2 low setpoint		
Loop 2, Alarm 2 high setpoint		
Loop 2, Alarm 3 low setpoint		
Loop 2, Alarm 3 high setpoint		

• ALARM HYSTERESIS

Hysteresis, a deadband between ON point and OFF point, is used to prevent frequent ON/OFF operations (generally called 'chattering') of an alarm output device when the PV fluctuates around the setpoint.



PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 hysteresis	0.0 to 999.9 (decimal by input 1 decimal setting)	0.0
Loop 1, Alarm 2 hysteresis		
Loop 1, Alarm 3 hysteresis		
Loop 2, Alarm 1 hysteresis	0.0 to 999.9 (decimal by input 2 decimal setting)	
Loop 2, Alarm 2 hysteresis		
Loop 2, Alarm 3 hysteresis		

• ALARM LATCHING

Once an alarm is tripped, it is held even when the alarm condition is cancelled.
Latched alarm is reset by turning the device's power supply off or by a command via communication.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 latching	Disable Enable	Disable
Loop 1, Alarm 2 latching		
Loop 1, Alarm 3 latching		
Loop 2, Alarm 1 latching		
Loop 2, Alarm 2 latching		
Loop 2, Alarm 3 latching		

• ALARM ON DELAY / ALARM OFF DELAY

Alarm ON delay time is applied to the time during which an alarm condition should remain true, before the alarm trips.
Alarm OFF delay time is applied to the time during which an alarm conditions should remain false, before the tripped alarm is reset.
Setting 0 means no delay in the alarm operations.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 ON delay	0 to 999 seconds	0
Loop 1, Alarm 2 ON delay		
Loop 1, Alarm 3 ON delay		
Loop 2, Alarm 1 ON delay		
Loop 2, Alarm 2 ON delay		
Loop 2, Alarm 3 ON delay		
Loop 1, Alarm 1 OFF delay		
Loop 1, Alarm 2 OFF delay		
Loop 1, Alarm 3 OFF delay		
Loop 2, Alarm 1 OFF delay		
Loop 2, Alarm 2 OFF delay		
Loop 2, Alarm 3 OFF delay		

• ALARM SP TYPE

When the SP is changed, actual target temperature gradually changes in a ramp setting until it reaches the final setpoint. Choose either the setpoint in the ramp transition or the final setpoint should be used for reference of alarm judgment.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 SP type	Ramp SP SP	Ramp SP
Loop 1, Alarm 2 SP type		
Loop 1, Alarm 3 SP type		
Loop 2, Alarm 1 SP type		
Loop 2, Alarm 2 SP type		
Loop 2, Alarm 3 SP type		

• ALARM OUTPUT

Specify the output device for alarms.
When one of the control outputs is specified, be sure also to specify 'Alarm OR' or 'Alarm AND' with its output assignment.
With 'Alarm OR' setting, the output is provided if one or more alarms assigned to it are in true conditions. With 'Alarm AND' setting it is provided only if all alarms assigned to it are in true conditions.

PARAMETER	RANGE	DEFAULT
Loop 1, Alarm 1 output	Network only Control output 1 Control output 2	Network only
Loop 1, Alarm 2 output		
Loop 1, Alarm 3 output		
Loop 2, Alarm 1 output		
Loop 2, Alarm 2 output		
Loop 2, Alarm 3 output		

CT INPUT

The Controller has two CT inputs (CT input 1, CT input 2) which are used to monitor the control outputs with clamp-on current sensors, for alarm purposes.

> **CAUTION** The Controller can monitor the control outputs only in case of 12V voltage pulse.
> These outputs must be set for PID or heating-cooling PID control assigned with heating output or cooling output.

■ CT SENSOR TYPE

PARAMETER	RANGE	DEFAULT
CT input 1, CT sensor type	See the table below.	CLSE-R5
CT input 2, CT sensor type		

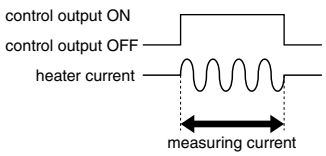
SENSOR MODEL	INPUT RANGE
CLSE-R5	0.0 – 5.0 A
CLSE-05	0.0 – 50.0 A
CLSE-10	0.0 – 100.0 A
CLSE-20	0.0 – 200.0 A
CLSE-40	0.0 – 400.0 A
CLSE-60	0.0 – 600.0 A

■ OUTPUT ASSIGNMENT

PARAMETER	RANGE	DEFAULT
CT input 1, Output assignment	Control output 1 Control output 2	Control output 1
CT input 2, Output assignment		

■ HEATER WIRE BREAK ALARM / SSR SHORTCIRCUIT FAILURE ALARM / OVERLOAD ALARM

The following three types of alarm are available using the CT inputs.
These alarms could be used independently or in combination.
For example, with a heater driven by an SSR, the heater wire break, the SSR shortcircuit failure and the overload can be all detected and alerted.

Heater wire break alarm	Current flows through the load normally when the control output is on. Current stops when the heater's wire breaks. The Controller measures the current with a clamp-on current sensor and triggers an alarm when it is below the setpoint. 
SSR shortcircuit failure alarm	Current stop normally when the control output is off. Current flows through the load when the SSR fails in the shortcircuit mode. The Controller measures the current with a clamp-on current sensor and triggers an alarm when it is above the setpoint.
Overload alarm	Regardless of the control status, the Controller continuously measures the current with a clamp-on current sensor and triggers an alarm when it is above the setpoint.

> **CAUTION** Control output must be turned on for at the minimum of 110 milliseconds to detect a heater wire break; must be turned off for at the minimum of 200 milliseconds to detect an SSR shortcircuit failure. If there is no ON and/or OFF status longer than the minimum duration for one control cycle, the Controller cannot measure current. Current display shows -0.1 A (invalid measurement) and all related alarms are reset except for those latched.

• ALARM FUNCTION

Choose alarm functions.

PARAMETER	RANGE	DEFAULT
CT input 1, Heater wire break alarm	Disable Enable	Disable
CT input 1, SSR shortcircuit failure alarm		
CT input 1, Overload alarm		
CT input 2, Heater wire break alarm		
CT input 2, SSR shortcircuit failure alarm		
CT input 2, Overload alarm		

• ALARM SETPOINT

Specify a threshold for each alarm.

PARAMETER	RANGE	DEFAULT
CT input 1, Heater wire break alarm setpoint	0.0 to 600.0 A	0.0
CT input 1, SSR shortcircuit failure alarm setpoint		
CT input 1, Overload alarm setpoint		
CT input 2, Heater wire break alarm setpoint		
CT input 2, SSR shortcircuit failure alarm setpoint		
CT input 2, Overload alarm setpoint		

• ALARM HYSTERESIS (DEADBAND)

Hysteresis, a deadband between ON point and OFF point, is used to prevent frequent ON/OFF operations (generally called 'chattering') of an alarm output device when the current fluctuates around the setpoint.

PARAMETER	RANGE	DEFAULT
CT input 1, Heater wire break alarm hysteresis	0.0 to 99.9 A	0.0
CT input 1, SSR shortcircuit failure alarm hysteresis		
CT input 1, Overload alarm hysteresis		
CT input 2, Heater wire break alarm hysteresis		
CT input 2, SSR shortcircuit failure alarm hysteresis		
CT input 2, Overload alarm hysteresis		

• ALARM LATCHING

Once an alarm is tripped, it is held when the alarm condition is cancelled.
Latched alarm is reset by turning the device's power supply off or by a command via communication.

PARAMETER	RANGE	DEFAULT
CT input 1, Heater wire break alarm latching	Disable Enable	Disable
CT input 1, SSR shortcircuit failure alarm latching		
CT input 1, Overload alarm latching		
CT input 2, Heater wire break alarm latching		
CT input 2, SSR shortcircuit failure alarm latching		
CT input 2, Overload alarm latching		

• ALARM OUTPUT

Specify the output device for alarms.
When one of the control outputs is specified, be sure also to specify 'Alarm OR' or 'Alarm AND' with its output assignment. With 'Alarm OR' setting, the output is provided if one or more alarms assigned to it are in true conditions. With 'Alarm AND' setting it is provided only if all alarms assigned to it are in true conditions.

PARAMETER	RANGE	DEFAULT
CT input 1, Heater wire break alarm output	Network only Control output 1 Control output 2	Network only
CT input 1, SSR shortcircuit failure alarm output		
CT input 1, Overload alarm output		
CT input 2, Heater wire break alarm output		
CT input 2, SSR shortcircuit failure alarm output		
CT input 2, Overload alarm output		