azbil

No. CP-SP-1218E

SDC45/46
Digital Indicating Controller
User's Manual
for
Installation and Configuration

Thank you for purchasing the SDC45/46 Digital Indicating Controller.

This manual contains information for ensuring the correct use of the SDC45/46. It also provides necessary information for installation, maintenance, and troubleshooting.

This manual should be read by those who design and maintain equipment that uses the SDC45/46. Be sure to keep this manual nearby for handy reference.

Yamatake Corporation

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

SAFETY REQUIREMENTS

To reduce risk of electric shock which could cause personal injury, follow all safety notices in this documentation.

This symbol warns the user of a potential shock hazard where hazardous live voltages may be accessible.

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment must be impaired.
- Do not replace any component (or part) not explicitly specified as replaceable by your supplier.
- All wiring must be in accordance with local norms and carried out by authorized and experienced personnel.
- A switch in the main supply is required near the equipment.
- Main power supply wiring requires a (T) 1.0 A, 250 V fuse(s). Install the fuse on the high potential (non-ground) side of the circuit (IEC 127).

EQUIPMENT RATINGS

Supply voltages:	100 to 240 Vac (operating power supply voltage 85 to 264 Vac)
Frequency:	50/60 Hz
Power consumption:	30 VA maximum (SDC45), 40 VA maximum (SDC46)

EQUIPMENT CONDITIONS

Do not operate the instrument in the presence of flammable liquids or vapors.
Operation of any electrical instrument in such an environment constitutes a safety hazard.

Temperature:	0 to 50 ˚C
Humidity:	10 to 90 % RH (without condensation)
Vibration:	2 m/s^2 (10 to 60 Hz)
Over-voltage category:	Category II (IEC60364-4-443, EN60664-1)
Pollution degree:	2
Installation location:	Indoors

EQUIPMENT INSTALLATION

The controller must be mounted into a panel to limit operator access to the rear terminal.
Specifications of common mode voltage: The common mode voltages of all I/O except for main supply and relay outputs are less than 30 V r.m.s. max., 42.4 V peak max., and 60 Vdc max.

STANDARDS COMPLIANCE

EN61010-1, EN61326

SAFETY PRECAUTIONS

■ About Icons

The safety precautions described in this manual are indicated by various icons. Please be sure you read and understand the icons and their meanings described below before reading the rest of the manual.

Safety precautions are intended to ensure the safe and correct use of this product, to prevent injury to the operator and others, and to prevent damage to property. Be sure to observe these safety precautions.

⚠ **WARNING**	Warnings are indicated when mishandling this product might result in death or serious injury.
⚠ **CAUTION**	Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to the product.

■ Examples

	Use caution when handling the product.
	The indicated action is prohibited.
	Be sure to follow the indicated instructions.

⚠WARNING

	Before removing, mounting, or wiring the SDC45/46, be sure to turn off the SDC45/46 and all connected devices. Failure to do so might cause electric shock.
	Incorrect wiring of the SDC45/46 can damage the SDC45/46 and lead to other hazards. Check that the SDC45/46 has been correctly wired before turning the power ON.
	Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
	Do not disassemble the SDC45/46. Doing so might cause electric shock or device failure.

⚠CAUTION

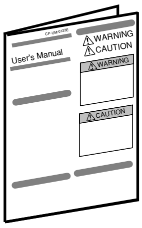
	Use the SDC45/46 within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Failure to do so might cause fire or device failure.
	Do not block ventilation holes. Doing so might cause fire or device failure.
	Wire the SDC45/46 properly using the specified types of wire and following recognized installation methods. Failure to do so might cause electric shock, fire or device failure.
	Do not allow wire clippings, chips or water to enter the controller case. They might cause fire or device failure.
	Firmly tighten the terminal screws to the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
	Do not use unused terminals on the SDC45/46 as relay terminals. Doing so might cause electric shock, fire or device failure.

⚠CAUTION

⚠	We recommend attaching the terminal cover (sold separately) after wiring the SDC45/46. Failure to do so might cause electric shock.
❗	Use the relays within the recommended service life. Failure to do so might cause fire or device failure.
❗	Use Yamatake Corporation's SURGENON if there is a risk of power surges caused by lightning. Otherwise, fire or device failure could result.
🚫	Do not operate the keys with a mechanical pencil or other sharp-tipped object. Doing so might cause device failure.
❗	After the power has been turned ON, the SDC45/46 does not operate for 2 to 60 s according to the settings. Therefore, great care should be taken if the relay output from the controller is used as an interlock signal.
❗	The frame ground (FG) terminal on the SDC45/46 has a ground terminal function. To limit the effects of external electrical noise, be sure to ground the SDC45/46. Failure to do so might cause malfunction.

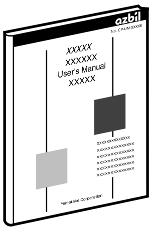
The Role of This Manual

A total of 5 different manuals are available for the SDC45/46. Read them as necessary for your specific requirements. If a manual you require is not available, contact Yamatake Corporation or its dealer.



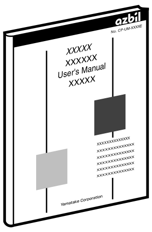
SDC45/46 Digital Indicating Controller Installation Instructions
Manual No. CP-UM-5445JE

This manual is supplied with the SDC45/46. Personnel in charge of design and/or manufacture of a system using the SDC45/46 must thoroughly read this manual. This manual describes the safety precautions, installation, wiring, primary specifications, and transitions of key operations and displays. For further information about operation, refer to another manual, Installation and Configuration.



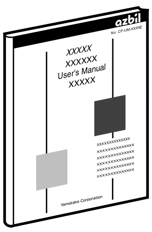
SDC45/46 Digital Indicating Controller User's Manual for Displays and Settings
Manual No. CP-SP-1265E

The manual is a reference document necessary to set or change data. The manual lists up the displays, setup items, setting ranges, and initial values.



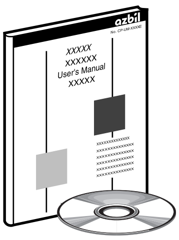
SDC45/46 Digital Indicating Controller User's Manual for Installation and Configuration
Manual No. CP-SP-1218E

This manual. Personnel in charge of design, manufacture, operation, and/or maintenance of a system using SDC45/46 must thoroughly read this manual. This manual also describes the installation, wiring, connections for communication, all functions and settings of the SDC45/46, operating procedures, troubleshooting, and detailed specifications.



SDC45V/46V Digital Indicating Controller User's Manual for Computational Functions
Manual No. CP-SP-1275E

It describes the computation functions of the SDC45V/46V. Please read it together with the Installation and Configuration manual (CP-SP-1218E) and the Displays and Settings manual (CP-SP-1265E).



SLP-C45 Smart Loader Package for the SDC45/46 Digital Indicating Controller
Manual No. CP-UM-5458E

This manual is supplied with the SLP-C45 Smart Loader Package. The manual describes the software used to make various settings for the SDC45/46 using a personal computer. Personnel in charge of design or setting of a system using SDC45/46 must thoroughly read this manual. The manual describes installation of the software into a personal computer, operation of the personal computer, various functions, and setup procedures.

Organization of This User's Manual

This manual is organized as follows:

Flowchart of key operations and displays

This section summarizes the flowchart of key operations and displays of the SDC45/46 in the diagram so as to describe them.

Chapter 1. OVERVIEW

This chapter describes the overview, features, model selection guide, and part names and functions of the SDC45/46.

Chapter 2. INSTALLATION

This chapter describes the environmental conditions and installation procedures when installing the SDC45/46.

Chapter 3. WIRING

This chapter describes the wiring procedures, wiring precautions, and connection examples.

Chapter 4. FUNCTIONS NECESSARY FOR CONTROL

This chapter describes the functions absolutely necessary to operate the control of the SDC45/46.

Chapter 5. OPERATION AND GENERAL FUNCTIONS

This chapter describes how to set the functions, which are normally used for the SDC45/46.

Chapter 6. FUNCTIONS OFTEN USED FOR OPERATIONS OTHER THAN CONTROL

This chapter describes how to set the functions, which are used for operations other than the control actions of the SDC45/46.

Chapter 7. FUNCTIONS USED AS REQUIRED

This chapter describes how to set the functions necessary for convenient operations of the SDC45/46.

Chapter 8. LIST OF SETTINGS

Refer to: "SDC45/46 Digital Indicating Controller User's Manual for Displays and Settings (CP-SP-1265E)".

Chapter 9. CPL COMMUNICATIONS FUNCTION

This chapter describes how to communicate the SDC45/46 with a host unit, such as a personal computer or PLC through Yamatake's standard CPL communication using RS-485.

Chapter 10. MODBUS COMMUNICATIONS FUNCTION

This chapter describes how to communicate the SDC45/46 with a host unit, such as a personal computer or MODBUS communication using RS-485.

Chapter 11. LIST OF COMMUNICATION DATA

This chapter shows the list of communication data inside the memory of the SDC45/46.

Chapter 12. TROUBLESHOOTING

This chapter describes the troubleshooting of the SDC45/46.

Chapter 13. MAINTENANCE, INSPECTION, AND DISPOSAL

This chapter describes how to carry out the maintenance and inspection of the SDC45/46 and how to dispose of the SDC45/46.

Chapter 14. SPECIFICATIONS

This chapter describes the general specifications, performance specifications, external dimensions, and optional parts of the SDC45/46.

Appendixes

These appendixes describe the function block diagrams, standard bit codes, standard numerical bit codes, and using characters and terms used in descriptions of this manual.

Contents

Flowcharts for Major Settings

Chapter 4. FUNCTIONS NECESSARY FOR CONTROL

Chapter 5. OPERATION

Chapter 7. FUNCTIONS USED AS REQUIRED

Chapter 8. LIST OF SETTINGS

Refer to: "SDC45/46 Digital Indicating Controller User's Manual for Displays and Settings (CP-SP-1265E)".

Chapter 9. CPL COMMUNICATIONS FUNCTION

Chapter 14. SPECIFICATIONS

Appendices

Conventions Used in This Manual

The following conventions are used in this manual:

Handling Precautions: Handling Precautions indicate items that the user should pay attention to when handling the SDC45/46.

Note: Notes indicate information that might benefit the user.

☞: This indicates the item or page that the user is requested to refer to.

(1), (2), (3): Numbers within parentheses indicate steps in a sequence or parts of an explanation.

[para] key, [<] key: Indicates keys on the panel.

"man" LED: Indicates various indicators on this unit.

>>: Indicates the result of an operation, details displayed on the personal computer or other devices, or the state of the device after operation.

- **Numeric value and character display on LED**
  - **7-segment LED**

Numeric values: The 7-segment LED expresses numeric values as follows:

0		1		2		3		4		–1	
5		6		7		8		9			

Alphabetical characters: The 7-segment LED expresses alphabetical characters shown below. There are some alphabetical characters, which are not displayed on the LED.

A a		B b		C c		D d		E e	
F f		G g		H h		I i		J j	
K k		L l		M m		N n		O o	
P p		Q q		R r		S s		T t	
U u		V v		Y y		Z z		–	

Handling Precautions

- As shown above, numeric value "2" and alphabetic character "Z" are shown in the same manner.
  Accordingly, numeric value "5" and alphabetic character "S", as well as numeric value "9" and alphabetic character "Q" are also shown in the same manner.

● **11-segment LED**

Numeric values: The 11-segment LED expresses numeric values as follows:

0		1		2		3		4	
5		6		7		8		9	

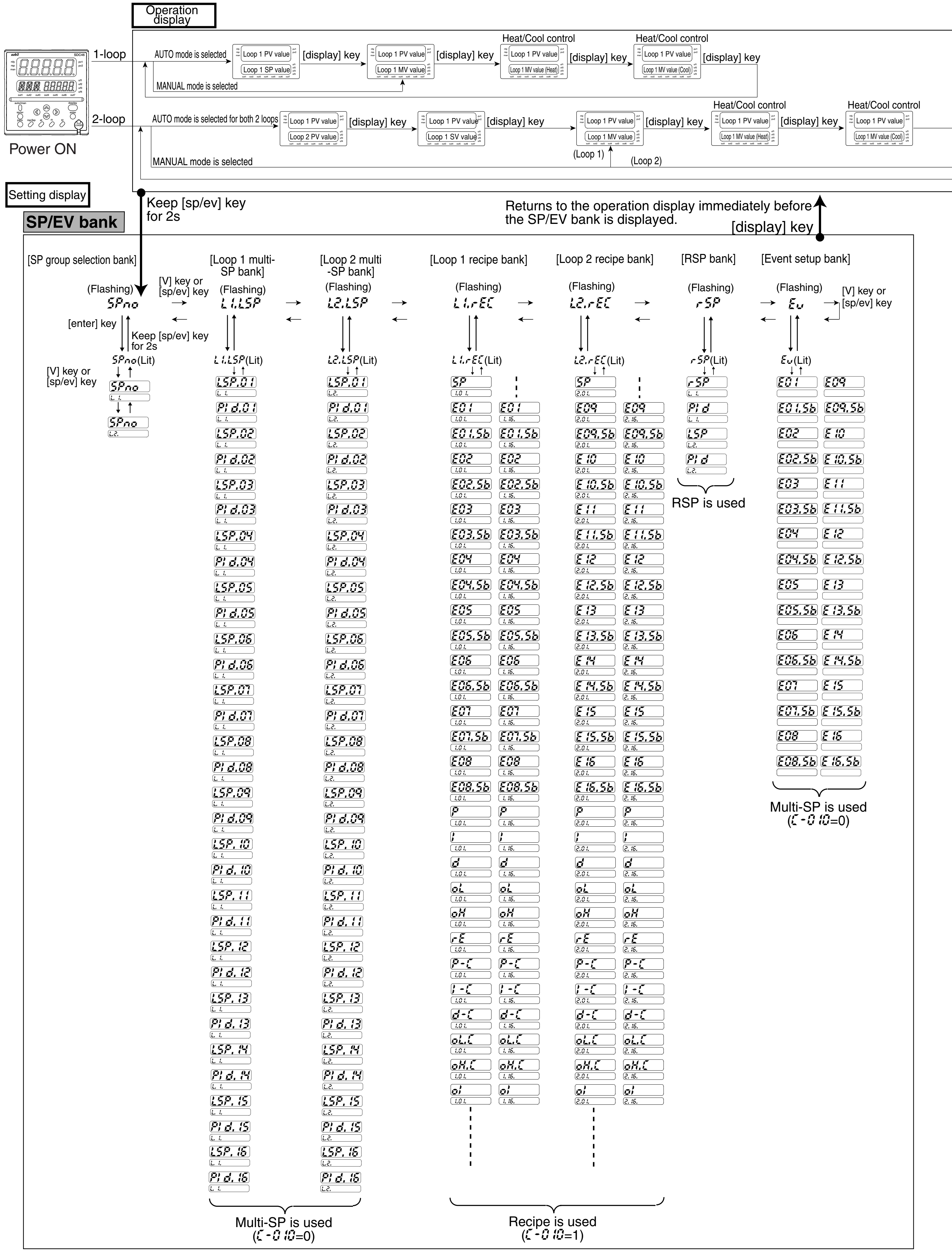
Alphabetical characters: The 11-segment LED expresses alphabetical characters shown below. There are some alphabetical characters, which are not displayed on the LED.

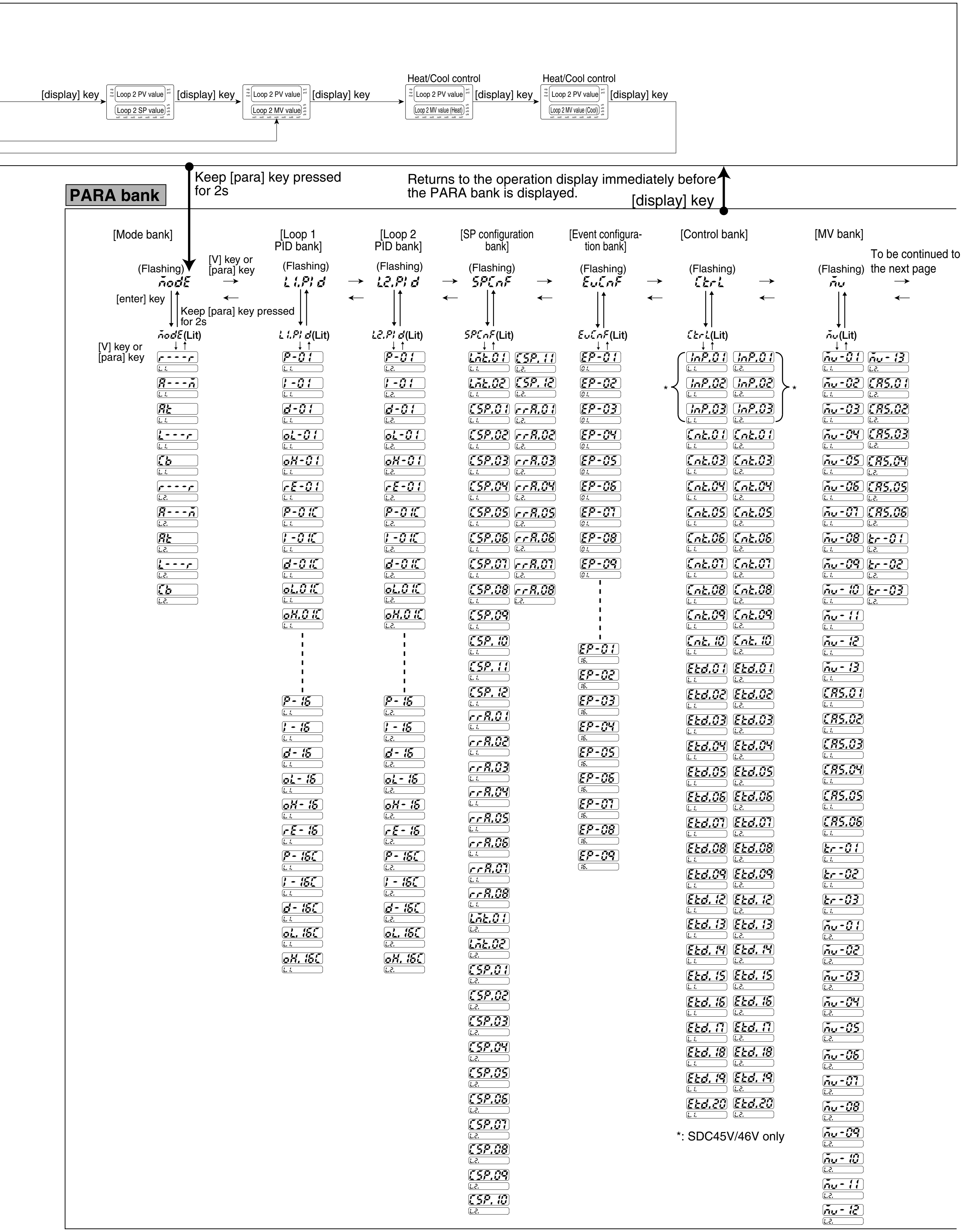
A a		B b		C c		D d		E e		F f	
G g		H h		I i		J j		K k		L l	
M m		N n		O o		P p		Q q		R r	
S s		T t		U u		V v		W w		X x	
Y y		Z z									

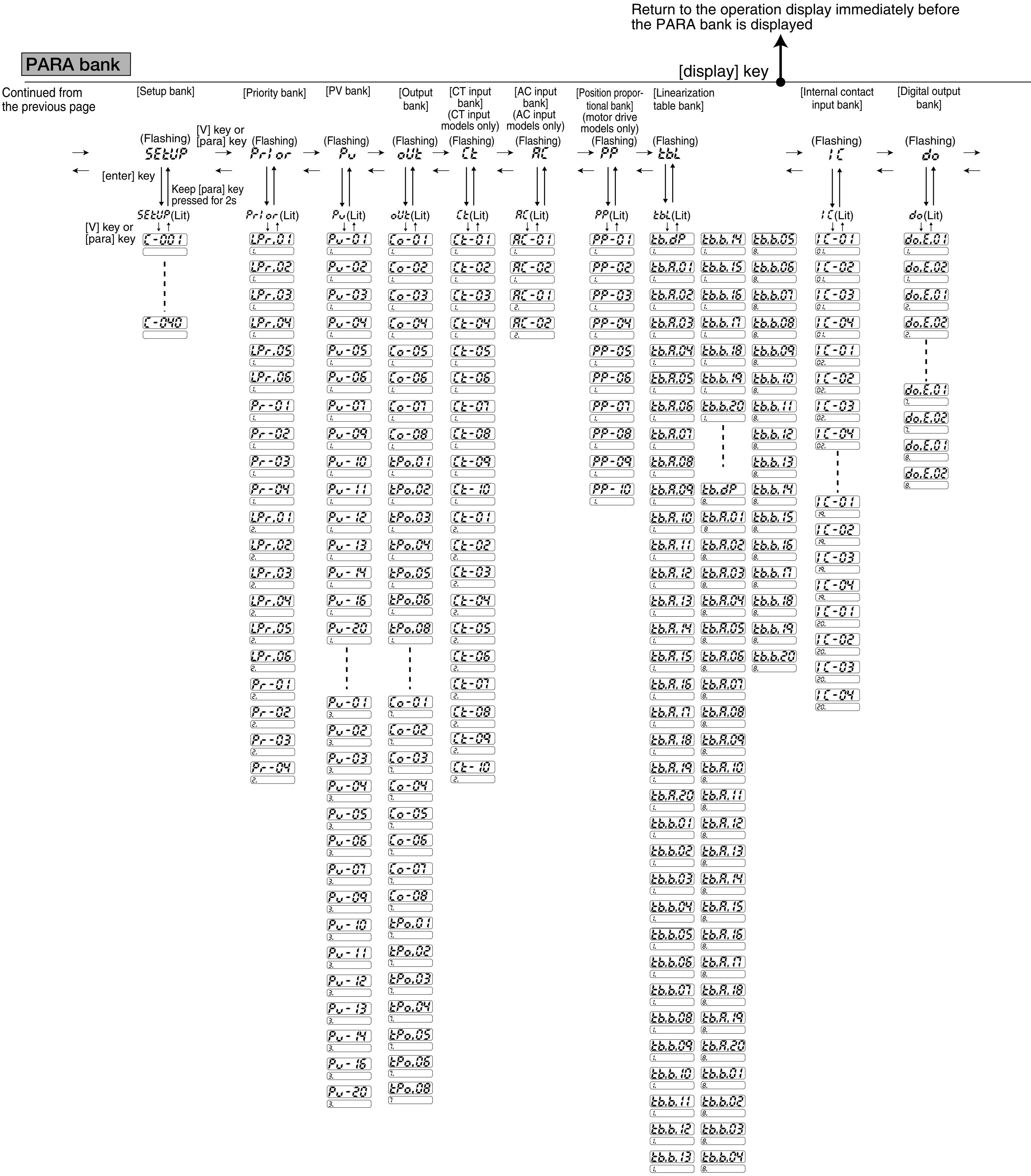
Handling Precautions

• As shown above, numeric value "5" and alphabetic character "S" are shown in the same manner.

Flowchart of key operations and displays

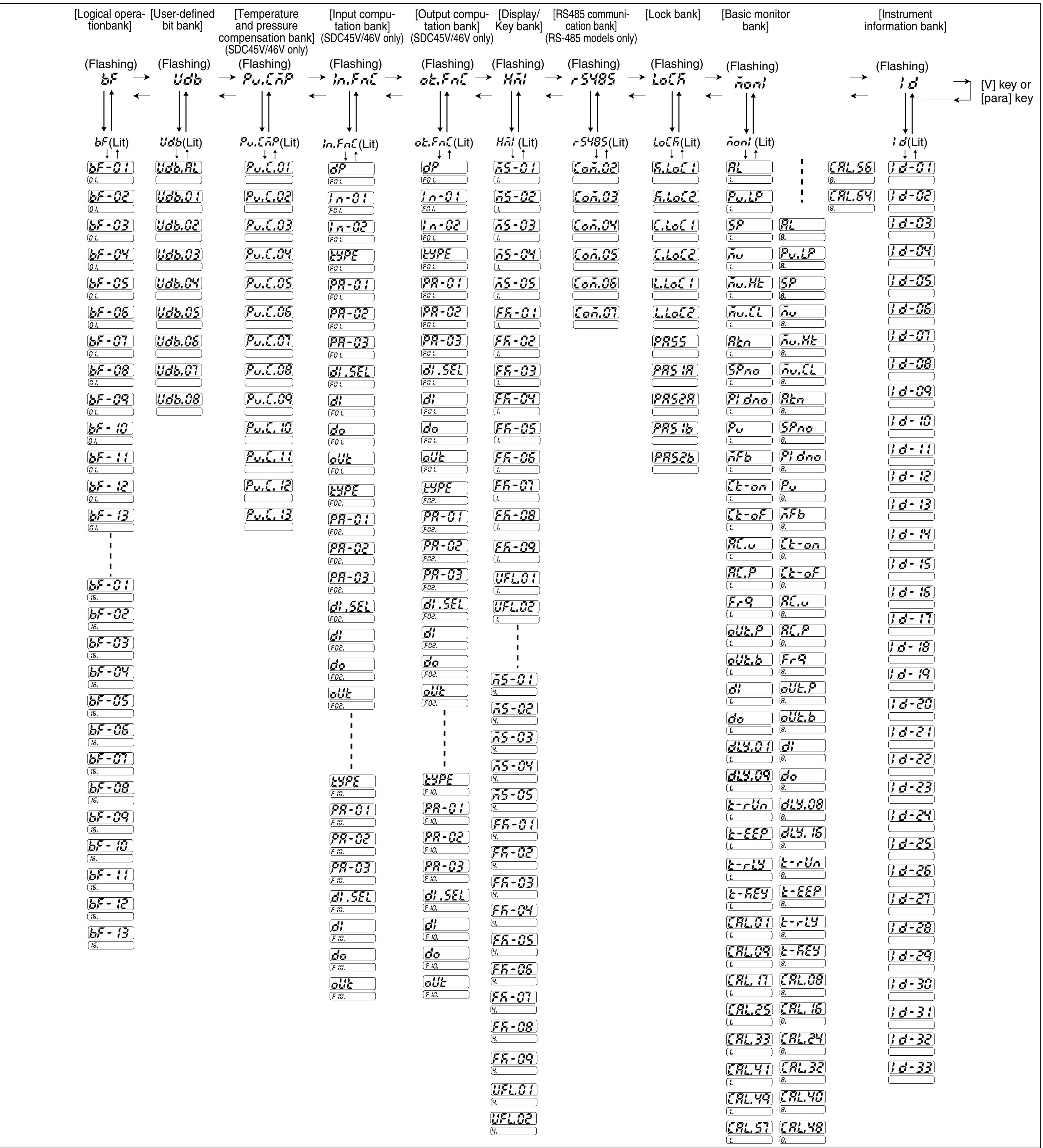



[display] key
Loop 2 PV value
Loop 2 SP value
Loop 2 MV value
Heat/Cool control
Loop 2 MV value (Heat)
Loop 2 MV value (Cool)
Keep [para] key pressed for 2s
Returns to the operation display immediately before the PARA bank is displayed.
PARA bank
[Mode bank]
[Loop 1 PID bank]
[Loop 2 PID bank]
[SP configuration bank]
[Event configuration bank]
[Control bank]
[MV bank]
To be continued to the next page
(Flashing)
[V] key or [para] key
[enter] key
(Lit)
*: SDC45V/46V only


PARA bank
Return to the operation display immediately before the PARA bank is displayed
[display] key
Continued from the previous page
[Setup bank]
[Priority bank]
[PV bank]
[Output bank]
[CT input bank] (CT input models only)
[AC input bank] (AC input models only)
[Position proportional bank] (motor drive models only)
[Linearization table bank]
[Internal contact input bank]
[Digital output bank]
(Flashing)
[V] key or [para] key
[enter] key
Keep [para] key pressed for 2s
(Lit)
[V] key or [para] key

■ Movement within bank

- Forward movement
  [sp/ev] key or [V] key (SP/EV bank)
  [para] key or [V] key (PARA bank)
- Backward movement
  [∧] key



Chapter 1. OVERVIEW

1 - 1 Overview and Features

■ Overview

The SDC45/46 (hereafter referred to as "this unit" or "the SDC") is a digital indicating controller designed to control temperature, pressure, flow rate, pH, liquid level, and other process variables. Up to two full multirange input points can be connected. Therefore, this unit is applicable to various control modes, such as single-loop PID control. The following features are provided to achieve complicated process controls. Thus, this unit can be used for a wide variety of applications.

■ Features

- A variety of models
  The best model for the application can be chosen from the following 3 models: standard model (SDC45A/46A), computation function model (SDC45V/46V), and high-accuracy model (SDC45R/46R). *1

- High speed and high accuracy
  This unit combines a high-speed sampling cycle with a 5-digit display and high accuracy.

- Multi-loop input
  Up to two full multi-range input points can be mounted. According to this function, the control modes, such as single-loop PID control (remote SP input), 2-loop PID control, cascade control, and backup control can be made with only one unit. The control mode can be changed by data settings.

- Improvement of visibility and operability
  High-intensity LEDs are used for the display part. This ensures excellent visibility. Additionally, a model that uses orange LEDs for all display parts is available. This also ensures good visibility. *2
  As for operation keys, various kinds of mode keys, and [∧], [∨], [<], and [>] keys are arranged. This ensures easy setting and mode change. A mechanical key mechanism is utilized for the main body, ensuring convenient operation with click-feeling.

- Achievement of advanced control
  The control action incorporates a new algorithm "Ra-PID (Rationa LOOP PID)"and "Just-FiTTER." Three types of auto tunings are prepared by assuming a variety of cases. This ensures easy obtaining of optimal control results.
  Additionally, input and output linearization approximation tables are provided as standard functions. This ensures optimal control results, which cannot be obtained with normal PID only. Also, use of two output points makes it possible to perform the heat/cool control.

- Various forms of input and output

  Up to seven output points can be connected to the SDC46A, and the SDC45A can take up to five. Output types can be selected from among relay contact, voltage pulse, current, continuous voltage, and transmitter power supply (24 Vdc).
  Multiple types of output allow various final control elements to be connected through this one unit. Control output assignments can be changed freely by means of settings.
  Additionally, the DI and DO points of the SDC46A/46V can be extended to up to 14 DI points and 8 DO points using optional functions. By exchanging the I/O with the PLC, auto operation of the equipment, mode change, various alarms, and statuses can be controlled, contributing to safe operation of the equipment.

- Personal computer loader supported

  A personal computer loader provides a monitoring function. Data setting, as well as device monitor and trend functions are provided. This unit can also be used as a simple data logger.

*1. The sampling cycle of the SDC45A/46A can be selected from 25, 50, 100, and 300 ms. On the SDC45R/46R/45V/46V the sampling cycle is fixed at 100 ms.

*2. There are no SDC45R/46R models with orange LED display.

1 - 2 Model Selection Table

■ SDC45A/V (with 14-digit model No.)

Basic model No.	Input model	Power supply	Output 1, 2	Output 3, 4	Output 5	Output 6, 7	Option	Addition 1	Addition 2	Specifications
C45A										Standard model
C45V										Computation function model
	1									1 input (1 full multiple) *1
	2									2 inputs (2 full multiple)
	3									3 inputs (1 full multiple, 2 linear) *2
		A								100 to 240 Vac
		D								24 Vdc
			1							1 form 1a1b relay
			2							2 form 1a relays
				C0						Current output (OUT 3)
				D0						Continuous voltage output (OUT 3)
				V0						Voltage pulse output (OUT 3)
				RR						2 form 1a relays
				CC						2 current outputs
				VV						2 voltage pulse outputs
				CV						Current (OUT 3) + voltage pulse (OUT4)
				SS						Motor drive triac + MFB input
					0					None
					R					Form 1a relay
					C					Current output
					D					Continuous voltage output
					P					Transmitter power supply
						0				None
							0			2 digital inputs (DI-F1/2) *3
							1			10 digital inputs *4
							2			2 digital inputs + 8 digital outputs *3
							3			2 digital inputs + 8 digital outputs + RS-485 communication *3
							4			2 CT inputs *5
							5			2 CT inputs + 8 digital inputs *5
							6			2 CT inputs + 8 digital outputs *5
							7			2 CT inputs + 8 digital outputs + RS-485 communication *5
								0		None
								T		Tropicalization treatment
								K		Anti-sulfide treatment
								D		Inspection certificate
								B		Tropicalization treatment + inspection certificate
								L		Anti-sulfide treatment + inspection certificate
								Y		Complying with the traceability certification
								Z		Tropicalization treatment + Complying with the traceability certification
								X		Anti-sulfide treatment + Complying with the traceability certification
									0	None
									1	LEDs: all orange

*1: Not available for SDC45V.
*2: SDC45V only.
*3: There are no digital inputs if "SS" is selected for Output 3, 4.
*4: There are 8 digital inputs if "SS" is selected for Output 3, 4.
*5: Cannot be selected if "SS" is selected for Output 3, 4.

■ SDC46A/V (with 14-digit model No.)

Basic model No.	Input model	Power supply	Output 1, 2	Output 3, 4	Output 5	Output 6, 7	Option	Addition 1	Addition 2	Specifications
C45A										Standard model
C45V										Computation function model
	1									1 input (1 full multiple) *1
	2									2 inputs (2 full multiple)
	3									3 inputs (1 full multiple, 2 linear) *2
		A								100 to 240 Vac
		D								24 Vdc
			1							1 form 1a1b relay
			2							2 form 1a relays
				C0						Current output (OUT 3)
				D0						Continuous voltage output (OUT 3)
				V0						Voltage pulse output (OUT 3)
				RR						2 form 1a relays
				CC						2 current outputs
				VV						2 voltage pulse outputs
				CV						Current (OUT 3) + voltage pulse (OUT4)
				SS						Motor drive triac + MFB input
				R1						Motor drive relay + MFB input
					0					None *4
					R					Form 1a relay *4
					C					Current output *4
					D					Continuous voltage output *4
					P					Transmitter power supply *4
						0				None
						1				Current output (OUT 6)
						2				Transmitter power supply (OUT 7)
						3				2 current outputs *3
						4				Current (OUT 6) + transmitter power supply (OUT 7)
							0			2 digital inputs (DI-F1/2) *5
							1			14 digital inputs *6
							2			14 digital inputs + 8 digital outputs *6
							3			14 digital inputs + 8 digital outputs + RS-485 communication *6
							4			2 CT inputs *7
							5			2 CT inputs + 12 digital inputs *7
							6			2 CT inputs + 12 digital inputs + 8 digital outputs *7
							7			2 CT inputs + 12 digital inputs + 8 digital outputs + RS-485 communication *7
								0		None
								T		Tropicalization treatment
								K		Anti-sulfide treatment
								D		Inspection certificate
								B		Tropicalization treatment + inspection certificate
								L		Anti-sulfide treatment + inspection certificate
								Y		Complying with the traceability certification
								Z		Tropicalization treatment + Complying with the traceability certification
								X		Anti-sulfide treatment + Complying with the traceability certification
									0	None
									1	LEDs: all orange

*1: Not available for SDC46V.

*2: SDC46V only.

*3: Not available if "CC" is selected for Output 3, 4 and "C" is selected for Output 5.

*4: Selection must be "0" if "R1" is selected for Output 3, 4.

*5: There are no digital inputs if "SS" or "R1" is selected for Output 3, 4.

*6: There are 12 digital inputs if "SS" or "R1" is selected for Output 3, 4.

*7: Not available if "SS" or "R1" is selected for Output 3, 4.

■ SDC45A (with 7-digit model No.)

Displays have all-orange LEDs.

Basic model No.	Set No.	Option 1	Option 2	Specifications
C45A				Standard model: 2 alarm outputs (OUT 1/2)
	0			None
		0		Regular type 1: 2 relay outputs (OUT 3/4) + 1 current output (OUT 5) + 2 digital inputs (DI-F1/2)
		1		Regular type 2: 1 current output (OUT 3) + 1 voltage pulse output (OUT 4) + 1 relay output (OUT 5) + 2 digital inputs (DI-F1/2)
		2		Position proportion type 1: 2 triac outputs (OUT 3/4) + 1 relay output (OUT 5)
		3		Regular type 3: 2 current outputs (OUT 3/4) + transmitter power supply (24 Vdc) (OUT 5) + 2 digital inputs (DI-F1/2)
		4		Position proportion type 2: 2 triac outputs (OUT 3/4) + transmitter power supply (24 Vdc) (OUT 5)
			0	None
			1	Communications (RS-485) + PV input 2 + 8 digital outputs
			2	PV input 2 + 8 digital outputs
			3	8 digital outputs
			4	PV input 2

■ SDC46A (with 7-digit model No.)

Basic model No.	Set No.	Option 1	Option 2	Specifications
C46A				Standard model: 2 alarm outputs (OUT 1/2) + 1 current output (OUT 6)
	0			None
		0		Regular type 1: 2 relay outputs (OUT 3/4) + 1 current output (OUT 5) + 2 digital inputs (DI-F1/2)
		1		Regular type 2: 1 current output (OUT 3) + 1 voltage pulse output (OUT 4) + 1 relay output (OUT 5) + 2 digital inputs (DI-F1/2)
		2		Position proportion type 1: 2 triac outputs (OUT 3/4) + 1 relay output (OUT 5)
		3		Regular type 3: 2 relay outputs (OUT 3/4) + 1 current output (OUT 5) + transmitter power supply (24 Vdc) (OUT 7) + 2 digital inputs (DI-F1/2)
		4		Position proportion type 2: 2 triac outputs (OUT 3/4) +1 relay output (OUT 5) + transmitter supply (24 Vdc) (OUT 7)
			0	None
			1	Communications (RS-485) + PV input 2 + 12 digital inputs + 8 digital outputs
			2	PV input 2 + 12 digital inputs + 8 digital outputs
			3	12 digital inputs + 8 digital outputs
			4	PV input 2

■ SDC45R

Basic model No.	Input model	Power supply	Output 1, 2	Output 3, 4	Output 5	Output 6, 7	Option	Addition 1	Addition 2	Specifications
C45R										High accuracy model
	1									2 inputs (1 RTD, 1 linear)
	2									2 inputs (2 RTDs)
		A								100 to 240 Vac
		D								24 Vdc
			1							1 form 1a1b relay
			2							2 form 1a relays
				CC						2 current outputs
				VV						2 voltage pulse outputs
					R					Form 1a relay
						0				None
							0			2 AC inputs
							1			2 AC inputs + 8 digital inputs
							8			2 AC inputs + RS-485 communication
								D		Inspection certificate
								Y		Complying with the traceability certification
									0	None

■ SDC46R

Basic model No.	Input model	Power supply	Output 1, 2	Output 3, 4	Output 5	Output 6, 7	Option	Addition 1	Addition 2	Specifications
C46R										High accuracy model
	1									2 inputs (1 RTD, 1 linear)
	2									2 inputs (2 RTDs)
		A								100 to 240 Vac
		D								24 Vdc
			1							1 form 1a1b relay
			2							2 form 1a relays
				CC						2 current outputs
				VV						2 voltage pulse outputs
					R					Form 1a relay
						0				None
						3				2 current outputs
							0			2 AC inputs
							1			2 AC inputs + 12 digital inputs
							8			2 AC inputs + RS-485 communication
								D		Inspection certificate
								Y		Complying with the traceability certification
									0	None

■ Accessories and optional parts

● Accessories

Name	Model No.
Mounting bracket	81405411-004
Gasket	81421863-001 (for SDC45A)
	81421864-001 (for SDC46A)

● Optional parts

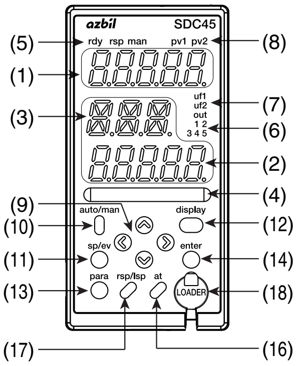
Item	Parts No. or model No.
Mounting bracket (2 units)	81405411-003
Terminal cover*	81441420-001
Current transformer	QN212A (ϕ12)
	QN206A (ϕ6)
Transformer for detecting heater power supply voltage	81406725-003
Hard cover	81441421-001 (for SDC45)
	81441422-001 (for SDC46)

*: 1 cover for SDC45, 2 for SDC46.

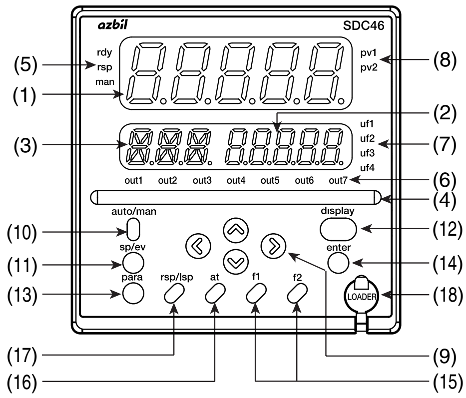
1 - 3 Names and Functions of Parts

■ Front panel

● **SDC45**



● **SDC46**



● **Description**

(1) Upper display:	Displays PV (present temperature etc.) or setup items.
(2) Lower display:	Displays SP (set temperature, etc.) and other parameters.
(3) Auxiliary display:	Displays group No., loop* No., and channel No. of setup item. * The control loop is formed by the PV input, PID control, and control output.
(4) Multi-status indicator:	Indicates MV or DI/DO status.
(5) Mode indicators:	
rdy:	Lights up in READY mode.
rsp:	Lights up in RSP (remote setting input) mode.
man:	Lights up in MANUAL mode.
(6) Output indicators:	
out1-7:	Light up when the output is ON (SDC45: out1-5). Always lit when the output is current or continuous voltage.
(7) User function indicators:	
uf1-4:	Light under user-assigned conditions (SDC45: uf1, uf2).
(8) Loop number indicators:	
pv1, pv2:	Light up to indicate which loop has the displayed PV value.
(9) [∧], [∨],[<], [>] keys:	Used to increment/decrement numeric values and shift between digits or settable items.
(10) [auto/man] key:	Used to change AUTO/MANUAL mode.
(11) [sp/ev] key:	Used to set the SP/EV bank.
(12) [display] key:	Used to change the display contents in the operation display mode.
(13) [para] key:	Used to set the PARA bank.
(14) [enter] key:	Used in initiating setup and to confirm changed values.
(15) [f1], [f2] key:	Used for user-assigned functions. (SDC46 only).
(16) [at] key:	Used to execute/cancel auto-tuning, or for user-assigned functions.
(17) [rsp/lsp] key:	Used to change between remote and local set point, or for user-assigned functions.
(18) Loader jack:	Jack for connection of PC loader cable (with cap).

■ Rear panel

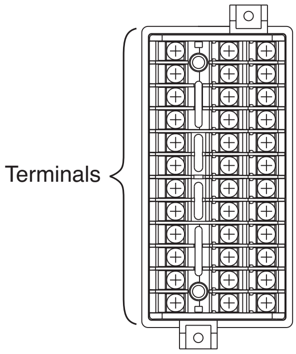
The rear panel of this unit contains terminals used to connect the power supply, inputs, and/or outputs.

For connections, always use crimp terminals suitable for M3 screws.

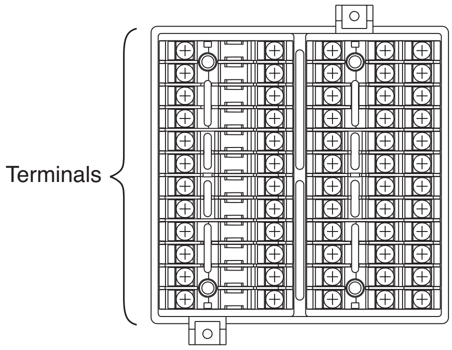
Terminal screws: M3

Tightening torque of terminal screws: 0.4 to 0.6 N·m or less

● SDC45

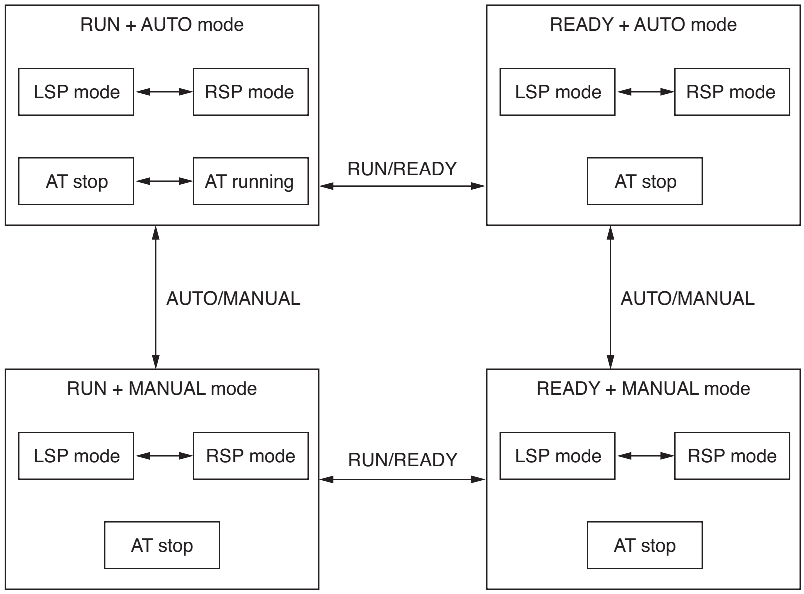


● SDC46



1 - 4 Operation Modes

The following shows the transition of operation modes:



RUN:	Control status
READY:	Control stop status
AUTO:	Automatic operation (This unit automatically determines the MV values.)
MANUAL:	Manual operation (The MV values are operated manually.)
LSP:	Local SP (The control is performed using the SP stored in the measuring instrument.)
RSP:	Remote SP (The analog input from the external device is used as SP.)
AT:	Auto tuning (The PID constants are set automatically using the limit cycle.)

When performing the 2-loop control with a 2-input model, the operation mode can be changed independently in each loop.

Chapter 2. INSTALLATION

⚠CAUTION

!	Use the SDC45/46 within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Failure to do so might cause fire or faulty operation.
⊘	Do not block ventilation holes. Doing so might cause fire or faulty operation.

■ Location

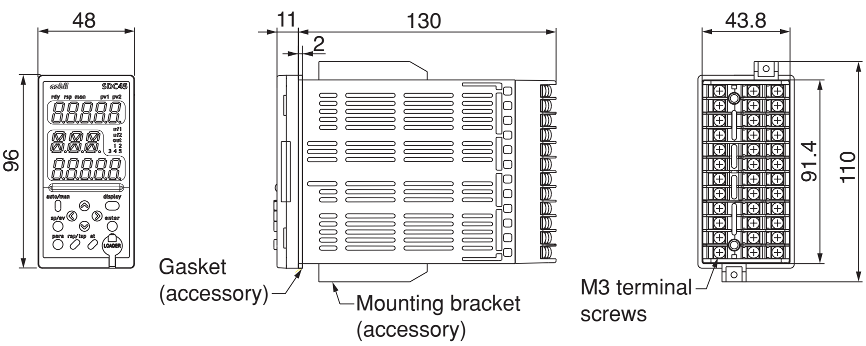
Install the controller in a location that meets the following criteria:

- Voltage to ground of 30 Vr.m.s. max., 42.4 V peak max., and 60 Vdc max.
- No high/low temperature/humidity.
- Free from silicone gas and other corrosive gases such as sulfide gas.
- Not dusty or sooty.
- Protected from direct sunlight, wind, and rain.
- Little mechanical vibration or shock.
- Not close to high voltage line, welding machine or other electrical noise generating source.
- At least 15 meters away from the high voltage ignition device for a boiler.
- No strong magnetic fields.
- No flammable liquid or gas.
- Indoors

■ External dimensions

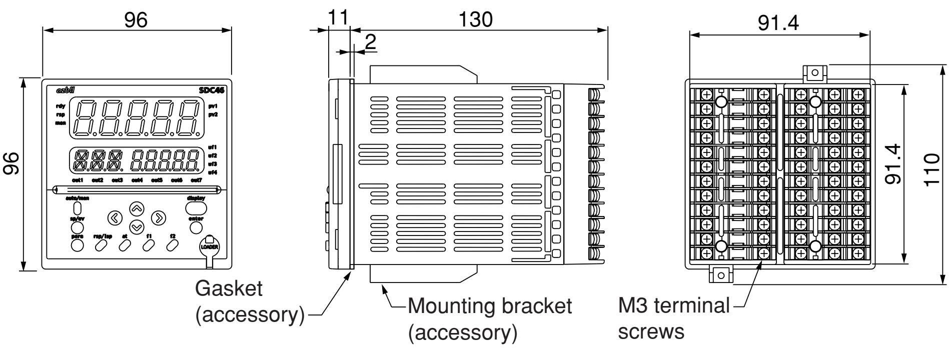
● SDC45

Unit: mm



● SDC46

Unit: mm



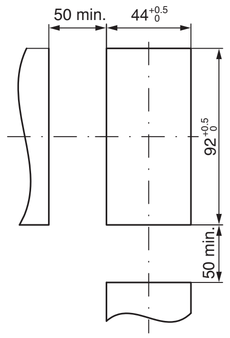
■ Panel cutout dimensions

Make the mounting holes according to the panel hole marking dimensions.

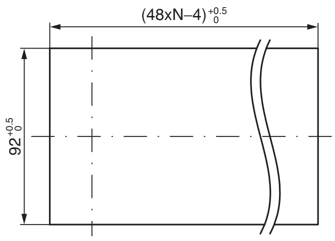
● **SDC45**

Unit: mm

Stand-alone mounting



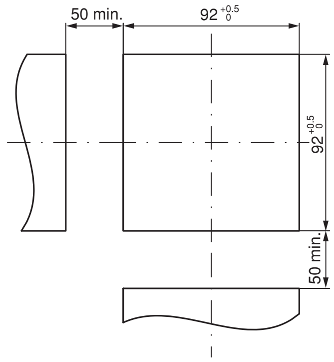
Gang-mounting (SDC45A/V only)



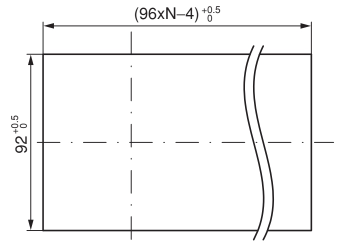
● **SDC46**

Unit: mm

Stand-alone mounting



Gang-mounting (SDC46A/V only)



Handling Precautions

- When used as a waterproof unit, be sure to install a gasket.
- Mount the SDC45R/46R with the stand-alone mounting method only.
- When three or more units are gang-mounted horizontally, the maximum allowable ambient temperature is 40 °C.
- Provide a space of at least 50 mm or more above and below the controller.

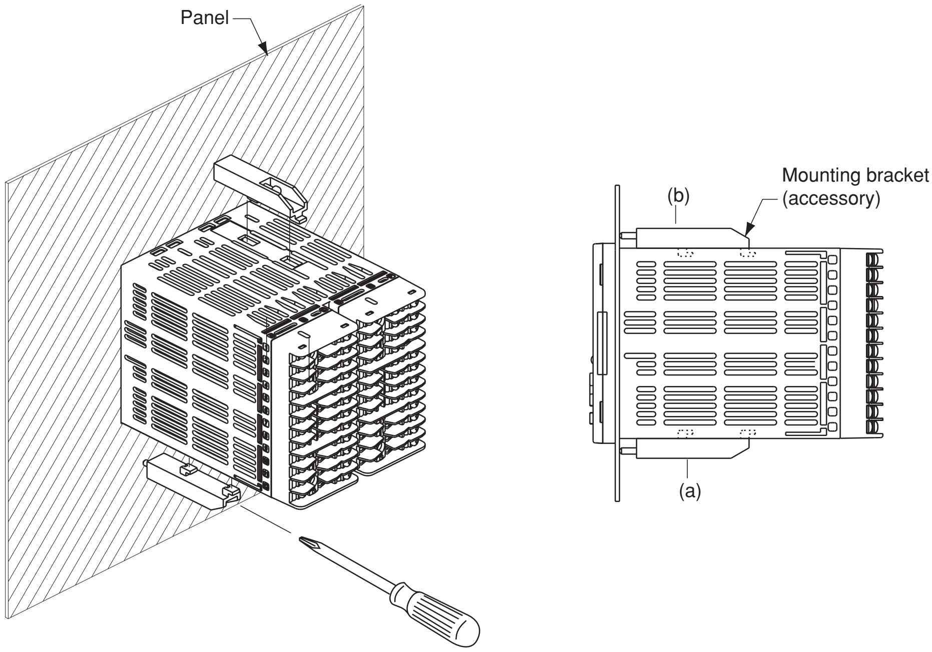
■ Mounting procedure

● Ordinal mounting

Tools: Phillips-head screwdriver

(1) Insert this unit from the front of the panel.

(2) Fix the top and bottom of this unit firmly with the mounting brackets (accessory). When mounting this unit, mount the lower mounting bracket (a) first.



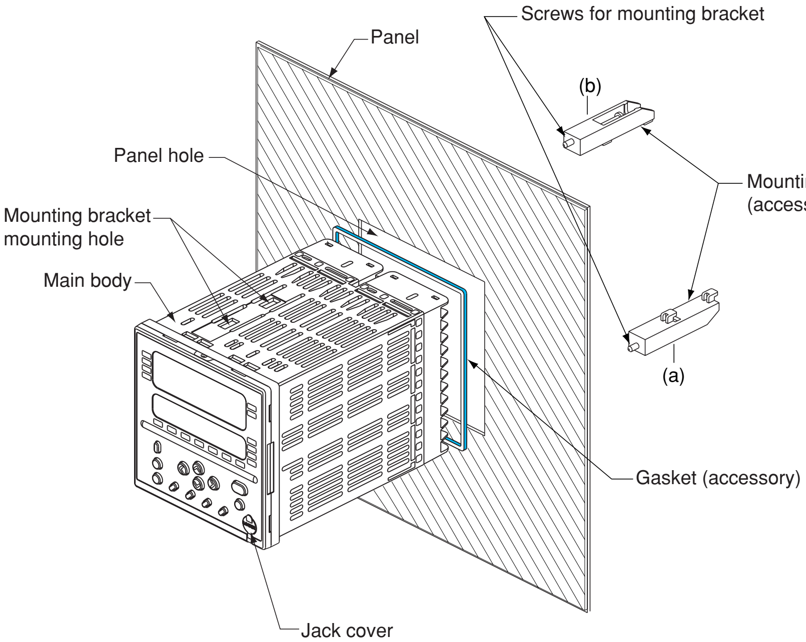
(3) To fasten this controller onto the panel, tighten the mounting bracket screws, and turn one more turn when there is no play between the bracket and panel.

! Handling Precautions

- Excessive tightening of the screws may deform the controller case.
- The mounting must be horizontal with the back not tilted more than 10° up or down.
- The mounting panel should be rigid and no more than 7 mm thick (5 mm max. when a gasket is used).

● Waterproof mounting

Tools: Phillips-head screwdriver



(1) Mount the gasket on the flange part of this unit.

(2) Make sure that the jack cover is inserted to the front panel of this unit firmly.

(3) From the front of the panel, insert this unit with the gasket mounted.

(4) Fix the top and bottom of the main body firmly from the rear of the panel with the mounting brackets (accessory).

When mounting this unit, mount the lower mounting bracket (a) first.

(5) To fasten this controller onto the panel, tighten a mounting bracket screws, and turn one more turn when there is no play between the bracket and panel.

Handling Precautions

- Excessive tightening of the screws may deform the controller case.
- If gang-mounted, dustproof and waterproof protection may not be maintained.
- When used as a waterproof unit, be sure to install a gasket.

Chapter 3.   WIRING

3 - 1 Wiring Precautions

⚠WARNING

- Before removing, mounting, or wiring the SDC45/46, be sure to turn off the SDC45/46 and all connected devices. Failure to do so might cause electric shock.
- Incorrect wiring of the SDC45/46 can damage the SDC45/46 and lead to other hazards. Check that the SDC45/46 has been correctly wired before turning the power ON.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
- Do not disassemble the SDC45/46. Doing so might cause electric shock or device failure.

⚠CAUTION

- Wire the SDC45/46 properly using the specified types of wire and following recognized installation methods. Failure to do so might cause electric shock, fire or device failure.
- Do not allow wire clippings, chips or water to enter the controller case. They might cause fire or device failure.
- Firmly tighten the terminal screws to the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
- Do not use unused terminals on the SDC45/46 as relay terminals. Doing so might cause electric shock, fire or device failure.
- We recommend attaching the terminal cover (sold separately) after wiring the SDC45/46. Failure to do so might cause electric shock.
- Use the relays within the recommended service life. Failure to do so might cause fire or device failure.
- Use Yamatake Corporation's SURGENON if there is a risk of power surges caused by lightning.
  Otherwise, fire or device failure could result.
- The frame ground (FG) terminal on the SDC45/46 has a ground terminal function. To limit the effects of external electrical noise, be sure to ground the SDC45/46. Failure to do so might cause malfunction.

■ Wiring precautions

- Be sure to provide a switch within operator reach for shutting off the main power supply to the controller in the main supply wiring. Also, the main supply wiring also requires a time-lagged (T) fuse rated at 1.0 A, 250 V. Install the switch or fuse on the high potential (non-ground) side of the circuit. (IEC127)
- Symbols in the terminal wiring label on the controller side:

Symbols	Meaning
～	AC power supply
⎓	DC power supply
⚠	Caution, danger of electric shock
⚠	Caution

- Before wiring the SDC45/46, verify the controller's model No. and terminal Nos. written on the label on the side. Inspect all wiring once wiring work has been completed.
- Use M3 crimp-type terminal lugs for wiring to terminals.

  The tightening torque of the terminal screw must be 0.4 to 0.6 N·m or less.
- Leave a distance of at least 50 cm between I/O lead wires or communications lead wires and power lead wires. Also, do not pass these lead wires through the same conduit or wiring duct.
- Be careful not to allow any crimp-type terminal lugs to touch adjacent terminals.
- Be sure that any device or equipment which is connected to this controller has adequate insulation for the controller's power supply voltage and maximum I/O voltages.
- The controller requires 2 to 60 seconds according to the settings to start up once the power is turned ON. A warm-up time of at least 30 minutes is recommended to allow the controller to attain the specified accuracy.

3 - 2 Recommended Cables

- Contact the thermocouple wires to the terminals in case of a thermocouple input. When a thermocouple is connected to terminals, or wiring distance is long, connect the wire via a shielded compensating lead wire.
- For input/output other than thermocouples, use a JCS 4364 instrument cable or equivalent (generally called twisted shielded cable for instrumentation use). Recommended twisted shielded cables are:

Fujikura Ltd.	2 conductors	IPEV-S-0.9 $mm^2 \times$ 1P
	3 conductors	ITEV-S-0.9 $mm^2 \times$ 1T
Hitachi Cable, Ltd.	2 conductors	KPEV-S-0.9 $mm^2 \times$ 1P
	3 conductors	KTEV-S-0.9 $mm^2 \times$ 1T

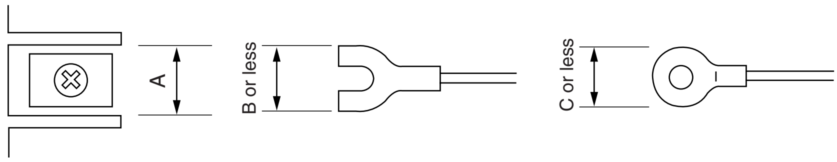
- A shielded multiconductor microphone cord (MVVS) may be used, if electromagnetic induction noise is comparatively low.
- Use a power cable with the following specifications: nominal cross-sectional area of 0.75 to 2.00 mm^2, rated voltage of 300 V or more, and rated temperature of 60 °C or more.
  If commercially available cables are used, CVV or VTC or equivalent is recommended.
  Use cables whose cross-sectional area is suitable for the crimp terminal lugs used.

3 - 3 Terminal Connections

⚠CAUTION

!	Firmly tighten the terminal screws to the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
⊘	Do not use unused terminals on the SDC45/46 as relay terminals. Doing so might cause electric shock, fire or device failure.
⚠	We recommend attaching the terminal cover (sold separately) after wiring the SDC45/46. Failure to do so might cause electric shock.

For wiring of SDC45/46, use an appropriate crimp type terminal lug suitable for the M3 screw.



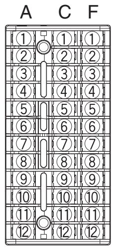
Applicable screw size	Terminal dimensions (mm)			Recommended crimp terminal JIS indication	Applicable electrical wire size	JST Mfg. Co. Model No. (Reference)
	A	B	C			
M3	6.1	5.8	5.8	RAV1.25-3	0.3 to 1.3 mm^2 AWG22 to 16	V1.25-3 V1.25 B3A

Handling Precautions

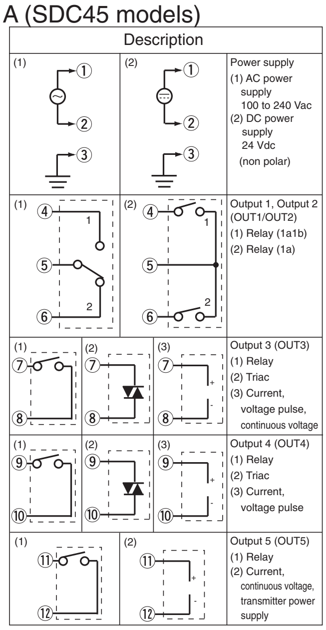
- When installing this unit in a place where the vibration or impact is large, always use an appropriate round crimp type terminal lug to avoid loose terminal connections.
- Pay special attention so that no crimp type terminal lugs are in touch with adjacent terminals.
- The tightening torque of the terminal screw must be 0.4 to 0.6 N·m or less.

3 - 4 Terminal Wiring Diagram

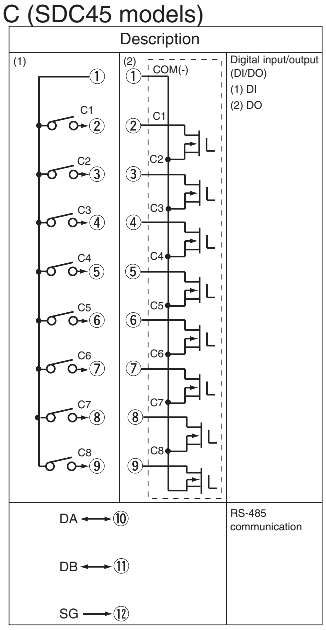
■ SDC45 terminals



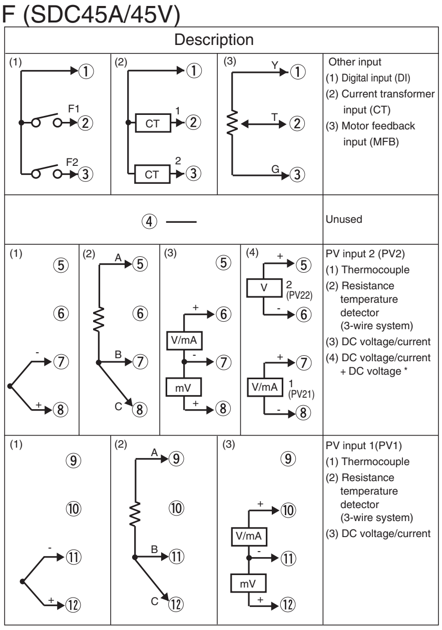
A (SDC45 models)



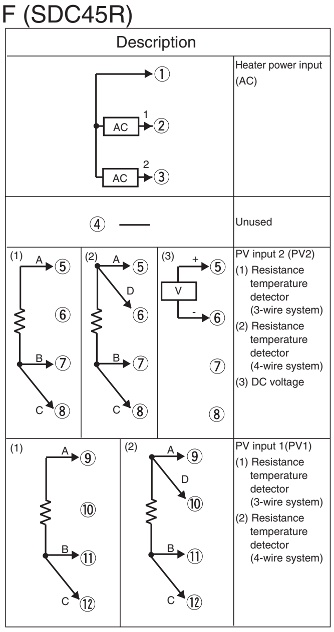
C (SDC45 models)



F (SDC45A/45V)

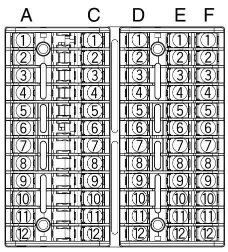


F (SDC45R)

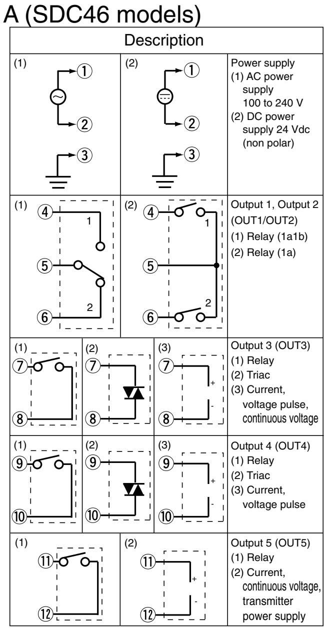


* SDC45V models all have 3 inputs.

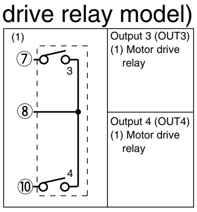
■ SDC46 terminals



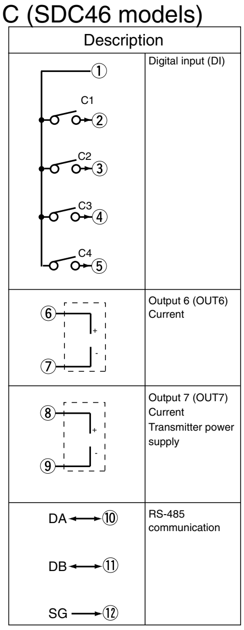
A (SDC46 models)



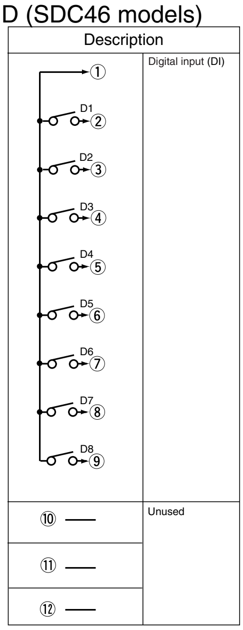
A (SDC46 Motor drive relay model)



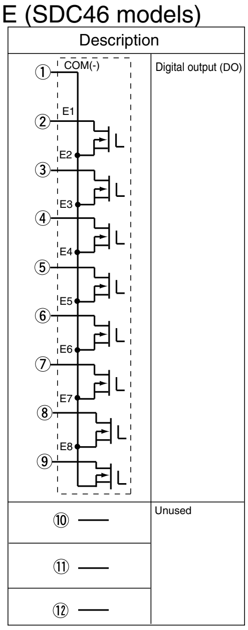
C (SDC46 models)



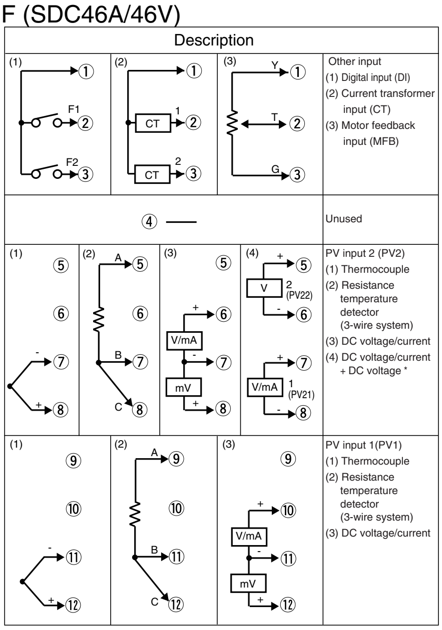
D (SDC46 models)



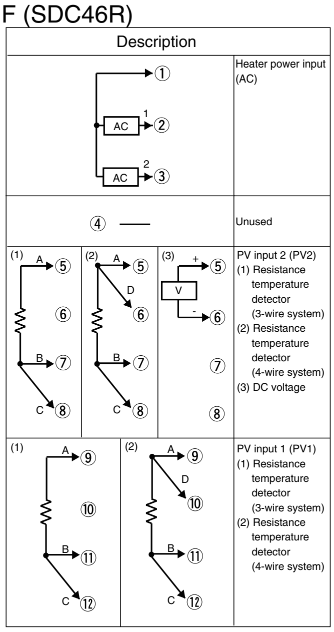
E (SDC46 models)



F (SDC46A/46V)



F (SDC46R)



* SDC46V models all have 3 inputs.

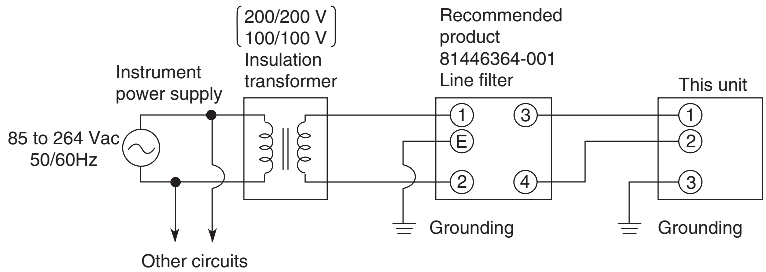
3 - 5 Power Supply Connections and Grounding

■ Power supply connections

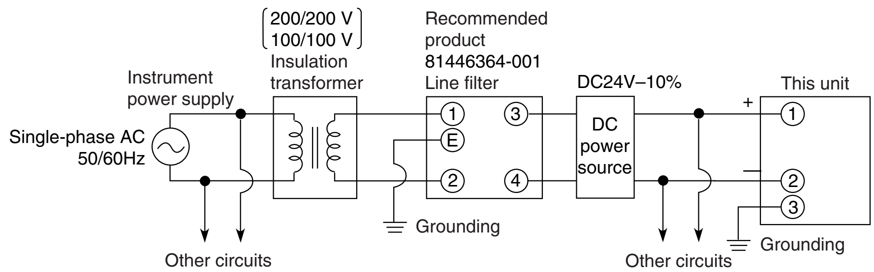
⚠WARNING

Before wiring, removing or mounting the SDC45A/46A, be sure to turn the power OFF. Failure to do so might cause electric shock or device failure.

● **AC power supply model**



● **DC power supply model**



■ Noise-reduction

Obtain the SDC45/46 power source from a single-phase instrumentation power source not subject to excess noise for AC model.
If the power source generates noise, add an insulation transformer, and use a line filter.
Line filter Yamatake Corporation Model No. 81446364-001
Use a CR filter for fast-rising noise.
CR filter Yamatake Corporation Model No. 81446365-001

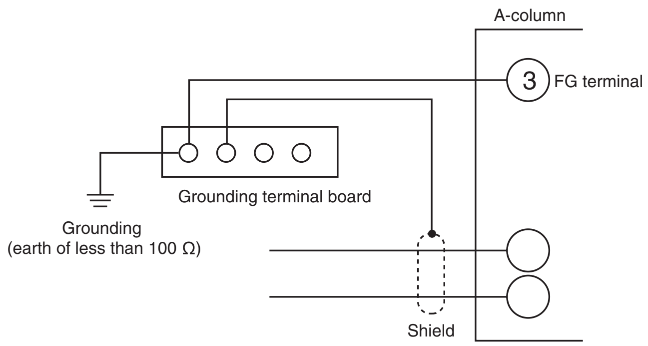
Handling Precautions

- After introducing noise-reduction measures, do not bundle cables from the primary and secondary coils of the isolation transformer together. Do not put them in the same conduit or duct.

■ Grounding

Connect the instrument by one-point grounding to FG terminal (terminal A-(3)). Do not perform any jumper wiring. Mounting a grounding terminal board separately, and connect shielded cables, etc. to the ground, if grounding work is difficult.

Grounding resistance:	Less than 100 Ω
Grounding conductor:	Annealed copper wire more than 2 mm^2 (AWG14)
Grounding conductor length:	20 m max.



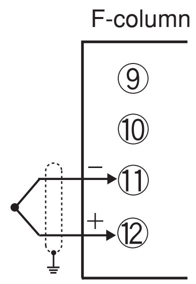
3 - 6 PV Input (PV) Connections

Handling Precautions

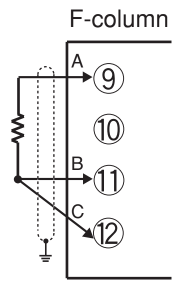
- Do not apply a voltage exceeding the allowable input voltage described in the specifications to each input. Doing so might cause the unit to malfunction.
- Make the connections properly while carefully checking the input polarities.
- Always use shielded wires for input wiring.
- When using a thermocouple for the input, take appropriate measures so that the terminal is not exposed to the wind. Failure to do so might cause an error to occur.
- Input ratings are shown below.
  DC voltage input (mV-range): -100 to +100 mV
  DC voltage input (V-range): -1 to +10 V
  DC current input: 0 to 20 mA

■ PV input 1 (PV1) connection

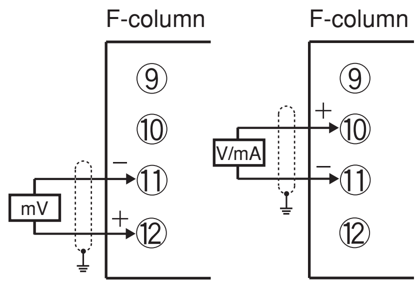
- **Thermocouple sensor**



- **RTD sensor**



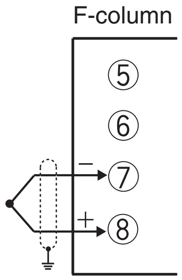
- **Linear voltage/linear current sensor**



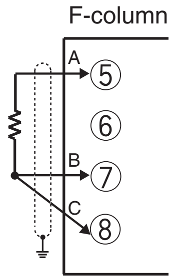
- When the range type is 43 to 46 (0 to 10 mV, -10 to +10 mV, 0 to 100 mV, -100 to +100 mV), terminal Nos. (11) and (12) are used.
- When the range type is 41 (4 to 20mA), 42 (0 to 20mA) and 47 to 51 (0 to 1 V, -1 to +1 V, 1 to 5 V, 0 to 5 V, 0 to 10 V), terminal Nos. (10) and (11) are used.

■ PV input 2 (PV2) connection

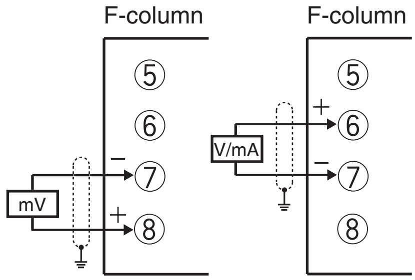
- **Thermocouple sensor**



- **RTD sensor**



- **Linear voltage/linear current sensor**



- When the range type is 43 to 46 (0 to 10 mV, -10 to +10 mV, 0 to 100 mV, -100 to +100 mV), terminal Nos. (7) and (8) are used.
- When the range type is 41 (4 to 20mA), 42 (0 to 20mA) and 47 to 51 (0 to 1 V, -1 to +1 V, 1 to 5 V, 0 to 5 V, 0 to 10 V), terminal Nos. (6) and (7) are used.

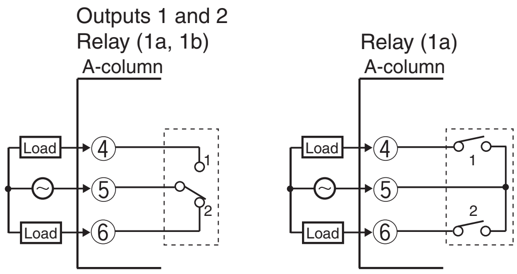
Note

- For details about SDC45V/46V 3-input models and SDC45R/46R models, refer to:
☞ ■ SDC45 terminals on page 3-5 and ■ SDC46 terminals on page 3-6.

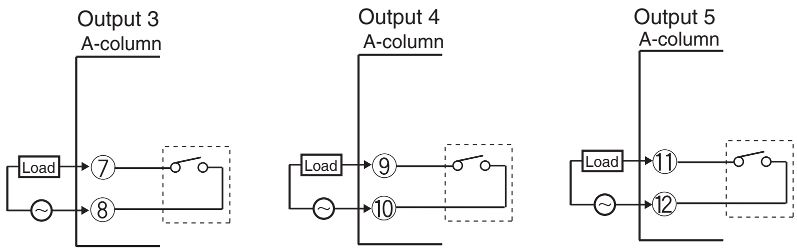
3 - 7 Output (OUT) Connections

The terminal assignment may vary depending on the model No. Make the connections properly while carefully checking the model No. and terminal No.
For details about terminal No. assignment, refer to:
☞ 3-4 Terminal Wiring Diagram (on page 3-5).

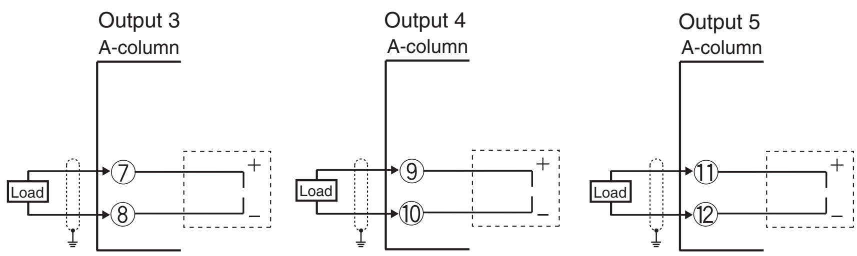
■ Relay output

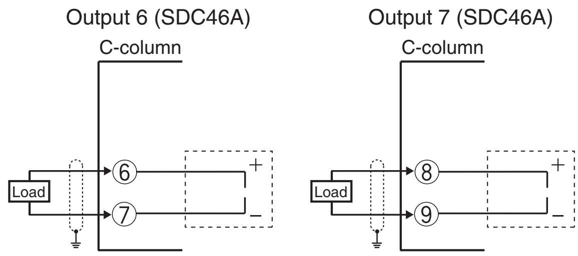


- Outputs 1 and 2 (1a1b)
  Contact rating: 3 A 250 Vac/30 Vdc
- Outputs 1 and 2 (1a)
  Contact rating: 1 A 250 Vac/30 Vdc
- Outputs 3 to 5
  Contact rating: 3 A 250 Vac/30 Vdc



■ Current output, continuous voltage output, voltage pulse output, and power supply for transmitter





- Current output
  4 to 20 mAdc/0 to 20 mAdc,
  600 Ω max.
- Continuous voltage output
  0 to 5 Vdc/1 to 5 Vdc/0 to 10 Vdc,
  1k Ω min.
- Voltage pulse output
  12 Vdc/30 mA max.

! Handling Precautions

- When opening or closing a micro current, use a bleeder resistance corresponding to the minimum open/close capacity of the relay to adjust it to a sufficient current level.
- Do not connect or disconnect a load with the power to this unit turned ON. Doing so might cause this unit or load to be faulty.
- Always use shielded wires to connect the current output or continuous voltage output.

■ Connection with solid state relay (SSR)

To drive the SSR, a model having voltage pulse outputs must be used.

A constant current type SSR must be used. The following describes how to connect the SSR.

The two conditions listed below must be satisfied.

- Input current (maximum): When the load current of the voltage pulse output is satisfied, parallel connection can be made.
- Operating voltage range (input): Check that the voltage between the terminals of the voltage pulse output is within the specified range.

● Yamatake's PGM10N/PGM10F series

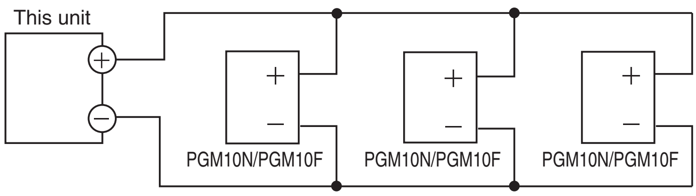
This example shows the calculation for the connection of this unit and the PGM10N015.

Note: For connection with other model number, check the specifications of each model.

- Input current: Since the input current is 10 mA or less, up to three units (10 mA × 3 = 30 mA ≤ 30 mA [maximum load current]) can be connected in parallel.
- Operating voltage range (input): The rated voltage is 3.5 to 30 Vdc. Therefore, the output voltage is within the range.

Output voltage = 12 Vdc $^{+15\%}_{-10\%}$

Connection diagram



Number of connectable units

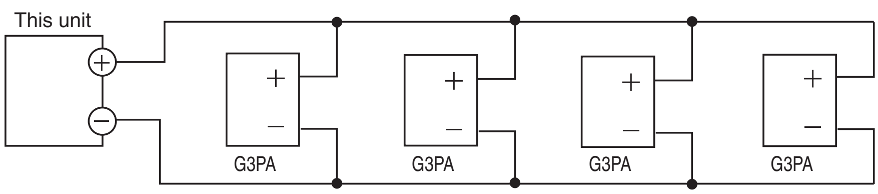
SSR	Connection	Number of connected units per output
PGM10N	Parallel connection	Up to 3 units
PGM10F	Parallel connection	Up to 2 units

● Omron's G3PA, G3PB, G3NA

- Input current: Since the input current is 7 mA or less, up to four units (7 mA × 4 = 28 mA ≤ 30 mA [maximum allowable current]) can be connected in parallel.
- Operating voltage range (input): The operating voltage is 4 to 30 (32) Vdc or 9.6 to 30Vdc. Therefore, the output voltage is within the range.

Output voltage = 12 Vdc $^{+15\%}_{-10\%}$

Connection diagram

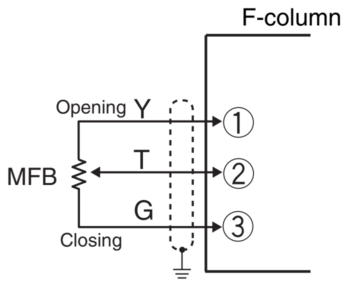


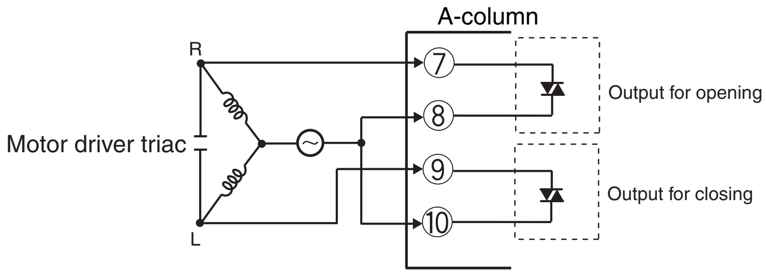
Number of connectable units

SSR	Connection	Number of connected units per output
Omron G3PA	Parallel connection	Up to 4 units
Omron G3PB	Parallel connection	Up to 4 units
Omron G3NA	Parallel connection	Up to 4 units

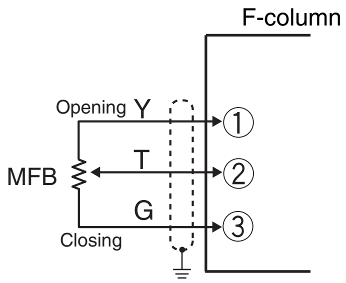
■ Connection if a motor driver is used

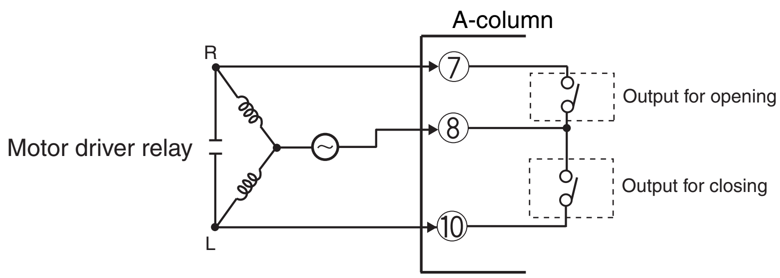
● Connections for motor driver triac output





● Connections for motor driver relay output





Note

- If the direction of motor rotation is reversed, reverse the wiring of R and L, and reverse the wiring of G and Y.
- Only 100 Vac supply voltage can be used for the ECM3000 with a direct connection (only for triac output).

Handling Precautions

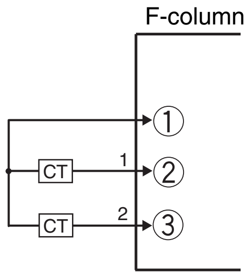
- If the supply voltage of the ECM3000 connected to the motor driver triac output is NOT 100 Vac, use an external auxiliary relay.
  If an external auxiliary relay is used, consider the minimum specified load current for the motor driver triac, and connect a bleeder resistor if necessary.
- If the power supply connected to the motor driver relay output is for a 100/200 Vac motor, pay attention to not only contact rating but also inrush current, and use an external auxiliary relay if necessary.
- Do not put wires for the triac or for relay output terminals (7), (8), (9) and 10 in the same duct with wires for MFB input terminals (1), (2), and (3). Also, they should not be combined in a 6-core cable. Doing so may cause this unit to malfunction due to motor startup noise, etc.
- Avoid using PID constants that cause repeated excessive ON-OFF action. Excessive ON-OFF will shorten the life of the motor and relay.
  In such cases, setting PP-04 (long life) to 1 (life-oriented) in the position proportional bank (PP) may reduce the number of operations of the triac/relay with almost no effect on control results.
- If PP-02 (selection of control methods) is set to 2 (estimated position control) or 3 (estimated position control + position adjustment at power-on), wiring for MFB terminals (1), (2), and (3) is not necessary (for control without feedback).
- If PP-02 (selection of control methods) is set to 0 (MFB control + estimated position control) or to 1 (MFB control + close upon line break), be sure to execute auto-tuning in PP-05 after completion of wiring. For details, refer to:
  ☞ ■ **Auto tuning** (PP-05) (page 4-22).
- If PP-02 (selection of control methods) is set to 2 (estimated position control) or to 3 (estimated position control + position adjustment at power-on), be sure to correctly input the value in PP-08 (full opening time).

3 - 8 Connections for Current Transformer Input/Heater Power Supply Voltage Input

■ Connections for current transformer input

Input ratings are shown below.

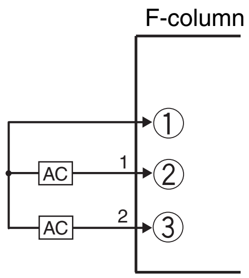
- AC 0 to 69 mA



■ Connections for heater power supply voltage input

Input ratings are shown below.

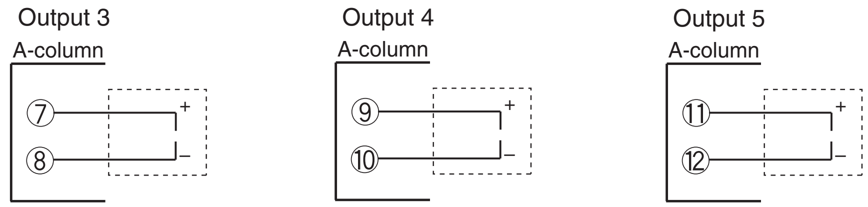
- AC 0 to 13.2 V

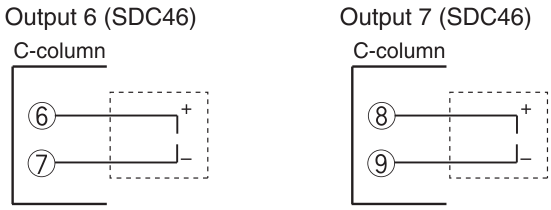


3 - 9 Connection with Transmitter

When this unit is used for the power supply of the transmitter (4 to 20 mAdc output), use a model, the output of which has the power supply for the transmitter

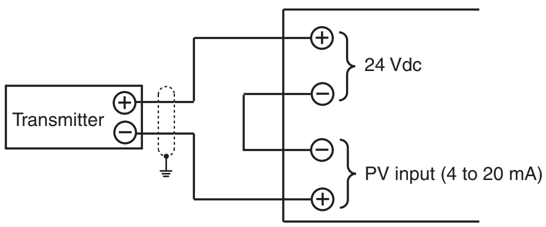
● Terminal numbers for transmitter power supply



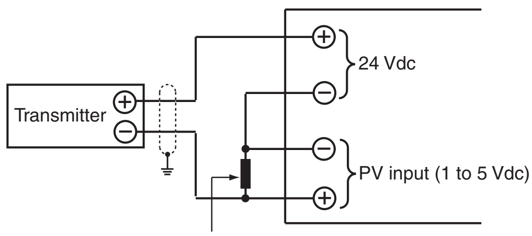


• Transmitter power supply function
24 Vdc, 30 mA max.

● Current input

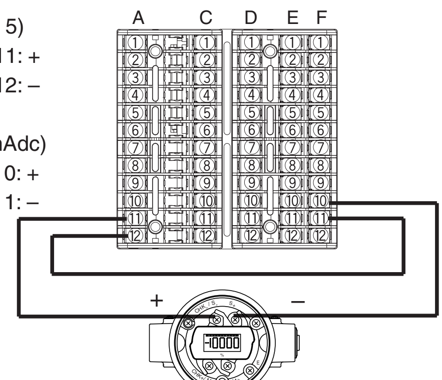


● Voltage input



● Example of wiring between the output 5 power supply and PV1 on the SDC46A1A2C0P0000

- 24Vdc (output 5)
  A-column No.11: +
  A-column No.12: –
- PV1 (4 to 20mAdc)
  F-column No.10: +
  F-column No.11: –



Pressure transmitter, etc.

Handling Precautions

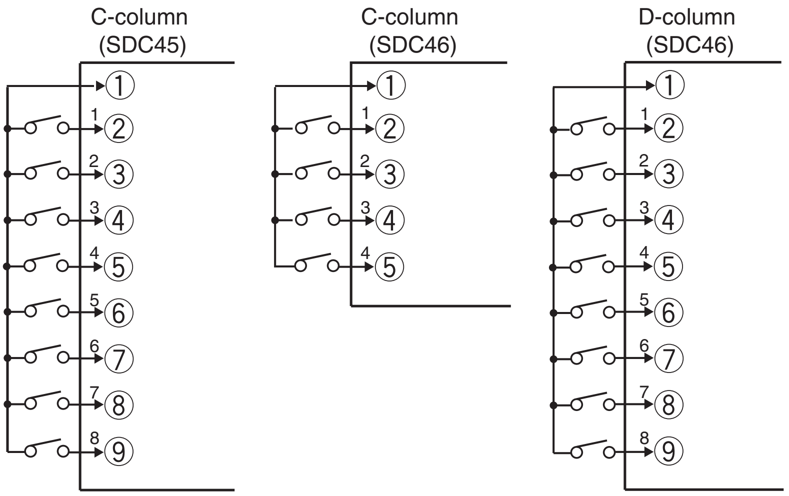
- The power supply for the transmitter always outputs the voltage at the same time when the power to this unit is turned ON.Therefore, carefully check the connections before turning ON the power to this unit.
  Additionally, do not connect or disconnect the transmitter with the power to this unit turned ON. Doing so might cause the transmitter to malfunction.
- Always use shielded wires for wiring.
- If a transmitter is connected to the power supply for the transmitter of this unit using the PV input as current input, be sure to set the PV input range to current input (4 to 20 mAdc) before doing an operational check.
  If the PV range is not configured properly, 24 Vdc will not be supplied to the circuits, and the transmitter will not operate.

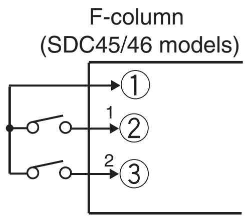
3 - 10 Digital Input (DI) Connections

The terminal assignment may vary depending on the model No. Make the connections properly while carefully checking the model No. and terminal No.

For details about terminal No. assignment, refer to:

☞ 3-4 Terminal Wiring Diagram (on page 3-5).



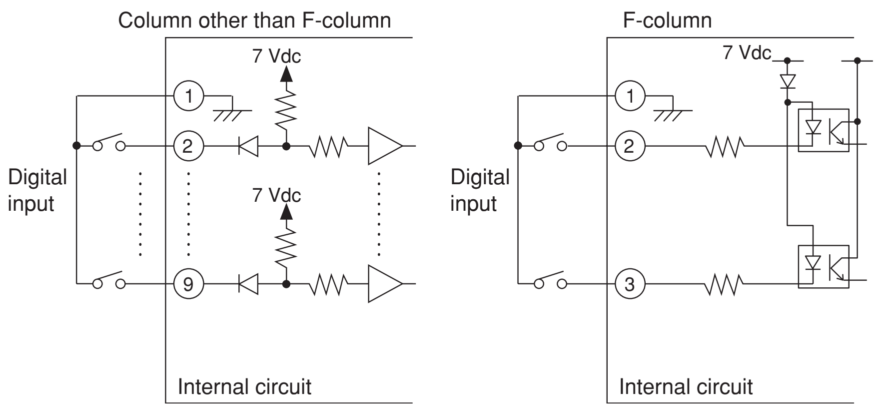


Connection:
Dry contact or transistor (sink type)
Terminal voltage:
7 Vdc ±15%
Terminal current:
3 to 7 mA

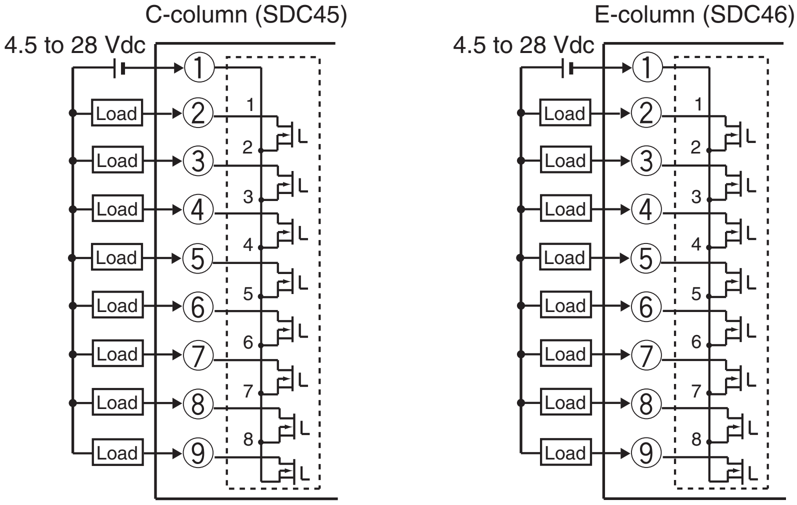
Handling Precautions

- The digital input of this unit is a type of built-in power supply. Always use dry contacts for external contacts.
- For dry contacts, always use a gold contact or other contact that can turn ON or OFF the micro current. When using other relay contacts, the relay contact may not be turned ON or OFF. Always use a contact having a sufficient allowance of the minimum open/close capacity to the short-circuit terminal current and open-terminal voltage of this unit.
- If a semiconductor (open collector, etc.) is used for dry contact, use an appropriate semiconductor that the voltage across the contact at both ends when the contact is turned ON satisfies the allowable ON drop voltage. Additionally, use an appropriate semiconductor that the leak current when the contact is turned OFF satisfies the allowable OFF leak current.

Internal circuit diagram of this unit to be connected to external switch input



3 - 11 Digital Output (DO) Connections

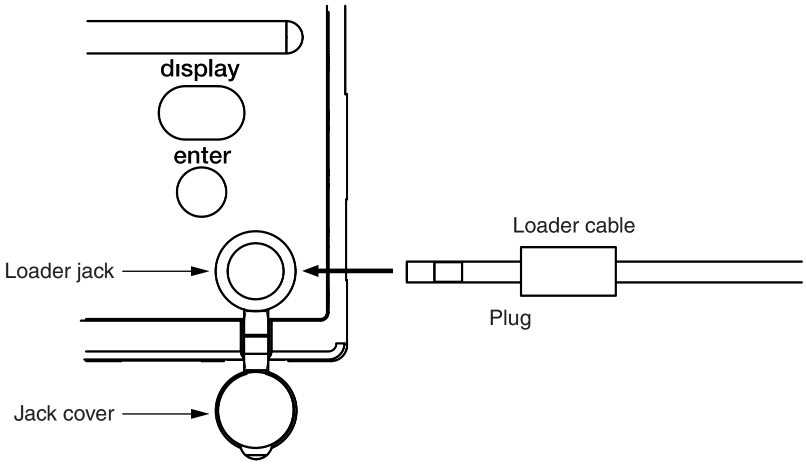


4.5 to 28 Vdc, 70 mA max./point, 500 mA max./unit

Handling Precautions

- Do not make the positive (+) terminal of the external power supply short-circuited with terminals (2) to (9) of C-column (SDC45) or E-column (SDC46). If the positive (+) terminal is short-circuited with above terminals, this might cause the digital output to malfunction. (A short-circuit protection circuit is not incorporated.)
- When connecting a semiconductor load, such as program controller (sequencer), always select an appropriate module having the same current direction.
  Additionally, do not use any semiconductor load, which is not operated by the leak current when the digital output of this unit is turned OFF.

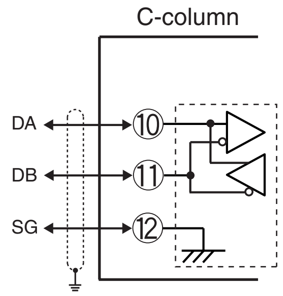
3 - 12 Loader Cable Connection



Handling Precautions

- Be sure to insert the plug into the loader jack properly.
- When plugging in or unplugging the loader cable, hold the plastic insulator. Do not pull on the cable.
- When no loader cable is connected, be sure to close the jack cover.
- For waterproof mounting, the jack cover must be closed.
- When the loader cable is connected, do not apply force to the cable or plug (side to side or up and down). Doing so may damage the cable or jack, or affect the functions or performance of the unit.

3 - 13 RS-485 Communication Connections

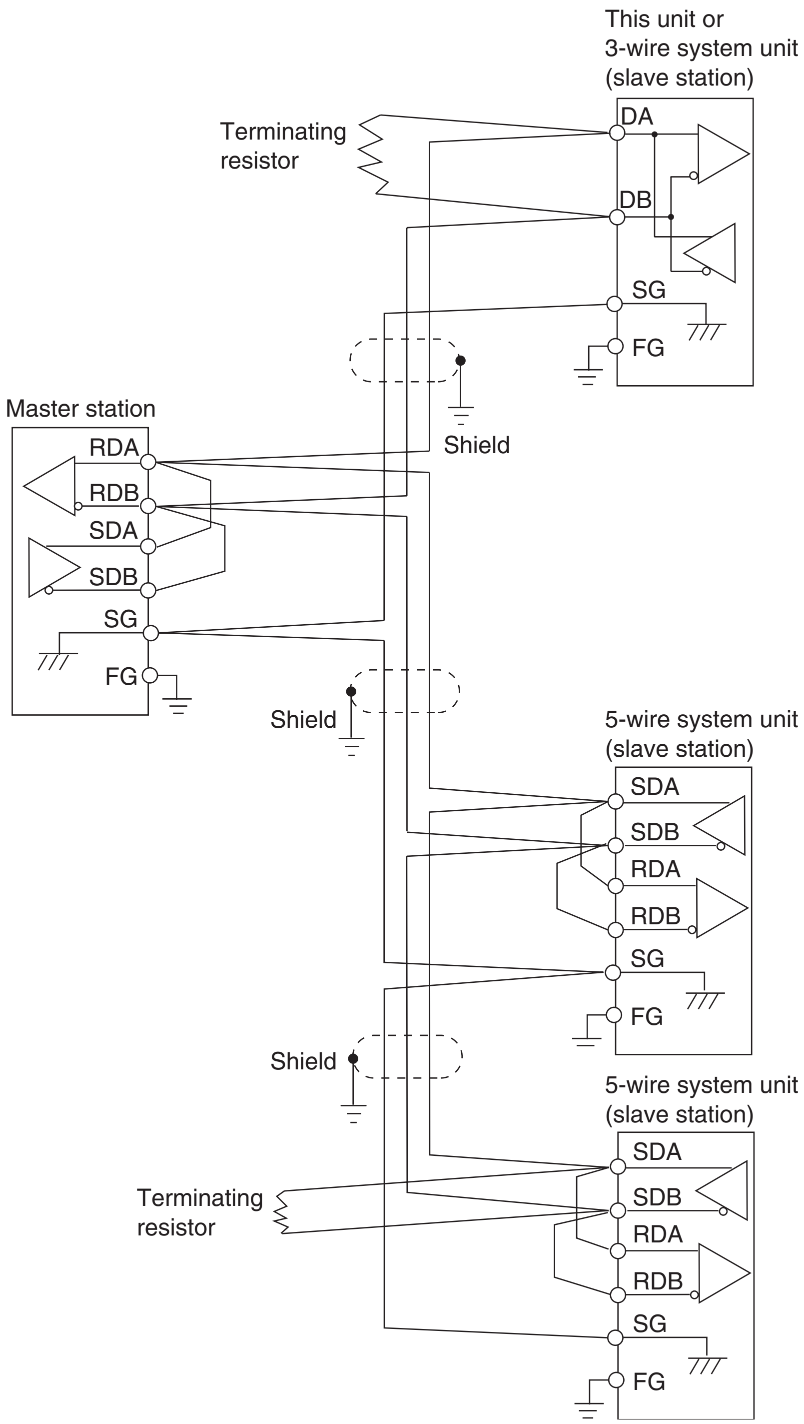


Transmission line: RS-485
Transmission distance: 500 m max.
Connectable units: 32 max.

Handling Precautions

- Be sure to connect the SG terminals each other. Failure to do so might cause unstable communications.
- Attach 0.5 W or greater terminating resistor of 150 Ω ± 5 % at each end of the communications lines.
- If units for which the connection of a terminating resistor is prohibited (Yamatake SDC15/25/26/35/36 or DMC10) are on the same transmission line, do not connect a terminating resistor to the SDC45/46 or to the communications line.
- Ground the shield FGs at one end in one location, not at both ends.

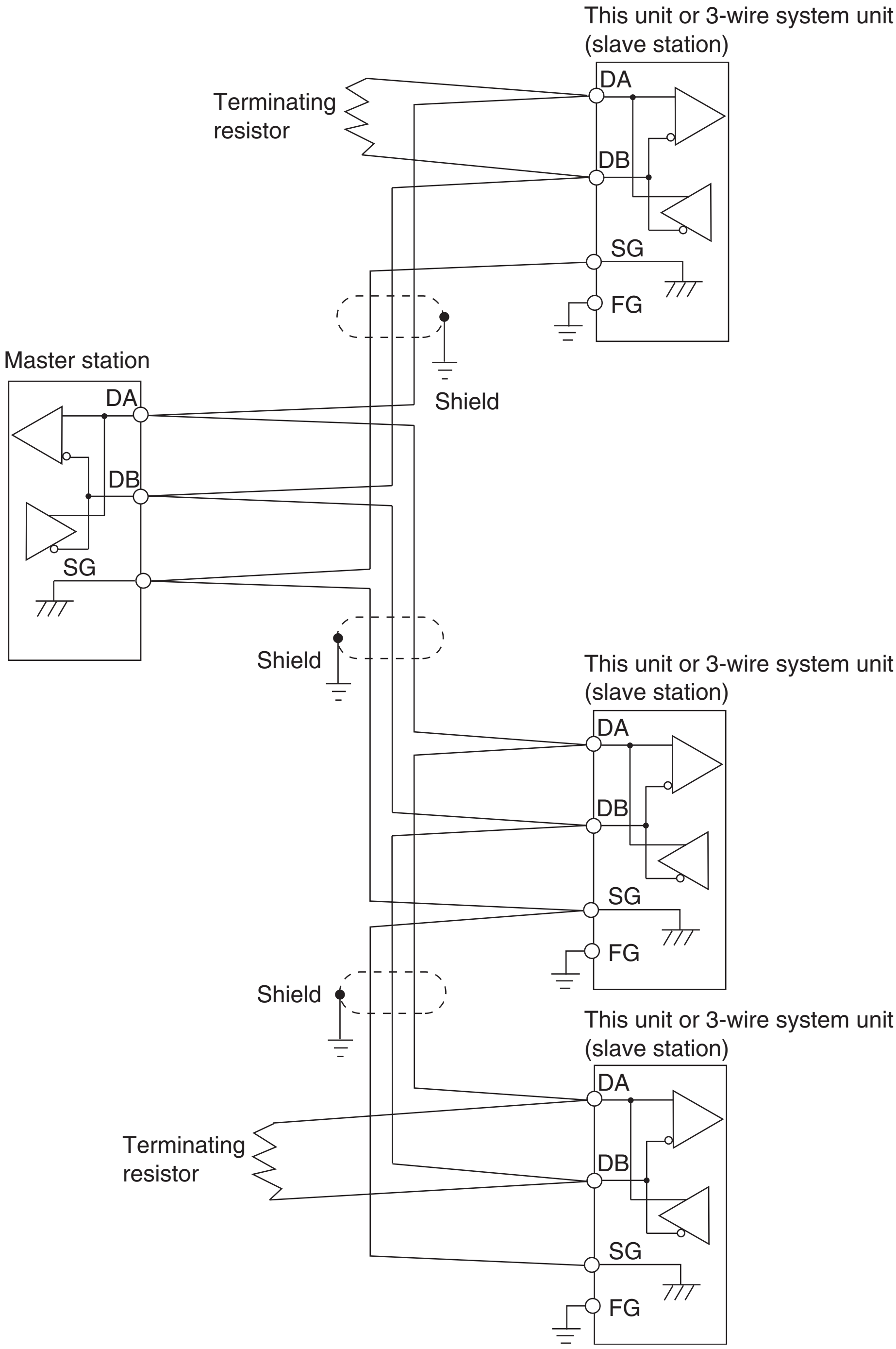
● **Multiple 5-wire system units together**



Handling Precautions

- If units for which the connection of a terminating resistor is prohibited (Yamatake SDC15/25/26/35/36 or DMC10) are on the same transmission line, do not connect a terminating resistor to the SDC45/46 or to the communications line.

- **3-wire system**



Handling Precautions

- If units for which the connection of a terminating resistor is prohibited (Yamatake SDC15/25/26/35/36 or DMC10) are on the same transmission line, do not connect a terminating resistor to the SDC45/46 or to the communications line.

3 - 14 Noise Generation Sources and Noise Suppression

Generally, it is thought that the following may be noise generation sources:

1. Relay and contacts
2. Solenoid coils and solenoid valves
3. Power line (higher than 90 Vac, in particular)
4. Inductive load
5. Motor commutator
6. Phase angle control SCR
7. Radio communication equipment
8. Welding machine
9. High-voltage ignition devices

The following shows effective measures for noise suppression:

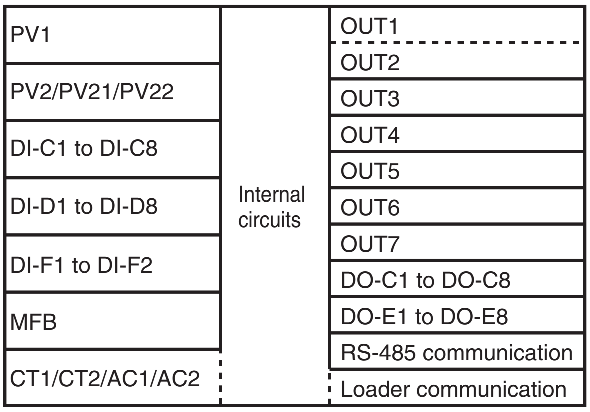
1. A CR filter is effective for quick-rising noises such as impulse noise.
   Recommended CR filter: Yamatake Corporation Model No. 81446365-001
2. A varistor is effective for noises with high crest values.
   Recommended varistor
   Yamatake Corporation Model No. : 81446366-001 (for 100 V)
   81446367-001 (for 200 V)

Handling Precautions

- Take great care when using a varistor since the varistor becomes short-circuited if it is faulty.

3 - 15 I/O Isolation

The following figure shows the mutual isolation between the input and output. In the following figure, sections bounded by a solid line are isolated from the rest of the circuit. Sections bounded by a dotted line are not isolated from the rest of the circuit.



The power circuit is isolated from all inputs/outputs, communications and internal circuits.

Handling Precautions

- The loader jack is not isolated from the internal circuits. Always put the cap on the loader jack when the loader is not used.
- For motor driver relays, OUT3 and OUT4 are not isolated.

Flowcharts for Major Settings

Chapters 4 to 7 describe the data settings of this unit.
To properly operate this unit, be sure to set each setting data correctly so that it meets the operation of this unit.

When operating this unit for the first time, configure the settings in the order shown below.

1. Setting of PARA bank
2. Setting of SP/EV bank

For details about data setting order in each setup, see the setting flowcharts on the following pages:
The functions of this unit vary depending on the ROM version. Before configuring the unit, check the ROM version and the settable functions.
For details, refer to:
Appendix-4 History of ROM Versions (Page App.-18).

1. Setting of PARA bank

● Key operations when setting or changing PARA bank

(1) Press the [display] key to return to the operation display.
(2) To select a bank, keep the [para] key pressed for 2 s.
(3) To display a bank to be set, press the [para] key, [∧] key, or [∨] key.
(4) When a desired bank is displayed, press the [enter] key.
(5) To display an item to be set, press the [para] key, [∧] key, [∨] key, [<] key, or [>] key.
(6) When a desired item is displayed, press the [enter] key.
(7) Change the set value with the [∧] key, [∨] key, [<] key, or [>] key.
(8) To set the set value you have changed, press the [enter] key.
(9) To set other items in the same bank, repeat the operation from step (5).
To set desired set data in other bank, continue the operation from step (2).
(10) To exit the setting, press the [display] key.

● Setting and operation flow

Start of key operation
[display] key → Keep the [para] key pressed for 2s. → Select a bank with [para] key, [∧] key, or [∨] key.

↓

Initial setup
Setup bank (SEtUP)
- C-001 Loop type ☞ Page 4-1
- C-010 Recipe enabled. ☞ Pages 6-17, 6-19
- C-011 SP system group ☞ Pages 7-41
- C-012 Sampling cycle time

← **Computer backup function is used.**
Setup bank (SEtUP) C-002 Computer backup type ☞ Page 7-5

↓

PV1 input setup
PV bank (PV)
(Auxiliary display 1.)
- Pv-01 Range type ☞ Page 4-3
- Pv-02 Decimal point position
- Pv-03 to Pv-20 Linear scaling high/low limit, filter, ratio, bias, etc. ☞ Page 4-6

↓

PV2 input setup
PV bank (Pv)
(Auxiliary display 2.)
- Pv-01 Range type ☞ Page 4-3
- Pv-02 Decimal point position
- Pv-03 to Pv-20 Linear scaling high/low limit, Filter, ratio, bias, etc. ☞ Page 4-6

← **Approximation by linearization table is used.**
Linearization table bank (tbL)
- tb.dP Linearization decimal point ☞ Page 7-11
- tb.A.01 to tb.b.20 Breakpoint

← **RSP multi-ratio is used.**
- SP configuration bank (SPCnF) rrA.01 to rrA.08 RSP ratio 1 to 8 ☞ Page 7-8
- Internal contact input bank (IC) IC01 to IC04 Operation type, input type, etc.

↓

Control setup
Control bank (CtrL)
- Cnt.01 Loop PV/SP /Decimal point position
- Cnt.03 Control action ☞ Page 4-14
- Cnt.04 Control algorithm
- Cnt.05 to Cnt.06 Control range high/low limit ☞ Page 4-6

← **Output at READY is changed.**
MV bank (ñv) ñv-01 to ñv-03 Output at READY

← **Output at PV alarm is used.**
MV bank (ñv) ñv-04 to ñv-05 Output at PV alarm

← **Fixed output value is used.**
- MV bank (ñv) ñv-06 to ñv-13 Fixed output value ☞ Page 7-14
- Internal contact input bank (IC) IC01 to IC04 Operation type, input type, etc.

↓

SP configuration setup
SP configuration bank (SPCnF) Lñt.01 to Lñt.02 SP high/low limit

↓

Continued on next page.

Continued from the previous page.

SP ramp is used.
SP configuration bank (SPCnF) CSP.01 to CSP.04 LSP ramp-up, ramp-down, etc. ☞ Page 7-46

Event configuration setup
Event configuration bank (EvCnF) EP-01 to EP-09 Operation type, Loop/Channel definition, Polarity, Standby, Hysteresis, Delay, etc. ☞ Page 6-5

Output setup
Output bank (oUt) Co-01 to Co-07 Continuous output (current output, continuous voltage output) ☞ Page 4-16
tPo.01 to tPo.06 ON/OFF output, Time proportional output

Approximation by linearization table is used.
Linearization table bank (TBL) tb.dP Linearization decimal point ☞ Page 7-11
tb.A.01 to tb.b.20 Breakpoint

Digital output setup
Digital output bank (do) do.C.01 to do.C.02 Output type, Latch
do.E.01 to do.E.02 Output type, Latch

Digital input is used.
Priority bank (Prior) LPr.01 to LPr.06 SP group selection, RUN/READY, AUTO/MANUAL, LSP/RSP, etc. ☞ Page 6-2
Pr-01 to Pr-02 Release all latches, OUT broken line table use group
Internal contact input bank (IC) IC01 to IC04 Operation type, Input type, etc. ☞ Page 6-11

PID constant setup
Loop 1 PID bank (L1.PId) P-XX, I-XX, d-XX Proportional band, Integration time, Derivative time ☞ Page 5-8
Loop 2 PID bank (L2.PId) oL-XX, oH-XX, rE-XX MV high/low limit, Manual reset
P.XXC, I.XXC, d.XXC Proportional band (cool), Integration time (cool), Derivative time (cool)
(XX shows the PID group No.) oL.XXC, oH.XXC MV high/low limit (cool)

Zone PID is used.
Priority bank (Prior) LPr.02 PID group selection ☞ Page 6-2
Control bank (Ctrl) Etd.12 to Etd.20 Zone PID ☞ Page 7-17

Event setup (For multi-SP)
Event setup bank (Ev) E01 to E16.Sb Event 1 to 16, Main setting, Sub setting ☞ Page 6-5

Display or key is changed.
Display/key bank (HMI) MS-01 to MS-05 MS display ☞ Page 7-20
FM-01 to FM-09 [rsp/lsp] key, [at] key, [f1] key, [f2] key
UFL.01 to UFL.02 "uf1 to uf4" lamp

RS-485 communication is used.
RS-485 communication bank (r5485) CoM.02 to CoM.07 to Station address, Transmission speed, etc. ☞ Page 9-1

Lock function is used.
Lock bank (LoCK) K.LoC1 to K.LoC2 Key lock
C.LoC1 to C.LoC2 RS-485 communication lock
L.LoC1 to L.LoC2 Loader communication lock

Completion of key operation
[display] key

2. Setting of SP/EV bank

● Key operations when setting or changing SP/EV bank

(1) Press the [display] key to return to the operation display.
(2) To select a bank, keep the [sp/ev] key pressed for 2 s.
(3) To display a bank to be set, press the [sp/ev] key, [∧] key, or [∨] key.
(4) When a desired bank is displayed, press the [enter] key.
(5) To display an item to be set, press the [sp/ev] key, [∧] key, [∨] key, [<] key, or [>] key.
(6) When a desired item is displayed, press the [enter] key.
(7) Change the set value with the [∧] key, [∨] key, [<] key, or [>] key.
(8) To set the set value you have changed, press the [enter] key.
(9) To set other items in the same bank, repeat the operation from step (5).
To set desired set data in other bank, continue the operation from step (2).
(10) To exit the setting, press the [display] key.

● Setting and operation flow

Start of key operation
[display] key → Keep the [sp/ev] key pressed for 2s. → Select a bank with [sp/ev] key, [∨] key, or [∧] key.

↓

SP group selection
SP group selection bank — SPno — SP group
☞ Page 5-8

↓

Multi-SP setup (For multi-SP)
Multi-SP setup (For multi-SP) (Auxiliary display L.1.)

LSP.01~LSP.16	LSP of SP groups 1 to 16
PId.01 to PId.16	PID group definition of SP groups 1 to 16

☞ Page 6-17

↓

Multi-SP setup (2-loop and multi-SP are used.)
Loop 2 multi-SP bank (Auxiliary display L.2.)

LSP.01~LSP.16	LSP of SP groups 1 to 16
PId.01 to PId.16	PID group definition of SP groups 1 to 16

☞ Page 6-17

↓

Completion of key operation
[display] key

Recipe setup (Recipe is used.)
Loop 1 recipe bank(L1.rEC)
(Auxiliary display 1.XX)
(XX shows the SP group No.)

SP	LSP
E01~E08.Sb	Event 1 to 8, main setting and sub setting
P, I, d	Proportional band, Integration time, Derivative time
oL, oH, rE	MV high/low limit, Manual reset
P-C, I-C, d-C	Proportional band (cool), Integration time (cool), Derivative time (cool)
oL.C, oH.C	MV high/low limit (cool)
oI	Initial output of PID control

☞ Pages 5-1, 5-6

↓

Recipe setup (2-loop and recipe are used.)
Loop 2 recipe bank(L2.rEC)
(Auxiliary display 2.XX)
(XX shows SP group No.)

SP	LSP
E09~E16.Sb	Event 9 to 16, main setting and sub setting
P, I, d	Proportional band, Integration time, Derivative time
oL, oH, rE	MV high/low limit, Manual reset
P-C, I-C, d-C	Proportional band (cool), Integration time (cool), Derivative time (cool)
oL.C, oH.C	MV high/low limit (cool)
oI	Initial output of PID control

☞ Pages 5-1, 5-6

↓

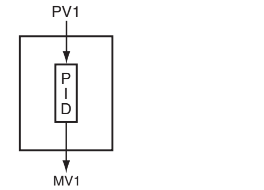
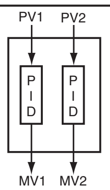
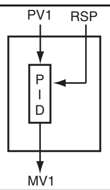
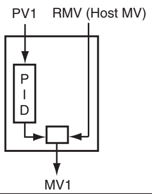
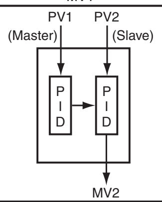
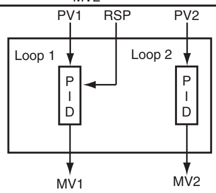
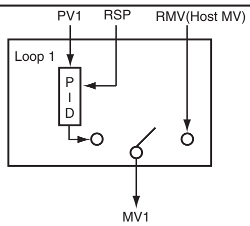
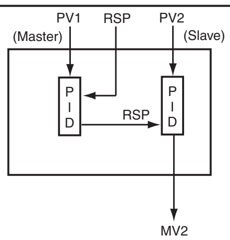
Completion of key operation
[display] key

Chapter 4. FUNCTIONS NECESSARY FOR CONTROL

4 - 1 How to Set the Loop Type

■ Bank and settings

Bank	Item display	Item name	Settings
SEtUP (Setup bank)	C-001	Loop type	See below

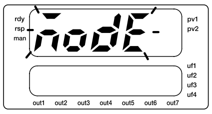
Loop type		1 input model	2 input model	3 input model
0: 1 loop		○	○	○
1: 2 loops (Independent)		×	○	○
2: 1 loop (RSP)		△	●	●
3: 1 loop (Computer backup)		×	○	○
4: 1 loop (Internal cascade)		×	○	○
5: 2 loops with an RSP on one side		×	△	●
6: 1 loop (Computer backup with an RSP)		×	△	●
7: 1 loop (Internal cascade with an RSP)		×	△	●

○ : Settable
● : Settable
Models with RS-485:
Select digital RSP or
PV input type
Models without RS-485:
Use PV input type
△ : Models with RS-485: Settable
Use digital RSP
Models without RS-485: Unsettable
× : Unsettable

■ Setting procedures

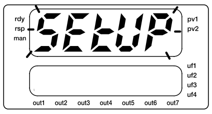
(1) Keep the [para] key pressed for 2 s in the operation display status.

>> MODE is flashing on the upper display.



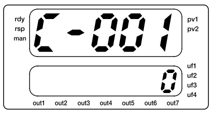
(2) Press the [∨] key or [para] key several times until SEtUP is shown on the upper display.

>> SEtUP is flashing on the upper display.



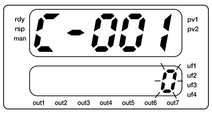
(3) Press the [enter] key.

>> C-001 is shown on the upper display.



(4) Press the [enter] key.

>> The value on the lower display starts flashing.



(5) Set a desired value with the [∨] key or [∧] key.

(6) Press the [enter] key to set the value.

(7) When the setting has been completed, press the [display] key.

>> The operation is then returned to the operation display status.

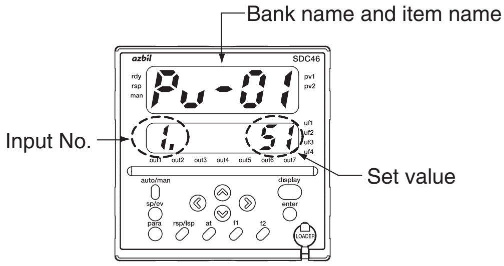
4 - 2 How to Set the Input Type

The input of this unit is a full-multi input method. The setting data is set properly according to the type of the signal to be connected.

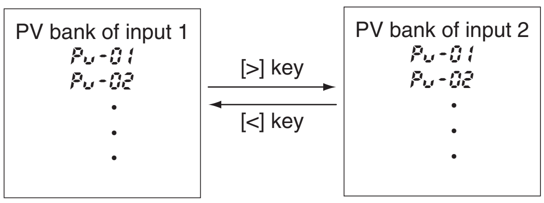
■ Bank and settings

Bank	Item display	Item name	Settings
Pu (PV bank)	Pu-01	Range type	See the list of input types shown on the next page.

■ Description of display



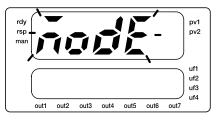
The input No. can be changed with the [<] key or [>] key. (For 2-input model)



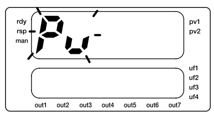
■ Setting procedures

● **PV input bank (Pu)**

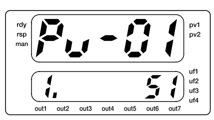
(1) Keep the [para] key pressed for 2s in the operation display status.
\>> ñodE is flashing on the upper display.



(2) Press the [∨] key or [para] key several times until Pu is shown on the upper display.
\>> Pu is flashing on the upper display.

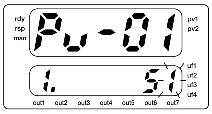


(3) Press the [enter] key.
\>> Pu-01 is shown on the upper display. At this time, check that 1. is shown on the auxiliary display.
(To set input 2, change the value with the [>] key or [<] key.)



(4) Press the [enter] key.

>> The value on the lower display starts flashing.



(5) Set a desired value with the [∨] key or [∧] key.

(6) Press the [enter] key to set the value.

(7) When the setting has been completed, press the [display] key.

>> The operation is then returned to the operation display status.

■ Input types

As shown below, input type is determined by the model No. and input No.

Model No.		Input No.			
Model No.	Input model	PV1	PV2	PV3	PV4
SDC45A/46A	1 Input	Multi range	None	None	None
	2 inputs	Multi range	Multi range	None	None
SDC45V/46V	2 inputs	Multi range	Multi range	None	None
	3 inputs	Multi range	None	Linear only 1	Linear only 2
SDC45R/46R	2 inputs (2 RTDs)	RTD use only	RTD use only	None	None
	2 inputs (1 RTD + 1 linear)	RTD use only	Linear only 3	None	None

■ Input types: Multi-range

PV-01 set value	Sensor type	Range
1	Thermocouple K	-270.0 to +1372.0 °C
2	Thermocouple E	-270.0 to +1000.0 °C
3	Thermocouple J	-200.0 to +1200.0 °C
4	Thermocouple T	-270.0 to +400.0 °C
5	Thermocouple B	0.0 to 1800.0 °C
6	Thermocouple R	-50.0 to +1768.0 °C
7	Thermocouple S	-50.0 to +1768.0 °C
8	Thermocouple WRe5-26	0.0 to 2300.0 °C
9	Thermocouple PR40-20	0.0 to 1900.0 °C
10	Thermocouple Ni-Ni•Mo	0.0 to 1300.0 °C
11	Thermocouple N	-200.0 to +1300.0 °C
12	Thermocouple PL II	0.0 to 1390.0 °C
13	Thermocouple DIN U	-200.0 to +600.0 °C
14	Thermocouple DIN L	-200.0 to +900.0 °C
15	Thermocouple Gold-iron/chromel	-273.0 to +27.0 °C
21	RTD Pt100	-200.0 to +850.0 °C
22	RTD Pt100	-200.00 to +300.00 °C
31	RTD JPt100	-200.0 to +640.0 °C
32	RTD JPt100	-200.00 to +300.00 °C
41	Current	4 to 20mA
42	Current	0 to 20mA
43	Voltage	0 to 10mV
44	Voltage	-10 to +10mV
45	Voltage	0 to 100mV
46	Voltage	-100 to +100mV
47	Voltage	0 to +1V
48	Voltage	-1 to +1V
49	Voltage	1 to +5V
50	Voltage	0 to +5V
51	Voltage	0 to +10V

The low limit for B thermocouple indication is 20 °C.

■ Input types: Linear only 1

PV-01 set value	Sensor type	Range
41	Current	4 to 20mA
42		0 to 20mA
49	Voltage	1 to 5V
50		0 to 5V
51		0 to 10V

■ Input types: Linear only 2

PV-01 set value	Sensor type	Range
49	Voltage	1 to 5V
50		0 to 5V
51		0 to 10V

■ Input types: Linear only 3

PV-01 set value	Sensor type	Range
47	Voltage	0 to 1V
49		1 to 5V
50		0 to 5V

■ Input types: RTD use only

PV-01 set value	Sensor type	Range
23	RTD Pt100 (3-wire system)	0.00 to 100.00°C 0.000 to 32.000°C
24	RTD Pt100 (4-wire system)	0.00 to 100.00°C 0.000 to 32.000°C
33	RTD JPt100 (3-wire system)	0.00 to 100.00°C 0.000 to 32.000°C
34	RTD JPt100 (4-wire system)	0.00 to 100.00°C 0.000 to 32.000°C

Note

- The input indication accuracy may vary depending on the type of sensor.
  For details, refer to:
  ☞ Chapter 14, Specifications ● Analog input (PV) (on page 14-1).

Handling Precautions

- If any value not available on the PV-01 setting list is set, the input value will be fixed at 0.0.

4 - 3 How to Set Range-Related Items

Each range is set corresponding to the input type set in section 4-2 How to Set an Input Type (on page 4-3).

■ Bank and settings

Bank	Item display	Item name	Settings
CtrL (Control bank)	Cnt.05	Range low limit for control	Low limit of range used for PID control * This item must be set.
	Cnt.06	Range high limit for control	High limit of range used for PID control * This item must be set.
Pv (PV bank)	Pv-04	Range low limit	Under-range is detected by the PV below this value.
	Pv-05	Range high limit	Over-range is detected by the PV exceeding this value.
	Pv-09	Linear scaling low limit	Value when the low limit of the linear signal is input. * This item must be set when the linear input is selected.
	Pv-10	Linear scaling high limit	Value when the high limit of the linear signal is input. * This item must be set when the linear input is selected.

■ Control range setup (Cnt.05, Cnt.06)

The high and low limits of the control range (Cnt.05, Cnt.06) are used for the loop PV (used in calculation of the PID). Set the high and low limits of the control range as needed for the application.

The control range is independent of the PV input range. Therefore, after setting the control range, no readjustment is necessary even in cases such as the following:

- Thermocouple input type is changed (e.g., K → R)
- RTD input type is changed (e.g., -200.0 to +850.0 → -200.0 to +300)
- Linear range scaling is changed (e.g., 0.0 to 5.0 kPa → 0.00 to 0.75 kPa)
- PV alarm setting is changed

Handling Precautions

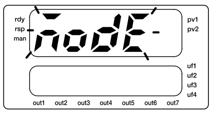
- The range for control affects the results of the auto tuning. Therefore, this range must be set.
- Execute PID tuning after setting the control range. If the control range is changed, tune the PID again.

● Setting procedures

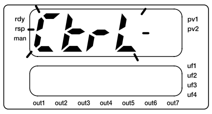
Example: K thermocouple range (0.0 to 800.0 °C) used for loop 1 PV

Bank	Item display	Item name	Settings
CtrL (Control bank)	Cnt.05	Range low limit for control	0.0
	Cnt.06	Range high limit for control	800.0

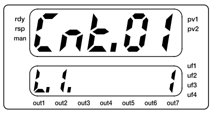
(1) Keep the [para] key pressed for 2 s in the operation display status.
>> modE is flashing on the upper display.



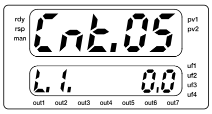
(2) Press the [∨] key or [para] key several times until CtrL is shown on the upper display.
>> CtrL is flashing on the upper display.



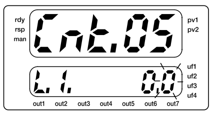
(3) Press the [enter] key. At this time, check that L.1. is shown on the auxiliary display.
>> Cnt.01 is shown on the upper display.
(To set input 2, change the value with the [>] key or [<] key.)



(4) Press the the [∨] key key several times until Cnt.05 is shown on the upper display.
>> Cnt.05 is shown on the upper display.



(5) Press the [enter] key.
>> The value on the lower display starts flashing.



(6) Set at 0.0 with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) In the same manner, return with the the [∨] key or [∧] key. Repeat the steps (4) to (7) to configure the settings for Cnt.06.

(9) When all settings have been completed, press the [display] key.
>> The operation is returned to the operation display status.

■ How to set the linear scaling (PV-09, PV-10)

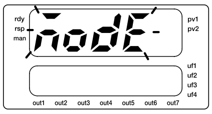
The high and low limits of the linear range (PV-09, PV-10) need to be set when the DC voltage or DC current is selected for the input type. Input high and low limit values corresponding to the output range (engineering range) of the connected unit.

● Setting procedures

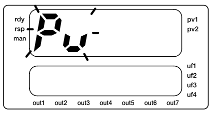
Example: Setting when the pressure transmitter is connected

Specifications of transmitter		Setting of this unit		
Output signal	Output range	Item display	Item name	Settings
4 mA DC	0.0 kPa	PV-09	Linear scaling low limit	0.0
20 mA DC	10.0 kPa	PV-10	Linear scaling high limit	10.0

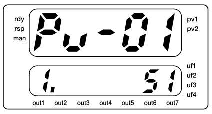
(1) Keep the [para] key pressed for 2 s in the operation display status.
>> MODE is flashing on the upper display.



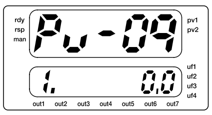
(2) Press the [∨] key or [para] key several times until PV is shown on the upper display.
>> PV is flashing on the upper display.



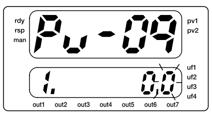
(3) Press the [enter] key.
>> PV-01 is shown on the upper display. At this time, check that 1. is shown on the auxiliary display.
(To set input 2, change the value with the [>] key or [<] key.)



(4) Press the [∨] key several times until PV-09 is shown on the upper display.
>> PV-09 is shown on the upper display.



(5) Press the [enter] key.
>> The value on the lower display starts flashing.



(6) Set at 0.0 with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) In the same manner, return with the [∨] key or [∧] key. Repeat the steps (4) to (7) to configure the settings for Pv-10.

(9) When the setting has been completed, press the [display] key.
>> The operation is returned to the operation display status.

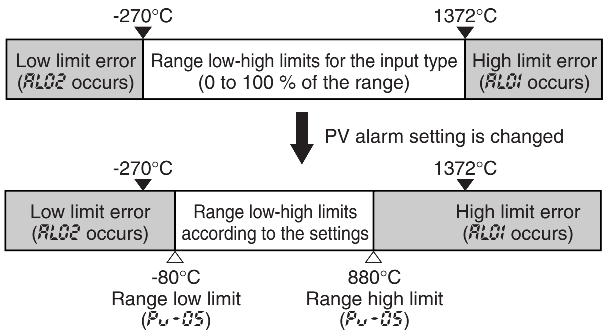
■ How to change the PV alarm setting (Pv-04, Pv-05)

The PV alarm setting differs for each input type.

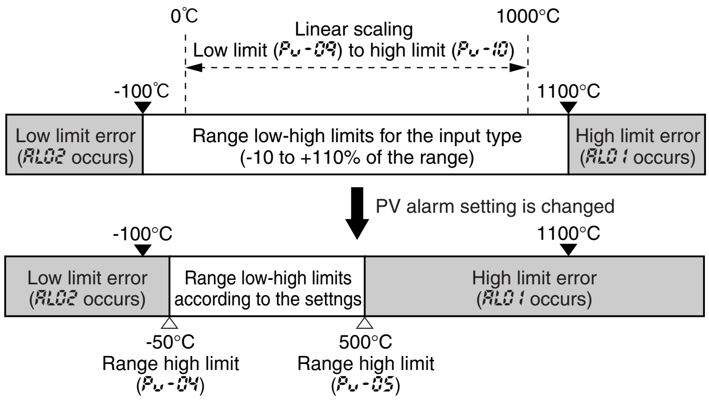
Input type	Low limit error	High limit error
Thermocouple, RTD	0 % of the range	100 % of the range
DC voltage, DC current	-10 % of the range	110 % of the range

By setting the PV input range narrowly, the point at which the PV alarm is activated can be changed. If no change of the PV alarm setting is needed, it is not necessary to set the high and low limits for the range (Pv-04, Pv-05). Use the factory settings (-19999U, 32000U).

● Example: changing the PV alarm setting for PV1 (K thermocouple, -270 to +1372 °C)



● Example: changing the PV alarm setting for PV1 (DC voltage, scaling 0 to 1000)

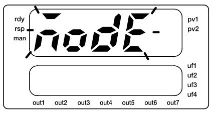


● Setting procedures

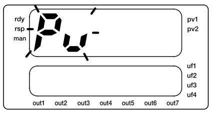
Example: changing the PV alarm setting for PV1 (K thermocouple, -270 to +1372 °C) to -80 °C (or less) and +880 °C (or more).

Bank	Item display	Item name	Settings
Pu (PV bank)	Pu-04	Range low limit	-80.0
	Pu-05	Range high limit	+880.0

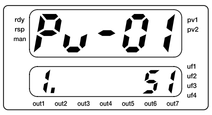
(1) Keep the [para] key pressed for 2 s in the operation display status.
>> mode is flashing on the upper display.



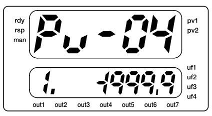
(2) Press the [∨] key or [para] key several times until Pu is shown on the upper display.
>> Pu is flashing on the upper display.



(3) Press the [enter] key.
>> Pu-01 is shown on the upper display. At this time, check that 1. is shown on the auxiliary display.
(To set input 2, change the value with the [>] key or [<] key.)

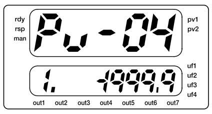


(4) Press the [∨] key several times until Pu-04 is shown on the upper display.
>> Pu-04 is shown on the upper display.



(5) Press the [enter] key.

>> The value on the lower display starts flashing.



(6) Set to -80.0 with the the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

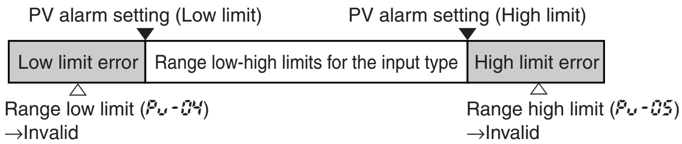
(8) In the same manner, return with the [∨] key or [∧] key. Repeat the steps (4) to (7) to configure the settings for Pv-05.

(9) When the setting has been completed, press the [display] key.

>> The operation is returned to the operation display status.

Handling Precautions

- If the low and high limits of the range (Pv-04, Pv-05) are set outside of the low-high limit range for the input type, the PV alarm setting will remain unchanged.



4 - 4 How to Set the Decimal Point Position

Apart from the decimal point position for the input range, which is set in the PV bank, the decimal point position for the display can be set.

■ Bank and settings

Bank	Item display	Item name	Settings
CtrL (Control bank)	Cnt.01	Loop PV/SP decimal point position	0: No decimal point, 1: 1 digit after the decimal point, 2: 2 digits after the decimal point 3: 3 digits after the decimal point 4: 4 digits after the decimal point

Settings for the decimal point position are reflected in the following screens/items.

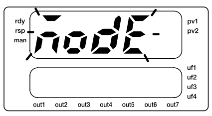
Display, Bank	Item name	Note
Operation display Monitor bank Communications profile (instrument status)	Loop PV and SP	
Control bank	Control range low and high limits	Even if the decimal point position is changed, the.set-tings are unchanged (within the allowable setting range). Example: changing 100 to 100.0 (from no decimal point to 1 digit after the decimal point)
	Zone 1 to 7	
	Hysteresis for zones	
MV bank	SP scaling low and high limits	
Multi-SP bank	LSP 1 to 16	
Recipe bank	LSP 1 to 16	
RSP bank	RSP	
Communications profile (operation processing)	LSP	
SP configuration bank	SP low and high limits	

■ Setting procedures

● Control (basic) bank (CtrL)

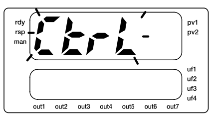
(1) Keep the [para] key pressed for 2 s in the operation display status.

>> modE is flashing on the upper display.



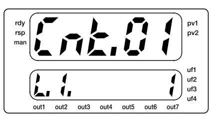
(2) Press the [∨] key or [para] key several times until CtrL is shown on the upper display.

>> CtrL is flashing on the upper display.



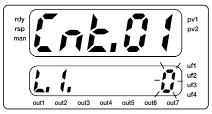
(3) Press the [enter] key.

>> Cnt.01 is shown on the upper display.



(4) Press the [enter] key.

>> The value on the lower display starts flashing.



(6) Set a desired value with the [∨] key or [∧] key.

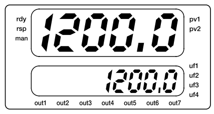
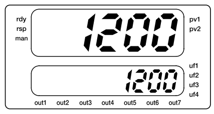
(7) Press the [enter] key to set the value.

(8) Press the [display] key.

>> The operation is returned to the operation display status.

Note

- Depending on the operation, the decimal point can be displayed or deleted.
  Example: changing from 1 digit after the decimal point to no decimal point

Operation status	Cnt.01 set	Display example
1 digit after the decimal point is displayed during trial run adjustment	1: 1 digit after the decimal point	
No decimal point is displayed after the start of regular operation.	0: No decimal point	

Handling Precautions

- In the case of a thermocouple or RTD, the maximum number of digits after the decimal point is determined separately for each range number. Set the decimal point position within the appropriate range for the range No.
  For details about ranges for each input type, refer to:
  ☞ 4-2 How to Set the Input Types, ■ Input types (on pages 4-4 and 4-5).
  If decimal point setting exceeds the range, the PV display will have the specified number of digits after the decimal point, but the digits after the position determined by the range No. will all be "0."

  Ex.: Based on the range No., 1 digit after the decimal point is shown for the K thermocouple (-270 to +1372 °C) in the PV display. If the decimal point position for the loop PV/SP is set for 2 digits after the decimal point, the PV display of temperatures around 500 °C will be as follows.

  PV display: 499.90
  PV display: 500.00
  PV display: 500.10
  PV display: 500.20

  This digit is always "0".

4 - 5 How to Set the Loop Control Action

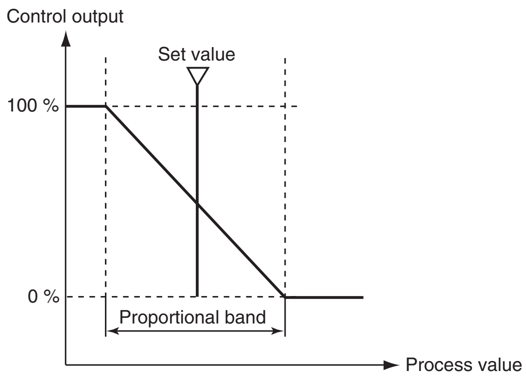
■ Bank and settings

Bank	Item display	Item name	Settings
CtrL (Control bank)	Cnt.03	Control action	0: Reverse action (heat), 1: Direct action (cool), 2: Heat/Cool

The basic operation of the PID control is set.

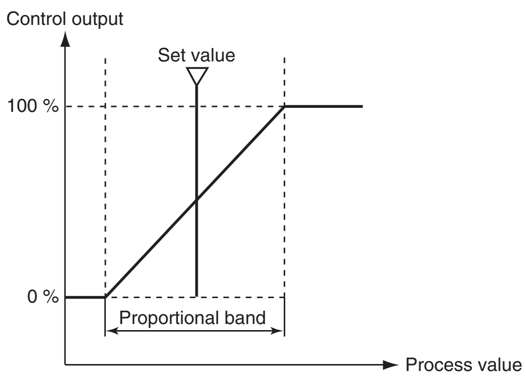
Heat action: Reverse action.

Control output decreases as the process value increases. Generally, this action is used for heating control.

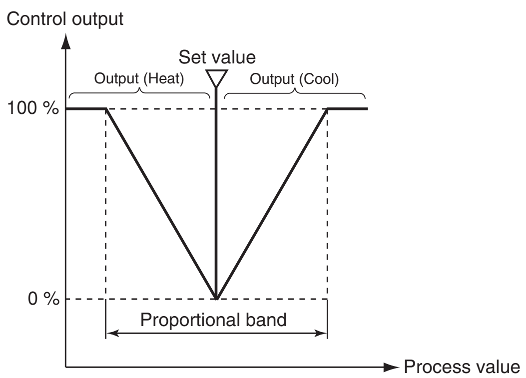


Cool action: Direct action.

Control output increases as the process value increases. Generally, this action is used for cooling control.

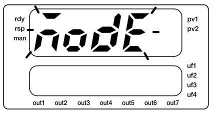


Heat/Cool action

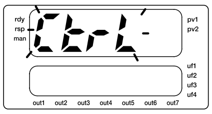


■ Setting procedures

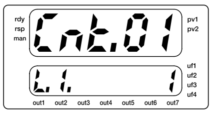
(1) Keep the [para] key pressed for 2 s in the operation display status.
>> modE is flashing on the upper display.



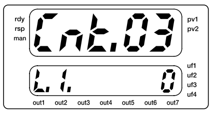
(2) Press the [∨] key or [para] key several times until CtrL is shown on the upper display.
>> CtrL is flashing on the upper display.



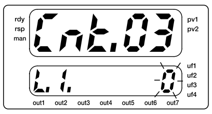
(3) Press the [enter] key.
>> Cnt.01 is shown on the upper display.



(4) Press the [∨] key several times until Cnt.03 is shown on the upper display.
>> Cnt.03 is shown on the upper display.



(5) Press the [enter] key.
>> The value on the lower display starts flashing.



(6) Set a desired value with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) Press the [display] key.
>> The operation is returned to the operation display status.

4 - 6 How to Set Outputs (continuous output and time proportional output)

Up to seven output points can be mounted on the SDC46 while up to five points can be mounted on the SDC45. Setup items of each setting may vary depending on the type of output and operation method.

■ Output types, applications, and settings

Output No.	Output type (Set by model No.)	Application	Bank	Item display
1 to 2	Relay	Time proportional output (MV) Alarm output (EV)	oUt	tPo.01 to 08
3 to 7	Relay Voltage pulse	Time proportional output (MV) Alarm output (EV)		
	Current Continuous voltage	Continuous output (MV) Transmission output (PV, SP, etc.)		Co-01 to 08
	Power supply for transmitter	24 Vdc power supply	None	-

■ Bank and settings

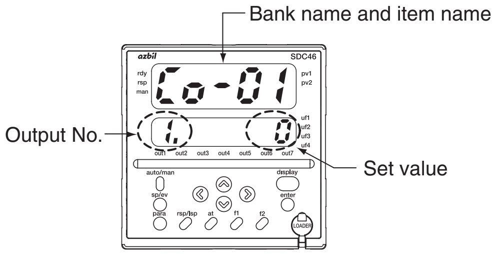
● For current output or continuous voltage output

Bank	Item display	Item name	Settings
oUt (Continuous output bank)	Co-01	Output range	Current output, 0: 4 to 20 mA, 1: 0 to 20 mA Continuous voltage output, 0: 1 to 5 V, 1: 0 to 5 V, 2: 0 to 10 V
	Co-02	Output type	0: Fixed at 0%, 1: MV, 2: Heat MV (for heat/cool control), 3: Cool MV (for heat/cool control), 4: PV (Loop), 5: SP, 6: Deviation (PV-SP), 7: PV (input channel) For others, see the list of standard numeric values (on page App.-15).
	Co-03	Loop/channel definition	0: Invalid, 1: Loop 1/Channel 1, 2: Loop 2/Channel 2
	Co-04	Output decimal position	0: No decimal point, 1: One digit below the decimal point, 2: Two digits below the decimal point, 3: Three digits below the decimal point, 4: Four digits below the decimal point
	Co-05	Low limit of output scaling	-19999 to +32000 U (Value assigned to the low limit of the output)
	Co-06	High limit of output scaling	-19999 to +32000 U (Value assigned to the high limit of the output)
	Co-07	Linearization table group definition	0: Not used., 1: 1 group, 2: 2 groups, 3: 3 groups, 4: 4 groups, 5: 5 groups, 6: 6 groups, 7: 7 groups, 8: 8 groups
	Co-08	Supply voltage correction	0: Disabled, 1: Correction by AC1 input, 2: Correction by AC2 input

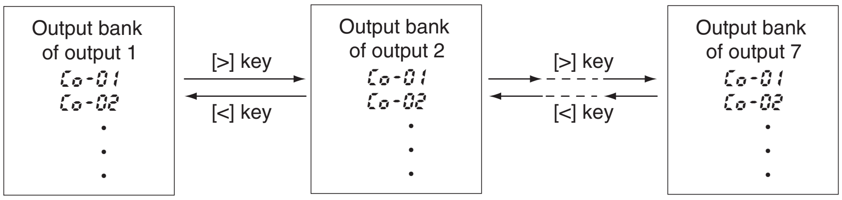
● For relay output or voltage pulse output

Bank	Item display	Item name	Settings
oUt (ON/OFF output bank)	tPo.01	Output type	0: OFF, 1: MV of loop 1, 2: Heat MV of loop 1 (for heat/cool control), 3: Cool MV of loop 1 (for heat/cool control), 4: MV of loop 2 5: Heat MV of loop 2 (for heat/cool control), 6: Cool MV of loop 2 (for heat/cool control) 13: Position proportional output 1 output for closing 14: Position proportional output 1 output for opening For others, see the list of standard bit Nos. (on page App.-14).
	tPo.02	Latch	0: Not latched., 1: Latched when turned ON., 2: Latched when turned OFF. (Except for OFF when power is turned ON.)
	tPo.03	Time proportional operation type	0: Priority on controllability, 1: Priority on device life
	tPo.04	Min. ON/OFF time	0 to 300 ms
	tPo.05	Time proportional cycle	Relay output, 5.0 to 120.0 s Voltage pulse output, 0.1 to 120.0 s
	tPo.06	Linearization table group definition	0: Not used., 1: group 1, 2: group 2, 3: group 3, 4: group 4, 5: group 5, 6: group 6, 7: group 7, 8: group 8
	tPo.08	Supply voltage correction	0: Disabled, 1: Correction by AC1 input, 2: Correction by AC2 input

■ Description of display

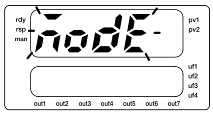


The output No. can be changed with the [<] key or [>] key.

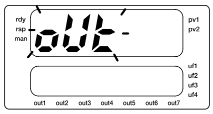


■ Setting procedures

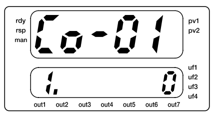
(1) Keep the [para] key pressed for 2 s in the operation display status.
>> mode is flashing on the upper display.



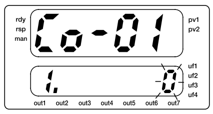
(2) Press the [∨] key or [para] key several times until out is shown on the upper display.
>> out is flashing on the upper display.



(3) Press the [enter] key.
>> Co-01 is shown on the upper display.



(4) Press the [enter] key.
>> The value on the lower display starts flashing.



(5) Set a desired value with the [∨] key or [∧] key.

(6) Press the [enter] key to set the value.

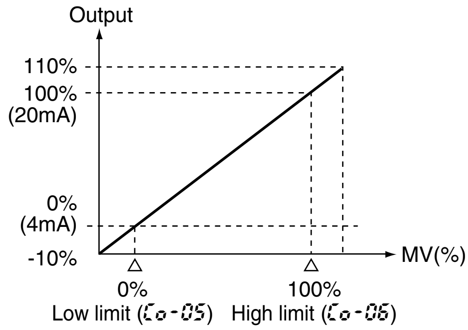
(7) In the same manner, return with the [∨] key or [∧] key. Repeat the steps (3) to (6) to configure the settings for Co-02 to Co-07 and tPo.01 to tPo.06.

(8) When all settings have been completed, press the [display] key.
>> The operation is returned to the operation display status.

■ Continuous output setup

Set the output range (Co-01) for the desired current or continuous voltage range. Specify the output type (Co-02) and loop/channel definition (Co-03) for the output. In the output decimal point position (Co-04), the decimal point position is set for the low limit of the output scaling (Co-05) and the high limit of the output scaling (Co-06).

With the low limit (Co-05) and high limit (Co-06) settings, output scaling can be applied to the data assigned in the output type.
If the high limit is set smaller than the low limit, reverse scaling is possible.
The figure below shows an example of scaled output applied to the MV for the power supply output (4 to 20 mA).

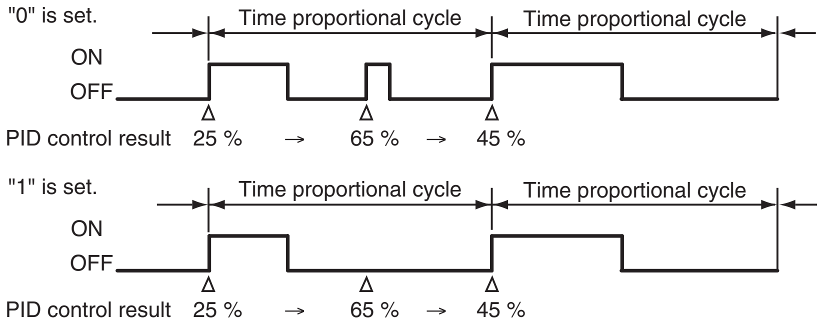


However, when the output range is 0 to 20 mA, 0 to 5 V, or 0 to 10 V, the output becomes 0 to 110 %.

In the linearization table group definition (Co-07), a scaling calculation can be set up for broken-line approximation values.
Also, by setting the linearization table group for OUT use (Pr-02) in the Priority bank (Prior), the linearization table groups used for broken line approximation can be specified from the internal contact input.

■ Time proportional output setup

When the output type (tPo.01) is set to 1 to 6, the time proportional value is output according to the settings of the time proportional cycle (tPo.05).
According to the time proportional operation type (tPo.03), the time proportional output becomes as follows.
When "0: Priority on controllability" is set, the output may be turned ON twice or more within the time proportional cycle. On the contrary, when "1: Priority on device life" is set, the output is turned ON zero time to once within the time proportional cycle.



The min. ON/OFF time (tPo.04) is valid. However, even though "0" is set, the min. ON/OFF time becomes 1 ms. In the relay output, even though a value less than "50" is set, the min. ON/OFF time on the operation is 50 ms.
The linearization table group definition (tPo.06), can be set so that the time proportional output corresponding to the linearization approximation value is made.
Additionally, by setting the linearization table use group (Prior) for OUT of the priority bank (Pr-02), you can change to the internal contact input definition. The latch (tPo.02) becomes invalid.

■ ON/OFF output setup

When the output type (tPo.01) is set at "0", the output becomes the OFF output.
When any of the standard bit Nos. 1024 to 2047 is set in the output type (tPo.01), the ON/OFF status of this standard bit is output.
The latch (tPo.02) and the min. ON/OFF time (tPo.04) are valid.
Additionally, even though a value less than "50" is set in the relay output, the min. ON/OFF time on the operation is 50 ms.
The time proportional operation type (tPo.03), time proportional cycle (tPo.05), and linearization table group definition (tPo.06) are invalid.

4 - 7 How to Set Motor Driver Output

Motor driver functions are available if "SS" or "R1" is selected for output 3 and 4 in the model selection table, or if "2" or "4" is selected for option 1 (for models with 7-digit model Nos.).
For details about model selection, refer to:
☞ 1-2 Model Selection Table (on page 1-3).

■ Motors that can be used for motor driver triac output

Yamatake's ECM3000 motors run on 100 Vac only.
Model No.: ECM3000F1100
ECM3000F1110
ECM3000F1200

■ Bank and settings

Bank	Item display	Item name	Settings
PP (Position proportional bank)	PP-01	Output type	0: Position proportional control OFF, 1: Loop 1 MV, 2: Loop 1 heating MV, 3: Loop 1 cooling MV, 4: Loop 2 MV, 5: Loop 2 heating MV, 6: Loop 2 cooling MV, 2048 to 3071: see list of standard numerical codes (Appendix 2)
	PP-02	Selection of control method	0: MFB control + estimated position control, 1: MFB control + close upon line break 2: Estimated position control 3: Estimated position control + position adjustment at power-on
	PP-03	Dead zone	0.5. to 25.0 %
	PP-04	Long life	0: Control-oriented, 1: Life-oriented
	PP-05	Auto-tuning	0: Stop, 1: Start
	PP-06	Fully closed FB value	0 to 8000
	PP-07	Ful opening FB value	0 to 8000
	PP-08	Full opening time	5.0 to 240.0 s
	PP-09	Loop designation	1: Loop 1, 2: Loop 2
	PP-10	Linearization table group designation	0: Disabled, 1: 1 group, 2: 2 groups, 3: 3 groups, 4: 4 groups, 5: 5 groups, 6: 6 groups, 7: 7 groups, 8: 8 groups

Bank	Item display	Auxiliary display	Item name	Settings
oUt	tPo.01	3.	Output type	14: Position proportional output 1 output for opening
(ON/OFF output bank)	tPo.01	4.	Output type	13: Position proportional output 1 output for closing

Handling Precautions

- Functions in the position proportional bank can be displayed and set if "SS" or "R1" was selected for output 3 - 4 in the model selection table, or if "2" or "4" was selected for option 1 (for models with 7-digit model Nos.).

■ Selection of output type (PP-01)

Selects the type of MV output to use as motor driver output.

■ Selection of control methods (PP-02)

● 0: MFB control + close upon line break

When the motor feedback (MFB) input is normal, the MFB function controls the motor position using actual measurements of the motor position. To use this function, set PP-05 to 1 and execute auto-tuning.

- If the motor feedback (MFB) input is abnormal, the MFB function controls the motor position on the basis of the estimated position of the motor (MFB value). This is called estimated position control.
  For example, if the MFB input fluctuates rapidly when the rotation of the motor enters a deteriorated position on the feedback potentiometer, the MFB function regards this sudden change as an abnormality and estimates the correct position of the motor. This estimated MFB is also used to control the motor position if the MFB line break alarm is activated.
- With estimated position control, some error is inevitable between the actual degree of motor opening and the estimated MFB. This error is corrected in the following ways:
  - If the (MV) output is 0.0 % or less, output for closing is always ON to fully close the motor.
  - If the (MV) output is 100.0 % or more, output for opening is always ON to fully open the motor.

  However, the following cases are excluded:
  - When the MV is limited to within 0.1-99.9 % by the output limiter.
  - When the MV is neither 0.0 % or less nor 100.0 % or more due to the control status.
- The following problems are likely to cause estimated position control:
  - Incorrect motor opening adjustment
  - Deterioration or insufficient resolution of the feedback potentiometer
  - Faulty MFB wiring

● 1: MFB control + close upon line break

If there is a break in the MFB line, the motor moves to the closed position and control action stops.

● 2: Estimated position control

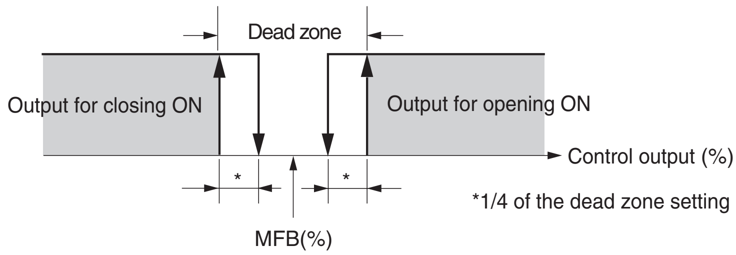
- The motor is always controlled by estimated position control on the basis of the estimated MFB, with or without connected MFB wiring.
- When using this setting, be sure to correctly input a full opening time (PP-08).
- The MFB line break alarm does not operate.
- The difference between the actual motor opening and the estimated MFB is corrected when the motor is forced to move to the closed position or to the open position by an MV of 0.0 or 100 %, respectively.

● 3: Estimated position control + position adjustment at power-on

When the power is turned on, the output for closing is ON only for the amount of time set for full opening time (PP-08), in order to align 0 % of the estimated MFB and the actual degree of motor opening. After the alignment, this control method operates the same way as #2, estimated position control.
When using this setting, be sure to correctly input a full opening time (PP-08).

■ Dead zone (PP-03)

If PP-04 (long life) is set to 1 (life-oriented), this function can be neither displayed nor set. This function sets the dead zone between motor opening and motor closing when position proportional control is used. As a guideline for configuration, when a constant manual output is generated during dead zone adjustment, the point at which hunting stops is the minimum value for the dead zone. If the zone is set too narrow, the motor will be activated constantly, shortening its lifetime enormously.
The factory setting is 10.0 %. This is a rough guide, but the desired control results and motor service life should be considered.



■ Long life (PP-04)

If 1 (life-oriented) is set, settings for Ctd.05 (MV up change limit), Ctd.06 (MV down change limit), and PP-03 (dead zone) will be invalid, and the optimum life-oriented value will be automatically calculated for the potentiometer.

■ Auto-tuning (PP-05)

! Handling Precautions

- If PP-02 (selection of control method) is set to 0 (MFB control + estimated position control) or 1 (MFB control + close upon line break), be sure to execute auto-tuning.

- If PP-02 (selection of control method) is set to 2 (estimated position control) or 3 (estimated position control + position adjustment at power-on), auto-tuning can be neither displayed nor set.
- Auto-tuning for position proportional control automatically sets PP-06 (fully closed FB value), PP-07 (fully open FB value), and PP-08 (full opening time).
- How to use auto-tuning
  (1) Set PP-02 (selection of control methods) to 0 (MFB control + estimated position control) or to 1 (MFB control + close upon line break).
  (2) Set PP-05 (auto-tuning) to 1 (start) and press the [enter] key. If 1 has already been set, press the [enter] key twice.

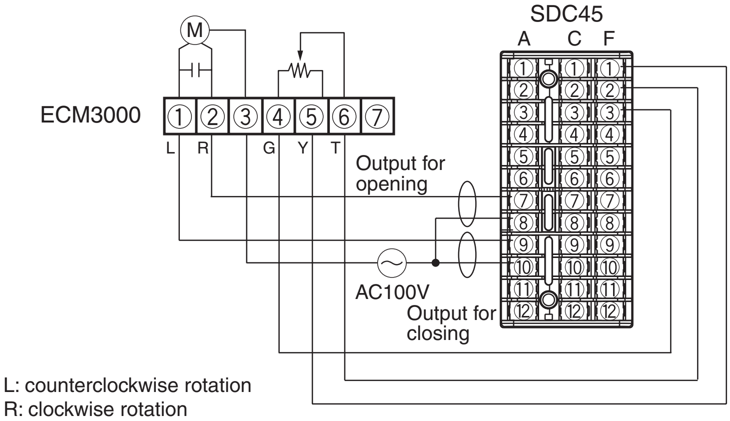
(3) Auto-tuning begins.
- "CA.CL" is shown on the upper display and the output for closing turns ON.
- The motor moves to the closed position and the auxiliary display shows the MFB value. When the value stabilizes, full closing operation is complete and the value is written to PP-06 (fully closed FB value).
- The upper display says "CA.oP" and the output for opening turns on.
- The motor turns to the open side and the auxiliary display shows the MFB value. When the value stabilizes, full opening operation is complete and the value is written to PP-07 (fully open FB value).
  Additionally, the time between the fully closed and fully open positions is written to PP-08 (full opening time). However, if the time is longer than the maximum of 240.0 s, PP-08 is 240.0 s.
- When auto tuning is complete, the basic display is again shown.

(4) To cancel tuning, press the [display] key.
Once auto-tuning starts, no key operation is possible except for cancellation of auto tuning with the [display] key.
In the following cases in which an error occurs, AL22 is displayed and the tuning values before auto-tuning began are restored. AL22 is displayed until auto-tuning is successfully completed or until the power is reset.
- The difference between the fully open and fully closed values is less than 300.
- The time between fully closed and fully open is less than 5 s.
- MFB line break alarm (AL21) occurs continuously or frequently.
- The MFB value takes more than 5 min to stabilize.
- The MFB or open/close output is miswired. (However, not all miswiring can be detected.)

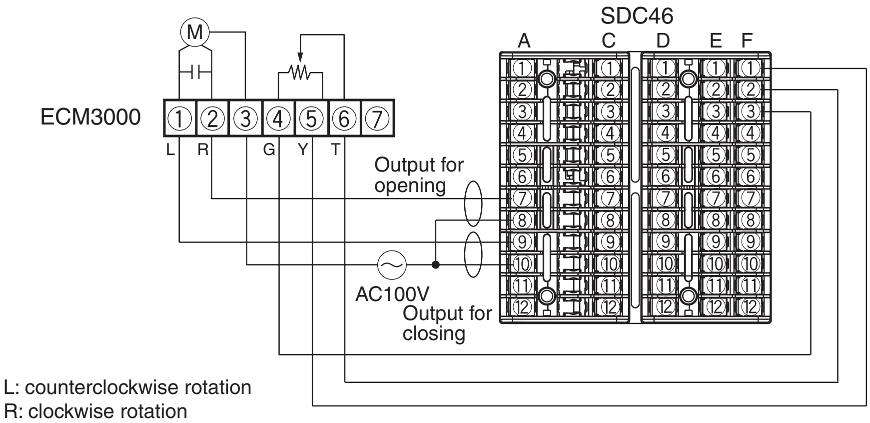
- With CPL communications, auto-tuning can be started or canceled by writing to the auto-tuning address (decimal 9444). Write "1" to start auto-tuning and "0" to cancel it.

Handling Precautions
- If the power of the main unit is turned off during auto-tuning for position proportional control, auto-tuning will be canceled when the power is turned on again.
- If the mode is switched between AUTO and MANUAL, RUN and READY, or LSP and RSP during auto-tuning for position proportional control, auto-tuning will continue.

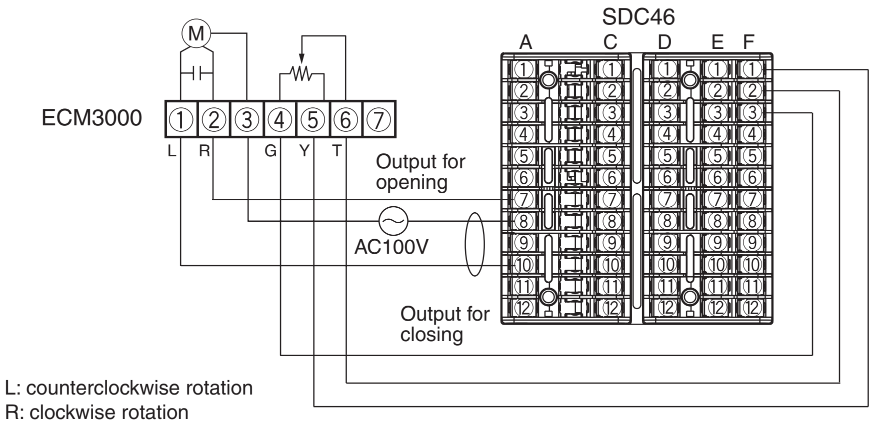
- **Wiring of motor**
  - SDC45 models



  - SDC46 models (model No. output 3, 4: SS)
    or SDC46 models with 7-digit model No. (option 1: 2 or 4)



  - SDC46 models (model No. output 3, 4: R1)



Note

- If the direction of motor rotation is reversed, reverse the wiring of R and L, and reverse the wiring of G and Y.
- Only 100 Vac supply voltage can be used for the ECM3000 with a direct connection (only for triac output).

■ Fully closed FB value (PP-06) and fully open FB value (PP-07)

- If PP-02 (selection of control method) is set to 2 (estimated position control) or 3 (estimated position control + position adjustment at power-on), auto-tuning can be neither displayed nor set.
- These values can be automatically set by auto-tuning for position proportional control. Manual setting is also possible.

Note

- For details about auto-tuning, refer to:
  ☞ ■ Auto-tuning (PP-05) (on page 4-22).

■ Full opening time (PP-08)

- If PP-02 (selection of control methods) is set to 0 (MFB control + estimated position control) or 1 (MFB control + close upon line break), PP-08 can be automatically set by auto-tuning for position proportional control. Manual setting is also possible.

Note

- For details about auto-tuning, refer to:
  ☞ ■ Auto-tuning (PP-05) (on page 4-22).

- If PP-02 (selection of control methods) is set to 2 (estimated position control) or 3 (estimated position control + position adjustment at power-on), input the actually measured opening time of the motor as the full opening time.

■ Loop assignment (PP-09)

A loop assignment is needed if PP-01 (output type) is set between 2048 and 3071. For the specified loop, the degree of opening is added to the operation display. If the specified loop is in MANUAL or READY mode, there is no position adjustment at power-on.

Chapter 5. OPERATION

5 - 1 Operation Displays

The operation display changes each time the [display] key is pressed.
Since switching the display does not affect control, any display can be chosen while control is in progress.

■ Operation display types

Operation display types are the following 14 types.

Screen No.	Upper display	Lower display	Display condition
1	Loop 1 PV	Loop 1 SP	
2	Loop 1 PV	Loop 1 MV	
3	Loop 1 PV	Loop 1 Heating MV	When heat/cool control is selected
4	Loop 1 PV	Loop 1 Cool MV	When heat/cool control is selected
5	Loop 2 PV	Loop 2 SP	
6	Loop 2 PV	Loop 2 MV	
7	Loop 2 PV	Loop 2 Heating MV	When heat/cool control is selected
8	Loop 2 PV	Loop 2 Cool MV	When heat/cool control is selected
9	Loop 1 PV	Loop 2 PV	
10	Loop 1 PV	MFB1	Motor driver output models only
11	Loop 2 PV	MFB2	Motor driver output models only
12	Loop 1 PV	Progress of auto-tuning	During auto-tuning only
13	Loop 2 PV	Progress of auto-tuning	During auto-tuning only
14	Loop 1 PV	Loop 2 MV	When the loop type is internal cascade

■ Operation display at power-on

The operation display pattern at power-on depends on the loop type set in C-001 in the setup bank, as shown below.

C-001 setting	Loop type	Display pattern at power-on
0	1 loop	Pattern 1
1	2 loops (independent)	Pattern 3
2	1 loop (RSP)	Pattern 1
3	1 loop (computer backup)	Pattern 1
4	1 loop (internal cascade)	Pattern 2
5	2 loops (with RSP for 1 loop)	Pattern 3
6	1 loop (computer backup with RSP)	Pattern 1
7	1 loop (internal cascade with RSP)	Pattern 2
8	2 loops (with RSP)	Pattern 3

The patterns 1 to 3 are as follows.

Pattern	Operation mode	Screen No.
Pattern 1	AUTO	1
	MANUAL	2
Pattern 2	AUTO	9
	MANUAL	14
Pattern 3	Loop 1 = AUTO, Loop 2 = AUTO	9
	Loop 1 = MANUAL, Loop 2 = AUTO	2
	Loop 1 = AUTO, Loop 2 = AMANUAL	6
	Loop 1 = MANUAL, Loop 2 = MANUAL	2

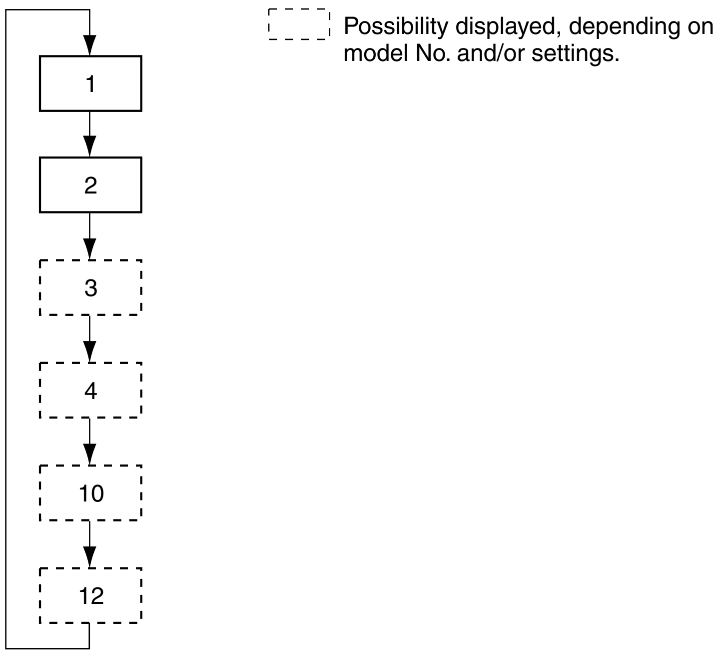
■ Switching order of the operation display

The order in which the operation display is changed depends on the loop type set in C-001 in the setup bank, as shown below.

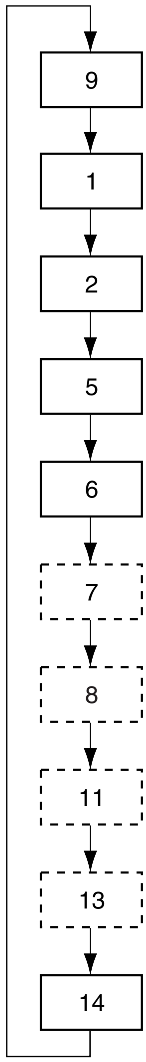
C-001 setting	Loop type	Switching order of screen No.
0	1 loop	Type 1
1	2 loops (independent)	Type 3
2	1 loop (RSP)	Type 1
3	1 loop (computer backup)	Type 1
4	1 loop (internal cascade)	Type 2
5	2 loops (with RSP for 1 loop)	Type 3
6	1 loop (computer backup with RSP)	Type 1
7	1 loop (internal cascade with RSP)	Type 2
8	2 loops (with RSP)	Type 3

The order in which the displays (listed by screen No.) are switched in each of types 1 to 3 is shown below.

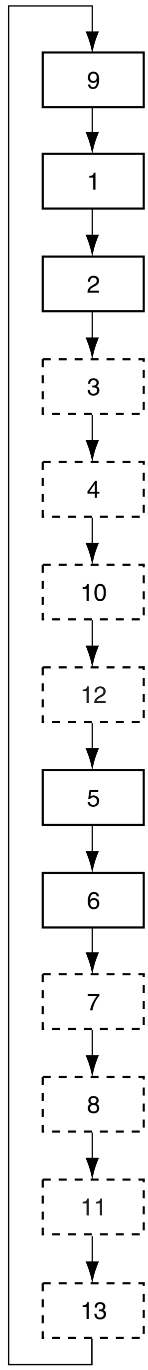
Switching order of type 1



Switching order of type 2



Switching order of type 3



■ Display status of mode indicator lamps

When two loops are operated independently, two PID controls are executed in the internal cascade control. Therefore, according to the displayed PV input No., each mode indication LED is lit, flashing, or off with the patterns shown in the tables below.

Meaning of display ❍ : Lit.
△ : Flashing
✕ : Off

- "rdy" LED

Mode	Display			
	PV1	PV2	PV1, PV2	Other
Loop 1: RUN Loop 2: RUN	×	×	×	×
Loop 1: READY Loop 2: RUN	❍	△	△	△
Loop 1: RUN Loop 2: READY	△	❍	△	△
Loop 1: READY Loop 2: READY	❍	❍	❍	❍

- "man" LED

Mode	Display			
	PV1	PV2	PV1, PV2	Other
Loop 1: AUTO Loop 2: AUTO	×	×	×	×
Loop 1: MANUAL Loop 2: AUTO	❍	△	△	△
Loop 1: AUTO Loop 2: MANUAL	△	❍	△	△
Loop 1: MANUAL Loop 2: MANUAL	❍	❍	❍	❍

- "rsp" LED

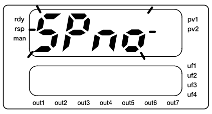
Mode	Display			
	PV1	PV2	PV1, PV2	Other
Loop 1: LSP Loop 2: LSP	×	×	×	×
Loop 1: LSP Loop 2: RSP	△	❍	△	△

5 - 2 How to Change the SP

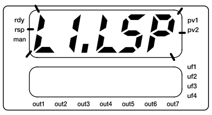
■ Setting procedures

The following describes an example that the LSP1 is changed when using the multi-SP:

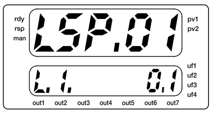
(1) Keep the [sp/ev] key pressed for 2s in the operation display status.
>> SPno is flashing on the upper display.



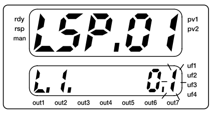
(2) Press the [∨] key or [sp/ev] key several times until L1.LSP is shown on the upper display.
>> L1.LSP is flashing on the upper display.



(3) Press the [enter] key.
>> LSP.01 is shown on the upper display. At this time, check that the auxiliary display shows L.1. This shows that the loop 1 is currently active.



(4) Press the [enter] key.
>> The value on the lower display starts flashing.



(5) Set a desired value with the [∨] key or [∧] key.

(6) Press the [enter] key to set the value.

(7) When the setting has been completed, press the [display] key.
>> The operation is then returned to the operation display status.

Note

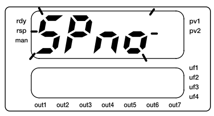
- When changing LSP1 of loop 2, select L2.LSP in step (2).
- When using the recipe, change the LSP1 from the loop 2 recipe bank (bank display:L1.rEC, L2.rEC) of the SP/EV bank.
- The LSP value can be changed directly from the operation display (depending on the settings).
  For details, refer to:
  ☞ 6-1 SP group/LSP value change from the operation display (page 6-1.

5 - 3 How to Change the SP Group

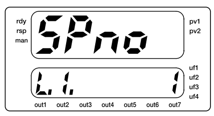
When multi-SP group and multiple recipe groups are set, the SP group used for control can be changed.
The multi-SP/recipe is set using the setup bank.
For details, refer to:
☞ 6-6 How to Use the Multi-SP (on page 6-17) and
6-7 How to Use Recipes (on page 6-19).

■ Setting procedures

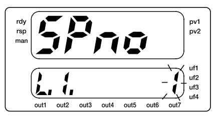
(1) Keep the [sp/ev] key pressed for 2s in the operation display status.
>> SPno is flashing on the upper display.



(2) Press the [enter] key.
>> Check that the auxiliary display shows L.1.. This shows that the loop 1 is currently active. If you want to change it to loop 2, change the value with the [∨] key, [∧] key, [>] key or [<] key.



(3) Press the [enter] key.
>> The value on the lower display starts flashing.



(4) Set a desired value with the [∨] key or [∧] key.

(5) Press the [enter] key to set the value.

(6) When the setting has been completed, press the [display] key.
>> The operation is then returned to the operation display status.

! Handling Precautions

- When "SP group selection"in the priority bank is set to "Internal contact input priority," the group cannot be changed with the keys.
  For details, refer to:
  ☞ 6-2 How to Set the Priority (on page 6-2).

5 - 4 How to Change the PID (auto tuning)

■ Starting procedures

(1) Check that the PV inputs and final control elements (heater power supply, etc.) are connected correctly and that the unit is ready for control.

(2) Press the [display] key to display the loop, in which the AT (auto tuning) is executed. (PV1 or PV2: For 2-input model)

(3) Check that the displayed loop is in the RUN and AUTO modes.

(4) Keep the [at] key pressed for 2s. (The function key registration is set in the initial settings.)

>> The display status of At.on on the lower display changes from flashing to lit. The AT is then started.

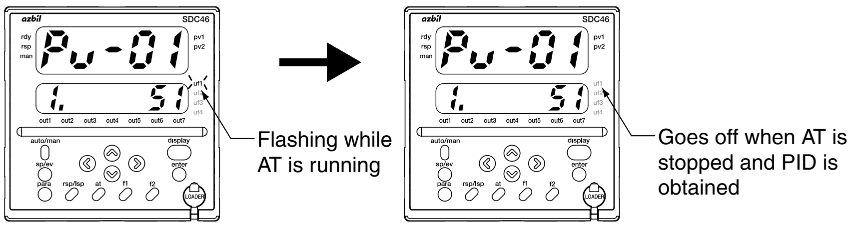
■ Stopping procedures

Normally, the AT completes automatically. To stop the AT while it is running, keep the [at] key again pressed for 2s.

>> The display status of At.oF on the lower display is then changed from flashing to lit. The AT is then stopped.
Additionally, the AT is also stopped when the operation mode is changed to the READY mode or MANUAL mode.

■ Display while AT is running

The "uf1" LED is flashing while the AT of the loop 1 is running.
(The user function indicator lamp setting is set at the initial value.)
When the AT has been completed and the PID has been obtained, the "uf1" LED is turned off.
The new PID value is written into the PID group currently being used.
Since no display is given while the AT of the loop 2 is running, set the user function indicator lamp when necessary.



Handling Precautions

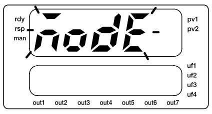
- Before starting the AT, check the PV inputs or final control elements are connected correctly. Make the control operation ready to start.
- To start the AT, it is preconditioned that the PV input error does not occur in the RUN mode and AUTO mode.
- For 2-input models, the AT cannot be started when both the PV1 and PV2 are displayed.
  With the [display] key, change the display to a loop you want to run the AT.
- If the READY mode or MANUAL mode is changed, or PV input error or power failure occurs while the AT is running, the AT is completed without

5 - 5 How to Change the PID (manual)

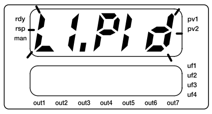
■ Setting procedures

The following describes an example that the PID is changed when using the multi-SP:

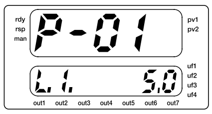
(1) Keep the [para] key pressed for 2s in the operation display status.
>> modE is flashing on the upper display.



(2) Press the [∨] key or [para] key several times until L1.PId is shown on the upper display.
>> L1.PId is flashing on the upper display.



(3) Press the [enter] key.
>> P-01 is shown on the upper display. This shows the proportional band of the 1st group. To change the PID group, change it with the [<] key or [>] key.



(4) Select an item you want to set with the [∨] key or [∧] key.
>> The selected item is shown on the upper display.

(5) Press the [enter] key.
>> The value on the lower display starts flashing.

(6) Set a desired value with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) When the setting has been completed, press the [display] key.
>> The operation is then returned to the operation display status.

Note

- To change the PID group of the loop 2, select L2.PId in step (2).
- When using the recipe, change the PID from the recipe bank (L1.rEC, L2.rEC) of the loop 2 of the SP/EV bank.

5 - 6 How to Change the Event Action Point

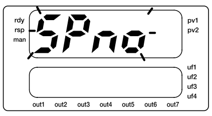
The event action point setting procedures may vary depending on the setting of the recipe enabled setup of the setup bank (item display: C-010), that is, multi-SP and recipe.

- If multi-SP use is set.
  The event action point is set using the event setup bank.
  The event action point setting consists of one set of main setting and sub setting for each event No.

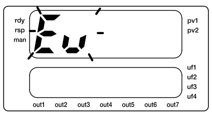
- If recipe use is set.
  The action points of events 1 to 8 are set using the loop 1 recipe bank while the action points of events 9 to 16 are set using the loop 2 recipe bank.
  The event action point setting consists of main settings and sub settings equivalent to the number of SP groups for each event No.

■ Setting procedures (for multi-SP)

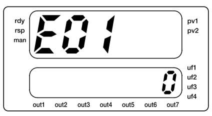
(1) Keep the [sp/ev] key pressed for 2s in the operation display status.
>> SPno is flashing on the upper display.



(2) Press the [∨] key or [sp/ev] key several times until Ev is shown on the upper display.
>> Ev is flashing on the upper display.



(3) Press the [enter] key.
>> The main setting of the action point 1 group is shown on the upper display.



(4) Select an item you want to set with the [∨] key or [∧] key.
>> The selected item is shown on the upper display.

(5) Press the [enter] key.
>> The value on the lower display starts flashing.

(6) Set a desired value with the [∨] key or [∧] key.

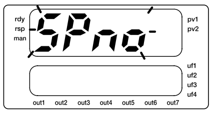
(7) Press the [enter] key to set the value.

(8) When the setting has been completed, press the [display] key.
>> The operation is then returned to the operation display status.

■ Setting procedures (for recipe)

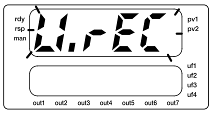
(1) Keep the [sp/ev] key pressed for 2s in the operation display status.

>> SPno is flashing on the upper display.



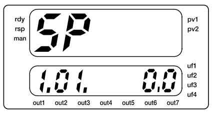
(2) Press the [∨] key or [sp/ev] key several times until L1.rEC is shown on the upper display. (L2.rEC for loop 2 recipe)

>> L1.rEC is flashing on the upper display.



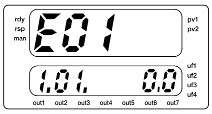
(3) Press the [enter] key.

>> The SP of the recipe group 1 of the loop 1 is shown on the upper display.



(4) Select an item you want to set with the [∨] key.

>> The main setting of the event 1 group is shown.



(5) Every time the [∨] key is pressed, the display changes until the sub setting of the event 8 group is shown.

>> The selected item is shown on the upper display.

(6) Press the [enter] key.

>> The value on the lower display starts flashing.

(7) Set a desired value with the [∨] key or [∧] key.

(8) Press the [enter] key to set the value.

(9) When the setting has been completed, press the [display] key.

>> The operation is then returned to the operation display status.

! Handling Precautions

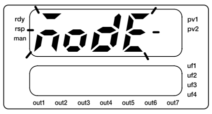
- If the operation type of the event is not set, "-----" is shown on the lower display and the setting cannot be configured.

5 - 7 How to Start and Stop the Control Operation (RUN/READY)

■ Setting procedures

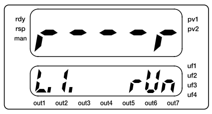
(1) Keep the [para] key pressed for 2s in the operation display status.

>> mode is flashing on the upper display.



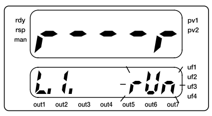
(2) Press the [enter] key.

>> r - - - r is shown on the upper display. At this time, check that the auxiliary display shows L.1.. This shows that the loop 1 is currently active. If you want to change it to loop 2, change the value with the [∨] key, [∧] key, [>] key or [<] key.)



(3) Press the [enter] key.

>> The value on the lower display starts flashing.



(4) Set a desired mode with the [∨] key or [∧] key.

rUn: RUN mode

rdY: READY mode

(5) Press the [enter] key to set the value.

(6) Press the [display] key.

>> The operation is then returned to the operation display status.

5 - 8 How to Manually Output the MV (AUTO/MANUAL)

This function is intended to change the MV using the key operation regardless of the operation status of the instrument.

■ Setting procedures

(1) In the operation display status, press the [display] key to display a loop you want to put it in the manual mode. (This operation is valid only for 2-loop models.)

(2) In the operation display status, keep the [auto/man] key pressed for 2s.
>> The display status of MAn on the lower display changes from flashing to lit (operation mode changes to the manual operation mode) and the numeric value starts flashing. (The "man" LED is lit.)

(3) Change the output value to a desired level with the [∨] key, [∧] key, [<] key, or [>] key.
>> The MV changes in synchronization with the key operation. (It is not necessary to press the [enter] key.)

(4) To return to the auto mode, keep the [auto/man] key again pressed for 2s.
>> The display status of AUto on the lower display changes from flashing to lit and the operation mode changes to the auto mode. (The "man" LED is off.)

Handling Precautions

- For 2-input models, when PV1 and PV2 are displayed at the same time, the mode cannot be changed. With the [display] key, change the display to a loop you want to run.

Note

- Bumpless (MV before change continues) or preset value can be selected for the MV when changing the manual mode.
  For details about settings, refer to:
  ☞ SDC45/46 Digital Indicating Controller User's Manual for Displays and Setting (CP-SP-1265E).

5 - 9 How to Change to the Remote SP (RSP/LSP)

When the loop with the RSP or internal cascade is selected in the 2-input model, a set value to be used can be selected from the remote or local.

■ How to change to the remote SP (RSP)

(1) In the operation display status, keep the [rsp/lsp] key pressed for 2s.
(The function key registration is set at the initial setting.)
When using the internal cascade control, perform the operation with PV2 displayed.
>> The display status of rSP on the upper display changes from flashing to lit and the mode changes to the remote SP mode. (The "rsp" LED is lit.)

■ How to change to the local SP (LSP)

(1) In the operation display status, keep the [rsp/lsp] key pressed for 2s.
When using the internal cascade control, perform the operation with PV2 displayed.
>> The display status of LSP on the upper display changes from flashing to lit and the mode is changed to the local SP mode. (The "rsp" LED is turned off.)

Handling Precautions

- For 2-input models, when PV1 and PV2 are displayed at the same time, the mode cannot be changed. With the [display] key, change the display to a loop you want to run.

Note

- When changing the remote SP to the local SP, the remote SP immediately before changing is written to the local SP, enabling the continuous control. (RSP tracking function)
For details about setting, refer to:
☞ SDC45/46 Digital Indicating Controller User's Manual for Displays and Setting (CP-SP-1265E) and 7-5 RSP Tracking (on page 7-10).

Chapter 6. FUNCTIONS OFTEN USED FOR OPERATIONS OTHER THAN CONTROL

6 - 1 SP Group/LSP Value Change from the Operation Display

The SP group or LSP value can be changed using the [enter] key when the operation display shows the PV or SP.

■ Bank and settings

● Setting 0: LSP can not be changed

Bank	Item display	Item name	Settings
SEtUP (Setup bank)	C-009	SP change method from the operation	0: Disabled 1: LSP value change enabled 2: SP group change enabled

Settings cannot be changed with the [enter] key.

● Setting 1: LSP can be changed

To change the LSP value, press the [enter] key when the operation display shows the PV or SP.*

To finalize the change of LSP value, press the [enter] key again.

To cancel the change, press the [display] key. Other keys are invalid.

If a change has not been finalized and if there is no key operation for 3 minutes, the change will be cancelled and the setting (blinking) will be replaced by the previous one (lit steadily).

*: The setting cannot be changed in RSP mode. During the SP ramp, the LSP and the displayed SP value differ, but while the setting is being changed using the keys, the most recent SP setting is displayed.

● Setting 2: SP group (recipe) can be changed

To change the SP group, press the [enter] key when the operation display shows the PV or SP.*

The number of SP groups that can be changed depends on the number of SP groups that are set up in the set-up bank.

To finalize a change of SP group, press the [enter] key again.

To cancel a change of SP group, press the [display] key. All other keys are invalid.

If a change has not been finalized and if there is no key operation for 3 minutes, the change will be cancelled and the setting (blinking) will be replaced by the previous one (lit steadily).

*: SP group change is impossible in the following cases:

- In RSP mode
- SP group selection is set to "internal contact input has priority."
- There is only one SP group.

6 - 2 How to Set the Priority

In the functions, one of set value, internal contact input (digital input), and other conditions can be used as conditions for operation change. What condition is used is set by the priority.

■ Setting bank

Priority bank (Prior)

■ Example: Selection of SP group

The following describes an example that the SP group selection function is used for four SP groups.

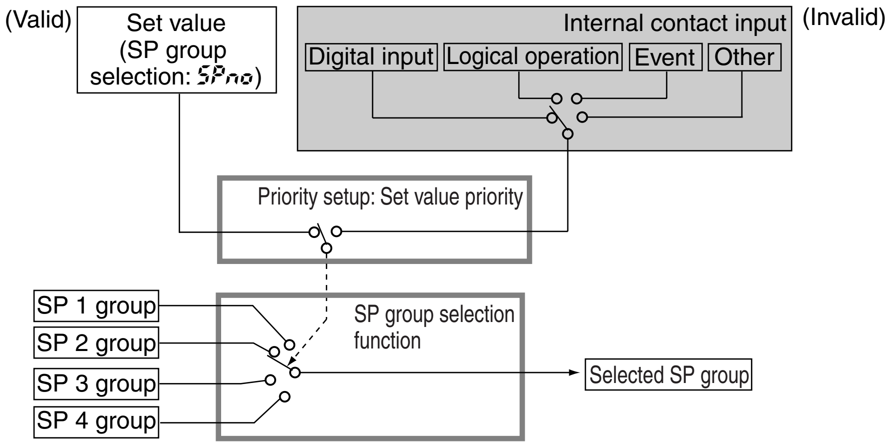
Set value (SP group selection) or internal contact input (digital input) is used for conditions for SP group selection is determined by the priority.

● SP group of control loop 1 is selected by the set value (SP group selection).

Configure the settings as shown below in the priority bank (Prior) setup.

When the priority setup is set at "Set value priority," the SP group selection function operates according to the set value of the SP group selection.

Display item	Auxiliary display	Item name	Setting
LPr.01	1.	(Loop 1) SP group selection	0: Set value priority

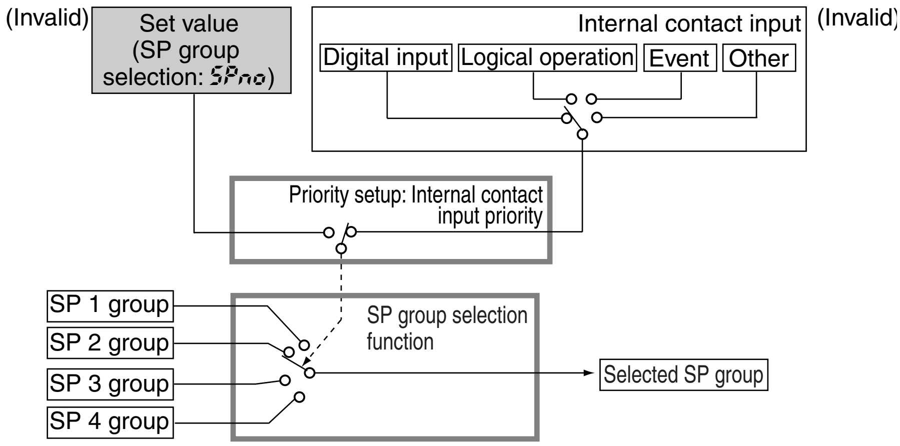


The SP group selection with the digital input is set for the internal contact input as shown in the Figure above. However, since the priority setup is set at "Set value priority," the SP group selection does not operate even though the digital input is operated.

● **SP group of control loop 1 is selected by the internal contact input (digital input).**

Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Setting
LPr.01	1.	SP group selection	1: Internal contact input priority



Since the priority setup is set at "Internal contact input priority," the SP group selection operates by the internal contact input.

When the SP group selection with the digital input is set for the internal contact input as shown in the Figure above, the SP group selection function operates by the digital input.

Since the priority setup is set at "Internal contact input priority," the SP group selection does not operate even though the set value of the SP group selection is changed.

If the SP group selection is not set for the internal contact input when the priority setup is set at "Internal contact input priority," this status is the same as that the input is OFF. One SP group is always selected.

■ Functions whose priority can be set for each control loop

Display item	Item name	Setting
LPr.01	SP group selection	0: Setting priority 1: Internal contact input priority
LPr.02	PID group selection	0: Setting priority 1: Internal contact input priority 2: Zone PID function priority
LPr.03	RUN/READY mode selection	0: Setting priority 1: Internal contact input priority
LPr.04	AUTO/MANUAL mode selection	0: Setting priority 1: Internal contact input priority
LPr.05	LSP/RSP mode selection	0: Setting priority 1: Internal contact input priority
LPr.06	Backup/through output selection	0: Setting priority 1: Internal contact input priority

■ Functions whose priority can be set regardless of control loop

Display item	Item name	Setting
Pr.01	Release all latches	0: Setting priority 1: Internal contact input priority
Pr.02	Linearization table group for OUT	0: Setting priority 1: Internal contact input priority
Pr.03	Switching the operation display	0: Setting priority 1: Internal contact input priority
Pr.04	Linearization table group for position proportional control	0: Setting priority 1: Internal contact input priority

6 - 3 How to Use Events

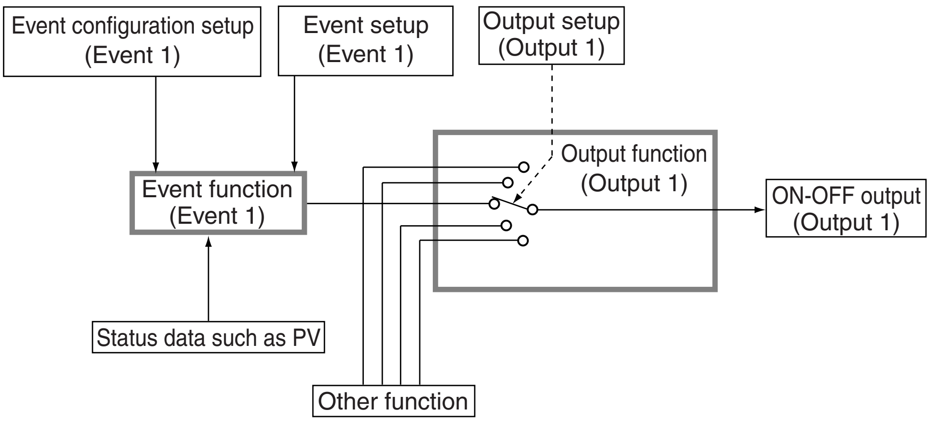
The ON/OFF status of the event is determined according to the conditions for each operation type.
The ON/OFF of the event can be output to the ON/OFF output terminal or digital output terminal.
Additionally, the ON/OFF status of the event can be used as input of the internal contact input function.

■ Setting banks

Event configuration bank (EvCnF)
Event setup bank (Ev)
Output bank (oUt)

■ Example: PV high limit alarm (on if an error occurs.)

The following describes an example that the relay of the output 1 is turned ON if the PV of loop 1 exceeds 800 °C. In this example, the event function and output function are used.



(1) Set the event configuration of event 1.
Configure the settings as shown below in the event configuration bank (EvCnF) setup.

Display item	Auxiliary display	Item name	Settings
EP-01	01.	Operation type	1: PV high limit
EP-02	01.	Loop/Channel definition	1
EP-03	01.	Polarity	0: Direct
EP-04	01.	Standby	0: No standby
EP-05	01.	Operation at READY	0: Continue
EP-06	01.	Decimal point position	0: No decimal point
EP-07	01.	Hysteresis	5
EP-08	01.	ON delay	0.0 (Unit: s)
EP-09	01.	OFF delay	0.0 (Unit: s)

(2) Set the event action point of event 1.
Configure the settings as shown below in the event setup bank (Ev) setup.

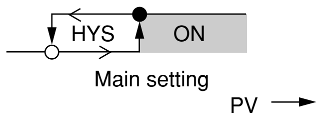
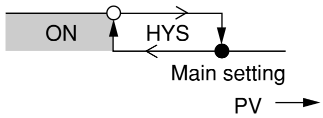
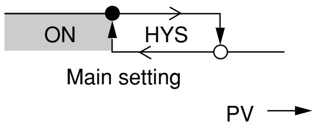
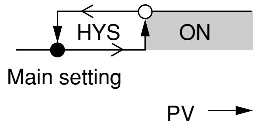
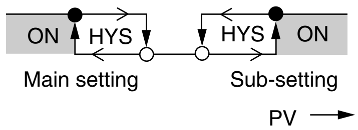
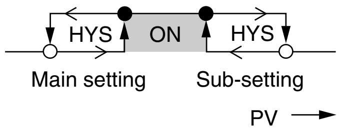
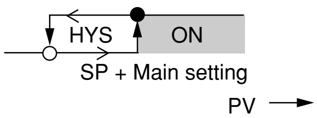
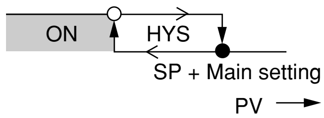
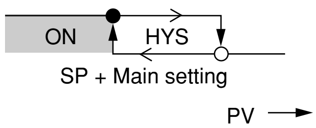
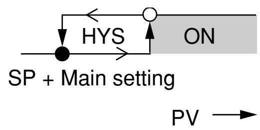
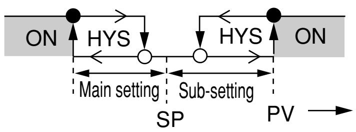
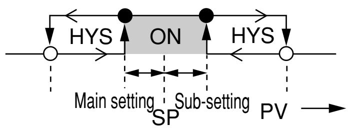
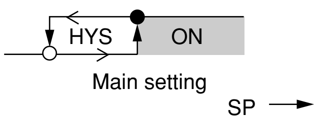
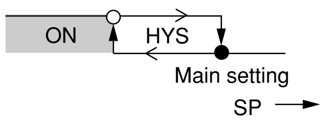
Display item	Auxiliary display	Item name	Settings
E01	No display	Event 1 main setting	800
E01.Sb	No display	Event 1 sub-setting	(setting is disabled.)

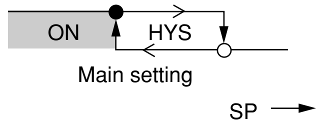
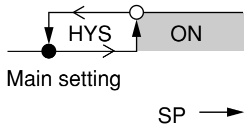
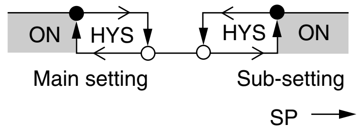
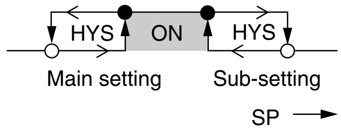
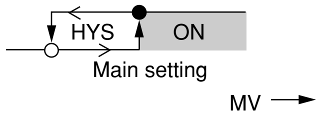
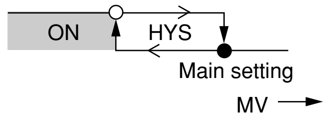
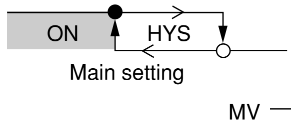
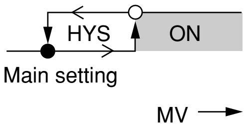
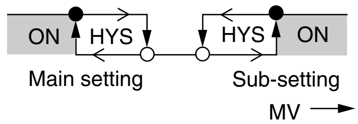
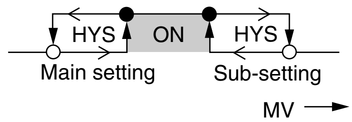
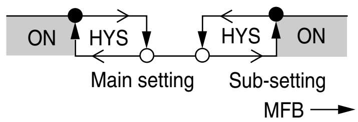
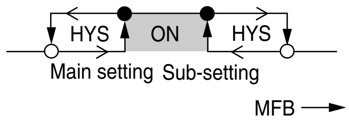
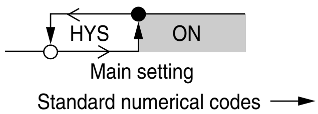
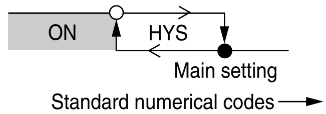
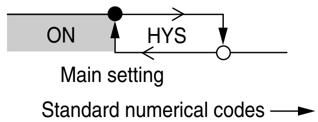
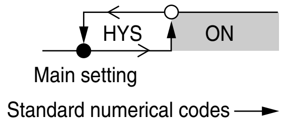
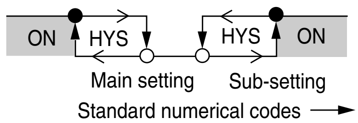
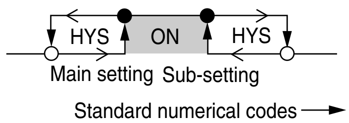
(3) Configure the settings so that the ON/OFF status of event 1 is output from output 1.
Configure the settings as shown below in the output bank (oUt) setup.

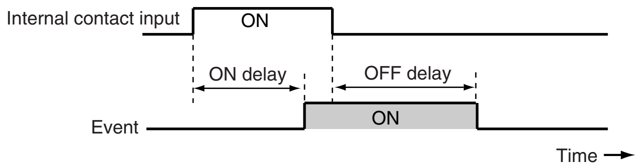
Display item	Auxiliary display	Item name	Settings
tPo.01	01.	Output type	1088: Event 1
tPo.02	01.	Latch	0: No latch
tPo.03	01.	Time proportional operation type	(setting is disabled.)
tPo.04	01.	Min. ON/OFF time	250 (ms)
tPo.05	01.	Time proportioning cycle time	(setting is disabled.)
tPo.06	01.	Linearization table group definition	(setting is disabled.)

■ Event operation type, polarity, hysteresis, main setting, and sub-setting

According to the operation type, polarity, main setting, sub-setting, hysteresis, and other settings, the operation of the event becomes as follows:

Operation type	Set value of operation type	Direct action ● shows that the ON/OFF is changed at this value. O shows that the ON/OFF is changed at a point that "1U" is added to this value.	Reverse action ● shows that the ON/OFF is changed at this value. O shows that the ON/OFF is changed at a point that "1U" is added to this value.
No event	0	Always OFF	Always OFF
PV high limit	1		
PV low limit	2		
PV high/low limit	3		
Deviation high limit	4		
Deviation low limit	5		
Deviation high/ low limit	6		
Deviation high limit (Final SP reference)	7	Same as the direct action of the deviation high limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.	Same as the reverse action of the deviation high limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.
Deviation low limit (Final SP reference)	8	Same as the direct action of the deviation low limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.	Same as the reverse action of the deviation low limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.
Deviation high/ low limit (Final SP reference)	9	Same as the direct action of the deviation high/low limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.	Same as the reverse action of the deviation high/low limit when the SP ramp is not used. The difference is that the SP ramp does not use the current SP, but it uses the final SP.
SP high limit	10		

Operation type	Set value of operation type	Direct action ● shows that the ON/OFF is changed at this value. ○ shows that the ON/OFF is changed at a point that "1U" is added to this value.	Reverse action ● shows that the ON/OFF is changed at this value. ○ shows that the ON/OFF is changed at a point that "1U" is added to this value.
SP low limit	11		
SP high/low limit	12		
MV high limit	13		
MV low limit	14		
MV high/low limit	15		
MFB high/low limit	16		
Upper limit for standard numerical codes	26		
Lower limit for standard numerical codes	27		
Upper/lower limit for standard numerical codes	28		
Alarm (status)	61	ON if alarm occurs (alarm code AL01 to 99). OFF in other cases.	OFF if alarm occurs (alarm code AL01 to 99). ON in other cases.
READY (status)	62	ON in the READY mode. OFF in the RUN mode.	OFF in the READY mode. ON in the RUN mode.
MANUAL (status)	63	ON in the MANUAL mode. OFF in the AUTO mode.	OFF in the MANUAL mode. ON in the AUTO mode.
RSP (status)	64	ON in the RSP mode. OFF in the LSP mode.	OFF in the RSP mode. ON in the LSP mode.
During AT (Status)	65	ON when AT is executed. OFF when AT is stopped.	OFF when AT is executed. ON when AT is stopped.
During SP ramp	66	ON during SP ramp. OFF when SP ramp is not performed or is completed.	OFF during SP ramp. ON when SP ramp is not performed or is completed.

<table>
<tr><th>Operation type</th><th>Set value of operation type</th><th>Direct action</th><th>Reverse action</th></tr>
<tr><td>Control action (status)</td><td>67</td><td>ON during direct action (cooling).
OFF during reverse action (heating).</td><td>OFF during direct action (cooling).
ON during reverse action (heating).</td></tr>
<tr><td>Through output (status)</td><td>68</td><td>ON in the through output mode of the computer backup.
OFF in the backup mode.</td><td>OFF in the through output mode of the computer backup.
ON in the backup mode.</td></tr>
<tr><td>Timer (status)</td><td>70</td><td colspan="2">The direct and reverse action settings are disabled for the timer event.
To use the timer event, it is necessary to set the operation type of the internal contact input to "Timer Stop/Start".
Additionally, multiple timer events can be controlled from individual internal contact input by setting an event No. in the loop/channel definition of the internal contact input.
● Setting items
• ON delay time: A period of time necessary for the event change from OFF to ON after the internal contact input has been changed from OFF to ON.
• OFF delay time: A period of time necessary for the event change from ON to OFF after the internal contact input has been changed from ON to OFF.
● Operation specifications
• The event is turned ON when the internal contact input ON continues for ON delay time or longer.
• The event is turned OFF when the internal contact input OFF continues for OFF delay time.
• In other cases, the current status is continued.


● CAUTION
The default settings of the ON delay and OFF delay before shipment are 0.0s.
The default setting of the loop/channel definition of the internal contact input is "0". In this case, all timer events can be stopped or started through one internal contact input.
Additionally, when a value exceeding "1" is set for the loop/channel definition, one specified timer event can be stopped or started through one internal contact input.</td></tr>
</table>

■ Loop/Channel definition

Setting differs depending on the operation type.

Loop/Channel definition	Operation type No.	Operation at READY*1	Standby*2
Loop 1 or 2 for the operation type	1 to 15	❍	❍
	62 to 68	❍	×
Loop 1 or 2 for use of standby or operation at READY	16	❍	❍
	61, 70	❍	×
Standard numerical code (2304 to 2720)	26 to 28	×	×

*1. ❍: Choice of continuation/forced OFF is available. ×: Always continues

*2. ❍: Choice of standby/no standby is available. ×: No standby

■ Event standby and operation at READY

"Standby" is a function that does not turn ON the event even though the event currently used satisfies the ON conditions when this unit is turned ON or when READY mode is changed to RUN mode.

The event is turned ON when the ON conditions are satisfied again once the OFF conditions have been satisfied. (The OFF conditions do not include the hysteresis range.)

"Standby + Standby at SP change" means that the standby is set again when the SP is changed (SP value and SP group number) in addition to the standby functions.

However, when the same SP value is written or when the SP value is not changed even though the SP group number is changed, the unit does not enter standby mode.

	READY		READY → RUN change	
Standby setup \ EVENT state at READY setup	0: Continued	1: Forced OFF	0: Continued	1: Forced OFF
0: None	Usual operation	OFF	Usual operation	Usual operation
1: Standby	OFF	OFF	OFF (standby state)	OFF (standby state)
2: Standby + Standby at SP change	OFF	OFF	OFF (standby state)	OFF (standby state)

■ Event decimal point

The decimal point position of the main setting and sub-setting of the event setup bank (action point) and the hysteresis setting of the event configuration bank can be changed.

■ ON delay and OFF delay

ON delay is a function that delays the timing, at which the event status is changed from OFF to ON. OFF delay is a function that delays the timing, at which the event status is changed from ON to OFF. However, the operation with the operation type set at timer event is performed as described on the previous page.

6 - 4 How to Use Internal Contact Input (digital input)

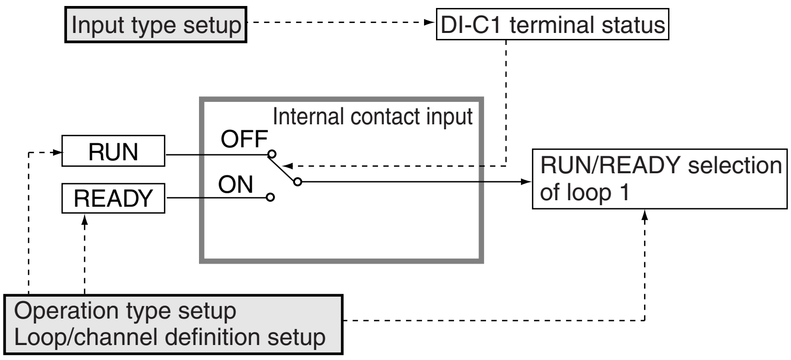
The internal contact input (digital input) can take in the ON/OFF data, which is specified in the input type, as internal contact input inside the instrument.
The change-over operation specified in the operation type can be performed with the ON/OFF data in the specified input type.

■ Setting banks

Priority bank (PrIor)
Internal contact input bank (IC)

■ Example 1: RUN/READY change-over by internal contact input

The following describes an example that the RUN/READY of the loop 1 is changed to READY when the DI-C1 terminal status is ON and it is changed to RUN when the DI-C1 terminal status is OFF.



(1) Set the priority to the internal contact input priority.
Configure the settings as shown below in the priority bank (PrIor) setup.

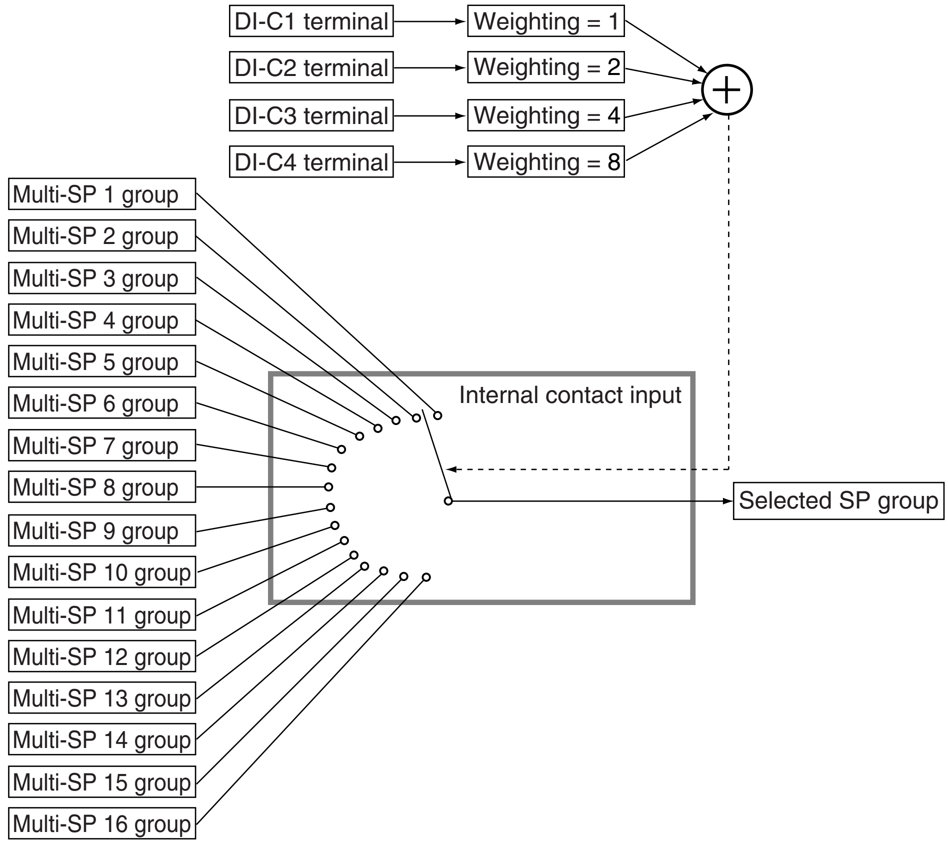
Display item	Auxiliary display	Item name	Setting
LPr.03	1.	RUN/READY mode selection	1: Internal contact input priority

(2) Set RUN/READY to the internal contact 1.
Configure the settings as shown below in the internal contact input bank (IC) setup.

Display item	Auxiliary display	Item name	Settings
IC-01	01.	Operation type	21: RUN/READY
IC-02	01.	Input type	1152: DI-C1 terminal status
IC-03	01.	Loop/channel definition	1: Loop 1
IC-04	01.	Weighting	(setting is invalid.)

■ Example 2: SP group selection by internal contact input

The following describes an example that the selection of multi-SP1 group to multi-SP 16 group in the loop 1 is made enabled using the DI-C1 to DI-C4 terminals.



DI-C1	OFF	ON	OFF	ON	• • • •	OFF	ON	OFF	ON
DI-C2	OFF	OFF	ON	ON	• • • •	OFF	OFF	ON	ON
DI-C3	OFF	OFF	OFF	OFF	• • • •	ON	ON	ON	ON
DI-C2	OFF	OFF	OFF	OFF	• • • •	ON	ON	ON	ON
Sum of the weighting values	0	1	2	3	• • • •	12	13	14	15
Selected SP group	SP1	SP2	SP3	SP4	• • • •	SP13	SP14	SP15	SP16

(1) Set the priority to the internal contact input priority.
Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Settings
LPr.01	No display	SP group selection	1: Internal contact input priority

(2) Set the SP system group.
Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Settings
C-011	1.	SP system group	16

(3) Set the SP group selection for four groups of internal contact inputs.
In the internal contact input bank (IC), set four groups of internal contact inputs as described below.

Display item	Auxiliary display	Item name	Settings
IC-01	01.	Operation type	1: SP group selection
IC-02	01.	Input type	1152: DI-C1 terminal status
IC-03	01.	Loop/channel definition	1
IC-04	01.	Weighting	1
IC-01	02.	Operation type	1: SP group selection
IC-02	02.	Input type	1153: DI-C2 terminal status
IC-03	02.	Loop/channel definition	1
IC-04	02.	Weighting	2
IC-01	03.	Operation type	1: SP group selection
IC-02	03.	Input type	1154: DI-C3 terminal status
IC-03	03.	Loop/channel definition	1
IC-04	03.	Weighting	4
IC-01	04.	Operation type	1: SP group selection
IC-02	04.	Input type	1155: DI-C4 terminal status
IC-03	04.	Loop/channel definition	1
IC-04	04.	Weighting	8

■ Operation type (IC-01)

Select operations, which are to be changed over by internal contact input, from the following table, "Operation Type Settings" and then set them properly.

Set value and meaning of operation type	Set value and meaning of loop/channel definition
0: No function	0 to 127: Invalid
1: SP group selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
2: PID group selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
3: Fixed value output selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
4: Multi-ratio selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
5: Linearization use group selection (For output)	0: Invalid, 1 to 7: Output No., 8 to 127: Invalid
6: Linearization use group selection (For position proportional control)	0 to 127: Invalid
21: RUN/READY mode selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
22: AUTO/MANUAL mode selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
23: LSP/RSP mode selection	0: All loops, 1: Loop 1, 2: Loop 2 (slave side of internal cascade function), 3 to 127: Invalid
24: AT start/stop selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
25: Backup/through output selection	0: All loops, 1: Invalid, 2: Loop 2, 3 to 127: Invalid
41: Control operation polarity selection	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
42: SP RAMP enabled/disabled	0: All loops, 1: Loop 1, 2: Loop 2, 3 to 127: Invalid
43: Operation display switching	0 to 127: Invalid
46: Timer stop/start selection	0: All timer events, 1 to 16: Event No. of timer event, 17 to 127: Invalid
47: Release all latches	0 to 127: Invalid

■ Input type (IC-02)

Use to specify the ON/OFF data that the data internal contact input uses as input. This ON/OFF data shows various kinds of instrument statuses and it is called "standard bit".

For details about standard bit numeric values, refer to:

☞ ■ Standard bit codes (on page App.-14).

■ Loop/channel definition (IC-03)

Use to specify a loop or channel is specified that becomes a target operated by the internal contact input. The meaning of the loop/channel definition may vary depending on the operation type.

For details, refer to:

☞ Operation Type Settings on the previous page.

■ Weighting (IC-04)

Use to select a group or number in a specific operation type, such as SP group selection, PID group selection, fixed value output selection, multi-ratio selection, selection of Linearization table use group (for OUT) or operation display switching.

When the input is OFF, the value becomes "0". When the input is ON, the value becomes the set value.

When the operation type and loop/channel definition use the same internal contact input, a selection is determined by the sum of weighting values as shown in the table below.

Sum of weights / Operation type	0	1 or more
SP group selection	1 group	Group with "1" added to the sum of weighting values is selected.
PID group selection	1 group	Group with "1" added to the sum of weighting values is selected.
Fixed value output selection	Fixed value output is not used. (This value becomes the MV of the PID control.)	Fixed value output with a number equivalent to the sum of weighting values.
Multi-ratio selection	Multi-ratio is not used. (Ratio = 1.000)	Multi-ratio with a number equivalent to the sum of weighting values.
Linearization use group selection	Approximation by linearization table is not used.	Linearization group with the sum of weighting values
Operation display switching	Operation display cannot be switched.	Screen No. of the sum of the weighting values. Operation display does not change if a nonexistent screen No. is specified.

6 - 5 How to Use Digital Output

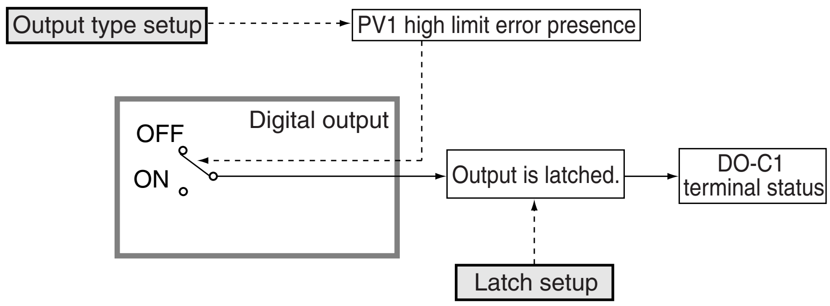
The digital output (DO) can output the ON/OFF data specified by the output type.
Additionally, the ON or OFF status of the digital output can be latched.

■ Setting banks

PV bank (Pv)
Digital output bank (do)

■ Example: DO turns ON if PV1 high limit error occurs

The following describes an example that the high limit error is given if the PV1 exceeds 1000.0°C or more, the PV1 high limit error alarm is output from the terminal DO-C1, and this ON status is latched.



(1) Set the high limit error of the PV1 input.
Configure the settings as shown below in the PV bank (Pv) setup.
Set the high limit of the PV1 using Pv-05.

Display item	Auxiliary display	Item name	Settings
Pv-01	1.	Range type	1: K thermocouple
Pv-02	1.	Decimal point position	1: One digit after the decimal point
Pv-03	1.	Temperature unit	0: Centigrade (°C)
Pv-04	1.	Range low limit	0.0
Pv-05	1.	Range high limit	1000.0
Pv-06	1.	Cold junction compensation	0: Compensated inside instrument.
Pv-09	1.	Linear scaling low limit	(setting is disabled.)
Pv-10	1.	Linear scaling high limit	(setting is disabled.)
Pv-11	1.	PV square root extraction dropout	(setting is disabled.)
Pv-12	1.	Filter	0.00
Pv-13	1.	Bias	0.0
Pv-14	1.	Ratio	1.000
Pv-16	1.	Thermocouple/mV-input burnout	0: Upscale at burnout
Pv-20	1.	Linearization table group definition	0: Not used.

(2) Set the operation of the DO-C1 terminal.
Configure the settings as shown below using the C-column terminal in the digital output bank (do).

Display item	Auxiliary display	Item name	Settings
do.C.01	1.	Output type	1824: PV input high limit error (PV1)
do.C.02	1.	Latch	1: Latched at ON.

■ Output type (do.C.01)

Use to specify the ON/OFF data to be output from the digital output. This ON/OFF data shows various kinds of instrument statuses and it is called "standard bit".
The standard bit Nos. are set as output type.

Note

- For details about standard bit Nos., refer to:
  ☞ ■ Standard bit codes (on page App.-16).

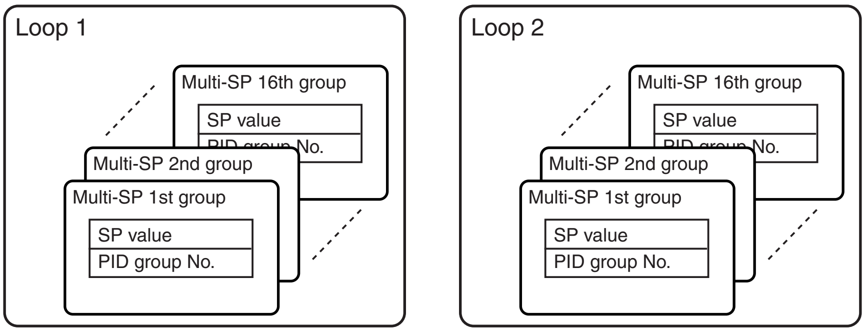
■ Latch (do.C.02)

Use to specify the latch operation of the digital output from the following selections:
0: Not latched.
1: Latched at ON.
2: Latched at OFF. (Except for OFF when the power is turned ON.)

To release the latch, the following methods are provided.
- Set the setup item "Release all latches" in the setup bank (C-003) to "1" (release latch).
- Change the latch setting (do.C.02) in the digital output bank to "0" (not latched).
- Turn OFF the power to this unit, and then turn it ON again.

6 - 6 How to Use the Multi-SP

The multi-SP can be set by combining LSP value and PID group definition on an SP group basis.
Up to 16 SP groups per loop are provided. You can select one group from these groups and use it for control.



■ Setting banks

Setup bank (SEtUP)
Loop 1 multi-SP bank (L1.LSP)
Loop 2 multi-SP bank (L2.LSP)
Loop 1 PID bank (L1.PId)
Loop 2 PID bank (L2.PId)
Priority bank (PrIor)
SP group selection bank (SPno)

■ Features

PID constant group separated from the SP group is provided. When selecting an SP group, the constants of the PID group corresponding to the PID group definition set in the SP group are used for the control. When using PID constants common to multiple SP groups, you can configure the settings so that the same PID group can be specified.
Additionally, even though the selection of the SP group is changed, the action point set value of the event does not change.

■ Example: Multi-SP is used with two LSP groups.

The following describes an example that two LSP groups and PID constants of two groups are used with two SP groups in the loop 1:

(1) Set the SP to two groups using the multi-SP.
Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Settings
C-010	No display	Recipe enabled	0: Multi-SP
C-011	No display	SP system group	2

(2) Set data for the SP group.
Configure the settings as shown below in the loop 1 multi-SP bank (L1.LSP) setup.

Display item	Auxiliary display	Item name	Settings
LSP.01	L.1.	(SP 1 group) LSP	100.0
PId.01	L.1.	(SP 1 group) PID group definition (For LSP)	1
LSP.02	L.1.	(SP 2 group) LSP	200.0
PId.02	L.1.	(SP 2 group) PID group definition (For LSP)	2

(3) Set data for the PID group.

Configure the settings as shown below in the loop 1 PID bank (L1.PId) setup.

Display item	Auxiliary display	Item name	Settings
P-01	L.1.	(Loop 1 PID 1 group) Proportional band	5.0
I-01	L.1.	(Loop 1 PID 1 group) Integration time	120
d-01	L.1.	(Loop 1 PID 1 group) Derivative time	30
oL-01	L.1.	(Loop 1 PID 1 group) MV low limit	0.0
oH-01	L.1.	(Loop 1 PID 1 group) MV high limit	100.0
(Omission)			
P-02	L.1.	(Loop 1 PID 2 group) Proportional band	5.0
I-02	L.1.	(Loop 1 PID 2 group) Integration time	100
d-02	L.1.	(Loop 1 PID 2 group) Derivative time	25
oL-02	L.1.	(Loop 1 PID 2 group) MV low limit	0.0
oH-02	L.1.	(Loop 1 PID 2 group) MV high limit	100.0
(Others omitted.)			

(4) Set the priority of the SP group selection.

Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Settings
LPr.01	L.1.	(Loop 1) SP group selection	0: Set value priority

(5) Select an SP group.

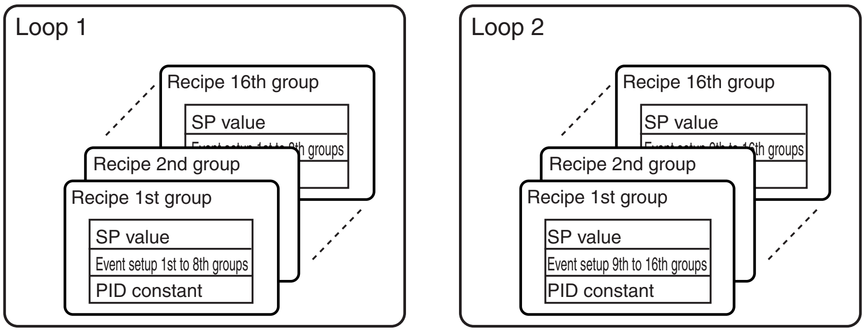
Select an SP group in the SP group selection bank (SPno).

To select the SP 2 group, configure the setting as described in the table below.

Display item	Auxiliary display	Item name	Settings
SPno	L.1.	(Loop 1) SP group selection	2: Select the SP 2 group.

6 - 7 How to Use Recipes

The recipe can be set by combining LSP value and event action point set value on an SP group basis. Up to 16 SP groups per loop are provided. You can select one group from these groups and use it for control.



■ Setting banks

Setup bank (SEtUP)
Event configuration bank (EvCnF)
Loop 1 recipe bank (L1.rEC)
Loop 2 recipe bank (L2.rEC)
Priority bank (PrLor)
SP group selection bank (SPno)

■ Features

When selecting an SP group, the operation is performed using the event action point set values and PID constants set in this SP group. Even though the event action point set values or PID constants of a certain SP group are changed, this does not affect other SP groups.
In the SP group of the loop 1, there are action point set values of event 1 to event 8.
In the SP group of the loop 2, there are action point set values of event 9 to event 16.

■ Example: Recipe of the LSP 2 group is used.

The following describes an example that two LSP groups, the event action point set values of two groups, and PID constants of two groups are used with two SP groups in the loop 1.
Event 1 is set to the PV high/low limit event of the loop 1, and event 2 to event 8 are set to "no event."

(1) Set the SP to two groups using the recipe.
Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Settings
C-010	No display	Recipe enabled	1: Recipe
C-011	No display	SP system group	2

(2) Set the event 1 to the PV high/low limit event.
Configure the settings as shown below in the event configuration bank (EuCnF) setup.

Display item	Auxiliary display	Item name	Settings
EP-01	01.	(Event 1) Operation type	3: PV high/low limit
EP-02	01.	(Event 1) Loop/Channel definition	1
EP-03	01.	(Event 1) Polarity	0: Direct
EP-04	01.	(Event 1) Standby	0: No standby
EP-05	01.	(Event 1) Operation at READY	0: Continue
EP-06	01.	(Event 1) Decimal point position	1: One digit below the decimal point
EP-07	01.	(Event 1) Hysteresis	5.0
EP-08	01.	(Event 1) ON delay	0.0
EP-09	01.	(Event 1) OFF delay	0.0
EP-01	02.	(Event 2) Operation type	0: No event
(Omission)			
EP-01	03.	(Event 3) Operation type	0: No event
(Omission)			
EP-01	04.	(Event 4) Operation type	0: No event
(Omission)			
EP-01	05.	(Event 5) Operation type	0: No event
(Omission)			
EP-01	06.	(Event 6) Operation type	0: No event
(Omission)			
EP-01	07.	(Event 7) Operation type	0: No event
(Omission)			
EP-01	08.	(Event 8) Operation type	0: No event
(Followings are omitted.)			

(3) Set data for the SP group.
Configure the settings as shown below in the loop 1 recipe bank (L1.rEC) setup.

Display item	Auxiliary display	Item name	Settings
SP	1.01.	(Loop 1 SP 1 group) LSP	100.0
E01	1.01.	(Loop 1 SP 1 group) Event 1 main setting	120.0
E01.Sb	1.01.	(Loop 1 SP 1 group) Event 1 sub-setting	80.0
E02	1.01.	(Loop 1 SP 1 group) Event 2 main setting	(setting is disabled.)
E02.Sb	1.01.	(Loop 1 SP 1 group) Event 2 sub-setting	(setting is disabled.)
E03	1.01.	(Loop 1 SP 1 group) Event 3 main setting	(setting is disabled.)
E03.Sb	1.01.	(Loop 1 SP 1 group) Event 3 sub-setting	(setting is disabled.)
E04	1.01.	(Loop 1 SP 1 group) Event 4 main setting	(setting is disabled.)
E04.Sb	1.01.	(Loop 1 SP 1 group) Event 4 sub-setting	(setting is disabled.)
E05	1.01.	(Loop 1 SP 1 group) Event 5 main setting	(setting is disabled.)
E05.Sb	1.01.	(Loop 1 SP 1 group) Event 5 sub-setting	(setting is disabled.)
E06	1.01.	(Loop 1 SP 1 group) Event 6 main setting	(setting is disabled.)
E06.Sb	1.01.	(Loop 1 SP 1 group) Event 6 sub-setting	(setting is disabled.)

Display item	Auxiliary display	Item name	Settings
E07	1.01.	(Loop 1 SP 1 group) Event 7 main setting	(setting is disabled.)
E07.Sb	1.01.	(Loop 1 SP 1 group) Event 7 sub-setting	(setting is disabled.)
E08	1.01.	(Loop 1 SP 1 group) Event 8 main setting	(setting is disabled.)
E08.Sb	1.01.	(Loop 1 SP 1 group) Event 8 sub-setting	(setting is disabled.)
P	1.01.	(Loop 1 SP 1 group) Proportional band	5.0
I	1.01.	(Loop 1 SP 1 group) Integration time	120
d	1.01.	(Loop 1 SP 1 group) Derivative time	30
oL	1.01.	(Loop 1 SP 1 group) MV low limit	0.0
oH	1.01.	(Loop 1 SP 1 group) MV high limit	100.0
rE	1.01.	(Loop 1 SP 1 group) Manual reset	50.0
P-C	1.01.	(Loop 1 SP 1 group) Proportional band (cool)	5.0
I-C	1.01.	(Loop 1 SP 1 group) Integration time (cool)	120
d-C	1.01.	(Loop 1 SP 1 group) Derivative time (cool)	30
oL.C	1.01.	(Loop 1 SP 1 group) MV low limit (cool)	0.0
oH.C	1.01.	(Loop 1 SP 1 group) MV high limit (cool)	100.0
oI	1.01.	(Loop 1 SP 1 group) Initial output of PID control	0.0
SP	1.02.	(Loop 1 SP 2 group) LSP	200.0
E01	1.02.	(Loop 1 SP 2 group) Event 1 main setting	220.0
E01.Sb	1.02.	(Loop 1 SP 2 group) Event 1 sub-setting	180.0
(Omission)			
P	1.02.	(Loop 1 SP 2 group) Proportional band	5.0
I	1.02.	(Loop 1 SP 2 group) Integration time	120
d	1.02.	(Loop 1 SP 2 group) Derivative time	30
oL	1.02.	(Loop 1 SP 2 group) MV low limit	0.0
oH	1.02.	(Loop 1 SP 2 group) MV high limit	100.0
rE	1.02.	(Loop 1 SP 2 group) Manual reset	50.0
P-C	1.02.	(Loop 1 SP 2 group) Proportional band (cool)	5.0
I-C	1.02.	(Loop 1 SP 2 group) Integration time (cool)	100
d-C	1.02.	(Loop 1 SP 2 group) Derivative time (cool)	25
oL.C	1.02.	(Loop 1 SP 2 group) MV low limit (cool)	0.0
oH.C	1.02.	(Loop 1 SP 2 group) MV high limit (cool)	100.0
oI	1.02.	(Loop 1 SP 2 group) Initial output of PID control	0.0

(4) Set the priority of the SP group selection.

Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Setting
LPr.01	L.1.	(Loop 1) SP group selection	0: Set value priority

(5) Select an SP group.

Select an SP group in the SP group selection bank (SPno).

To select the SP 2 group, configure the setting as described in the table below.

Display item	Auxiliary display	Item name	Setting
SPno	L.1.	(Loop 1) SP group selection	2: Select the SP 2 group

When the SP group selection is changed, the SP value, event action point set value, and PID constant used for the control changes according to the SP group setup.

6 - 8 Current Transformer (CT) Input

On CT input models, current to the heater can be measured by CT input.
Channels 1 and 2 (CH1, CH2) are available for CT input.
There are 3 types of current measurement, as follows. Select the appropriate detection mode.

(1) Measured current output ON when SDC output is ON/OFF
(2) Measured current output OFF when SDC output is ON/OFF
(3) Measured current output unrelated to SDC output ON/OFF

Use (1) for detection of heater line break or overcurrent.
Use (2) for detection of heater short circuit (actuator short circuit).
Use (3) for constant current measurement. The measured value is conveniently shown as output ON current.

- Methods (1) and (2) of current detection can be used if CT operation (Ct-01) is set to any value from 1 to 5.
- If CT operation is set to 0, current detection method (3) is available.

■ Bank and settings

The auxiliary display shows CT input No. (1: CT input 1. 2: CT input 2)

Bank	Item display	Item name	Settings
Ct (CT input bank)	Ct-01	CT operation	0: Current measurement 1: OUT1 heater line break detection 2: OUT2 heater line break detection 3: OUT3 heater line break detection 4: OUT4 heater line break detection 5: OUT5 heater line break detection
	Ct-02	Waiting time for CT measurement	30 to 300ms
	Ct-03	The number of CT turns	100 to 4000
	Ct-04	The number of CT power line passes	1 to 6
	Ct-05	Amount of current indicating disconnected heater	0.0 to 350.0A
	Ct-06	Amount of current indicating overcurrent	0.0 to 350.0A
	Ct-07	Amount of current indicating short circuit	0.0 to 350.0A
	Ct-08	Hysteresis	0.0 to 350.0A
	Ct-09	Delay time	0.0 to 3200.0s
	Ct-10	Condition for restoring the status before measurement	1024 to 2047 (standard bit codes)

■ CT operation (Ct-01)

CT inputs 1 and 2 can be independently set.

- Models with 2 CT inputs (selected by option field in the model No.) can display and set this function.
- If set to 0 (current measurement), whenever the SDC output is ON the value for measured current will be updated, and whenever the SDC output is OFF the value for measured current will be fixed at 0.0 amps.

■ Waiting time for CT measurement (Ct-02)

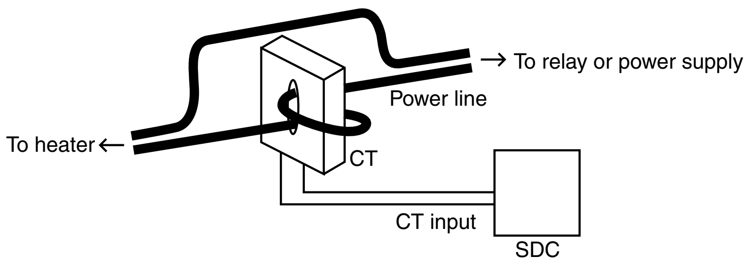
If the CT operation is set to detect a heater line break, the time from the change in output ON/OFF until the start of current measurement can be set.

- Models with 2 CT inputs (selected by option field in the model No.) can display and set this function if the CT operation is set to detect a heater line break.
- Following a change in output ON/OFF, and after the waiting time for CT measurement, current measurement starts. It ends 100 ms later.

■ The number of CT turns/ power line passes (Ct-03, Ct-04)

These functions can be set independently for the CTs connected to CT inputs 1 and 2.

- Models with 2 CT inputs (selected by option field in the model No.) can display and set these functions.
- Be sure to enter a setting for the number of turns of the CT connected to the SDC.
- For the number of power line passes, count the number of times the power line passes through the CT hole.
  For example, if the power line goes through the hole twice, as shown below, set "2."



■ Amount of current that indicates a disconnected heater (Ct-05)

If the current measured by the CT is below the set value when the SDC output is ON, a heater line break will be detected.
When set to "0.0," detection is disabled.

■ Amount of current that indicates overcurrent (Ct-06)

If the current measured by the CT is above the set value when the SDC output is ON, an overcurrent will be detected.
When set to "0.0," detection is disabled.

■ Amount of current indicating short circuit (Ct-07)

If the current measured by the CT is above the set value when the SDC output is OFF, a short circuit will be detected.
When set to "0.0," detection is disabled.

■ Hysteresis (Ct-08)

Applies to the detection of heater line break, overcurrent, and short circuit of the actuator.

■ Delay time (Ct-09)

Applies to the detection of heater line break, overcurrent, and short circuit of the actuator.

■ Condition for restoring the status before measurement (Ct- 10)

A standard bit code can be set as the condition for restoring the status before measurement of current. For example, if the control output is OFF after detection of a line break, use this function to cancel continuing detection of the line break.

! Handling Precautions

- The ON/OFF status of heater line break/overcurrent/short circuit detection is reflected in the standard bit codes.
  ☞ Standard bit codes of Chapter 11 List of Communication Data (on page 11-95).
- To detect a line break or the like using an event function, set the event operation type (EP-01) to standard numerical codes and specify the desired standard numerical code No. and the loop/channel definition (EP-02).
  ☞ 6-3 How to Use Events (on page 6-5).
- If ON/OFF signals for detecting a line break or overcurrent are generated from the relay output or digital output (DO), set the desired CT operation for the output type assignment in the output bank or digital output bank.

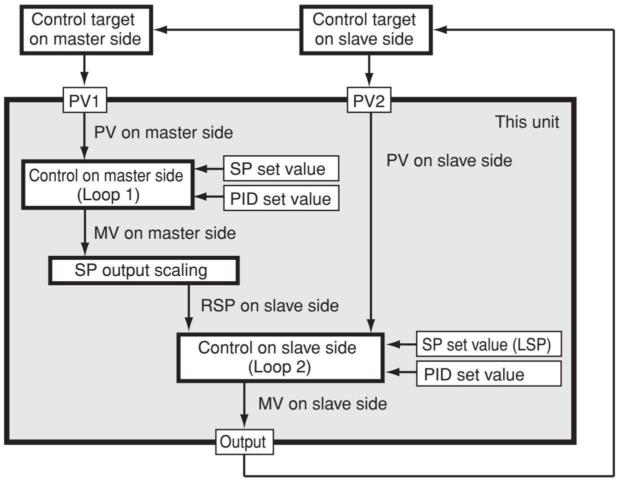
Chapter 7. FUNCTIONS USED AS REQUIRED

7 - 1 Internal Cascade Function

If the SDC is a 2- or 3-input model, it can control both the master and slave sides of the cascade control.

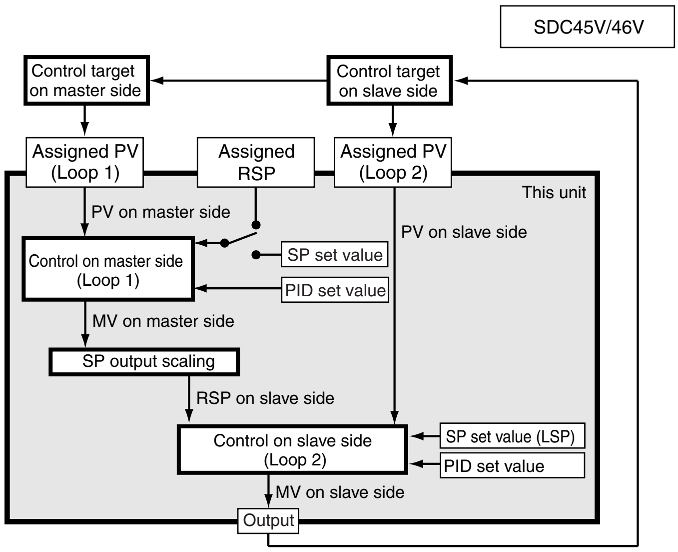
● 2-input models

The control on the master side operates as loop 1 control. The PV1 becomes PV on the master side.
The control on the slave side operates as loop 2 control. The PV2 becomes PV on the slave side.
The MV on the master side is converted into the RSP on the slave side through the SP output scaling.



● 3-input models

Control of the master is done as loop 1 control, and PV1 is for the master PV. RSP input can be selected for the SP settings. PV and RSP inputs use the data assigned in the loop control bank.
Control of the slave is done as loop 2 control, and PV2 is for the slave PV. PV input uses the data assigned in the loop control bank. The master MV is converted to the slave RSP by means of SP output scaling.



Handling Precautions

- 1-input models cannot use the internal cascade function.

■ Setting banks

Setup bank (SEtUP)
MV bank (mv)
Output bank (oUt)

■ Example: The MV on the slave side is output from output 3 by internal cascade control.

The following describes an example that the MV on the master side is converted into RSP ranging from 0 °C to 200 °C in order to control the slave side, and the MV on the slave side is output from output 3:

(1) Configure the settings so that the internal cascade function can be used.
Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Setting
C-001	No display	Loop type	4: 1 loop (internal cascade)

(2) Configure the settings so that the MV on the master side is converted into the RSP on the slave side.
Configure the settings as shown below in the MV bank (mv) setup.

Display item	Auxiliary display	Item name	Settings
CAS.01	L.1.	(Loop 1) Scaling method	0: Fixed
CAS.02	L.1.	(Loop 1) Scaling low limit	0.0
CAS.03	L.1.	(Loop 1) Scaling high limit	200.0
CAS.04	L.1.	(Loop 1) Tracking mode	(Setting is invalid.)
CAS.05	L.1.	(Loop 1) SP output filter	0.00 (unit: s)

The RSP conversion calculation formula may vary depending on the scaling method (CAS.01).

- Fixed (CAS.01 = 0)
  RSP = (MVm ÷ 100) × (SH - SL) + SL
- SP reference (CAS.01 = 1)
  RSP = (MVm ÷ 100) × (SH - SL) + SL + SPm
- PV reference (CAS.01 = 2)
  RSP = (MVm ÷ 100) × (SH - SL) + SL + PVm

The following shows the meanings of variables used in the calculation formulas:

SL: Scaling low limit
SH: Scaling high limit
MVm: MV on master side
SPm: SP on master side
PVm: PV on master side

(3) The MV on the slave side is output from the output 3.
The setup items may vary depending on whether the output 3 is the continuous output or the ON/OFF output.
When the output 3 is the continuous output, configure the settings as shown below in the output bank (oUt) setup.

In this example, an MV of 0 to 100 % on the slave side is output as 4 to 20 mA.

Display item	Auxiliary display	Item name	Settings
Co-01	3.	(Output 3) Output range	0: 4 to 20mA
Co-02	3.	(Output 3) Output type	1: MV
Co-03	3.	(Output 3) Loop/channel definition	2
Co-04	3.	(Output 3) Decimal point position	1: One digit after the decimal point
Co-05	3.	(Output 3) Low limit of output scaling	0.0
Co-06	3.	(Output 3) High limit of output scaling	100.0
Co-07	3.	(Output 3) Linearization table group definition	0: Not used.

When the output 3 is the ON/OFF output, configure the settings as shown below in the output bank (oUt) setup.
In this example, the setting with the controllability priority is made assuming that the time proportional cycle time is 10 s.

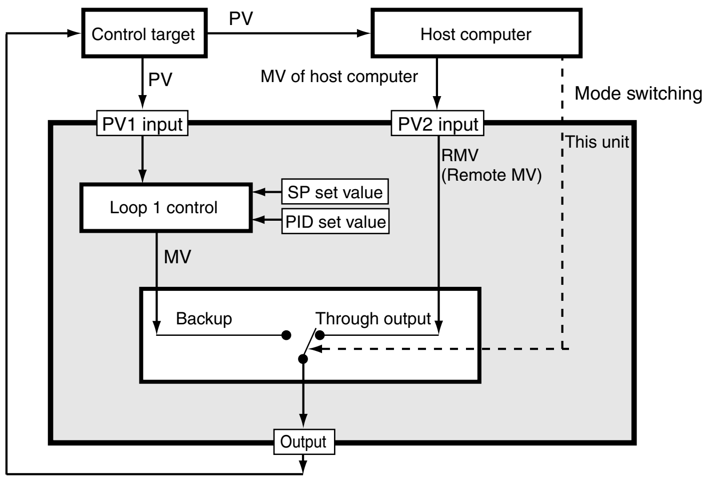
Display item	Auxiliary display	Item name	Settings
tPo.01	3.	(Output 3) Output type	4: MV of loop 2
tPo.02	3.	(Output 3) Latch	(Setting is disabled.)
tPo.03	3.	(Output 3) Time proportional operation type	0: Priority on controllability
tPo.04	3.	(Output 3) Min. ON/OFF time	250 (unit: ms)
tPo.05	3.	(Output 3) Time proportional cycle	10.0 (unit: s)
tPo.06	3.	(Output 3) Linearization table group definition	0: Not used.

7 - 2 Computer Backup

If the SDC is a 2- or 3- input model, a computer backup function is available. There are two backup modes, as shown below.

● 2-input models

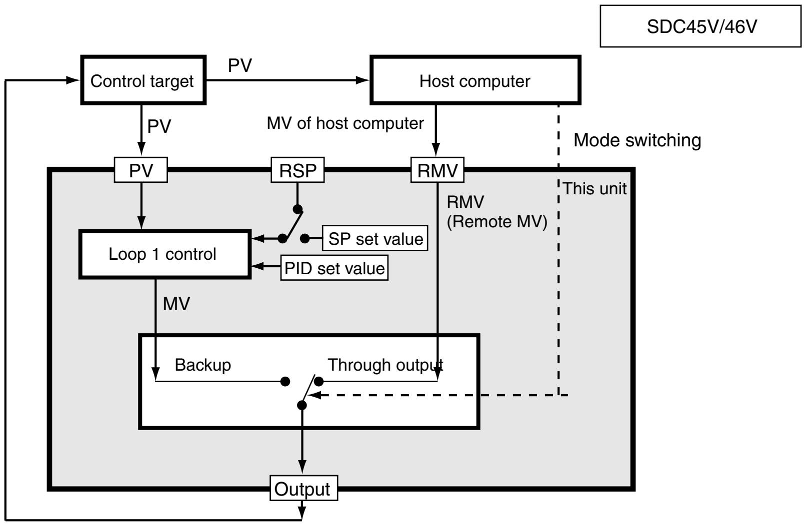
- Through output mode
  The connected computer does the main control calculation. The SDC receives the MV from the computer through its PV2 input, and then outputs it as the MV from the SDC.
- Backup mode
  The SDC does the main control calculation, rather than the connected computer. The PV1 input is used as the PV of the loop 1.



● 3-input models

For PV, RSP, and RMV, the settings specified in the control bank are used.
On 3-input models, the computer backup function with use of the RSP is available.

- Through output mode
  The connected computer does the main control calculation. The SDC receives the MV from the computer through its RMV input, and then outputs it as the MV from the SDC.
- Backup mode
  The SDC performs the control calculation instead of the host computer. For the SP, the RSP input can be selected.



Handling Precautions

- The computer backup function is not available on 1-input models.

■ Setting banks

Setup bank (SEtUP)
Priority bank (Prior)
Internal contact input bank (IC)
Output bank (oUt)

■ Example

The following describes an example that the terminal status of the DI-F1 (F1 of digital input) is used to change to the computer backup and the MV is output to the output 3:

(1) Configure the settings so that the computer backup function can be used.

Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Settings
C-001	No display	Loop type	3: 1 loop (computer backup)
C-002	No display	Computer backup type	0: Computer backup method 1

The operation when the through output is changed to the backup may vary depending on the type of computer backup as described below.

Method 1: The LSP becomes the same value as the PV. A change in MV is small.
Method 2: The LSP does not change. A change in MV is large.
Method 3: The LSP does not change. A change in MV is small.

(2) Using the priority setup, configure the settings so that the mode of the computer backup is changed by the internal contact input.
Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Setting
LPr.06	1.	(Loop 1) Backup/through output	1: Internal contact input priority

(3) Configure the settings as shown below in the internal contact input bank (IC) so that the mode of the computer backup is changed by the terminal status of DI-F1 (F1 of digital input).

Display item	Auxiliary display	Item name	Settings
IC-01	01.	(Internal contact 1 group) Operation type	25: Backup/through output selection
IC-02	01.	(Internal contact 1 group) Input type	1176: DI-F1
IC-03	01.	(Internal contact 1 group) Loop/channel definition	1
IC-04	01.	(Internal contact 1 group) Weighting	(Setting is invalid.)

(4) The MV of loop 1 is output from the output 3. The setup items may vary depending on whether the output 3 is the continuous output or the ON/OFF output.
When the output 3 is the continuous output, configure the settings as shown below in the output bank (oUt) setup. In this example, an MV of 0 to 100 % on the slave side is output as 4 to 20 mA.

Display item	Auxiliary display	Item name	Settings
Co-01	3.	(Output 3) Output range	0: 4 to 20 mA
Co-02	3.	(Output 3) Output type	1: MV
Co-03	3.	(Output 3) Loop/channel definition	1
Co-04	3.	(Output 3) Decimal point position	1: One digit after the decimal point
Co-05	3.	(Output 3) Low limit of output scaling	0.0
Co-06	3.	(Output 3) High limit of output scaling	100.0
Co-07	3.	(Output 3) Linearization table group definition	0: Not used.

When the output 3 is the ON/OFF output, configure the settings as shown below in the output bank (oUt) setup. In this example, the setting with the controllability priority is made assuming that the time proportional cycle time is 10 s.

Display item	Auxiliary display	Item name	Settings
tPo.01	3.	(Output 3) Output type	1: MV of loop 1
tPo.02	3.	(Output 3) Latch	(setting is disabled.)
tPo.03	3.	(Output 3) Time proportional operation type	0: Priority on controllability
tPo.04	3.	(Output 3) Min. ON/OFF time	250 (unit: ms)
tPo.05	3.	(Output 3) Time proportional cycle	10.0 (unit: s)
tPo.06	3.	(Output 3) Linearization table group definition	0: Not used.

7 - 3 MV Tracking

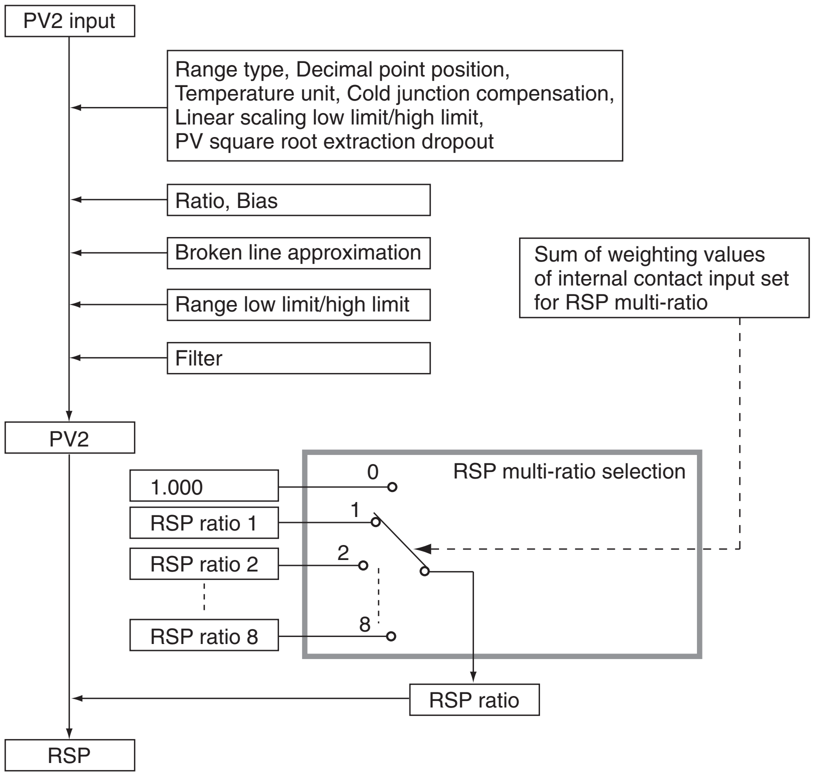
In RUN mode, in AUTO, when MV tracking changeover is ON, there is through-output of the MV tracking signal (-10 to +110 % max.) Also in RUN AUTO mode, when MV tracking changeover turns from ON to OFF, initialization is bumpless.

■ Bank and setting

Bank	Item display	Item name	Settings
MV (Control bank)	tr-01	MV tracking changeover	0: OFF 1: Contact output of input computation F7 (SDC45V/46V models only) 2: Contact output of output computation F7 (SDC45V/46V models only) 1024 to 2047 (standard bit codes)
	tr-02	Reverse MV tracking signal	0: Direct 1: Reverse
	tr-03	MV tracking signal	0: 0 % fixed 1: Output of input computation F7 (SDC45V/46V models only) 2: Contact output of output computation F7 (SDC45V/46V models only) 2048 to 3071 (standard numerical codes)

7 - 4 RSP Multi-Ratio

When this unit is a 2-input model and the 1-loop control with RSP is performed, the RSP multi-ratio function can be used.
The RSP multi-ratio function uses a ratio selected from multiple RSP ratio settings by the internal contact input. The RSP is calculated using the following calculation formula:
$RSP = PV2 \times RA$
The RA is a value of the selected RSP ratio.
However, when the sum of weighting values of the internal contact input is "0" or when the multi-ratio selection setting does not exist in the internal contact input, the RA becomes "1.000" (RA = 1.000).
Additionally, since the number of RSP ratio settings is "8", RSP ratio 8 is selected if the sum of weighting values of the internal contact input is "9" or more.



Handling Precautions

- The RSP multi-ratio function can be used only when this unit is a 2-input model. The 1-input model cannot use the RSP multi-ratio function.

■ Setting banks

SP configuration bank (SPCnF)
Internal contact input bank (IC)

■ Example

The following describes an example that the ratio selection is used from "0.100" to "0.700" in steps of "0.100" using three digital inputs, C-column 1 to C-column 3:

(1) Set the multi-ratio.
Configure the settings as shown below in the SP configuration bank (SPCnF) setup. (In this example, the RSP ratio 8 is not used.)

Display item	Auxiliary display	Item name	Settings
rrA.01	L.1.	(Loop 1) RSP ratio 1	0.100
rrA.02	L.1.	(Loop 1) RSP ratio 2	0.200
rrA.03	L.1.	(Loop 1) RSP ratio 3	0.300
rrA.04	L.1.	(Loop 1) RSP ratio 4	0.400
rrA.05	L.1.	(Loop 1) RSP ratio 5	0.500
rrA.06	L.1.	(Loop 1) RSP ratio 6	0.600
rrA.07	L.1.	(Loop 1) RSP ratio 7	0.700
rrA.08	L.1.	(Loop 1) RSP ratio 8	1.000

(2) In the internal contact input setup bank (IC), configure the settings so that the multi-ratio selection uses the digital inputs C-column 1 to C-column 3.

Display item	Auxiliary display	Item name	Settings
IC-01	01.	(Internal contact 1 group) Operation type	4: Multi-ratio selection
IC-02	01.	(Internal contact 1 group) Input type	1152: DI-C1
IC-03	01.	(Internal contact 1 group) Loop/channel definition	1
IC-04	01.	(Internal contact 1 group) Weighting	1
IC-01	02.	(Internal contact 2 group) Operation type	4: Multi-ratio selection
IC-02	02.	(Internal contact 2 group) Input type	1153: DI-C2
IC-03	02.	(Internal contact 2 group) Loop/channel definition	1
IC-04	02.	(Internal contact 2 group) Weighting	2
IC-01	03.	(Internal contact 3 group) Operation type	4: Multi-ratio selection
IC-02	03.	(Internal contact 3 group) Input type	1154: DI-C3
IC-03	03.	(Internal contact 3 group) Loop/channel definition	1
IC-04	03.	(Internal contact 3 group) Weighting	4

7 - 5 RSP Tracking

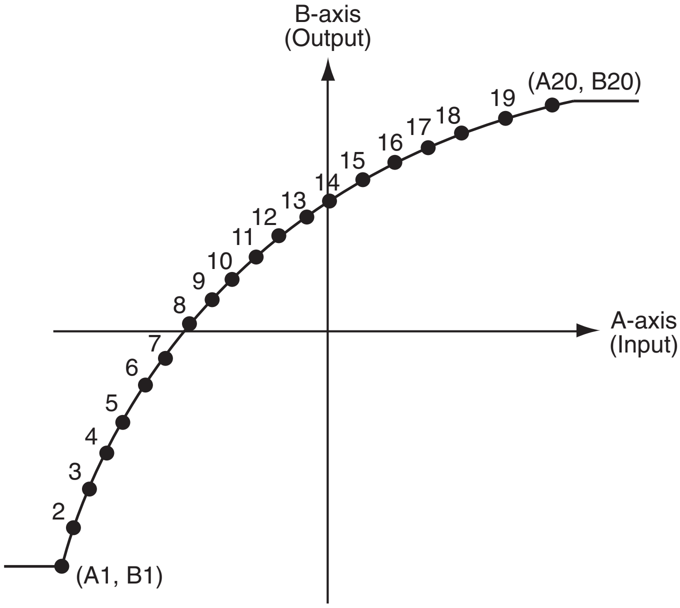
When the mode changes from RSP to LSP, the RSP is written to the LSP. If there are multiple SP system groups, the RSP is written to the LSP whose number was selected when the mode was changed.
If the loop type is internal cascade, the internal RSP is written as a slave LSP.
However, RSP tracking is not done in the following cases:
- In READY mode.
- In MANUAL mode.
- In the case of fixed value output.

■ Setting banks

SP configuration bank (SPCnF)

7 - 6 Approximation by Linearization Table

This unit can use an approximation by linearization table for the PV input or continuous output.
There are eight groups of linearizations. One linearization group has 20-point settings.
Settings A1 to A20 are input values for the approximation by linearization table while settings B1 to B20 are output values for the approximation by linearization table. They are shown as a graph in the figure below.
When the input is A1 or less, the output becomes B1.
When the input is A20 or more, the output becomes B20.



■ Approximation by linearization table of output

To use the approximation by linearization table for the continuous output, configure the settings in the linearization table use group for OUT of the priority bank (Pr-02) so that the linearization group is selected by the set value or the internal contact input.

■ Setting banks

PV bank (Pv)
Linearization table bank (tbL)

■ Example

The following describes an example that the approximation by linearization table of the linearization table 1 group is used for the PV1 input:
An input ranging from "0.0" to "100.0" is converted into other characteristic of "0.0" to "100.0".

(1) Specify a group of the linearization table using the PV input.
Configure the settings as shown below in the PV bank (Pv) setup.

Display item	Auxiliary display	Item name	Setting
Pv-20	1.	(PV1 input) Linearization table group definition	1: 1 group

(2) Set the linearization table.

Configure the settings as shown below in the linearization table bank (tbL) setup.

Display item	Auxiliary display	Item name	Settings
tb.dP	1.	(Linearization table 1 group) Breakpoint decimal point point	1: One digit below the decimal position
tb.A.01	1.	(Linearization table 1 group) Breakpoint A1	0.0
tb.A.02	1.	(Linearization table 1 group) Breakpoint A2	17.4
tb.A.03	1.	(Linearization table 1 group) Breakpoint A3	25.0
(Omission)			
tb.A.18	1.	(Linearization table 1 group) Breakpoint A18	75.0
tb.A.19	1.	(Linearization table 1 group) Breakpoint A19	82.6
tb.A.20	1.	(Linearization table 1 group) Breakpoint A20	100.0
tb.b.01	1.	(Linearization table 1 group) Breakpoint B1	0.0
tb.b.02	1.	(Linearization table 1 group) Breakpoint B2	10.0
tb.b.03	1.	(Linearization table 1 group) Breakpoint B3	15.0
(Omission)			
tb.b.18	1.	(Linearization table 1 group) Breakpoint B18	85.0
tb.b.19	1.	(Linearization table 1 group) Breakpoint B19	90.0
tb.b.20	1.	(Linearization table 1 group) Breakpoint B20	100.0

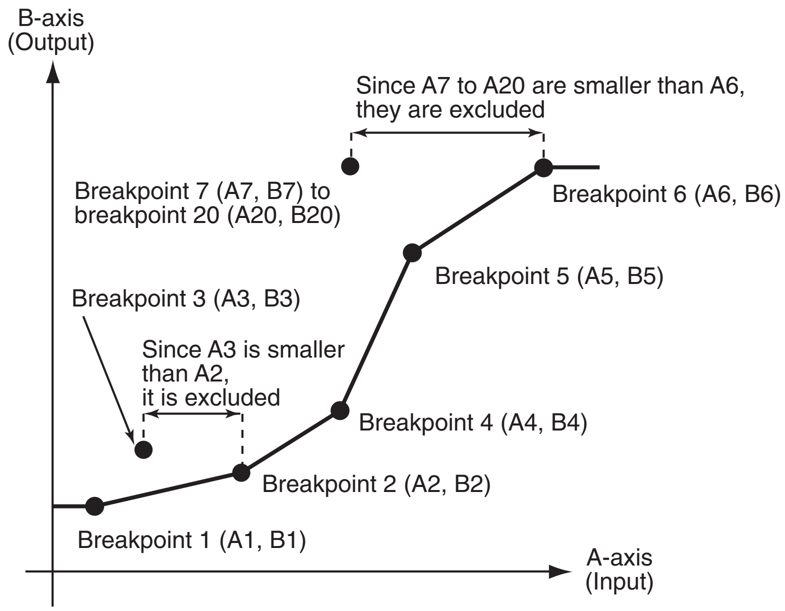
The decimal point position used to set breakpoints A1 to 20 and breakpoints B1 to 20 is specified using the breakpoint decimal point position (tb.dP).

■ Magnitude correlation of breakpoint A setting is not the numerical order.

Linearization is written except for deviation points.

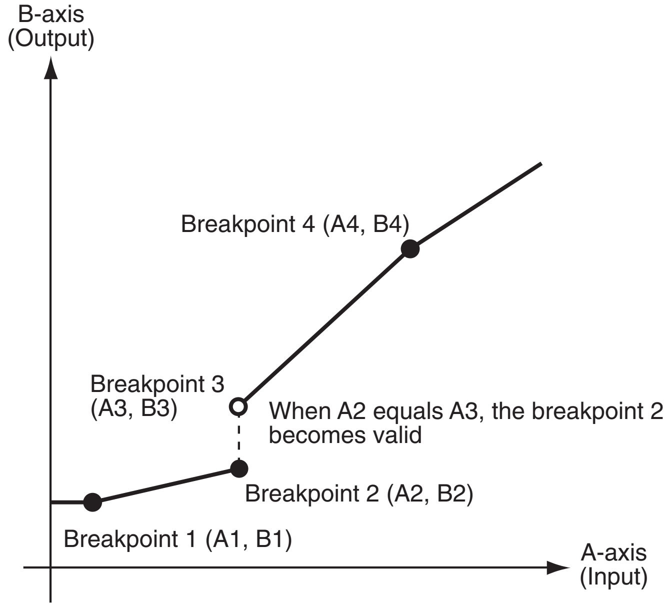
It is possible not to use the breakpoint located halfway. (breakpoint 3 shown in the figure below.)

It is possible not to use the excess breakpoints. (breakpoints 7 to 20 shown in the figure below.)



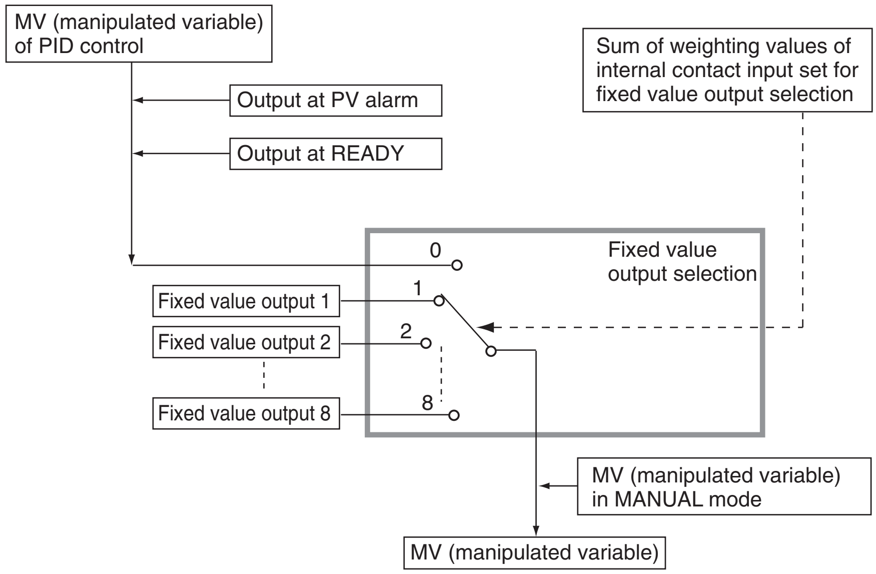
■ A options of the adjacent breakpoints are the same.

A breakpoint having a smaller No. becomes valid. Additionally, the two points are not connected by a linearization.



7 - 7 Fixed Value Output

This unit can use a fixed value selected by the internal contact input instead of the MV (manipulated variable) of the PID control. Eight fixed value outputs are set for each loop.
However, when the sum of weighting values of the internal contact inputs is "0" or when the fixed value group selection setting is not provided on the internal contact input, the fixed value output cannot be used.
Additionally, since the number of fixed value output settings is "8", the fixed value output 8 is selected if the sum of weighting values of the internal contact inputs is "9" or more.
The priority of the fixed value output is higher than the MV of the PID control, Output at PV alarm, Output at READY, Output at READY (heat), Output at READY (cool), and through output of computer backup, but it is lower than the MV in the MANUAL mode.



■ Setting banks

MV bank (ñu)
Internal contact input bank (IC)

■ Example

The following describes an example that the fixed value output selection is used from "10.0 %" to "70.0 %" in steps of "10.0" using three digital inputs, C-column 1 to C-column 3:

(1) Set the fixed value output.
Configure the settings as shown below in the MV bank (ñu) setup (in this example, the fixed value output 8 is not used).

Display item	Auxiliary display	Item name	Settings
ñu-06	L.1.	(Loop 1) Fixed value output 1	10.0
ñu-07	L.1.	(Loop 1) Fixed value output 2	20.0
ñu-08	L.1.	(Loop 1) Fixed value output 3	30.0
ñu-09	L.1.	(Loop 1) Fixed value output 4	40.0
ñu-10	L.1.	(Loop 1) Fixed value output 5	50.0
ñu-11	L.1.	(Loop 1) Fixed value output 6	60.0
ñu-12	L.1.	(Loop 1) Fixed value output 7	70.0
ñu-13	L.1.	(Loop 1) Fixed value output 8	0.0

(2) In the internal contact input bank (IC), configure the settings so that the fixed values are selected using the digital inputs, C-column 1 to C-column 3.

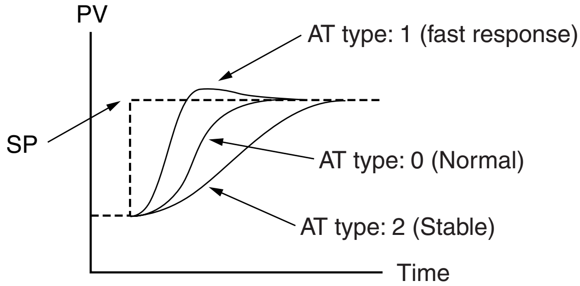
Display item	Auxiliary display	Item name	Settings
IC-01	01.	(Internal contact 1 group) Operation type	3: Fixed value output selection
IC-02	01.	(Internal contact 1 group) Input type	1152: DI-C1
IC-03	01.	(Internal contact 1 group) Loop/channel definition	1
IC-04	01.	(Internal contact 1 group) Weighting	1
IC-01	02.	(Internal contact 2 group) Operation type	3: Fixed value output selection
IC-02	02.	(Internal contact 2 group) Input type	1153: DI-C2
IC-03	02.	(Internal contact 2 group) Loop/channel definition	1
IC-04	02.	(Internal contact 2 group) Weighting	2
IC-01	03.	(Internal contact 3 group) Operation type	3: Fixed value output selection
IC-02	03.	(Internal contact 3 group) Input type	1154: DI-C3
IC-03	03.	(Internal contact 3 group) Loop/channel definition	1
IC-04	03.	(Internal contact 3 group) Weighting	4

7 - 8 How to Change Auto-Tuning (AT) Types

When using AT, select the proper AT type in order to achieve successful AT that fits the control characteristics of the target application. The AT type can be selected from the following 3 types:

0: Normal (regular control characteristics)
1: Fast response (reaction to disturbance)
2: Stable (minimal up/down PV fluctuation)

The figure below illustrates the differences in control results using the PID constants generated by each AT type.



Differences in SPs

■ Setting banks

Control bank (Ctrl)

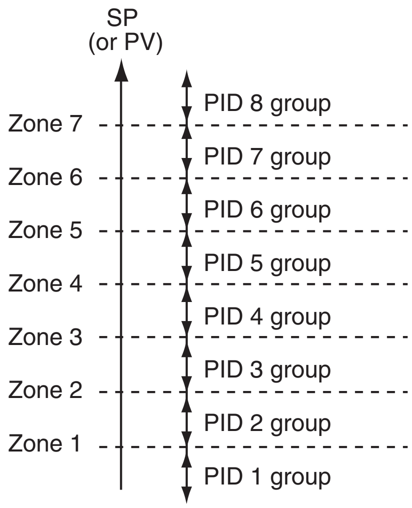
■ Example

The AT type for loop 1 is changed to "fast response."

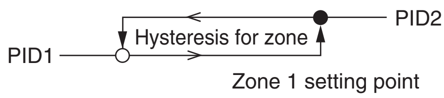
Display item	Auxiliary display	Item name	Settings
Cnt-07	1.	AT type	1: Fast response

7 - 9 Zone PID

This unit can perform the PID control using the zone PID function. The zone PID is a function that selects a PID constant group from group 1 to 8 according to the SP value or PV value.



The following shows the operation at the change-over point between zones. The change-over between the PID1 and PID2 is described as an example:



● means that the PID group is changed by this value.
○ means that the PID group is changed at a point where 1U elapses from this value.

Handling Precautions

- The zone PID function can be used only when the recipe enabled (C-010) setup is "0" (multi-SP). When the setting is "1" (recipe), this function cannot be used.
  Additionally, 16 PID constant groups are provided for each loop. However, when using the zone PID, only groups 1 to 8 can be used.

■ Setting banks

Setup bank (SEtUP)
Priority bank (PrIor)
Control bank (CtrL)

■ Example

The following describes an example that the zone PID function is used with PV from 100 °C in steps of 100 °C in the loop 1:

(1) Set the multi-SP.
Configure the settings as shown below in the setup bank (SEtUP) setup.

Display item	Auxiliary display	Item name	Setting
C-010	No display	Recipe enabled	0: Multi-SP

(2) Set the priority of the PID group selection.
Configure the settings as shown below in the priority bank (PrIor) setup.

Display item	Auxiliary display	Item name	Setting
LPr.02	1.	(Loop 1) PID group selection	0: Zone PID function priority

(3) Set a zone.
Configure the settings as shown below in the control bank (CtrL) setup.
Set the zones 1 to 7 so that they become larger sequentially.
The hysteresis for the zone is used when the zone is moved to that having a number, which is 1 smaller than the current number. Set a value, which is sufficiently smaller than the width of each zone.

Display item	Auxiliary display	Item name	Settings
Etd. 12	L. 1.	(Loop 1) Zone operation selection	1: Selection with PV value.
Etd. 13	L. 1.	(Loop 1) Zone 1	100.0
Etd. 14	L. 1.	(Loop 1) Zone 2	200.0
Etd. 15	L. 1.	(Loop 1) Zone 3	300.0
Etd. 16	L. 1.	(Loop 1) Zone 4	400.0
Etd. 17	L. 1.	(Loop 1) Zone 5	500.0
Etd. 18	L. 1.	(Loop 1) Zone 6	600.0
Etd. 19	L. 1.	(Loop 1) Zone 7	700.0
Etd.20	L. 1.	(Loop 1) Hysteresis for zone	5.0

7 - 10 Cold Junction Compensation

If the PV range is set for thermocouples, the cold junction compensation method can be selected.

■ Bank and setting

Bank	Item display	Item name	Settings
PV (PV bank)	PV-06	Cold junction compensation	0: Internal 1: External 2: By sensor or another channel

● 2: Compensation by a sensor on another channel

- When this setting is used for PV1 input, PV2 input is for the reference junction temperature.
- When this setting is used for PV2 input, PV1 input is for the reference junction temperature.
- If the input of another channel is used for items other than RTDs (none, thermocouple, linear, and unused), a cold junction compensation failure (AL71/72) will occur. In this case, cold junction compensation cannot be executed.
- If the input of the other channel is outside the -20 to +80 °C range, a cold junction compensation failure (AL71/72) will occur.
  Cold junction compensation will be executed, but temperatures less than -20.0 °C or more than +80.0 °C will be treated as -20.0 °C and +80.0 °C respectively.

7 - 11 Function Keys

This unit can set the mode change-over for keys shown in the Table below. Up to eight data settings can be assigned. This function is called "function key (F key) function".

Key	Applicable model No.		Initial value of F key basic registration setting (Fn-01)	Setting range of F key basic registration setting (Fn-01)
	SDC45	SDC46		
rsp/lsp	○	○	5: RSP/LSP selection	0: No registration, 1: Item setting, 2: RUN/READY selection,
at	○	○	4: AT start/stop selection	3: Undefined., 4: AT start/stop selection, 5: RSP/LSP selection,
f1	×	○	0: No registration	6: Backup/through output selection,
f2	×	○	0: No registration	7 to 14: User defined bits 1 to 8 selection

■ Setting banks

Priority bank (Prior)
Display/key bank (HMI)

■ Auxiliary display

The table below shows the relationships between the function keys and Fn-01 to Fn-09 on the auxiliary display.

Function key	Auxiliary display	Model No.
rsp/lsp	1.	SDC45, SDC46
at	2.	SDC45, SDC46
f1	3.	SDC46
f2	4.	SDC46

■ Settings

The values for F key assignments 1 to 8 (Fn-02 to Fn-09) are communication data addresses (for RAM). Since they are hexadecimal values, they contain the letters A to F in addition to numerals.

! Handling Precautions

- Settings for F key assignment items are communications data addresses (for RAM). However, when the settings are changed using the F key, both the RAM and EEPROM data are changed accordingly.

■ Example 1

In the following example, RUN/READY mode changeover is assigned to the [rsp/lsp] key.

(1) Set the priority of the RUN/READY selection.
Configure the settings in the priority bank (PrIor) as shown below.

Display item	Auxiliary display	Item name	Settings
LPr.03	1.	(Loop 1) RUN/READY selection	0: Set value priority
LPr.03	2.	(Loop 2) RUN/READY selection	0: Set value priority

When the loop type is 1-loop, "Loop 2 RUN/READY selection" cannot be set.

(2) Assign RUN/READY changeover to the [rsp/lsp] key.
Configure the setting in the display/key bank (HMI) as shown below.

Display item	Auxiliary display	Item name	Settings
FA-01	1.	([rsp/lsp] key) F key basic registration	2: RUN/READY selection
FA-02	1.	([rsp/lsp] key) F key assignment item 1	(setting is invalid.)
FA-03	1.	([rsp/lsp] key) F key assignment item 2	(setting is invalid.)
FA-04	1.	([rsp/lsp] key) F key assignment item 3	(setting is invalid.)
FA-05	1.	([rsp/lsp] key) F key assignment item 4	(setting is invalid.)
FA-06	1.	([rsp/lsp] key) F key assignment item 5	(setting is invalid.)
FA-07	1.	([rsp/lsp] key) F key assignment item 6	(setting is invalid.)
FA-08	1.	([rsp/lsp] key) F key assignment item 7	(setting is invalid.)
FA-09	1.	([rsp/lsp] key) F key assignment item 8	(setting is invalid.)

(3) Check that the function key assignment was successful.
First, press the [display] key to view the operation display screen.
Next, press the [rsp/lsp] key and check that "rUn" or "rdY" on the lower display starts flashing.
Subsequently, as the [rsp/lsp] key is kept pressed, "rUn" or "rdY" on the lower display stops flashing and remains lit, and the RUN/READY mode has been changed.

■ Example 2

In this example the loop 1 SP low limit and loop 1 SP high limit are assigned to the [at] key.

(1) Assign the desired items to the [at] key.
Configure the settings as shown below in the display/key bank (HMI) setup.

Display item	Auxiliary display	Item name	Settings
FN-01	2.	([at] key) F key basic registration	1: Item setting
FN-02	2.	([at] key) F key assignment item 1	010A0 (SP low limit of loop 1)
FN-03	2.	([at] key) F key assignment item 2	010A1 (SP high limit of loop 1)
FN-04	2.	([at] key) F key assignment item 3	00000 (invalid)
FN-05	2.	([at] key) F key assignment item 4	00000 (invalid)
FN-06	2.	([at] key) F key assignment item 5	00000 (invalid)
FN-07	2.	([at] key) F key assignment item 6	00000 (invalid)
FN-08	2.	([at] key) F key assignment item 7	00000 (invalid)
FN-09	2.	([at] key) F key assignment item 8	00000 (invalid)

(2) Check that the function key assignment was successful.
First, press the [display] key to view the operation display screen.
Next, check that the display changes to the loop 1 SP low limit setting when the [at] key is pressed for 2 s or more.
Check that the display changes to the loop 1 SP high limit setting when the [at] key is pressed again.

■ Example 3

In the following example three settings pertaining to the PID group used by loop 1 are assigned to the [at] key, namely the proportional band, the integral time, and the derivative time.

(1) Assign the setup items to the [at] key.
Configure the settings in the display/key bank (KnI) as shown below.

Display item	Auxiliary display	Item name	Settings
FK-01	2.	([at] key) F key basic registration	1: Item setting
FK-02	2.	([at] key) F key assignment item 1	03A00 (loop 1 PID group proportional band)
FK-03	2.	([at] key) F key assignment item 2	03A01 (loop 1 PID group integral time)
FK-04	2.	([at] key) F key assignment item 3	03A02 (loop 1 PID group derivative time)
FK-05	2.	([at] key) F key assignment item 4	00000 (invalid)
FK-06	2.	([at] key) F key assignment item 5	00000 (invalid)
FK-07	2.	([at] key) F key assignment item 6	00000 (invalid)
FK-08	2.	([at] key) F key assignment item 7	00000 (invalid)
FK-09	2.	([at] key) F key assignment item 8	00000 (invalid)

(2) Check that the function key assignment was successful.
First, press the [display] key to view the operation display screen.
Next, check that the display changes to the loop 1 PID group proportional band setting when the [at] key is pressed for 2 s or more.
Check that the loop 1 PID group integral time setting is displayed when the [at] key is pressed again.
Check that the display changes to the loop 1 PID group derivative time setting when the [at] key is pressed again.

Note

- The tables below show the values to set for F key assignments 1 to 8 (FK-02 to FK-09) if PID group settings are assigned to the F key.

PID group settings for loop 1

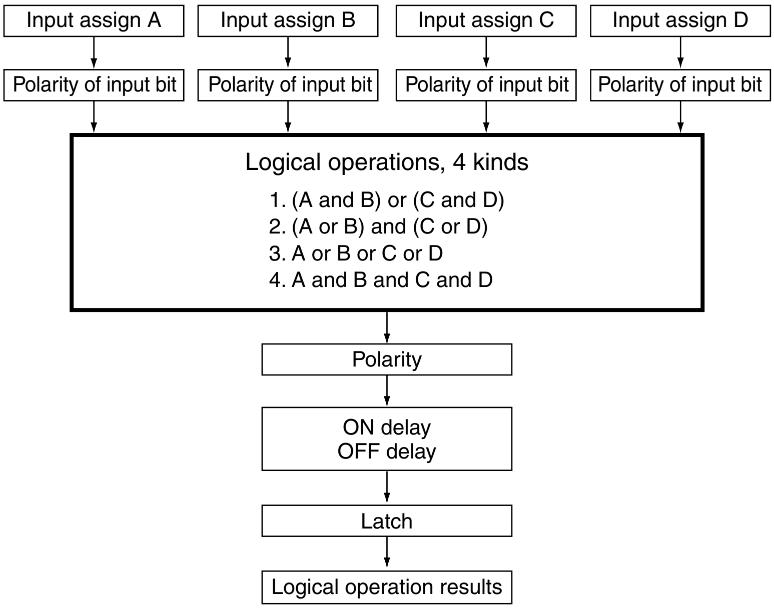
Proportional band	03A00
Integral time	03A01
Derivative time	03A02
Manual reset	03A03
MV low limit	03A04
MV high limit	03A05
Proportional band for cooling	03A06
Integral time for cooling	03A07
Derivative time for cooling	03A08
(Reserved for future use)	–
MV low limit for cooling	03A0A
MV high limit for cooling	03A0B

PID group settings for loop 2

Proportional band	03A0C
Integral time	03A0D
Derivative time	03A0E
Manual reset	03A0F
MV low limit	03A10
MV high limit	03A11
Proportional band for cooling	03A12
Integral time for cooling	03A13
Derivative time for cooling	03A14
(Reserved for future use)	–
MV low limit for cooling	03A16
MV high limit for cooling	03A17

7 - 12 Logical Operations

This unit can perform the logical operation (Boolean operation consisting of "0" and "1") corresponding to various instrument statuses and can use the logical operation results as ON/OFF outputs or internal contact inputs.
16 groups of logical operations are provided. One operation group consists of four inputs and one output.
Four kinds of logical operations are provided. Furthermore, the input or output logic can be inverted.



■ Processing sequence for logical operations

Certain logical operation results can be used as inputs of the logical operation in the same group or different group. The operating process of the logical operation is performed at intervals of sampling cycles in the group No. order.
Therefore, the logical operation results of a smaller group No. can be used in the same sampling cycle. The logical operation results of the same group No. or a lager group No. are used in the next sampling cycle.

■ Setting banks

Logical operation bank (bF)
Output bank (oUt)

■ Example

The following describes an example that output 1 is turned ON when any of the event 1, event 2, and alarm indication is turned ON using the logical operation 1 group:

(1) Set the logical operation.
Configure the settings as shown below in the logical operation bank (bF) setup in the status that the auxiliary display shows 01. (group 1).

Display item	Auxiliary display	Item name	Settings
bF-01	01.	(Logical operation group 1) Operation type	3: Operation 3 (A or B or C or D)
bF-02	01.	(Logical operation group 1) Input assign A	1088: Event 1
bF-03	01.	(Logical operation group 1) Input assign B	1089: Event 2
bF-04	01..	(Logical operation group 1) Input assign C	1792: Representative of all alarms
bF-05	01.	(Logical operation group 1) Input assign D	1024:OFF
bF-06	01.	(Logical operation group 1) Input bit polarity A	0: Direct
bF-07	01.	(Logical operation group 1) Input bit polarity B	0: Direct
bF-08	01.	(Logical operation group 1) Input bit polarity C	0: Direct
bF-09	01.	(Logical operation group 1) Input bit polarity D	0: Direct
bF-10	01.	(Logical operation group 1) ON delay time	0.0 (unit: s)
bF-11	01.	(Logical operation group 1) OFF delay time	0.0 (unit: s)
bF-12	01.	(Logical operation group 1) Reverse	0: Direct
bF-13	01.	(Logical operation group 1) Latch	0: Not latched.

(2) Set the results of the logical operation 1 for the output 1.
Configure the settings as shown below in the output bank (oUt) setup.

Display item	Auxiliary display	Item name	Settings
tPo.01	1.	(Output 1) Output type	1440: Results of logical operation 1
tPo.02	1.	(Output 1) Latch	0: Not latched.
tPo.03	1.	(Output 1) Time proportional operation type	(setting is disabled.)
tPo.04	1.	(Output 1) Min. ON/OFF time	250 (unit: ms)
tPo.05	1.	(Output 1) Time proportional cycle	(setting is disabled.)
tPo.06	1.	(Output 1) Linearization table group definition	(setting is disabled.)

7 - 13 Display Switching Function

This function switches the current display to a different one without using the [display] key. It is useful for the following applications:

- Regularly switching the current display to another display specified by the user (e.g., PV/SP display).
- Switching the current display to any display via communications or internal contact input (digital input).

■ Setting banks

Priority bank (PrIor)
Setup bank (SEtUP)
Internal contact input bank (IC)

■ Example 1: Regular switching to a certain operation display

This function can be used for the following applications:

- Showing the desired operation display after power-on
- After the display is changed with the [display] key, automatically switching back to a display specified by the user.

In the following example the upper and lower displays are switched to the PV and SP of loop 1 respectively 60 s after the displays are changed with the [display] key.

(1) Set the priority for operation display switching.
Set the priority bank (PrIor) as follows.

Display item	Auxiliary display	Item name	Settings
Pr-03	1.	Operation display switching	1: Settings + the [display] key

(2) Set the screen No.
Set the setup bank (SEtUP) as follows.

Display item	Auxiliary display	Item name	Settings
C-014	No display	Operation display Display assignment	1: PV of loop 1, SP of loop 1

(3) Set the return time.
Set the setup bank (SEtUP) as shown below.

Display item	Auxiliary display	Item name	Settings
C-015	No display	Operation display return time	60s

■ Example 2: Switching the operation display via communications

In the next example the upper and lower displays are switched to the PV and SP of loop 1 or the PV and MV of loop 1 respectively through communications.

(1) Set the priority of operation display switching.
Set the priority bank (Prior) as follows.

Display item	Auxiliary display	Item name	Settings
Pr-03	1.	Operation display switching	1: Settings + the [display] key

(2) Set the return time.
Configure the settings in the setup bank (SEtUP) as shown below. In this case, the current display is automatically switched to the display specified by communications 10 s after the display is changed with the [display] key.

Display item	Auxiliary display	Item name	Settings
Pr-015	No display	Operation display return time	10s

(3) Change the screen No. via communications.
In the setup bank (SEtUP), set C-014 (data address) to 1 (PV and SP of loop 1) or 2 (PV and MV of loop 1).

Handling Precautions

- Two types of data addresses are used for operation display and display assignment: RAM and EEPROM. Generally RAM addresses should be used.
  For details about differences between RAM and EEPROM addresses, refer to:
  ☞ 9-4 Definition of Data Addresses (on page 9-12).

■ Example 3: Switching the operation display with the internal contact input

In the next example the upper and lower displays are switched to loop 1 PV and loop 2 PV respectively when the digital input (DI-C1) is ON.

For details about how to use internal contact input, refer to:

☞ How to Use Internal Contact Input (on page 6-11).

(1) Set the priority for operation display switching.
Set the priority bank (PrIor) as follows.

Display item	Auxiliary display	Item name	Settings
Pr-03	1.	Operation display switching	2: internal contact input + the [display] key

(2) Set operation display switching for internal contact 1.
Set the internal contact input bank (IC) as follows.

Display item	Auxiliary display	Item name	Settings
IC-01	01	Operation type	43: Operation display switching
IC-02	01	Input type	1152: terminal status of DI-C1
IC-03	01	Loop/channel definition	(Setting is invalid)
IC-04	01	Sum of the weighting values	9: PV of loop 1, PV of loop 2

(3) Set the return time.
Configure the settings in the setup bank (SEtUP) as shown below. In this case, the current display is automatically switched to the display specified by the internal contact input 30 s after the display is changed with the [display] key.

Display item	Auxiliary display	Item name	Settings
C-015	(None)	Operation display Return time	30s

■ Operation display return time (C-015)

Even when the operation display switching function is in use, the display can be changed with the [display] key. If there is no key operation during the operation display return time (C-015), the display will return to the specified screen.

Handling Precautions

- If the operation display return time (C-015) is set to 0 s, the operation display cannot be switched with the [display] key.
  If the operation display return time ((C-015) is set too short, the display may be switched suddenly in the middle of key operation to change the manual MV, LSP, or SP group (recipe), so be sure to specify an appropriate return time.

Note

- In SP/EV or PARA bank setup screens, if there is no key operation for 3 minutes, the display will automatically return to the operation display. Afterwards, if the operation display switching function is in use, after the operation display return time (C-015) passes, the operation display will be switched to the specified one.

■ Screen No.

The following screen Nos. can be specified for use by the operation display switching function. They are used for both selection of the operation display (C-014) and for the sum of the weighting values of the internal contact input.

Screen No.	Upper display	Lower display	Auxiliary display	Effective condition
0	(No switching function)			
1	Loop 1 PV	Loop 1 SP	*1	
2	Loop 1 PV	Loop 1 MV	*2	
3	Loop 1 PV	Loop 1 Heating MV	Ht.	Loop 1 is heat/cool control
4	Loop 1 PV	Loop 1 Cool MV	CL.	Loop 1 is heat/cool control
5	Loop 2 PV	Loop 2 SP	*1	When loop 2 is used
6	Loop 2 PV	Loop 2 MV	*2	When loop 2 is used
7	Loop 2 PV	Loop 2 Heating MV	Ht..	Loop 2 is heat/cool control
8	Loop 2 PV	Loop 2 Cool MV	CL.	Loop 2 is heat/cool control
9	Loop 1 PV	Loop 2 PV	Pv.	When loop 2 is used
10	(No switching function)			

*1. For LSP mode, "SP.-" (where - is the group No. in hexadecimal), and for RSP mode simply "rSP".

*2. "MV" for all cases except computer backup. For computer backup, the display depends on the mode, as shown below.
- "bMV." for backup mode.
- "rMV." for through-output mode.

Handling Precautions

- The display will not be switched if a screen No. that is not available for display (because of the model or settings), or any nonexistent screen No. is specified.

7 - 14 Digital RSP

Models with optional RS-485 communications can use a digital RSP. Its value can be changed through communications. As with an analog RSP, it is possible to switch between LSP and RSP modes.

■ Setting banks

SP configuration bank (SPCnF)

■ Example

In the following example the loop type is set to 1 in order to use a digital RSP.

(1) Set the loop type.
Configure the settings in the setup bank (SEtUP) as shown below.

Display item	Auxiliary display	Item name	Settings
C-001	No display	Loop type	2: 1 loop (RSP)

(2) Set the digital RDP to be enabled.
In the SP configuration bank (SPCnF), set as follows.

Display item	Auxiliary display	Item name	Settings
CSP.11	L.1.	Digital RSP selection	1: Enabled

(3) Write the desired value to the digital RSP data address via communications.
Write the desired value to the digital RSP (CSP.12) data address in the SP configuration bank (SPCnF).

Handling Precautions

- Either RAM or EEPROM data addresses can be used for the digital RSP, but if the SDC is constantly writing the RSP or if the RSP is changed 30 times or more per day, use RAM.
  For details about the difference between RAM address and EEPROM address, refer to:
  ☞ 9-4 Definition of Data Addresses (on page 9-12).

Note

- If the optional communications function is added to a single-output model, "2: 1-loop with RSP" can be selected as the loop type.

7 - 15 User Function Indicators

With user function indicators, users can set the conditions under which the LED is ON/OFF.
The SDC46 has 4 (uf1 to 4) indicators, while the SDC45 has 2 (uf1 to 2).
The default settings are shown below.

Indicators	Conditions for lighting	Lighting status
Uf1	1600: Loop 1 AT pause / AT status	2: Blinking (while ON)
Uf2	1547: When communicating	0: Lit (while ON)
Uf3	1024: OFF	
Uf4	1024: OFF	

Note

- For location of the indicators, refer to:
  ☞ 1-3 Names and Functions of Parts (on page 1-7).

■ Setting banks

Display/Key bank (HMI)

■ Example

In the following example uf3 is set to blink during a loop 1 SP ramp.

(1) In the SP configuration bank (SPCnF), set the operation conditions for the SP ramp.
In this case we set the SP to change 10 units per minute.

Display item	Auxiliary display	Item name	Settings
CSP.01	1	SP ramp unit	1: No decimal point/min
CSP.02	1	Slope of SP up-ramp for LSP	10
CSP.03	1	Slope of SP down-ramp for LSP	10

(2) A bit that turns on during an SP ramp is available for both up and down ramps.
Set the bits to turn on for either direction by using a logical operation.
(Bank: bF)

Display item	Auxiliary display	Item name	Settings
bF-01	1	Type of operation	3: Operation 3 (A or B or C or D)
bF-02	1	Input assignment A	1648: Loop 1 SP ramp (up-ramp)
bF-03	1	Input assignment B	1648: Loop 1 SP ramp (down-ramp)
bF-04	1	Input assignment C	1024: OFF
bF-05	1	Input assignment D	1024: OFF

(3) Set the conditions for lighting uf3.

Display item	Auxiliary display	Item name	Settings
UFL.01	3	Conditions for lighting	1440: Results of logical operation 1
UFL.02	3	Lighting status	2: Blinking (while ON)

(4) Check that it operates properly.
When a new value is set for the SP, the SP should change according to the ramp setting. As it changes, uf3 should blink.

7 - 16 Multi-Status (MS) Indicator

The MS indicator uses LEDs to show the status of the MV or DI/DO.
It can show three pairs of conditions and lighting statuses, which are set in order of priority.

■ Setting banks

Display/Key bank (HMI)

■ Example: display of the MV output using the LED bar.

In this example the MV output is displayed on the LED bar.
In the display/key (MS display) bank (HMI), configure the settings as follows.

Display item	Auxiliary display	Item name	Settings
MS-01	1.	Conditions for lighting	1025: ON
MS-02	1.	Lighting status	15: MV graph (loop 1)
MS-03	1.	Decimal point position	1: 1 digit after the decimal point
MS-04	1.	Scaling low limit	0.0
MS-05	1.	Scaling high limit	100.0

■ Conditions for lighting

Conditions for lighting (MS-01) are satisfied only if the specified lighting status is ON. If MS-01 is set to 1024 (OFF), the lighting conditions are never satisfied, and if it is set to 1025 (ON), they are always satisfied.

■ Priority for the MS indicator

3 priorities can be set and shown on the indicator.
1. to 3. on the auxiliary display represent the 1st, 2nd, and 3rd priority settings respectively in the display/key (MS display) bank.

- If the conditions for 1st priority are satisfied, the 1st priority lighting status goes into effect.
- If the conditions for 1st priority are not satisfied, but the conditions for 2nd priority are, the 2nd priority lighting status goes into effect.
- If the conditions for 1st and 2nd priority are not satisfied, but the conditions for 3rd priority are, the 3rd priority lighting status goes into effect.
- If none of the conditions is satisfied, the MS indicator turns off.

■ Lighting status and display type

Specify MS indicator action in detail by setting the lighting status (mS-02). This determines the display type as well.

mS-02 Setting	Description	Notes	Display type
0	Lit		Lit blinking
1	Slow blinking		
2	2 blinks	Repeated 2 blinks and light off	
3	Rapid blinking		
4	Left to right	Moving light from left to right	
5	Right to left	Moving light from right to left	
6	Left-right round trip	Moving light to both ends	
7	Deviation OK (loop 1)	Whole indicator lit when deviation is within range.	Lit within the specified deviation
8	Deviation OK (loop 2)	Whole indicator off when deviation is out of range	
11	Deviation graph (loop 1)	Shows deviation with a bar display whose center is 0 %	Bar display (0-centered one side scaling)
12	Deviation graph (loop 2)		
15	MV graph (loop1)	MV or MFB shown with bar display	Bar display (fixed scaling)
16	MV graph (loop1)		
19	MV graph for heating (loop 1)		
20	MV graph for heating (loop 2)		
23	MV graph for cooling (loop 1)		
24	MV graph for cooling (loop 2)		
27	MFB1 graph		
29	DI/DO monitor (cols. C + F)	DI or DO monitor for cols. C and D	DI/DO monitor
30	DI/DO monitor (col. D)	DI or DO monitor for col. D	
31	DI/DO monitor (col. E)	DI or DO monitor for col. E	
32	Event status monitor	Monitors events 1 to 12	
1024 to 2048	Standard numerical codes	Shows standard numerical code using bar display	Bar display (low/high limit scaling)

■ Display type

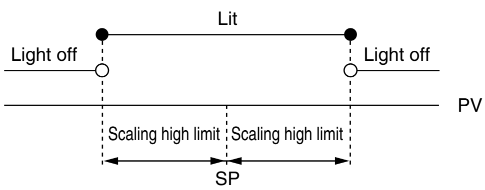
● Lit blinking

Lights up, blinks, or lights with horizontal movement.

● Lit within the specified deviation

When the deviation is within the specified range, the whole MS indicator is lit. Otherwise it is off.

- Set the deviation range for the scaling high limit (mS-05).
- Set the number of digits after the decimal point (mS-03) for the scaling high limit (mS-05).
- If the scaling high limit (mS-05) is set to 0 U, the whole MS indicator is lit only when PV = SP.



Light on/off when deviation is OK

● Bar display (0-centered one side scaling)

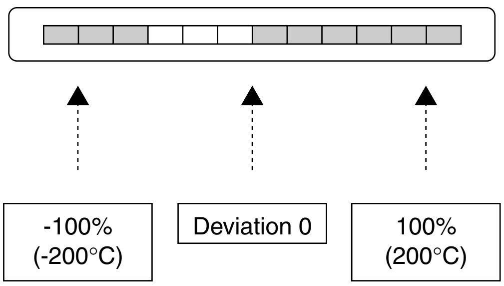
This shows scaled data (percentage) with a bar display.

The center of the MS indicator is 0 %. The left and right halves represent -100 to 0 % and 0 to 100 % respectively.

- For the scaling high limit (ñS-05), set the value in the target data that is equivalent to 100 %.
- Set the number of digits after the decimal point (ñS-03) for the scaling high limit (ñS-05).

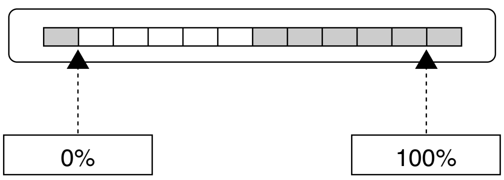
Range of target data	MS indicator (□: Light ON, ■: Light OFF)
X ≦ 100.0%	□□□□□□■■■■■■
−100.0% < X ≦ −80.0%	■□□□□□■■■■■■
−80.0% < X ≦ −60.0%	■■□□□□■■■■■■
−60.0% < X ≦ −40.0%	■■■□□□■■■■■■
−40.0% < X ≦ −20.0%	■■■■□□■■■■■■
−20.0% < X ≦ 0.0%	■■■■■□■■■■■■
0.0% < X ≦ 20.0%	■■■■■■□■■■■■
20.0% < X ≦ 40.0%	■■■■■■□□■■■■
40.0% < X ≦ 60.0%	■■■■■■□□□■■■
60.0% < X ≦ 80.0%	■■■■■■□□□□■■
80.0% < X ≦ 100.0%	■■■■■■□□□□□■
100.0% < X	■■■■■■□□□□□□

- For example, to show a deviation of ±200 °C on the MS indicator, set the scaling high limit (ñS-05) to 200 (digits after the decimal point: 0). If the deviation is -100 °C (-50 %), the bar display will be as shown below.



● Bar display (fixed scaling)

The left end of the MS indicator is 0 %, and the whole bar shows 0 to 100 %.



Range of target data	MS indicator (□ : Light ON, ■ : Light OFF)
X ≦ 0.0%	■■■■■■■■■■■■
0.0% < X ≦ 10.0%	■□■■■■■■■■■■
10.0% < X ≦ 20.0%	■□□■■■■■■■■■
20.0% < X ≦ 30.0%	■□□□■■■■■■■■
30.0% < X ≦ 40.0%	■□□□□■■■■■■■
40.0% < X ≦ 50.0%	■□□□□□■■■■■■
50.0% < X ≦ 60.0%	■□□□□□□■■■■■
60.0% < X ≦ 70.0%	■□□□□□□□■■■■
70.0% < X ≦ 80.0%	■□□□□□□□□■■■
80.0% < X ≦ 90.0%	■□□□□□□□□□■■
90.0% < X ≦ 100.0%	■□□□□□□□□□□■
100.0% < X	■□□□□□□□□□□□

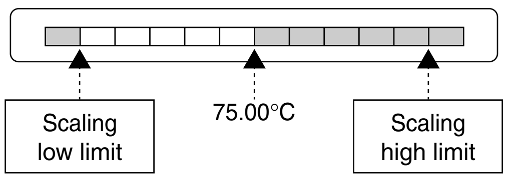
- **Bar display (low/high limit scaling)**

The left end of the MS indicator is 0 % and the bar shows scaled percentage data (0 to 100 %).

- For the scaling low and high limits (MS-04 and MS-05), set the target data values that are equivalent to 0 and 100 % respectively. The low limit setting must be less than the high limit setting.
- Set the number of digits after the decimal point (MS-03) for the scaling low limit and high limits (MS-04 and MS-05).

Range of target data	MS indicator (□ : Light ON, ■ : Light OFF)
X ≦ 0.0%	■■■■■■■■■■■■
0.0% < X ≦ 10.0%	■□■■■■■■■■■■
10.0% < X ≦ 20.0%	■□□■■■■■■■■■
20.0% < X ≦ 30.0%	■□□□■■■■■■■■
30.0% < X ≦ 40.0%	■□□□□■■■■■■■
40.0% < X ≦ 50.0%	■□□□□□■■■■■■
50.0% < X ≦ 60.0%	■□□□□□□■■■■■
60.0% < X ≦ 70.0%	■□□□□□□□■■■■
70.0% < X ≦ 80.0%	■□□□□□□□□■■■
80.0% < X ≦ 90.0%	■□□□□□□□□□■■
90.0% < X ≦ 100.0%	■□□□□□□□□□□■
100.0% < X	■□□□□□□□□□□□

- For example, if the scaling is set for a PV of 0.00 to 150.00 °C (with 2 digits after the decimal point), a PV of 75.00 °C is shown as below.



- **DI/DO monitor**

This is used to show whether DI, DO, and events are ON or OFF. The LED assignments are shown below.

DI/DO monitor (columns C and F)

LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 9	LED 10	LED 11	LED 12
DI-C1	DI-C2	DI-C3	DI-C4	DI-C5	DI-C6	DI-C7	DI-C8	DI-F1	DI-F2	OFF	OFF
DO-C1	DO-C2	DO-C3	DO-C4	DO-C5	DO-C6	DO-C7	DO-C8	DI-F1	DI-F2	OFF	OFF

Note: In col. C, DI or DO is implemented depending on the model number.

DI/DO monitor (column D)

LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 9	LED 10	LED 11	LED 12
DI-D1	DI-D2	DI-D3	DI-D4	DI-D5	DI-D6	DI-D7	DI-D8	OFF	OFF	OFF	OFF

DI/DO monitor (column E)

LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 9	LED 10	LED 11	LED 12
DI-E1	DI-E2	DI-E3	DI-E4	DI-E5	DI-E6	DI-E7	DI-E8	OFF	OFF	OFF	OFF

Event No.

LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8	LED 9	LED 10	LED 11	LED 12
EV 1	EV 2	EV 3	EV 4	EV 5	EV 6	EV 7	EV 8	EV 9	EV 10	EV 11	EV 12

Note: The status of events 13 and following is not shown.

7 - 17 Key Lock, Communications Lock, and Loader Lock

To protect settings and prevent inadvertent changes, access can be restricted by key lock, RS-485 communications lock, and loader communications lock.

■ Setting banks

Lock bank (LoCK)

Key lock levels and restricted items related to setting changes (❍: accessible, ×: inaccessible)

Target parameter	K.LoC1 (key lock and setting change) settings			
	0	1	2	3
Settings assigned to rsp/lsp, at, F1, and F2 keys Manual MV on the operation display Lock bank parameters SP group (recipe group)/LSP value on the operation display	❍	❍	❍	❍
Multi-SP bank parameters RSP bank parameters Recipe bank parameters	❍	❍	❍	×
Event setup bank parameters Mode bank parameters	❍	❍	×	×
Setting changes in banks other than the above	❍	×	×	×

Key lock levels and restricted items related to display (❍: accessible, ×: inaccessible)

Target parameter	K.LoC2 (key lock and display) settings		
	0	1	2
Settings assigned to rsp/lsp, at, F1, and F2 keys Operation display (PV, SP, MV, etc.) Multi-SP bank parameters RSP bank parameters Recipe bank parameters Lock bank parameters	❍	❍	❍
Event setup bank parameters Mode bank parameters Instrument information bank parameters	❍	❍	×
Display of banks other than the above	❍	×	×

Lock levels and restricted items related to communications and loaders

Display item	Auxiliary display	Item name	Settings
C.LoC1		RS-485 lock on reading	0: Unlock, 1: Lock
C.LoC2		RS-485 lock on writing	0: Unlock, 1: Lock
C.LoC1		Loader lock on reading	0: Unlock, 1: Lock
C.LoC2		Loader lock on writing	0: Unlock, 1: Lock

Handling Precautions

- Even with a lock on RS-485 or loader communications, reading/writing the following parameters is possible.

Bank	Item
Setup	Release all latches
SP group selection	SP group selection
Mode	RUN/READY AUTO/MANUAL AT stop/start LSP/RSP Backup/through output
Communications profile (instrument status)	READY/RUN AUTO/MANUAL AT cancel/execution LSP/RSP PAV SP MV
Communications profile (operation)	SP group selection LSP Manual MV READY/RUN AUTO/MANUAL AT stop/start LSP/RSP
PV	Decimal point position
RSP	RSP
Control	Decimal point position for loop PV/SP
Output (continuous output)	Decimal point position for output
Monitor	All items
User-defined bit	All items
Standard bit	All items
Standard numerical code	All items

7 - 18 Password

A password can be set to prevent settings of the key lock, RS-485 communication lock, and loader communication lock from being changed.

■ Setting banks

Lock bank (LoCK)

Item display	Auxiliary display	Item name	Settings
PASS	(None)	Password display	0 to 15 5: Show passwords 1 and 2
PAS1A	(None)	Password1A (Input of password 1)	0000 to FFFF (hexadecimal value)
PAS2A	(None)	Password2A (Input of password 2)	0000 to FFFF (hexadecimal value)
PAS1b	(None)	Password1B (Lock/unlock password 1)	0000 to FFFF (hexadecimal value)
PAS2b	(None)	Password2B (Lock/unlock password 2)	0000 to FFFF (hexadecimal value)

■ Password display

Passwords 1 and 2 can be displayed and set (input, locked/unlocked) only when password display (PASS) is set to 5.
After changing the settings (input, locking/unlocking) for passwords 1 and 2, set password display (PASS) to 0.

■ Input of passwords

(1) Specify 2 hexadecimal values for the 2 passwords.

(2) For password 1, set password 1A (PAS1A).

(3) For password 2, set password 2A (PAS2A).

■ Locking

(1) Input some value other than password 1 as the password 1B (PAS1b) setting.

(2) Input some value other than password 2 as the password 2B (PAS2b) setting.

(3) The key lock, RS-485 lock, and loader lock settings are now protected from accidental or unauthorized change. Also, password 1A (PAS1A) and password 2A (PAS2A) are now displayed as "[-----]" and are protected from change.

■ Unlocking

(1) Input password 1 as the password1B (PAS1b) setting.

(2) Input password 2 as the password2B (PAS2b) setting.

(3) The key lock, RS-485 communications lock, and loader communications lock settings can now be changed.
Also, the hexadecimal values for passwords 1A (PAS1A) and 2A (PAS2A) can be displayed and changed.

Handling Precautions

- Make sure that passwords 1 and 2 are not forgotten
- Unlocking is possible only if passwords 1 and 2 are both correctly matched. If only one password is correct, the lock will remain in force. If password input is unsuccessful, it is not possible to determine whether either password 1 or 2 was correct or incorrect.
- If the passwords cannot be entered correctly, contact Yamatake or a dealer. Passwords can be reset to the default settings at the factory.
If this is done, all customer settings on the device will be lost.

7 - 19 Sampling Cycle

The sampling cycle of the SDC45A/46A consists of updating the analog input and calculating the control constants. The frequency of the sampling cycle can be changed as needed, according to the characteristics of the control target, to achieve better control.
The default setting is 100 ms (setting 2).

■ Setting banks

Setup bank (SEtUP)

■ Example

The SDC setting below is used for a rapid-response ceramic heater.
The sampling cycle is 25 ms.

Display item	Auxiliary display	Item name	Settings
C-012	(None)	Sampling cycle	0: 25ms

7 - 20 Startup Delay after Power-On

The time from power-on until the beginning of operation can be extended to as much as 60 s.
Operation begins after the startup time (2 to 5 s depending on the model) and the time set for delay elapse.
The startup time for the model cannot be reduced.
The default setting is 0 s.

■ Setting banks

Setup bank (SEtUP)

■ Example

When set as below, the SDC begins to operate 30 s or more after power-on.

Display item	Auxiliary display	Item name	Settings
C-01	(None)	Startup delay after power-on	30

7 - 21 Brightness Adjustment

The brightness of the upper, lower, and auxiliary displays can be changed to one of 3 levels.
The default setting is 0 (Standard).

■ Setting banks

Setup bank (SEtUP)

■ Example

With the setting below, the display brightness becomes 1 step darker than the regular setting.

Display item	Auxiliary display	Item name	Settings
C-040	(None)	Display brightness	1: Somewhat dark

7 - 22 SP Bias

A bias can be added to the SP.

■ Setting banks

SP configuration bank (SPCnF)

■ Example

With the settings shown below, the LSP and RSP of loop 1 are assigned a bias of 10.0 and 20.0 respectively.

(1) Set the LSP bias.
In the SP configuration bank (SPCnF), set as follows.

Display item	Auxiliary display	Item name	Settings
CSP.07	L. 1.	LSP bias	10.0

(2) Set the RSP bias.
In the SP configuration bank (SPCnF), set as follows.

Display item	Auxiliary display	Item name	Settings
CSP.08	L. 1.	RSP bias	20.0

7 - 23 Heater Power Supply Voltage Compensation (SDC45R/46R only)

On models with AC input, compensation for heater supply voltage fluctuation is available using AC input.
The heater voltage compensation function improves control by correcting the output (MV) in proportion to the fluctuation of the supply voltage of a heater used as the actuator in temperature control.
AC 1 and 2 are available for AC input.

■ Connections for heater supply voltage input

Refer to:
☞ ■ Connections for heater supply voltage input (on page 3-12).

■ Setting banks

Set AC input in the AC input bank.
The auxiliary display shows the AC input No. (1: AC1, 2: AC2).

Bank	Item display	Item name	Settings
AC (AC input bank)	AC-01	Reference voltage	4.00 to 11.00V
	AC-02	Filter	0.00 to 120.00s

Set up heater supply voltage compensation in the output bank (continuous or ON/OFF).
If output is current or continuous voltage, set Co-08. For time proportional output, set tPo.08. The auxiliary display shows the output No. (1 to 7).

Bank	Item display	Item name	Settings
oUt (Output bank)	Co-08	Supply voltage compensation selection	0: Disabled 1: Correction using AC 1 input 2: Correction using AC 2 input
	tPo.08	Supply voltage compensation selection	0: Disabled 1: Correction using AC 1 input 2: Correction using AC 2 input

■ Reference voltage (AC-01)

Set the amount of the AC voltage output from the transformer for the heater.
For example, if the voltage is decreased from 200 V to 10 V, set 10.00.
The SDC will determine the amount of compensation depending on the ratio of the actual AC input voltage to the reference voltage.

■ Filter (AC-02)

The AC input voltage can be filtered with a primary delay filter.
If the heater supply voltage is affected by small rapid fluctuations, with a negative effect on the compensation of the output (MV), this filter can reduce the effect.

■ Power supply voltage compensation selection (Co-08, tPo.-08)

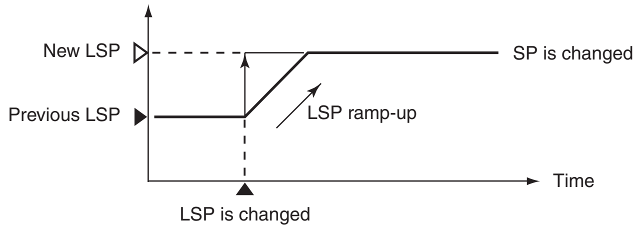
Correction by AC1 or AC2 input is available for continuous output (current or continuous voltage) or time proportional output.

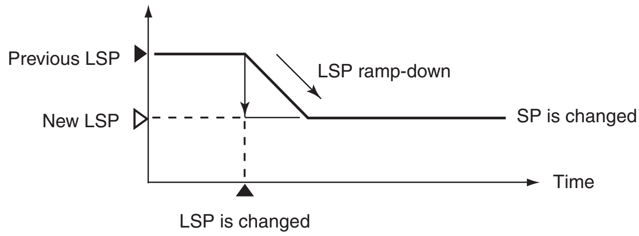
Handling Precautions

- If the AC input voltage is only 40 % of the reference voltage settings or less, the output (MV) will not be compensated.
  If the AC input voltage is 120 % or more of the reference voltage setting, the compensated output (MV) will be 120 %.
- The purpose of AC input is not to measure the supply voltage, but to improve temperature control by the heater.

7 - 24 How to Change the LSP with Constant Ramp

When changing the set value of the LSP or the SP group selection, it is possible to change the SP with a constant SP ramp.



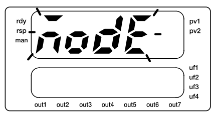


■ Bank and settings

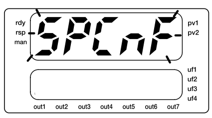
Bank	Item display	Item name	Settings
SPCnF (SP configuration bank)	CSP.01	SP ramp unit	0: No decimal point/s, 1: No decimal point/min, 2: No decimal point/h, 3: 0.1/s, 4: 0.1/min, 5: 0.1/h, 6: 0.01/s, 7: 0.01/min, 8: 0.01/h, 9: 0.001/s, 10: 0.001/min, 11: 0.001/h
	CSP.02	SP ramp-up for LSP	0 U (No ramp) 1 to 32000 U (decimal point position may vary depending on the SP ramp unit)
	CSP.03	SP ramp-down for LSP	0 U (No ramp) 1 to 32000 U (decimal point position may vary depending on the SP ramp unit)
	CSP.09	PV start for LSP	0: Enabled, 1: Disabled

■ Setting procedures

(1) Keep the [para] key pressed for 2s in the operation display status.
>> nodE is flashing on the upper display.

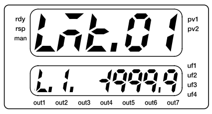


(2) Press the [∨] key or [para] key several times until SPCnF is shown on the upper display.
>> SPCnF is flashing on the upper display.



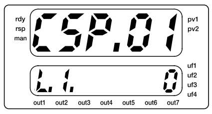
(3) Press the [enter] key.

>> Lnt.01 is shown on the upper display. At this time, check that the auxiliary display shows L.1. This shows that the loop 1 is currently active.



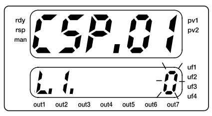
(4) Press the [∨] key several times until CSP.01 is shown on the upper display.

>> CSP.01 is shown on the upper display.



(5) Press the [enter] key.

>> The value on the lower display starts flashing.



(6) Set a desired value with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) In the same manner, return with the [∨] key or [∧] key. Repeat the steps (4) to (7) to configure the settings for CSP.02 to CSP.03.

(9) When settings have been completed, press the [display] key.

>> The operation is returned to the operation display status.

■ Conditions for ramp start

- LSP value is changed.
- SP group (multi-SP group/recipe group) is changed.
- Mode is changed from RSP to LSP.

■ Conditions for ramp start with PV used as start point

If any of the following arises, the ramp is started with PV used as start point instead of the previous SP:

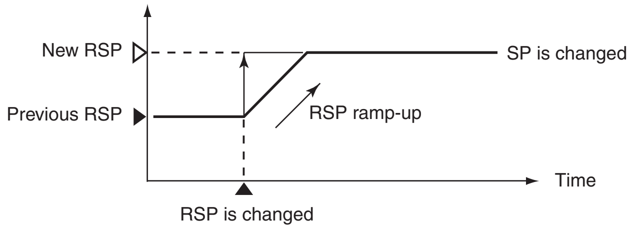
- The power is turned ON.
- The MANUAL mode is changed to the AUTO mode.
- The READY mode is changed to the RUN mode.
- The through output is changed to the backup mode.
- The fixed value output is released.
- The "Loop type" item of the setup bank is changed.

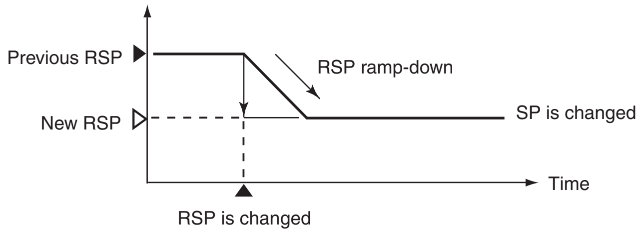
Handling Precautions

- In any one of the following situations, SDC ramp operation will not begin. Also, if a ramp is in progress and one of these situations occurs, the ramp operation will be halted.
  - In MANUAL mode
  - In READY mode
  - In through-output mode
  - When ramp operations are prohibited by internal contact input
  - While fixed-value output is being generated
- Under the following circumstances ramp operation cannot be initiated by the PV.
  - If a PV input error occurs
  - If PV start (CSP.09) is set to 1 (PV start disabled)

7 - 25 How to Change the RSP with Constant Ramp

When changing the set value of the RSP, it is possible to change the SP with a constant SP ramp.



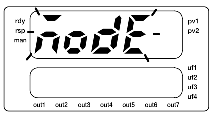


■ Bank and settings

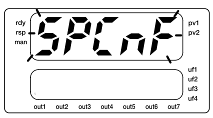
Bank	Item display	Item name	Settings
SPCnF (SP configuration bank)	CSP.01	SP ramp unit	0: No decimal point/s, 1: No decimal point/min, 2: No decimal point/h, 3: 0.1/s, 4: 0.1/min, 5: 0.1/h, 6: 0.01/s, 7: 0.01/min, 8: 0.01/h, 9: 0.001/s, 10: 0.001/min, 11: 0.001/h
	CSP.05	SP ramp-up for RSP	0 U (No ramp) 1 to 32000 U (decimal point position may vary depending on the SP ramp unit)
	CSP.06	SP ramp-down for RSP	0 U (No ramp) 1 to 32000 U (decimal point position may vary depending on the SP ramp unit)
	CSP.10	PV start for RSP	0: Enabled, 1: Disabled

■ Setting procedures

(1) Keep the [para] key pressed for 2s in the operation display status.
>> modE is flashing on the upper display.

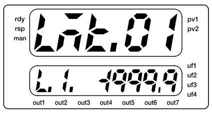


(2) Press the [∨] key or [para] key several times until SPCnF is shown on the upper display.
>> SPCnF is flashing on the upper display.



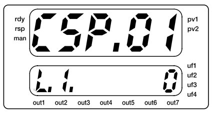
(3) Press the [enter] key.

>> Lmt.01 is shown on the upper display. At this time, check that the auxiliary display shows L.1. This shows that the loop 1 is currently active.



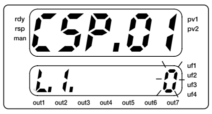
(4) Press the [∨] key several times until CSP.01 is shown on the upper display.

>> CSP.01 is shown on the upper display.



(5) Press the [enter] key.

>> The value on the lower display starts flashing.



(6) Set a desired value with the [∨] key or [∧] key.

(7) Press the [enter] key to set the value.

(8) In the same manner, return with the [∨] key or [∧] key. Repeat the steps (4) to (7) to configure the settings for CSP.05 to CSP.06.

(9) When settings have been completed, press the [display] key.

>> The operation is returned to the operation display status.

■ Conditions for ramp start

- RSP value is changed.
- Mode is changed from LSP to RSP.

■ Conditions for ramp start with PV used as start point

If any of the following arises, the ramp is started with PV used as start point instead of the previous SP:

- The power is turned ON.
- The MANUAL mode is changed to the AUTO mode.
- The READY mode is changed to the RUN mode.
- The through output is changed to the backup mode.
- The fixed value output is released.
- The "Loop type" item of the setup bank is changed.

Handling Precautions

- In any one of the following situations, SDC ramp operation will not begin. Also, if a ramp is in progress and one of these situations occurs, the ramp operation will be halted.
  - In MANUAL mode
  - In READY mode
  - In through-output mode
  - When ramp operations are prohibited by internal contact input
  - While fixed-value output is being generated
- Under the following circumstances ramp operation cannot be initiated by the PV.
  - If a PV input error occurs
  - If PV start (CSP. 10) is set to 1 (PV start disabled)

Chapter 8. LIST OF SETTINGS

Refer to: "SDC45/46 Digital Indicating Controller User's Manual for Displays and Settings (CP-SP-1265E)".

Chapter 9. CPL COMMUNICATIONS FUNCTION

9 - 1 Outline of Communication

If the optional model is provided with the RS-485 communication function, communication with a PC, PLC or other host devices are available using a user-configured program.
The communication protocol of this unit can be selected from the Controller Peripheral Link (CPL) communication (Yamatake's host communication protocol) and the MODBUS communication.
This chapter describes the CPL communications.

■ Features

The features of the SDC45/46's communication function are as follows:

- Up to 31 units can be connected to a single master station as a host device.
- When the communication specifications of the host device conform to the RS-232C interface, the communication converter CMC10L (sold separately) is required. The CMC10L allows the conversion between RS-232C and RS-485.
- Almost all of the device parameters can be communicated.
  For details on communication parameters, refer to:
  ☞ Chapter 11, LIST OF COMMUNICATION DATA.
- Random access commands are available.
  Two or more number of parameters at separated addresses can be read or written by a single command.

■ Setup

The following setups are required for performing the CPL communications.
The items on the table below can be displayed and set up only when the optional model number is provided with the RS-485 communication function.

Item name (RS-485 communication bank)	Item display	Contents of setup	Initial value
CPL/MODBUS	Con.01	0: CPL 1: MODBUS ASCII format 2: MODBUS RTU format	0
Station address	Con.02	0: Does not communicate 1 to 127	0
Transmission speed	Con.03	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	2
Data format (Data length)	Con.04	0: 7 bits 1: 8 bits	1
Data format (Parity)	Con.05	0: Even parity 1: Odd parity 2: No parity	0
Data format (Stop bit)	Con.06	0: 1 stop bit 1: 2 stop bits	0
Response time-out	Con.07	1 to 250ms	3

! Handling Precautions

- Setups can be performed through key operation on this unit or the SLP-C45 Smart Loader Package. However, they cannot be performed via RS-485 communications.
- If you use the Yamatake CMC10L as an RS-232C/RS-485 converter, set the response time-out (Con.07) to 3 ms or longer.

■ Communication procedures

The communication procedure is as follows:

(1) The instruction message is sent from the host device (master station) to one unit (slave station) to communicate with.

(2) The slave station receives the instruction message, and performs read or write processing according to the content of the message.

(3) The slave station sends a message corresponding to the processing content as a response message.

(4) The master station receives the response message.

! Handling Precautions

- It is not allowed to use two or more number of protocols together on a single RS-485 transmission line (such as CPL, MODBUS ASCII format, and MODBUS RTU format).

9 - 2 Message Structure

■ Message structure

The following shows the message structure.
Messages are broadly classified into two layers: the data link layer and the application layer.

- Data link layer
  This layer contains the basic information required for the communication such as the destination of the communication message and the check information of the message.
- Application layer
  Data is read and written in this layer. The content of the layer varies according to the purpose of the message.

Messages comprise parts (1) to (8) as shown in the figure below.
The command (details sent from the master station) and the response (details returned from the slave station) are stored in the application layer.

02H			58H		03H		0DH 0AH
STX			X		ETX		CR LF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Data link layer				Application layer	Data link layer		
1 frame							

(1) STX (start of message)
(2) Station address
(3) Sub-address
(4) Device code
(5) Send message = command,
response message = response
(6) ETX (end of command/response)
(7) Checksum
(8) Delimiter (end of message)

■ Data link layer

● Outline

The data link layer is of a fixed length. The position of each data item and the number of its characters are already decided. Note, however, that the data positions of the data link layer from ETX onwards shift according to the number of characters in the application layer.

● Response start conditions

- The device sends the response message only when message structure in the data link layer is all correct. If even one of these is incorrect, no response messages are sent, and the device waits for new message.

● List of data link layer data definitions

The following list shows the definitions for data in the data link layer:

Data name	Character code	Number of characters	Meaning of data
STX	02H	1	Start of message
Station address	0 to 7FH are expressed as hexadecimal character codes.	2	Identification of device to communicate with
Sub-address	"00" (30H, 30H)	2	No function
Device code	"X" (58H) or "x" (78H)	1	Device type
ETX	03H	1	End position of the application layer
Checksum	00H to FFH are expressed as two-digit hexadecimal character codes.	2	Checksum of message
Delimiter	CR(0DH), LF(0AH)	2	End of message

● Description of data items

- STX(02H)
  When it receives an STX, the SDC regards it as the start of a transmitted message, even if no delimiter for the previous STX has been received. In this way, if electrical noise (etc.) causes an error in a message, the SDC can respond properly when the next message from the master station is received.
- Station address
  The SDC creates a response message only when the station address on the received message is that of the SDC. The station address consists of two hexadecimal characters.
  The SDC returns the same station address as that of the received message. However, if the station address is set to "0" (30H 30H), the SDC makes no response even if the station addresses match.
- Sub-address
  Two hexadecimal characters between "00" (30H 30H) and "FF" (46H 46H) can be used. The SDC returns the same sub-address as that of the received message.
- Device code
  "X" (58H) or "x" (78H) can be used. Because the device code is fixed for each device series, other codes cannot be used. The SDC returns the same device code as that of the received message. As an example of use, "X" (58H) can be used as the default code, while "x" (78H) is used for resent messages.
- ETX
  ETX indicates the end of the application layer.
- Checksum
  This value is for checking whether or not some abnormality (e.g. noise) causes the message content to change during communications.
  The checksum is expressed as two hexadecimal characters.
- How to calculate a checksum
  (1) Add the character codes in the message from STX through ETX in single byte units.
  (2) Take two's complement of the low-order one byte of the addition result.
  (3) Convert the obtained two's complement to a two-byte ASCII code.

The following is a sample checksum calculation for a sample message:

STX: 02H
'0': 30H (first byte of the station address)
'1': 31H (second byte of the station address)
'0': 30H (first byte of the sub-address)
'0': 30H (second byte of the sub-address)
'X': 58H (device code)
'R': 52H (first byte of the command)
'D': 44H (second byte of the command)
(omitted)
ETX: 03H

(1) Add the character codes in the message from STX through ETX in single byte units.
The addition operation in single byte units is as follows:
02H + 30H + 31H + 30H + 30H + 58H + 52H + 53H + • • • + 03H.
Assume that the result is 376H.
(2) The low-order one byte of the addition result 376H is 76H. The two's complement of 76H is 8AH.
(3) Convert the obtained 8AH to a two-byte ASCII code.
The result is:
'8': 38H
'A': 41H,
and the two bytes, '8'(38H) and 'A'(41H), are the checksum.

• Delimiter (CR/LF)
This indicates the end of the message. Immediately after LF is received, the device enters a state allowed to process the received message.

■ Application layer

The table below shows the configuration of the application layer.

Item	Description
Command	"RS" (decimal format continuous address data read command)
	"WS" (decimal format continuous address data write command)
	"RD" (hex format continuous address data read command)
	"WD" (hex format continuous address data write command)
	"RU" (hex format random address data read command)
	"WU" (hex format random address data write command)
Data delimiter	RS, WS command: "," (comma) Other commands: none
Word address	RS, WS command: Base 10 numbers + W (501W, etc.) Other commands: Numeric value in hex notation, such as "01F5".
Read count	RS, WS command: Base 10 numbers (1, etc.) Other commands: Numeric value in hex notation, such as "0001".
Numerical value to be written	RS, WS command: Base 10 numbers (100, etc.) Other commands: Numeric value in hex notation, such as "0064".

The number of addresses accessible by a single command and response message.

Type	Number of addresses	Type	Number of addresses
RS	1 to 16	WD	1 to 16
WS	1 to 16	RU	1 to 16
RD	1 to 16	WU	1 to 16

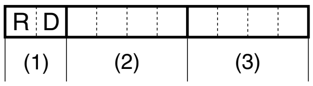
9 - 3 Description of Commands

■ Fixed length continuous data read command (RD command)

Reads data from contiguous data addresses in hexadecimal format.

● Command message

Specify the starting data address and the number of words. The format for the application layer of command messages is shown below.

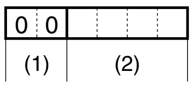


(1) Fixed length continuous data read command
(2) Starting data address
(3) Number of read data

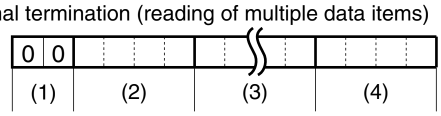
● Response message

The format for the application layer of response messages is shown below.

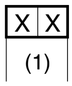
• Normal termination (reading of single data item)



• Normal termination (reading of multiple data items)



• Abnormal termination



The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code
(2) Data
(3) Data 2 to data (n-1)
(4) Data n

Note

For details on hexadecimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Hexadecimal numbers (on page 9-13).

■ Fixed length continuous data write command (WD command)

Writes data to continuous data addresses in hexadecimal format.

● Command message

Specify the starting data address and 1 word or more. The format for the application layer of command messages is shown below.

• Writing of single data item

W D		
(1)	(2)	(3)

• Writing of multiple data items

W D				
(1)	(2)	(3)	(4)	(5)

(1) Fixed length continuous data write command
(2) Starting data address
(3) Data 1
(4) Data 2 to data (n-1)
(5) Data n

● Response message

The format for the application layer of response messages is shown below.

• Normal termination

0 0
(1)

• Abnormal termination

X X
(1)

The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code

Note

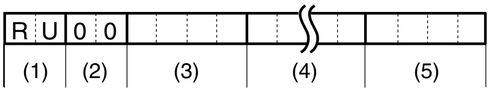
For details on hexadecimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Hexadecimal numbers (on page 9-13).

■ Fixed length random data read command (RU command)

Reads data from "random" (non-continuous) data addresses in hexadecimal format.

● Command message

Specify 1 or more data addresses. The format for the application layer of command messages is shown below.

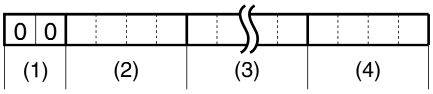


(1) Fixed length random data read command
(2) Sub-command: fixed to "00".
(3) Data address 1
(4) Data address 2 to data address (n-1)
(5) Data address n

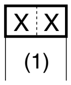
● Response message

The format for the application layer of response messages is shown below.

• Normal termination



• Abnormal termination



The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code
(2) Data 1
(3) Data 2 to data (n-1)
(4) Data n

Note

For details on hexadecimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Hexadecimal numbers (on page 9-13).

■ Fixed length random data write command (WU command)

Writes data to "random" (non-continuous) data addresses in hexadecimal format.

● Command message

Make a set of data address and data, and specify 1 group or more. The format for the application layer of command messages is shown below.

W U	0 0					
(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) Fixed length random data write command
(2) Sub-command: fixed to "00".
(3) Data address 1
(4) Write data 1
(5) Data address, write data 2 to write data (n-1)
(6) Data address n
(7) Write data n

● Response message

The format for the application layer of response messages is shown below.

• Normal termination

0 0
(1)

• Abnormal termination

X X
(1)

The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code

Note

For details on hexadecimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Hexadecimal numbers (on page 9-13).

■ Continuous data read command (RS command)

Reads data is read from continuous data addresses in decimal format.

● Command message

Specify the starting data address and number of words. The format for the application layer of command messages is shown below.

R	S	,	4	0	9	6	W	,	1
(1)		(2)	(3)					(2)	(4)
Application layer									

(1) Command
(2) Data delimiter
(3) Starting data address
(4) Number of words

● Response message

The format for the application layer of response messages is shown below.

• Normal termination (reading of single data item)

0	0	,	
(1)		(2)	(3)

• Normal termination (reading of multiple data items)

0	0	,		,		,	
(1)		(2)	(3)	(2)	(4)	(2)	(5)

• Abnormal termination

X	X
(1)	

The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code
(2) Data delimiter
(3) Data
(4) Data 2 to data (n-1)
(5) Data n

Note

For details on decimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Decimal numbers (on page 9-14).

■ Continuous data write command (WS command)

Writes data to continuous data addresses in decimal format.

● Command message

Specify the starting data address and 1 word or more. The format for the application layer of command messages is shown below.

W	S	,	4	0	9	6	W	,	1	,	6	5
(1)		(2)	(3)					(2)	(4)	(2)	(5)	

(1) Command
(2) Data delimiter
(3) Starting data address
(4) Data 1
(5) Data 2

● Response message

The format for the application layer of response messages is shown below.

• Normal termination

0	0
(1)	

• Abnormal termination

X	X
(1)	

The abnormal termination code is entered at XX.
For details of codes, refer to:
☞ 9-6, List of Termination Codes (on page 9-15).

(1) Termination code

Note

For details on decimal number format, refer to:
☞ 9-5 Numeric Representation in the Application Layer ■ Decimal numbers (on page 9-14).

9 - 4 Definition of Data Addresses

● RAM and EEPROM areas of data addresses

Data addresses are categorized as follows:

Data address Hexadecimal notation	Data address Decimal notation	Name	Remarks
1000 to 4FFF	4096 to 20479	RAM access data address	Reading and writing of these addresses are both performed on RAM. Since writing is not performed to EEPROM, the value returns to that stored in EEPROM after restarted.
5000 to 8FFF	20480 to 36863	EEPROM access data address	Writing is performed to both RAM and EEPROM; reading is performed only on RAM. Since writing is also performed to EEPROM, the value does not change even after restarted.

Handling Precautions

· EEPROM's erase/write cycles are limited.
Accordingly, it is recommended that very frequently written parameters be written to RAM, which does not have a limitation on cycles.
Note that with regard to the data written to RAM area, that data is saved to EEPROM area when the power is turned ON again.

● Write data range

If the write value exceeds the range determined by parameters, writing is not performed and an abnormal termination code is returned.

● Write conditions

An abnormal termination code is also returned when the writing is not possible due to the conditions.

9 - 5 Numeric Representation in the Application Layer

Numeric values in the application layer include data addresses, the number of words, and data values. Hexadecimal or decimal numbers are used depending on the command. Command and response messages both use the same format.

■ Hexadecimal numbers

Specifications for hexadecimal numbers are shown below.
If values do not meet the specifications, the SDC will send an abnormal termination code and abort command message processing.

Item	Specification	Illegal formats
Command name	RD WD RU WU	RS command (no hexadecimal numbers) WS command (no hexadecimal numbers)
Usable characters	0(30H) to 9(39H) A(41H) to F(46H)	1 2 3 a ("a" cannot be used) - 1 2 3 ("-" cannot be used) 1 2 3 (space cannot be used)
Number of characters	4	1 2 3 (3 characters) 0 1 2 3 4 (5 characters)
Usable values	8000H to 7FFFH (signed data) 0000H to FFFFH (unsigned data)	
Typical character strings	0 0 0 0 1 2 A B 0 1 2 3 F F F F	

■ Decimal numbers

Specifications for decimal numbers are shown below.
For data addresses, and "W" (57H) to the end of the decimal numeral.
If values do not meet the specifications, the SDC will send an abnormal termination code and abort command message processing.

Item	Specification	Illegal formats
Command	RS WS	RD command (no decimal numbers) WD command (no decimal numbers)
Usable characters	0(30H) to 9(39H) -(2DH)	1 2 3 A ("A" cannot be used) + 1 2 3 ("+" cannot be used) ␣ 1 2 3 (space cannot be used)
Delimiter	,(2CH) The delimiter is put between values	
Number of digits	Positive numbers: 1 to 5 digits Negative numbers: 2 to 6 digits Zero: 1 digit	Nothing (between delimiters) 1 2 3 4 5 6 (6 positive numbers)
Usable values	-32768 to +32767 (signed data) 0 to 65535 (unsigned data)	
Format for positive numbers	First digit must be from 1(31H) to 9(39H)	0 1 (0 cannot be the first digit)
Format for negative numbers	First character must be "-" (2DH) followed by 1(31H) to 9(39H)	- 0 1 (0 cannot be the second character)
Format for 0	0	- 0 ("-" cannot be used) 0 0 (1 digit only)
Typical character strings	1 3 2 7 6 7 - 1 2 - 3 2 7 6 8	

9 - 6 List of Termination Codes

The outcome of processing the application layer of the command message is indicated in the termination code of the response message. In addition to the normal termination code, there are abnormal termination codes (no processing was done) and warning termination codes (processing may have been done).

■ Termination codes for read commands

Termination code	Description	Processing by SDC
00 (normal)	Normal termination	Read-out value was returned
99 (abnormal)	Undefined command	Only termination code was returned (without data)
10 (abnormal)	Parameter error*	Only termination code was returned (without data)
40 (abnormal)	Word count error	Only termination code was returned (without data)
21 (warning)	Data address error	Data from this address was returned as "0"
22 (warning)	Data range error	Data read from this address was returned as 8000 or 7FFF (hex), or as -32768 or +32767 (decimal)
23 (warning)	Impossible due to device conditions	Data from this address was returned as "0"

*: The following are parameter errors
- Incorrect numerical representation
- Incorrect command message format

■ Termination codes for write commands

Termination code	Description	Processing by SDC
00 (normal)	Normal termination	All data was written
99 (abnormal)	Undefined command	No data was written
10 (abnormal)	Parameter error*	No data was written
40 (abnormal)	Word count error	No data was written
21 (warning)	Data address error	There was at least one data address where nothing was written
22 (warning)	Data range error	There was at least one data address where nothing was written
23 (warning)	Impossible due to device conditions	There was at least one data address where nothing was written

*: The following are parameter errors
- Incorrect numerical representation
- Incorrect command message format

9 - 7 Reception and Transmission Timing

■ Timing specifications for instruction and response message

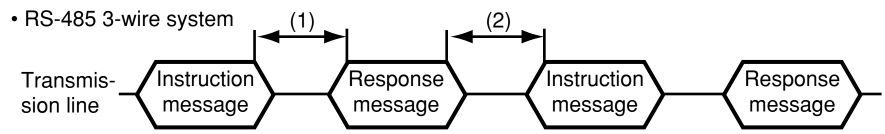
The cautions below are required with regard to the timing to transmit a instruction message from the master station and a response message from the slave station.

● Response monitor time

The maximum response time from the end of the instruction message transmission by the master station until when the master station receives a response message from the slave station is two seconds ((1) in the figure below). So, the response monitor time should be set to two seconds.
Generally, when a response time-out occurs, the instruction message is resent.

● Transmission start time

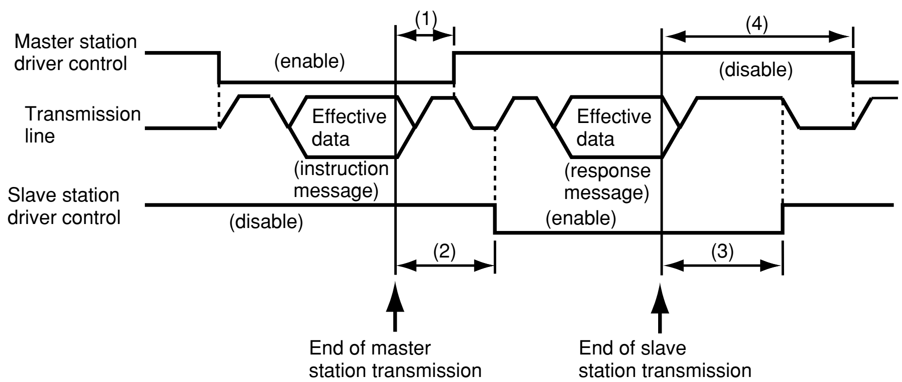
A wait time of 10 ms is required before the master station starts to transmit the next instruction message (to the same slave station or a different slave station) after the end of receiving response message ((2) in the figure below).



(1) End of master station transmission -
Transmission start time of slave station = Max. 2000 ms
(2) End of slave station transmission -
Transmission start time of master station = Min. 10 ms

■ RS-485 driver control timing specifications

When the transmission/reception on the RS-485 3-wire system is directly controlled by the master station, care should be paid to the following timing:



(1) End of master station transmission - Driver disable time = Max. 500 µs
(2) End of slave station reception - Driver enable time = Response time-out
RS-485 communication bank (item display: Com.07) or more
(3) End of slave station transmission - Driver disable time = Max. 10 ms
(4) End of master station reception - Driver enable time = Min. 10 ms

Chapter 10. MODBUS COMMUNICATIONS FUNCTIONS

10 - 1 Outline of Communication

If the optional model is provided with the RS-485 communications function, communication with a PC, PLC or other host devices are available using a user-configured program.
The communication protocol can be selected from the Controller Peripheral Link (CPL) communication (Yamatake's host communication protocol) and the MODBUS communication. This chapter describes the MODBUS communications.

■ Features

The features of the SDC45/46's communication function are as follows:

- Up to 31 units can be connected to a single master station as a host device.
- When the communication specifications of the host device conform to the RS-232C interface, the communication converter CMC10L (sold separately) is required. The CMC10L allows the conversion between RS-232C and RS-485.
- Almost all of the device parameters can be communicated.
  For details on communication parameters, refer to;
  ☞ Chapter 11, LIST OF COMMUNICATION DATA.

■ Setup

The following setups are required for performing the MODBUS communication:

Item (RS-485 Communication bank)	Display	Contents	Initial value
CPL/MODBUS	Com.01	0: CPL 1: MODBUS ASCII format 2: MODBUS RTU format	0
Station address	Com.02	0: Does not communicate 1 to 127	0
Transmission speed	Com.03	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	2
Data format (data length)	Com.04	0: 7 bits 1: 8 bits	1
Data format (parity)	Com.05	0: Even parity 1: Odd parity 2: No parity	0
Data format (stop bit)	Com.06	0: 1 stop bit 1: 2 stop bits	0
Response time-out	Com.07	1 to 250ms	3

- If the optional model number is provided with the RS-485 communications function, display and setup are available.
- If the communications type is set to MODBUS RTU format, data format (data length) cannot be displayed nor set up, and the action is fixed to 8-bit data.

Handling Precautions

- Setups can be performed through key operation on this unit or the SLP-C45 Smart Loader Package. However, they cannot be performed via RS-485 communications.
- If you use the Yamatake CMC10L as an RS-232C/RS-485 converter, set the response time-out (Com.07) to 3ms or longer.

■ Communication procedures

The communication procedure is as follows:

(1) The instruction message is sent from the host device (master station) to one unit (slave station) to communicate with.

(2) The slave station receives the instruction message, and performs read or write processing according to the content of the message.

(3) The slave station sends a message corresponding to the processing content as a response message.

(4) The master station receives the response message.

Handling Precautions

It is not allowed to use two or more number of protocols together on a single RS-485 transmission line such as CPL, MODBUS ASCII format, and MODBUS RTU format.

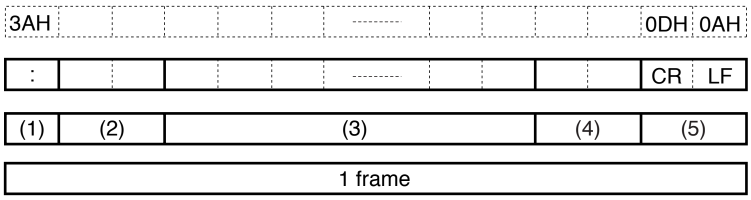
10 - 2 Message Structure

■ Message structure

This section describes the message structure.

● MODBUS ASCII

All messages other than delimiters are written in hexadecimal ASCII codes.
A message of MODBUS ASCII consists of (1) to (6) below.
The part of (3) stores commands, which are transmission contents from the master station and responses, which are transmission contents from the slave station.
All messages use ASCII codes. (Each slot below corresponds to one character.)



(1) Start code (1 byte)
(2) Station address (2 bytes)
(3) Send message, response message
(4) Check code (2-byte LRC)
(5) End code (2 bytes)

- Start code
  The start code is a colon (3AH). Whenever it receives the start code, the SDC judges that it is the start of a sent message, even if no end code for the previous start code has been received. In this way, even if electrical noise (etc.) causes an error in a message, the SDC can respond properly when the next message from the master station is received.

- Station address
  The SDC creates a response message only when the station address on the received message is the same as that of the SDC. The station address consists of two hexadecimal characters.
  However, if the station address is set to “0” (30H 30H), the SDC makes no response even if the station addresses match. The SDC returns the same station address as that of the received message.

- Check code (LRC)
  This code, consisting of two hexadecimal characters, is used to check whether or not some problem (such as electrical noise) has corrupted the message during transmission. The method used to create the check code is described below.

  (1) Data from the beginning of the station address up to just before the check code is added. Note that the values added are not those of the pairs of ASCII numerals in the sent message that express the hex values, but rather the one-byte binary data converted from the two ASCII characters.

  (2) Take two's complement of the addition result is taken.

  (3) The low-order byte of the addition result is converted to two hexadecimal characters.

- End code (CR/LF)
  This indicates the end of the message. As soon as LF is received, processing of the received message can begin.

Note

- A sample check code (LRC) calculation is shown below.

[Sample message]

:	: 3AH (start of the message)
'0'	: 30H (first byte of the station address)
'A'	: 41H (second byte of the station address)
'0'	: 30H (first byte of the read command)
'3'	: 33H (second byte of the read command)
'0'	: 30H (first byte of the start data address)
'3'	: 33H (second byte of the start data address)
'E'	: 45H (third byte of the start data address)
'9'	: 39H (fourth byte of the start data address)
'0'	: 30H (first byte of the number of read data)
'0'	: 30H (second byte of the number of read data)
'0'	: 30H (third byte of the number of read data)
'2'	: 32H (fourth byte of the number of read data)

(1) Add the data from the top up to just before the checksum.
The add operation is as follows:
0AH + 03H + 03H + E9H + 00H + 02H
The result is FBH.

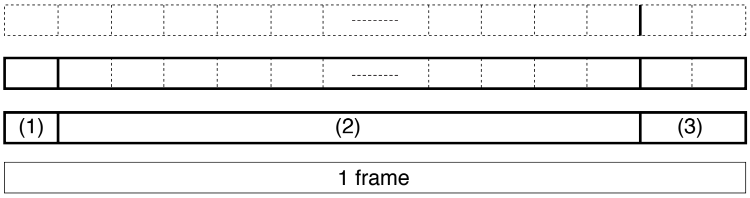
(2) The low-order byte of the addition result FBH is FBH as is. The two's complement of FBH is 05H.

(3) Convert the obtained 05H to a two-byte ASCII code.
The result is:
'0'   : 30H
'5'   : 35H,

and the two bytes, '0' (30H) and '5' (35H), are the check code.

● MODBUS RTU

All messages are written in binary data.
A MODBUS RTU message consists of (1) to (3) below.
The part of (2) stores commands, which are transmission contents from the master station and responses, which are transmission contents from the slave station.
All messages use binary data. (Each slot below corresponds to one character.)



(1) Station address (1 byte)
(2) Send message, response message
(3) Checksum (2 bytes)

- Station address
  The SDC creates a response message only when the station address of the received message is the same as that of the SDC. The station address in a message is expressed as 1 byte. However, when the station address is set to "0," the SDC makes no response even if the station addresses match.The SDC returns the same station address as that of the received message.
- Check code (CRC)
  This code is used for checking whether or not some abnormality (e.g., electrical noise) causes the message to change during transmission. The check code is expressed as 2 bytes.

The CRC check code creation method is shown below.

The section of the message from the station address until just before the check code is used in the calculation. For the calculation, the binary data in the message is used. The check code is 16 bit data and can be calculated by using the C-language function "get_crc16()" shown below. In the message, the low-order byte comes first, and then the high-order byte. The opposite order is used in other 16 bit data.

```
[Description]       16-bit CRC is calculated.
[Argument 1]        Length of character string (number of bytes)
[Argument 2]        Pointer for start of character string
[Function value]    Calculation result

unsigned short get_crc16(signed int len, const unsigned char *p)
{
    unsigned short crc16;
    unsigned short next;
    unsigned short carry;
    signed int i;
    crc16 = 0xffff;

    while (len > 0)
    {
        next = (unsigned short)*p;
        crc16 ^= next;
        for (i = 0; i < 8; i++)
        {
            carry = crc16 & 0x0001;
            crc16 >>= 1;
            if (carry != 0)
            {
                crc16 ^= 0xa001;
            }
        }
        p++;
        len--;
    }

    return crc16;
}
```

- 1-frame end judgment
  A message end (1-frame end) is determined when a time period specified for each transmission speed has passed during which no character is received. It is considered that 1 frame has ended when the next character is not received before the time-out time shown below passes.
  However, the time-out time has a fluctuation of ±1ms from the values in the table below.

Set transmission speed (bps)	Time-out time
4800	9ms or more
9600	5ms or more
19200	3ms or more
38400	2ms or more

■ Command type

The following types of command (send message) are compatible with the SDC.

Command type	Description		Conformance class
	ASCII	RTU (binary)	
Multiple word read-out	"03" (2-byte)	03H (1-byte)	class 0
Multiple word write	"10" (2-byte)	10H (1-byte)	class 0
Single word write	"06" (2-byte)	06H (1-byte)	class 1 *

* The SDC is not compliant with class 1 commands other than single word write.

■ Exception codes

If the response message is abnormal, it will have one of the exception codes below after the function code.

Type of Error	Exception Code		Description
	ASCII	RTU (binary)	
Function code error	"01" (2-byte)	01H (1-byte)	Function code not supported by SDC
Data address error	"02" (2-byte)	02H (1-byte)	Cannot read/write at data address
Data error	"03" (2-byte)	03H (1-byte)	Error other than the above

■ Number of words

In a 1-frame message, the amount of data read or written is shown below.

Command type (function code)	Amount of data	
	ASCII	RTU (binary)
Multiple data read-out(03)	1 to 16	1 to 16
Multiple data write(10)	1 to 16	1 to 16
Single word write(06)	1	1

Note

- For the details of MODBUS specifications, refer to;
  ☞ Modicon Modbus Protocol Reference Guide (PI-MBUS-300 Rev.J) by MODICON, Inc.
  ☞ OPEN MODBUS/TCP SPECIFICATION (Release 1.0) by Schneider Electric

10 - 3 Description of Commands

■ Multiple data read-out command (03H)

Data of contiguous data addresses is read out in hexadecimal.

● Command message

Specify the start data address and number of data. The command message structure is shown below.

MODBUS ASCII

3AH	30H	41H	30H	33H	30H	33H	45H	39H	30H	30H	30H	32H	30H	35H	0DH	0AH
:	0	A	0	3	0	3	E	9	0	0	0	2	0	5	CR	LF
(1)	(2)		(3)		(4)				(5)				(6)		(7)	

(1) Start code
(2) Station address
(3) Function code
(4) Starting data address
(5) Number of words
(6) Check code (LRC)
(7) End code

MODBUS RTU

0AH	03H	03H	E9H	00H	02H	14H	C0H
(1)	(2)	(3)		(4)		(5)	

(1) Station address
(2) Function code
(3) Starting data address
(4) Number of read-out words
(5) Check code (CRC)

● Response Message

The structure of a response message is shown below.

MODBUS ASCII

- Example in case of normal reception

3AH	30H	41H	30H	33H	30H	34H	30H	33H	30H	31H	30H	30H	30H	33H	45H	38H	D0H	0AH
:	0	A	0	3	0	4	0	3	0	1	0	0	0	3	E	8	CR	LF
(1)	(2)		(3)		(4)		(5)				(6)				(7)		(8)	

(1) Start code
(2) Station address
(3) Function code
(4) Number of read data X 2
(5) Read data 1
(6) Read data 2
(7) Check code (LRC)
(8) End code

- Example in case of error

3AH	30H	41H	38H	34H	30H	31H	37H	31H	0DH	0AH
:	0	A	8	4	0	1	7	1	CR	LF
(1)	(2)		(3)		(4)		(5)		(6)	

(1) Start code
(2) Station address
(3) Function code (If an abnormality occurs, set the MSB of the function code in the sent message to 1. In this case, since undefined “04” is sent as a command with a sent message, “84” is sent back.)
(4) Abnormal termination code (☞ refer to page 10-6)
(5) Check code (LRC)
(6) End code

MODBUS RTU

- Example in case of normal reception

0AH	03H	04H	03H	01H	00H	03H	51H	76H
(1)	(2)	(3)	(4)		(5)		(6)	

(1) Station address
(2) Function code
(3) Number of read data X 2 (bytes)
(4) Read data 1
(5) Read data 2
(6) Check code (CRC)

- Example in case of error

0AH	84H	01H	F3H	02H
(1)	(2)	(3)	(4)	

(1) Station address
(2) Error flag (since undefined "04H" is sent as a command with a send message, the most significant bit is turned ON and sent back as "84H".)
(3) Abnormal termination code (☞ refer to page 10-6)
(4) Check code (CRC)

■ Multiple data write command (10H)

Data is written to data with contiguous data addresses in hexadecimal.

● Command message

Specify the start data address and 1 word or more. The structure of the application layer of a command message is shown below.

(Example) Example: 01A0H and 0E53H are written to 2 contiguous data addresses starting at 05DDH.

MODBUS ASCII

3AH	30H	31H	31H	30H	30H	35H	44H	44H	30H	30H	30H	32H	30H	34H
:	0	1	1	0	0	5	D	D	0	0	0	2	0	4
(1)	(2)		(3)		(4)				(5)				(6)	

30H	31H	41H	30H	30H	45H	35H	33H	30H	35H	0DH	0AH
0	1	A	0	0	E	5	3	0	5	CR	LF
(7)				(8)				(9)		(10)	

(1) Start of message
(2) Station address
(3) Write command 10H
(4) Starting write data address
(5) Number of write data
(6) Number of write data X 2
(7) Write data 1
(8) Write data 2
(9) Check code (LRC)
(10) End code

MODBUS RTU

01H	10H	05H	DDH	00H	02H	04H	01H	A0H	0EH	53H	45H	B9H
(1)	(2)	(3)		(4)		(5)	(6)		(7)		(8)	

(1) Station address
(2) Write command 10H
(3) Starting write data address
(4) Number of write data
(5) Number of write data x 2
(6) Write data 1
(7) Write data 2
(8) Check code (CRC)

● **Response Message**

The structure of the application layer of a response message is shown below.

MODBUS ASCII

3AH	30H	31H	31H	30H	30H	35H	44H	44H	30H	30H	30H	32H	30H	42H	0DH	0AH
:	0	1	1	0	0	5	D	D	0	0	0	2	0	B	CR	LF
(1)	(2)		(3)		(4)				(5)				(6)		(7)	

(1) Start code
(2) Station address
(3) Function code
(4) Starting write data address 1
(5) Number of write data
(6) Check code (LRC)
(7) End code

MODBUS RTU

01H	10H	05H	DDH	00H	02H	D1H	3EH
(1)	(2)	(3)		(4)		(5)	

(1) Station address
(2) Function code
(3) Starting write data address
(4) Number of write data
(5) Check code (CRC)

Note

- The response message at the time of abnormal termination is the same as that for abnormal termination of the multiple-data read command.

■ Single data write command (06H)

One data address of data is written in hexadecimal.

● Command message

Specify the data address and data. The command message structure is shown below.

(Example) The value of 01A0H is written to data address 05DDH.

MODBUS ASCII

3AH	30H	31H	30H	36H	30H	35H	44H	44H	30H	31H	41H	30H	37H	36H	0DH	0AH
:	0	1	0	6	0	5	D	D	0	1	A	0	7	6	CR	LF
(1)	(2)		(3)		(4)				(5)				(6)		(7)	

(1) Start of message
(2) Station address
(3) Function code
(4) Data address
(5) Write data
(6) Check code (LRC)
(7) End code

MODBUS RTU

01H	06H	05H	DDH	01H	A0H	18H	D4H
(1)	(2)	(3)		(4)		(5)	

(1) Station address
(2) Function code
(3) Data address
(4) Write data
(5) Check code (CRC)

● Response Message

Normally the response message is the same as the command.

Note

• If an error has occurred, the response message is the same as when the multiple data read command results in an error.

10 - 4 Numeric Representation

Numerical values include data addresses, numbers specifying the number of data words, and data values, all of which are hexadecimal numbers.
Numeric representation varies depending on whether the communications type is Modbus ASCII or Modbus RTU. This applies to both command and response messages.

■ ASCII hexadecimal numbers

Specifications for ASCII hexadecimal numbers are shown in the table below.
If values do not meet these specifications, the SDC will send an abnormal termination code, aborting command message processing.

Item	Specification	Illegal formats
Usable characters	0(30H) to 9(39H) A(41H) to F(46H)	1 2 3 a ("a" cannot be used) - 1 2 3 ("-" cannot be used) 1 2 3 (space cannot be used)
Number of characters	4 or 2	1 2 3 (3 characters) 0 1 2 3 4 (5 characters)
Usable values (4 characters)	8000H to 7FFFH (signed data) 0000H to FFFFH (unsigned data)	
Usable values (2 characters)	00H to 7FFFH (signed data)	
Typical character strings	0 0 0 0 1 2 A B 0 1 2 3 F F F F	

■ RTU hexadecimal numbers

Specifications for RTU hexadecimal numbers are shown in the table below.
If values do not meet these specifications, the SDC will send an abnormal termination code, aborting command message processing.

Item	Specification	Illegal formats
Usable characters	00H to FFH (all)	
Number of characters	2 or 1	00H 01H 02H (3 characters)
Usable values (2 characters)	8000H to 7FFFH (signed data) 0000H to FFFFH (unsigned data)	
Usable values	00H to FFH (signed data)	
Typical character strings	00H 00H 12H ABH 01H 23H FFH FFH	

10 - 5 CPL Communication Function and Common Specifications

■ Definition of Data Address

Refer to;

☞ Section 9-4, Definition of Data Address, on page 9-12

■ RS-485 Driver Control Timing Specifications

Refer to;

☞ Section 9-7, Reception and Transmission Timing, on page 9-16.

Chapter 11. LIST OF COMMUNICATION DATA

The following shows the meanings of the symbols stated in the "RAM/EEPROM Read/Write" columns:

No symbol : Possible.
□ : Possible according to the conditions.
△ : Possible, but data is invalid.
× : Impossible.

Handling Precautions

- When reading the EEPROM address, data in the RAM is read in the same manner as reading of the RAM address.

Decimal point information

-:	No decimal point
1 to 3:	Decimal point position (original value of data is multiplied by 10, 100, or 1000)
LP1 and 2:	Determined by the settings for the loop 1 or loop 2 in the control bank ("loop PV/SV decimal point position").
PV1 and 2:	Determined by the settings for PV1 or PV2 in the PV bank ("decimal point position").
RMP1 and 2:	Determined by the settings for loop 1 or loop 2 in the SP configuration bank ("SP ramp unit").
PID1 and 2:	Determined by the settings for loop 1 or loop 2 in the control bank ("integral time/derivative time decimal point position").
OUT1 to 7:	Determined by the settings for outputs 1 through 7 in the output bank ("output decimal point position").
EV1 to 7:	Determined by the settings for event Nos. 1 through 16 in the event configuration bank ("decimal point position").
Linearizations 1 to 8:	Determined by the settings for Linearizations 1 through 8 in the Linearization table bank ("breakpoint decimal point position").
MS1 to 3:	Determined by the settings for priorities 1 through 3 in the display/key bank ("MS display decimal point position").
FL:	Determined by the decimal point position setting (for setting the flow rate) in the temperature and pressure compensation bank.
FL-T:	Determined by the decimal point position setting in the PV bank for temperature compensation input.
FL-P:	Determined by the decimal point position setting in the PV bank for pressure compensation input.
I-F:	Determined by the decimal point position setting in the input computation bank.
I-F01 to I-F10:	Determined by the settings for the computation type of computation units F01 to F10 in the input computation bank.
O-F:	Determined by the decimal point position set in the output computation bank.
O-F01 to O-F10:	Determined by the settings for the computation types of computation units F01 to F10 in the output computation bank.

SP group selection

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
SP group selection	Loop 1	SP group selection	1000	5000					–	
	Loop 2	SP group selection	1004	5004					–	

Loop 1 Multi-SP

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 Multi-SP	SP1	LSP	1010	5010					LP1	
		PID group definition	1011	5011					–	
	SP2	LSP	1012	5012					LP1	
		PID group definition	1013	5013					–	
	SP3	LSP	1014	5014					LP1	
		PID group definition	1015	5015					–	
	SP4	LSP	1016	5016					LP1	
		PID group definition	1017	5017					–	
	SP5	LSP	1018	5018					LP1	
		PID group definition	1019	5019					–	
	SP6	LSP	101A	501A					LP1	
		PID group definition	101B	501B					–	
	SP7	LSP	101C	501C					LP1	
		PID group definition	101D	501D					–	
	SP8	LSP	101E	501E					LP1	
		PID group definition	101F	501F					–	
	SP9	LSP	1020	5020					LP1	
		PID group definition	1021	5021					–	
	SP10	LSP	1022	5022					LP1	
		PID group definition	1023	5023					–	
	SP11	LSP	1024	5024					LP1	
		PID group definition	1025	5025					–	
	SP12	LSP	1026	5026					LP1	
		PID group definition	1027	5027					–	
	SP13	LSP	1028	5028					LP1	
		PID group definition	1029	5029					–	
	SP14	LSP	102A	502A					LP1	
		PID group definition	102B	502B					–	
	SP15	LSP	102C	502C					LP1	
		PID group definition	102D	502D					–	
	SP16	LSP	102E	502E					LP1	
		PID group definition	102F	502F					–	

Loop 2 Multi-SP

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 Multi-SP	SP1	LSP	1030	5030					LP2	
		PID group definition	1031	5031					–	
	SP2	LSP	1032	5032					LP2	
		PID group definition	1033	5033					–	
	SP3	LSP	1034	5034					LP2	
		PID group definition	1035	5035					–	
	SP4	LSP	1036	5036					LP2	
		PID group definition	1037	5037					–	
	SP5	LSP	1038	5038					LP2	
		PID group definition	1039	5039					–	
	SP6	LSP	103A	503A					LP2	
		PID group definition	103B	503B					–	
	SP7	LSP	103C	503C					LP2	
		PID group definition	103D	503D					–	
	SP8	LSP	103E	503E					LP2	
		PID group definition	103F	503F					–	
	SP9	LSP	1040	5040					LP2	
		PID group definition	1041	5041					–	
	SP10	LSP	1042	5042					LP2	
		PID group definition	1043	5043					–	
	SP11	LSP	1044	5044					LP2	
		PID group definition	1045	5045					–	
	SP12	LSP	1046	5046					LP2	
		PID group definition	1047	5047					–	
	SP13	LSP	1048	5048					LP2	
		PID group definition	1049	5049					–	
	SP14	LSP	104A	504A					LP2	
		PID group definition	104B	504B					–	
	SP15	LSP	104C	504C					LP2	
		PID group definition	104D	504D					–	
	SP16	LSP	104E	504E					LP2	
		PID group definition	104F	504F					–	

RSP

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
RSP	Loop 1	RSP	1090	5090		×		×	LP1	
		PID group definition	1091	5091					–	
	Loop 2	RSP	1094	5094		×		×	LP2	Added to version 1.05.
		PID group definition	1095	5095					–	

SP configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
SP configuration	Loop 1	SP low limit	10A0	50A0					LP1	
		SP high limit	10A1	50A1					LP1	
	Loop 2	SP low limit	10A4	50A4					LP2	
		SP high limit	10A5	50A5					LP2	
	Loop 1	SP ramp unit	10B0	50B0					–	
		SP ramp-up for LSP	10B1	50B1					RMP1	
		SP ramp-down for LSP	10B2	50B2					RMP1	
		RSP tracking	10B3	50B3					–	
		SP ramp-up for RSP	10B4	50B4					RMP1	Add to version 3.00.
		SP ramp-down for RSP	10B5	50B5					RMP1	
		LSP bias	10B6	50B6					LP1	
		RSP bias	10B7	50B7					LP1	
		PV start for LSP	10B8	50B8					–	
		PV start for RSP	10B9	50B9					–	
		Digital RSP selection	10BA	50BA					–	
		Digital RSP	10BB	50BB					LP1	
	Loop 2	SP ramp unit	10C0	50C0					–	
		SP ramp-up for LSP	10C1	50C1					RMP2	
		SP ramp-down for LSP	10C2	50C2					RMP2	
		RSP tracking	10C3	50C3					–	
		SP ramp-up for RSP	10C4	50C4					RMP1	Add to version 3.00.
		SP ramp-down for RSP	10C5	50C5					RMP1	
		LSP bias	10C6	50C6					LP1	
		RSP bias	10C7	50C7					LP1	
		PV start for LSP	10C8	50C8					–	
		PV start for RSP	10C9	50C9					–	
		Digital RSP selection	10CA	50CA					–	
		Digital RSP	10CB	50CB					LP1	

Event setup

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Event setup	EV1	Event main setting	10F0	50F0					EV1	
		Event sub-setting	10F1	50F1					EV1	
	EV2	Event main setting	10F2	50F2					EV2	
		Event sub-setting	10F3	50F3					EV2	
	EV3	Event main setting	10F4	50F4					EV3	
		Event sub-setting	10F5	50F5					EV3	
	EV4	Event main setting	10F6	50F6					EV4	
		Event sub-setting	10F7	50F7					EV4	
	EV5	Event main setting	10F8	50F8					EV5	
		Event sub-setting	10F9	50F9					EV5	
	EV6	Event main setting	10FA	50FA					EV6	
		Event sub-setting	10FB	50FB					EV6	
	EV7	Event main setting	10FC	50FC					EV7	
		Event sub-setting	10FD	50FD					EV7	
	EV8	Event main setting	10FE	50FE					EV8	
		Event sub-setting	10FF	50FF					EV8	
	EV9	Event main setting	1100	5100					EV9	
		Event sub-setting	1101	5101					EV9	
	EV10	Event main setting	1102	5102					EV10	
		Event sub-setting	1103	5103					EV10	
	EV11	Event main setting	1104	5104					EV11	
		Event sub-setting	1105	5105					EV11	
	EV12	Event main setting	1106	5106					EV12	
		Event sub-setting	1107	5107					EV12	
	EV13	Event main setting	1108	5108					EV13	
		Event sub-setting	1109	5109					EV13	
	EV14	Event main setting	110A	510A					EV14	
		Event sub-setting	110B	510B					EV14	
	EV15	Event main setting	110C	510C					EV15	
		Event sub-setting	110D	510D					EV15	
	EV16	Event main setting	110E	510E					EV16	
		Event sub-setting	110F	510F					EV16	

Event configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Event configuration	EV1	Operation type	1130	5130					–	
		Loop/channel definition	1131	5131					–	
		Direct/reverse	1132	5132					–	
		Standby	1133	5133					–	
		EVENT state at READY	1134	5134					–	
		Decimal point position	1135	5135					–	
		Hysteresis	1136	5136					EV1	
		ON delay	1137	5137					1	
		OFF delay	1138	5138					1	
	EV2	Operation type	1140	5140					–	
		Loop/channel definition	1141	5141					–	
		Direct/reverse	1142	5142					–	
		Standby	1143	5143					–	
		EVENT state at READY	1144	5144					–	
		Decimal point position	1145	5145					–	
		Hysteresis	1146	5146					EV2	
		ON delay	1147	5147					1	
		OFF delay	1148	5148					1	
	EV3	Operation type	1150	5150					–	
		Loop/channel definition	1151	5151					–	
		Direct/reverse	1152	5152					–	
		Standby	1153	5153					–	
		EVENT state at READY	1154	5154					–	
		Decimal point position	1155	5155					–	
		Hysteresis	1156	5156					EV3	
		ON delay	1157	5157					1	
		OFF delay	1158	5158					1	
	EV4	Operation type	1160	5160					–	
		Loop/channel definition	1161	5161					–	
		Direct/reverse	1162	5162					–	
		Standby	1163	5163					–	
		EVENT state at READY	1164	5164					–	
		Decimal point position	1165	5165					–	
		Hysteresis	1166	5166					EV4	
		ON delay	1167	5167					1	
		OFF delay	1168	5168					1	

Event configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Event configuration	EV5	Operation type	1170	5170					–	
		Loop/channel definition	1171	5171					–	
		Direct/reverse	1172	5172					–	
		Standby	1173	5173					–	
		EVENT state at READY	1174	5174					–	
		Decimal point position	1175	5175					–	
		Hysteresis	1176	5176					EV5	
		ON delay	1177	5177					1	
		OFF delay	1178	5178					1	
	EV6	Operation type	1180	5180					–	
		Loop/channel definition	1181	5181					–	
		Direct/reverse	1182	5182					–	
		Standby	1183	5183					–	
		EVENT state at READY	1184	5184					–	
		Decimal point position	1185	5185					–	
		Hysteresis	1186	5186					EV6	
	EV6	ON delay	1187	5187					1	
		OFF delay	1188	5188					1	
	EV7	Operation type	1190	5190					–	
		Loop/channel definition	1191	5191					–	
		Direct/reverse	1192	5192					–	
		Standby	1193	5193					–	
		EVENT state at READY	1194	5194					–	
		Decimal point position	1195	5195					–	
		Hysteresis	1196	5196					EV7	
		ON delay	1197	5197					1	
		OFF delay	1198	5198					1	
	EV8	Operation type	11A0	51A0					–	
		Loop/channel definition	11A1	51A1					–	
		Direct/reverse	11A2	51A2					–	
		Standby	11A3	51A3					–	
		EVENT state at READY	11A4	51A4					–	
		Decimal point position	11A5	51A5					–	
		Hysteresis	11A6	51A6					EV8	
		ON delay	11A7	51A7					1	
		OFF delay	11A8	51A8					1	

Event configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Event configuration	EV9	Operation type	11B0	51B0					–	
		Loop/channel definition	11B1	51B1					–	
		Direct/reverse	11B2	51B2					–	
		Standby	11B3	51B3					–	
		EVENT state at READY	11B4	51B4					–	
		Decimal point position	11B5	51B5					–	
		Hysteresis	11B6	51B6					EV9	
		ON delay	11B7	51B7					1	
		OFF delay	11B8	51B8					1	
	EV10	Operation type	11C0	51C0					–	
		Loop/channel definition	11C1	51C1					–	
		Direct/reverse	11C2	51C2					–	
		Standby	11C3	51C3					–	
		EVENT state at READY	11C4	51C4					–	
		Decimal point position	11C5	51C5					–	
		Hysteresis	11C6	51C6					EV10	
		ON delay	11C7	51C7					1	
		OFF delay	11C8	51C8					1	
	EV11	Operation type	11D0	51D0					–	
		Loop/channel definition	11D1	51D1					–	
		Direct/reverse	11D2	51D2					–	
		Standby	11D3	51D3					–	
		EVENT state at READY	11D4	51D4					–	
		Decimal point position	11D5	51D5					–	
		Hysteresis	11D6	51D6					EV11	
		ON delay	11D7	51D7					1	
		OFF delay	11D8	51D8					1	
	EV12	Operation type	11E0	51E0					–	
		Loop/channel definition	11E1	51E1					–	
		Direct/reverse	11E2	51E2					–	
		Standby	11E3	51E3					–	
		EVENT state at READY	11E4	51E4					–	
		Decimal point position	11E5	51E5					–	
		Hysteresis	11E6	51E6					EV12	
		ON delay	11E7	51E7					1	
		OFF delay	11E8	51E8					1	

Event configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Event configuration	EV13	Operation type	11F0	51F0					–	
		Loop/channel definition	11F1	51F1					–	
		Direct/reverse	11F2	51F2					–	
		Standby	11F3	51F3					–	
		EVENT state at READY	11F4	51F4					–	
		Decimal point position	11F5	51F5					–	
		Hysteresis	11F6	51F6					EV13	
		ON delay	11F7	51F7					1	
		OFF delay	11F8	51F8					1	
	EV14	Operation type	1200	5200					–	
		Loop/channel definition	1201	5201					–	
		Direct/reverse	1202	5202					–	
		Standby	1203	5203					–	
		EVENT state at READY	1204	5204					–	
		Decimal point position	1205	5205					–	
		Hysteresis	1206	5206					EV14	
		ON delay	1207	5207					1	
		OFF delay	1208	5208					1	
	EV15	Operation type	1210	5210					–	
		Loop/channel definition	1211	5211					–	
		Direct/reverse	1212	5212					–	
		Standby	1213	5213					–	
		EVENT state at READY	1214	5214					–	
		Decimal point position	1215	5215					–	
		Hysteresis	1216	5216					EV15	
		ON delay	1217	5217					1	
		OFF delay	1218	5218					1	
	EV16	Operation type	1220	5220					–	
		Loop/channel definition	1221	5221					–	
		Direct/reverse	1222	5222					–	
		Standby	1223	5223					–	
		EVENT state at READY	1224	5224					–	
		Decimal point position	1225	5225					–	
		Hysteresis	1226	5226					EV16	
		ON delay	1227	5227					1	
		OFF delay	1228	5228					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP1	LSP	1330	5330					LP1	
		Event 1 main setting	1331	5331					EV1	
		Event 1 sub-setting	1332	5332					EV1	
		Event 2 main setting	1333	5333					EV2	
		Event 2 sub-setting	1334	5334					EV2	
		Event 3 main setting	1335	5335					EV3	
		Event 3 sub-setting	1336	5336					EV3	
		Event 4 main setting	1337	5337					EV4	
		Event 4 sub-setting	1338	5338					EV4	
		Event 5 main setting	1339	5339					EV5	
		Event 5 sub-setting	133A	533A					EV5	
		Event 6 main setting	133B	533B					EV6	
		Event 6 sub-setting	133C	533C					EV6	
		Event 7 main setting	133D	533D					EV7	
		Event 7 sub-setting	133E	533E					EV7	
		Event 8 main setting	133F	533F					EV8	
		Event 8 sub-setting	1340	5340					EV8	
		Proportional band	1341	5341					1	
		Integral time	1342	5342					PID1	
		Derivative time	1343	5343					PID1	
		Output low limit	1344	5344					1	
		Output high limit	1345	5345					1	
		Manual reset	1346	5346					1	
		Proportional band for cool side	1347	5347					1	
		Integration time for cool side	1348	5348					PID1	
		Derivative time for cool side	1349	5349					PID1	
		Output low limit for cool side	134A	534A					1	
		Output high limit for cool side	134B	534B					1	
		Initial output of PID control	134C	534C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP2	LSP	1350	5350					LP1	
		Event 1 main setting	1351	5351					EV1	
		Event 1 sub-setting	1352	5352					EV1	
		Event 2 main setting	1353	5353					EV2	
		Event 2 sub-setting	1354	5354					EV2	
		Event 3 main setting	1355	5355					EV3	
		Event 3 sub-setting	1356	5356					EV3	
		Event 4 main setting	1357	5357					EV4	
		Event 4 sub-setting	1358	5358					EV4	
		Event 5 main setting	1359	5359					EV5	
		Event 5 sub-setting	135A	535A					EV5	
		Event 6 main setting	135B	535B					EV6	
		Event 6 sub-setting	135C	535C					EV6	
		Event 7 main setting	135D	535D					EV7	
		Event 7 sub-setting	135E	535E					EV7	
		Event 8 main setting	135F	535F					EV8	
		Event 8 sub-setting	1360	5360					EV8	
		Proportional band	1361	5361					1	
		Integral time	1362	5362					PID1	
		Derivative time	1363	5363					PID1	
		Output low limit	1364	5364					1	
		Output high limit	1365	5365					1	
		Manual reset	1366	5366					1	
		Proportional band for cool side	1367	5367					1	
		Integration time for cool side	1368	5368					PID1	
		Derivative time for cool side	1369	5369					PID1	
		Output low limit for cool side	136A	536A					1	
		Output high limit for cool side	136B	536B					1	
		Initial output of PID control	136C	536C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP3	LSP	1370	5370					LP1	
		Event 1 main setting	1371	5371					EV1	
		Event 1 sub-setting	1372	5372					EV1	
		Event 2 main setting	1373	5373					EV2	
		Event 2 sub-setting	1374	5374					EV2	
		Event 3 main setting	1375	5375					EV3	
		Event 3 sub-setting	1376	5376					EV3	
		Event 4 main setting	1377	5377					EV4	
		Event 4 sub-setting	1378	5378					EV4	
		Event 5 main setting	1379	5379					EV5	
		Event 5 sub-setting	137A	537A					EV5	
		Event 6 main setting	137B	537B					EV6	
		Event 6 sub-setting	137C	537C					EV6	
		Event 7 main setting	137D	537D					EV7	
		Event 7 sub-setting	137E	537E					EV7	
		Event 8 main setting	137F	537F					EV8	
		Event 8 sub-setting	1380	5380					EV8	
		Proportional band	1381	5381					1	
		Integral time	1382	5382					PID1	
		Derivative time	1383	5383					PID1	
		Output low limit	1384	5384					1	
		Output high limit	1385	5385					1	
		Manual reset	1386	5386					1	
		Proportional band for cool side	1387	5387					1	
		Integration time for cool side	1388	5388					PID1	
		Derivative time for cool side	1389	5389					PID1	
		Output low limit for cool side	138A	538A					1	
		Output high limit for cool side	138B	538B					1	
		Initial output of PID control	138C	538C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Loop 1 recipe	SP4	LSP	1390	5390					LP1	
		Event 1 main setting	1391	5391					EV1	
		Event 1 sub-setting	1392	5392					EV1	
		Event 2 main setting	1393	5393					EV2	
		Event 2 sub-setting	1394	5394					EV2	
		Event 3 main setting	1395	5395					EV3	
		Event 3 sub-setting	1396	5396					EV3	
		Event 4 main setting	1397	5397					EV4	
		Event 4 sub-setting	1398	5398					EV4	
		Event 5 main setting	1399	5399					EV5	
		Event 5 sub-setting	139A	539A					EV5	
		Event 6 main setting	139B	539B					EV6	
		Event 6 sub-setting	139C	539C					EV6	
		Event 7 main setting	139D	539D					EV7	
		Event 7 sub-setting	139E	539E					EV7	
		Event 8 main setting	139F	539F					EV8	
		Event 8 sub-setting	13A0	53A0					EV8	
		Proportional band	13A1	53A1					1	
		Integral time	13A2	53A2					PID1	
		Derivative time	13A3	53A3					PID1	
		Output low limit	13A4	53A4					1	
		Output high limit	13A5	53A5					1	
		Manual reset	13A6	53A6					1	
		Proportional band for cool side	13A7	53A7					1	
		Integration time for cool side	13A8	53A8					PID1	
		Derivative time for cool side	13A9	53A9					PID1	
		Output low limit for cool side	13AA	53AA					1	
		Output high limit for cool side	13AB	53AB					1	
		Initial output of PID control	13AC	53AC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP5	LSP	13B0	53B0					LP1	
		Event 1 main setting	13B1	53B1					EV1	
		Event 1 sub-setting	13B2	53B2					EV1	
		Event 2 main setting	13B3	53B3					EV2	
		Event 2 sub-setting	13B4	53B4					EV2	
		Event 3 main setting	13B5	53B5					EV3	
		Event 3 sub-setting	13B6	53B6					EV3	
		Event 4 main setting	13B7	53B7					EV4	
		Event 4 sub-setting	13B8	53B8					EV4	
		Event 5 main setting	13B9	53B9					EV5	
		Event 5 sub-setting	13BA	53BA					EV5	
		Event 6 main setting	13BB	53BB					EV6	
		Event 6 sub-setting	13BC	53BC					EV6	
		Event 7 main setting	13BD	53BD					EV7	
		Event 7 sub-setting	13BE	53BE					EV7	
		Event 8 main setting	13BF	53BF					EV8	
		Event 8 sub-setting	13C0	53C0					EV8	
		Proportional band	13C1	53C1					1	
		Integral time	13C2	53C2					PID1	
		Derivative time	13C3	53C3					PID1	
		Output low limit	13C4	53C4					1	
		Output high limit	13C5	53C5					1	
		Manual reset	13C6	53C6					1	
		Proportional band for cool side	13C7	53C7					1	
		Integration time for cool side	13C8	53C8					PID1	
		Derivative time for cool side	13C9	53C9					PID1	
		Output low limit for cool side	13CA	53CA					1	
		Output high limit for cool side	13CB	53CB					1	
		Initial output of PID control	13CC	53CC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP6	LSP	13D0	53D0					LP1	
		Event 1 main setting	13D1	53D1					EV1	
		Event 1 sub-setting	13D2	53D2					EV1	
		Event 2 main setting	13D3	53D3					EV2	
		Event 2 sub-setting	13D4	53D4					EV2	
		Event 3 main setting	13D5	53D5					EV3	
		Event 3 sub-setting	13D6	53D6					EV3	
		Event 4 main setting	13D7	53D7					EV4	
		Event 4 sub-setting	13D8	53D8					EV4	
		Event 5 main setting	13D9	53D9					EV5	
		Event 5 sub-setting	13DA	53DA					EV5	
		Event 6 main setting	13DB	53DB					EV6	
		Event 6 sub-setting	13DC	53DC					EV6	
		Event 7 main setting	13DD	53DD					EV7	
		Event 7 sub-setting	13DE	53DE					EV7	
		Event 8 main setting	13DF	53DF					EV8	
		Event 8 sub-setting	13E0	53E0					EV8	
		Proportional band	13E1	53E1					1	
		Integral time	13E2	53E2					PID1	
		Derivative time	13E3	53E3					PID1	
		Output low limit	13E4	53E4					1	
		Output high limit	13E5	53E5					1	
		Manual reset	13E6	53E6					1	
		Proportional band for cool side	13E7	53E7					1	
		Integration time for cool side	13E8	53E8					PID1	
		Derivative time for cool side	13E9	53E9					PID1	
		Output low limit for cool side	13EA	53EA					1	
		Output high limit for cool side	13EB	53EB					1	
		Initial output of PID contro	13EC	53EC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP7	LSP	13F0	53F0					LP1	
		Event 1 main setting	13F1	53F1					EV1	
		Event 1 sub-setting	13F2	53F2					EV1	
		Event 2 main setting	13F3	53F3					EV2	
		Event 2 sub-setting	13F4	53F4					EV2	
		Event 3 main setting	13F5	53F5					EV3	
		Event 3 sub-setting	13F6	53F6					EV3	
		Event 4 main setting	13F7	53F7					EV4	
		Event 4 sub-setting	13F8	53F8					EV4	
		Event 5 main setting	13F9	53F9					EV5	
		Event 5 sub-setting	13FA	53FA					EV5	
		Event 6 main setting	13FB	53FB					EV6	
		Event 6 sub-setting	13FC	53FC					EV6	
		Event 7 main setting	13FD	53FD					EV7	
		Event 7 sub-setting	13FE	53FE					EV7	
		Event 8 main setting	13FF	53FF					EV8	
		Event 8 sub-setting	1400	5400					EV8	
		Proportional band	1401	5401					1	
		Integral time	1402	5402					PID1	
		Derivative time	1403	5403					PID1	
		Output low limit	1404	5404					1	
		Output high limit	1405	5405					1	
		Manual reset	1406	5406					1	
		Proportional band for cool side	1407	5407					1	
		Integration time for cool side	1408	5408					PID1	
		Derivative time for cool side	1409	5409					PID1	
		Output low limit for cool side	140A	540A					1	
		Output high limit for cool side	140B	540B					1	
		nitial output of PID control	140C	540C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP8	LSP	1410	5410					LP1	
		Event 1 main setting	1411	5411					EV1	
		Event 1 sub-setting	1412	5412					EV1	
		Event 2 main setting	1413	5413					EV2	
		Event 2 sub-setting	1414	5414					EV2	
		Event 3 main setting	1415	5415					EV3	
		Event 3 sub-setting	1416	5416					EV3	
		Event 4 main setting	1417	5417					EV4	
		Event 4 sub-setting	1418	5418					EV4	
		Event 5 main setting	1419	5419					EV5	
		Event 5 sub-setting	141A	541A					EV5	
		Event 6 main setting	141B	541B					EV6	
		Event 6 sub-setting	141C	541C					EV6	
		Event 7 main setting	141D	541D					EV7	
		Event 7 sub-setting	141E	541E					EV7	
		Event 8 main setting	141F	541F					EV8	
		Event 8 sub-setting	1420	5420					EV8	
		Proportional band	1421	5421					1	
		Integral time	1422	5422					PID1	
		Derivative time	1423	5423					PID1	
		Output low limit	1424	5424					1	
		Output high limit	1425	5425					1	
		Manual reset	1426	5426					1	
		Proportional band for cool side	1427	5427					1	
		Integration time for cool side	1428	5428					PID1	
		Derivative time for cool side	1429	5429					PID1	
		Output low limit for cool side	142A	542A					1	
		Output high limit for cool side	142B	542B					1	
		Initial output of PID control	142C	542C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Loop 1 recipe	SP9	LSP	1430	5430					LP1	
		Event 1 main setting	1431	5431					EV1	
		Event 1 sub-setting	1432	5432					EV1	
		Event 2 main setting	1433	5433					EV2	
		Event 2 sub-setting	1434	5434					EV2	
		Event 3 main setting	1435	5435					EV3	
		Event 3 sub-setting	1436	5436					EV3	
		Event 4 main setting	1437	5437					EV4	
		Event 4 sub-setting	1438	5438					EV4	
		Event 5 main setting	1439	5439					EV5	
		Event 5 sub-setting	143A	543A					EV5	
		Event 6 main setting	143B	543B					EV6	
		Event 6 sub-setting	143C	543C					EV6	
		Event 7 main setting	143D	543D					EV7	
		Event 7 sub-setting	143E	543E					EV7	
		Event 8 main setting	143F	543F					EV8	
		Event 8 sub-setting	1440	5440					EV8	
		Proportional band	1441	5441					1	
		Integral time	1442	5442					PID1	
		Derivative time	1443	5443					PID1	
		Output low limit	1444	5444					1	
		Output high limit	1445	5445					1	
		Manual reset	1446	5446					1	
		Proportional band for cool side	1447	5447					1	
		Integration time for cool side	1448	5448					PID1	
		Derivative time for cool side	1449	5449					PID1	
		Output low limit for cool side	144A	544A					1	
		Output high limit for cool side	144B	544B					1	
		Initial output of PID control	144C	544C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Loop 1 recipe	SP10	LSP	1450	5450					LP1	
		Event 1 main setting	1451	5451					EV1	
		Event 1 sub-setting	1452	5452					EV1	
		Event 2 main setting	1453	5453					EV2	
		Event 2 sub-setting	1454	5454					EV2	
		Event 3 main setting	1455	5455					EV3	
		Event 3 sub-setting	1456	5456					EV3	
		Event 4 main setting	1457	5457					EV4	
		Event 4 sub-setting	1458	5458					EV4	
		Event 5 main setting	1459	5459					EV5	
		Event 5 sub-setting	145A	545A					EV5	
		Event 6 main setting	145B	545B					EV6	
		Event 6 sub-setting	145C	545C					EV6	
		Event 7 main setting	145D	545D					EV7	
		Event 7 sub-setting	145E	545E					EV7	
		Event 8 main setting	145F	545F					EV8	
		Event 8 sub-setting	1460	5460					EV8	
		Proportional band	1461	5461					1	
		Integral time	1462	5462					PID1	
		Derivative time	1463	5463					PID1	
		Output low limit	1464	5464					1	
		Output high limit	1465	5465					1	
		Manual reset	1466	5466					1	
		Proportional band for cool side	1467	5467					1	
		Integration time for cool side	1468	5468					PID1	
		Derivative time for cool side	1469	5469					PID1	
		Output low limit for cool side	146A	546A					1	
		Output high limit for cool side	146B	546B					1	
		Initial output of PID control	146C	546C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 ecipe	SP11	LSP	1470	5470					LP1	
		Event 1 main setting	1471	5471					EV1	
		Event 1 sub-setting	1472	5472					EV1	
		Event 2 main setting	1473	5473					EV2	
		Event 2 sub-setting	1474	5474					EV2	
		Event 3 main setting	1475	5475					EV3	
		Event 3 sub-setting	1476	5476					EV3	
		Event 4 main setting	1477	5477					EV4	
		Event 4 sub-setting	1478	5478					EV4	
		Event 5 main setting	1479	5479					EV5	
		Event 5 sub-setting	147A	547A					EV5	
		Event 6 main setting	147B	547B					EV6	
		Event 6 sub-setting	147C	547C					EV6	
		Event 7 main setting	147D	547D					EV7	
		Event 7 sub-setting	147E	547E					EV7	
		Event 8 main setting	147F	547F					EV8	
		Event 8 sub-setting	1480	5480					EV8	
		Proportional band	1481	5481					1	
		Integral time	1482	5482					PID1	
		Derivative time	1483	5483					PID1	
		Output low limit	1484	5484					1	
		Output high limit	1485	5485					1	
		Manual reset	1486	5486					1	
		Proportional band for cool side	1487	5487					1	
		Integration time for cool side	1488	5488					PID1	
		Derivative time for cool side	1489	5489					PID1	
		Output low limit for cool side	148A	548A					1	
		Output high limit for cool side	148B	548B					1	
		Initial output of PID control	148C	548C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP12	LSP	1490	5490					LP1	
		Event 1 main setting	1491	5491					EV1	
		Event 1 sub-setting	1492	5492					EV1	
		Event 2 main setting	1493	5493					EV2	
		Event 2 sub-setting	1494	5494					EV2	
		Event 3 main setting	1495	5495					EV3	
		Event 3 sub-setting	1496	5496					EV3	
		Event 4 main setting	1497	5497					EV4	
		Event 4 sub-setting	1498	5498					EV4	
		Event 5 main setting	1499	5499					EV5	
		Event 5 sub-setting	149A	549A					EV5	
		Event 6 main setting	149B	549B					EV6	
		Event 6 sub-setting	149C	549C					EV6	
		Event 7 main setting	149D	549D					EV7	
		Event 7 sub-setting	149E	549E					EV7	
		Event 8 main setting	149F	549F					EV8	
		Event 8 sub-setting	14A0	54A0					EV8	
		Proportional band	14A1	54A1					1	
		Integral time	14A2	54A2					PID1	
		Derivative time	14A3	54A3					PID1	
		Output low limit	14A4	54A4					1	
		Output high limit	14A5	54A5					1	
		Manual reset	14A6	54A6					1	
		Proportional band for cool side	14A7	54A7					1	
		Integration time for cool side	14A8	54A8					PID1	
		Derivative time for cool side	14A9	54A9					PID1	
		Output low limit for cool side	14AA	54AA					1	
		Output high limit for cool side	14AB	54AB					1	
		Initial output of PID control	14AC	54AC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP13	LSP	14B0	54B0					LP1	
		Event 1 main setting	14B1	54B1					EV1	
		Event 1 sub-setting	14B2	54B2					EV1	
		Event 2 main setting	14B3	54B3					EV2	
		Event 2 sub-setting	14B4	54B4					EV2	
		Event 3 main setting	14B5	54B5					EV3	
		Event 3 sub-setting	14B6	54B6					EV3	
		Event 4 main setting	14B7	54B7					EV4	
		Event 4 sub-setting	14B8	54B8					EV4	
		Event 5 main setting	14B9	54B9					EV5	
		Event 5 sub-setting	14BA	54BA					EV5	
		Event 6 main setting	14BB	54BB					EV6	
		Event 6 sub-setting	14BC	54BC					EV6	
		Event 7 main setting	14BD	54BD					EV7	
		Event 7 sub-setting	14BE	54BE					EV7	
		Event 8 main setting	14BF	54BF					EV8	
		Event 8 sub-setting	14C0	54C0					EV8	
		Proportional band	14C1	54C1					1	
		Integral time	14C2	54C2					PID1	
		Derivative time	14C3	54C3					PID1	
		Output low limit	14C4	54C4					1	
		Output high limit	14C5	54C5					1	
		Manual reset	14C6	54C6					1	
		Proportional band for cool side	14C7	54C7					1	
		Integration time for cool side	14C8	54C8					PID1	
		Derivative time for cool side	14C9	54C9					PID1	
		Output low limit for cool side	14CA	54CA					1	
		Output high limit for cool side	14CB	54CB					1	
		Initial output of PID control	14CC	54CC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP14	LSP	14D0	54D0					LP1	
		Event 1 main setting	14D1	54D1					EV1	
		Event 1 sub-setting	14D2	54D2					EV1	
		Event 2 main setting	14D3	54D3					EV2	
		Event 2 sub-setting	14D4	54D4					EV2	
		Event 3 main setting	14D5	54D5					EV3	
		Event 3 sub-setting	14D6	54D6					EV3	
		Event 4 main setting	14D7	54D7					EV4	
		Event 4 sub-setting	14D8	54D8					EV4	
		Event 5 main setting	14D9	54D9					EV5	
		Event 5 sub-setting	14DA	54DA					EV5	
		Event 6 main setting	14DB	54DB					EV6	
		Event 6 sub-setting	14DC	54DC					EV6	
		Event 7 main setting	14DD	54DD					EV7	
		Event 7 sub-setting	14DE	54DE					EV7	
		Event 8 main setting	14DF	54DF					EV8	
		Event 8 sub-setting	14E0	54E0					EV8	
		Proportional band	14E1	54E1					1	
		Integral time	14E2	54E2					PID1	
		Derivative time	14E3	54E3					PID1	
		Output low limit	14E4	54E4					1	
		Output high limit	14E5	54E5					1	
		Manual reset	14E6	54E6					1	
		Proportional band for cool side	14E7	54E7					1	
		Integration time for cool side	14E8	54E8					PID1	
		Derivative time for cool side	14E9	54E9					PID1	
		Output low limit for cool side	14EA	54EA					1	
		Output high limit for cool side	14EB	54EB					1	
		Initial output of PID control	14EC	54EC					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP15	LSP	14F0	54F0					LP1	
		Event 1 main setting	14F1	54F1					EV1	
		Event 1 sub-setting	14F2	54F2					EV1	
		Event 2 main setting	14F3	54F3					EV2	
		Event 2 sub-setting	14F4	54F4					EV2	
		Event 3 main setting	14F5	54F5					EV3	
		Event 3 sub-setting	14F6	54F6					EV3	
		Event 4 main setting	14F7	54F7					EV4	
		Event 4 sub-setting	14F8	54F8					EV4	
		Event 5 main setting	14F9	54F9					EV5	
		Event 5 sub-setting	14FA	54FA					EV5	
		Event 6 main setting	14FB	54FB					EV6	
		Event 6 sub-setting	14FC	54FC					EV6	
		Event 7 main setting	14FD	54FD					EV7	
		Event 7 sub-setting	14FE	54FE					EV7	
		Event 8 main setting	14FF	54FF					EV8	
		Event 8 sub-setting	1500	5500					EV8	
		Proportional band	1501	5501					1	
		Integral time	1502	5502					PID1	
		Derivative time	1503	5503					PID1	
		Output low limit	1504	5504					1	
		Output high limit	1505	5505					1	
		Manual reset	1506	5506					1	
		Proportional band for cool side	1507	5507					1	
		Integration time for cool side	1508	5508					PID1	
		Derivative time for cool side	1509	5509					PID1	
		Output low limit for cool side	150A	550A					1	
		Output high limit for cool side	150B	550B					1	
		Initial output of PID control	150C	550C					1	

Loop 1 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 recipe	SP16	LSP	1510	5510					LP1	
		Event 1 main setting	1511	5511					EV1	
		Event 1 sub-setting	1512	5512					EV1	
		Event 2 main setting	1513	5513					EV2	
		Event 2 sub-setting	1514	5514					EV2	
		Event 3 main setting	1515	5515					EV3	
		Event 3 sub-setting	1516	5516					EV3	
		Event 4 main setting	1517	5517					EV4	
		Event 4 sub-setting	1518	5518					EV4	
		Event 5 main setting	1519	5519					EV5	
		Event 5 sub-setting	151A	551A					EV5	
		Event 6 main setting	151B	551B					EV6	
		Event 6 sub-setting	151C	551C					EV6	
		Event 7 main setting	151D	551D					EV7	
		Event 7 sub-setting	151E	551E					EV7	
		Event 8 main setting	151F	551F					EV8	
		Event 8 sub-setting	1520	5520					EV8	
		Proportional band	1521	5521					1	
		Integral time	1522	5522					PID1	
		Derivative time	1523	5523					PID1	
		Output low limit	1524	5524					1	
		Output high limit	1525	5525					1	
		Manual reset	1526	5526					1	
		Proportional band for cool side	1527	5527					1	
		Integration time for cool side	1528	5528					PID1	
		Derivative time for cool side	1529	5529					PID1	
		Output low limit for cool side	152A	552A					1	
		Output high limit for cool side	152B	552B					1	
		Initial output of PID control	152C	552C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP1	LSP	1530	5530					LP2	
		Event 9 main setting	1531	5531					EV9	
		Event 9 sub-setting	1532	5532					EV9	
		Event 10 main setting	1533	5533					EV10	
		Event 10 sub-setting	1534	5534					EV10	
		Event 11 main setting	1535	5535					EV11	
		Event 11 sub-setting	1536	5536					EV11	
		Event 12 main setting	1537	5537					EV12	
		Event 12 sub-setting	1538	5538					EV12	
		Event 13 main setting	1539	5539					EV13	
		Event 13 sub-setting	153A	553A					EV13	
		Event 14 main setting	153B	553B					EV14	
		Event 14 sub-setting	153C	553C					EV14	
		Event 15 main setting	153D	553D					EV15	
		Event 15 sub-setting	153E	553E					EV15	
		Event 16 main setting	153F	553F					EV16	
		Event 16 sub-setting	1540	5540					EV16	
		Proportional band	1541	5541					1	
		Integral time	1542	5542					PID2	
		Derivative time	1543	5543					PID2	
		Output low limit	1544	5544					1	
		Output high limit	1545	5545					1	
		Manual reset	1546	5546					1	
		Proportional band for cool side	1547	5547					1	
		Integration time for cool side	1548	5548					PID2	
		Derivative time for cool side	1549	5549					PID2	
		Output low limit for cool side	154A	554A					1	
		Output high limit for cool side	154B	554B					1	
		Initial output of PID control	154C	554C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP2	LSP	1550	5550					LP2	
		Event 9 main setting	1551	5551					EV9	
		Event 9 sub-setting	1552	5552					EV9	
		Event 10 main setting	1553	5553					EV10	
		Event 10 sub-setting	1554	5554					EV10	
		Event 11 main setting	1555	5555					EV11	
		Event 11 sub-setting	1556	5556					EV11	
		Event 12 main setting	1557	5557					EV12	
		Event 12 sub-setting	1558	5558					EV12	
		Event 13 main setting	1559	5559					EV13	
		Event 13 sub-setting	155A	555A					EV13	
		Event 14 main setting	155B	555B					EV14	
		Event 14 sub-setting	155C	555C					EV14	
		Event 15 main setting	155D	555D					EV15	
		Event 15 sub-setting	155E	555E					EV15	
		Event 16 main setting	155F	555F					EV16	
		Event 16 sub-setting	1560	5560					EV16	
		Proportional band	1561	5561					1	
		Integral time	1562	5562					PID2	
		Derivative time	1563	5563					PID2	
		Output low limit	1564	5564					1	
		Output high limit	1565	5565					1	
		Manual reset	1566	5566					1	
		Proportional band for cool side	1567	5567					1	
		Integration time for cool side	1568	5568					PID2	
		Derivative time for cool side	1569	5569					PID2	
		Output low limit for cool side	156A	556A					1	
		Output high limit for cool side	156B	556B					1	
		Initial output of PID control	156C	556C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP3	LSP	1570	5570					LP2	
		Event 9 main setting	1571	5571					EV9	
		Event 9 sub-setting	1572	5572					EV9	
		Event 10 main setting	1573	5573					EV10	
		Event 10 sub-setting	1574	5574					EV10	
		Event 11 main setting	1575	5575					EV11	
		Event 11 sub-setting	1576	5576					EV11	
		Event 12 main setting	1577	5577					EV12	
		Event 12 sub-setting	1578	5578					EV12	
		Event 13 main setting	1579	5579					EV13	
		Event 13 sub-setting	157A	557A					EV13	
		Event 14 main setting	157B	557B					EV14	
		Event 14 sub-setting	157C	557C					EV14	
		Event 15 main setting	157D	557D					EV15	
		Event 15 sub-setting	157E	557E					EV15	
		Event 16 main setting	157F	557F					EV16	
		Event 16 sub-setting	1580	5580					EV16	
		Proportional band	1581	5581					1	
		Integral time	1582	5582					PID2	
		Derivative time	1583	5583					PID2	
		Output low limit	1584	5584					1	
		Output high limit	1585	5585					1	
		Manual reset	1586	5586					1	
		Proportional band for cool side	1587	5587					1	
		Integration time for cool side	1588	5588					PID2	
		Derivative time for cool side	1589	5589					PID2	
		Output low limit for cool side	158A	558A					1	
		Output high limit for cool side	158B	558B					1	
		Initial output of PID control	158C	558C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2	SP4	LSP	1590	5590					LP2	
ecipe		Event 9 main setting	1591	5591					EV9	
		Event 9 sub-setting	1592	5592					EV9	
		Event 10 main setting	1593	5593					EV10	
		Event 10 sub-setting	1594	5594					EV10	
		Event 11 main setting	1595	5595					EV11	
		Event 11 sub-setting	1596	5596					EV11	
		Event 12 main setting	1597	5597					EV12	
		Event 12 sub-setting	1598	5598					EV12	
		Event 13 main setting	1599	5599					EV13	
		Event 13 sub-setting	159A	559A					EV13	
		Event 14 main setting	159B	559B					EV14	
		Event 14 sub-setting	159C	559C					EV14	
		Event 15 main setting	159D	559D					EV15	
		Event 15 sub-setting	159E	559E					EV15	
		Event 16 main setting	159F	559F					EV16	
		Event 16 sub-setting	15A0	55A0					EV16	
		Proportional band	15A1	55A1					1	
		Integral time	15A2	55A2					PID2	
		Derivative time	15A3	55A3					PID2	
		Output low limit	15A4	55A4					1	
		Output high limit	15A5	55A5					1	
		Manual reset	15A6	55A6					1	
		Proportional band for cool side	15A7	55A7					1	
		Integration time for cool side	15A8	55A8					PID2	
		Derivative time for cool side	15A9	55A9					PID2	
		Output low limit for cool side	15AA	55AA					1	
		Output high limit for cool side	15AB	55AB					1	
		Initial output of PID control	15AC	55AC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP5	LSP	15B0	55B0					LP2	
		Event 9 main setting	15B1	55B1					EV9	
		Event 9 sub-setting	15B2	55B2					EV9	
		Event 10 main setting	15B3	55B3					EV10	
		Event 10 sub-setting	15B4	55B4					EV10	
		Event 11 main setting	15B5	55B5					EV11	
		Event 11 sub-setting	15B6	55B6					EV11	
		Event 12 main setting	15B7	55B7					EV12	
		Event 12 sub-setting	15B8	55B8					EV12	
		Event 13 main setting	15B9	55B9					EV13	
		Event 13 sub-setting	15BA	55BA					EV13	
		Event 14 main setting	15BB	55BB					EV14	
		Event 14 sub-setting	15BC	55BC					EV14	
		Event 15 main setting	15BD	55BD					EV15	
		Event 15 sub-setting	15BE	55BE					EV15	
		Event 16 main setting	15BF	55BF					EV16	
		Event 16 sub-setting	15C0	55C0					EV16	
		Proportional band	15C1	55C1					1	
		Integral time	15C2	55C2					PID2	
		Derivative time	15C3	55C3					PID2	
		Output low limit	15C4	55C4					1	
		Output high limit	15C5	55C5					1	
		Manual reset	15C6	55C6					1	
		Proportional band for cool side	15C7	55C7					1	
		Integration time for cool side	15C8	55C8					PID2	
		Derivative time for cool side	15C9	55C9					PID2	
		Output low limit for cool side	15CA	55CA					1	
		Output high limit for cool side	15CB	55CB					1	
		Initial output of PID control	15CC	55CC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP6	LSP	15D0	55D0					LP2	
		Event 9 main setting	15D1	55D1					EV9	
		Event 9 sub-setting	15D2	55D2					EV9	
		Event 10 main setting	15D3	55D3					EV10	
		Event 10 sub-setting	15D4	55D4					EV10	
		Event 11 main setting	15D5	55D5					EV11	
		Event 11 sub-setting	15D6	55D6					EV11	
		Event 12 main setting	15D7	55D7					EV12	
		Event 12 sub-setting	15D8	55D8					EV12	
		Event 13 main setting	15D9	55D9					EV13	
		Event 13 sub-setting	15DA	55DA					EV13	
		Event 14 main setting	15DB	55DB					EV14	
		Event 14 sub-setting	15DC	55DC					EV14	
		Event 15 main setting	15DD	55DD					EV15	
		Event 15 sub-setting	15DE	55DE					EV15	
		Event 16 main setting	15DF	55DF					EV16	
		Event 16 sub-setting	15E0	55E0					EV16	
		Proportional band	15E1	55E1					1	
		Integral time	15E2	55E2					PID2	
		Derivative time	15E3	55E3					PID2	
		Output low limit	15E4	55E4					1	
		Output high limit	15E5	55E5					1	
		Manual reset	15E6	55E6					1	
		Proportional band for cool side	15E7	55E7					1	
		Integration time for cool side	15E8	55E8					PID2	
		Derivative time for cool side	15E9	55E9					PID2	
		Output low limit for cool side	15EA	55EA					1	
		Output high limit for cool side	15EB	55EB					1	
		Initial output of PID control	15EC	55EC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP7	LSP	15F0	55F0					LP2	
		Event 9 main setting	15F1	55F1					EV9	
		Event 9 sub-setting	15F2	55F2					EV9	
		Event 10 main setting	15F3	55F3					EV10	
		Event 10 sub-setting	15F4	55F4					EV10	
		Event 11 main setting	15F5	55F5					EV11	
		Event 11 sub-setting	15F6	55F6					EV11	
		Event 12 main setting	15F7	55F7					EV12	
		Event 12 sub-setting	15F8	55F8					EV12	
		Event 13 main setting	15F9	55F9					EV13	
		Event 13 sub-setting	15FA	55FA					EV13	
		Event 14 main setting	15FB	55FB					EV14	
		Event 14 sub-setting	15FC	55FC					EV14	
		Event 15 main setting	15FD	55FD					EV15	
		Event 15 sub-setting	15FE	55FE					EV15	
		Event 16 main setting	15FF	55FF					EV16	
		Event 16 sub-setting	1600	5600					EV16	
		Proportional band	1601	5601					1	
		Integral time	1602	5602					PID2	
		Derivative time	1603	5603					PID2	
		Output low limit	1604	5604					1	
		Output high limit	1605	5605					1	
		Manual reset	1606	5606					1	
		Proportional band for cool side	1607	5607					1	
		Integration time for cool side	1608	5608					PID2	
		Derivative time for cool side	1609	5609					PID2	
		Output low limit for cool side	160A	560A					1	
		Output high limit for cool side	160B	560B					1	
		Initial output of PID control	160C	560C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP8	LSP	1610	5610					LP2	
		Event 9 main setting	1611	5611					EV9	
		Event 9 sub-setting	1612	5612					EV9	
		Event 10 main setting	1613	5613					EV10	
		Event 10 sub-setting	1614	5614					EV10	
		Event 11 main setting	1615	5615					EV11	
		Event 11 sub-setting	1616	5616					EV11	
		Event 12 main setting	1617	5617					EV12	
		Event 12 sub-setting	1618	5618					EV12	
		Event 13 main setting	1619	5619					EV13	
		Event 13 sub-setting	161A	561A					EV13	
		Event 14 main setting	161B	561B					EV14	
		Event 14 sub-setting	161C	561C					EV14	
		Event 15 main setting	161D	561D					EV15	
		Event 15 sub-setting	161E	561E					EV15	
		Event 16 main setting	161F	561F					EV16	
		Event 16 sub-setting	1620	5620					EV16	
		Proportional band	1621	5621					1	
		Integral time	1622	5622					PID2	
		Derivative time	1623	5623					PID2	
		Output low limit	1624	5624					1	
		Output high limit	1625	5625					1	
		Manual reset	1626	5626					1	
		Proportional band for cool side	1627	5627					1	
		Integration time for cool side	1628	5628					PID2	
		Derivative time for cool side	1629	5629					PID2	
		Output low limit for cool side	162A	562A					1	
		Output high limit for cool side	162B	562B					1	
		Initial output of PID control	162C	562C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP9	LSP	1630	5630					LP2	
		Event 9 main setting	1631	5631					EV9	
		Event 9 sub-setting	1632	5632					EV9	
		Event 10 main setting	1633	5633					EV10	
		Event 10 sub-setting	1634	5634					EV10	
		Event 11 main setting	1635	5635					EV11	
		Event 11 sub-setting	1636	5636					EV11	
		Event 12 main setting	1637	5637					EV12	
		Event 12 sub-setting	1638	5638					EV12	
		Event 13 main setting	1639	5639					EV13	
		Event 13 sub-setting	163A	563A					EV13	
		Event 14 main setting	163B	563B					EV14	
		Event 14 sub-setting	163C	563C					EV14	
		Event 15 main setting	163D	563D					EV15	
		Event 15 sub-setting	163E	563E					EV15	
		Event 16 main setting	163F	563F					EV16	
		Event 16 sub-setting	1640	5640					EV16	
		Proportional band	1641	5641					1	
		Integral time	1642	5642					PID2	
		Derivative time	1643	5643					PID2	
		Output low limit	1644	5644					1	
		Output high limit	1645	5645					1	
		Manual reset	1646	5646					1	
		Proportional band for cool side	1647	5647					1	
		Integration time for cool side	1648	5648					PID2	
		Derivative time for cool side	1649	5649					PID2	
		Output low limit for cool side	164A	564A					1	
		Output high limit for cool side	164B	564B					1	
		Initial output of PID control	164C	564C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP10	LSP	1650	5650					LP2	
		Event 9 main setting	1651	5651					EV9	
		Event 9 sub-setting	1652	5652					EV9	
		Event 10 main setting	1653	5653					EV10	
		Event 10 sub-setting	1654	5654					EV10	
		Event 11 main setting	1655	5655					EV11	
		Event 11 sub-setting	1656	5656					EV11	
		Event 12 main setting	1657	5657					EV12	
		Event 12 sub-setting	1658	5658					EV12	
		Event 13 main setting	1659	5659					EV13	
		Event 13 sub-setting	165A	565A					EV13	
		Event 14 main setting	165B	565B					EV14	
		Event 14 sub-setting	165C	565C					EV14	
		Event 15 main setting	165D	565D					EV15	
		Event 15 sub-setting	165E	565E					EV15	
		Event 16 main setting	165F	565F					EV16	
		Event 16 sub-setting	1660	5660					EV16	
		Proportional band	1661	5661					1	
		Integral time	1662	5662					PID2	
		Derivative time	1663	5663					PID2	
		Output low limit	1664	5664					1	
		Output high limit	1665	5665					1	
		Manual reset	1666	5666					1	
		Proportional band for cool side	1667	5667					1	
		Integration time for cool side	1668	5668					PID2	
		Derivative time for cool side	1669	5669					PID2	
		Output low limit for cool side	166A	566A					1	
		Output high limit for cool side	166B	566B					1	
		Initial output of PID control	166C	566C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP11	LSP	1670	5670					LP2	
		Event 9 main setting	1671	5671					EV9	
		Event 9 sub-setting	1672	5672					EV9	
		Event 10 main setting	1673	5673					EV10	
		Event 10 sub-setting	1674	5674					EV10	
		Event 11 main setting	1675	5675					EV11	
		Event 11 sub-setting	1676	5676					EV11	
		Event 12 main setting	1677	5677					EV12	
		Event 12 sub-setting	1678	5678					EV12	
		Event 13 main setting	1679	5679					EV13	
		Event 13 sub-setting	167A	567A					EV13	
		Event 14 main setting	167B	567B					EV14	
		Event 14 sub-setting	167C	567C					EV14	
		Event 15 main setting	167D	567D					EV15	
		Event 15 sub-setting	167E	567E					EV15	
		Event 16 main setting	167F	567F					EV16	
		Event 16 sub-setting	1680	5680					EV16	
		Proportional band	1681	5681					1	
		Integral time	1682	5682					PID2	
		Derivative time	1683	5683					PID2	
		Output low limit	1684	5684					1	
		Output high limit	1685	5685					1	
		Manual reset	1686	5686					1	
		Proportional band for cool side	1687	5687					1	
		Integration time for cool side	1688	5688					PID2	
		Derivative time for cool side	1689	5689					PID2	
		Output low limit for cool side	168A	568A					1	
		Output high limit for cool side	168B	568B					1	
		Initial output of PID control	168C	568C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Loop 2 recipe	SP12	LSP	1690	5690					LP2	
		Event 9 main setting	1691	5691					EV9	
		Event 9 sub-setting	1692	5692					EV9	
		Event 10 main setting	1693	5693					EV10	
		Event 10 sub-setting	1694	5694					EV10	
		Event 11 main setting	1695	5695					EV11	
		Event 11 sub-setting	1696	5696					EV11	
		Event 12 main setting	1697	5697					EV12	
		Event 12 sub-setting	1698	5698					EV12	
		Event 13 main setting	1699	5699					EV13	
		Event 13 sub-setting	169A	569A					EV13	
		Event 14 main setting	169B	569B					EV14	
		Event 14 sub-setting	169C	569C					EV14	
		Event 15 main setting	169D	569D					EV15	
		Event 15 sub-setting	169E	569E					EV15	
		Event 16 main setting	169F	569F					EV16	
		Event 16 sub-setting	16A0	56A0					EV16	
		Proportional band	16A1	56A1					1	
		Integral time	16A2	56A2					PID2	
		Derivative time	16A3	56A3					PID2	
		Output low limit	16A4	56A4					1	
		Output high limit	16A5	56A5					1	
		Manual reset	16A6	56A6					1	
		Proportional band for cool side	16A7	56A7					1	
		Integration time for cool side	16A8	56A8					PID2	
		Derivative time for cool side	16A9	56A9					PID2	
		Output low limit for cool side	16AA	56AA					1	
		Output high limit for cool side	16AB	56AB					1	
		Initial output of PID control	16AC	56AC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP13	LSP	16B0	56B0					LP2	
		Event 9 main setting	16B1	56B1					EV9	
		Event 9 sub-setting	16B2	56B2					EV9	
		Event 10 main setting	16B3	56B3					EV10	
		Event 10 sub-setting	16B4	56B4					EV10	
		Event 11 main setting	16B5	56B5					EV11	
		Event 11 sub-setting	16B6	56B6					EV11	
		Event 12 main setting	16B7	56B7					EV12	
		Event 12 sub-setting	16B8	56B8					EV12	
		Event 13 main setting	16B9	56B9					EV13	
		Event 13 sub-setting	16BA	56BA					EV13	
		Event 14 main setting	16BB	56BB					EV14	
		Event 14 sub-setting	16BC	56BC					EV14	
		Event 15 main setting	16BD	56BD					EV15	
		Event 15 sub-setting	16BE	56BE					EV15	
		Event 16 main setting	16BF	56BF					EV16	
		Event 16 sub-setting	16C0	56C0					EV16	
		Proportional band	16C1	56C1					1	
		Integral time	16C2	56C2					PID2	
		Derivative time	16C3	56C3					PID2	
		Output low limit	16C4	56C4					1	
		Output high limit	16C5	56C5					1	
		Manual reset	16C6	56C6					1	
		Proportional band for cool side	16C7	56C7					1	
		Integration time for cool side	16C8	56C8					PID2	
		Derivative time for cool side	16C9	56C9					PID2	
		Output low limit for cool side	16CA	56CA					1	
		Output high limit for cool side	16CB	56CB					1	
		Initial output of PID control	16CC	56CC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP14	LSP	16D0	56D0					LP2	
		Event 9 main setting	16D1	56D1					EV9	
		Event 9 sub-setting	16D2	56D2					EV9	
		Event 10 main setting	16D3	56D3					EV10	
		Event 10 sub-setting	16D4	56D4					EV10	
		Event 11 main setting	16D5	56D5					EV11	
		Event 11 sub-setting	16D6	56D6					EV11	
		Event 12 main setting	16D7	56D7					EV12	
		Event 12 sub-setting	16D8	56D8					EV12	
		Event 13 main setting	16D9	56D9					EV13	
		Event 13 sub-setting	16DA	56DA					EV13	
		Event 14 main setting	16DB	56DB					EV14	
		Event 14 sub-setting	16DC	56DC					EV14	
		Event 15 main setting	16DD	56DD					EV15	
		Event 15 sub-setting	16DE	56DE					EV15	
		Event 16 main setting	16DF	56DF					EV16	
		Event 16 sub-setting	16E0	56E0					EV16	
		Proportional band	16E1	56E1					1	
		Integral time	16E2	56E2					PID2	
		Derivative time	16E3	56E3					PID2	
		Output low limit	16E4	56E4					1	
		Output high limit	16E5	56E5					1	
		Manual reset	16E6	56E6					1	
		Proportional band for cool side	16E7	56E7					1	
		Integration time for cool side	16E8	56E8					PID2	
		Derivative time for cool side	16E9	56E9					PID2	
		Output low limit for cool side	16EA	56EA					1	
		Output high limit for cool side	16EB	56EB					1	
		Initial output of PID control	16EC	56EC					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP15	LSP	16F0	56F0					LP2	
		Event 9 main setting	16F1	56F1					EV9	
		Event 9 sub-setting	16F2	56F2					EV9	
		Event 10 main setting	16F3	56F3					EV10	
		Event 10 sub-setting	16F4	56F4					EV10	
		Event 11 main setting	16F5	56F5					EV11	
		Event 11 sub-setting	16F6	56F6					EV11	
		Event 12 main setting	16F7	56F7					EV12	
		Event 12 sub-setting	16F8	56F8					EV12	
		Event 13 main setting	16F9	56F9					EV13	
		Event 13 sub-setting	16FA	56FA					EV13	
		Event 14 main setting	16FB	56FB					EV14	
		Event 14 sub-setting	16FC	56FC					EV14	
		Event 15 main setting	16FD	56FD					EV15	
		Event 15 sub-setting	16FE	56FE					EV15	
		Event 16 main setting	16FF	56FF					EV16	
		Event 16 sub-setting	1700	5700					EV16	
		Proportional band	1701	5701					1	
		Integral time	1702	5702					PID2	
		Derivative time	1703	5703					PID2	
		Output low limit	1704	5704					1	
		Output high limit	1705	5705					1	
		Manual reset	1706	5706					1	
		Proportional band for cool side	1707	5707					1	
		Integration time for cool side	1708	5708					PID2	
		Derivative time for cool side	1709	5709					PID2	
		Output low limit for cool side	170A	570A					1	
		Output high limit for cool side	170B	570B					1	
		Initial output of PID control	170C	570C					1	

Loop 2 recipe

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 recipe	SP16	LSP	1710	5710					LP2	
		Event 9 main setting	1711	5711					EV9	
		Event 9 sub-setting	1712	5712					EV9	
		Event 10 main setting	1713	5713					EV10	
		Event 10 sub-setting	1714	5714					EV10	
		Event 11 main setting	1715	5715					EV11	
		Event 11 sub-setting	1716	5716					EV11	
		Event 12 main setting	1717	5717					EV12	
		Event 12 sub-setting	1718	5718					EV12	
		Event 13 main setting	1719	5719					EV13	
		Event 13 sub-setting	171A	571A					EV13	
		Event 14 main setting	171B	571B					EV14	
		Event 14 sub-setting	171C	571C					EV14	
		Event 15 main setting	171D	571D					EV15	
		Event 15 sub-setting	171E	571E					EV15	
		Event 16 main setting	171F	571F					EV16	
		Event 16 sub-setting	1720	5720					EV16	
		Proportional band	1721	5721					1	
		Integral time	1722	5722					PID2	
		Derivative time	1723	5723					PID2	
		Output low limit	1724	5724					1	
		Output high limit	1725	5725					1	
		Manual reset	1726	5726					1	
		Proportional band for cool side	1727	5727					1	
		Integration time for cool side	1728	5728					PID2	
		Derivative time for cool side	1729	5729					PID2	
		Output low limit for cool side	172A	572A					1	
		Output high limit for cool side	172B	572B					1	
		Initial output of PID control	172C	572C					1	

Mode

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Mode	Loop 1	RUN/READY	1B30	5B30		□		□	–	0:RUN 1:READY
		AUTO/MANUAL	1B31	5B31		□		□	–	0:AUTO 1:MANUAL
		AT stop/start	1B32	5B32		□		□	–	0:AT stop 1:AT start
		LSP/RSP	1B33	5B33		□		□	–	0:LSP 1:RSP
		Backup/through output	1B34	5B34		□		□	–	0:Backup 1:Through output
	Loop 2	RUN/READY	1B40	5B40		□		□	–	0:RUN 1:READY
		AUTO/MANUAL	1B41	5B41		□		□	–	0:AUTO 1:MANUAL
		AT stop/start	1B42	5B42		□		□	–	0:AT stop 1:AT start
		LSP/RSP	1B43	5B43		□		□	–	0:LSP 1:RSP
		Backup/through output	1B44	5B44		□		□	–	0:Backup 1:Through output

Loop 1 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 PID	PID1	Proportional band	1B70	5B70					1	
		Integral time	1B71	5B71					PID1	
		Derivative time	1B72	5B72					PID1	
		Output low limit	1B73	5B73					1	
		Output high limit	1B74	5B74					1	
		Manual reset	1B75	5B75					1	
		Proportional band for cool side	1B76	5B76					1	
		Integration time for cool side	1B77	5B77					PID1	
		Derivative time for cool side	1B78	5B78					PID1	
		Output low limit for cool side	1B79	5B79					1	
		Output high limit for cool side	1B7A	5B7A					1	
	PID2	Proportional band	1B80	5B80					1	
		Integral time	1B81	5B81					PID1	
		Derivative time	1B82	5B82					PID1	
		Output low limit	1B83	5B83					1	
		Output high limit	1B84	5B84					1	
		Manual reset	1B85	5B85					1	
		Proportional band for cool side	1B86	5B86					1	
		Integration time for cool side	1B87	5B87					PID1	
		Derivative time for cool side	1B88	5B88					PID1	
		Output low limit for cool side	1B89	5B89					1	
		Output high limit for cool side	1B8A	5B8A					1	
	PID3	Proportional band	1B90	5B90					1	
		Integral time	1B91	5B91					PID1	
		Derivative time	1B92	5B92					PID1	
		Output low limit	1B93	5B93					1	
		Output high limit	1B94	5B94					1	
		Manual reset	1B95	5B95					1	
		Proportional band for cool side	1B96	5B96					1	
		Integration time for cool side	1B97	5B97					PID1	
		Derivative time for cool side	1B98	5B98					PID1	
		Output low limit for cool side	1B99	5B99					1	
		Output high limit for cool side	1B9A	5B9A					1	
	PID4	Proportional band	1BA0	5BA0					1	
		Integral time	1BA1	5BA1					PID1	
		Derivative time	1BA2	5BA2					PID1	
		Output low limit	1BA3	5BA3					1	
		Output high limit	1BA4	5BA4					1	
		Manual reset	1BA5	5BA5					1	
		Proportional band for cool side	1BA6	5BA6					1	
		Integration time for cool side	1BA7	5BA7					PID1	
		Derivative time for cool side	1BA8	5BA8					PID1	
		Output low limit for cool side	1BA9	5BA9					1	
		Output high limit for cool side	1BAA	5BAA					1	

Loop 1 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 PID	PID5	Proportional band	1BB0	5BB0					1	
		Integral time	1BB1	5BB1					PID1	
		Derivative time	1BB2	5BB2					PID1	
		Output low limit	1BB3	5BB3					1	
		Output high limit	1BB4	5BB4					1	
		Manual reset	1BB5	5BB5					1	
		Proportional band for cool side	1BB6	5BB6					1	
		Integration time for cool side	1BB7	5BB7					PID1	
		Derivative time for cool side	1BB8	5BB8					PID1	
		Output low limit for cool side	1BB9	5BB9					1	
		Output high limit for cool side	1BBA	5BBA					1	
	PID6	Proportional band	1BC0	5BC0					1	
		Integral time	1BC1	5BC1					PID1	
		Derivative time	1BC2	5BC2					PID1	
		Output low limit	1BC3	5BC3					1	
		Output high limit	1BC4	5BC4					1	
		Manual reset	1BC5	5BC5					1	
		Proportional band for cool side	1BC6	5BC6					1	
		Integration time for cool side	1BC7	5BC7					PID1	
		Derivative time for cool side	1BC8	5BC8					PID1	
		Output low limit for cool side	1BC9	5BC9					1	
		Output high limit for cool side	1BCA	5BCA					1	
	PID7	Proportional band	1BD0	5BD0					1	
		Integral time	1BD1	5BD1					PID1	
		Derivative time	1BD2	5BD2					PID1	
		Output low limit	1BD3	5BD3					1	
		Output high limit	1BD4	5BD4					1	
		Manual reset	1BD5	5BD5					1	
		Proportional band for cool side	1BD6	5BD6					1	
		Integration time for cool side	1BD7	5BD7					PID1	
		Derivative time for cool side	1BD8	5BD8					PID1	
		Output low limit for cool side	1BD9	5BD9					1	
		Output high limit for cool side	1BDA	5BDA					1	
	PID8	Proportional band	1BE0	5BE0					1	
		Integral time	1BE1	5BE1					PID1	
		Derivative time	1BE2	5BE2					PID1	
		Output low limit	1BE3	5BE3					1	
		Output high limit	1BE4	5BE4					1	
		Manual reset	1BE5	5BE5					1	
		Proportional band for cool side	1BE6	5BE6					1	
		Integration time for cool side	1BE7	5BE7					PID1	
		Derivative time for cool side	1BE8	5BE8					PID1	
		Output low limit for cool side	1BE9	5BE9					1	
		Output high limit for cool side	1BEA	5BEA					1	

Loop 1 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 PID	PID9	Proportional band	1BF0	5BF0					1	
		Integral time	1BF1	5BF1					PID1	
		Derivative time	1BF2	5BF2					PID1	
		Output low limit	1BF3	5BF3					1	
		Output high limit	1BF4	5BF4					1	
		Manual reset	1BF5	5BF5					1	
		Proportional band for cool side	1BF6	5BF6					1	
		Integration time for cool side	1BF7	5BF7					PID1	
		Derivative time for cool side	1BF8	5BF8					PID1	
		Output low limit for cool side	1BF9	5BF9					1	
		Output high limit for cool side	1BFA	5BFA					1	
	PID10	Proportional band	1C00	5C00					1	
		Integral time	1C01	5C01					PID1	
		Derivative time	1C02	5C02					PID1	
		Output low limit	1C03	5C03					1	
		Output high limit	1C04	5C04					1	
		Manual reset	1C05	5C05					1	
		Proportional band for cool side	1C06	5C06					1	
		Integration time for cool side	1C07	5C07					PID1	
		Derivative time for cool side	1C08	5C08					PID1	
		Output low limit for cool side	1C09	5C09					1	
		Output high limit for cool side	1C0A	5C0A					1	
	PID11	Proportional band	1C10	5C10					1	
		Integral time	1C11	5C11					PID1	
		Derivative time	1C12	5C12					PID1	
		Output low limit	1C13	5C13					1	
		Output high limit	1C14	5C14					1	
		Manual reset	1C15	5C15					1	
		Proportional band for cool side	1C16	5C16					1	
		Integration time for cool side	1C17	5C17					PID1	
		Derivative time for cool side	1C18	5C18					PID1	
		Output low limit for cool side	1C19	5C19					1	
		Output high limit for cool side	1C1A	5C1A					1	
	PID12	Proportional band	1C20	5C20					1	
		Integral time	1C21	5C21					PID1	
		Derivative time	1C22	5C22					PID1	
		Output low limit	1C23	5C23					1	
		Output high limit	1C24	5C24					1	
		Manual reset	1C25	5C25					1	
		Proportional band for cool side	1C26	5C26					1	
		Integration time for cool side	1C27	5C27					PID1	
		Derivative time for cool side	1C28	5C28					PID1	
		Output low limit for cool side	1C29	5C29					1	
		Output high limit for cool side	1C2A	5C2A					1	

Loop 1 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 1 PID	PID13	Proportional band	1C30	5C30					1	
		Integral time	1C31	5C31					PID1	
		Derivative time	1C32	5C32					PID1	
		Output low limit	1C33	5C33					1	
		Output high limit	1C34	5C34					1	
		Manual reset	1C35	5C35					1	
		Proportional band for cool side	1C36	5C36					1	
		Integration time for cool side	1C37	5C37					PID1	
		Derivative time for cool side	1C38	5C38					PID1	
		Output low limit for cool side	1C39	5C39					1	
		Output high limit for cool side	1C3A	5C3A					1	
	PID14	Proportional band	1C40	5C40					1	
		Integral time	1C41	5C41					PID1	
		Derivative time	1C42	5C42					PID1	
		Output low limit	1C43	5C43					1	
		Output high limit	1C44	5C44					1	
		Manual reset	1C45	5C45					1	
		Proportional band for cool side	1C46	5C46					1	
		Integration time for cool side	1C47	5C47					PID1	
		Derivative time for cool side	1C48	5C48					PID1	
		Output low limit for cool side	1C49	5C49					1	
		Output high limit for cool side	1C4A	5C4A					1	
	PID15	Proportional band	1C50	5C50					1	
		Integral time	1C51	5C51					PID1	
		Derivative time	1C52	5C52					PID1	
		Output low limit	1C53	5C53					1	
		Output high limit	1C54	5C54					1	
		Manual reset	1C55	5C55					1	
		Proportional band for cool side	1C56	5C56					1	
		Integration time for cool side	1C57	5C57					PID1	
		Derivative time for cool side	1C58	5C58					PID1	
		Output low limit for cool side	1C59	5C59					1	
		Output high limit for cool side	1C5A	5C5A					1	
	PID16	Proportional band	1C60	5C60					1	
		Integral time	1C61	5C61					PID1	
		Derivative time	1C62	5C62					PID1	
		Output low limit	1C63	5C63					1	
		Output high limit	1C64	5C64					1	
		Manual reset	1C65	5C65					1	
		Proportional band for cool side	1C66	5C66					1	
		Integration time for cool side	1C67	5C67					PID1	
		Derivative time for cool side	1C68	5C68					PID1	
		Output low limit for cool side	1C69	5C69					1	
		Output high limit for cool side	1C6A	5C6A					1	

Loop 2 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2	PID1	Proportional band	1C70	5C70					1	
PID		Integral time	1C71	5C71					PID2	
		Derivative time	1C72	5C72					PID2	
		Output low limit	1C73	5C73					1	
		Output high limit	1C74	5C74					1	
		Manual reset	1C75	5C75					1	
		Proportional band for cool side	1C76	5C76					1	
		Integration time for cool side	1C77	5C77					PID2	
		Derivative time for cool side	1C78	5C78					PID2	
		Output low limit for cool side	1C79	5C79					1	
		Output high limit for cool side	1C7A	5C7A					1	
	PID2	Proportional band	1C80	5C80					1	
		Integral time	1C81	5C81					PID2	
		Derivative time	1C82	5C82					PID2	
		Output low limit	1C83	5C83					1	
		Output high limit	1C84	5C84					1	
		Manual reset	1C85	5C85					1	
		Proportional band for cool side	1C86	5C86					1	
		Integration time for cool side	1C87	5C87					PID2	
		Derivative time for cool side	1C88	5C88					PID2	
		Output low limit for cool side	1C89	5C89					1	
		Output high limit for cool side	1C8A	5C8A					1	
	PID3	Proportional band	1C90	5C90					1	
		Integral time	1C91	5C91					PID2	
		Derivative time	1C92	5C92					PID2	
		Output low limit	1C93	5C93					1	
		Output high limit	1C94	5C94					1	
		Manual reset	1C95	5C95					1	
		Proportional band for cool side	1C96	5C96					1	
		Integration time for cool side	1C97	5C97					PID2	
		Derivative time for cool side	1C98	5C98					PID2	
		Output low limit for cool side	1C99	5C99					1	
		Output high limit for cool side	1C9A	5C9A					1	
	PID4	Proportional band	1CA0	5CA0					1	
		Integral time	1CA1	5CA1					PID2	
		Derivative time	1CA2	5CA2					PID2	
		Output low limit	1CA3	5CA3					1	
		Output high limit	1CA4	5CA4					1	
		Manual reset	1CA5	5CA5					1	
		Proportional band for cool side	1CA6	5CA6					1	
		Integration time for cool side	1CA7	5CA7					PID2	
		Derivative time for cool side	1CA8	5CA8					PID2	
		Output low limit for cool side	1CA9	5CA9					1	
		Output high limit for cool side	1CAA	5CAA					1	

Loop 2 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 PID	PID5	Proportional band	1CB0	5CB0					1	
		Integral time	1CB1	5CB1					PID2	
		Derivative time	1CB2	5CB2					PID2	
		Output low limit	1CB3	5CB3					1	
		Output high limit	1CB4	5CB4					1	
		Manual reset	1CB5	5CB5					1	
		Proportional band for cool side	1CB6	5CB6					1	
		Integration time for cool side	1CB7	5CB7					PID2	
		Derivative time for cool side	1CB8	5CB8					PID2	
		Output low limit for cool side	1CB9	5CB9					1	
		Output high limit for cool side	1CBA	5CBA					1	
	PID6	Proportional band	1CC0	5CC0					1	
		Integral time	1CC1	5CC1					PID2	
		Derivative time	1CC2	5CC2					PID2	
		Output low limit	1CC3	5CC3					1	
		Output high limit	1CC4	5CC4					1	
		Manual reset	1CC5	5CC5					1	
		Proportional band for cool side	1CC6	5CC6					1	
		Integration time for cool side	1CC7	5CC7					PID2	
		Derivative time for cool side	1CC8	5CC8					PID2	
		Output low limit for cool side	1CC9	5CC9					1	
		Output high limit for cool side	1CCA	5CCA					1	
	PID7	Proportional band	1CD0	5CD0					1	
		Integral time	1CD1	5CD1					PID2	
		Derivative time	1CD2	5CD2					PID2	
		Output low limit	1CD3	5CD3					1	
		Output high limit	1CD4	5CD4					1	
		Manual reset	1CD5	5CD5					1	
		Proportional band for cool side	1CD6	5CD6					1	
		Integration time for cool side	1CD7	5CD7					PID2	
		Derivative time for cool side	1CD8	5CD8					PID2	
		Output low limit for cool side	1CD9	5CD9					1	
		Output high limit for cool side	1CDA	5CDA					1	
	PID8	Proportional band	1CE0	5CE0					1	
		Integral time	1CE1	5CE1					PID2	
		Derivative time	1CE2	5CE2					PID2	
		Output low limit	1CE3	5CE3					1	
		Output high limit	1CE4	5CE4					1	
		Manual reset	1CE5	5CE5					1	
		Proportional band for cool side	1CE6	5CE6					1	
		Integration time for cool side	1CE7	5CE7					PID2	
		Derivative time for cool side	1CE8	5CE8					PID2	
		Output low limit for cool side	1CE9	5CE9					1	
		Output high limit for cool side	1CEA	5CEA					1	

Loop 2 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2 PID	PID9	Proportional band	1CF0	5CF0					1	
		Integral time	1CF1	5CF1					PID2	
		Derivative time	1CF2	5CF2					PID2	
		Output low limit	1CF3	5CF3					1	
		Output high limit	1CF4	5CF4					1	
		Manual reset	1CF5	5CF5					1	
		Proportional band for cool side	1CF6	5CF6					1	
		Integration time for cool side	1CF7	5CF7					PID2	
		Derivative time for cool side	1CF8	5CF8					PID2	
		Output low limit for cool side	1CF9	5CF9					1	
		Output high limit for cool side	1CFA	5CFA					1	
	PID10	Proportional band	1D00	5D00					1	
		Integral time	1D01	5D01					PID2	
		Derivative time	1D02	5D02					PID2	
		Output low limit	1D03	5D03					1	
		Output high limit	1D04	5D04					1	
		Manual reset	1D05	5D05					1	
		Proportional band for cool side	1D06	5D06					1	
		Integration time for cool side	1D07	5D07					PID2	
		Derivative time for cool side	1D08	5D08					PID2	
		Output low limit for cool side	1D09	5D09					1	
		Output high limit for cool side	1D0A	5D0A					1	
	PID11	Proportional band	1D10	5D10					1	
		Integral time	1D11	5D11					PID2	
		Derivative time	1D12	5D12					PID2	
		Output low limit	1D13	5D13					1	
		Output high limit	1D14	5D14					1	
		Manual reset	1D15	5D15					1	
		Proportional band for cool side	1D16	5D16					1	
		Integration time for cool side	1D17	5D17					PID2	
		Derivative time for cool side	1D18	5D18					PID2	
		Output low limit for cool side	1D19	5D19					1	
		Output high limit for cool side	1D1A	5D1A					1	
	PID12	Proportional band	1D20	5D20					1	
		Integral time	1D21	5D21					PID2	
		Derivative time	1D22	5D22					PID2	
		Output low limit	1D23	5D23					1	
		Output high limit	1D24	5D24					1	
		Manual reset	1D25	5D25					1	
		Proportional band for cool side	1D26	5D26					1	
		Integration time for cool side	1D27	5D27					PID2	
		Derivative time for cool side	1D28	5D28					PID2	
		Output low limit for cool side	1D29	5D29					1	
		Output high limit for cool side	1D2A	5D2A					1	

Loop 2 PID

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Loop 2	PID13	Proportional band	1D30	5D30					1	
PID		Integral time	1D31	5D31					PID2	
		Derivative time	1D32	5D32					PID2	
		Output low limit	1D33	5D33					1	
		Output high limit	1D34	5D34					1	
		Manual reset	1D35	5D35					1	
		Proportional band for cool side	1D36	5D36					1	
		ntegration time for cool side	1D37	5D37					PID2	
		Derivative time for cool side	1D38	5D38					PID2	
		Output low limit for cool side	1D39	5D39					1	
		Output high limit for cool side	1D3A	5D3A					1	
	PID14	Proportional band	1D40	5D40					1	
		Integral time	1D41	5D41					PID2	
		Derivative time	1D42	5D42					PID2	
		Output low limit	1D43	5D43					1	
		Output high limit	1D44	5D44					1	
		Manual reset	1D45	5D45					1	
		Proportional band for cool side	1D46	5D46					1	
		Integration time for cool side	1D47	5D47					PID2	
		Derivative time for cool side	1D48	5D48					PID2	
		Output low limit for cool side	1D49	5D49					1	
		Output high limit for cool side	1D4A	5D4A					1	
	PID15	Proportional band	1D50	5D50					1	
		Integral time	1D51	5D51					PID2	
		Derivative time	1D52	5D52					PID2	
		Output low limit	1D53	5D53					1	
		Output high limit	1D54	5D54					1	
		Manual reset	1D55	5D55					1	
		Proportional band for cool side	1D56	5D56					1	
		Integration time for cool side	1D57	5D57					PID2	
		Derivative time for cool side	1D58	5D58					PID2	
		Output low limit for cool side	1D59	5D59					1	
		Output high limit for cool side	1D5A	5D5A					1	
	PID16	Proportional band	1D60	5D60					1	
		Integral time	1D61	5D61					PID2	
		Derivative time	1D62	5D62					PID2	
		Output low limit	1D63	5D63					1	
		Output high limit	1D64	5D64					1	
		Manual reset	1D65	5D65					1	
		Proportional band for cool side	1D66	5D66					1	
		Integration time for cool side	1D67	5D67					PID2	
		Derivative time for cool side	1D68	5D68					PID2	
		Output low limit for cool side	1D69	5D69					1	
		Output high limit for cool side	1D6A	5D6A					1	

Control

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Control	Loop 1	Loop PV/SP decimal point position	1F70	5F70					–	
		(Reserved for future extension.)	1F71	5F71	×	×	×	×	–	
		Control action	1F72	5F72					–	
		Control algorithm	1F73	5F73					–	
		Control range low limit	1F74	5F74					LP1	
		Control range high limit	1F75	5F75					LP1	
		AT type	1F76	5F76					–	
		Heat/cool control dead zone	1F77	5F77					1	
		Initial output of PID control	1F78	5F78					1	
		Abnormal PV definition	1F79	5F79					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
	Loop 2	Loop PV/SP decimal point position	1F80	5F80					–	
		(Reserved for future use.)	1F81	5F81	×	×	×	×	–	
		Control action	1F82	5F82					–	
		Control algorithm	1F83	5F83					–	
		Control range low limit	1F84	5F84					LP2	
		Control range high limit	1F85	5F85					LP2	
		AT type	1F86	5F86					–	
		Heat/cool control dead zone	1F87	5F87					1	
		Initial output of PID control	1F88	5F88					1	
		Abnormal PV definition	1F89	5F89					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
	Loop 1	PID control initialization	1FB0	5FB0					–	
		Integration time/derivative time decimal point position	1FB1	5FB1					–	
		Output operation at changing Auto/Manual	1FB2	5FB2					–	
		Preset MANUAL value	1FB3	5FB3					1	
		MV increase change limit	1FB4	5FB4					2	
		MV decrease change limit	1FB5	5FB5					2	
		Heat/cool selection	1FB6	5FB6					–	
		MV low limit at AT	1FB7	5FB7					1	
		MV high limit at AT	1FB8	5FB8					1	
		(Reserved for future use.)	1FB9	5FB9	×	×	×	×	–	
		(Reserved for future use.)	1FBA	5FBA	×	×	×	×	–	
		Zone action selection	1FBB	5FBB					–	
		Zone 1	1FBC	5FBC					LP1	
		Zone 2	1FBD	5FBD					LP1	
		Zone 3	1FBE	5FBE					LP1	
		Zone 4	1FBF	5FBF					LP1	
		Zone 5	1FC0	5FC0					LP1	
		Zone 6	1FC1	5FC1					LP1	
		Zone 7	1FC2	5FC2					LP1	
		Zone hysteresis	1FC3	5FC3					LP1	
		(Reserved for future use.)	1FC4	5FC4	×	×	×	×	–	

Control

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Control	Loop 2	PID control initialization	1FD0	5FD0					–	
		Integration time/derivative time decimal point position	1FD1	5FD1					–	
		Output operation at changing Auto/Manual	1FD2	5FD2					–	
		Preset MANUAL value	1FD3	5FD3					1	
		MV increase change limit	1FD4	5FD4					2	
		MV decrease change limit	1FD5	5FD5					2	
		Heat/cool selection	1FD6	5FD6					–	
		MV low limit at AT	1FD7	5FD7					1	
		MV high limit at AT	1FD8	5FD8					1	
		(Reserved for future use.)	1FD9	5FD9	×	×	×	×	–	
		(Reserved for future use.)	1FDA	5FDA	×	×	×	×	–	
		Zone action selection	1FDB	5FDB					–	
		Zone 1	1FDC	5FDC					LP2	
		Zone 2	1FDD	5FDD					LP2	
		Zone 3	1FDE	5FDE					LP2	
		Zone 4	1FDF	5FDF					LP2	
		Zone 5	1FE0	5FE0					LP2	
		Zone 6	1FE1	5FE1					LP2	
		Zone 7	1FE2	5FE2					LP2	
		Zone hysteresis	1FE3	5FE3					LP2	
		(Reserved for future use.)	1FE4	5FE4	×	×	×	×	–	
	Loop 1	PV assignment	29D0	69D0					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		RSP assignment	29D1	69D1					–	
		RMV assignment	29D2	69D2					–	
	Loop 2	PV assignment	29E0	69E0					–	
		RSP assignment	29E1	69E1					–	
		RMV assignment	29E2	69E2					–	

MV

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
MV	Loop 1	Output at READY	20B0	60B0					1	
		Output at READY (Heat)	20B1	60B1					1	
		Output at READY (Cool)	20B2	60B2					1	
		Output operation at PV alarm	20B3	60B3					–	
		Output at PV alarm	20B4	60B4					1	
		Fixed value output 1	20B5	60B5					1	
		Fixed value output 2	20B6	60B6					1	
		Fixed value output 3	20B7	60B7					1	
		Fixed value output 4	20B8	60B8					1	
		Fixed value output 5	20B9	60B9					1	
		Fixed value output 6	20BA	60BA					1	
		Fixed value output 7	20BB	60BB					1	
		Fixed value output 8	20BC	60BC					1	
	Loop 2	Output at READY	20C0	60C0					1	
		Output at READY (Heat)	20C1	60C1					1	
		Output at READY (Cool)	20C2	60C2					1	
		Output operation at PV alarm	20C3	60C3					–	
		Output at PV alarm	20C4	60C4					1	
		Fixed value output 1	20C5	60C5					1	
		Fixed value output 2	20C6	60C6					1	
		Fixed value output 3	20C7	60C7					1	
		Fixed value output 4	20C8	60C8					1	
		Fixed value output 5	20C9	60C9					1	
		Fixed value output 6	20CA	60CA					1	
		Fixed value output 7	20CB	60CB					1	
		Fixed value output 8	20CC	60CC					1	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization table	Linearization 1	Breakpoint decimal point position	20F0	60F0					–	
		Breakpoint A1	20F1	60F1					Linearization 1	
		Breakpoint A2	20F2	60F2					Linearization 1	
		Breakpoint A3	20F3	60F3					Linearization 1	
		Breakpoint A4	20F4	60F4					Linearization 1	
		Breakpoint A5	20F5	60F5					Linearization 1	
		Breakpoint A6	20F6	60F6					Linearization 1	
		Breakpoint A7	20F7	60F7					Linearization 1	
		Breakpoint A8	20F8	60F8					Linearization 1	
		Breakpoint A9	20F9	60F9					Linearization 1	
		Breakpoint A10	20FA	60FA					Linearization 1	
		Breakpoint A11	20FB	60FB					Linearization 1	
		Breakpoint A12	20FC	60FC					Linearization 1	
		Breakpoint A13	20FD	60FD					Linearization 1	
		Breakpoint A14	20FE	60FE					Linearization 1	
		Breakpoint A15	20FF	60FF					Linearization 1	
		Breakpoint A16	2100	6100					Linearization 1	
		Breakpoint A17	2101	6101					Linearization 1	
		Breakpoint A18	2102	6102					Linearization 1	
		Breakpoint A19	2103	6103					Linearization 1	
		Breakpoint A20	2104	6104					Linearization 1	
		Breakpoint B1	2105	6105					Linearization 1	
		Breakpoint B2	2106	6106					Linearization 1	
		Breakpoint B3	2107	6107					Linearization 1	
		Breakpoint B4	2108	6108					Linearization 1	
		Breakpoint B5	2109	6109					Linearization 1	
		Breakpoint B6	210A	610A					Linearization 1	
		Breakpoint B7	210B	610B					Linearization 1	
		Breakpoint B8	210C	610C					Linearization 1	
		Breakpoint B9	210D	610D					Linearization 1	
		Breakpoint B10	210E	610E					Linearization 1	
		Breakpoint B11	210F	610F					Linearization 1	
		Breakpoint B12	2110	6110					Linearization 1	
		Breakpoint B13	2111	6111					Linearization 1	
		Breakpoint B14	2112	6112					Linearization 1	
		Breakpoint B15	2113	6113					Linearization 1	
		Breakpoint B16	2114	6114					Linearization 1	
		Breakpoint B17	2115	6115					Linearization 1	
		Breakpoint B18	2116	6116					Linearization 1	
		Breakpoint B19	2117	6117					Linearization 1	
		Breakpoint B20	2118	6118					Linearization 1	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization	Linearization 2	Breakpoint decimal point position	2120	6120					–	
table		Breakpoint A1	2121	6121					Linearization 2	
		Breakpoint A2	2122	6122					Linearization 2	
		Breakpoint A3	2123	6123					Linearization 2	
		Breakpoint A4	2124	6124					Linearization 2	
		Breakpoint A5	2125	6125					Linearization 2	
		Breakpoint A6	2126	6126					Linearization 2	
		Breakpoint A7	2127	6127					Linearization 2	
		Breakpoint A8	2128	6128					Linearization 2	
		Breakpoint A9	2129	6129					Linearization 2	
		Breakpoint A10	212A	612A					Linearization 2	
		Breakpoint A11	212B	612B					Linearization 2	
		Breakpoint A12	212C	612C					Linearization 2	
		Breakpoint A13	212D	612D					Linearization 2	
		Breakpoint A14	212E	612E					Linearization 2	
		Breakpoint A15	212F	612F					Linearization 2	
		Breakpoint A16	2130	6130					Linearization 2	
		Breakpoint A17	2131	6131					Linearization 2	
		Breakpoint A18	2132	6132					Linearization 2	
		Breakpoint A19	2133	6133					Linearization 2	
		Breakpoint A20	2134	6134					Linearization 2	
		Breakpoint B1	2135	6135					Linearization 2	
		Breakpoint B2	2136	6136					Linearization 2	
		Breakpoint B3	2137	6137					Linearization 2	
		Breakpoint B4	2138	6138					Linearization 2	
		Breakpoint B5	2139	6139					Linearization 2	
		Breakpoint B6	213A	613A					Linearization 2	
		Breakpoint B7	213B	613B					Linearization 2	
		Breakpoint B8	213C	613C					Linearization 2	
		Breakpoint B9	213D	613D					Linearization 2	
		Breakpoint B10	213E	613E					Linearization 2	
		Breakpoint B11	213F	613F					Linearization 2	
		Breakpoint B12	2140	6140					Linearization 2	
		Breakpoint B13	2141	6141					Linearization 2	
		Breakpoint B14	2142	6142					Linearization 2	
		Breakpoint B15	2143	6143					Linearization 2	
t		Breakpoint B16	2144	6144					Linearization 2	
		Breakpoint B17	2145	6145					Linearization 2	
		Breakpoint B18	2146	6146					Linearization 2	
		Breakpoint B19	2147	6147					Linearization 2	
		Breakpoint B20	2148	6148					Linearization 2	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization able	Linearization 3	Breakpoint decimal point position	2150	6150					–	
		Breakpoint A1	2151	6151					Linearization 3	
		Breakpoint A2	2152	6152					Linearization 3	
		Breakpoint A3	2153	6153					Linearization 3	
		Breakpoint A4	2154	6154					Linearization 3	
		Breakpoint A5	2155	6155					Linearization 3	
		Breakpoint A6	2156	6156					Linearization 3	
		Breakpoint A7	2157	6157					Linearization 3	
		Breakpoint A8	2158	6158					Linearization 3	
		Breakpoint A9	2159	6159					Linearization 3	
		Breakpoint A10	215A	615A					Linearization 3	
		Breakpoint A11	215B	615B					Linearization 3	
		Breakpoint A12	215C	615C					Linearization 3	
		Breakpoint A13	215D	615D					Linearization 3	
		Breakpoint A14	215E	615E					Linearization 3	
		Breakpoint A15	215F	615F					Linearization 3	
		Breakpoint A16	2160	6160					Linearization 3	
		Breakpoint A17	2161	6161					Linearization 3	
		Breakpoint A18	2162	6162					Linearization 3	
		Breakpoint A19	2163	6163					Linearization 3	
		Breakpoint A20	2164	6164					Linearization 3	
		Breakpoint B1	2165	6165					Linearization 3	
		Breakpoint B2	2166	6166					Linearization 3	
		Breakpoint B3	2167	6167					Linearization 3	
		Breakpoint B4	2168	6168					Linearization 3	
		Breakpoint B5	2169	6169					Linearization 3	
		Breakpoint B6	216A	616A					Linearization 3	
		Breakpoint B7	216B	616B					Linearization 3	
		Breakpoint B8	216C	616C					Linearization 3	
		Breakpoint B9	216D	616D					Linearization 3	
		Breakpoint B10	216E	616E					Linearization 3	
		Breakpoint B11	216F	616F					Linearization 3	
		Breakpoint B12	2170	6170					Linearization 3	
		Breakpoint B13	2171	6171					Linearization 3	
		Breakpoint B14	2172	6172					Linearization 3	
		Breakpoint B15	2173	6173					Linearization 3	
		Breakpoint B16	2174	6174					Linearization 3	
		Breakpoint B17	2175	6175					Linearization 3	
		Breakpoint B18	2176	6176					Linearization 3	
		Breakpoint B19	2177	6177					Linearization 3	
		Breakpoint B20	2178	6178					Linearization 3	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization table	Linearization 4	Breakpoint decimal point position	2180	6180					–	
		Breakpoint A1	2181	6181					Linearization 4	
		Breakpoint A2	2182	6182					Linearization 4	
		Breakpoint A3	2183	6183					Linearization 4	
		Breakpoint A4	2184	6184					Linearization 4	
		Breakpoint A5	2185	6185					Linearization 4	
		Breakpoint A6	2186	6186					Linearization 4	
		Breakpoint A7	2187	6187					Linearization 4	
		Breakpoint A8	2188	6188					Linearization 4	
		Breakpoint A9	2189	6189					Linearization 4	
		Breakpoint A10	218A	618A					Linearization 4	
		Breakpoint A11	218B	618B					Linearization 4	
		Breakpoint A12	218C	618C					Linearization 4	
		Breakpoint A13	218D	618D					Linearization 4	
		Breakpoint A14	218E	618E					Linearization 4	
		Breakpoint A15	218F	618F					Linearization 4	
		Breakpoint A16	2190	6190					Linearization 4	
		Breakpoint A17	2191	6191					Linearization 4	
		Breakpoint A18	2192	6192					Linearization 4	
		Breakpoint A19	2193	6193					Linearization 4	
		Breakpoint A20	2194	6194					Linearization 4	
		Breakpoint B1	2195	6195					Linearization 4	
		Breakpoint B2	2196	6196					Linearization 4	
		Breakpoint B3	2197	6197					Linearization 4	
		Breakpoint B4	2198	6198					Linearization 4	
		Breakpoint B5	2199	6199					Linearization 4	
		Breakpoint B6	219A	619A					Linearization 4	
		Breakpoint B7	219B	619B					Linearization 4	
		Breakpoint B8	219C	619C					Linearization 4	
		Breakpoint B9	219D	619D					Linearization 4	
		Breakpoint B10	219E	619E					Linearization 4	
		Breakpoint B11	219F	619F					Linearization 4	
		Breakpoint B12	21A0	61A0					Linearization 4	
		Breakpoint B13	21A1	61A1					Linearization 4	
		Breakpoint B14	21A2	61A2					Linearization 4	
		Breakpoint B15	21A3	61A3					Linearization 4	
		Breakpoint B16	21A4	61A4					Linearization 4	
		Breakpoint B17	21A5	61A5					Linearization 4	
		Breakpoint B18	21A6	61A6					Linearization 4	
		Breakpoint B19	21A7	61A7					Linearization 4	
		Breakpoint B20	21A8	61A8					Linearization 4	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization table	Linearization 5	Breakpoint decimal point position	21B0	61B0					–	
		Breakpoint A1	21B1	61B1					Linearization 5	
		Breakpoint A2	21B2	61B2					Linearization 5	
		Breakpoint A3	21B3	61B3					Linearization 5	
		Breakpoint A4	21B4	61B4					Linearization 5	
		Breakpoint A5	21B5	61B5					Linearization 5	
		Breakpoint A6	21B6	61B6					Linearization 5	
		Breakpoint A7	21B7	61B7					Linearization 5	
		Breakpoint A8	21B8	61B8					Linearization 5	
		Breakpoint A9	21B9	61B9					Linearization 5	
		Breakpoint A10	21BA	61BA					Linearization 5	
		Breakpoint A11	21BB	61BB					Linearization 5	
		Breakpoint A12	21BC	61BC					Linearization 5	
		Breakpoint A13	21BD	61BD					Linearization 5	
		Breakpoint A14	21BE	61BE					Linearization 5	
		Breakpoint A15	21BF	61BF					Linearization 5	
		Breakpoint A16	21C0	61C0					Linearization 5	
		Breakpoint A17	21C1	61C1					Linearization 5	
		Breakpoint A18	21C2	61C2					Linearization 5	
		Breakpoint A19	21C3	61C3					Linearization 5	
		Breakpoint A20	21C4	61C4					Linearization 5	
		Breakpoint B1	21C5	61C5					Linearization 5	
		Breakpoint B2	21C6	61C6					Linearization 5	
		Breakpoint B3	21C7	61C7					Linearization 5	
		Breakpoint B4	21C8	61C8					Linearization 5	
		Breakpoint B5	21C9	61C9					Linearization 5	
		Breakpoint B6	21CA	61CA					Linearization 5	
		Breakpoint B7	21CB	61CB					Linearization 5	
		Breakpoint B8	21CC	61CC					Linearization 5	
		Breakpoint B9	21CD	61CD					Linearization 5	
		Breakpoint B10	21CE	61CE					Linearization 5	
		Breakpoint B11	21CF	61CF					Linearization 5	
		Breakpoint B12	21D0	61D0					Linearization 5	
		Breakpoint B13	21D1	61D1					Linearization 5	
		Breakpoint B14	21D2	61D2					Linearization 5	
		Breakpoint B15	21D3	61D3					Linearization 5	
		Breakpoint B16	21D4	61D4					Linearization 5	
		Breakpoint B17	21D5	61D5					Linearization 5	
		Breakpoint B18	21D6	61D6					Linearization 5	
		Breakpoint B19	21D7	61D7					Linearization 5	
		Breakpoint B20	21D8	61D8					Linearization 5	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization table	Linearization 6	Breakpoint decimal point position	21E0	61E0					–	
		Breakpoint A1	21E1	61E1					Linearization 6	
		Breakpoint A2	21E2	61E2					Linearization 6	
		Breakpoint A3	21E3	61E3					Linearization 6	
		Breakpoint A4	21E4	61E4					Linearization 6	
		Breakpoint A5	21E5	61E5					Linearization 6	
		Breakpoint A6	21E6	61E6					Linearization 6	
		Breakpoint A7	21E7	61E7					Linearization 6	
		Breakpoint A8	21E8	61E8					Linearization 6	
		Breakpoint A9	21E9	61E9					Linearization 6	
		Breakpoint A10	21EA	61EA					Linearization 6	
		Breakpoint A11	21EB	61EB					Linearization 6	
		Breakpoint A12	21EC	61EC					Linearization 6	
		Breakpoint A13	21ED	61ED					Linearization 6	
		Breakpoint A14	21EE	61EE					Linearization 6	
		Breakpoint A15	21EF	61EF					Linearization 6	
		Breakpoint A16	21F0	61F0					Linearization 6	
		Breakpoint A17	21F1	61F1					Linearization 6	
		Breakpoint A18	21F2	61F2					Linearization 6	
		Breakpoint A19	21F3	61F3					Linearization 6	
		Breakpoint A20	21F4	61F4					Linearization 6	
		Breakpoint B1	21F5	61F5					Linearization 6	
		Breakpoint B2	21F6	61F6					Linearization 6	
		Breakpoint B3	21F7	61F7					Linearization 6	
		Breakpoint B4	21F8	61F8					Linearization 6	
		Breakpoint B5	21F9	61F9					Linearization 6	
		Breakpoint B6	21FA	61FA					Linearization 6	
		Breakpoint B7	21FB	61FB					Linearization 6	
		Breakpoint B8	21FC	61FC					Linearization 6	
		Breakpoint B9	21FD	61FD					Linearization 6	
		Breakpoint B10	21FE	61FE					Linearization 6	
		Breakpoint B11	21FF	61FF					Linearization 6	
		Breakpoint B12	2200	6200					Linearization 6	
		Breakpoint B13	2201	6201					Linearization 6	
		Breakpoint B14	2202	6202					Linearization 6	
		Breakpoint B15	2203	6203					Linearization 6	
		Breakpoint B16	2204	6204					Linearization 6	
		Breakpoint B17	2205	6205					Linearization 6	
		Breakpoint B18	2206	6206					Linearization 6	
		Breakpoint B19	2207	6207					Linearization 6	
		Breakpoint B20	2208	6208					Linearization 6	

Linearization table

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Linearization table	Linearization 7	Breakpoint decimal point position	2210	6210					–	
		Breakpoint A1	2211	6211					Linearization 7	
		Breakpoint A2	2212	6212					Linearization 7	
		Breakpoint A3	2213	6213					Linearization 7	
		Breakpoint A4	2214	6214					Linearization 7	
		Breakpoint A5	2215	6215					Linearization 7	
		Breakpoint A6	2216	6216					Linearization 7	
		Breakpoint A7	2217	6217					Linearization 7	
		Breakpoint A8	2218	6218					Linearization 7	
		Breakpoint A9	2219	6219					Linearization 7	
		Breakpoint A10	221A	621A					Linearization 7	
		Breakpoint A11	221B	621B					Linearization 7	
		Breakpoint A12	221C	621C					Linearization 7	
		Breakpoint A13	221D	621D					Linearization 7	
		Breakpoint A14	221E	621E					Linearization 7	
		Breakpoint A15	221F	621F					Linearization 7	
		Breakpoint A16	2220	6220					Linearization 7	
		Breakpoint A17	2221	6221					Linearization 7	
		Breakpoint A18	2222	6222					Linearization 7	
		Breakpoint A19	2223	6223					Linearization 7	
		Breakpoint A20	2224	6224					Linearization 7	
		Breakpoint B1	2225	6225					Linearization 7	
		Breakpoint B2	2226	6226					Linearization 7	
		Breakpoint B3	2227	6227					Linearization 7	
		Breakpoint B4	2228	6228					Linearization 7	
		Breakpoint B5	2229	6229					Linearization 7	
		Breakpoint B6	222A	622A					Linearization 7	
		Breakpoint B7	222B	622B					Linearization 7	
		Breakpoint B8	222C	622C					Linearization 7	
		Breakpoint B9	222D	622D					Linearization 7	
		Breakpoint B10	222E	622E					Linearization 7	
		Breakpoint B11	222F	622F					Linearization 7	
		Breakpoint B12	2230	6230					Linearization 7	
		Breakpoint B13	2231	6231					Linearization 7	
		Breakpoint B14	2232	6232					Linearization 7	
		Breakpoint B15	2233	6233					Linearization 7	
		Breakpoint B16	2234	6234					Linearization 7	
		Breakpoint B17	2235	6235					Linearization 7	
		Breakpoint B18	2236	6236					Linearization 7	
		Breakpoint B19	2237	6237					Linearization 7	
		Breakpoint B20	2238	6238					Linearization 7	

Linearization table

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Linearization table	Linearization 8	Breakpoint decimal point position	2240	6240					–	
		Breakpoint A1	2241	6241					Linearization 8	
		Breakpoint A2	2242	6242					Linearization 8	
		Breakpoint A3	2243	6243					Linearization 8	
		Breakpoint A4	2244	6244					Linearization 8	
		Breakpoint A5	2245	6245					Linearization 8	
		Breakpoint A6	2246	6246					Linearization 8	
		Breakpoint A7	2247	6247					Linearization 8	
		Breakpoint A8	2248	6248					Linearization 8	
		Breakpoint A9	2249	6249					Linearization 8	
		Breakpoint A10	224A	624A					Linearization 8	
		Breakpoint A11	224B	624B					Linearization 8	
		Breakpoint A12	224C	624C					Linearization 8	
		Breakpoint A13	224D	624D					Linearization 8	
		Breakpoint A14	224E	624E					Linearization 8	
		Breakpoint A15	224F	624F					Linearization 8	
		Breakpoint A16	2250	6250					Linearization 8	
		Breakpoint A17	2251	6251					Linearization 8	
		Breakpoint A18	2252	6252					Linearization 8	
		Breakpoint A19	2253	6253					Linearization 8	
		Breakpoint A20	2254	6254					Linearization 8	
		Breakpoint B1	2255	6255					Linearization 8	
		Breakpoint B2	2256	6256					Linearization 8	
		Breakpoint B3	2257	6257					Linearization 8	
		Breakpoint B4	2258	6258					Linearization 8	
		Breakpoint B5	2259	6259					Linearization 8	
		Breakpoint B6	225A	625A					Linearization 8	
		Breakpoint B7	225B	625B					Linearization 8	
		Breakpoint B8	225C	625C					Linearization 8	
		Breakpoint B9	225D	625D					Linearization 8	
		Breakpoint B10	225E	625E					Linearization 8	
		Breakpoint B11	225F	625F					Linearization 8	
		Breakpoint B12	2260	6260					Linearization 8	
		Breakpoint B13	2261	6261					Linearization 8	
		Breakpoint B14	2262	6262					Linearization 8	
		Breakpoint B15	2263	6263					Linearization 8	
		Breakpoint B16	2264	6264					Linearization 8	
		Breakpoint B17	2265	6265					Linearization 8	
		Breakpoint B18	2266	6266					Linearization 8	
		Breakpoint B19	2267	6267					Linearization 8	
		Breakpoint B20	2268	6268					Linearization 8	

Setup

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Setup		SP change from operation display	2270	6270					–	Added to version 2.00.
		Use of recipe	2271	6271					–	
		SP system group	2272	6272					–	
		Sampling cycle	2273	6273					–	
		Start delay at power ON	2274	6274					–	
		Operation display screen designation	2275	6275					–	Added to version 2.00.
		Operation display return time	2276	6276					–	
		Power frequency	2277	6277					–	
		Start-up method	2278	6278					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Maximum power failure time for hot start	2279	6279					–	
		Detection of power failure	227A	627A					–	Add to version 2.00.
		Year	228C	628C					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Date	228D	628D					–	
		Time	228E	628E					–	
		Loop type	22B0	62B0					–	
		PC backup type	22B1	62B1					–	
		Release all latches	22B2	62B2					–	
		Display brightness	22C0	62C0					–	

Priority

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Priority	Loop 1	SP group selection	22D0	62D0					–	
		PID group selection	22D1	62D1					–	
		RUN/READY mode selection	22D2	62D2					–	
		AUTO/MANUAL mode selection	22D3	62D3					–	
		LSP/RSP mode selection	22D4	62D4					–	
		Backup/through output selection	22D5	62D5					–	
	Loop 2	SP group selection	22E0	62E0					–	
		PID group selection	22E1	62E1					–	
		RUN/READY mode selection	22E2	62E2					–	
		AUTO/MANUAL mode selection	22E3	62E3					–	
		LSP/RSP mode selection	22E4	62E4					–	
		Backup/through output selection	22E5	62E5					–	Invalid setting
		Release all latches	2310	6310					–	
		OUT Linearization table use group	2311	6311					–	
		Switching the operation display	2312	6312					–	Added to version 2.00.
		Linearization table group for position proportional control	2313	6313					–	

PV

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
PV	PV1	Range type	2340	6340					–	
		Decimal point position	2341	6341					–	
		Temperature unit	2342	6342					–	
		Range low limit	2343	6343					PV1	
		Range high limit	2344	6344					PV1	
		Cold junction compensation	2345	6345					–	
		Zener barrier adjustment	2346	6346					2	
		(Reserved for future use.)	2347	6347	×	×	×	×	–	
		Linear scaling low limit	2348	6348					PV1	
		Linear scaling high limit	2349	6349					PV1	
		Square root extraction dropout	234A	634A					1	
		Filter	234B	634B					2	
		Bias	234C	634C					PV1	
		Ratio	234D	634D					3	
		(Reserved for future use.)	234E	634E	×	×	×	×	–	
		Thermocouple·mV input burnout	234F	634F					–	
		(Reserved for future use.)	2350	6350	×	×	×	×	–	
		(Reserved for future use.)	2351	6351	×	×	×	×	–	
		(Reserved for future use.)	2352	6352	×	×	×	×	–	
		Linearization table group definition	2353	6353					–	
	PV2	Range type	2360	6360					–	
		Decimal point position	2361	6361					–	
		Temperature unit	2362	6362					–	
		Range low limit	2363	6363					PV2	
		Range high limit	2364	6364					PV2	
		Cold junction compensation	2365	6365					–	
		Zener barrier adjustment	2366	6366					2	
		(Reserved for future use.)	2367	6367	×	×	×	×	–	
		Linear scaling low limit	2368	6368					PV2	
		Linear scaling high limit	2369	6369					PV2	
		Square root extraction dropout	236A	636A					1	
		Filter	236B	636B					2	
		Bias	236C	636C					PV2	
		Ratio	236D	636D					3	
		(Reserved for future use.)	236E	636E	×	×	×	×	–	
		Thermocouple·mV input burnout	236F	636F					–	
		(Reserved for future use.)	2370	6370	×	×	×	×	–	
		(Reserved for future use.)	2371	6371	×	×	×	×	–	
		(Reserved for future use.)	2372	6372	×	×	×	×	–	
		Linearization table group definition	2373	6373					–	

PV

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
PV	PV22	Range type	2380	6380					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Decimal point position	2381	6381					–	
		Temperature unit	2382	6382					–	
		Range low limit	2383	6383					PV22	
		Range high limit	2384	6384					PV22	
		Cold junction compensation	2385	6385					–	
		Zener barrier adjustment	2386	6386					2	
		(Reserved for future use.)	2387	6387	×	×	×	×	–	
		Linear scaling low limit	2388	6388					PV22	
		Linear scaling high limit	2389	6389					PV22	
		Square root extraction dropout	238A	638A					1	
		Filter	238B	638B					2	
		Bias	238C	638C					PV22	
		Ratio	238D	638D					3	
		(Reserved for future use.)	238E	638E	×	×	×	×	–	
		Thermocouple·mV input burnout	238F	638F					–	
		(Reserved for future use.)	2390	6390	×	×	×	×	–	
		(Reserved for future use.)	2391	6391	×	×	×	×	–	
		(Reserved for future use.)	2392	6392	×	×	×	×	–	
		Linearization table group definition	2393	6393					–	

Output (continuous output)

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Output (continuous output)	OUT3	Output range	2420	6420					–	
		Output type	2421	6421					–	
		Loop/channel definition	2422	6422					–	
		Output decimal point position	2423	6423					–	
		Output scaling low limit	2424	6424					OUT3	
		Output scaling high limit	2425	6425					OUT3	
		Linearization table group definition	2426	6426					–	
		Supply voltage compensation	2427	6427					–	Added to version 3.00.
	OUT4	Output range	2430	6430					–	
		Output type	2431	6431					–	
		Loop/channel definition	2432	6432					–	
		Output decimal point position	2433	6433					–	
		Output scaling low limit	2434	6434					OUT4	
		Output scaling high limit	2435	6435					OUT4	
		Linearization table group definition	2436	6436					–	
		Supply voltage compensation	2437	6437					–	Added to version 3.00.
	OUT5	Output range	2440	6440					–	
		Output type	2441	6441					–	
		Loop/channel definition	2442	6442					–	
		Output decimal point position	2443	6443					–	
		Output scaling low limit	2444	6444					OUT5	
		Output scaling high limit	2445	6445					OUT5	
		Linearization table group definition	2446	6446					–	
		Supply voltage compensation	2447	6447					–	Added to version 3.00.
	OUT6	Output range	2450	6450					–	
		Output type	2451	6451					–	
		Loop/channel definition	2452	6452					–	
		Output decimal point position	2453	6453					–	
		Output scaling low limit	2454	6454					OUT6	
		Output scaling high limit	2455	6455					OUT6	
		Linearization table group definition	2456	6456					–	
		Supply voltage compensation	2457	6457					–	Added to version 3.00.
	OUT7	Output range	2460	6460					–	
		Output type	2461	6461					–	
		Loop/channel definition	2462	6462					–	
		Output decimal point position	2463	6463					–	
		Output scaling low limit	2464	6464					OUT7	
		Output scaling high limit	2465	6465					OUT7	
		Linearization table group definition	2466	6466					–	
		Supply voltage compensation	2467	6467					–	Added to version 3.00.

Output (ON/OFF output)

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Output (ON/OFF output)	OUT1	Output type	2470	6470					–	
		Latch	2471	6471					–	
		Time proportional cycle mode	2472	6472					–	
		Minimum ON/OFF time	2473	6473					–	
		Time proportional cycle	2474	6474					1	
		Linearization table group definition	2475	6475					–	
		(Reserved for future use.)	2476	6476	×	×	×	×	–	
		Supply voltage compensation	2477	6477					–	Added to version 3.00.
	OUT2	Output type	2480	6480					–	
		Latch	2481	6481					–	
		Time proportional cycle mode	2482	6482					–	
		Minimum ON/OFF time	2483	6483					–	
		Time proportional cycle	2484	6484					1	
		Linearization table group definition	2485	6485					–	
		(Reserved for future use.)	2486	6486	×	×	×	×	–	
		Supply voltage compensation	2487	6487					–	Added to version 3.00.
	OUT3	Output type	2490	6490					–	
		Latch	2491	6491					–	
		Time proportional cycle mode	2492	6492					–	
		Minimum ON/OFF time	2493	6493					–	
		Time proportional cycle	2494	6494					1	
		Linearization table group definition	2495	6495					–	
		(Reserved for future use.)	2496	6496	×	×	×	×	–	
		Supply voltage compensation	2497	6497					–	Added to version 3.00.
	OUT4	Output type	24A0	64A0					–	
		Latch	24A1	64A1					–	
		Time proportional cycle mode	24A2	64A2					–	
		Minimum ON/OFF time	24A3	64A3					–	
		Time proportional cycle	24A4	64A4					1	
		Linearization table group definition	24A5	64A5					–	
		(Reserved for future use.)	24A6	64A6	×	×	×	×	–	
		Supply voltage compensation	24A7	64A7					–	Added to version 3.00.
	OUT5	Output type	24B0	64B0					–	
		Latch	24B1	64B1					–	
		Time proportional cycle mode	24B2	64B2					–	
		Minimum ON/OFF time	24B3	64B3					–	
		Time proportional cycle	24B4	64B4					1	
		Linearization table group definition	24B5	64B5					–	
		(Reserved for future use.)	24B6	64B6	×	×	×	×	–	
		Supply voltage compensation	24B7	64B7					–	Added to version 3.00.

Position proportional

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Position proportional		Output type	24E0	64E0					–	Added to version 2.00.
		Control method selection	24E1	64E1					–	
		Dead zone	24E2	64E2					1	
		Long life	24E3	64E3					–	
		Auto tuning	24E4	64E4					–	
		Fully closed FB value	24E5	64E5					–	
		Fully opened FB value	24E6	64E6					–	
		Full opening time	24E7	64E7					1	
		Loop assignment	24E8	64E8					–	
		Linearization table group definition	24E9	64E9					–	

International contact input

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Internal contact input	Contact 1	Operation type	2500	6500					–	
		Input type	2501	6501					–	
		Loop/channel definition	2502	6502					–	
		Weight	2503	6503					–	
	Contact 2	Operation type	2508	6508					–	
		Input type	2509	6509					–	
		Loop/channel definition	250A	650A					–	
		Weight	250B	650B					–	
	Contact 3	Operation type	2510	6510					–	
		Input type	2511	6511					–	
		Loop/channel definition	2512	6512					–	
		Weight	2513	6513					–	
	Contact 4	Operation type	2518	6518					–	
		Input type	2519	6519					–	
		Loop/channel definition	251A	651A					–	
		Weight	251B	651B					–	
	Contact 5	Operation type	2520	6520					–	
		Input type	2521	6521					–	
		Loop/channel definition	2522	6522					–	
		Weight	2523	6523					–	
	Contact 6	Operation type	2528	6528					–	
		Input type	2529	6529					–	
		Loop/channel definition	252A	652A					–	
		Weight	252B	652B					–	
	Contact 7	Operation type	2530	6530					–	
		Input type	2531	6531					–	
		Loop/channel definition	2532	6532					–	
		Weight	2533	6533					–	
	Contact 8	Operation type	2538	6538					–	
		Input type	2539	6539					–	
		Loop/channel definition	253A	653A					–	
		Weight	253B	653B					–	
	Contact 9	Operation type	2540	6540					–	
		Input type	2541	6541					–	
		Loop/channel definition	2542	6542					–	
		Weight	2543	6543					–	
	Contact 10	Operation type	2548	6548					–	
		Input type	2549	6549					–	
		Loop/channel definition	254A	654A					–	
		Weight	254B	654B					–	
	Contact 11	Operation type	2550	6550					–	
		Input type	2551	6551					–	
		Loop/channel definition	2552	6552					–	
		Weight	2553	6553					–	
	Contact 12	Operation type	2558	6558					–	
		Input type	2559	6559					–	
		Loop/channel definition	255A	655A					–	
		Weight	255B	655B					–	

International contact input

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Internal contact input	Contact 13	Operation type	2560	6560					–	
		Input type	2561	6561					–	
		Loop/channel definition	2562	6562					–	
		Weight	2563	6563					–	
	Contact 14	Operation type	2568	6568					–	
		Input type	2569	6569					–	
		Loop/channel definition	256A	656A					–	
		Weight	256B	656B					–	
	Contact 15	Operation type	2570	6570					–	
		Input type	2571	6571					–	
		Loop/channel definition	2572	6572					–	
		Weight	2573	6573					–	
	Contact 16	Operation type	2578	6578					–	
		Input type	2579	6579					–	
		Loop/channel definition	257A	657A					–	
		Weight	257B	657B					–	
	Contact 17	Operation type	2580	6580					–	
		Input type	2581	6581					–	
		Loop/channel definition	2582	6582					–	
		Weight	2583	6583					–	
	Contact 18	Operation type	2588	6588					–	
		Input type	2589	6589					–	
		Loop/channel definition	258A	658A					–	
		Weight	258B	658B					–	
	Contact 19	Operation type	2590	6590					–	
		Input type	2591	6591					–	
		Loop/channel definition	2592	6592					–	
		Weight	2593	6593					–	
	Contact 20	Operation type	2598	6598					–	
		Input type	2599	6599					–	
		Loop/channel definition	259A	659A					–	
		Weight	259B	659B					–	

Digital output

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Digital output	DO-C1	Output type	25A0	65A0					–	
		Latch	25A1	65A1					–	
	DO-C2	Output type	25A8	65A8					–	
		Latch	25A9	65A9					–	
	DO-C3	Output type	25B0	65B0					–	
		Latch	25B1	65B1					–	
	DO-C4	Output type	25B8	65B8					–	
		Latch	25B9	65B9					–	
	DO-C5	Output type	25C0	65C0					–	
		Latch	25C1	65C1					–	
	DO-C6	Output type	25C8	65C8					–	
		Latch	25C9	65C9					–	
	DO-C7	Output type	25D0	65D0					–	
		Latch	25D1	65D1					–	
	DO-C8	Output type	25D8	65D8					–	
		Latch	25D9	65D9					–	
	DO-E1	Output type	2620	6620					–	
		Latch	2621	6621					–	
	DO-E2	Output type	2628	6628					–	
		Latch	2629	6629					–	
	DO-E3	Output type	2630	6630					–	
		Latch	2631	6631					–	
	DO-E4	Output type	2638	6638					–	
		Latch	2639	6639					–	
	DO-E5	Output type	2640	6640					–	
		Latch	2641	6641					–	
	DO-E6	Output type	2648	6648					–	
		Latch	2649	6649					–	
	DO-E7	Output type	2650	6650					–	
		Latch	2651	6651					–	
	DO-E8	Output type	2658	6658					–	
		Latch	2659	6659					–	

Logical operation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Logical operation	Operation 1	Operation type	2660	6660					–	
		Input assignment A	2661	6661					–	
		Input assignment B	2662	6662					–	
		Input assignment C	2663	6663					–	
		Input assignment D	2664	6664					–	
		Input bit polarity A	2665	6665					–	
		Input bit polarity B	2666	6666					–	
		Input bit polarity C	2667	6667					–	
		Input bit polarity D	2668	6668					–	
		ON delay time	2669	6669					1	
		OFF delay time	266A	666A					1	
		Polarity	266B	666B					–	
		Latch	266C	666C					–	
	Operation 2	Operation type	2670	6670					–	
		Input assignment A	2671	6671					–	
		Input assignment B	2672	6672					–	
		Input assignment C	2673	6673					–	
		Input assignment D	2674	6674					–	
		Input bit polarity A	2675	6675					–	
		Input bit polarity B	2676	6676					–	
		Input bit polarity C	2677	6677					–	
		Input bit polarity D	2678	6678					–	
		ON delay time	2679	6679					1	
		OFF delay time	267A	667A					1	
		Polarity	267B	667B					–	
		Latch	267C	667C					–	
	Operation 3	Operation type	2680	6680					–	
		Input assignment A	2681	6681					–	
		Input assignment B	2682	6682					–	
		Input assignment C	2683	6683					–	
		Input assignment D	2684	6684					–	
		Input bit polarity A	2685	6685					–	
		Input bit polarity B	2686	6686					–	
		Input bit polarity C	2687	6687					–	
		Input bit polarity D	2688	6688					–	
		ON delay time	2689	6689					1	
		OFF delay time	268A	668A					1	
		Polarity	268B	668B					–	
		Latch	268C	668C					–	
	Operation 4	Operation type	2690	6690					–	
		Input assignment A	2691	6691					–	
		Input assignment B	2692	6692					–	
		Input assignment C	2693	6693					–	
		Input assignment D	2694	6694					–	
		Input bit polarity A	2695	6695					–	
		Input bit polarity B	2696	6696					–	
		Input bit polarity C	2697	6697					–	
		Input bit polarity D	2698	6698					–	
		ON delay time	2699	6699					1	
		OFF delay time	269A	669A					1	
		Polarity	269B	669B					–	
		Latch	269C	669C					–	

Logical operation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Logical operation	Operation 5	Operation type	26A0	66A0					–	
		Input assignment A	26A1	66A1					–	
		Input assignment B	26A2	66A2					–	
		Input assignment C	26A3	66A3					–	
		Input assignment D	26A4	66A4					–	
		Input bit polarity A	26A5	66A5					–	
		Input bit polarity B	26A6	66A6					–	
		Input bit polarity C	26A7	66A7					–	
		Input bit polarity D	26A8	66A8					–	
		ON delay time	26A9	66A9					1	
		OFF delay time	26AA	66AA					1	
		Polarity	26AB	66AB					–	
		Latch	26AC	66AC					–	
	Operation 6	Operation type	26B0	66B0					–	
		Input assignment A	26B1	66B1					–	
		Input assignment B	26B2	66B2					–	
		Input assignment C	26B3	66B3					–	
		Input assignment D	26B4	66B4					–	
		Input bit polarity A	26B5	66B5					–	
		Input bit polarity B	26B6	66B6					–	
		Input bit polarity C	26B7	66B7					–	
		Input bit polarity D	26B8	66B8					–	
		ON delay time	26B9	66B9					1	
		OFF delay time	26BA	66BA					1	
		Polarity	26BB	66BB					–	
		Latch	26BC	66BC					–	
	Operation 7	Operation type	26C0	66C0					–	
		Input assignment A	26C1	66C1					–	
		Input assignment B	26C2	66C2					–	
		Input assignment C	26C3	66C3					–	
		Input assignment D	26C4	66C4					–	
		Input bit polarity A	26C5	66C5					–	
		Input bit polarity B	26C6	66C6					–	
		Input bit polarity C	26C7	66C7					–	
		Input bit polarity D	26C8	66C8					–	
		ON delay time	26C9	66C9					1	
		OFF delay time	26CA	66CA					1	
		Polarity	26CB	66CB					–	
		Latch	26CC	66CC					–	
	Operation 8	Operation type	26D0	66D0					–	
		Input assignment A	26D1	66D1					–	
		Input assignment B	26D2	66D2					–	
		Input assignment C	26D3	66D3					–	
		Input assignment D	26D4	66D4					–	
		Input bit polarity A	26D5	66D5					–	
		Input bit polarity B	26D6	66D6					–	
		Input bit polarity C	26D7	66D7					–	
		Input bit polarity D	26D8	66D8					–	
		ON delay time	26D9	66D9					1	
		OFF delay time	26DA	66DA					1	
		Polarity	26DB	66DB					–	
		Latch	26DC	66DC					–	

Logical operation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Logical operation	Operation 9	Operation type	26E0	66E0					–	
		Input assignment A	26E1	66E1					–	
		Input assignment B	26E2	66E2					–	
		Input assignment C	26E3	66E3					–	
		Input assignment D	26E4	66E4					–	
		Input bit polarity A	26E5	66E5					–	
		Input bit polarity B	26E6	66E6					–	
		Input bit polarity C	26E7	66E7					–	
		Input bit polarity D	26E8	66E8					–	
		ON delay time	26E9	66E9					1	
		OFF delay time	26EA	66EA					1	
		Polarity	26EB	66EB					–	
		Latch	26EC	66EC					–	
	Operation 10	Operation type	26F0	66F0					–	
		Input assignment A	26F1	66F1					–	
		Input assignment B	26F2	66F2					–	
		Input assignment C	26F3	66F3					–	
		Input assignment D	26F4	66F4					–	
		Input bit polarity A	26F5	66F5					–	
		Input bit polarity B	26F6	66F6					–	
		Input bit polarity C	26F7	66F7					–	
		Input bit polarity D	26F8	66F8					–	
		ON delay time	26F9	66F9					1	
		OFF delay time	26FA	66FA					1	
		Polarity	26FB	66FB					–	
		Latch	26FC	66FC					–	
	Operation 11	Operation type	2700	6700					–	
		Input assignment A	2701	6701					–	
		Input assignment B	2702	6702					–	
		Input assignment C	2703	6703					–	
		Input assignment D	2704	6704					–	
		Input bit polarity A	2705	6705					–	
		Input bit polarity B	2706	6706					–	
		Input bit polarity C	2707	6707					–	
		Input bit polarity D	2708	6708					–	
		ON delay time	2709	6709					1	
		OFF delay time	270A	670A					1	
		Polarity	270B	670B					–	
		Latch	270C	670C					–	
	Operation 12	Operation type	2710	6710					–	
		Input assignment A	2711	6711					–	
		Input assignment B	2712	6712					–	
		Input assignment C	2713	6713					–	
		Input assignment D	2714	6714					–	
		Input bit polarity A	2715	6715					–	
		Input bit polarity B	2716	6716					–	
		Input bit polarity C	2717	6717					–	
		Input bit polarity D	2718	6718					–	
		ON delay time	2719	6719					1	
		OFF delay time	271A	671A					1	
		Polarity	271B	671B					–	
		Latch	271C	671C					–	

Logical operation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Logical operation	Operation 13	Operation type	2720	6720					–	
		Input assignment A	2721	6721					–	
		Input assignment B	2722	6722					–	
		Input assignment C	2723	6723					–	
		Input assignment D	2724	6724					–	
		Input bit polarity A	2725	6725					–	
		Input bit polarity B	2726	6726					–	
		Input bit polarity C	2727	6727					–	
		Input bit polarity D	2728	6728					–	
		ON delay time	2729	6729					1	
		OFF delay time	272A	672A					1	
		Polarity	272B	672B					–	
		Latch	272C	672C					–	
	Operation 14	Operation type	2730	6730					–	
		Input assignment A	2731	6731					–	
		Input assignment B	2732	6732					–	
		Input assignment C	2733	6733					–	
		Input assignment D	2734	6734					–	
		Input bit polarity A	2735	6735					–	
		Input bit polarity B	2736	6736					–	
		Input bit polarity C	2737	6737					–	
		Input bit polarity D	2738	6738					–	
		ON delay time	2739	6739					1	
		OFF delay time	273A	673A					1	
		Polarity	273B	673B					–	
		Latch	273C	673C					–	
	Operation 15	Operation type	2740	6740					–	
		Input assignment A	2741	6741					–	
		Input assignment B	2742	6742					–	
		Input assignment C	2743	6743					–	
		Input assignment D	2744	6744					–	
		Input bit polarity A	2745	6745					–	
		Input bit polarity B	2746	6746					–	
		Input bit polarity C	2747	6747					–	
		Input bit polarity D	2748	6748					–	
		ON delay time	2749	6749					1	
		OFF delay time	274A	674A					1	
		Polarity	274B	674B					–	
		Latch	274C	674C					–	
	Operation 16	Operation type	2750	6750					–	
		Input assignment A	2751	6751					–	
		Input assignment B	2752	6752					–	
		Input assignment C	2753	6753					–	
		Input assignment D	2754	6754					–	
		Input bit polarity A	2755	6755					–	
		Input bit polarity B	2756	6756					–	
		Input bit polarity C	2757	6757					–	
		Input bit polarity D	2758	6758					–	
		ON delay time	2759	6759					1	
		OFF delay time	275A	675A					1	
		Polarity	275B	675B					–	
		Latch	275C	675C					–	

User-defined bit

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
User-defined bit		User-defined bits 1-8	2760	6760					–	
		User-defined bits 1	2761	6761					–	
		User-defined bits 2	2762	6762					–	
		User-defined bits 3	2763	6763					–	
		User-defined bits 4	2764	6764					–	
		User-defined bits 5	2765	6765					–	
		User-defined bits 6	2766	6766					–	
		User-defined bits 7	2767	6767					–	
		User-defined bits 8	2768	6768					–	

Display/key

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Display/key	Top priority	MS display, condition	2780	6780					–	
		MS display, status	2781	6781					–	
		MS display, decimal point position	2782	6782					–	
		MS display, scaling low limit	2783	6783					MS1	
		MS display, scaling high limit	2784	6784					MS1	
	Second priority	MS display, condition	2790	6790					–	
		MS display, status	2791	6791					–	
		MS display, decimal point position	2792	6792					–	
		MS display, scaling low limit	2793	6793					MS2	
		MS display, scaling high limit	2794	6794					MS2	
	Third priority	MS display, condition	27A0	67A0					–	
		MS display, status	27A1	67A1					–	
		MS display, decimal point position	27A2	67A2					–	
		MS display, scaling low limit	27A3	67A3					MS3	
		MS display, scaling high limit	27A4	67A4					MS3	
	UF1	UF LED, condition	27F0	67F0					–	
	LED	UF LED, status	27F1	67F1					–	
	UF2	UF LED, condition	27F4	67F4					–	
	LED	UF LED, status	27F5	67F5					–	
	UF3	UF LED, condition	27F8	67F8					–	
	LED	UF LED, status	27F9	67F9					–	
	UF4	UF LED, condition	27FC	67FC					–	
	LED	UF LED, status	27FD	67FD					–	

Display/key

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Display/key	rsp/lsp key	F key basic registration	27B0	67B0					–	
		F key assignment item 1	27B1	67B1					–	
		F key assignment item 2	27B2	67B2					–	
		F key assignment item 3	27B3	67B3					–	
		F key assignment item 4	27B4	67B4					–	
		F key assignment item 5	27B5	67B5					–	
		F key assignment item 6	27B6	67B6					–	
		F key assignment item 7	27B7	67B7					–	
		F key assignment item 8	27B8	67B8					–	
	at key	F key basic registration	27C0	67C0					–	
		F key assignment item 1	27C1	67C1					–	
		F key assignment item 2	27C2	67C2					–	
		F key assignment item 3	27C3	67C3					–	
		F key assignment item 4	27C4	67C4					–	
		F key assignment item 5	27C5	67C5					–	
		F key assignment item 6	27C6	67C6					–	
		F key assignment item 7	27C7	67C7					–	
		F key assignment item 8	27C8	67C8					–	
	f1 key	F key basic registration	27D0	67D0					–	
		F key assignment item 1	27D1	67D1					–	
		F key assignment item 2	27D2	67D2					–	
		F key assignment item 3	27D3	67D3					–	
		F key assignment item 4	27D4	67D4					–	
		F key assignment item 5	27D5	67D5					–	
		F key assignment item 6	27D6	67D6					–	
		F key assignment item 7	27D7	67D7					–	
		F key assignment item 8	27D8	67D8					–	
	f2 key	F key basic registration	27E0	67E0					–	
		F key assignment item 1	27E1	67E1					–	
		F key assignment item 2	27E2	67E2					–	
		F key assignment item 3	27E3	67E3					–	
		F key assignment item 4	27E4	67E4					–	
		F key assignment item 5	27E5	67E5					–	
		F key assignment item 6	27E6	67E6					–	
		F key assignment item 7	27E7	67E7					–	
		F key assignment item 8	20E8	67E8					–	

RS-485 communications

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
RS-485 communications		Communication types	2800	6800		×		×	–	Added to version 3.00.
		Machine address	2801	6801		×		×	–	
		Transmission speed	2802	6802		×		×	–	
		Data format (Data length)	2803	6803		×		×	–	
		Data format (Parity)	2804	6804		×		×	–	
		Data format (Stop bit)	2805	6805		×		×	–	
		Response time-out	2806	6806		×		×	–	

Lock

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Lock		Key lock (Setting change)	2810	6810		×		×	–	
		Key lock (Display)	2811	6811		×		×	–	
		RS-485 communication lock (Read)	2812	6812		×		×	–	
		RS-485 communication lock (Write)	2813	6813		×		×	–	
		Loader communication lock (Read)	2814	6814		×		×	–	
		Loader communication lock (Write)	2815	6815		×		×	–	

Monitor

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Monitor		Alarm information 1	2830	6830		×		×	–	For details, see alarm information 1-4 in "Basic Monitor Bank" of another manual, List of Displays and Settings (on pages 2-38 and 2-40).
		Alarm information 2	2831	6831		×		×	–	
		Alarm information 3	2832	6832		×		×	–	
		Alarm information 4	2833	6833		×		×	–	
	Loop 1	PV	2840	6840		×		×	LP1	
		SP	2841	6841		×		×	LP1	
		MV	2842	6842		×		×	1	
		Heat MV	2843	6843		×		×	1	
		Cool MV	2844	6844		×		×	1	
		AT progress	2845	6845		×		×	–	
		SP group selection	2846	6846		×		×	–	
		PID group selection	2847	6847		×		×	–	Added to version 3.00.
	Loop 2	PV	2850	6850		×		×	LP2	
		SP	2851	6851		×		×	LP2	
		MV	2852	6852		×		×	1	
		Heat MV	2853	6853		×		×	1	
		Cool MV	2854	6854		×		×	1	
		AT progress	2855	6855		×		×	–	
		SP group selection	2856	6856		×		×	–	
		PID group selection	2857	6857		×		×	–	Added to version 3.00.
	PV1	PV1	2880	6880		×		×	PV1	
	PV2/PV21	PV2/PV21	2881	6881		×		×	PV2	
	PV22	PV22	2882	6882		×		×	PV22	Added to version 2.00.
	MFB1	MFB1 amount of opening (estimated)	2890	6890		×		×	1	Added to version 2.00.
		Flow rate (with temperature-pressure compensation)	289A	689A		×		×	FL	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Flow rate input (PV raw input %)	289B	689B		×		×	1	
		Temperature compensation input	289C	689C		×		×	FL-T	
		Pressure compensation input	289D	689D		×		×	FL-P	
	CT1	Current when output ON	28A0	68A0		×		×	1	Added to version 2.00.
		Current when output OFF	28A1	68A1		×		×	1	
	CT2	Current when output ON	28A2	68A2		×		×	1	
		Current when output OFF	28A3	68A3		×		×	1	
	AC1	AC measurement voltage	28B0	68B0		×		×	2	Added to version 3.00.
		AC percent	28B1	68B1		×		×	1	
	AC2	AC measurement voltage	28B4	68B4		×		×	2	
		AC percent	28B5	68B5		×		×	1	
		Power frequency	28C0	68C0		×		×	–	

Monitor

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Monitor	OUT1	Output percent data	28D0	68D0		×		×	1	
	OUT2	Output percent data	28D1	68D1		×		×	1	
	OUT3	Output percent data	28D2	68D2		×		×	1	
	OUT4	Output percent data	28D3	68D3		×		×	1	
	OUT5	Output percent data	28D4	68D4		×		×	1	
	OUT6	Output percent data	28D5	68D5		×		×	1	
	OUT7	Output percent data	28D6	68D6		×		×	1	
	OUT1	Output ON/OFF data	28E0	68E0		×		×	–	
	OUT2	Output ON/OFF data	28E1	68E1		×		×	–	
	OUT3	Output ON/OFF data	28E2	68E2		×		×	–	
	OUT4	Output ON/OFF data	28E3	68E3		×		×	–	
	OUT5	Output ON/OFF data	28E4	68E4		×		×	–	
	OUT6	Output ON/OFF data	28E5	68E5		×		×	–	
	OUT7	Output ON/OFF data	28E6	68E6		×		×	–	
		DI-C1 to DI-C4	28F0	68F0		×		×	–	For details, see digital output information 1-6 in "Basic Monitor Bank" of another manual, List of Displays and Settings (on pages 2-29 and 2-31).
		DI-C5 to DI-C8	28F1	68F1		×		×	–	
		DI-D1 to DI-D4	28F2	68F2		×		×	–	
		DI-D5 to DI-D8	28F3	68F3		×		×	–	
		(Reserved for future use.)	28F4	68F4		×		×	–	
		(Reserved for future use.)	28F5	68F5		×		×	–	
		DI-F1 to DI-F2	28F6	68F6		×		×	–	
		DO-C1 to DO-C4	2900	6900		×		×	–	
		DO-C5 to DO-C8	2901	6901		×		×	–	
		(Reserved for future use.)	2902	6902		×		×	–	
		(Reserved for future use.)	2903	6903		×		×	–	
		DO-E1 to DO-E4	2904	6904		×		×	–	
		DO-E5 to DO-E8	2905	6905		×		×	–	
	EV1	Delay remaining time	2910	6910		×		×	1	
	EV2	Delay remaining time	2911	6911		×		×	1	
	EV3	Delay remaining time	2912	6912		×		×	1	
	EV4	Delay remaining time	2913	6913		×		×	1	
	EV5	Delay remaining time	2914	6914		×		×	1	
	EV3	Delay remaining time	2915	6915		×		×	1	
	EV7	Delay remaining time	2916	6916		×		×	1	
	EV8	Delay remaining time	2917	6917		×		×	1	
	EV9	Delay remaining time	2918	6918		×		×	1	
	EV10	Delay remaining time	2919	6919		×		×	1	
	EV11	Delay remaining time	291A	691A		×		×	1	
	EV12	Delay remaining time	291B	691B		×		×	1	
	EV13	Delay remaining time	291C	691C		×		×	1	
	EV14	Delay remaining time	291D	691D		×		×	1	
	EV15	Delay remaining time	291E	691E		×		×	1	
	EV16	Delay remaining time	291F	691F		×		×	1	
		Number of days continuously energized	2930	6930		×		×	–	Number of days (1: One day)
		Number of EEPROM writing cycles	2940	6940		×		×	–	1/100

Instrument information

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Instrument information		Firmware information (1) (ROM ID)	2A10	6A10		×		×	–	Added to version 2.00.
		Firmware information (2) (ROM version 1)	2A11	6A11		×		×	2	
		Firmware information (3) (ROM version 2)	2A11	6A12		×		×	2	
		Firmware information (4) (Version for SLP)	2A13	6A13		×		×	–	
		Firmware information (5) (Version for EST)	2A14	6A14		×		×	–	
		Date code (year)	2A15	6A15		×		×	–	
		Date code (month and day)	2A16	6A16		×		×	2	
		Production number	2A17	6A17		×		×	–	

SP configuration

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
SP configuration	Loop 1	RSP ratio 1	2A70	6A70					3	Added to version 1.05.
		RSP ratio 2	2A71	6A71					3	
		RSP ratio 3	2A72	6A72					3	
		RSP ratio 4	2A73	6A73					3	
		RSP ratio 5	2A74	6A74					3	
		RSP ratio 6	2A75	6A75					3	
		RSP ratio 7	2A76	6A76					3	
		RSP ratio 8	2A77	6A77					3	
	Loop 2	RSP ratio 1	2A80	6A80					3	
		RSP ratio 2	2A81	6A81					3	
		RSP ratio 3	2A82	6A82					3	
		RSP ratio 4	2A83	6A83					3	
		RSP ratio 5	2A84	6A84					3	
		RSP ratio 6	2A85	6A85					3	
		RSP ratio 7	2A86	6A86					3	
		RSP ratio 8	2A87	6A87					3	

Temperature-pressure compensation

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Temperature-pressure compensation		Compensation method	2AB0	6AB0					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Temperature unit for temperature compensation	2AB1	6AB1					–	
		Design temperature for temperature compensation	2AB2	6AB2					1	
		Pressure unit for pressure compensation	2AB3	6AB3					–	
		Design pressure for pressure compensation	2AB4	6AB4					1	
		Decimal point position (for flow rate settings)	2AB5	6AB5					–	
		Flow rate scaling lower limit	2AB6	6AB6					FL	
		Flow rate scaling upper limit	2AB7	6AB7					FL	
		Square root extraction dropout	2AB8	6AB8					1	
		Filter	2AB9	6AB9					2	
		Bias	2ABA	6ABA					FL	
		Ratio	2ABB	6ABB					3	
		Linearization table group definition	2ABC	6ABC					–	

MV

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
MV	Loop 1	Scaling system	2AD0	6AD0					–	
		Scaling low limit	2AD1	6AD1					LP1	
		Scaling high limit	2AD2	6AD2					LP1	
		SP tracking mode	2AD3	6AD3					–	Add to version 1.05.
		SP output filter	2AD4	6AD4					2	
		SP tracking signal	2AD5	6AD5					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		MV tracking mode	2AF0	6AF0					–	Add to version 2.00.
		SP tracking	2AF1	6AF1					–	
		SP tracking signal	2AF2	6AF2					–	
	Loop 2	Scaling system	2AD8	6AD8					–	
		Scaling low limit	2AD9	6AD9					LP2	
		Scaling high limit	2ADA	6ADA					LP2	
		SP tracking mode	2ADB	6ADB					–	Add to version 1.05.
		SP output filter	2ADC	6ADC					2	
		SP tracking signal	2ADD	6ADD					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		MV tracking mode	2AF8	6AF8					–	Add to version 2.00.
		SP tracking	2AF9	6AF9					–	
		SP tracking signal	2AFA	6AFA					–	

AC input

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
AC input	AC1	Reference voltage	2B80	6B80					2	Add to version 3.00.
		Filter	2B81	6B81					2	
	AC2	Reference voltage	2B84	6B84					2	
		Filter	2B85	6B85					2	

CT input

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
CT input	CT1	CT type	2B90	6B90					–	Added to version 2.00.
		CT measurement wait time	2B91	6B91					–	
		Number of CT turns	2B92	6B92					–	
		Number of CT power wire loops	2B93	6B93					–	
		Heater burnout detection current value	2B94	6B94					1	
		Over-current detection current value	2B95	6B95					1	
		Short-circuit detection current value	2B96	6B96					1	
		Hysteresis	2B97	6B97					1	
		Delay time	2B98	6B98					1	
		Condition for restoration of unmeasured value	2B99	6B99					–	
	CT2	CT type	2BA0	6BA0					–	
		CT measurement wait time	2BA1	6BA1					–	
		Number of CT turns	2BA2	6BA2					–	
		Number of CT power wire loops	2BA3	6BA3					–	
		Heater burnout detection current value	2BA4	6BA4					1	
		Over-current detection current value	2BA5	6BA5					1	
		Short-circuit detection current value	2BA6	6BA6					1	
		Hysteresis	2BA7	6BA7					1	
		Delay time	2BA8	6BA8					1	
		Condition for restoration of unmeasured value	2BA9	6BA9					–	

Input computation

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Input computation	F01	Decimal point position	2BD0	6BD0					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Input 1	2BD1	6BD1					–	
		Input 2	2BD2	6BD2					–	
		Computation types	2BD3	6BD3					–	
		Setting 1	2BD4	6BD4					I-F01	
		Setting 2	2BD5	6BD5					I-F01	
		Setting 3	2BD6	6BD6					I-F01	
		Contact input	2BD7	6BD7					–	
		Contact input monitor	2BD8	6BD8		×		×	–	
		Contact output monitor	2BD9	6BD9		×		×	–	
		Computation unit output monitor	2BDA	6BDA		×		×	I-F	
	F02	Computation types	2BE3	6BE3					–	
		Setting 1	2BE4	6BE4					I-F02	
		Setting 2	2BE5	6BE5					I-F02	
		Setting 3	2BE6	6BE6					I-F02	
		Contact input	2BE7	6BE7					–	
		Contact input monitor	2BE8	6BE8		×		×	–	
		Contact output monitor	2BE9	6BE9		×		×	–	
		Computation unit output monitor	2BEA	6BEA		×		×	I-F	
	F03	Computation types	2BF3	6BF3					–	
		Setting 1	2BF4	6BF4					I-F03	
		Setting 2	2BF5	6BF5					I-F03	
		Setting 3	2BF6	6BF6					I-F03	
		Contact input	2BF7	6BF7					–	
		Contact input monitor	2BF8	6BF8		×		×	–	
		Contact output monitor	2BF9	6BF9		×		×	–	
		Computation unit output monitor	2BFA	6BFA		×		×	I-F	
	F04	Computation types	2C03	6C03					–	
		Setting 1	2C04	6C04					I-F04	
		Setting 2	2C05	6C05					I-F04	
		Setting 3	2C06	6C06					I-F04	
		Contact input	2C07	6C07					–	
		Contact input monitor	2C08	6C08		×		×	–	
		Contact output monitor	2C09	6C09		×		×	–	
		Computation unit output monitor	2C0A	6C0A		×		×	I-F	
	F05	Computation types	2C13	6C13					–	
		Setting 1	2C14	6C14					I-F05	
		Setting 2	2C15	6C15					I-F05	
		Setting 3	2C16	6C16					I-F05	
		Contact input	2C17	6C17					–	
		Contact input monitor	2C18	6C18		×		×	–	
		Contact output monitor	2C19	6C19		×		×	–	
		Computation unit output monitor	2C1A	6C1A		×		×	I-F	

Input computation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Input computation	F06	Computation types	2C23	6C20					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Setting 1	2C24	6C24					I-F06	
		Setting 2	2C25	6C25					I-F06	
		Setting 3	2C26	6C26					I-F06	
		Contact input	2C27	6C27					–	
		Contact input monitor	2C28	6C28		×		×	–	
		Contact output monitor	2C29	6C29		×		×	–	
		Computation unit output monitor	2C2A	6C2A		×		×	I-F	
	F07	Computation types	2C33	6C30					–	
		Setting 1	2C34	6C34					I-F07	
		Setting 2	2C35	6C35					I-F07	
		Setting 3	2C36	6C36					I-F07	
		Contact input	2C37	6C37					–	
		Contact input monitor	2C38	6C38		×		×	–	
		Contact output monitor	2C39	6C39		×		×	–	
		Computation unit output monitor	2C3A	6C3A		×		×	I-F	
	F08	Computation types	2C43	6C40					–	
		Setting 1	2C44	6C44					I-F08	
		Setting 2	2C45	6C45					I-F08	
		Setting 3	2C46	6C46					I-F08	
		Contact input	2C47	6C47					–	
		Contact input monitor	2C48	6C48		×		×	–	
		Contact output monitor	2C49	6C49		×		×	–	
		Computation unit output monitor	2C4A	6C4A		×		×	I-F	
	F09	Computation types	2C53	6C50					–	
		Setting 1	2C54	6C54					I-F09	
		Setting 2	2C55	6C55					I-F09	
		Setting 3	2C56	6C56					I-F09	
		Contact input	2C57	6C57					–	
		Contact input monitor	2C58	6C58		×		×	–	
		Contact output monitor	2C59	6C59		×		×	–	
		Computation unit output monitor	2C5A	6C5A		×		×	I-F	
	F10	Computation types	2C63	6C63					–	
		Setting 1	2C64	6C64					I-F10	
		Setting 2	2C65	6C65					I-F10	
		Setting 3	2C66	6C66					I-F10	
		Contact input	2C67	6C67					–	
		Contact input monitor	2C68	6C68		×		×	–	
		Contact output monitor	2C69	6C69		×		×	–	
		Computation unit output monitor	2C6A	6C6A		×		×	I-F	

Output computation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Output computation	F01	Decimal point position	2C70	6C70					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/45R/46R
		Input 1	2C71	6C71					–	
		Input 2	2C72	6C72					–	
		Computation types	2C73	6C73					–	
		Setting 1	2C74	6C74					O-F01	
		Setting 2	2C75	6C75					O-F01	
		Setting 3	2C76	6C76					O-F01	
		Contact input	2C77	6C77					–	
		Contact input monitor	2C78	6C78		×		×	–	
		Contact output monitor	2C79	6C79		×		×	–	
		Computation unit output monitor	2C7A	6C7A		×		×	O-F	
	F02	Computation types	2C83	6C80					–	
		Setting 1	2C84	6C84					O-F02	
		Setting 2	2C85	6C85					O-F02	
		Setting 3	2C86	6C86					O-F02	
		Contact input	2C87	6C87					–	
		Contact input monitor	2C88	6C88		×		×	–	
		Contact output monitor	2C89	6C89		×		×	–	
		Computation unit output monitor	2C8A	6C8A		×		×	O-F	
	F03	Computation types	2C93	6C90					–	
		Setting 1	2C94	6C94					O-F03	
		Setting 2	2C95	6C95					O-F03	
		Setting 3	2C96	6C96					O-F03	
		Contact input	2C97	6C97					–	
		Contact input monitor	2C98	6C98		×		×	–	
		Contact output monitor	2C99	6C99		×		×	–	
		Computation unit output monitor	2C9A	6C9A		×		×	O-F	
	F04	Computation types	2CA3	6CA3					–	
		Setting 1	2CA4	6CA4					O-F04	
		Setting 2	2CA5	6CA5					O-F04	
		Setting 3	2CA6	6CA6					O-F04	
		Contact input	2CA7	6CA7					–	
		Contact input monitor	2CA8	6CA8		×		×	–	
		Contact output monitor	2CA9	6CA9		×		×	–	
		Computation unit output monitor	2CAA	6CAA		×		×	O-F	
	F05	Computation types	2CB3	6CB0					–	
		Setting 1	2CB4	6CB4					O-F05	
		Setting 2	2CB5	6CB5					O-F05	
		Setting 3	2CB6	6CB6					O-F05	
		Contact input	2CB7	6CB7					–	
		Contact input monitor	2CB8	6CB8		×		×	–	
		Contact output monitor	2CB9	6CB9		×		×	–	
		Computation unit output monitor	2CBA	6CBA		×		×	O-F	

Output computation

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Output computation	F06	Computation types	2CC3	6CC3					–	Added to version 2.00. Cannot be read or written on the SDC45A/46A/ 45R/46R
		Setting 1	2CC4	6CC4					O-F06	
		Setting 2	2CC5	6CC5					O-F06	
		Setting 3	2CC6	6CC6					O-F06	
		Contact input	2CC7	6CC7					–	
		Contact input monitor	2CC8	6CC8		×		×	–	
		Contact output monitor	2CC9	6CC9		×		×	–	
		Computation unit output monitor	2CCA	6CCA		×		×	O-F	
	F07	Computation types	2CC3	6CC3					–	
		Setting 1	2CC4	6CC4					O-F07	
		Setting 2	2CC5	6CC5					O-F07	
		Setting 3	2CC6	6CC6					O-F07	
		Contact input	2CC7	6CC7					–	
		Contact input monitor	2CC8	6CC8		×		×	–	
		Contact output monitor	2CC9	6CC9		×		×	–	
		Computation unit output monitor	2CCA	6CCA		×		×	O-F	
	F08	Computation types	2CE3	6CE3					–	
		Setting 1	2CE4	6CE4					O-F08	
		Setting 2	2CE5	6CE5					O-F08	
		Setting 3	2CE6	6CE6					O-F08	
		Contact input	2CE7	6CE7					–	
		Contact input monitor	2CE8	6CE8		×		×	–	
		Contact output monitor	2CE9	6CE9		×		×	–	
		Computation unit output monitor	2CEA	6CEA		×		×	O-F	
	F09	Computation types	2CF3	6CF3					–	
		Setting 1	2CF4	6CF4					O-F09	
		Setting 2	2CF5	6CF5					O-F09	
		Setting 3	2CF6	6CF6					O-F09	
		Contact input	2CF7	6CF7					–	
		Contact input monitor	2CF8	6CF8		×		×	–	
		Contact output monitor	2CF9	6CF9		×		×	–	
		Computation unit output monitor	2CFA	6CFA		×		×	O-F	
	F10	Computation types	2D03	6D03					–	
		Setting 1	2D04	6D04					O-F10	
		Setting 2	2D05	6D05					O-F10	
		Setting 3	2D06	6D06					O-F10	
		Contact input	2D07	6D07					–	
		Contact input monitor	2D08	6D08		×		×	–	
		Contact output monitor	2D09	6D09		×		×	–	
		Computation unit output monitor	2D0A	6D0A		×		×	O-F	

Standard bit

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Standard bit		OFF(0)	4500	8500		×		×	–	
		ON(1)	4501	8501		×		×	–	
		Event 1	4540	8540		×		×	–	
		Event 2	4541	8541		×		×	–	
		Event 3	4542	8542		×		×	–	
		Event 4	4543	8543		×		×	–	
		Event 5	4544	8544		×		×	–	
		Event 6	4545	8545		×		×	–	
		Event 7	4546	8546		×		×	–	
		Event 8	4547	8547		×		×	–	
		Event 9	4548	8548		×		×	–	
		Event 10	4549	8549		×		×	–	
		Event 11	454A	854A		×		×	–	
		Event 12	454B	854B		×		×	–	
		Event 13	454C	854C		×		×	–	
		Event 14	454D	854D		×		×	–	
		Event 15	454E	854E		×		×	–	
		Event 16	454F	854F		×		×	–	
		CT1	4560	8560		×		×	–	Added to version 2.00.
		CT2	4561	8561		×		×	–	
		CT1	4564	8564		×		×	–	
		CT2	4565	8565		×		×	–	
		CT1	4568	8568		×		×	–	
		CT2	4569	8569		×		×	–	
		DI-C1 terminal status	4580	8580		×		×	–	
		DI-C2 terminal status	4581	8581		×		×	–	
		DI-C3 terminal status	4582	8582		×		×	–	
		DI-C4 terminal status	4583	8583		×		×	–	
		DI-C5 terminal status	4584	8584		×		×	–	
		DI-C6 terminal status	4585	8585		×		×	–	
		DI-C7 terminal status	4586	8586		×		×	–	
		DI-C8 terminal status	4587	8587		×		×	–	
		DI-D1 terminal status	4588	8588		×		×	–	
		DI-D2 terminal status	4589	8589		×		×	–	
		DI-D3 terminal status	458A	858A		×		×	–	
		DI-D4 terminal status	458B	858B		×		×	–	
		DI-D5 terminal status	458C	858C		×		×	–	
		DI-D6 terminal status	458D	858D		×		×	–	
		DI-D7 terminal status	458E	858E		×		×	–	
		DI-D8 terminal status	458F	858F		×		×	–	
		DI-F1 terminal status	4598	8598		×		×	–	
		DI-F2 terminal status	4599	8599		×		×	–	

Standard bit

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Standard bit		DO-C1 terminal status	45C0	85C0		×		×	–	
		DO-C2 terminal status	45C1	85C1		×		×	–	
		DO-C3 terminal status	45C2	85C2		×		×	–	
		DO-C4 terminal status	45C3	85C3		×		×	–	
		DO-C5 terminal status	45C4	85C4		×		×	–	
		DO-C6 terminal status	45C5	85C5		×		×	–	
		DO-C7 terminal status	45C6	85C6		×		×	–	
		DO-C8 terminal status	45C7	85C7		×		×	–	
		DO-E1 terminal status	45D0	85D0		×		×	–	
		DO-E2 terminal status	45D1	85D1		×		×	–	
		DO-E3 terminal status	45D2	85D2		×		×	–	
		DO-E4 terminal status	45D3	85D3		×		×	–	
		DO-E5 terminal status	45D4	85D4		×		×	–	
		DO-E6 terminal status	45D5	85D5		×		×	–	
		DO-E7 terminal status	45D6	85D6		×		×	–	
		DO-E8 terminal status	45D7	85D7		×		×	–	
		OUT1 (ON/OFF status)	4600	8600		×		×	–	
		OUT2 (ON/OFF status)	4601	8601		×		×	–	
		OUT3 (ON/OFF status)	4602	8602		×		×	–	
		OUT4 (ON/OFF status)	4603	8603		×		×	–	
		OUT5 (ON/OFF status)	4604	8604		×		×	–	
		OUT6 (ON/OFF status)	4605	8605		×		×	–	
		OUT7 (ON/OFF status)	4606	8606		×		×	–	
		User-defined bit 1	4680	8680		×		×	–	
		User-defined bit 2	4681	8681		×		×	–	
		User-defined bit 3	4682	8682		×		×	–	
		User-defined bit 4	4683	8683		×		×	–	
		User-defined bit 5	4684	8684		×		×	–	
		User-defined bit 6	4685	8685		×		×	–	
		User-defined bit 7	4686	8686		×		×	–	
		User-defined bit 8	4687	8687		×		×	–	
		Results of logical operation 1	46A0	86A0		×		×	–	
		Results of logical operation 2	46A1	86A1		×		×	–	
		Results of logical operation 3	46A2	86A2		×		×	–	
		Results of logical operation 4	46A3	86A3		×		×	–	
		Results of logical operation 5	46A4	86A4		×		×	–	
		Results of logical operation 6	46A5	86A5		×		×	–	
		Results of logical operation 7	46A6	86A6		×		×	–	
		Results of logical operation 8	46A7	86A7		×		×	–	
		Results of logical operation 9	46A8	86A8		×		×	–	
		Results of logical operation 10	46A9	86A9		×		×	–	
		Results of logical operation 11	46AA	86AA		×		×	–	
		Results of logical operation 12	46AB	86AB		×		×	–	
		Results of logical operation 13	46AC	86AC		×		×	–	
		Results of logical operation 14	46AD	86AD		×		×	–	
		Results of logical operation 15	46AE	86AE		×		×	–	
		Results of logical operation 16	46AF	86AF		×		×	–	

Standard bit

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Standard bit		Key status (auto/man)	46E0	86E0		×		×	–	
		Key status (sp/ev)	46E1	86E1		×		×	–	
		Key status (para)	46E2	86E2		×		×	–	
		Key status (rsp/lsp)	46E3	86E3		×		×	–	
		Key status (at)	46E4	86E4		×		×	–	
		Key status (f1)	46E5	86E5		×		×	–	
		Key status (f2)	46E6	86E6		×		×	–	
		Key status (up)	46E7	86E7		×		×	–	
		Key status (left)	46E8	86E8		×		×	–	
		Key status (right)	46E9	86E9		×		×	–	
		Key status (down)	46EA	86EA		×		×	–	
		Key status (display)	46EB	86EB		×		×	–	
		Key status (enter)	46EC	86EC		×		×	–	
		Communications status (normal receipt on a byte basis)	4709	8709		×		×	–	
		(Reserved for future use.)	470A	870A	×	×	×	×	–	
		Communications status (normal receipt on a byte basis)	470B	870B		×		×	–	
		Communications status (an error received)	470C	870C		×		×	–	
		Power failure detection	470D	870D		×		×	–	Added to version 2.00.
		Loop 1 PID hot start detection	470E	870E		×		×	–	
		Loop 2 PID hot start detection	470F	870F		×		×	–	
		RUN/READY status of loop 1	4720	8720		×		×	–	0:RUN
		RUN/READY status of loop 2	4721	8721		×		×	–	1:READY
		AUTO/MANUAL status of loop 1	4730	8730		×		×	–	0:AUTO
		AUTO/MANUAL status of loop 2	4731	8731		×		×	–	1:MANUAL
		AT stop/start status of loop 1	4740	8740		×		×	–	0:AT stop
		AT stop/start status of loop 2	4741	8741		×		×	–	1:AT start
		LSP/RSP status of loop 1	4750	8750		×		×	–	0:LSP
		LSP/RSP status of loop 2	4751	8751		×		×	–	1:RSP
		During SP ramp of loop 1 (up)	4770	8770		×		×	–	
		During SP ramp of loop 2 (up)	4771	8771		×		×	–	
		During SP ramp of loop 1 (down)	4780	8780						
		During SP ramp of loop 2 (down)	4781	8781						
		Backup/through output status of loop 1	47A0	87A0		×		×	–	0:Backup 1:Through output status
		(Reserved for future use.)	47A1	87A1	×	×	×	×	–	
		All typical alarms	4800	8800		×		×	–	OR of all the alarms to be displayed
		PV input high limit alarm (PV1)	4820	8820		×		×	–	
		PV input high limit alarm (PV2/PV21)	4821	8821		×		×	–	
		PV input high limit alarm (PV22)	4822	8822		×		×	–	Added to version 2.00.
		PV input low limit alarm (PV1)	4830	8830		×		×	–	
		PV input low limit alarm (PV2/PV21)	4831	8831		×		×	–	
		PV input low limit alarm (PV22)	4832	8832		×		×	–	Added to version 2.00.
		CJ input alarm (PV1)	4840	8840		×		×	–	
		CJ input alarm (PV2)	4841	8841		×		×	–	
		MFB1 (motor feedback 1) input error	4858	8858		×		×	–	Added to version 2.00.
		MFB1 estimation in progress	4860	8860		×		×	–	
		MFB1 adjustment error	4868	8868		×		×	–	

Standard value

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Standard value		CT1 input alarm	48A0	88A0		×		×	–	Added to version 2.00.
		CT2 input alarm	48A1	88A1		×		×	–	
		Parameter failure	48B0	88B0		×		×	–	
		Adjustment data failure (CPU board)	48B1	88B1		×		×	–	
		Adjustment data failure (PV board)	48B2	88B2		×		×	–	
		(Reserved for future use.)	48B3	88B3	×	×	×	×	–	
		ROM failure (CPU board)	48B4	88B4		×		×	–	
		ROM failure (PV board)	48B5	88B5		×		×	–	
		(Reserved for future use.)	48B6	88B6	×	×	×	×	–	
		Battery voltage alarm	48B7	88B7		×		×	–	Added to version 2.00.
		RTC alarm	48B8	88B8		×		×	–	
		PV1	4A00	8A00		×		×	PV1	
		PV2/PV21	4A01	8A01		×		×	PV2	
		PV22	4A02	8A02		×		×	PV22	Added to version 2.00.
		PV of loop 1 (used for PID operation)	4A10	8A10		×		×	LP1	
		PV of loop 2 (used for PID operation)	4A11	8A11		×		×	LP2	
		SP of loop 1 (in use)	4A20	8A20		×		×	LP1	
		SP of loop 2 (in use)	4A21	8A21		×		×	LP2	
		SP of loop 1 (finally attained value)	4A30	8A30		×		×	LP1	
		SP of loop 2 (finally attained value)	4A31	8A31		×		×	LP2	
		SP output of loop 1	4A50	8A50		×		×	LP1	
		(Reserved for future use.)	4A51	8A51	△	×	△	×	LP2	
		MV of loop 1	4A70	8A70		×		×	1	
		MV of loop 2	4A71	8A71		×		×	1	
		MV of loop 1 (Heat)	4A80	8A80		×		×	1	
		MV of loop 2 (Heat)	4A81	8A81		×		×	1	
		MV of loop 1 (Cool)	4A90	8A90		×		×	1	
		MV of loop 2 (Cool)	4A91	8A91		×		×	1	
		MFB1 amount of opening (estimated)	4AA0	8AA0		×		×	–	Added to version 2.00.
		MFB1 amount of opening (measured)	4AB0	8AB0		×		×	–	
		CT1 current when output ON	4AC0	8AC0		×		×	–	
		CT2 current when output ON	4AC1	8AC1		×		×	–	
		CT1 current when output OFF	4AD0	8AD0		×		×	–	
		CT2 current when output OFF	4AD1	8AD1		×		×	–	
		Deviation of loop 1 (PV-SP)	4AE0	8AE0		×		×	LP1	
		Deviation of loop 2 (PV-SP)	4AE1	8AE1		×		×	LP2	
		AC1 measurement voltage	4AF0	8AF0		×		×	2	Added to version 2.00.
		AC2 measurement voltage	4AF1	8AF1		×		×	2	
		AC1 percent	4B00	8B00		×		×	1	
		AC2 percent	4B01	8B01		×		×	1	
		Flow rate (with temperature-pressure compensation)	4B20	8B20		×		×	FL	Added to version 2.00.
		Input computation result	4B30	8B30		×		×	I-L	
		Output computation result	4B40	8B40		×		×	O-L	

Standard value

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Standard value		Event 1 delay remaining time	4B60	8B60		×		×	1	
		Event 2 delay remaining time	4B61	8B61		×		×	1	
		Event 3 delay remaining time	4B62	8B62		×		×	1	
		Event 4 delay remaining time	4B63	8B63		×		×	1	
		Event 5 delay remaining time	4B64	8B64		×		×	1	
		Event 6 delay remaining time	4B65	8B65		×		×	1	
		Event 7 delay remaining time	4B66	8B66		×		×	1	
		Event 8 delay remaining time	4B67	8B67		×		×	1	
		Event 9 delay remaining time	4B68	8B68		×		×	1	
		Event 10 delay remaining time	4B69	8B69		×		×	1	
		Event 11 delay remaining time	4B6A	8B6A		×		×	1	
		Event 12 delay remaining time	4B6B	8B6B		×		×	1	
		Event 13 delay remaining time	4B6C	8B6C		×		×	1	
		Event 14 delay remaining time	4B6D	8B6D		×		×	1	
		Event 15 delay remaining time	4B6E	CB6E		×		×	1	
		Event 16 delay remaining time	4B6F	CB6F		×		×	1	
		MV used for position proportional control	4BA0	CBA0	×	×	×	×	1	Added to version 2.00.

Communications profile (instrument status)

Bank name	No.	Item name	RAM address Hexadecimal	EEPROM address Hexadecimal	RAM Read	RAM Write	EEPROM Read	EEPROM Write	Decimal point information	Remarks
Communications profile (Instrument status)	Loop 1	RUN/READY	3810	7810		×		×	–	0:RUN 1:READY
		AUTO/MANUAL	3811	7811		×		×	–	0:AUTO 1:MANUAL
		AT stop/start	3812	7812		×		×	–	0:AT stop 1:AT start
		LSP/RSP	3813	7813		×		×	–	0:LSP 1:RSP
		PV	3814	7814		×		×	LP1	
		SP	3815	7815		×		×	LP1	
		MV	3816	7816		×		×	1	
		(Reserved for future use.)	3817	7817	△	×	△	×	–	
	Loop 2	RUN/READY	3818	7818		×		×	–	0:RUN 1:READY
		AUTO/MANUAL	3819	7819		×		×	–	0:AUTO 1:MANUAL
		AT stop/start	381A	781A		×		×	–	0:AT stop 1:AT start
		LSP/RSP	381B	781B		×		×	–	0:LSP 1:RSP
		PV	381C	781C		×		×	LP2	
		SP	381D	781D		×		×	LP2	
		MV	381E	781E		×		×	1	
		(Reserved for future use.)	381F	781F	△	×	△	×	–	

Communications profile (operation)

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Communications profile (operation)	Loop 1	SP group selection	3900	7900					–	If internal contact input is given high prriority, writing is invalid.
		LSP	3901	7901					LP1	
		Manual MV	3902	7902		□		□	1	
		RUN/READY	3903	7903		□		□	–	0:RUN 1:READY
		AUTO/MANUAL	3904	7904		□		□	–	0:AUTO 1:MANUAL
		AT stop/start	3905	7905		□		□	–	0:AT stop 1:AT start
		LSP/RSP	3906	7906		□		□	–	0:LSP 1:RSP
		(Reserved for future use.)	3907	7907	△	△	△	△	–	
	Loop 2	SP group selection	3908	7908					–	If internal contact input is given high prriority, writing is invalid.
		LSP	3909	7909					LP2	
		Manual MV	390A	790A		□		□	1	
		RUN/READY	390B	790B		□		□	–	0:RUN 1:READY
		AUTO/MANUAL	390C	790C		□		□	–	0:AUTO 1:MANUAL
		AT stop/start	390D	790D		□		□	–	0:AT stop 1:AT start
		LSP/RSP	390E	790E		□		□	–	0:LSP 1:RSP
		(Reserved for future use.)	390F	790F	△	△	△	△	–	

Communications profile (PID group in use)

Bank name	No.	Item name	RAM address	EEPROM address	RAM		EEPROM		Decimal point	Remarks
			Hexadecimal	Hexadecimal	Read	Write	Read	Write	information	
Communications profile (PID group in use)	Loop 1	Proportional band	3A00	7A00					1	Set value for the PID group in use
		Integral time	3A01	7A01					PID1	
		Derivative time	3A02	7A02					PID1	
		Manual reset	3A03	7A03					1	
		Output low limit	3A04	7A04					1	
		Output high limit	3A05	7A05					1	
		Proportional band for cool side	3A06	7A06					1	
		Integration time for cool side	3A07	7A07					PID1	
		Derivative time for cool side	3A08	7A08					PID1	
		(Reserved for future use.)	3A09	7A09	△	△	△	△	1	
		Output low limit for cool side	3A0A	7A0A					1	
		Output high limit for cool side	3A0B	7A0B					1	
	Loop 2	Proportional band	3A0C	7A0C					1	Set value for the PID group in use
		Integral time	3A0D	7A0D					PID2	
		Derivative time	3A0E	7A0E					PID2	
		Manual reset	3A0F	7A0F					1	
		Output low limit	3A10	7A10					1	
		Output high limit	3A11	7A11					1	
		Proportional band for cool side	3A12	7A12					1	
		Integration time for cool side	3A13	7A13					PID2	
		Derivative time for cool side	3A14	7A14					PID2	
		(Reserved for future use.)	3A15	7A15	△	△	△	△	1	
		Output low limit for cool side	3A16	7A16					1	
		Output high limit for cool side	3A17	7A17					1	

Chapter 12. TROUBLESHOOTING

■ Alarm code displays and corrective actions

Alarm codes and countermeasures in case of abnormal operation of this controller.

Alarm code	Failure name	Cause	Corrective action
AL01	PV1 input failure (over-range)	Sensor burnout, incorrect wiring, incorrect PV1 range type setting.	Check the wiring or reset PV1 range type (Pu-01). Reset PV1 range high/low limits (Pu-04: Range low limit, Pu-05: Range high limit.)
AL02	PV1 input failure (under-range)		
AL03	PV2 input failure (over-range)	Sensor burnout, incorrect wiring, incorrect PV2 range type setting.	Check the wiring or reset PV2 range type (Pu-01). Reset PV2 range high/low limits (Pu-04: Range low limit, Pu-05: Range high limit.)
AL04	PV2 input failure (under-range)		
AL05	PV22 input high limit failure (SDC45V/46V only)	Sensor burnout, incorrect wiring, incorrect PV22 range type setting.	Check the wiring or reset PV22 range type (Pu-01). Reset PV22 range high/low limits (Pu-04: Range low limit, Pu-05: Range high limit.)
AL06	PV22 input low limit failure (SDC45V/46V only)		
AL17	Control range error	Incorrect control range	Reset the control range high and low limits. (Cnt.05: range low limit for control, Cnt.06: range high limit for control)
AL21	MFB input error	Line break, incorrect wiring	Check the wiring
AL22	Motor adjustment error	Line break, incorrect wiring Motor power supply cut-off	Check the wiring,Check the power to the motor, Readjustment
AL25	CT1 input error	CT over range	Check the CT input
AL26	CT2 input error	Incorrect setting of CT input	Reset the CT input
AL71	Abnormal PV1 CJ compensation	Abnormal terminal temperature (thermocouple).	Check the ambient temperature.
AL72	Abnormal PV2 CJ compensation		
AL81	Battery voltage drop (SDC45V/46V only)	Weak battery	Replace the battery.
AL82	Built-in clock error (SDC45V/46V only)	Weak battery, Hardware failure	Reset the clock after battery replacement
AL83	Board configuration problem	Hardware failure	Replace the unit.
AL96	Main board error		
AL97	Parameter failure	Power was turned OFF while setting data. Data is corrupted due to noise, etc.	Restart the system. Reset data (AL97: setting data, AL98: tuning data) or replace the unit.
AL98	Adjustment data problem		
AL99	ROM failure	ROM (memory) is faulty.	Restart the system. Replace the unit.

Chapter 13. MAINTENANCE, INSPECTION, AND DISPOSAL

13 - 1 Maintenance and Inspection

Cleaning:	When removing dirt from the instrument, wipe it off with a soft cloth rag.
Part replacement:	Do not replace any parts of this unit.
Fuse replacement:	When replacing the fuse connected to the electric wiring, always use the specified standard fuse. Standard IEC127 Shut-down speed Slow-action type (T) Rated voltage 250V Rated current 1.0A

13 - 2 Disposal

■ SDC45A/46A/45R/46R

When discarding the SDC45A/46A/45R/46R, dispose of it appropriately as industrial waste in accordance with local regulations.

■ SDC45V/46V

⚠ CAUTION

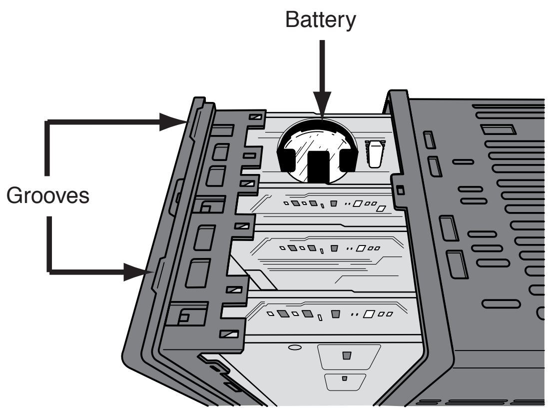
- When discarding this device, shut off the power and wait 10 minutes or longer before removing the battery.
  Failure to do so might cause an electric shock or burn.
- When the battery is removed, some settings and internal operation status data will be lost.
- Dispose of the battery appropriately, following local regulations.

When discarding the SDC45V/46V, remove the battery following the procedure given below, and then dispose of it appropriately, following local regulations.

● Battery removal procedure

(1) Remove the case.
Insert the flat head of a screwdriver into the grooves (on the top, bottom, right and left sides) between the front panel and the case, and then gradually pull the case off while gently prying with the screwdriver.

(2) Remove the battery from the battery holder.
Pull the battery upward.



Handling Precautions

• The SDC45V/46V has a built-in battery that is used for memory backup.
To remove/replace the battery, except when discarding this device, contact Yamatake Corporation.

Chapter 14. SPECIFICATIONS

● Analog input (PV)

Input type Thermocouple: K, E, J, T, B, R, S, N(JIS C 1602-1995)
WRe5-26(ASTM E988-96(Reapproved 2002))
PR40-20, Ni-Ni•Mo, PL II,
Gold-iron/Chromel (ASTM E1751-00),
DIN U, DIN L(DIN 43710-1985)

Resistance temperature detector (RTD):
Pt100(JIS C 1604-1997)
JPt100(JIS C 1604-1989)

DC voltage (mV-range): 0 to 10 mV, -10 to +10 mV, 0 to 100 mV, -100 to +100 mV

DC voltage (V-range): 0 to 1 V, -1 to +1 V, 1 to 5 V, 0 to 5 V, 0 to 10 V

DC current: 4 to 20 mA, 0 to 20 mA

Sampling cycle: 25 ms, 50 ms, 100 ms, 300 ms (SDC45A/46A)
100 ms (SDC45V/46V/45R/46R)

• Thermocouple input

Indication accuracy (under standard conditions):

Sensor type	Input indication accuracy	
K	±0.1 % rdg. ± 1 digit	400 °C or higher
	±0.5 °C	-100 to less than +400 °C
	±1.0 °C	-200 to less than -100 °C
	±20.0 °C	Less than -200 °C
J	±0.1 % rdg. ± 1 digit	400 °C or higher
	±0.5 °C	-100 to less than +400 °C
	±1.0 °C	Less than -100 °C
E	±0.1 % rdg. ± 1 digit	400 °C or higher
	±0.5 °C	-100 to less than +400 °C
	±1.0 °C	-200 to less than -100 °C
	±15.0 °C	Less than -200 °C
T	±0.5 °C	-100 °C or higher
	±1.0 °C	-200 to less than -100 °C
	±10.0 °C	Less than -200 °C
B	±2 °C	800 °C or higher
	±4 °C	260 to less than 800 °C
	±70 °C	Less than 260 °C
R	±0.1 % rdg. ± 1 digit	1000 °C or higher
	±2.0 °C	0 to less than 1000 °C
	±4.0 °C	Less than 0 °C
S	±0.1 % rdg. ± 1 digit	1000 °C or higher
	±2.0 °C	0 to less than 1000 °C
	±4.0 °C	Less than 0 °C
N	±1.4 °C	0 °C or higher
	±4.0 °C	Less than 0 °C
WRe5-26	±0.1 % rdg. ± 1 digit	1400 °C or higher
	±1.5 °C	Less than 1400 °C
PR40-20	±8 °C	800 °C or higher
	±20 °C	300 to less than 800 °C
	±40 °C	Less than 300 °C
Ni-Ni•Mo	±1.4 °C	
PL II	±1.4 °C	
DIN U	±0.7 °C	0 °C or higher
	±1.0 °C	Less than 0 °C
DIN L	±1.0 °C	0 °C or higher
	±1.5 °C	Less than 0 °C
Gold-iron/Chromel	±1.5 °C	

Internal cold junction compensation accuracy:
±0.5 °C (under standard conditions)
±1.0 °C Ambient temperature, 0 to 50 °C (under other standard conditions)

Cold junction compensation method: Internal/external (0 °C only) compensation selectable

Allowable input voltage: -1.0 V to +3.5 V

⚠ CAUTION: Do not apply a voltage exceeding the allowable input voltage.
Doing so might cause this unit to malfunction.

Input bias current: 0.2 μA (flowed out from the positive (+) terminal.)
When the thermocouple/mV input burnout setup is set at "upscale at burnout":
0.05 μA (flowed out from the positive (+) terminal or flowed into the positive (+) terminal)
When the thermocouple/mV input burnout setup is set at "unknown at burnout."

Input impedance: 1 MΩ min.

Burnout indication: Upscale or unknown can be selected in the thermocouple/mV input burnout setup.

Allowable parallel connection resistance:
1 MΩ min., Burnout detection is provided.

- **RTD input (SDC45A/SDC46A/45V/46V)**

Indication accuracy (under standard conditions):

Sensor type	Range	Input indication accuracy
Pt100	-200.0 to +850.0 °C	±0.3 °C
	-200.00 to +300.00 °C	±0.15 °C
JPt100	-200.0 to +640.0 °C	±0.3 °C
	-200.00 to +300.00 °C	±0.15 °C

Measuring current: 1 mA ± 0.02 mA Flowed out from the terminals A and C to the terminal B.

Allowable wiring resistance: 85 Ω max. including the Zener barrier resistance per RTD.

Effect of wiring resistance: 0.02 °C/Ω max., wiring resistance is 85 Ω max.

Burnout indication: Burnout of terminal A, upscale
Burnout of terminal B or C, or two or more wires, downscale

- **RTD input (SDC45R/SDC46R)**

Indication accuracy (under standard conditions):

Sensor type	Wire system	Range	Input indication accuracy
Pt100	3-wire system 4-wire system	0.00 to 100.00 °C	±0.05 °C
JPt100	3-wire system 4-wire system	0.00 to 100.00 °C	±0.05 °C

Measuring current: 1.042 mA ± 1% Flowed out from the terminals A and C to the terminal B. (3-system wire)
Flowed out from the terminals A to the terminal B. (4-system wire)

Allowable wiring resistance: 2 Ω max. per RTD.

Effect of wiring resistance: 0.01 °C/Ω max., 3-wire system, wiring resistance is 2 Ω max.
0.001 °C/Ω max., 4-wire system, wiring resistance is 2 Ω max.

Burnout indication:	Burnout of terminal A, upscale (3-wire system), downscale (4-wire system) Burnout of terminal B, downscale Burnout of terminal C, downscale (3-wire system), upscale (4-wire system) Burnout of terminal D, upscale

- **DC voltage (mV-range) input**

Indication accuracy (under standard conditions):	±0.1 %FS ±1 digit
Allowable input voltage:	-10 V to +2.5 V ⚠ CAUTION: Do not apply a voltage exceeding the allowable input voltage. Doing so might cause this unit to malfunction.
Input bias current:	0.2 µA (flowed out from the positive (+) terminal.) When the thermocouple/mV input burnout setup is set at "upscale at burnout" 0.05 µA (flowed out from the positive (+) terminal or flowed into the positive (+) terminal) When the thermocouple/mV input burnout setup is set at "unknown at burnout"
Input impedance:	1 MΩ min.
Burnout indication:	Upscale or unknown can be selected in the thermocouple/mV input burnout setup.

- **DC voltage (V-range) input**

Indication accuracy (under standard conditions):	±0.1 %FS ±1 digit
Allowable input voltage:	-10 V to +25 V ⚠ CAUTION: Do not apply a voltage exceeding the allowable input voltage. Doing so might cause this unit to malfunction.
Input bias current:	1 µA max. (flowed out from the positive (+) terminal or flowed into the positive (+) terminal) Each of 0 to 1 V and -1 to +1 V ranges 5 µA max. (flowed into the positive (+) terminal.) Each of 1 to 5 V and 0 to 5 V ranges 10 µA max. (Flowed into the positive (+) terminal.) 0 to 10 V range
Input impedance:	1 MΩ min.
Burnout indication:	Equivalent to 0 V-input

- **DC current input**

Indication accuracy (under standard conditions):	±0.1 %FS ±1 digit
Allowable input voltage:	-1 V to +4 V ⚠ CAUTION: Do not apply a voltage exceeding the allowable input voltage. Doing so might cause this unit to malfunction.
Input impedance:	110 Ω max.

Burnout indication: Downscale 4 to 20 mA range
Equivalent to 0 mA-input 0 to 20 mA range

- **Motor feedback input (MFB)**

Allowable potentiometer value: 100 to 2,500 Ω
Indication accuracy: ±0.2 %FS (under standard conditions)
Sampling frequency: 100ms

- **Current transformer input**

Compatible current transformer: QN212A(ϕ 12, 800T)
QN206A(ϕ 6, 800T)
Input range: 0 to 50 Aac
Current measurement range: 0.0 to 55.0 Aac
(accuracy may be out of specifications for less than 0.4 Aac.)
Indication accuracy: ±3 %FS ± 1 digit
Indication resolution: 0.1 Aac
Input impedance: 10 Ω (typ)

- **Heater power supply voltage input**

Input frequency: 50 Hz/60 Hz
Input range: 0 to 12 Vac
Voltage measurement range: 0 to 13.2 Vac
(Accuracy may be out of specifications for less than 0.5 Vac.)
Indication accuracy: ± 0.5 %FS ± 1 digit
Indication resolution: 0.01 Vac
Input impedance: 126 kΩ (typ)
Transformer for detecting heater power supply voltage: 81406725-003

- **Digital input (DI)**

Types of connectable outputs: Dry contact or transistor (sink type)
Open terminal voltage: 7 Vdc ±15 %
Terminal current (during short-circuit): 3 to 7 mA
Allowable ON contact resistance: 500 Ω max.
Allowable OFF contact resistance: 100 kΩ min.
Allowable ON residual voltage: 1.5 V max.
Allowable OFF-state leakage current: 0.1 mA max.
ON/OFF minimum detectable pulse width: 25 ms min.

- **Control output (Control output (OUT) / auxiliary output (AUX) / event output (EV))**

・**Relay output (outputs 1 and 2)**

Contact configuration: 1a1b or 1a, selected by the model No.
Contact rating: 3 A 250 Vac/30 Vdc 1a1b, resistance load
1 A 250 Vac/30 Vdc 1a, resistance load
Contact voltage: 250 Vac max./125 Vdc max.
Life: Min. 100,000 operations, rated load
Min. switching specifications: 100 mA /5 Vdc 1a1b
10 mA/5 Vdc 1a

- **Relay output (output 3, 4 and 5)**

Contact configuration:	1a
Contact rating:	3 A 250 Vac/30 Vdc resistance load
Contact voltage:	250 Vac max./125 Vdc max.
Life:	Min. 100,000 operations, rated load
Min. switching specifications:	100 mA/5 Vdc

- **Current output**

Output current:	4 to 20 mAdc (2.4 to 21.6 mAdc)
	0 to 20 mAdc (0.0 to 22.0 mAdc)
Load resistance:	600 Ω max.
Output accuracy:	±0.1 %FS (standard conditions)
Output resolution:	1/15,000
Open terminal voltage:	23 Vdc max.

- **Continuous voltage output**

Output current:	0 to 5 Vdc (0.0 to 5.5 Vdc)
	1 to 5 Vdc (0.6 to 5.4 Vdc)
	0 to 10 Vdc (0.0 to 11.0 Vdc)
Load resistance:	1 kΩ min.
Load limit current:	21 mA (standard value under standard conditions)
Output accuracy:	±0.1 %FS (standard conditions)
Output resolution:	1/20,000 (for 0 to 10 V)

- **Voltage pulse output**

Output current:	12 Vdc +15 %/-10 %
Load current:	30 mA max.
Load limit current:	52 mA (standard value under standard conditions)
OFF leak current:	0.1 mA max.
Output response time:	500 μs max., 10 % ↔ 90 % of output voltage

- **Motor drive output (triac output)**

Contact form:	1a
Compatible motors:	ECM3000F1**0 (100 Vac, relay contact input)
Rated load voltage:	75 to 264 Vac (except with motor load)
Minimum load current:	20 mA
Maximum load current:	0.25 A

- **Motor drive output (relay output)**

Contact form:	1a + 1a
Contact rating:	2A at 250 Vac max./(cosϕ = 0.4)
	2.5 A at 24 Vdc (L/R=0.7 ms)
Contact voltage:	250 Vac max./125 Vdc max.
Life:	Min. 100,000 operations (under rated conditions)
Min. switching specifications:	40 mA/24 Vdc

- **Transmitter power supply function**

Output current:	24 Vdc ±10 %
Load current:	30 mA max.
Load limit current:	45 mA (standard value under standard conditions)
Ripple voltage:	100 mV max. (standard conditions)

- **Digital output (DO)**

Output type:	Transistor (sink type)
Load voltage:	4.5 to 28 Vdc
Load current:	70 mA max./point
	500 mA max./unit
ON-state residual voltage:	0.5 V max.
OFF-state leakage current:	0.1 mA max.

- **RS-485 communications**

Transmission line:	RS-485, 3-wire method 3-wire system multi-drop
Transmission speed:	4800, 9600, 19200, 38400 bps
Transmission distance:	500 m max.
Connectable units:	32 max. (including master station)
Communication system:	Half-duplex, start/stop synchronization
Terminating resistor:	150 Ω, at both ends of the line
Bit length:	8 bits/7 bits
Stop bit length:	1 or 2 bits
Parity bit:	Even parity, odd parity, or non-parity
Communication protocol:	CPL, MODBUS conforming

- **Internal clock**

Accuracy:	±270 sec./month (ambient temperature 25 °C)

- **Environmental conditions**

· **Standard conditions**

Ambient temperature:	23 ± 2 °C (SDC45A/46A/45V/46V)
	23 ± 0.1 °C (SDC45R/46R)
Ambient humidity:	60 ±5 %RH
Rated power supply voltage:	105 Vac ± 1 % (100 to 240 Vac power model)
	24 Vdc ± 5 %
	(100 to 240 Vac power model, SDC45A/46A/45V/46V)
	24 Vdc ± 2 %
	(100 to 240 Vac power model, SDC45R/46R)
Power frequency:	50 ±1 Hz or 60 ±1 Hz (100 to 240 Vac power model)
Vibration resistance:	0 m/s^2
Shock resistance:	0 m/s^2
Mounting angle:	Reference plane ±3 °
Warm-up time:	30 min or longer

· **Operating conditions**

Ambient temperature:	0 to 50 °C (SDC45A/46A/45V/46V)
	20 to 25 °C (SDC45R/46R)
Ambient humidity:	10 to 90 %RH (without condensation)
Rated power supply voltage:	85 to 264 Vac (100 to 240 Vac power model)
	21.6 to 26.4 Vdc (24 Vdc power model)
Power frequency:	50 ± 2 Hz or 60 ± 2 Hz (100 to 240 Vac power model)
Vibration resistance:	0 to 2 m/s^2 10 to 60 Hz for 2 h each in X, Y, and Z directions
Shock resistance:	0 to 10 m/s^2

Mounting angle:	Reference plane ±10 °
Altitude:	2000 m max.

- **Transportation conditions**

Ambient temperature:	-20 to +70 °C
Ambient humidity:	10 to 95 %RH without condensation
Vibration resistance:	0 to 5 m/s^2 10 to 60 Hz (for 2 h each in X, Y, and Z directions)
Shock resistance:	0 to 500 m/s^2

● Memory backup

Backup system:	Serial EEPROM, battery and double layer capacitor for SRAM (SDC45V/SDC46V)
Number of rewrite operations:	Max. 1,000,000 for EEPROM; no limitation for SRAM
Backup life:	EEPROM 10 years
	SRAM 30 min (by double layer capacitor (while changing battery, at an ambient temperature of 35 °C or less, after capacitor is charged for 1 h or more)
	3 years (by battery (at 10 to 35 °C ambient temperature, without connection to power)

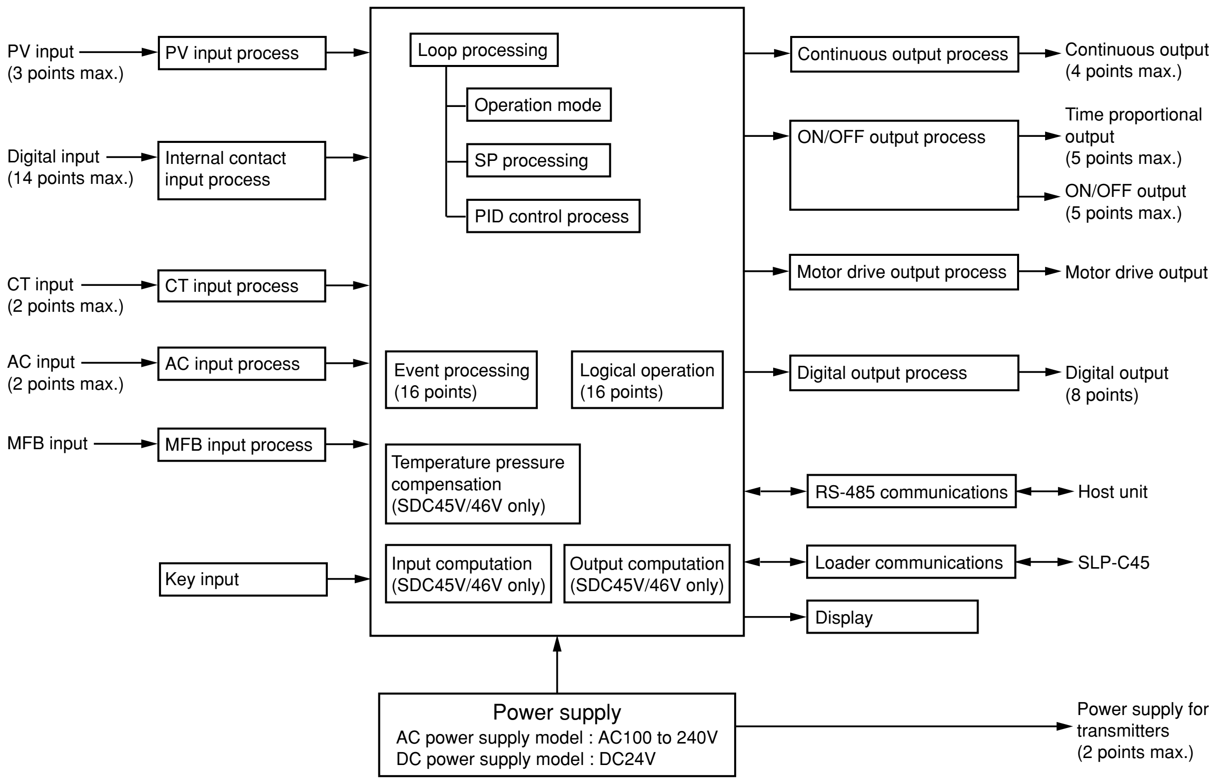
● Other specifications

Rated power voltage:	100 to 240 Vac (100 to 240 Vac power model)
Power consumption:	30 VA max. (SDC45 100 to 240 Vac power model)
	40 VA max. (SDC46 100 to 240 Vac power model)
	12 W max. (SDC45 24 Vdc power model)
	15 W max. (SDC46 24 Vdc power model)
Power ON inrush current:	35 A max./10 ms max. (100 to 240 Vac power model)
	20 A max./10 ms max. (24 Vdc power model)
Allowable transient power loss:	20 ms min.
Insulation resistance:	20 MΩ min. the resistance between power terminals A1 and A2, and FG terminal A3 is measured with a 500 Vdc-megger.
Dielectric strength:	1500 Vac for 1 min (dielectric strength between the power terminals A1, A2 or FG terminal A3 and each input/output terminal, and the dielectric strength between power terminals A1-A2 and FG terminal A3.)
Mass:	Approx. 400 g (SDC45A) (including dedicated mounting bracket)
	Approx. 700 g (SDC46A) (including dedicated mounting bracket)
Terminal screw tightening torque:	0.4 to 0.6N•m
Protection:	IP65 (under operating conditions)
Standards compliance:	EN61010-1, EN61326
Overvoltage category:	Category II (IEC60364-4-443, IEC60664-1)
Allowable pollution degree:	Pollution degree 2
Mask/case material:	PPO
Mask/case color:	Black

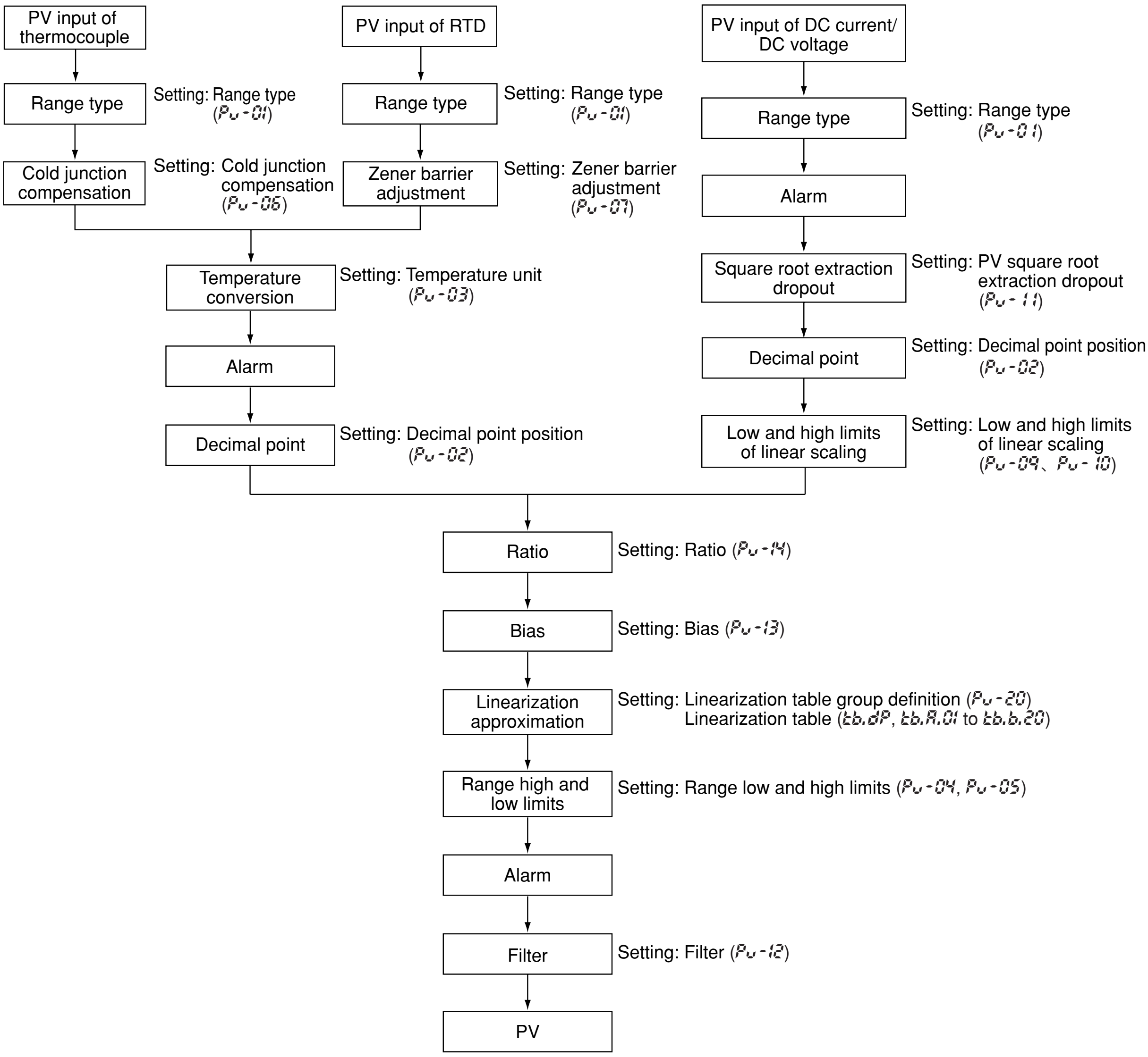
Appendices

Appendix 1 Function Block Diagrams

■ Basic function block diagram

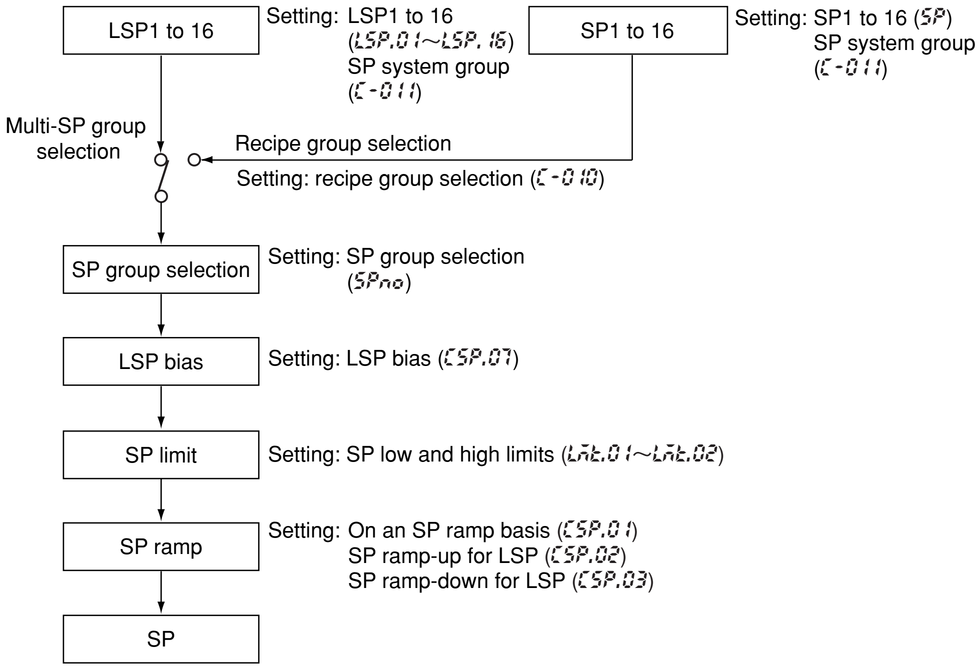


■ PV input process block diagram



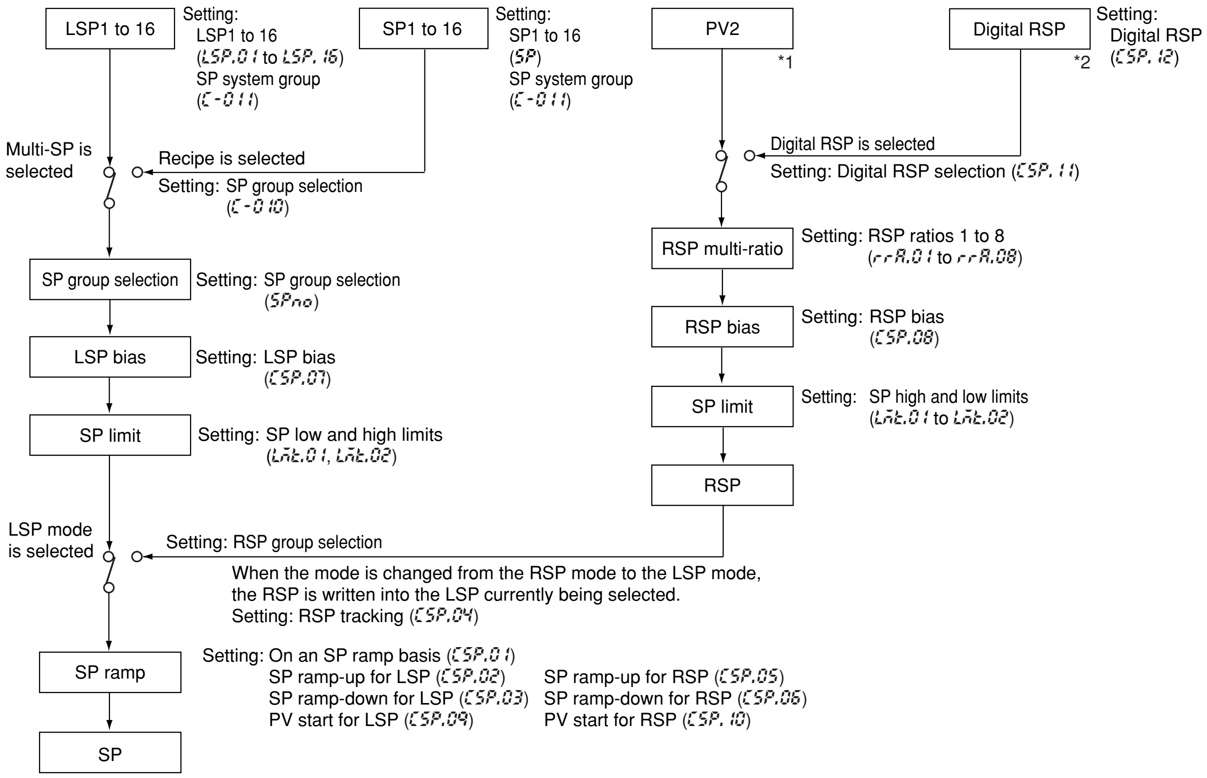
■ SP process block diagram

SP process without an RSP.



■ SP process block diagram (with RSP)

SP process with an RSP:



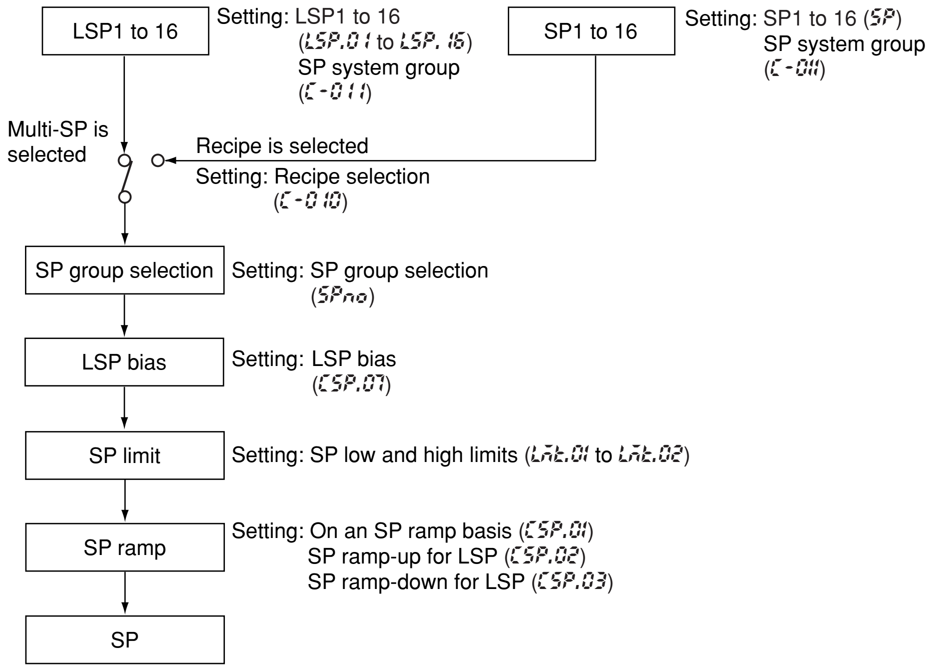
*1 In the case of SDC45V/46V, PV2 is selected in the RSP assignment (InP.02) by standard numerical code.

*2 RS-485 models only

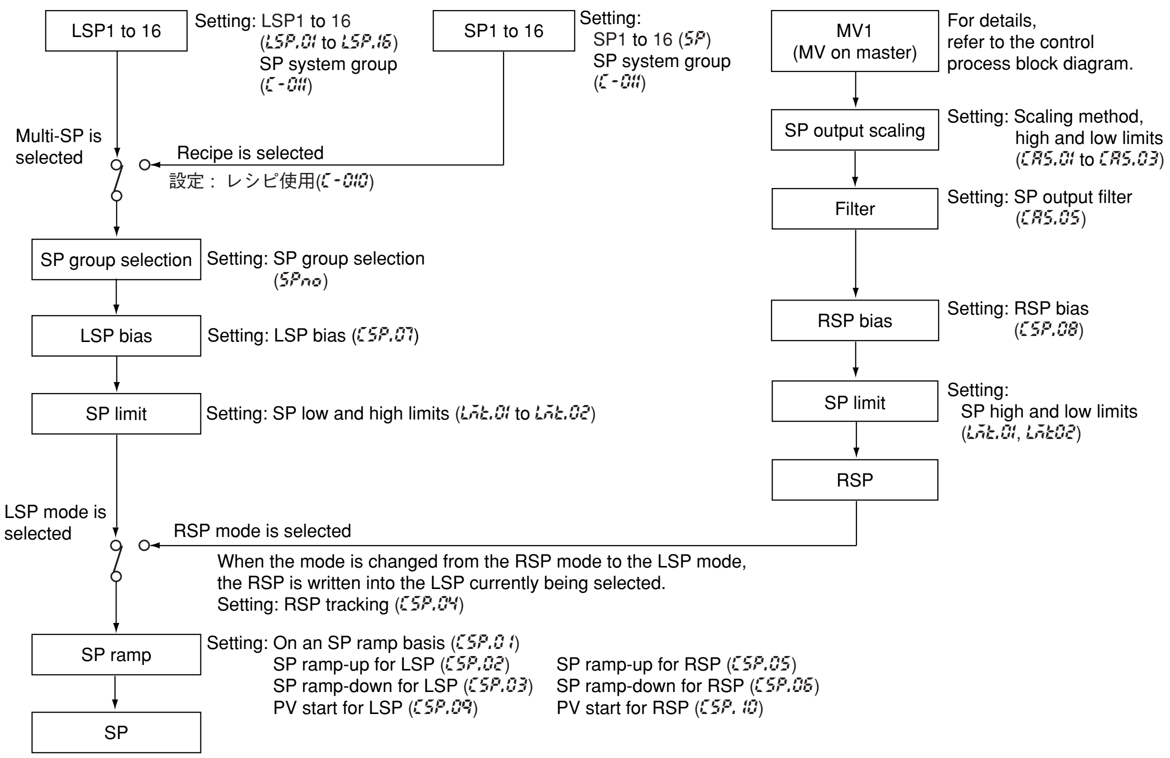
■ SP process block diagram (internal cascade)

The following describes a SP process with the internal cascade:
The master and slave use different SP processes. The master uses the loop 1 setting while the slave uses the loop 2 setting. The MV on the master is converted through the SP output scaling and it is used for the RSP on the slave.

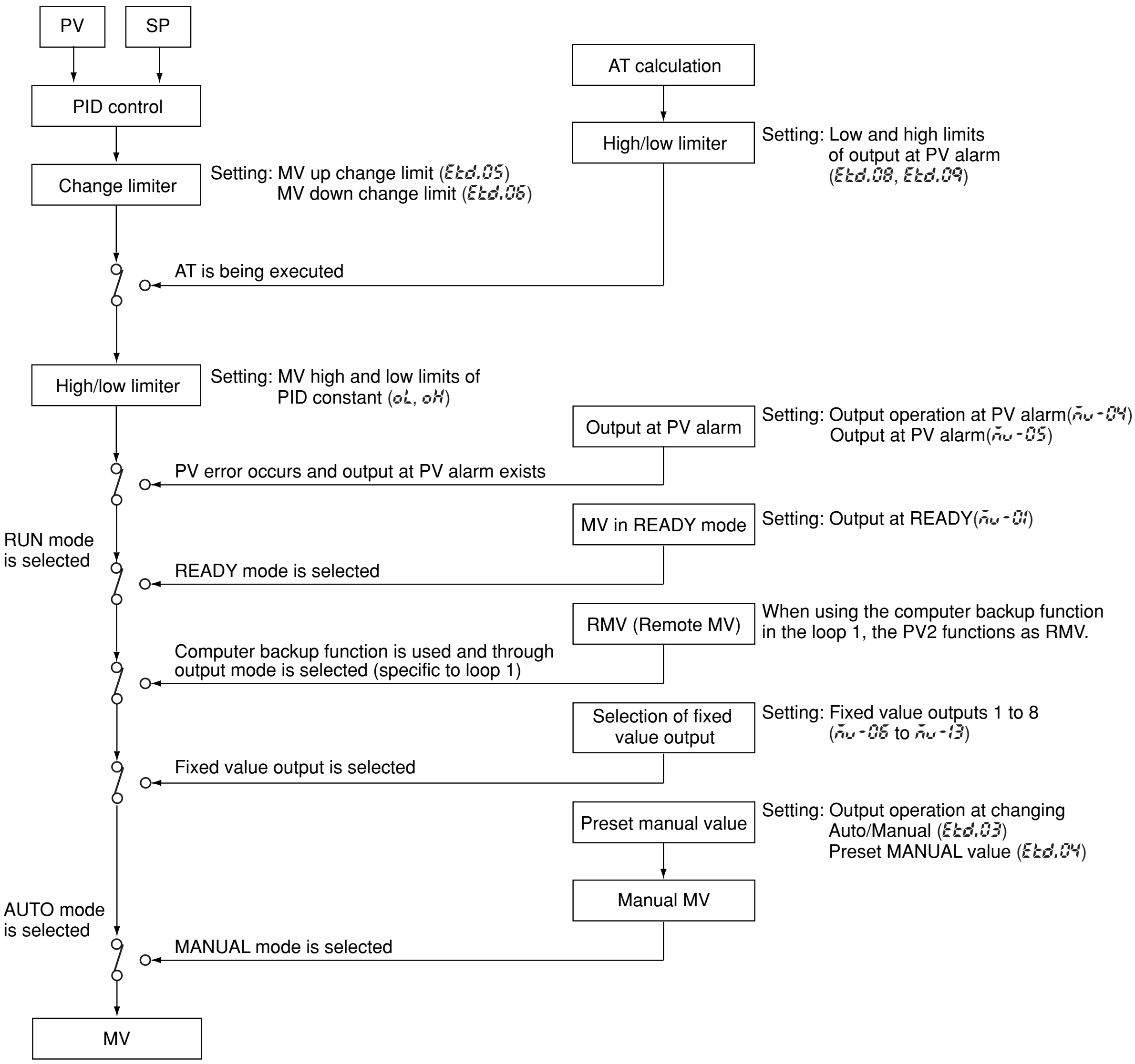
● Master (loop 1)



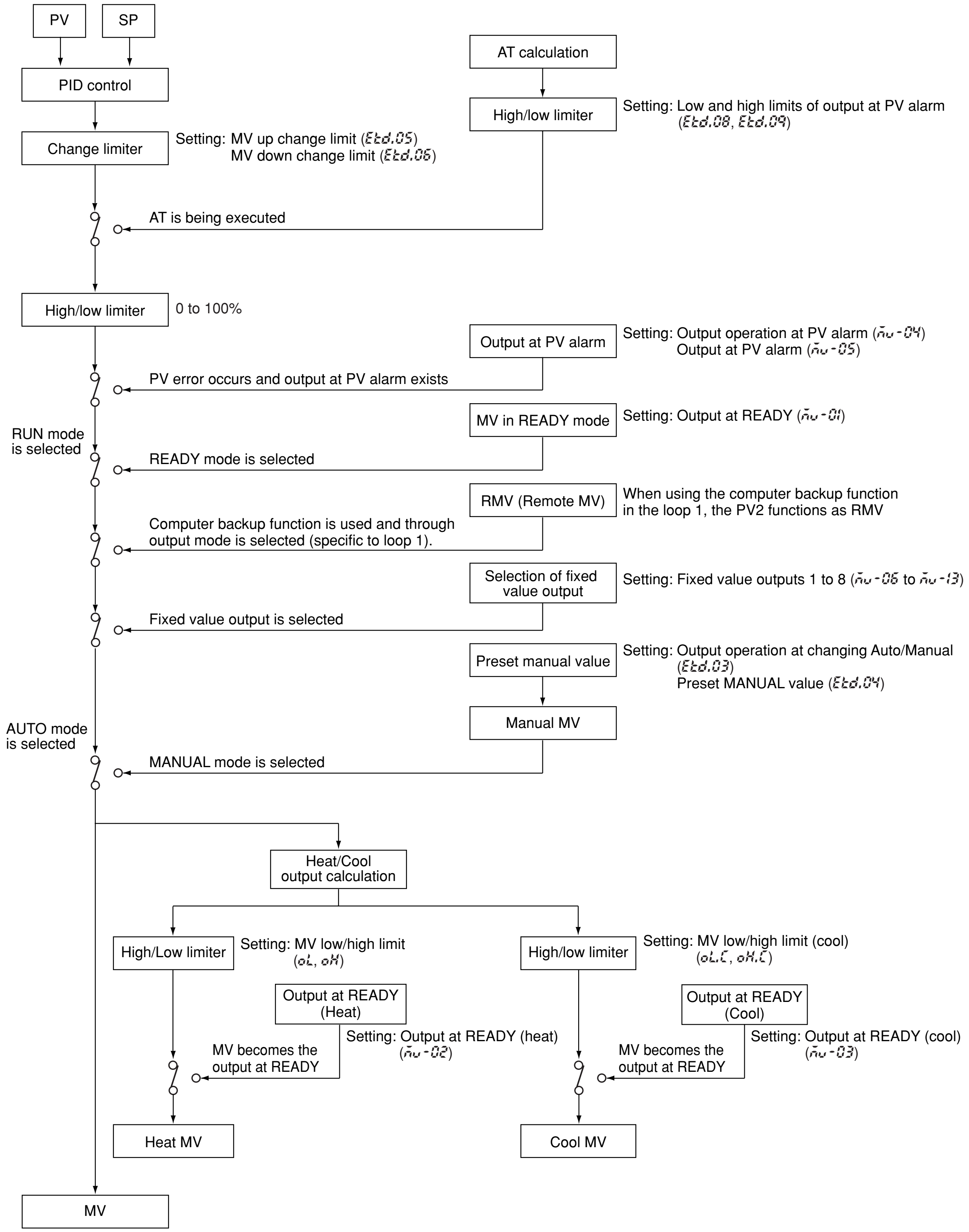
● Slave (loop 2)



■ Control process block diagram (direct or reverse action)

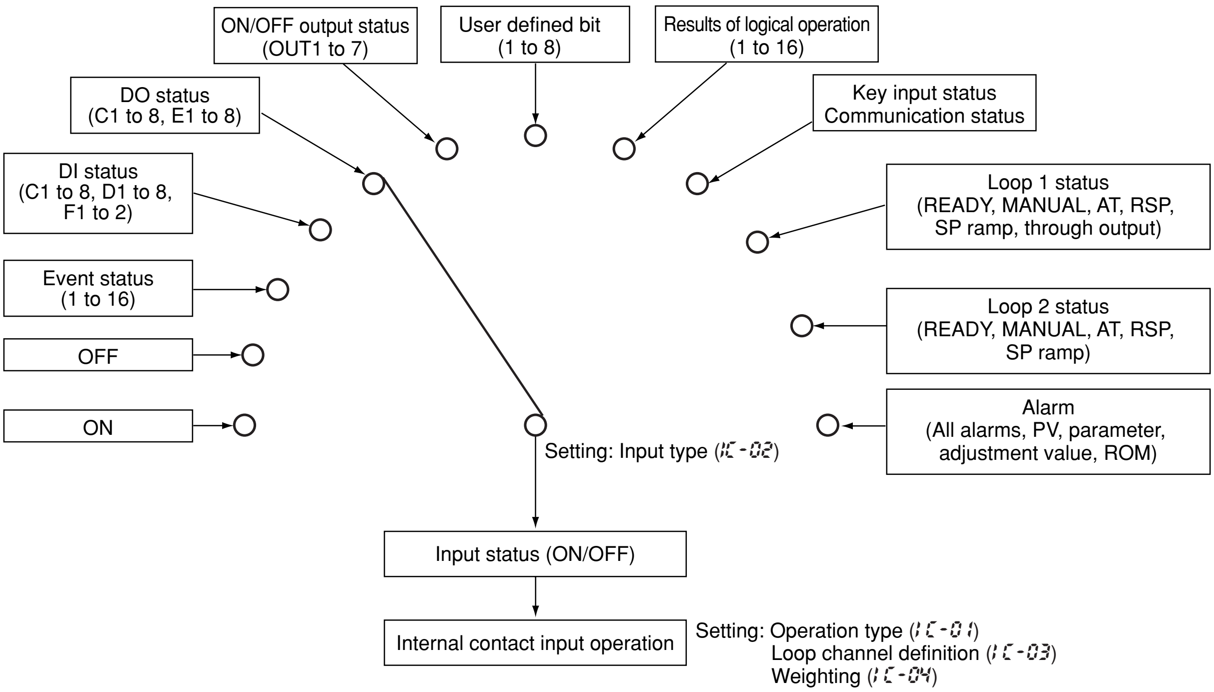


■ Control process block diagram (heat/cool control)



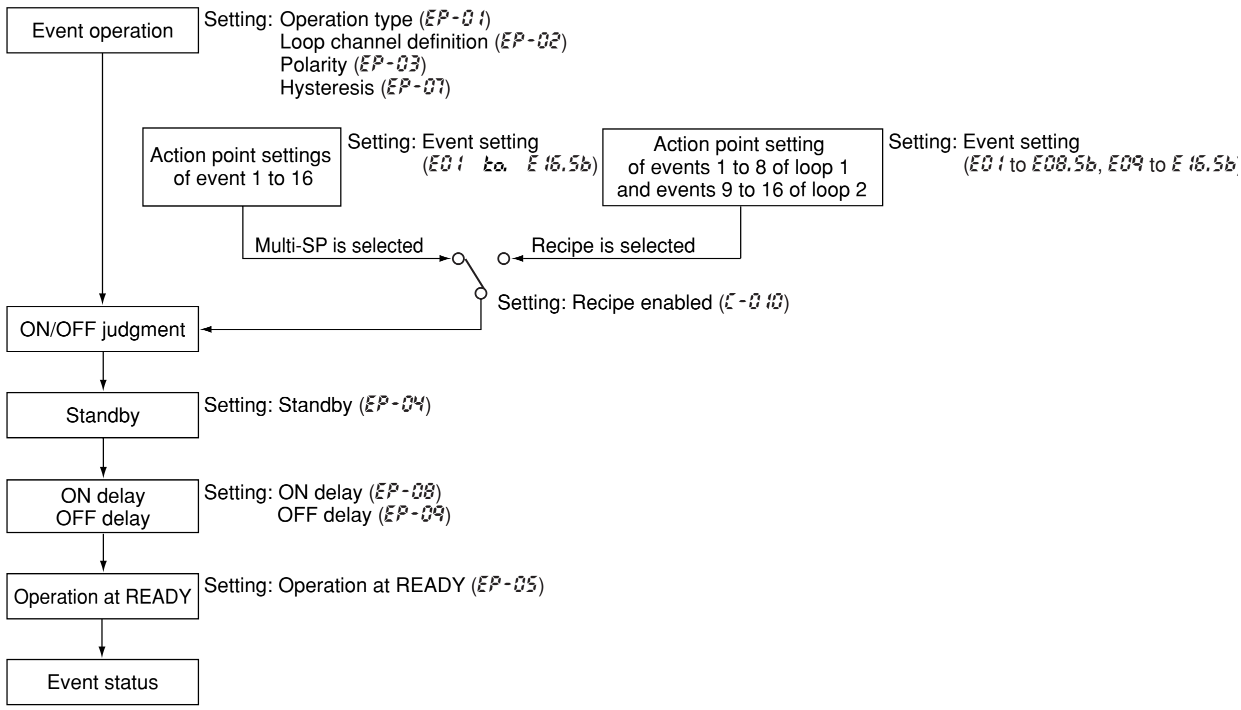
■ Internal contact input process block diagram

There are 20 groups of internal contact input processes. All groups use the same process. Settings are provided for each group.



■ Event process block diagram

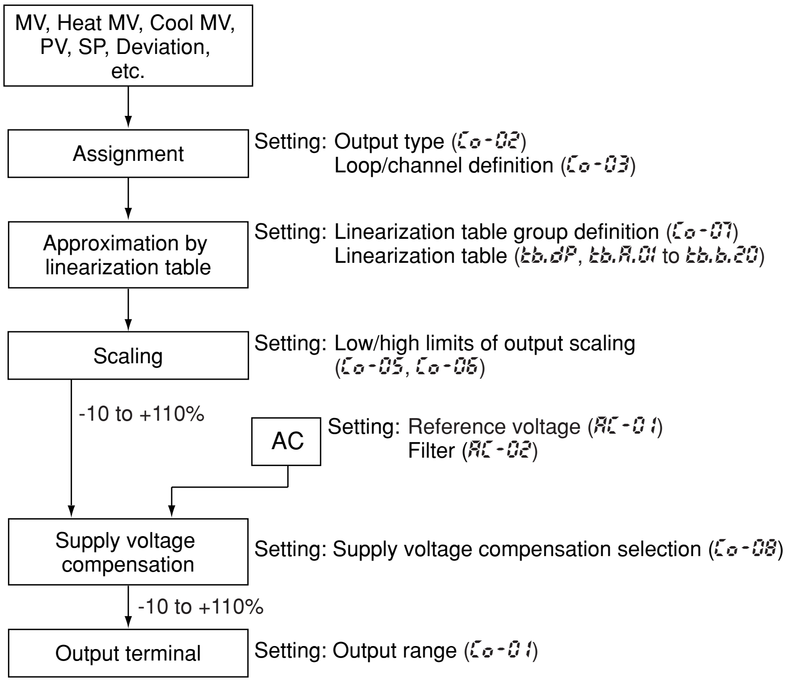
There are 16 groups of event processes. All groups use the same process. Settings are provided for each group.



App.-9

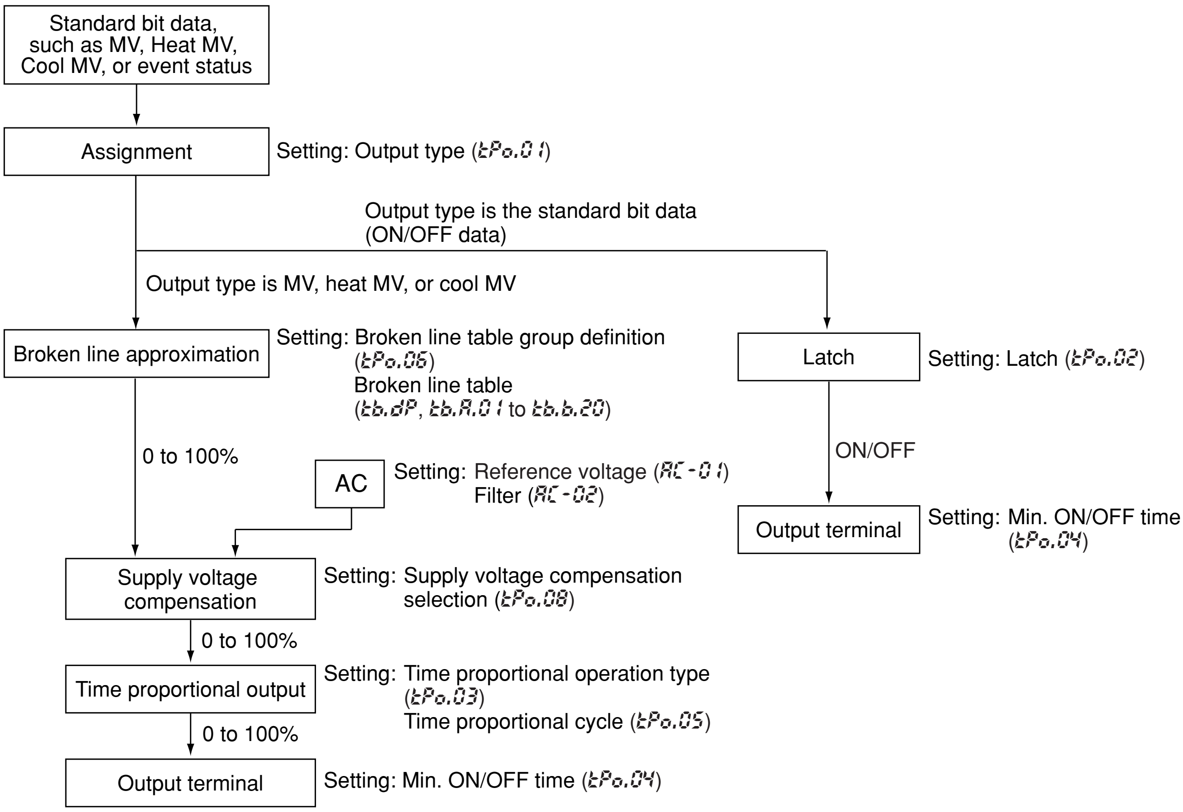
■ Continuous output process block diagram

The following shows the current output and continuous voltage output processes:



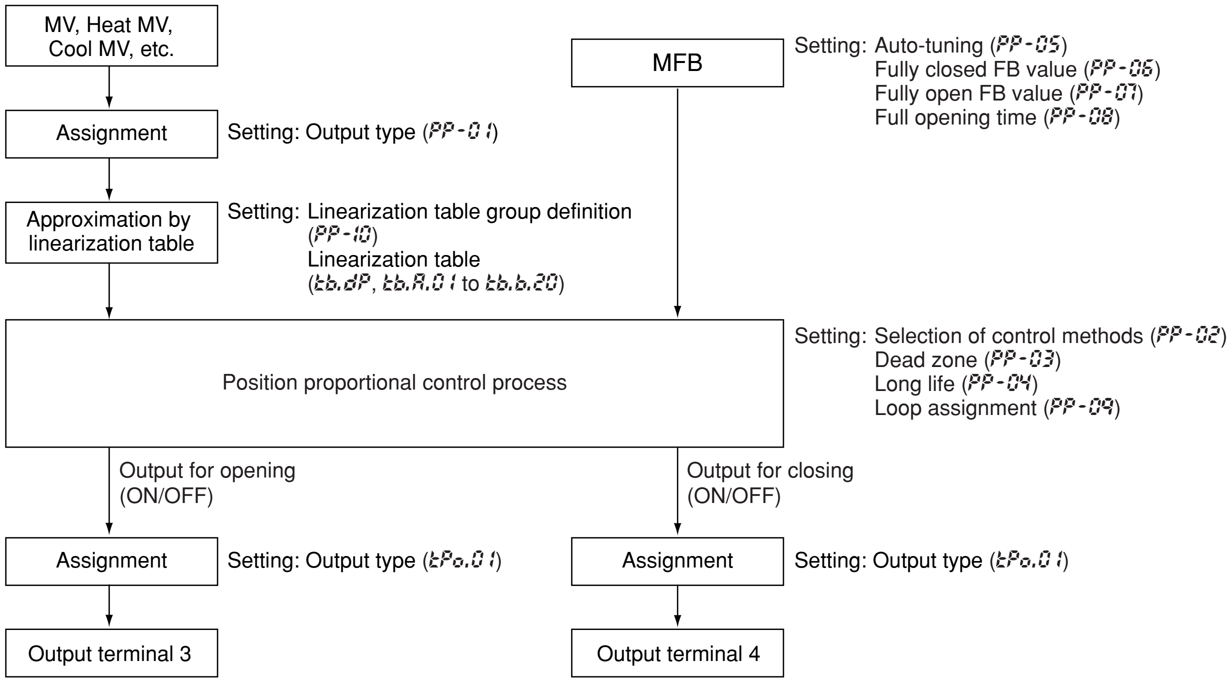
■ ON/OFF output process block diagram

The following shows the relay output and voltage pulse output processes:



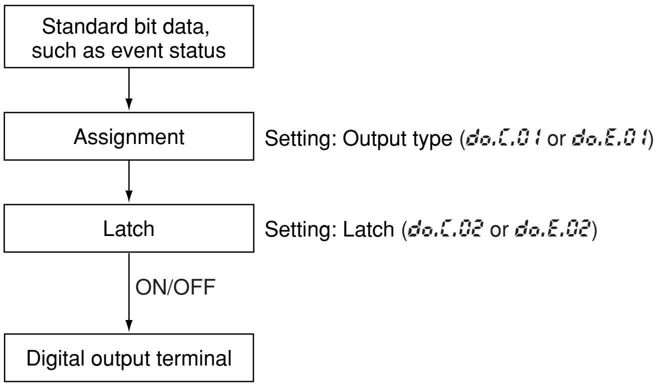
■ Motor drive output process diagram

Processes for motor drive triac output and motor drive relay output:



■ Digital output process block diagram

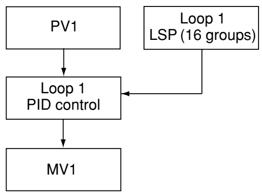
The following shows the process of the digital output (DO) terminals:



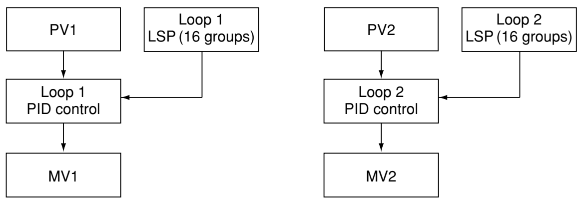
Appendix 2 Loop Process Block Diagram

There are five kinds of loops. For 1-input model, only "1-loop" is possible.
For 1-input model (with communication function, 2-input model, 3-input model, configure the setting using the loop type (item display: C-001) in the setup bank.
For the SDC45V/46V, select [Loop input allocation (InP.01)] in the control bank (CtrL), and assign [1: PV1] and [2: PV2] to [Loop 1] and [Loop 2] respectively.
The following shows the process block diagram of each loop:

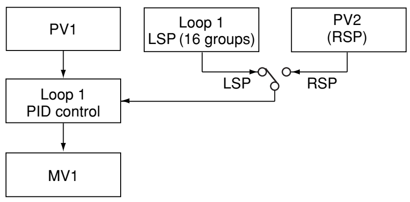
- **1-loop**



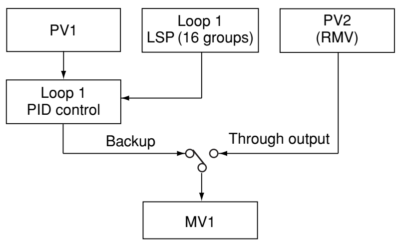
- **2-loop (independent)**



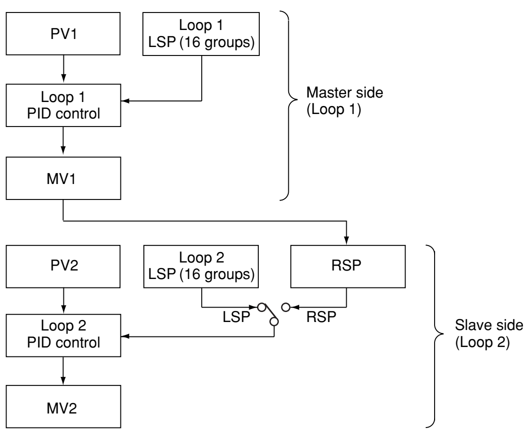
- **1-loop (RSP)**



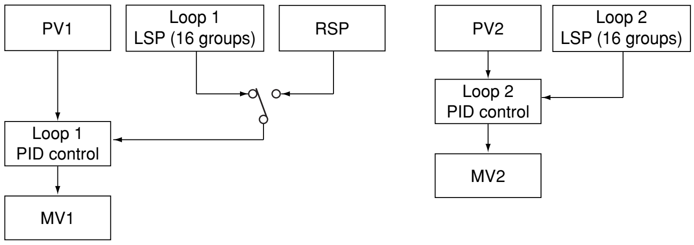
- **1-loop (computer backup)**



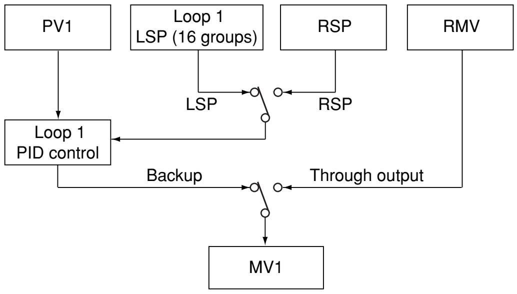
- **1-loop (internal cascade)**



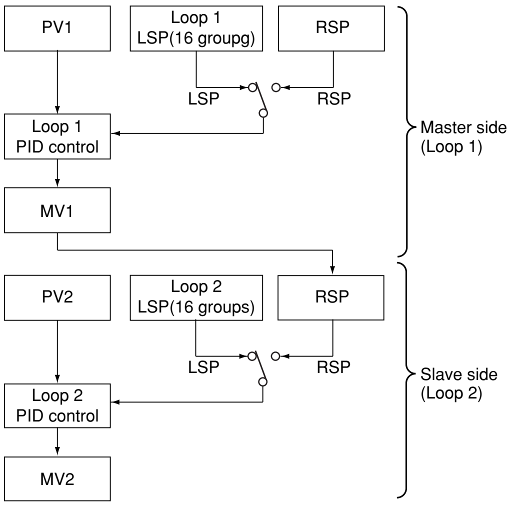
- **2-loop with an RSP on one side**



- **1-loop (computer backup with RSP)**



- **1-loop (internal cascade with RSP)**



Appendix 3 Standard Bit Codes and Standard Numerical Codes

■ Standard bit codes

The range of the standard bit codes is 1024 to 2047.
Codes not stated in the list are undefined. Therefore, do not use such codes
The standard bit codes are set values common to the following items:

- Output type (tPo.01) of output bank (ON/OFF output)
- Input type (IC-02) of internal contact input bank
- Output type (doC.01, doE.01) of digital output (C/E-column terminal)
- Input assignment A/B/C/D (bF-02 to bF-05) of logical operation
- Lighting conditions (MS-01) for display and key bank (MS display)
- Lighting conditions (UFL-01) for display and key bank (UFLED setting)
- Tracking selection (CAS-04) of MV bank
- MV tracking selection (tr-01) of MV bank

Standard bit code	Meaning of standard bit
1024	OFF (0)
1025	ON (1)
1088	Event 1
1089	Event 2
1090	Event 3
1091	Event 4
1092	Event 5
1093	Event 6
1094	Event 7
1095	Event 8
1096	Event 9
1097	Event 10
1098	Event 11
1099	Event 12
1100	Event 13
1101	Event 14
1102	Event 15
1103	Event 16
1120	CT1 Heater burnout detection
1121	CT2 Heater burnout detection
1124	CT1 Over-current detection
1125	CT2 Over-current detection
1128	CT1 Short-circuit detection
1129	CT2 Short-circuit detection
1152	Terminal status of DI-C1
1153	Terminal status of DI-C2
1154	Terminal status of DI-C3
1155	Terminal status of DI-C4
1156	Terminal status of DI-C5
1157	Terminal status of DI-C6
1158	Terminal status of DI-C7
1159	Terminal status of DI-C8
1160	Terminal status of DI-D1
1161	Terminal status of DI-D2
1162	Terminal status of DI-D3
1163	Terminal status of DI-D4
1164	Terminal status of DI-D5
1165	Terminal status of DI-D6
1166	Terminal status of DI-D7
1167	Terminal status of DI-D8
1176	Terminal status of DI-F1
1177	Terminal status of DI-F2
1216	Terminal status of DO-C1
1217	Terminal status of DO-C2
1218	Terminal status of DO-C3
1219	Terminal status of DO-C4
1220	Terminal status of DO-C5
1221	Terminal status of DO-C6
1222	Terminal status of DO-C7

Standard bit code	Meaning of standard bit
1223	Terminal status of DO-C8
1232	Terminal status of DO-E1
1233	Terminal status of DO-E2
1234	Terminal status of DO-E3
1235	Terminal status of DO-E4
1236	Terminal status of DO-E5
1237	Terminal status of DO-E6
1238	Terminal status of DO-E7
1239	Terminal status of DO-E8
1280	OUT1 (ON/OFF status)
1281	OUT2 (ON/OFF status)
1282	OUT3 (ON/OFF status)
1283	OUT4 (ON/OFF status)
1284	OUT5 (ON/OFF status)
1285	OUT6 (ON/OFF status)
1286	OUT7 (ON/OFF status)
1408	User defined bit 1
1409	User defined bit 2
1410	User defined bit 3
1411	User defined bit 4
1412	User defined bit 5
1413	User defined bit 6
1414	User defined bit 7
1415	User defined bit 8
1440	Results of logical operation 1
1441	Results of logical operation 2
1442	Results of logical operation 3
1443	Results of logical operation 4
1444	Results of logical operation 5
1445	Results of logical operation 6
1446	Results of logical operation 7
1447	Results of logical operation 8
1448	Results of logical operation 9
1449	Results of logical operation 10
1450	Results of logical operation 11
1451	Results of logical operation 12
1452	Results of logical operation 13
1453	Results of logical operation 14
1454	Results of logical operation 15
1455	Results of logical operation 16
1504	Key status (auto/man)
1505	Key status (sp/ev)
1506	Key status (para)
1507	Key status (rsp/lsp)
1508	Key status (at)
1509	Key status (f1)
1510	Key status (f2)
1511	Key status (up)
1512	Key status (left)

Standard bit code	Meaning of standard bit
1513	Key status (right)
1514	Key status (down)
1515	Key status (display)
1516	Key status (enter)
1545	Communication status (Normal receipt on a byte basis)
1547	Communication status (Normal transmission on a byte basis)
1548	Communication status (An error received)
1549	Power failure detection
1550	Hot start detection for loop 1 PID (Only SDC45V46V)
1551	Hot start detection for loop 2 PID (Only SDC45V46V)
1568	RUN/READY status of loop 1
1569	RUN/READY status of loop 2
1584	AUTO/MANUAL status of loop 1
1585	AUTO/MANUAL status of loop 2
1600	AT stop /AT status of loop 1
1601	AT stop /AT status of loop 2
1616	LSP/RSP status of loop 1
1617	LSP/RSP status of loop 2
1648	During SP ramp of loop 1 (ramp-up)
1649	During SP ramp of loop 2 (ramp-up)
1664	During SP ramp of loop 1 (ramp-down)
1665	During SP ramp of loop 2 (ramp-down)
1696	Backup/through output status of loop 1
1792	All typical alarms (logical OR of all alarms to be displayed)
1824	PV input high limit alarm (PV1)
1825	PV input high limit alarm (PV2/PV21)
1826	PV input high limit alarm (PV22)
1840	PV input low limit alarm (PV1)
1841	PV input low limit alarm (PV2/PV21)
1842	PV input low limit alarm (PV22)
1856	CJ input alarm (PV1)
1857	CJ input alarm (PV2)
1880	MFB1 input error
1888	MFB1 estimation in progress
1896	MFB1 adjustment error
1952	CT1 input alarm
1953	CT2 input alarm
1968	Parameter failure
1969	Adjustment value failure (CPU board)
1970	Adjustment value failure (PV board)
1972	ROM failure (CPU board)
1973	ROM failure (PV board)
1975	Battery voltage alarm (SDC45V/46V only)
1976	RTC alarm (SDC45V/46V only)

■ Standard numerical codes

The range of the standard numerical codes is 2048 to 3071.

Codes not stated in the list are undefined. Therefore, do not use such codes.

The standard numerical codes are set values common to the following items:

・Output type (Co-02) of output bank (continuous output)

・Lighting status (MS-02) of display and key bank (MS display)

Standard numerical code	Meaning of standard bit
2304	PV1
2305	PV2/PV21
2306	PV22 (SDC45V/SDC46V 3-input model only)
2320	PV of loop 1 (used for PID control)
2321	PV of loop 2 (used for PID control)
2336	SP of loop 1 (in use)
2337	SP of loop 2 (in use)
2352	SP of loop 1 (finally attained value)
2353	SP of loop 2 (finally attained value)
2384	SP output of loop 1
2416	MV of loop 1
2417	MV of loop 2
2432	Heat MV of loop 1
2433	Heat MV of loop 2
2448	Cool MV of loop 1
2449	Cool MV of loop 2
2464	MFB1 (Motor opening feedback value 1) (including estimation)
2480	MFB1 (Motor opening feedback value 1) (measurement value)
2496	CT1 current when output ON
2497	CT2 current when output ON
2512	CT1 current when output OFF
2513	CT2 current when output OFF
2528	Deviation of loop 1 (PV-SP)
2529	Deviation of loop 2 (PV-SP)
2544	AC1 value measurement voltage
2545	AC2 value measurement voltage
2560	AC1 value percent data
2561	AC2 value percent data
2592	Flow rate (with temperature pressure compensation) (SDC45V/46V only)
2608	Input computation result (SDC45V/46V only)
2624	Output computation result (SDC45V/46V only)
2656	Event 1 delay remaining time
2657	Event 2 delay remaining time
2658	Event 3 delay remaining time
2659	Event 4 delay remaining time
2660	Event 5 delay remaining time
2661	Event 6 delay remaining time
2662	Event 7 delay remaining time
2663	Event 8 delay remaining time
2664	Event 9 delay remaining time
2665	Event 10 delay remaining time
2666	Event 11 delay remaining time
2667	Event 12 delay remaining time
2668	Event 13 delay remaining time
2669	Event 14 delay remaining time
2670	Event 15 delay remaining time
2671	Event 16 delay remaining time
2720	Event 16 delay remaining time

Appendix 4 History of ROM Versions

This chapter describes added functions and specification changes in ROM versions.
The ROM version can be checked in Id-02 ("F/W information 2 (ROM version 1)") in the instrument information bank (Id).

■ Ver. 1.05 to 1.99 (available in June, 2007)

● Added functions

Descriptions
Compatible with internal cascade control
RSP multi-ratio function added.
SP tracking function added
Function added that restores the operation display when [display] is pressed while [<] is held down.

● Specification changes

Descriptions
The displayed label for the scaling method in the MV bank was changed from SCL.01 to CAS.01.
The displayed labels for the scaling low/high limits in the MV bank were changed from SCL.02/SCL.03 to CAS.02/CAS.03.
The displayed label for SP group selection in the monitor bank was changed from SPS to SPno.
The displayed label for the SP group selection bank was changed from SPS to SPno.
The displayed label for the SP group selection in the SP group selection bank was changed from SPS to SPno.

■ Ver. 2.00 to 2.99 (available in December, 2007)

● Added functions

Descriptions
Compatible with SDC45V/46V (computation function model).
Compatible with DC power models.
Compatible with position proportional control by MFB input.
Compatible with CT input.
RS and WS commands added for CPL communications.
For cold junction compensation, a function added that compensates for the terminal temperature using a sensor on another channel.
A function was added that allows change of SP group/LSP value from the operation display.
Display switching function added.
MV tracking function added.
Power failure detection function added
The following event operation types were added. 16: Upper/lower limits for MFB (motor feedback) 26: Upper limit for standard numerical codes 27: Lower limit for standard numerical codes 28: Upper/lower limits for standard numerical codes
The following alarm codes were added.
AL05/06: PV22 input error Al21: MFB input error AL22: Motor adjustment error AL25/26: CT input error AL81: Low battery voltage AL82: Internal clock error AL96: Main board error
Instrument information bank (Id) added.

- **Specification changes**

Descriptions
The selected group has display priority in the multi-SP, PID, and recipe banks.
The zone PID (ETD.12 to ETD.20) in the control bank can be set only when the PID group selection (LPR.02) is set to 2 (Zone PID function priority).
The default setting for SP scaling in the MV bank was changed from 1000.0 to 100.0.
The settable loop types in the setup bank now depend on the model No.
In the internal contact input bank, if configuration of an item (IC-02 to IC04) is unnecessary due to the operation type, the item is now displayed as “---.”
The default setting for input type (groups 17 to 20) in the internal contact input bank was changed to 1024 (OFF).

■ Ver. 3.00 and later (available in September, 2008)

- **Added functions**

Descriptions
Compatible with SDC45R/46R (high accuracy model).
Compatible with AC input.
Power supply voltage correction function.
RSP ramp function added.
A function that prevents PV start depending on the setting was added to the LSP ramp function.
LSP bias and RSP bias functions added.
Assignment of the proportional band, integral time, and derivative time of the PID group in use to a function key.
Ability to check the PID group currently used from the console or by communications.
Compatible with MODBUS communications protocol.

- **Specification changes**

Descriptions
Function keys 1 to 8 (FK-02 to FK-09) in the display/key bank can be assigned only if the function key registration setting (FK-01) is 1.

Appendix 5 Abbreviations and Terms

Abbreviations are used in descriptions, tables, and illustrations of this manual. The following describes major abbreviations.

AT:	Auto Tuning. The PID is automatically adjusted at an optimal numeric value.
DI:	Digital input
DISP:	Display. Pressing the [display] key will change the contents of the display.
DO:	Digital output (control output of relay and voltage pulse, and event output)
OL:	Output Low. Output low limit, a minimum limit level of the output, is set.
OH:	Output High. Output high limit, a maximum limit level of the output, is set.
PARA:	Parameter. A variable to determine the operating conditions for this unit. A desired numeric value is set.
PID :	PID has the following meanings. P (Proportioning). Proportional operation. I (Integral). Integral operation or reset operation. D (Derivative). Derivative operation or rate operation.
PV:	Process Variable. Measured values of the thermocouple, RTD, and linear input.
SP:	Set value of Set Point. For example, set point to control the temperature.
LSP :	Local Set Point. A set value stored in the controller.
RSP:	Remote Set Point. A set value given from the outside by the analog signal.
MV:	Manipulated Variable. An output of the instrument to be controlled. This output shows the PID control results.
LMV:	Local Manipulated Variable. When the loop type is set at computer backup, MV of the PID control result of this unit is called "LMV". "LMV" is distinguished from "RMV", an MV given from the outside.
RMV:	Remote Manipulated Variable. MV given from the outside by the analog signal.
Setup:	Setup is a setting operation corresponding to how to use a unit that incorporates operating conditions, such as control action.
Hysteresis:	An operation gap during event operation. A difference between the value at which the event OFF is changed to ON and the value at which the event ON is changed to OFF. Hysteresis is shown as "(HYSR" in the Figs. in this manual.
EV:	Event. EV shows a set value of the event function. The event function is the ON/OFF signal function, which is output in the control status. EV with numeric values added, like EV1 or EV2 shows an event function. A numeric value shows relevant event No.

U: An abbreviation of "Unit". This shows the minimum unit of the setting. When the number of digits below the decimal point of the set value is "0", "1", "2", "3", and "4", 1U=1, 1U=0.1, 1U=0.01, 1U=0.001, and 1U=0.0001, respectively.

Cascade control: Control method that two PID controllers are connected in series. This control method is effective if a large response delay exists between the operation part and measurement point.

Heat/cool output: Control output, which is output when the heat output is related with the cool output within one controller.

AUTO: Auto operation status that the PID control result is used as MV.

MANUAL: Manual operation status that a value manually set by the operator is used as MV.

READY: Standby status, in which the control calculation is stopped.

RUN: Status, in which the control calculation is executed.

Revision History

Printed date	Manual Number	Edition	Revised pages	Description
Nov. 2007	**CP-SP-1218E**	**1st Edition**		
Oct. 2009		**2nd Edition**		Overall revision
Jan. 2010		**3rd Edition**	iii, iv 3-1, 3-2, 3-3, 3-11, 3-16, 3-18, 3-19, 3-21 4-9	Description deleted. Explanation added. Explanation added. Graph corrected.
Jan. 2011		**4th Edition**	i iii, 3-1 v 1-1 2-1 12-1 14-7	EQUIPMENT INSTALLATION changed. Wiring explanation changed. Manual No. revised. ■Futures changed. ■Location changed and condition added. Alarm code AL17 added. Number of rewrite operations changed. Delete Number of EEPROM writing cycles.
May 2011		**5th Edition**	iii 3-9, 3-15	Wiring description deleted. Description deleted.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Yamatake products.
You are required to acknowledge and agree upon the following terms and conditions for your purchase of Yamatake products (field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Yamatake products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Yamatake product has any failure attributable to Yamatake during the aforementioned warranty period, Yamatake shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

(1) Failure caused by your improper use of Yamatake product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
(2) Failure caused for other reasons than Yamatake product;
(3) Failure caused by any modification or repair made by any person other than Yamatake or Yamatake's subcontractors;
(4) Failure caused by your use of Yamatake product in a manner not conforming to the intended usage of that product;
(5) Failure that the state-of-the-art at the time of Yamatake's shipment did not allow Yamatake to predict; or
(6) Failure that arose from any reason not attributable to Yamatake, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Yamatake shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Yamatake products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Yamatake product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

(1) Regulations and standards or laws that your Equipment is to comply with.
(2) Examples of application described in any documents provided by Yamatake are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
(3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although Yamatake is constantly making efforts to improve the quality and reliability of Yamatake products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, safety design, or the like so that the said Equipment may satisfy the level of the reliability and safety required in your use, whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth.

3. Precautions and restrictions on application

Yamatake products other than those explicitly specified as applicable (e.g. Yamatake Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area). Any Yamatake products shall not be used for/with medical equipment.
In addition,
you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual , etc. in case that you intend to use Yamatake product for any purposes specified in (1) through (6) below.
Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design and other designs of protection/safety circuit on your own responsibility to ensure the reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [For use outside nuclear energy controlled areas] [For use of Yamatake Limit Switch For Nuclear Energy]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

   Use of Yamatake products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Yamatake products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

   Mechanical components, such as relays and switches, used for Yamatake products will reach the end of their life due to wear by repetitious open/close operations.

   In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc.

   as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Yamatake products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.

   Field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts.

   For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

   Prior to your use of Yamatake products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Yamatake products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

   Please note that the descriptions contained in any documents provided by Yamatake are subject to change without notice for improvement or for any other reason.

   For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

   Please note that the production of any Yamatake product may be discontinued without notice.

   For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.

   For field instruments, we may not be able to undertake parts replacement for similar reasons.

azbil

Yamatake Corporation
Advanced Automation Company

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan

URL: http://www.azbil.com

Specifications are subject to change without notice. (08)

1st Edition: Issued in Nov. 2007 (W)
5th Edition: Issued in May 2011 (G)