User's
Manual

UT55A/UT52A
Digital Indicating Controllers
User's Manual

IM 05P01C31-01EN

Yokogawa Electric Corporation

IM 05P01C31-01EN
1st Edition

Product Registration

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Introduction

Thank you for purchasing the UT55A/UT52A digital indicating controller (hereinafter referred to as UT55A/UT52A).
This manual describes how to use UT55A/UT52A functions other than UT55A/UT52A's communication function and ladder sequence function. Please read through this user's manual carefully before using the product.
Note that the manuals for the UT55A/UT52A comprise the following six documents:

- **Printed manual**

Manual Name	Manual Number	Description
UT55A/UT52A Operation Guide	IM 05P01C31-11EN	This manual describes the basic operation method. It is also contained in the provided CD-ROM.

- **Electronic manuals contained in the provided CD-ROM**

Manual Name	Manual Number	Description
UT55A/UT52A Operation Guide	IM 05P01C31-11EN	This is identical to the printed manual.
UT55A/UT52A User's Manual	IM 05P01C31-01EN	This manual. It describes the usage of all functions except the ladder sequence and communication functions.
UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual	IM 05P07A01-01EN	This manual describes how to use UT55A/ UT52A in Ethernet and serial communications. For communication wiring, see the Operation Guide or User's Manual.
UTAdvanced Series Communication Interface (PROFIBUS-DP) User's Manual	IM 05P07A01-02EN	This manual describes how to use UT55A/ UT52A in PROFIBUS-DP communications. For communication wiring, see the Operation Guide or User's Manual.
LL50A Parameter Setting Software Installation Manual	IM 05P05A01-01EN	This manual describes how to install and uninstall the LL50A.
LL50A Parameter Setting Software User's Manual	IM 05P05A01-02EN	This manual describes how to use the LL50A, ladder sequence function, and peer-to-peer communication.

Target Readers

This guide is intended for the following personnel;
- Engineers responsible for installation, wiring, and maintenance of the equipment.
- Personnel responsible for normal daily operation of the equipment.

Notice

- The contents of this manual are subject to change without notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform Yokogawa Electric's sales office or sales representative.
- Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

1st Edition : May 2009 (YK)

Trademarks

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- Adobe, Acrobat, and Postscript are either registered trademarks or trademarks of Adobe Systems Incorporated.
- Ethernet is a registered trademark of XEROX Corporation in the United States.
- We do not use the TM or ® mark to indicate these trademarks or registered trademarks in this user's manual.
- All other product names mentioned in this user's manual are trademarks or registered trademarks of their respective companies.

Safety Precautions

This instrument is a product of Installation Category II of IEC/EN/CSA/UL61010-1 Safety Standards and Class A of EN61326-1, EN55011 (EMC Standards).

CAUTION

This instrument is an EMC class A product. In a domestic environment, this product may cause radio interference in which case the user needs to take adequate measures.

The instrument is a product rated Measurement Category I (CAT.I).

* Measurement Category I (CAT.I)

This category applies to electric equipment that measures a circuit connected to a low-voltage facility and receives power from stationary equipment such as electric switchboards.

To use the instrument properly and safely, observe the safety precautions described in this user's manual when operating it. Use of the instrument in a manner not prescribed herein may compromise protection features inherent in the device. We assume no liability for or warranty on a fault caused by users' failure to observe these instructions.

This instrument is designed to be used within the scope of Measurement Category I (CAT. I) and is dedicated for indoor use.

Notes on the User's Manual

- This user's manual should be readily accessible to the end users so it can be referred to easily. It should be kept in a safe place.
- Read the information contained in this manual thoroughly before operating the product.
- The purpose of this user's manual is not to warrant that the product is well suited to any particular purpose, but rather to describe the functional details of the product.

Safety, Protection, and Modification of the Product

The following symbols are used in the product and user's manuals to indicate safety precautions:

⚠ "Handle with Care" (This symbol is attached to the part(s) of the product to indicate that the user's manual should be referred to in order to protect the operator and the instrument from harm.)

∼ AC

⎓ AC/DC

⧈ The equipment wholly protected by double insulation or reinforced insulation.

⏚ Functional grounding terminal (Do not use this terminal as a protective grounding terminal.)

- In order to protect the system controlled by this product and the product itself, and to ensure safe operation, observe the safety precautions described in this user's manual. Use of the instrument in a manner not prescribed herein may compromise the product's functions and the protection features inherent in the device. We assume no liability for safety, or responsibility for the product's quality, performance or functionality should users fail to observe these instructions when operating the product.
- Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or failsafe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.
- Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.
- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Modification of the product is strictly prohibited.

WARNING

- Power Supply
  Ensure that the instrument's supply voltage matches the voltage of the power supply before turning ON the power.
- Do Not Use in an Explosive Atmosphere
  Do not operate the instrument in locations with combustible or explosive gases or steam. Operation in such environments constitutes an extreme safety hazard. Use of the instrument in environments with high concentrations of corrosive gas (H_2S, SO_X, etc.) for extended periods of time may cause a failure.
- Do Not Remove Internal Unit
  The internal unit should not be removed by anyone other than YOKOGAWA's service personnel. There are dangerous high voltage parts inside.
- Damage to the Protective Construction
  Operation of the instrument in a manner not specified in this user's manual may damage its protective construction.

Warning and Disclaimer

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- The product is provided on an "as is" basis. YOKOGAWA assumes no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

Notes on Software

- YOKOGAWA makes no warranties, either expressed or implied, with respect to the software's merchantability or suitability for any particular purpose, except as specified in the terms of the separately provided warranty.
- This software may be used on one specific machine only.
- To use the software on another machine, the software must be purchased again separately.
- It is strictly prohibited to reproduce the product except for backup purposes.
- Store the software CD-ROM (the original medium) in a safe place.
- All reverse-engineering operations, such as reverse compilation or the reverse assembly of the product are strictly prohibited.
- No part of the product's software may be transferred, converted, or sublet for use by any third party, without prior written consent from YOKOGAWA.

Handling Precautions for the Main Unit

- The instrument comprises many plastic components. To clean it, wipe it with a soft, dry cloth. Do not use organic solvents such as benzene or thinner for cleaning, as discoloration or deformation may result.
- Keep electrically charged objects away from the signal terminals. Not doing so may cause the instrument to fail.
- Do not apply volatile chemicals to the display area, operation keys, etc. Do not leave the instrument in contact with rubber or PVC products for extended periods. Doing so may result in failure.
- If the equipment emits smoke or abnormal smells or makes unusual noises, turn OFF the instrument's power immediately and unplug the device. In such an event, contact your sales representative.

Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from that which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

UT55A/52A Main Unit

The UT55A/UT52A main units have nameplates affixed to the side of the case.
Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

No. (Instrument number)

When contacting your sales representative, inform them of this number, too.

Model and Suffix Codes of UT55A

[Style:S1]

Model	Suffix code					Optional suffix code	Description
UT55A							Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)
Type 1: Basic control	-0						Standard type
	-1						Position proportional type
	-2						Heating/cooling type
Type 2: Functions (*1)		0					None
		1					Remote (1 additional aux. analog) input, 6 additional DIs, 5 additional DOs, and RS-485 communication (Max.19.2 kbps, 2-wire/4-wire) (*2)
		2					Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max.19.2 kpbs, 2-wire/4-wire) (*2)
		3					5 additional DIs and 5 additional DOs
		4					Remote (1 additional aux. analog) input and 1 additional DI
		5					Remote (1 additional aux. analog) input, 6 additional DIs, and 5 additional DOs
		6					5 additional DIs and 15 additional DOs
		7					3 additional aux. analog inputs and 3 additional DIs
Type 3: Open networks			0				None
			1				RS-485 communication (Max.38.4 kbps, 2-wire/4-wire)
			2				Ethernet communication (with serial gateway function)
			4				PROFIBUS-DP communication
Display language (*3)				-10			English
				-20			German
				-30			French
				-40			Spanish
Fixed code					-00		Always "-00"
Optional suffix codes						/DR	Additional direct input (TC and 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*4)
						/LP	24 V DC loop power supply (*5)
						/HA	Heater break alarm (*6)
						/DC	Power supply 24 V AC/DC
						/CT	Coating (*7)

*1: When “1” or “6” is specified for the Type 2 code, only “0” can be specified for the Type 3 code.
*2: When the /LP option is specified, the RS-485 communication for “1” or “2” of the Type 2 code is 2-wire system
*3: English, German, French, and Spanish can be displayed as the guide display.
*4: When any of “1,” “2,” “4,” “5,” or “7” is specified for the Type 2 code, the /DR option can be specified.
*5: The /LP option can be specified in the combination of Type 2 code (any of "0," "2," "3," or "4") and Type 3 code (any of "0" or "1"). Additionally, the /LP option can be specified in the combination of Type 2 code "1" and Type 3 code "0".
*6: When “-0” is specified for the Type 1 code, the /HA option can be specified.
*7: When the /CT option is specified, the UT55A does not conform to the safety standards (UL and CSA) and CE marking.

Model and Suffix Codes of UT52A

[Style:S1]

Model	Suffix code	Optional suffix code	Description
UT52A			Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)
Type 1: Basic control	-0		Standard type
	-1		Position proportional type
	-2		Heating/cooling type
Type 2: Functions	0		None
	1		Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max. 38.4 kbps, 2-wire)
	2		Remote (1 additional aux. analog) input and 1 additional DI
	3		2 additional DIs and 2 additional DOs
Type 3: Open networks	0		None
Display language (*1)	-10		English
	-20		German
	-30		French
	-40		Spanish
Fixed code	-00		Always "-00"
Optional suffix codes		/DR	Additional direct input (TC and 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*2)
		/LP	24 V DC loop power supply (*3)
		/HA	Heater break alarm (*4)
		/DC	Power supply 24 V AC/DC
		/CT	Coating (*5)

*1: English, German, French, and Spanish can be displayed as the guide display.
*2: When “2” is specified for the Type 2 code, the /DR option can be specified.
*3: The /LP option can be specified in the combination of Type 1 code (any of "-0" or "-1") and Type 2 code "0."
*4: When “-0” is specified for the Type 1 code, the /HA option can be specified.
*5: When the /CT option is specified, the UT52A does not conform to the safety standards (UL and CSA) and CE marking.

Coating Treatment

(1)HumiSeal coating treatment

Apply HumiSeal coating to the printed circuit board assembly.

Do not apply HumiSeal coating to the following parts: connector, gold-plated contact area, relay part, RJC device, and in the vicinity of the push switch/LED lamp.

(2)Apply terminal coating to the gold-plated contact area on the printed circuit board.

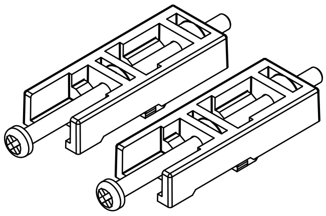
Notes

- There are two treatments as described above, but we do not guarantee their effectiveness.
  We do not supply any test data on these treatments.
- Do not apply any treatment to the screw terminal area on the back side of the instrument.

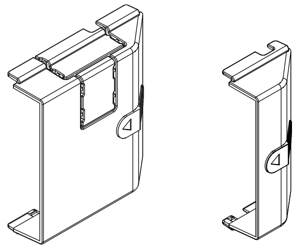
Accessories

The product is provided with the following accessories according to the model and suffix codes. Check that none of them are missing or damaged.

1

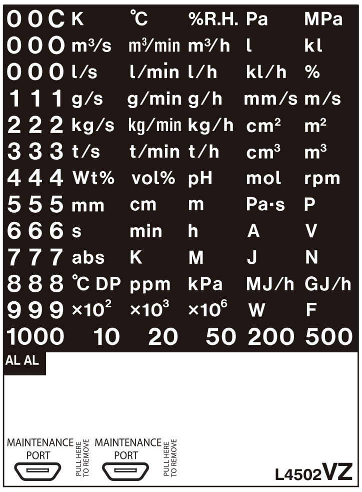


2

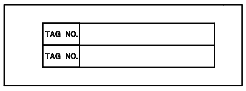


For UT55A For UT52A

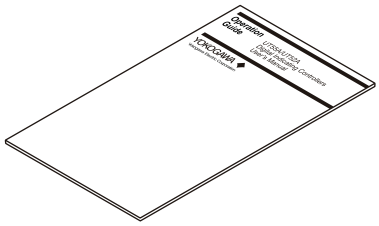
3



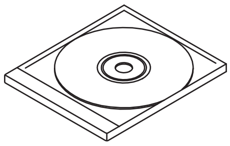
4



5



6



No.	Product Name	Quantity	Remark
1	Brackets	2	For fixing the upper and lower parts
2	Terminal cover	1	For UT55A: L4502XP For UT52A: L4502XQ
3	Unit label	1	Part number: L4502VZ
4	Tag label	1	Part number: L4502VE
5	Operation Guide	1	Single-loop control (A3 size, x6)
6	User’s Manual (CD-ROM)	1	Contains all manuals

Accessory (sold separately)

The following lists an accessory sold separately.

• LL50A Parameter Setting Software

Model	Suffix code	Description
LL50A	-00	Parameter Setting Software with Ladder Program Building Function

Symbols Used in This Manual

This symbol is used on the instrument. It indicates the possibility of injury to the user or damage to the instrument, and signifies that the user must refer to the user's manual for special instructions. The same symbol is used in the user's manual on pages that the user needs to refer to, together with the term "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

Note

Identifies important information required to operate the instrument.

▶

Indicates related operations or explanations for the user's reference.

[ ]

Indicates a character string displayed on the display.

Setting Display

Indicates a setting display and describes the keystrokes required to display the relevant setting display.

Setting Details

Provides the descriptions of settings.

Description

Describes restrictions etc. regarding a relevant operation.

How to Open an Electronic Manual

The provided CD-ROM contains PDF files of the manuals. Place this CD-ROM in the PC's CD-ROM drive; the Startup Window appears. Click on the relevant manual name to open the selected manual.

If the Startup Window does not appear, select My Computer and double click on UT_manual to open the manual concerned in the English directory.

How to Use This Manual

For the ladder sequence and communication functions, see the respective manuals. This user's manual is organized into Chapters 1 to 19 as shown below. This manual mainly uses the illustrations of the UT55A for describing the operations and functions. The basic operations are the same for the UT52A, so please read them in the same way.

Chapter	Title and Description
1	**Introduction to Functions** Describes the main functions of the UT55A/UT52A.
2	**UT55A/UT52A Operating Procedures** Describes the flow from unpacking to regular operations.
3	**Part Names** Describes part names and functions on the front panel.
4	**Basic Operation** Describes basic operation of the UT55A/UT52A.
5	**Quick Setting Function** Describes the minimum necessary settings for operation.
6	**Monitoring and Control of Regular Operations** Describes monitoring displays of regular operations and operation.
7	**Input (PV, Remote, and Auxiliary Analog) Functions** Describes PV input, remote input, and advanced secondary control input.
8	**Control Functions** Describes basic control and advanced control.
9	**Auxiliary Control Functions** Describes auxiliary control functions
10	**Output (Control and Retransmission) Functions** Describes output functions.
11	**Alarm Functions** Describes alarm output and status output.
12	**Contact Input/Output Functions** Describes contact input/output functions.
13	**Display, Key, and Security Functions** Describes display, user function key and security functions.
14	**Parameter Initialization** Describes the initialization to factory default values and to user default values.
15	**Power Failure Recovery Processing/Power Frequency Setting/Other Settings** Describes operations performed after momentary power interruption and power failures.
16	**Troubleshooting, Maintenance, and Inspections** Describes troubleshooting, maintenance, periodic inspections, and disposal.
17	**Installation and Wiring** Describes installation and wiring.
18	**Parameters** Provides parameter maps.
19	**Specifications** Provides the UT55A/UT52A specifications.

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Contents

Chapter 17 Installation and Wiring

Chapter 18 Parameters

Chapter 19 Specifications

Appendix Input and Output Table ....

Revision Information

1.1 Quick Setting Function

The Quick setting function is a function to easily set the basic function of the controller.

Buy and Unpacking

Check the contents.

Installation and Wiring

Installation and Wiring: Chapter 17
Install and wire a controller, and then turn on the pov

Setup

Q: What should I do to perform control immediately?
First, I want to set the input and output.

A: Use the Quick setting function to perform the setup easily.
Quick setting function: Chapter 5

Operation

Q: How do I determine the PID?

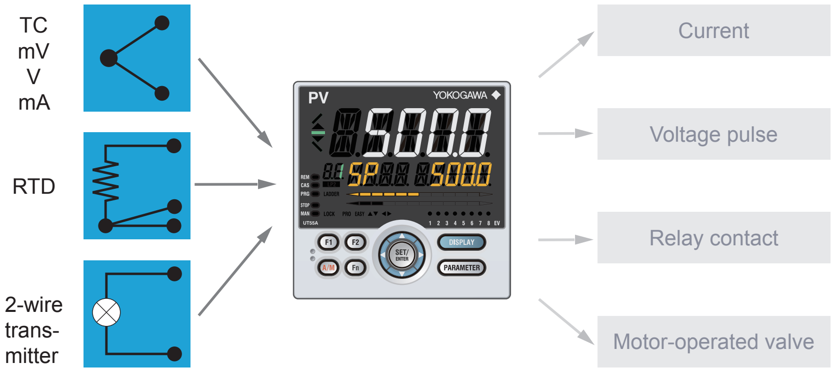
A: Use Auto-tuning to perform the tuning easily.
Auto-tuning: Section 6.3

1.2 Input/Output Function

PV Input (equipped as standard)

PV input is a universal input to arbitrarily set the type and range for the thermocouple (TC), resistance-temperature detector (RTD), and DC voltage/current.

► Chapter 7 Input (PV, Remote, and Auxiliary Analog) Functions



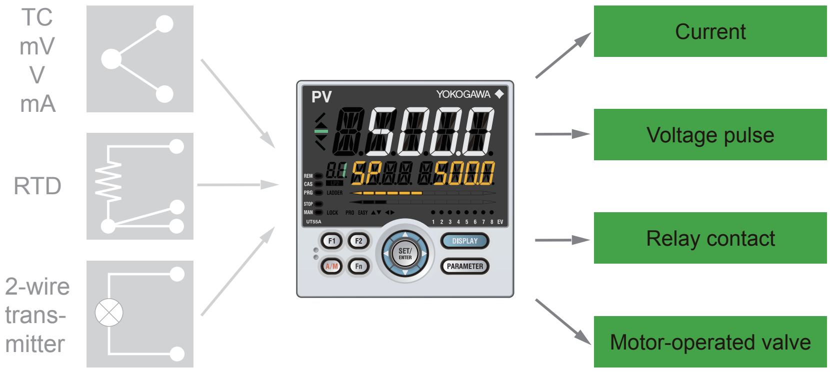
Control Output (equipped as standard)

Control output (OUT) is a universal output to arbitrarily set the type for the current, voltage pulse, and relay. Heating/cooling control and Position proportional control are possible by specifying the suffix code for the control.

Position proportional control is used exclusively for the motor-operated valve (suffix code: Type 1 = -1).

Heating/cooling control is for two output type of heat and cool (suffix code: Type 1 = -2).

► Chapter 10 Output (Control and Retransmission) Functions

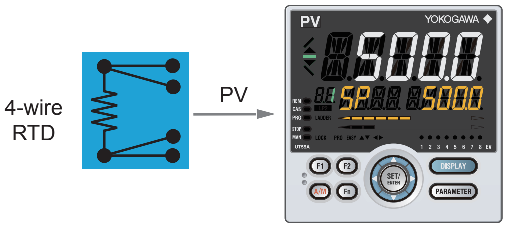


Remote Input (suffix code: Type 2=1, 2, 4, 5, or 7)

Remote input (RSP) is external analog signal used for remote setpoint.

► Chapter 7 Input (PV, Remote, and Auxiliary Analog) Functions

Add direct input (optional suffix code /DR) to the remote input to use the 4-wire RTD as PV input. The LL50A Parameter Setting Software is required.



Auxiliary Analog Input (suffix code: Type 2=7)

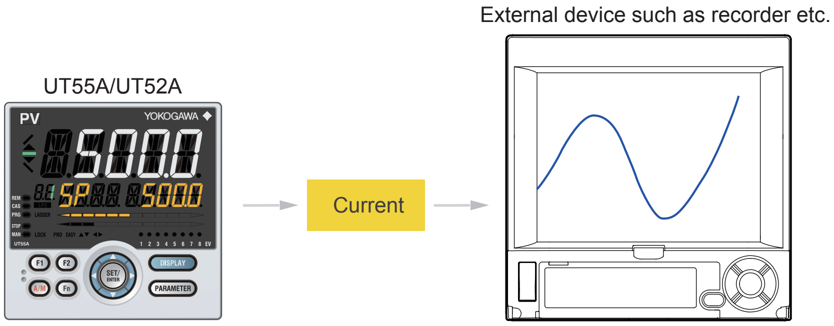
Two auxiliary analog inputs can be used separately from PV input (PV) and remote input (RSP).

► Chapter 7 Input (PV, Remote, and Auxiliary Analog) Functions

Retransmission Output (equipped as standard)

Retransmission output outputs a PV input value (PV), target setpoint (SP), control output value (OUT) and the like as an analog signal to, for example, the recorder.

► Chapter 10 Output (Control and Retransmission) Functions



Contact Input (suffix code: Type 2=6)

Up to 8 contact inputs can be incorporated. The operation modes can be switched.
PID control and sequence control can be performed simultaneously using the ladder sequence function.
The contact input can be specified with other suffix codes. For details, see the table of Model and Suffix Codes.

► Chapter 12 Contact Input/Output Functions

Contact Output (suffix code: Type 2=6)

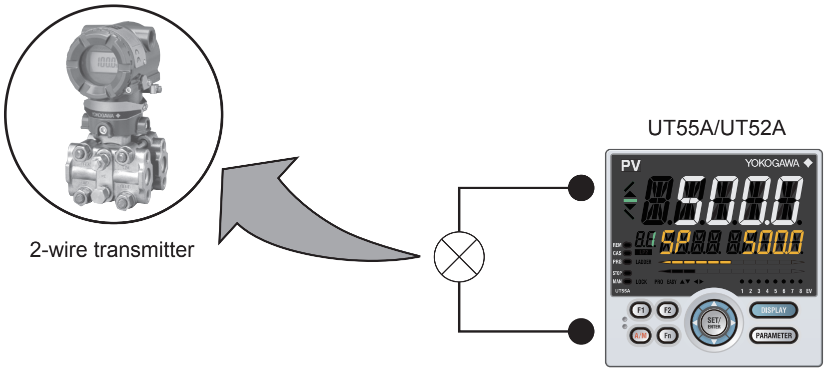
Up to 18 contact outputs can be incorporated. Contact output can output events such as alarms.
PID control and sequence control can be performed simultaneously using the ladder sequence function.
The contact output can be specified with other suffix codes. For details, see the table of Model and Suffix Codes.

► Chapter 11 Alarm Functions

24 V DC Loop Power Supply (optional suffix code: /LP)

24 V DC loop power supply can be supplied to 2-wire transmitter.

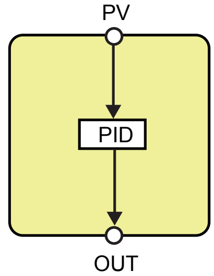
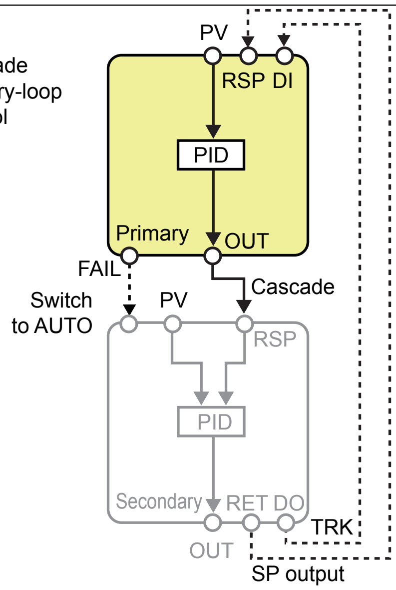
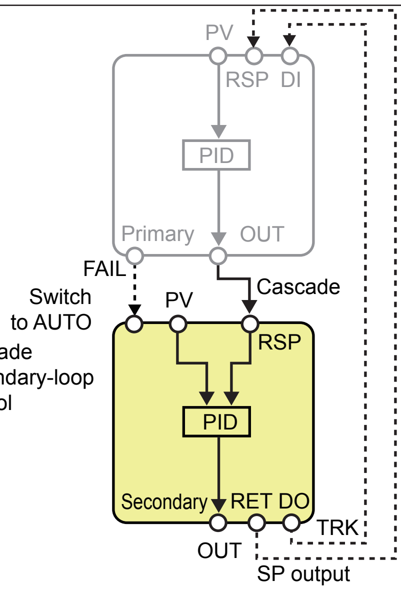
► 17.4.10 24 V DC Loop Power Supply Wiring

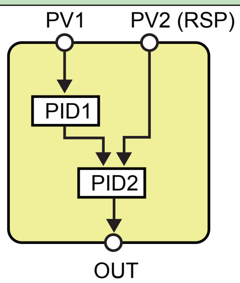
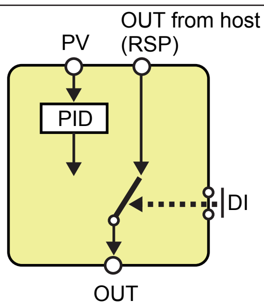
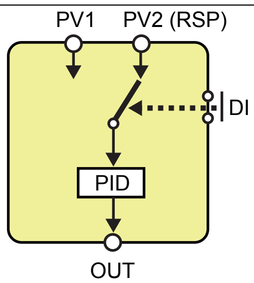
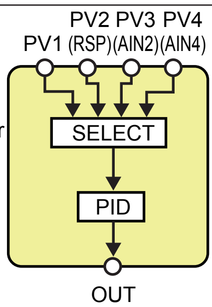
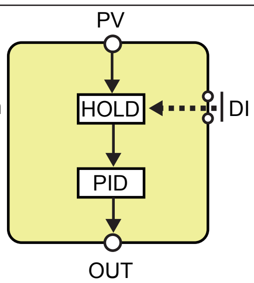


1.3 Control Functions

Control Mode

The UT55A/UT52A are controllers equipped with 8 control modes. Some control modes require a remote input (RSP) terminal.
For the auxiliary functions of control modes, see the respective sections.

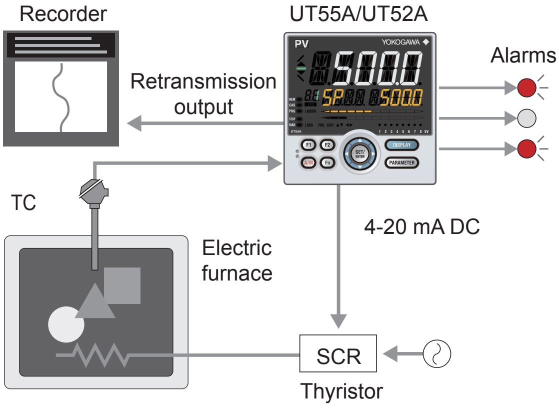
Control mode schematic diagram	Description
Single-loop control 	"Single-loop control" provides the basic control function having one control computation unit. ► 8.1.1 Single-loop Control, Single-loop Heating/cooling Control, Single-loop Position Proportional Control, and Single-loop Two-position Two-level Control
Cascade primary-loop control 	"Cascade primary-loop control" sets up a controller as the primary-loop controller when two controllers are used for Cascade control. It is used in connection with "Cascade secondary-loop control." It provides the output tracking function and FAIL output to the secondary-loop controller. Remote input (RSP) terminal is required for output tracking input ► 8.1.2 Cascade Primary-loop Control
Cascade secondary-loop control 	"Cascade secondary-loop control" sets up a controller as the secondary-loop controller when two controllers are used for Cascade control. It is used in connection with "Cascade primary-loop control." It provides the target setpoint output function and tracking signal output function to the primary-loop controller. Remote input (RSP) terminal is required for cascade input. ► 8.1.3 Cascade Secondary-loop Control, Cascade Secondary-loop Heating/cooling Control, and Cascade Secondary-loop Position Proportional Control

<table>
<tr><th>Control mode schematic diagram</th><th>Description</th></tr>
<tr><td>Cascade control

</td><td>“Cascade control” uses two control computation units and permits Cascade control using just a single controller.
Remote input (RSP) terminal is required for Loop-2 PV input.
► 8.1.4 Cascade Control, Cascade Heating/cooling Control, and Cascade Position Proportional Control</td></tr>
<tr><td>Loop control for backup

</td><td>“Loop control for backup” allows control in connection with host control equipment (such as another controller or programmable controller (PLC)). If the host control equipment breaks down and the controller receives the FIAL signal, the controller performs backup control operations.
Remote input (RSP) terminal is required for output tracking input.
► 8.1.5 Loop Control for Backup, Heating/cooling Loop Control for Backup, and Position Proportional Loop Control for Backup</td></tr>
<tr><td>Loop control with PV switching

</td><td>“Loop control with PV switching” uses two PV inputs, which are switched according to input contact signals or measurement ranges.
Remote input (RSP) terminal is required for Loop-2 PV input.
► 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching</td></tr>
<tr><td>Loop control with PV auto-selector

</td><td>“Loop control with PV auto-selector” automatically selects or calculates the larger, the smaller, the average, or difference (of PV1 and PV2) of two to four PV inputs.
Remote input (RSP) terminal and auxiliary analog input terminal are required for the inputs 2, 3, and 4.
► 8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector</td></tr>
<tr><td>Loop control with PV-hold function

</td><td>“Loop control with PV-hold function” holds the PV input value and control output value according to the input contact signals.
► 8.1.8 Loop Control with PV-hold Function, Heating/cooling Loop Control with PV-hold Function, and Position Proportional Loop Control with PV-hold Function</td></tr>
</table>

PID Control

PID control is a general control using the PID control-related parameters.

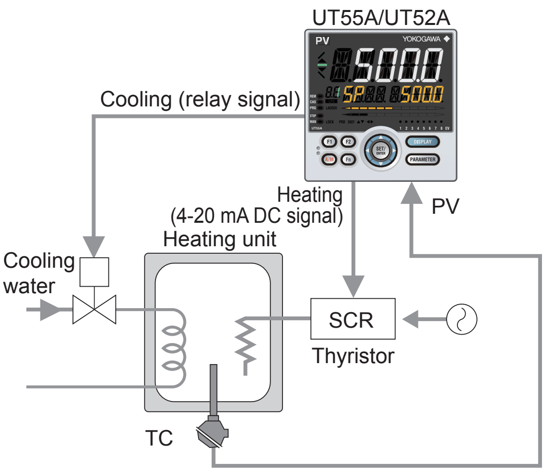
► 8.2.1 PID Control



Heating/cooling Control (suffix code: Type 1 = -2)

Heating/cooling control is available only for Heating/cooling type.
In Heating/cooling control, the controller outputs the result of control computation after splitting it into heating-purpose and cooling-purpose signals.

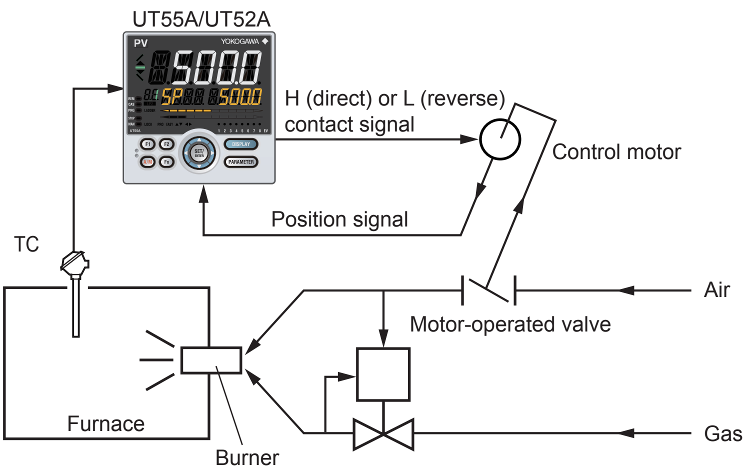
► 8.2.3 Heating/cooling Control



Position Proportional Control (suffix code: Type 1 = -1)

Position proportional control is available only for Position proportional type. It is used exclusively for the motor-operated valve.

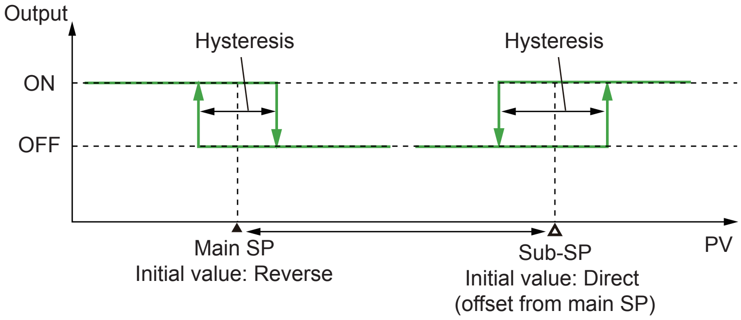
► 10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)



Two-position Two-level Control (suffix code: Type 1 = -2)

Two-position two-level control has two target setpoints to control ON and OFF respectively.

► 8.2.4 Two-position Two-level Control



Sample PI Control

Sample PI control is useful for processes with long dead times where the results of the control output are not quickly reflected on the PV.

► 8.2.6 Sample PI Control

Batch PID Control

Batch PID control is useful for cases where control is performed causing the PV to settle to a SP as quickly as possible without overshooting.

► 8.2.7 Batch PID Control

Feedforward Control

Feedforward control cancels the disturbance before the effects of the disturbance appear in the controlled system by applying a signal – to correct for the disturbance – directly to the controller.

► 8.2.8 Feedforward Control

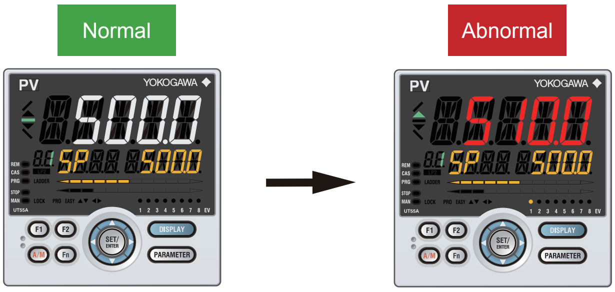
1.4 Display and Key Functions

Employing a 14-segment, active color LCD greatly increases the monitoring and operating capabilities.

Active Color PV Display (display color change)

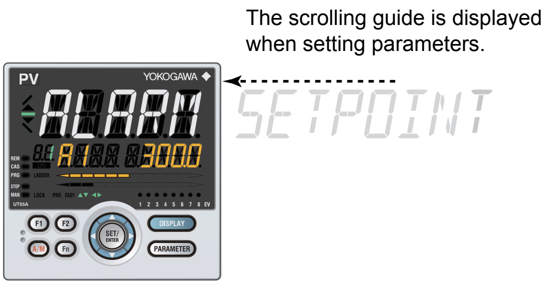
The active color PV display function changes the PV display color (red or white) when abnormality occurs in PV etc.

► 13.1.1 Setting Active Color PV Display Function



Guide Display

The guide is displayed on PV display when setting parameters. This guide can be turned on/off with the Fn key.



Multilingual Guide Display

English, German, French, or Spanish can be displayed in Guide display.

► 13.1.12 Switching Guide Display Language

Parameter Display Level

To intended use of the operator, the display level of the parameter can be set.

► Chapter 18 Parameters

User Function Keys

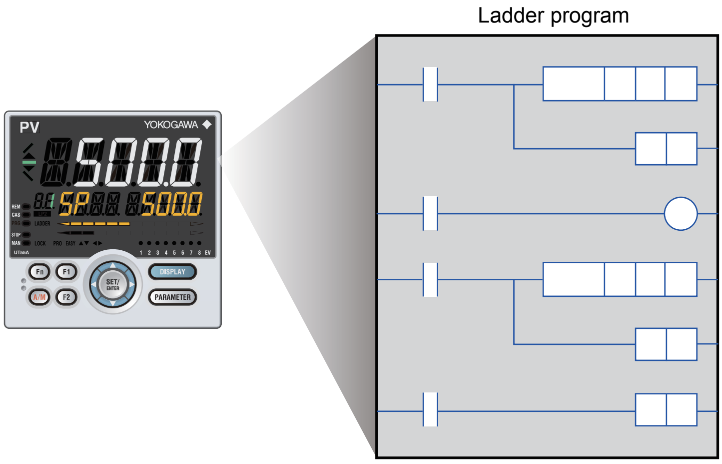
The UT55A has user function keys (F1, F2, and Fn).
The UT52A has a user function key (Fn).
Assign a function to a user function key to use it as an exclusive key.

► 13.2 Assigning Function to User Function Key and A/M Key

1.5 Ladder Sequence Function

To use the ladder sequence function, it is necessary to create a ladder program using LL50A Parameter Setting Software and download it to a controller.

► Ladder sequence function: LL50A Parameter Setting Software User's Manual



1.6 Communication Functions

The UT55A/UT52A can use RS-485 communication, Ethernet communication, and PROFIBUS-DP communication by specifying the suffix code and optional suffix code for each communication.

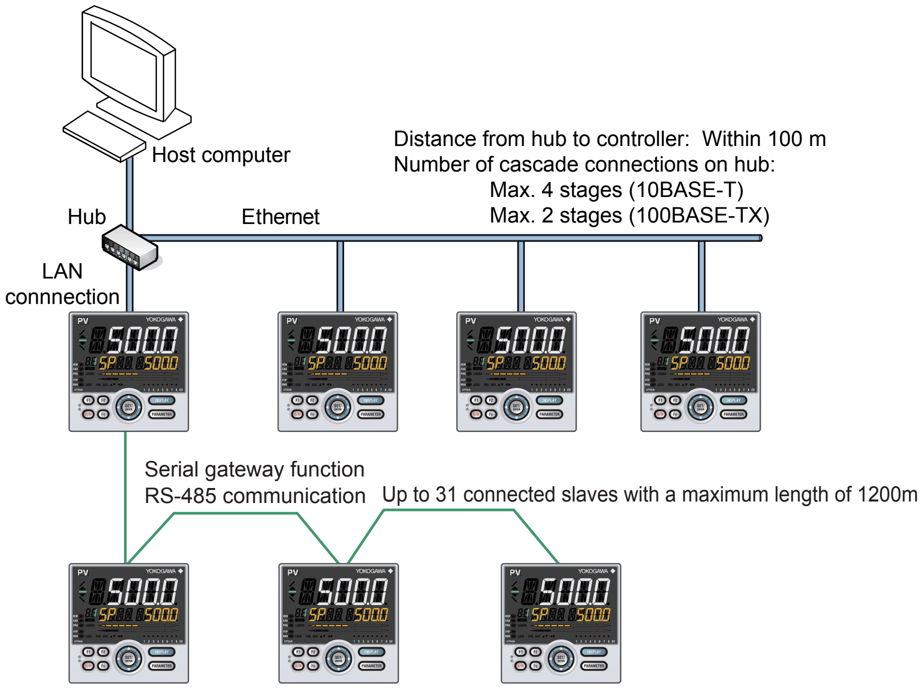
► UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

RS-485 Communication (Modbus communication, PC link communication, and Ladder communication)

The UT55A/UT52A can communicate with PCs, PLCs, touch panels, and other devices.

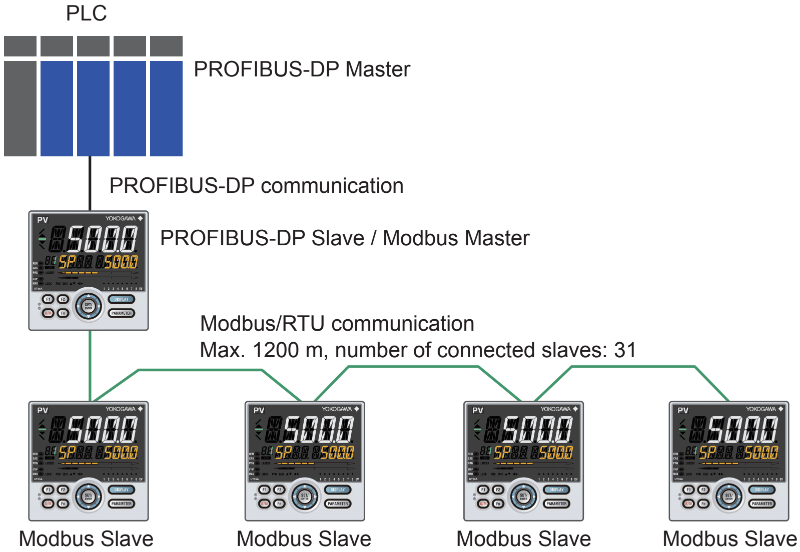
Ethernet Communication (Modbus/TCP)

The UT55A can be connected to IEEE802.3-compliant network (10BASE-T/100BASE-TX).
A serial gateway function can increase the number of connected controllers.



PROFIBUS-DP Communication

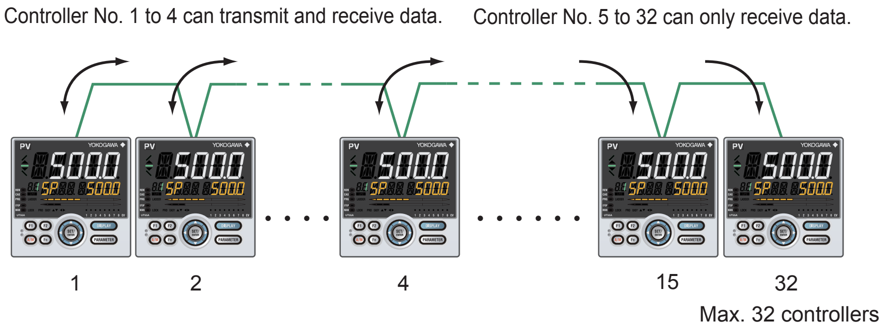
The UT55A can be used as the slave devices for PROFIBUS-DP communication. Read-out of PV, operation or alarm status, and SP setting can be done by accessing the remote I/O on the master unit of PROFIBUS-DP.



Peer-to-peer Communication

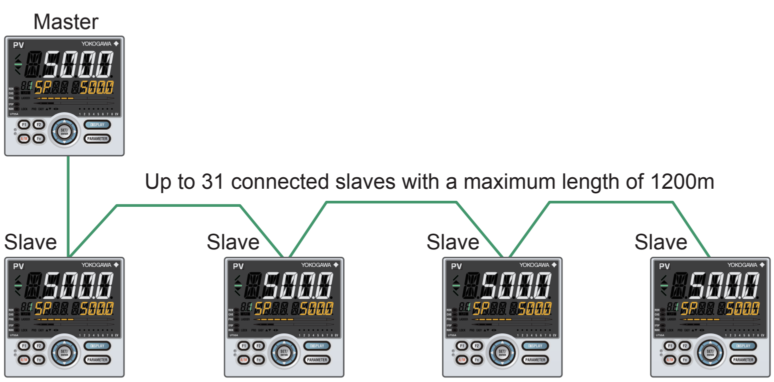
In Peer-to-peer communication, controllers send and receive process data each other and share data. However, ladder program creation using LL50A Parameter Setting Software is necessary.

► Ladder program: LL50A Parameter Setting Software User's Manual



Coordinated Operation

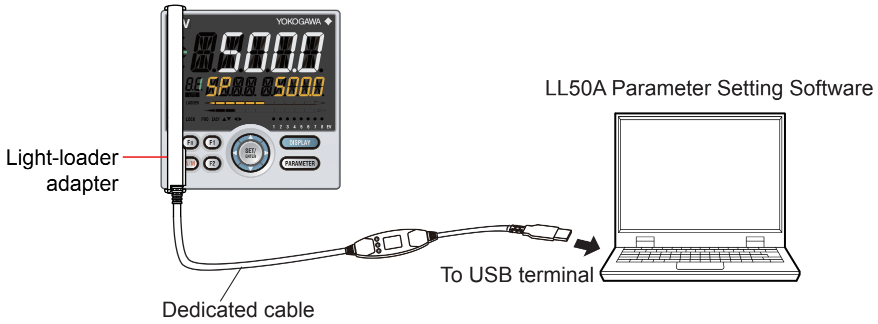
A system of coordinated operation is configured with a master controller and a number of slave controllers. The slave controllers are set to operate in the same way as the master controller. Therefore you do not have to create a communication program.



Light-loader Communication

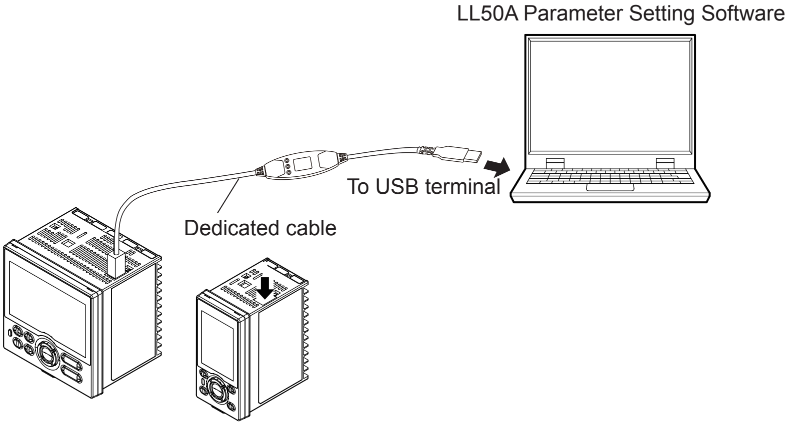
Use the LL50A to set parameters and create ladder programs. Attach the adapter to the front of the controller to communicate.

► Light-loader function: LL50A Parameter Setting Software User's Manual



Maintenance Port Communication (Power supply is not required for the UT55A/UT52A)

Maintenance port is used to connect with the dedicated cable when using LL50A Parameter Setting Software (sold separately). The parameters can be set without supplying power to the UT55A/UT52A.



CAUTION

When using the maintenance port, do not supply power to the controller. Otherwise, the controller does not work normally.

If power is supplied to the controller while the cable is connected, or the cable is connected to the controller already turned on, unplug the cable and turn on the controller again. The controller returns to the normal condition.

1.7 Definition of Main Symbols and Terms

Main Symbol

PV: Measured input value
SP: Target setpoint
OUT: Control output value
RSP: Remote setpoint

A/M: AUTO/MAN
C/A/M: CAS/AUTO/MAN
AUTO: Automatic
MAN: Manual
CASCADE, CAS: Cascade
REMOTE, REM: Remote
LOCAL, LCL: Local

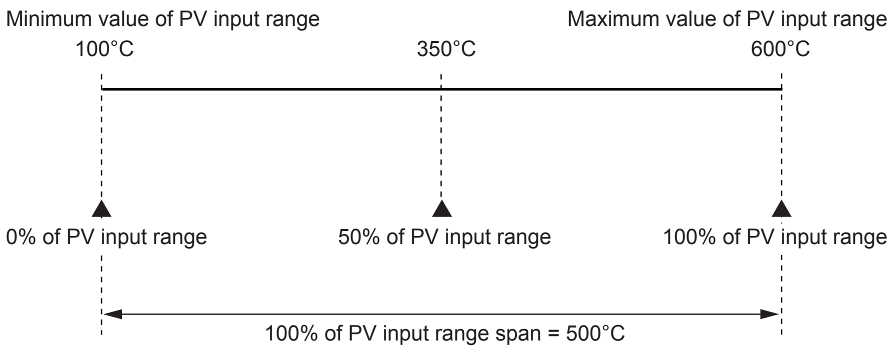
E1, E2, E3, and E4: Terminal areas
► 17.4 Wiring

Engineering Units

Input range (scale): the PV range low limit is set to 0%, and the high limit is set to 100% for conversion.
Input range (scale) span: the PV range span is set to 100% for conversion.

In this manual, the parameter setting range is described as the “input range” and “input range span.” This means that engineering units are required to be set. Set a temperature for temperature input.

The following describes a conversion example.
When the PV input range is 100 to 600°C, 0% of the PV range is equivalent to 100°C, 50% of the PV range is equivalent to 350°C, and 100% of the PV range is equivalent to 600°C.
100% of the PV range span is equivalent to 500°C.
20% of the PV range span is equivalent to 100°C.



The above applies to the scale for voltage and current input.

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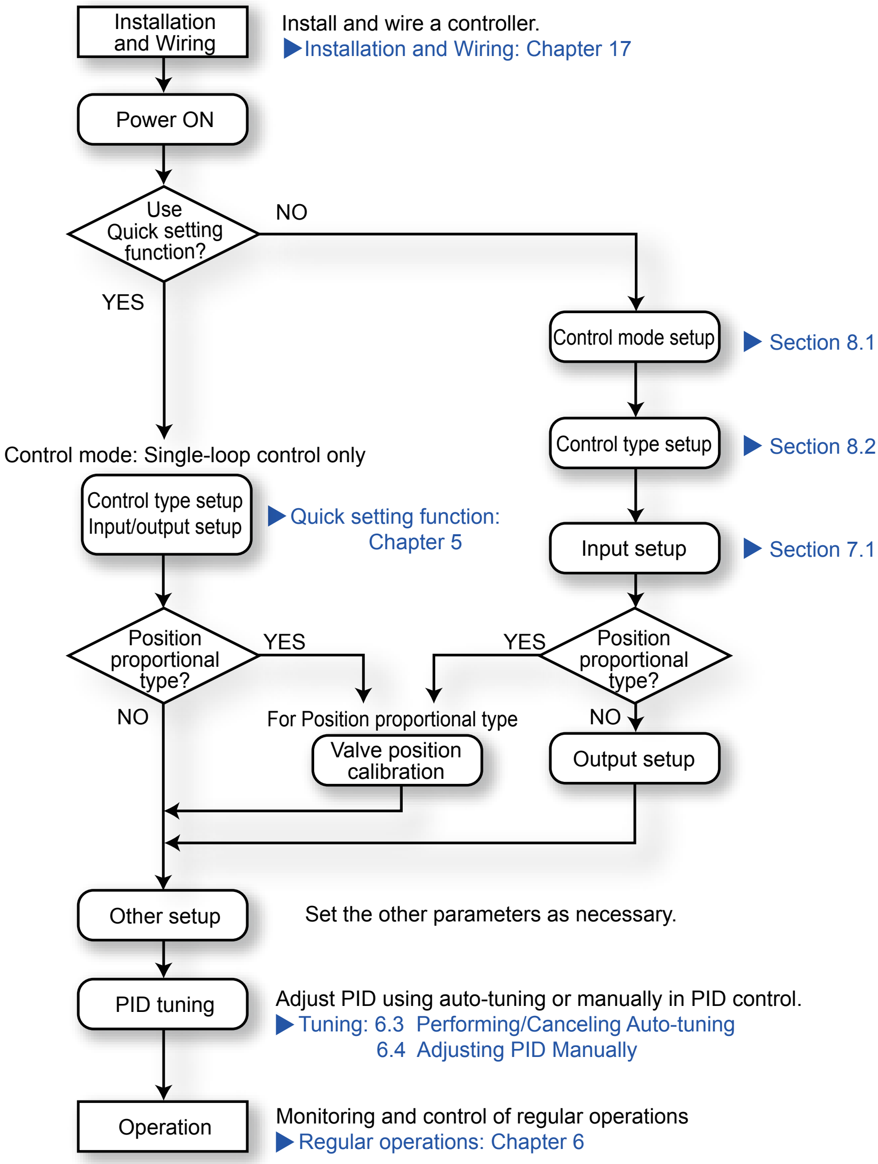
2.1 UT55A/UT52A Operating Procedures



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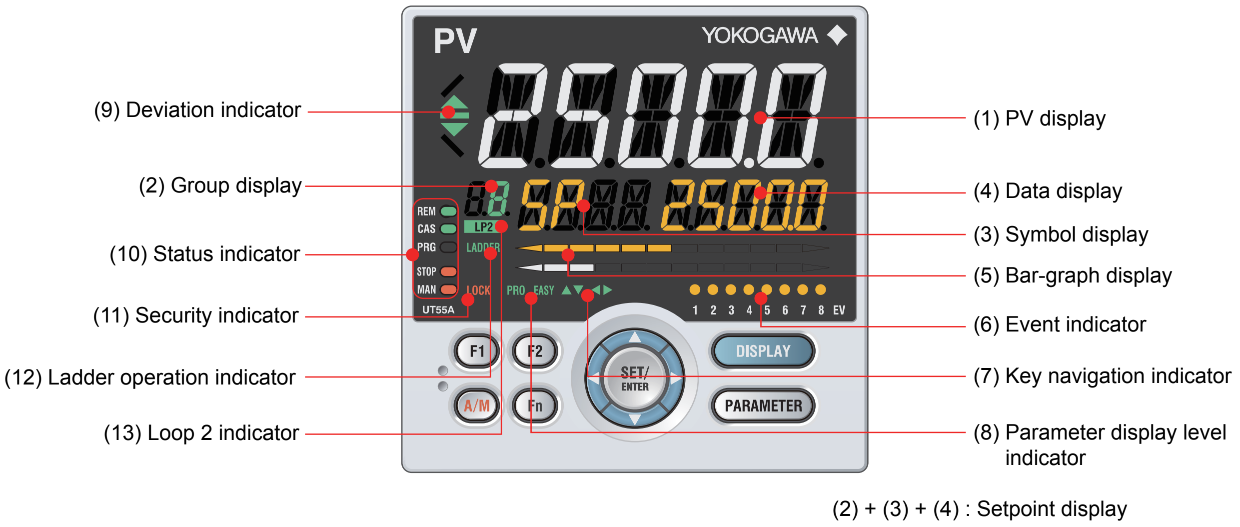
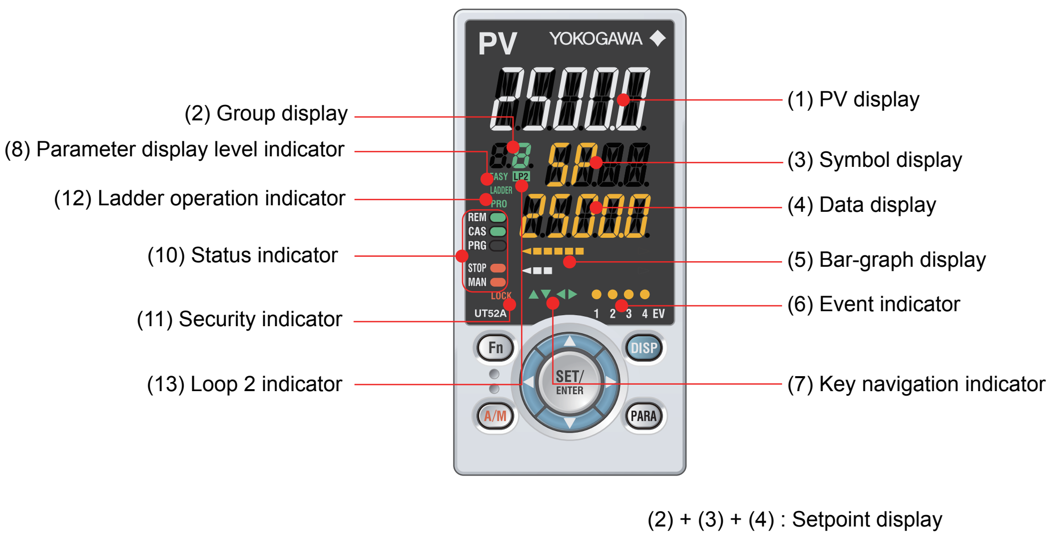
3.1 Names and Functions of Display Parts

See the next page.

UT55A


(9) Deviation indicator
(2) Group display
(10) Status indicator
(11) Security indicator
(12) Ladder operation indicator
(13) Loop 2 indicator
(1) PV display
(4) Data display
(3) Symbol display
(5) Bar-graph display
(6) Event indicator
(7) Key navigation indicator
(8) Parameter display level indicator
(2) + (3) + (4) : Setpoint display

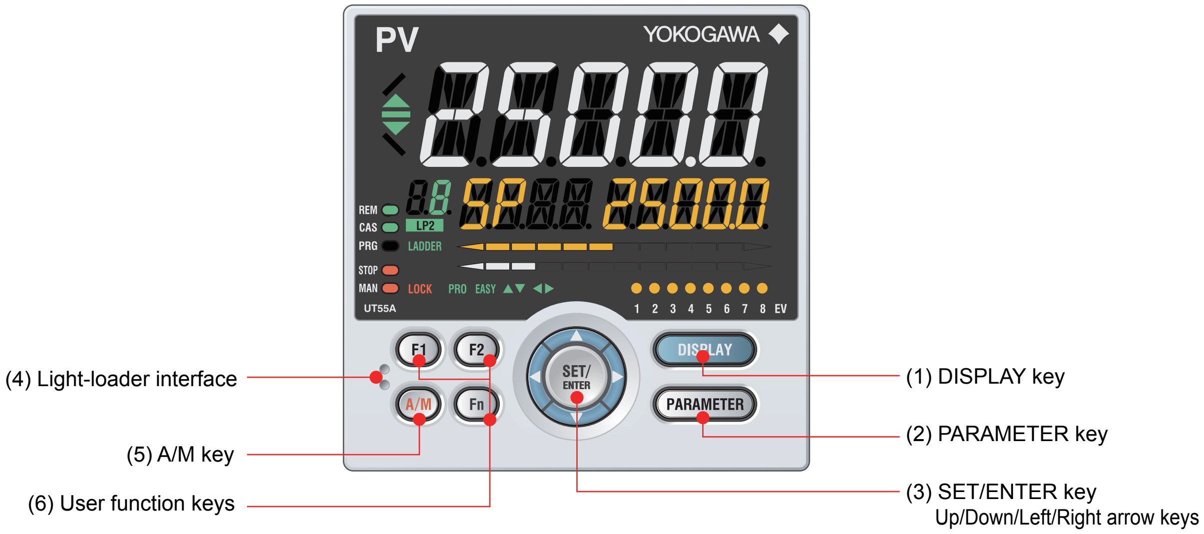
UT52A


(2) Group display
(8) Parameter display level indicator
(12) Ladder operation indicator
(10) Status indicator
(11) Security indicator
(13) Loop 2 indicator
(1) PV display
(3) Symbol display
(4) Data display
(5) Bar-graph display
(6) Event indicator
(7) Key navigation indicator
(2) + (3) + (4) : Setpoint display

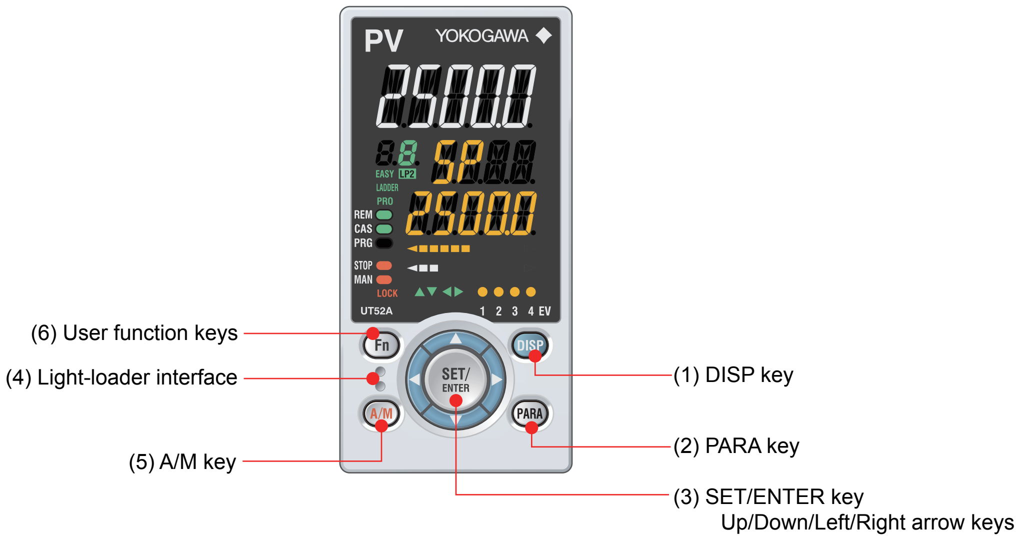
<table>
<tr><th>No. in figure</th><th>Name</th><th>Description</th></tr>
<tr><td>(1)</td><td>PV display
(white or red)</td><td>Displays PV.
Displays an error code if an error occurs.
Displays the scrolling guide in the Menu Display and Parameter Setting Display when the guide display ON/OFF is set to ON.</td></tr>
<tr><td>(2)</td><td>Group display
(green)</td><td>Displays a group number (1 to 8, or R) and terminal area (E1 to E4).
1 to 8 represent SP numbers in the Operation Display.
R and E1 to E4 are displayed in the Parameter Setting Display.</td></tr>
<tr><td>(3)</td><td>Symbol display
(orange)</td><td>Displays a parameter symbol.</td></tr>
<tr><td>(4)</td><td>Data display (orange)</td><td>Displays a parameter setpoint and menu symbol.</td></tr>
<tr><td>(5)</td><td>Bar-graph display
(orange and white)</td><td>Displays control output value (OUT) and measured input value (PV).
The data to be displayed can be set by the parameter.
Initial value: upper bar (deviation), lower bar (control output, internal computed value in Position proportional control);
in Heating/cooling control, upper bar (heating-side control output), lower bar (cooling-side control output)</td></tr>
<tr><td>(6)</td><td>Event indicator
(orange)</td><td>UT55A: Lit when the alarms 1 to 8 occur. (Initial value: 1 to 4)
UT52A: Lit when the alarms 1 to 4 occur.
Event displays other than alarms can be set by the parameter.</td></tr>
<tr><td>(7)</td><td>Key navigation indicator
(green)</td><td>Lit or blinks when the Up/Down or Left/Right arrow key operation is possible.</td></tr>
<tr><td>(8)</td><td>Parameter display level indicator
(green)</td><td>Displays the setting conditions of the parameter display level function.
<table>
<tr><th>Parameter display level</th><th>EASY</th><th>PRO</th></tr>
<tr><td>Easy setting mode</td><td>Lit</td><td>Unlit</td></tr>
<tr><td>Standard setting mode</td><td>Unlit</td><td>Unlit</td></tr>
<tr><td>Professional setting mode</td><td>Unlit</td><td>Lit</td></tr>
</table></td></tr>
<tr><td>(9)</td><td>Deviation indicator
(for UT55A only)
(green)</td><td>Displays the status of a deviation (PV - SP).
▲: Lit if a deviation exceeds the deviation display band.
▬: Lit when a deviation is within the deviation display band.
▼: Lit if a deviation falls below the deviation display band.
The deviation indicator is unlit if the Displays other than the Operation Display or SELECT Display are shown.
Deviation display band can be set by the parameter.</td></tr>
<tr><td>(10)</td><td>Status indicator
(green and red)</td><td>Displays the operating conditions and control status.
<table>
<tr><th>Display</th><th>Description</th></tr>
<tr><td>REM</td><td>Lit when in remote mode (REM).</td></tr>
<tr><td>CAS</td><td>Lit when in cascade mode (CAS).</td></tr>
<tr><td>PRG</td><td>Unused</td></tr>
<tr><td>STOP</td><td>Lit when in stop mode (STOP).</td></tr>
<tr><td>MAN</td><td>Lit when in manual mode (MAN).
Blinks during auto-tuning.</td></tr>
</table></td></tr>
<tr><td>(11)</td><td>Security indicator (red)</td><td>Lit if a password is set. The setup parameter settings are locked.</td></tr>
<tr><td>(12)</td><td>Ladder operation indicator (green)</td><td>Lit while the ladder operation is executed.</td></tr>
<tr><td>(13</td><td>Loop 2 indicator
(LP2 lamp)
(green)</td><td>Lit when the control mode is Cascade control.
In the Operation Display, the LP2 lamp is lit while the Loop-2 data is displayed on Setpoint display.
In the Parameter Setting Display, the LP2 lamp indicates the loop of displayed menu symbol or parameter symbol.
The LP2 lamp is lit while the Loop-2 menu symbol or parameter symbol is displayed.</td></tr>
</table>

3.2 Names and Functions of Keys

UT55A



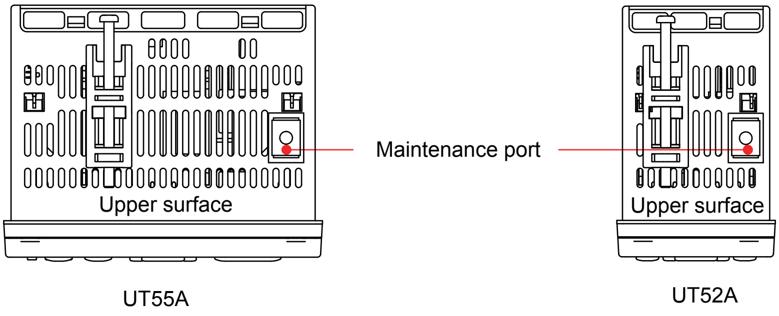
UT52A



No. in figure	Name	Description
(1)	**UT55A: DISPLAY key** **UT52A: DISP key**	Used to switch the Operation Displays. Press the key in the Operation Display to switch the provided Operation Displays. Press the key in the Menu Display or Parameter Setting Display to return to the Operation Display.
(2)	**UT55A: PARAMETER key** **UT52A: PARA key**	Hold down the key for 3 seconds to move to the Operation Parameter Setting Display. Hold down the key and the Left arrow key simultaneously for 3 seconds to move to the Setup Parameter Setting Display. Press the key in the Parameter Setting Display to return to the Menu Display. Press the key once to cancel the parameter setting (setpoint is blinking).
(3)	**SET/ENTER key** **Up/Down/ Left/Right arrow keys**	**SET/ENTER key** Press the key in the Menu Display to move to the Parameter Setting Display of the Menu. Press the key in the Parameter Setting Display to transfer to the parameter setting mode (setpoint is blinking), and the parameter can be changed. Press the key during parameter setting mode to register the setpoint. **Up/Down/Left/Right arrow keys** Press the Left/Right arrow keys in the Menu Display to switch the Displays. Press the Up/Down/Left/Right arrow keys in the Parameter Setting Display to switch the Displays. Press the Up/Down arrow keys during parameter setting mode (setpoint is blinking) to change a setpoint. Press the Left/Right arrow keys during parameter setting mode (setpoint is blinking) to move between digits according to the parameter.
(4)	**Light-loader interface**	It is the communication interface to the adapter cable when setting and storing parameters via PC. The LL50A Parameter Setting Software (sold separately) is required.
(5)	**A/M key**	Used to switch between AUTO and MAN modes. The setting is switched between AUTO and MAN each time the key is pressed. The user can assign a function key.
(6)	**User function keys**	The UT55A has F1, F2, and Fn keys. The UT52A has only the Fn key. The user can assign a function to the key. The function is set by the parameter.

Maintenance Port (Power supply is not required for the UT55A/UT52A).

The maintenance port is used to connect with the dedicated cable when using LL50A Parameter Setting Software (sold separately). The parameters can be set without supplying power to the UT55A/UT52A.



CAUTION

When using the maintenance port, do not supply power to the controller. Otherwise, the controller does not work normally.

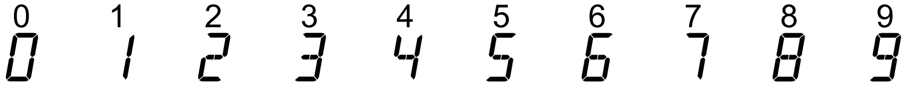
If power is supplied to the controller while the cable is connected, or the cable is connected to the controller already turned on, unplug the cable and turn on the controller again. The controller returns to the normal condition.

3.3 List of Display Symbols

The following shows the parameter symbols, menu symbols, alphanumeric of guide, and symbols which are displayed on the UT55A/UT52A.

Figure (common to all display area)

0 1 2 3 4 5 6 7 8 9



PV display (14 segments): Alphabet

A B C D E F

G H I J K L

M N O P Q R

S T U V W X

Y Z

Symbol display and Data display (11 segments): Alphabet

A B C D E F

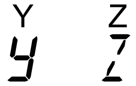
c (lower-case)

G H I J K L

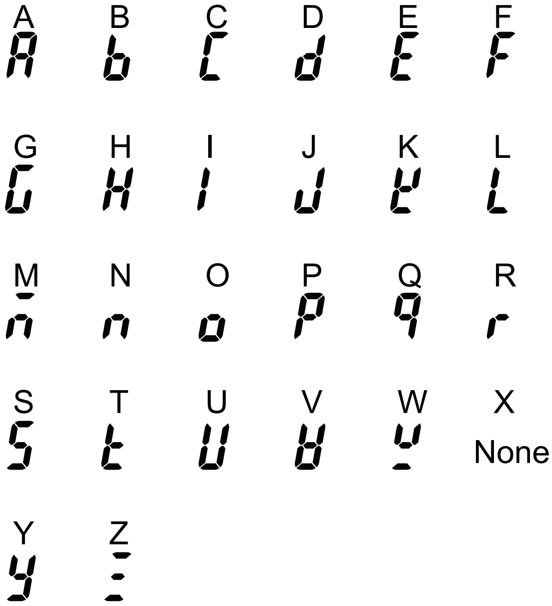
M N O P Q R

S T U V W X

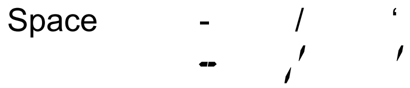
Y Z



Group display (7 segments): Alphabet



PV display (14 segments): Symbol



3.4 Brief Description of Setting Details (Parameters)

This manual describes the Setting Details as follows in addition to the functional Description.

Setting Details

(Display Example)

Parameter symbol	Name	Display level	Setting range	Menu symbol
A1 to A8	Alarm-1 to -8 setpoint	EASY	Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type	SP Ope

(1) Parameter symbol: Symbol displayed on Symbol display on the front panel.

(2) Name: Parameter name

(3) Display level: Indicates the parameter display level.

(4) Setting range: Parameter setting range

(5) Menu symbol: Indicates the menu to which the parameter belongs.
Ope: Operation parameter
Set: Setup parameter

Parameter Display Level

Display level		Description
EASY	Easy setting mode: The minimum necessary parameters are displayed.	Corresponding parameters are displayed in all modes.
STD	Standard setting mode: The wider range of parameters than those shown in Easy setting mode are displayed.	Corresponding parameters are displayed only in Standard setting mode and Professional setting mode. Parameter display level indicators "EASY" and "PRO" are unlit in Standard setting mode. *: "STD" is the symbol used in this manual only.
PRO	Professional setting mode: All parameters are displayed.	Corresponding parameters are displayed only in Professional setting mode.

Note

For more intelligible display operation of parameters and the references, see Chapter 18, "Parameter Map."

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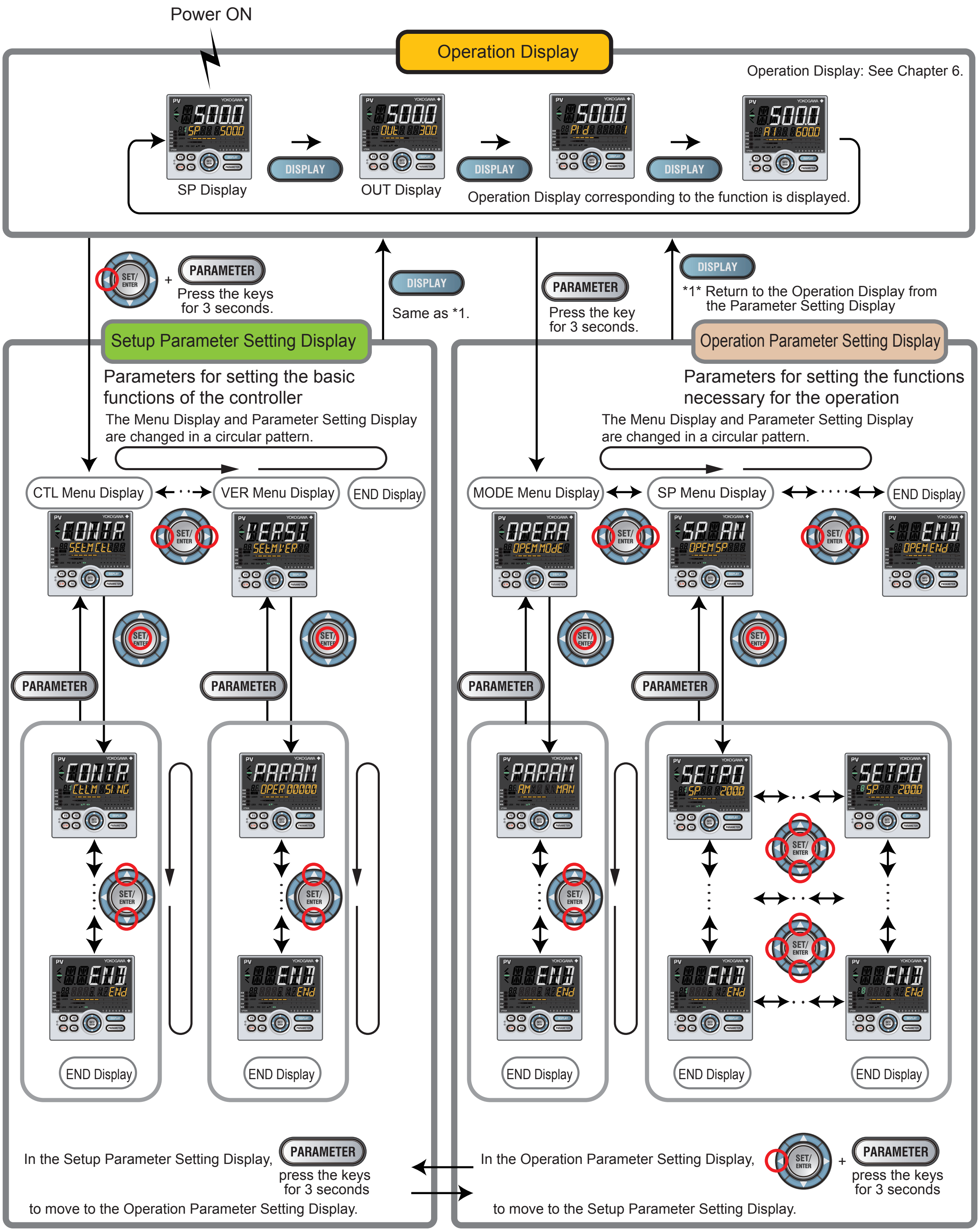
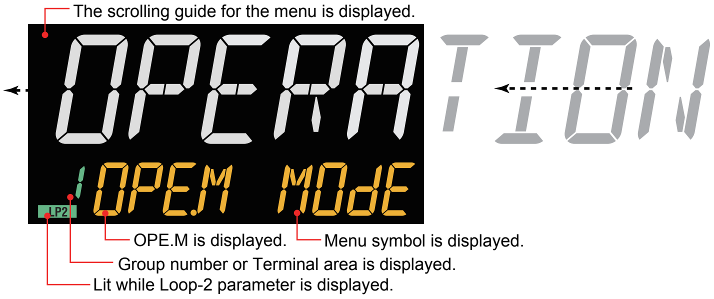
4.1 Overview of Display Switch and Operation Keys

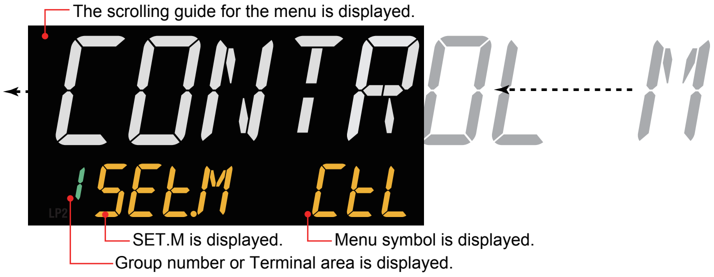
The following shows the transition of Operation Display, Operation Parameter Setting Display, and Setup Parameter Setting Display.
The “Operation Parameter Setting Display” has the parameters for setting the functions necessary for the operation.
The “Setup Parameter Setting Display” has the parameters for setting the basic functions of the controller.



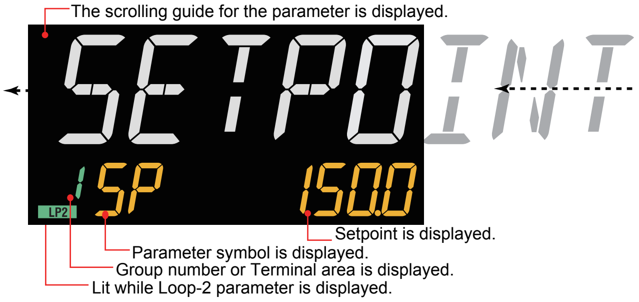
The display pattern of the UT55A/UT52A is as follows; the Menu Display and Parameter Setting Display.
For the Operation Display, see Chapter 6, “Monitoring and Control of Regular Operations.”

<table>
<tr><th>Display</th><th>Description</th></tr>
<tr><td>Menu Display</td><td>The Menu Display is segmented by the function and optional terminal position. The scrolling guide for the menu is displayed on PV display. The guide display can be turned on/off with the Fn key.

Menu Display of Operation Parameter


Menu Display of Setup Parameter


</td></tr>
<tr><td>Parameter Setting Display</td><td>The following is the Display for displaying and setting a parameter.
The parameters have three types of display levels; Easy setting mode, Standard setting mode, and Professional setting mode. The parameters to be displayed can be limited according to the setting of the parameter display level.
The scrolling guide for the parameter is displayed on PV display. The guide display can be turned on/off with the Fn key.

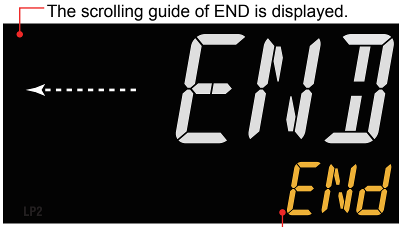
Parameter Setting Display (Example of Operation Parameter Setting Display)


</td></tr>
</table>

Display Shown at the End (the Lowest Level) of the Parameter Setting Display

As shown in the figure below, the END Display is shown to indicate the end of the Menu Display and Parameter Setting Display. There are no setting items.

The scrolling guide of END is displayed.

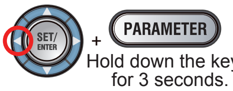


END is displayed.

Basic Key Operation Sequence

- **To move to the Setup Parameter Setting Display**

Hold down the PARAMETER (or PARA) key and the Left arrow key simultaneously for 3 seconds.



Hold down the keys
for 3 seconds.

- **To move to the Operation Parameter Setting Display**

Hold down the PARAMETER (or PARA) key for 3 seconds.

Hold down the key
for 3 seconds.

- **To move to the Operation Display**

Press the DISPLAY (or DISP) key once.

4.2 How to Set Parameters

The following operating procedure describes an example of setting alarm setpoint (A1).

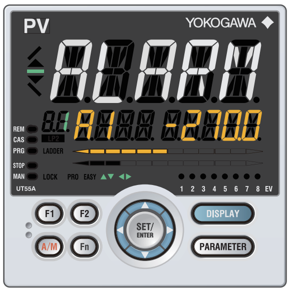
Operation

1. Hold down the **PARAMETER** key for 3 seconds in the Operation Display to call up the [**MODE**] Menu Display.

2. Press the **Right arrow** key to display the [**SP**] Menu Display.

3. Press the **SET/ENTER** key to display the [**SP**] Parameter Setting Display.

4. Press the **Down arrow** key to display the [**A1**] Parameter Setting Display.



5. Press the **SET/ENTER** key to blink the setpoint.

6. Press the **Up** or **Down arrow** key to change the setpoint.

7. Press the **SET/ENTER** key to register the setpoint (the setpoint stops blinking).

8. Press the **PARAMETER** key once to return to the Menu Display. Press the **DISPLAY** key once to return to the Operation Display.

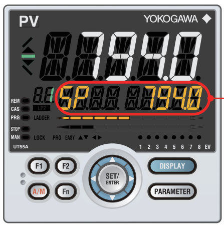
This completes the setting procedure.

How to Cancel Parameter Setting

To cancel parameter setting when a parameter is being set (setpoint is blinking), press the **PARAMETER** key once.

How to Set Parameter Setpoint

Numeric Value Setting



1. Display the Parameter Setting Display.

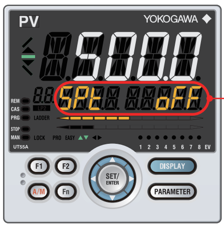
2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).

3. Press the Left arrow key to move one digit to the left. (Press the Right arrow key to move one digit to the right.)

4. Press the Up or Down arrow key to change the setpoint. Press the Up arrow key when 9 is displayed to move one digit to the left. Press the Down arrow key when 0 is displayed to move one digit to the right.

5. Press the SET/ENTER key to register the setpoint.

Selection Data Setting



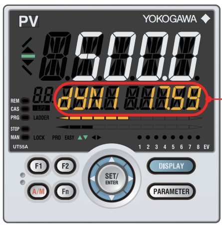
1. Display the Parameter Setting Display.

2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).

3. Press the Up arrow key to change the setpoint (press the Down arrow key to change the setpoint).

4. Press the SET/ENTER key to register the setpoint.

Time (minute.second) Setting



Example of 17 minutes 59 seconds

1. Display the Parameter Setting Display.

2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).

3. Press the Left arrow key to move one digit to the left. (press the Right arrow key to move one digit to the right.)

4. Press the Up or Down arrow key to change the setpoint. Press the Up arrow key when 5 is displayed to move one digit to the left. Press the Down arrow key when 0 is displayed to move one digit to the right.

5. Press the SET/ENTER key to register the setpoint.

Blank Page

5.1 Setting Using Quick Setting Function

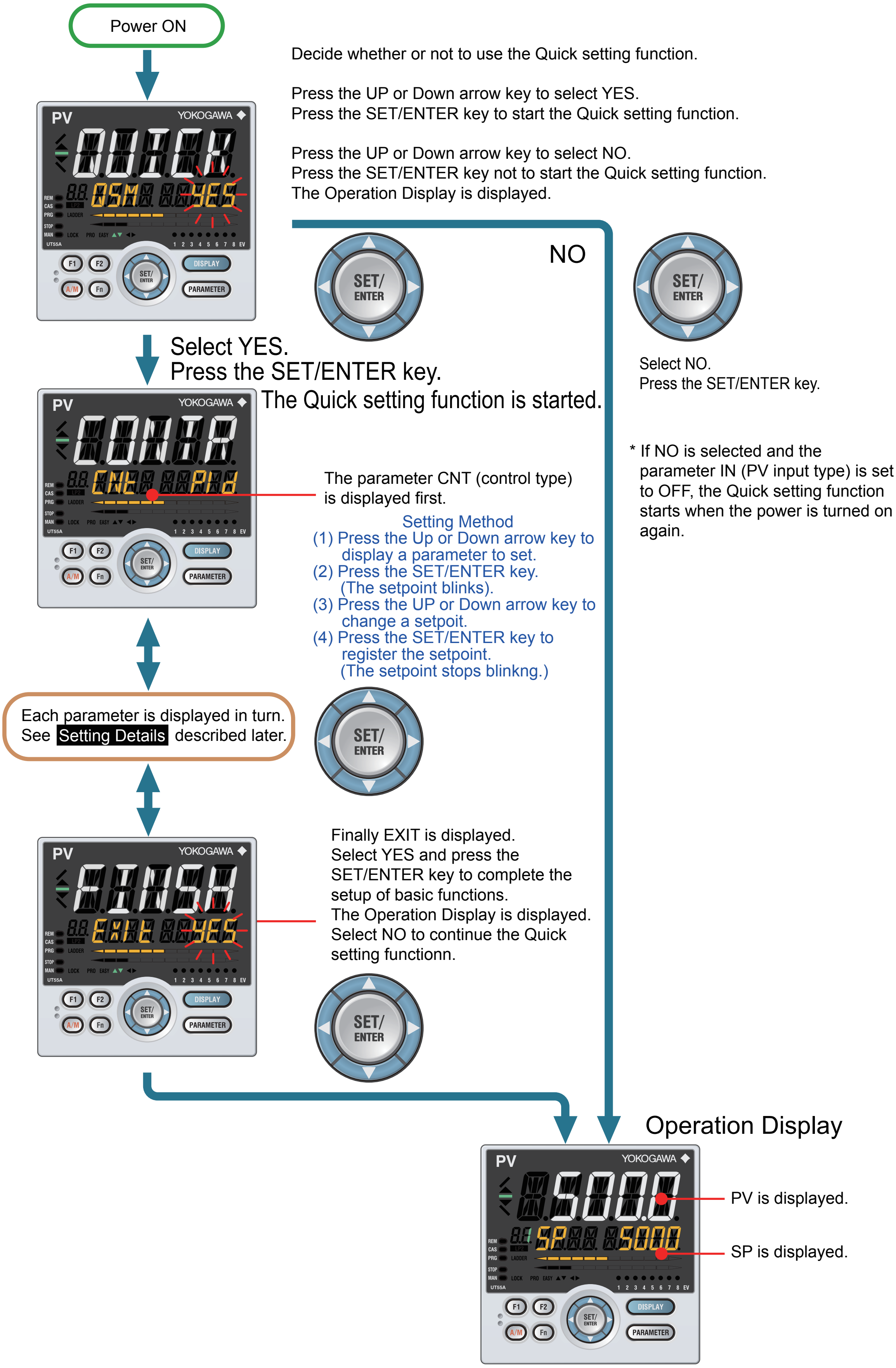
Description

The Quick setting function is a function to easily set the basic function of the controller. The Quick setting function starts when the power is turned on after wiring.

The Quick setting function can be used only when the control mode is Single-loop control. In other control modes, set the functions without using the Quick setting function.

The following lists the items to set using the Quick setting function.
(1) Control type (PID control, Heating/cooling control, etc.)
(2) Input function (PV input, range, scale (at voltage/current input), etc.)
(3) Output function (control output type and cycle time)

Flowchart of Quick Setting Function



Setting Example

Set the following parameters to set to PID control, thermocouple Type K (range: 0.0 to 500.0°C), and current control output. No need to change the parameters other than the following parameters.

Set QSM = YES to enter the quick setting mode.

(1) Set CNT = PID.
(2) Set IN = K1.
(3) Set UNIT = C (initial value).
(4) Set RH = 500.0.
(5) Set RL = 0.0.
(6) Set OT = 00.02

Set EXIT = YES to quit the quick setting mode.
The Operation Display is shown.

Setting Details

Control Type

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL Set

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

► Control type: 8.2 Setting Control Type (CNT)

Input Function

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>IN</td><td>PV input type</td><td>EASY</td><td>OFF: Disable
K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F
K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F
K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F
J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F
T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F
T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F
B: 0.0 to 1800.0 °C / 32 to 3300 °F
S: 0.0 to 1700.0 °C / 32 to 3100 °F
R: 0.0 to 1700.0 °C / 32 to 3100 °F
N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F
E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F
L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F
U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F
U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F
W: 0.0 to 2300.0 °C / 32 to 4200 °F
PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F
P2040: 0.0 to 1900.0 °C / 32 to 3400 °F
WRE: 0.0 to 2000.0 °C / 32 to 3600 °F
JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F
JPT2: -150.0 to 150.0 °C / -200.0 to 300.0 °F
PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F
PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F
PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F
0.4-2V: 0.400 to 2.000 V
1-5V: 1.000 to 5.000 V
4-20: 4.00 to 20.00 mA
0-2V: 0.000 to 2.000 V
0-10V: 0.00 to 10.00 V
0-20 : 0.00 to 20.00 mA
-1020: -10.00 to 20.00 mV
0-100: 0.0 to 100.0 mV</td><td rowspan="4">PV Set</td></tr>
<tr><td>UNIT</td><td>PV input unit</td><td>EASY</td><td>-: No unit
C: Degree Celsius
-: No unit
- -: No unit
- - -: No unit
F: Degree Fahrenheit</td></tr>
<tr><td>RH</td><td>Maximum value of PV input range</td><td>EASY</td><td rowspan="2">Depends on the input type.
- For temperature input -
Set the temperature range that is actually controlled. (RL<RH)
- For voltage / current input -
Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL=RH.)</td></tr>
<tr><td>RL</td><td>Mininum value of PV input range</td><td>EASY</td></tr>
</table>

Note1: W:W-5% Re/W-26% Re(Hoskins Mfg. Co.). ASTM E988
WRE: W97Re3-W75Re25

Input Function (Continued)

Parameter symbol	Name	Display level	Setting range	Menu symbol
SDP	PV input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	PV Set
SH	Maximum value of PV input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	
SL	Mininum value of PV input scale	EASY		

► Input setting: 7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

Output Function

Parameter symbol	Name	Display level	Setting range	Menu symbol
OT	Output type selection	EASY	Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay)	OUT Set
CT	Control output cycle time Heating-side control output cycle time (in Heating/cooling control)	EASY	0.5 to 1000.0 s	
CTc	Cooling-side control output cycle time	EASY		

► Output type: 10.1 Setting Control Output Type
► Cycle time: 10.2 Setting Control Output Cycle Time

5.2 Restarting Quick Setting Function

Once functions have been built using the Quick setting function, the Quick setting function does not start even when the power is turned on. The following methods can be used to restart the Quick setting function.

- Set the parameter QSM (Quick setting mode) to ON and turn on the power again.
- Set the parameter IN (PV input type) to OFF and turn on the power again.

CAUTION

The parameters related to the range or scale such as alarm setpoints are initialized if the control type is changed.
Changing the control mode (CTLM) allows you to restart the Quick setting function. However, be careful because some parameters will be initialized.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
IN	PV input type	EASY	OFF: Disable	PV Set
QSM	Quick setting mode	EASY	OFF: Disable ON: Enable	SYS Set

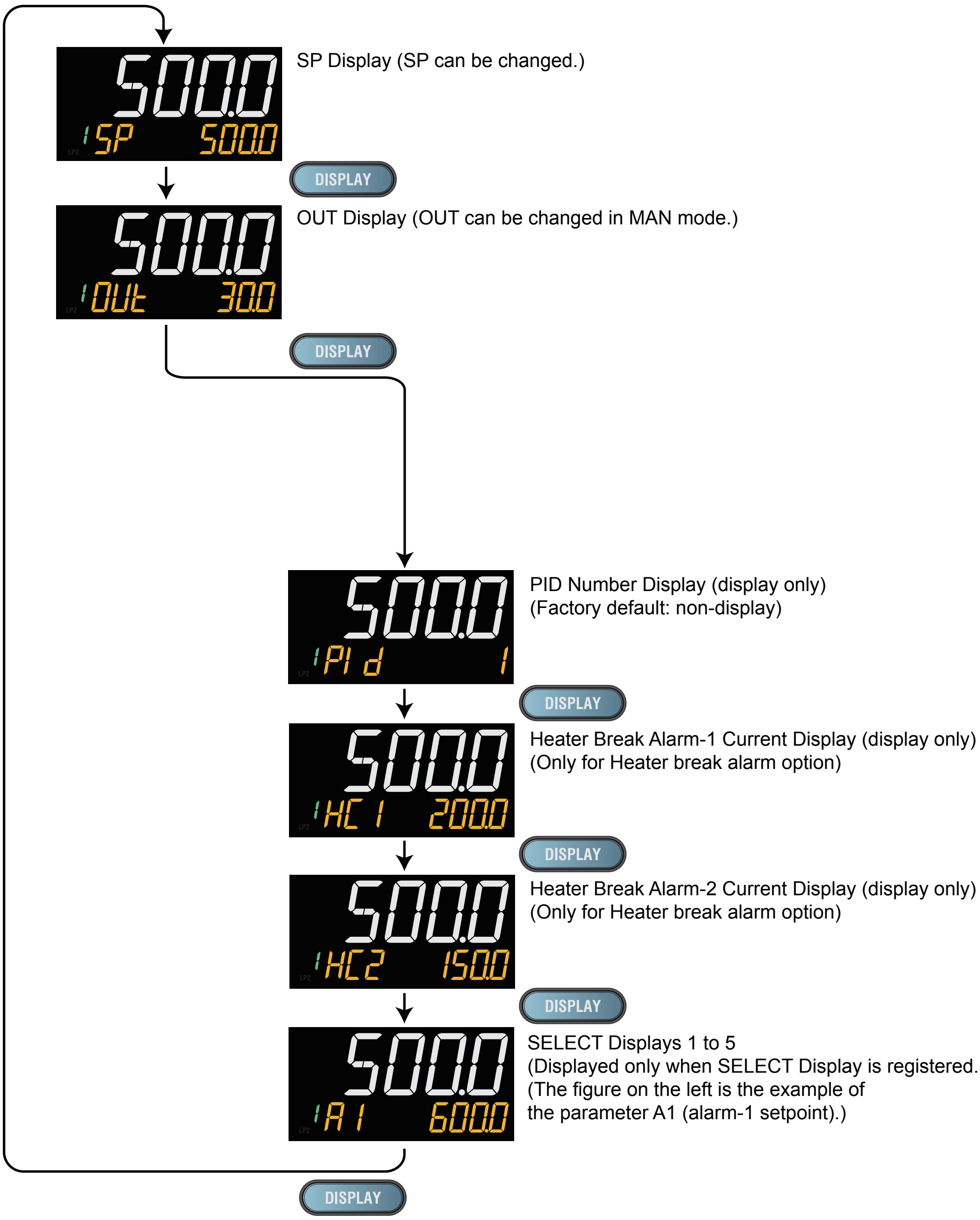
6.1 Monitoring and Control of Operation Displays

6.1.1 Operation Display Transitions in Single-loop Control, Cascade Primary-loop Control, Cascade Secondary-loop Control, Loop Control for Backup, and Loop Control with PV-hold Function.

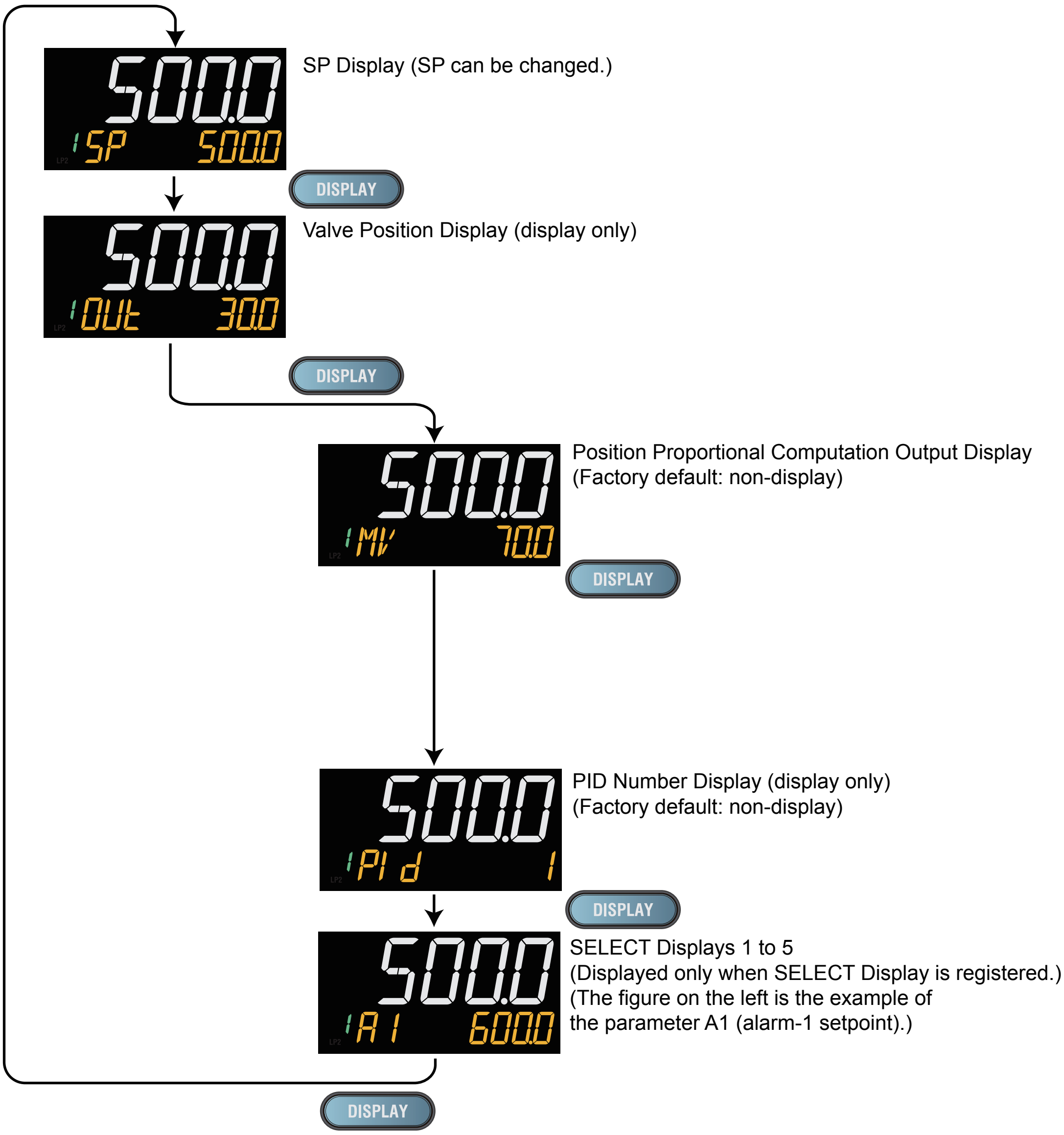
(The displays only for the Standard type are displayed in Cascade primary-loop control.)

► Display/Non-display of Operation Display: 13.3.5 Setting Display/Non-display of Operation Display
► Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 displays)

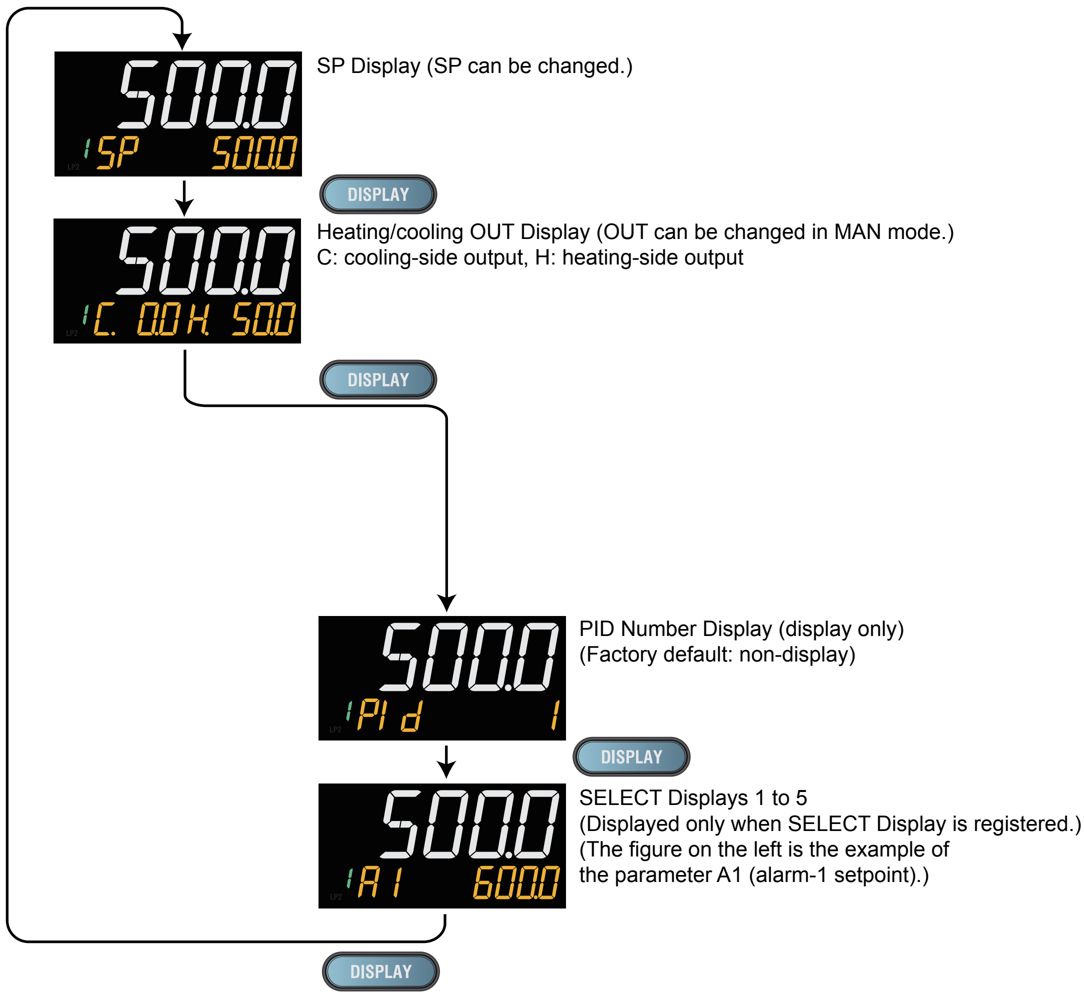
Standard Type



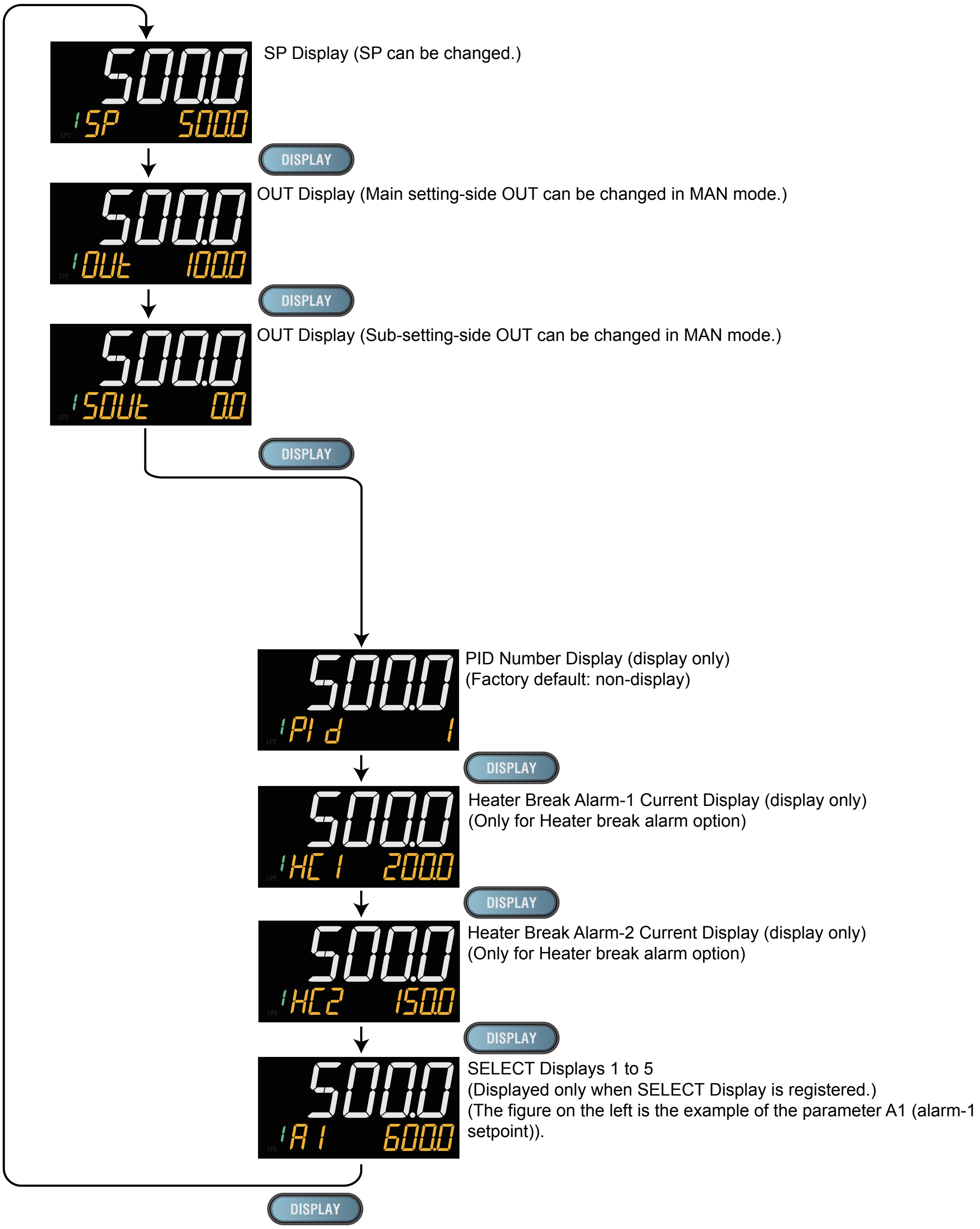
Position Proportional Type



Heating/cooling Type



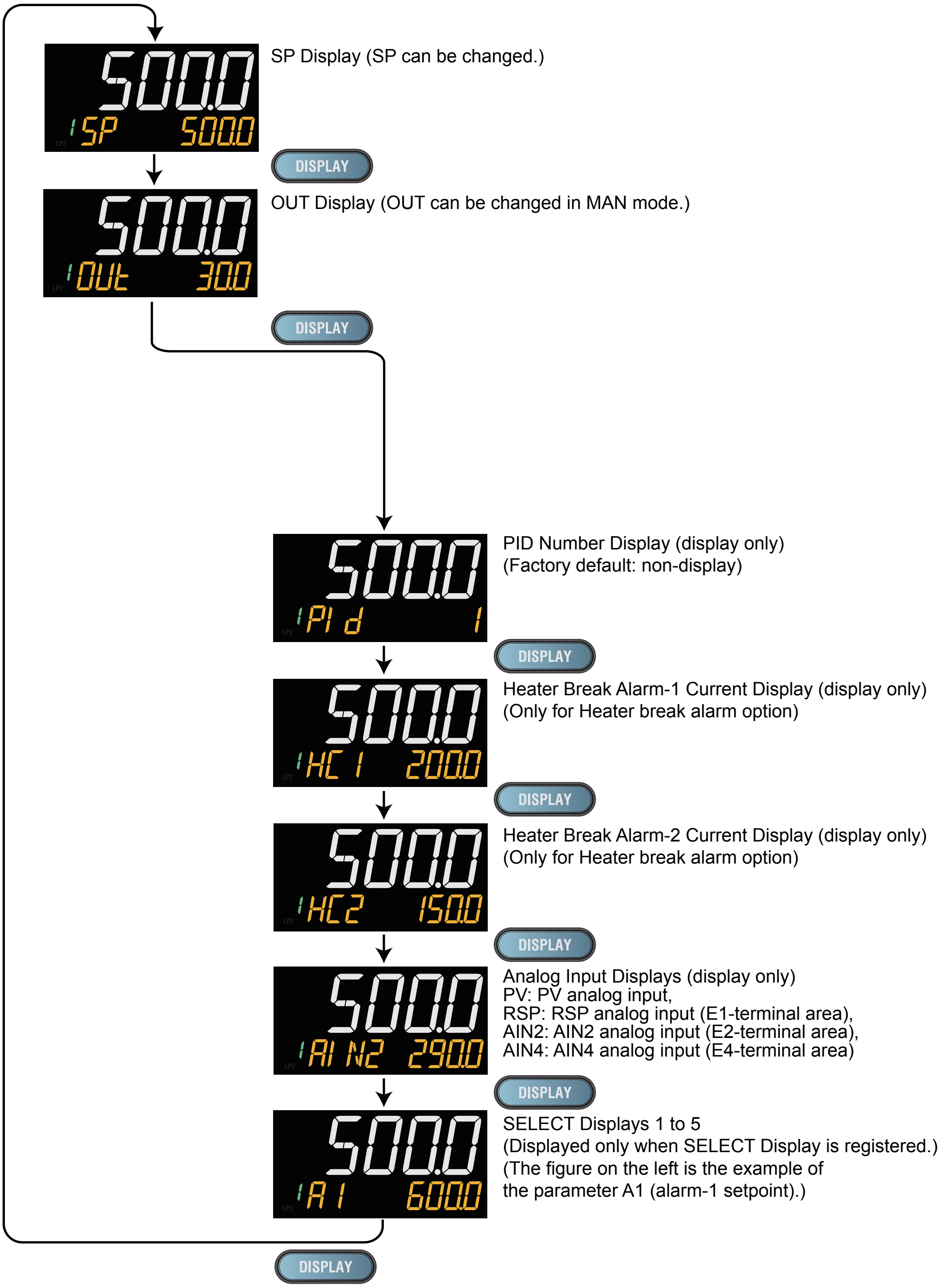
Single-loop Two-position two-level control



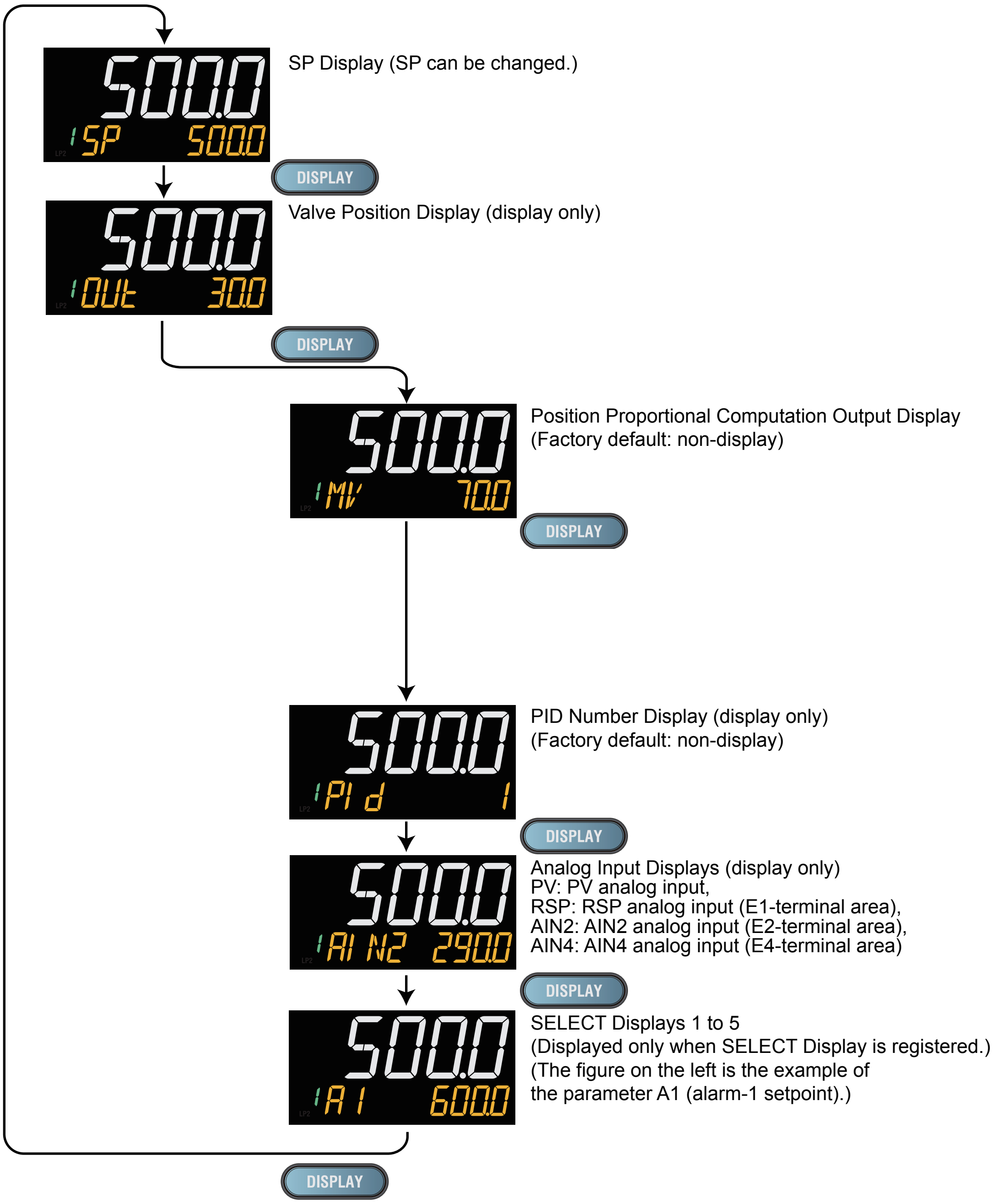
6.1.2 Operation Display Transitions in Loop Control with PV Switching and Loop Control with PV Auto-selector

► Display/non-display of Operation Display: 13.3.5 Setting Display/Non-display of Operation Display
► Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 Displays)

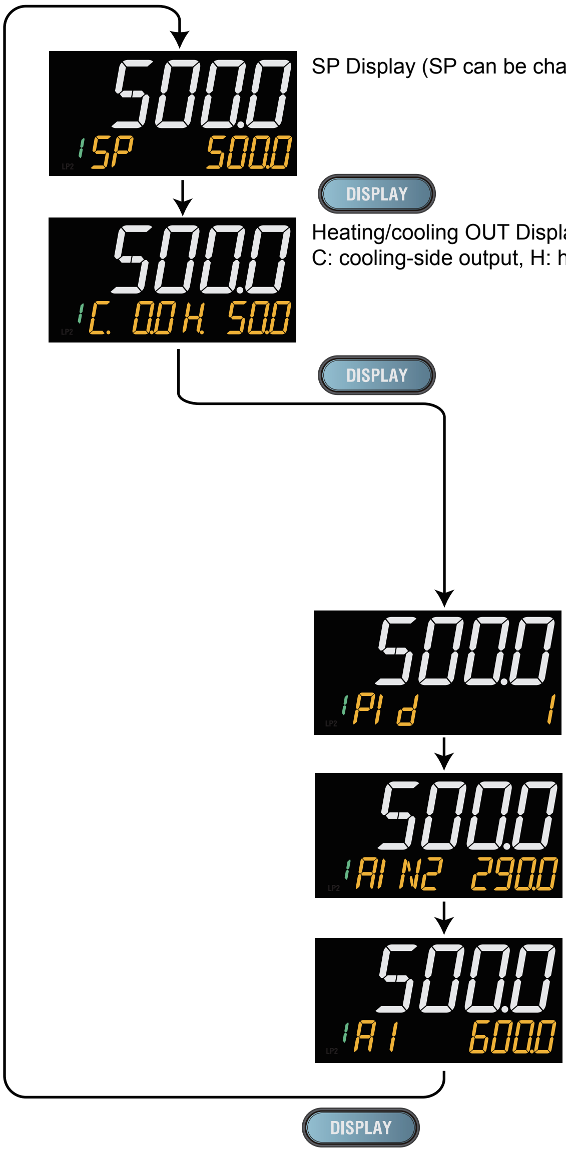
Standard Type



Position Proportional Type



Heating/cooling Type



SP Display (SP can be changed.)

Heating/cooling OUT Display (OUT can be changed in MAN mode.)
C: cooling-side output, H: heating-side output

PID Number Display (display only)
(Factory default: non-display)

Analog Input Displays (display only)
PV: PV analog input,
RSP: RSP analog input (E1-terminal area),
AIN2: AIN2 analog input (E2-terminal area),
AIN4: AIN4 analog input (E4-terminal area)

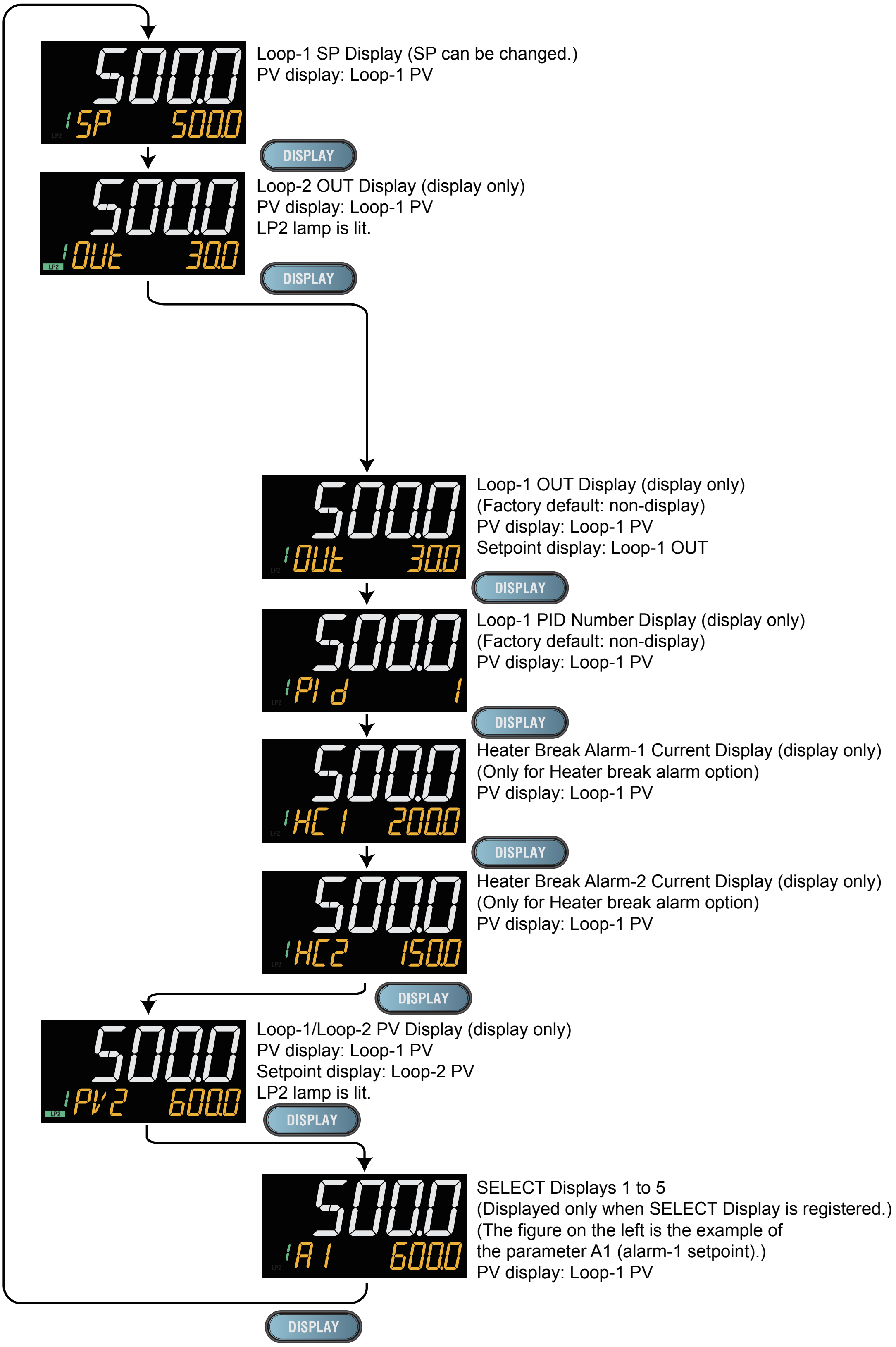
SELECT Displays 1 to 5
(Displayed only when SELECT Display is registered.)
(The figure on the left is the example of
the parameter A1 (alarm-1 setpoint).)

6.1.3 Operation Display Transitions in Cascade Control

► Display/non-display of Operation Display: 13.3.5 Setting Display/Non-Display of Operation Display
► Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 Displays)

Standard Type

When the operation mode is Cascade:



When the operation mode is AUTO or MAN:

Loop-2 SP Display (SP can be changed.)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Loop-2 OUT Display (OUT can be changed.)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Loop-1 PID Number Display (display only)
(Factory default: non-display)
PV display: Loop-2 PV

DISPLAY

Loop-2 PID Number Display (display only)
(Factory default: non-display)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Heater Break Alarm-1 Current Display (display only)
(Only for Heater break alarm option)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Heater Break Alarm-2 Current Display (display only)
(Only for Heater break alarm option)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Loop-2/Loop-1 PV Display (display only)
PV display: Loop-2 PV
Setpoint display: Loop-1 PV

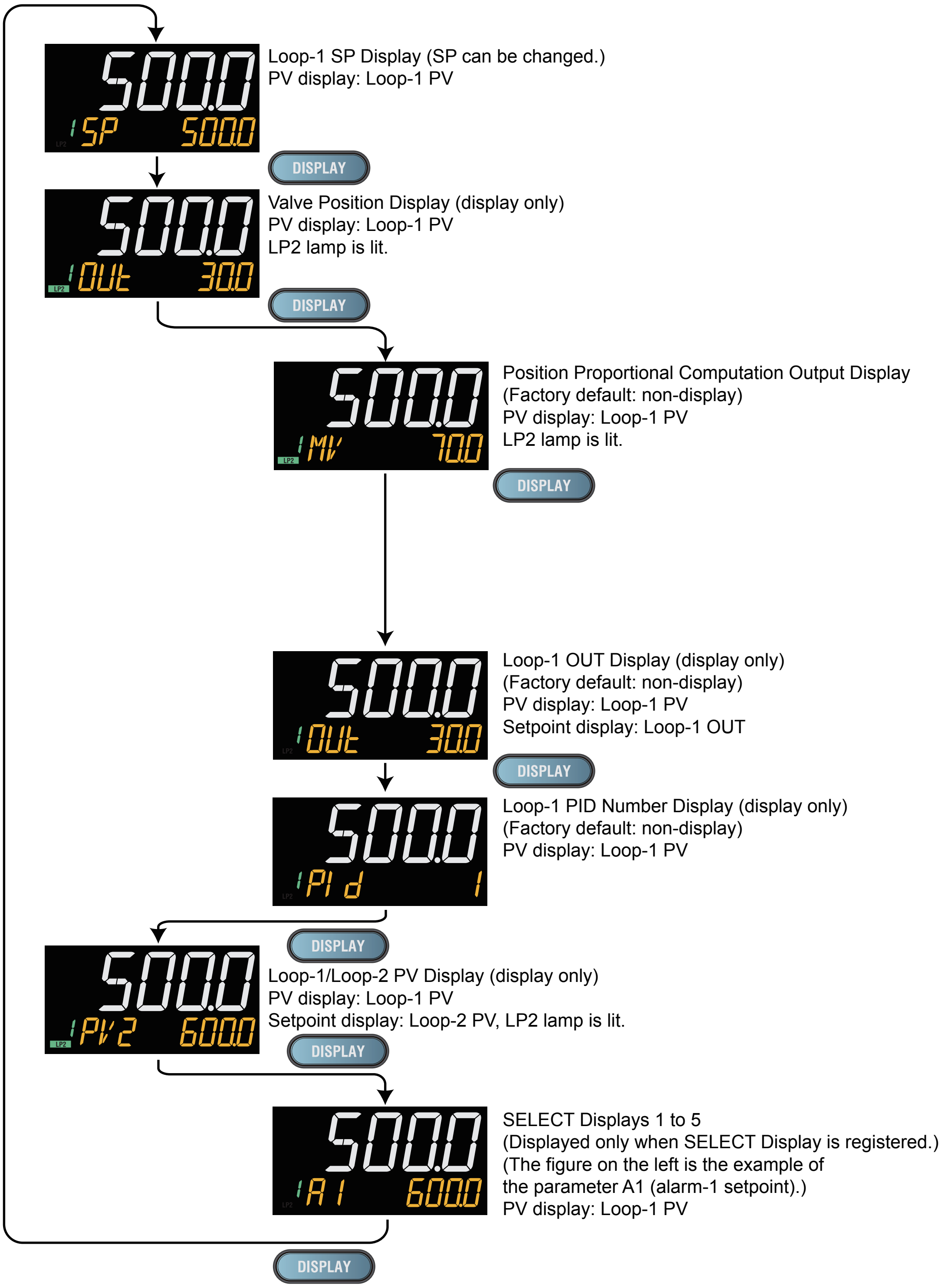
DISPLAY

SELECT Displays 1 to 5
(Displayed only when SELECT Display is registered.)
(The figure on the left is the example of
the parameter A1 (alarm-1 setpoint).)
PV display: Loop-2 PV

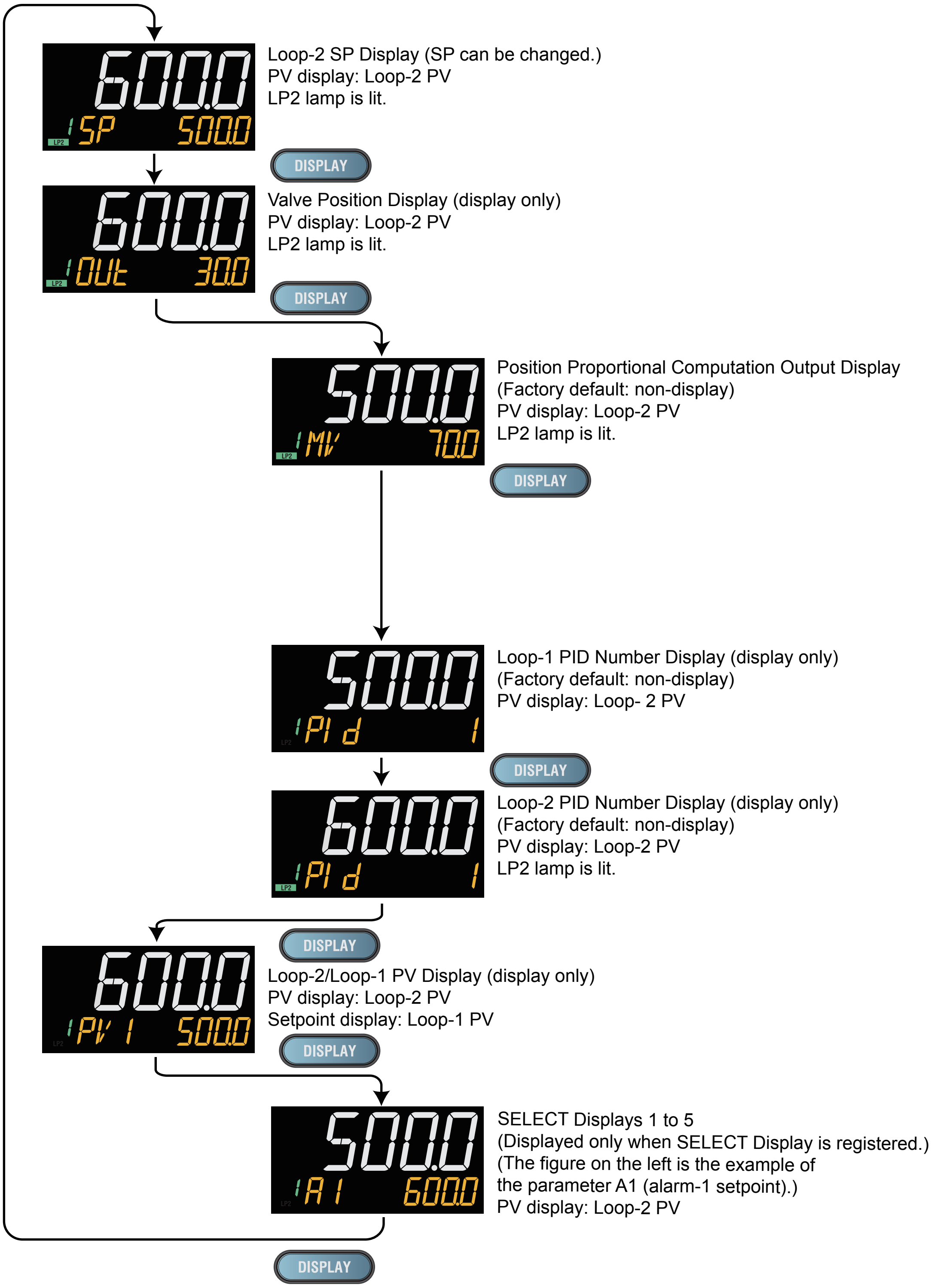
DISPLAY

Position Proportional Type

When the operation mode is Cascade:



When the operation mode is AUTO or MAN:

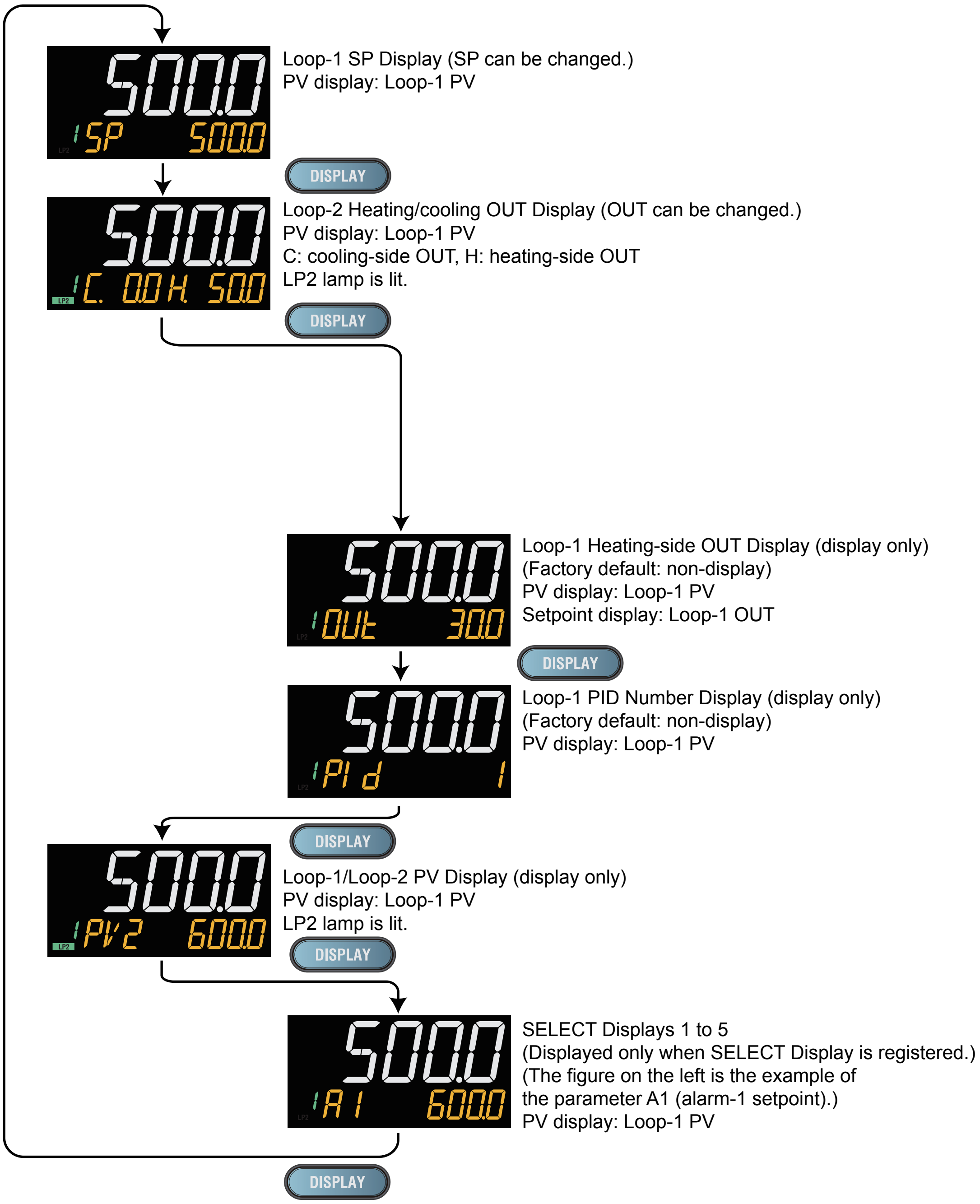


6

Monitoring and Control of Regular Operations

Heating/cooling Type

When the operation mode is Cascade:



When the operation mode is AUTO or MAN:

Loop-2 SP Display (SP can be changed.)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Loop-2 Heating/cooling OUT Display (OUT can be changed.)
PV display: Loop-2 PV
C: cooling-side OUT, H: heating-side OUT
LP2 lamp is lit.

DISPLAY

Loop-1 PID Number Display (display only)
(Factory default: non-display)
PV display: Loop-2 PV

DISPLAY

Loop-2 PID Number Display (display only)
(Factory default: non-display)
PV display: Loop-2 PV
LP2 lamp is lit.

DISPLAY

Loop-2/Loop-1 PV Display (display only)
PV display: Loop-2 PV

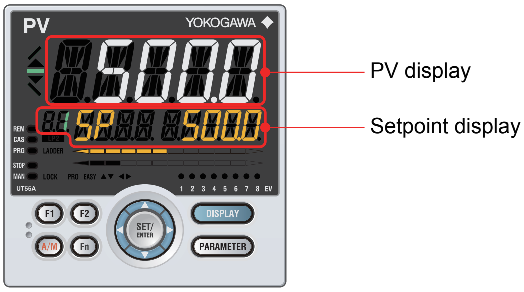
DISPLAY

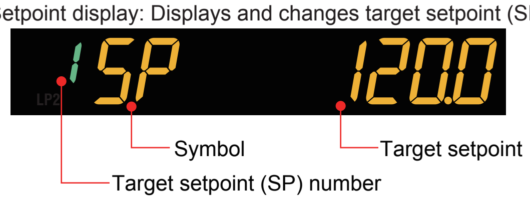
SELECT Displays 1 to 5
(Displayed only when SELECT Display is registered.)
(The figure on the left is the example of
the parameter A1 (alarm-1 setpoint).)
PV display: Loop-2 PV

DISPLAY

Details of the Operation Display

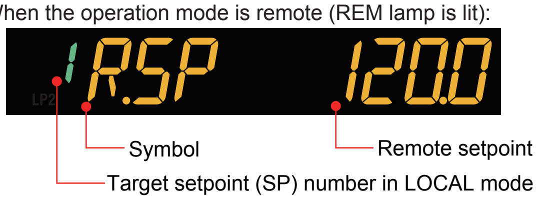
The following is the Operation Display types and each display and operation description.

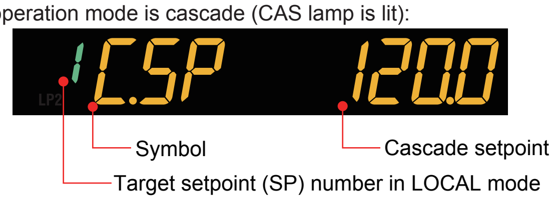


<table>
<tr><th>Operation Display</th><th>Display and operation description</th></tr>
<tr><td>SP Display</td><td>
PV display: Displays measured input value (PV).
Setpoint display: Displays and changes target setpoint (SP).


The Display is switched to the SP Display if the operation mode is switched to AUTO, CAS, LCL, or REM when other Operation Display is shown.

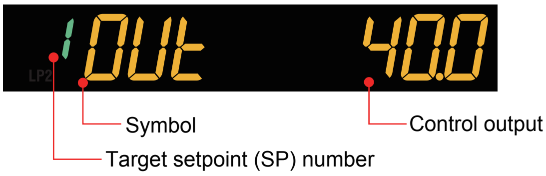
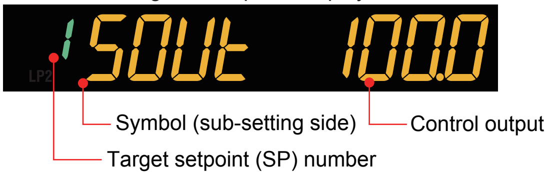
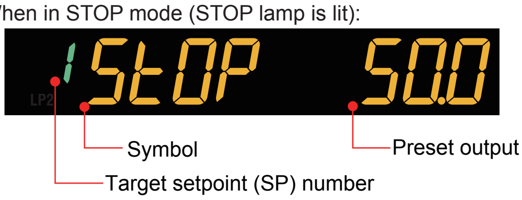
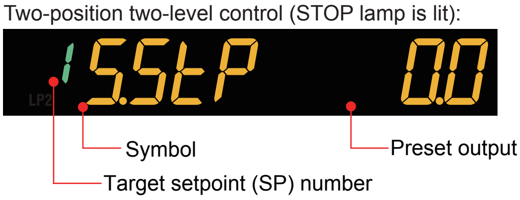
[SP Change Operation]
(1) Press the SET/ENTER key to move to the setting mode (the setpoint blinks).
(2) Use the Left or Right arrow key to move between digits (the setpoint blinks).
(3) Use the UP or Down arrow key to change the value (the setpoint blinks).
(4) Press the SET/ENTER key to register the setpoint. (the setpoint stops blinking).
* Only Up or Down arrow key operation is also possible.

When the operation mode is remote (REM lamp is lit):


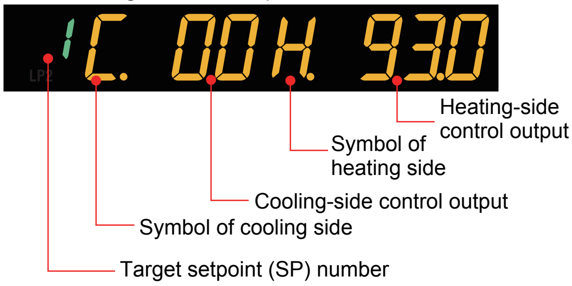
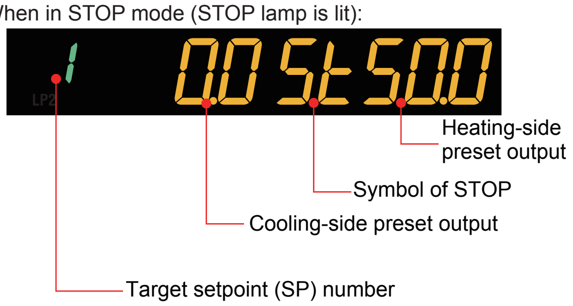
When the control mode is Cascade secondary-loop control and the operation mode is cascade (CAS lamp is lit):


When the control mode is Cascade secondary-loop control and the operation mode is AUTO or MAN, the Loop-2 SP is displayed.
</td></tr>
</table>

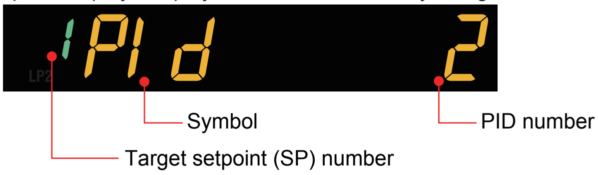
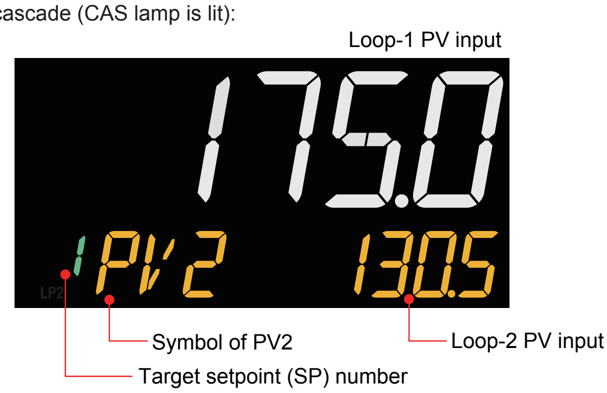
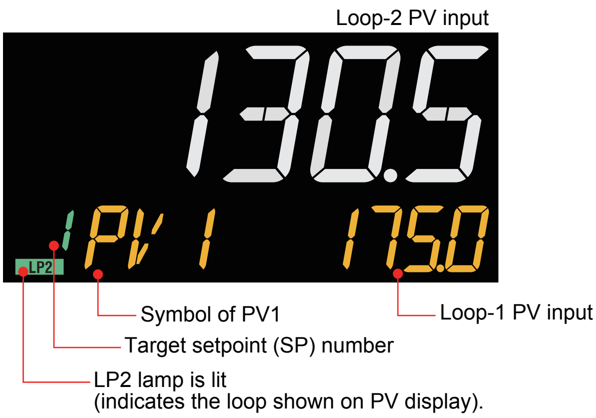
(Continued)

Operation Display	Display and operation description
OUT Display (Valve Position Display)	PV display: Displays measured input value (PV). Setpoint display: Displays control output value and changes control output value in MAN mode.  Displays the valve's feedback input value (at 0 to 100% valve opening) in Position proportional control. The Display is switched to the OUT Display if the operation mode is switched to MAN when other Operation Display is shown. The Display is switched to the OUT Display while auto-tuning is performed. Sub-setting-side output in Two-position two-level control is displayed as below. Main setting-side output is displayed as above.  **[OUT Change Operation]** The control output value can be changed with the Up or Down arrow key in MAN mode (MAN lamp is lit). The control output value is changed by direct operation (without pressing the SET/ENTER key), and cannot be changed by moving between digits using the Left and Right arrow keys. In Position proportional control and in MAN mode, the valve opens as long as the Up arrow key is being pressed, and closes as long as the Down arrow key is being pressed. In Two-position two-level control, main setting-side output and sub-setting-side output can be manipulated individually. When in STOP mode (STOP lamp is lit):  In Two-position two-level control (STOP lamp is lit):  Preset output value is displayed in STOP mode. Preset output values cannot be changed by OUT change operation.

(Continued)

Operation Display	Display and operation description
Heating/cooling OUT Display	PV display: Displays measured input value (PV). Setpoint display: Displays heating-side and cooling-side control output value and changes control output value in MAN mode.  When the control output value is less than 100%, one digit is displayed to the right of the decimal point. When the control output value is equal to or more than 100%, no digits are displayed to the right of the decimal point. The display is switched to the Heating/cooling OUT Display if the operation mode is switched to MAN when other Operation Display is shown. An interruption is displayed while auto-tuning is performed. **[OUT Change Operation]** In MAN mode (MAN lamp is lit) pressing the Up arrow key causes the cooling-side output to decrease, and the heating-side output to increase. Pressing the Down arrow key causes the cooling-side output to increase, and the heating-side output to decrease. The control output value is changed by direct operation (without pressing the SET/ENTER key), and cannot be changed by moving between digits using the Left and Right arrow keys. When in STOP mode (STOP lamp is lit):  Heating-side or cooling-side preset output value is displayed in STOP mode. Preset output values cannot be changed by OUT change operation. Loop-2 output value is always displayed in Cascade control.

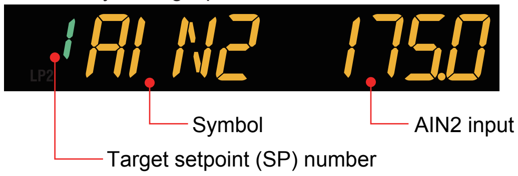
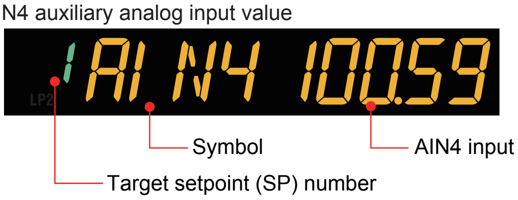
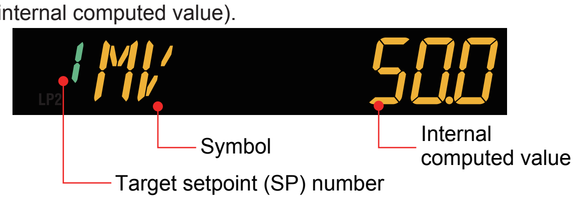
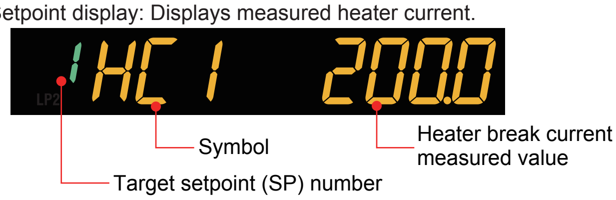
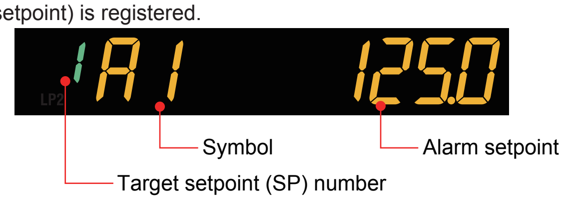
(Continued)

Operation Display	Display and operation description
PID Number Display	PV display: Displays measured input value (PV). Setpoint display: Displays PID number currently being used.  Loop-1 PID number is displayed when the control mode is Cascade control and the operation mode is cascade. Loop-2 PID number is displayed when the control mode is Cascade control and the operation mode is AUTO or MAN.
PV1/PV2 Display	The following is the Display shown when the control mode is cascade. PV display and Setpoint display: Displays Loop-1 PV input and Loop-2 PV input. When the control mode is Cascade control and the operation mode is cascade (CAS lamp is lit):  When the control mode is Cascade control and the operation mode is AUTO or MAN: 

6

Monitoring and Control of Regular Operations

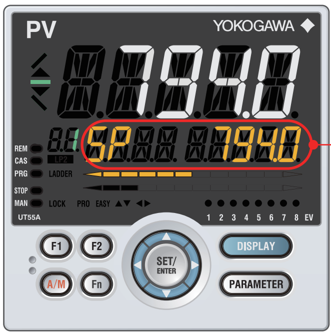
(Continued)

Operation Display	Display and operation description
Analog Input Display	PV display: Displays measured input value (PV). Setpoint display: Displays PV, RSP, AIN2, or AIN4 analog input value. AIN2 auxiliary analog input value  AIN4 auxiliary analog input value 
Position Proportional Computation Output Display	PV display: Displays measured input value (PV). Setpoint display: Displays position proportional computation output value (internal computed value).  Can be changed in MAN mode. The valve opens or closes so that the valve's feedback input value reaches the setpoint.
Heater Break Alarm Current Display	PV display: Displays measured input value (PV). Setpoint display: Displays measured heater current. 
SELECT Display	SELECT Display is for registering frequently-used parameters from Parameter Setting Display, and for displaying them on Operation Display so that the parameter settings can be easily changed in normal operation. PV display: Displays measured input value (PV). Setpoint display: Displays and changes the registered parameter. The following is the display example when the parameter A1 (alarm-1 setpoint) is registered. 

6.2 Setting Target Setpoint

Operation in the Operation Display

Operation



1. Bring the SP Display into view.

2. Press the SET/ENTER key to move to the setting mod
(the setpoint blinks).

3. Press the Left arrow key to move one digit to the left.
(Press the Right arrow key to move one digit to the rigl

4. Press the Up or Down arrow key to change a setpoint.
Press the Up arrow key when 9 is displayed to move one digit to the left.
Press the Down arrow key when 0 is displayed to move one digit to the right.

5. Press the SET/ENTER key to register the setpoint.
Control with the new setpoint.

Operation in Parameter Setting Display

Setting Display

Parameter Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **Right arrow** key (to [**SP**] Menu Display) > **SET/ENTER** key (The setting parameter is displayed.)

Press the Right arrow key until the **[SP]** Menu Display appears.

In the Setting Display for the target setpoint parameter, pressing the Left or Right arrow keys changes the group. (The group number is displayed on Group display.)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SP	Target setpoint	EASY	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)	SP **Ope**
SPGR.	Number of SP groups	STD	1 to 8	CTL **Set**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: If the SP limiter is set, the setting can be made within the range of the SP limiter.

Description

The controller has eight target setpoints (SP).
In Cascade control, both Loop1 and Loop 2 have eight target setpoints.

► SP limiter: 9.1 Setting SP Limiter
► SELECT parameter: 13.1.5 Registering SELECT Parameter Display (Up to 10 Displays)

6.3 Performing and Canceling Auto-tuning

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **SET/ENTER** key (The operation mode is displayed.) > **Down arrow** key (The operation mode is displayed.)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
AT	AUTO-tuning switch	EASY	OFF: Disable 1: Perform auto-tuning. Tuning result is stored in the PID of group 1. 2: Perform auto-tuning. Tuning result is stored in the PID of group 2. 3: Perform auto-tuning. Tuning result is stored in the PID of group 3. 4: Perform auto-tuning. Tuning result is stored in the PID of group 4. 5: Perform auto-tuning. Tuning result is stored in the PID of group 5. 6: Perform auto-tuning. Tuning result is stored in the PID of group 6. 7: Perform auto-tuning. Tuning result is stored in the PID of group 7. 8: Perform auto-tuning. Tuning result is stored in the PID of group 8. R: Tuning result is stored in the PID for reference deviation.	MODE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

CAUTION

Set the operation mode to AUTO and RUN to perform auto-tuning.

Lamp Status

Status	STOP lamp	CAS lamp	MAN lamp
During auto-tuning	Unlit	Unlit	Blinking

In Cascade control, perform Loop-2 auto-tuning in AUTO and RUN modes, then Loop-1 auto-tuning in Cascade and RUN modes.

Lamp Status

Status	STOP lamp	CAS lamp	MAN lamp
During auto-tuning of Loop-2	Unlit	Unlit	Blinking
During auto-tuning of Loop-1	Unlit	Lit	Blinking

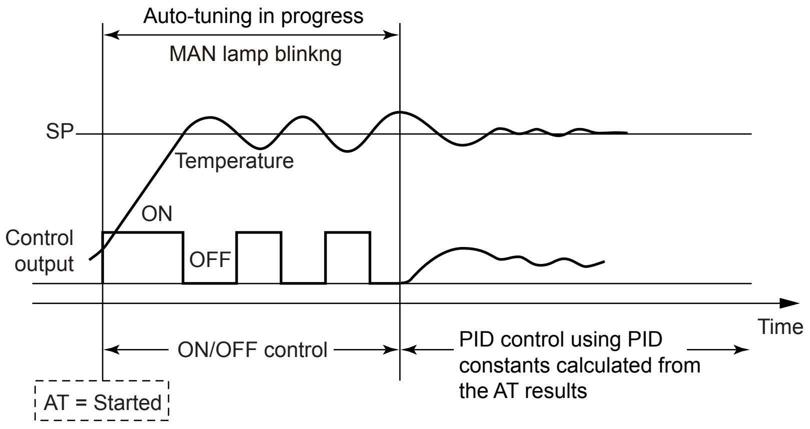
Description

Auto-tuning is a function with which the controller automatically measures the process characteristics and sets PID constants, which are control-related parameters, to optimum values for the setpoint. Auto-tuning temporarily executes ON/OFF control, calculates appropriate PID constants from response data obtained, and sets these constants.

CAUTION

Do not perform auto-tuning for the following processes.
Tune PID manually.

- Processes with fast response such as flow rate control and pressure control.
- Processes which do not allow the output to be turned on and off even temporarily.
- Processes which prohibit output changes at control valves (or other actuators).
- Processes in which product quality can be adversely affected if PV values fluctuate beyond their allowable ranges.



Tuning Point and Storage Location of Tuning Results

The tuning point when performing auto-tuning is the target setpoint that is currently used for control computation.
PID constants after the tuning are stored in the PID group that is specified when performing auto-tuning.

Operation mode	AT setpoint	Tuning point	Storage location
Local	1 to 8, R	Setpoint that is currently used	P, I, and D of the PID group specified in AT. In Heating/cooling control: P, I, D, Pc, Ic, and Dc
Remote	1 to 8, R	Remote setpoint	P, I, and D of the PID group specified in AT. In Heating/cooling control: P, I, D, Pc, Ic, and Dc

When the setpoint of AT is “R,” the AT result is stored in the PID group for reference deviation.

Auto-tuning cannot be performed when the control type (CNT) is as follows.
- ON/OFF control (1 point of hysteresis)
- ON/OFF control (2 points of hysteresis)
- Two-position two-level control
- Sample PI control

In addition, auto-tuning cannot be performed in the following cases (no error indication).
- Input error occurs. (Input burnout, ADC error, etc.)
- The operation mode is STOP.
- The operation mode is MAN.
- Output limiter setpoint at auto-tuning: AT.OL≥AT.OH

Start and Stop of Auto-tuning

Start and stop of auto-tuning can be set by parameter setting, communication, or contact input.
Auto-tuning is stopped in the following cases.
- Switch to MAN
- Switch to STOP
- The parameter AT is set to OFF.
- Power failure
- Auto-tuning is not finished even after the time-out detection time is elapsed.

The time-out detection time is about 24 hours.

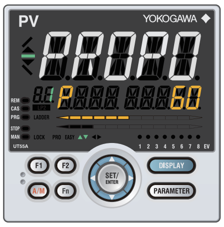
When the auto-tuning error occurs, the error code is shown in the Operation Display. Press any key to erase it.

► Auto-tuning time output limiter and auto-tuning execution time shortening: 8.8 Adjusting Auto-tuning Operation

6.4 Adjusting PID Manually

Setting Display

Parameter Setting Display



Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **Right arrow** key (to [**PID**] Menu Display) > **SET/ENTER** key (The setting parameter is displayed.) > **Down arrow** key (The setting parameter is displayed.)

In the Setting Display for the PID parameters, Displays can be arbitrarily switched using the Up, Down, Left or Right arrow key. Pressing the Left or Right arrow key changes the group. (The group number is displayed on Group display.)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
P	Proportional band Heating-side proportional band (in Heating/cooling control)	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control	PID Ope
I	Integral time Heating-side integral time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	
D	Derivative time Heating-side derivative time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	
Pc	Cooling-side proportional band	EASY	0.0 to 999.9% Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control	
Ic	Cooling-side integral time	EASY	OFF: Disable 1 to 6000 s	
Dc	Cooling-side derivative time	EASY	OFF: Disable 1 to 6000 s	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

There are eight groups of PID parameters.
In Cascade control, both Loop 1 and Loop 2 have eight groups.

The PID parameters can be selected by using the following two methods:

(1) SP group number selection

The PID group which is set in the PID number selection (PIDN) of each SP group is used.

SP number (SPNO)	Target setpoint (SP)	Setting range of PID number selection (PIDN)
1	SP	1 to 8
2	SP	1 to 8
3	SP	1 to 8
4	SP	1 to 8
5	SP	1 to 8
6	SP	1 to 8
7	SP	1 to 8
8	SP	1 to 8

When the SP parameter is displayed, the SP number is shown on Group display.
When the PID parameters are displayed, the PID number is shown on Group display.

► Selection by keystroke: 6.6 Selecting Target Setpoint Number (SPNO)
► Selection by contact input: 12.1 Setting Contact Input Function

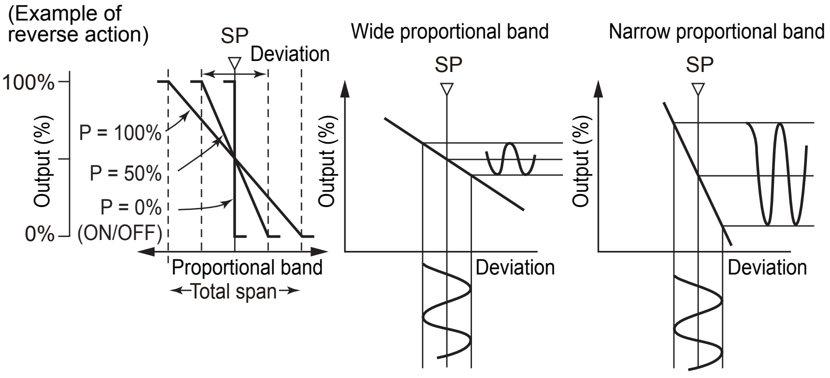
(2) Zone PID selection

► Selection by each Zone: 8.4 Switching PID

Description

Description and Tuning of Proportional Band

The proportional band is defined as the amount of change in input (or deviation), as a percent of span, required to cause the control output to change from 0% to 100%.
Because a narrower proportional band gives greater output change for any given deviation, it therefore also makes the control performance more susceptible to oscillation.
At the same time, a narrower proportional band reduces the offset.
Reducing the proportional band to its smallest limit (proportional band = 0%) results in ON/OFF control.

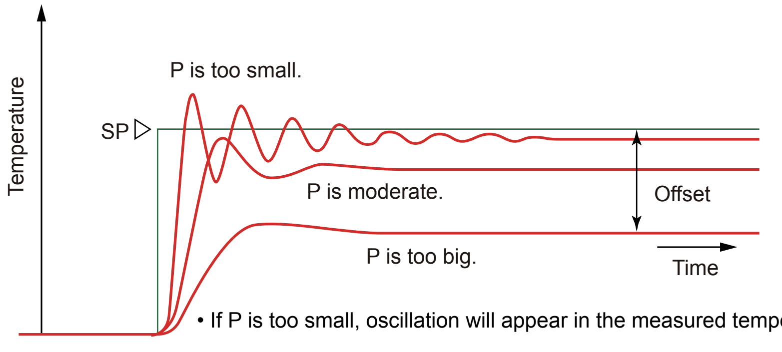


$$\text{Output} = \frac{100}{P} e$$

P: Proportional band
e: Deviation

To fine-tune a proportional band obtained using auto-tuning, or to manually tune the proportional band:

- Work from larger to smaller numbers (wider to narrower).
- If cycling appears, that means that the proportional band is too narrow.
- Proportional band tuning cannot cancel an offset.



• If P is too small, oscillation will appear in the measured temperature.

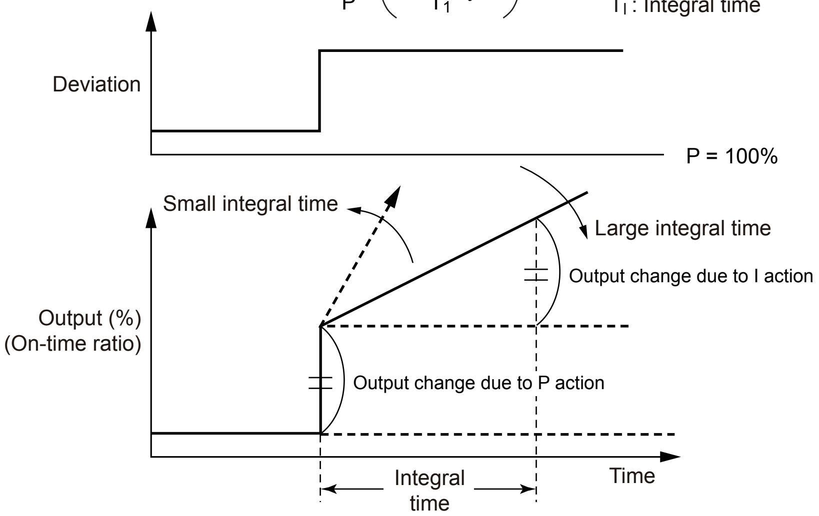
► Offset: 10.8 Canceling Offset of PV and SP (Manual Reset)

Description and Tuning of Integral Time

The integral action (I action) is a function that will automatically diminish the offset (steady-state deviation) that is inherently unavoidable with proportional action alone. The integral action continuously increases or decreases the output in proportion to the time integral of the deviation (the product of the deviation and the time that the deviation continues.)
The integral action is normally used together with proportional action as proportional-plus-integral action (PI action).
The integral time (I) is defined as the time required to develop, when a stepwise change in deviation is imposed, an output change due to integral action that is exactly equal to the change due to proportional action. The longer the integral time set, the slower the change in output; the smaller the time, the faster the output changes.

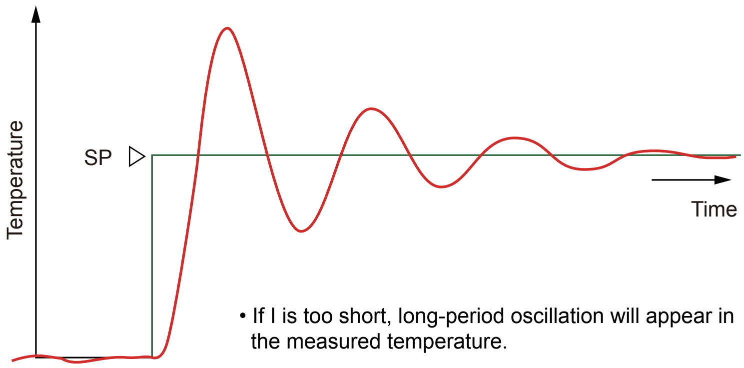
$$\text{Output} = \frac{100}{P}\left(e + \frac{1}{T_I}\int e\,dt\right)$$

e : Deviation
T_I : Integral time



To manually tune the integral time

- The main goal is to reduce the offset.
- Adjust from longer time to shorter time.
- If you see an oscillation at a longer period than that seen when the proportional band is too narrow, then you have made the integral time too short.



Use the manual reset (MR) to cancel an offset when the integral action is disabled.

► Manual reset: 10.8 Canceling Offset of PV and SP (Manual Reset)

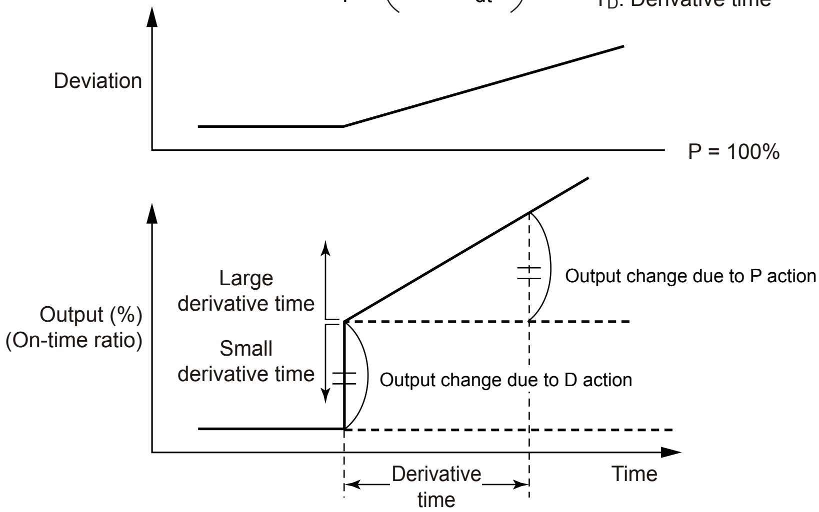
Description and Tuning of Derivative Time

If the control object has a large time constant or dead time, the corrective action will be too slow with proportional action or proportional-plus-integral action alone, causing overshoot. However, even just sensing whether the deviation is on an increasing or a decreasing trend and adding some early corrective action can improve the controllability. Thus the derivative action (D action) is action that changes the output in proportion to the deviation derivative value (rate-of-change).

The derivative time is defined as the time required with PD action to develop, when a constant-slope change in deviation is imposed, an output change due to derivative action that is exactly equal to the change due to proportional action.

$$\text{Output} = \frac{100}{P}\left(e + T_D \frac{d}{dt} e\right)$$

e : Deviation
T_D: Derivative time

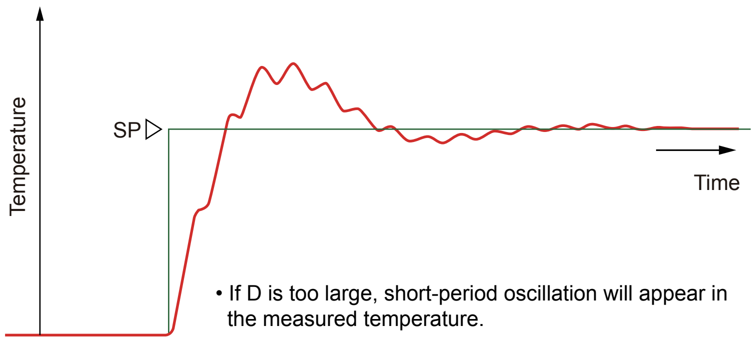


To manually tune the derivative time

- Adjust from shorter time to longer time.
- If you see a short-period oscillation, the time is too long.

The longer the derivative time set, the stronger the corrective action, and the more likely the output will become oscillatory. Oscillations due to derivative action are characterized by a short period.

D = OFF should always be used when controlling fast-responding inputs such as pressure and flow rate, or inputs characterized by rapid fluctuation, such as optical sensors.



Manual PID Tuning Procedure

(1) In principle, auto-tuning must be used.
(2) Tune PID parameters in the order of P, I, and D. Adjust a numeric slowly by observing the result, and keep notes of what the progress is.
(3) Gradually reduce P from a larger value. When the PV value begins to oscillate, stop tuning and increase the value somewhat.
(4) Also gradually reduce I from a larger value. When the PV value begins to oscillate (with long period), stop tuning and increase the value somewhat.
(5) Gradually increase D from a smaller value. When the PV value begins to oscillate (with short period), stop tuning and lower the value slightly.

Reference Values for Manual Tuning of Temperature, Pressure, and Flow Rate

		Setting range (reference)	Initial value for tuning (reference)
Pressure	P	100 to 300%	200%
	I	5 to 30 s	15 s
	D	OFF	OFF
Flow rate	P	100 to 240%	150%
	I	8 to 30 s	20 s
	D	OFF	OFF
Temperature (electric furnace)	P	1 to 20%	5%
	I	180 to 600 s	240 s
	D	1/4 to 1/6 of I	60 s

6.5 Setting Alarm Setpoint

Setting Display

Parameter Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **Right arrow** key (to [**SP**] Menu Display) > **SET/ENTER** key (The setting parameter is displayed.) > **Down arrow** key (The setting parameter is displayed.)

In the setting Display for the alarm parameters, Displays can be arbitrarily switched using the Up, Down, Left or Right arrow key. Pressing the Left or Right arrow key changes the group. (The group number is displayed on Group display.)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
A1 to A8	Alarm-1 to -8 setpoint	EASY	Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type	SP **Ope**
ALNO.	Number of alarms	PRO	1 to 8	CTL **Set**

Note:1 When the alarm setpoint parameter is displayed, the group number is shown on Group display.
Note2: The initial value of the parameter ALNO. is “4.” Four alarm setpoint parameters are displayed for each SP group.
Note3: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Description

Each alarm type has eight alarm setpoints.
In Cascade control, each alarm type has eight setpoints for Loop 1 and Loop 2, respectively.
Specifying the SP number (SPNO) determines the alarm setpoint to be used.

Alarm-related parameter	Number of settings
Alarm type	8 (number of settings) x 2 (number of loops)
PV velocity alarm time setpoint	8 (number of settings) x 2 (number of loops)
Alarm hysteresis	8 (number of settings) x 2 (number of loops)
Alarm delay timer	8 (number of settings) x 2 (number of loops)
Alarm setpoint	8 (number of settings) x 2 (number of loops) x 8 (number of groups)

► Alarm type: Chapter 11 Alarm Functions

6.6 Selecting Target Setpoint Number (SPNO)

Setting Display

Parameter Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **SET/ENTER** key (The setting parameter is displayed.) > **Down arrow** key (The setting parameter is displayed.)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SPNO.	SP number selection	EASY	1 to 8 (Depends on the setup parameter SPGR. setting.)	MODE **Ope**
SPGR.	Number of SP groups	STD	1 to 8	CTL **Set**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Description

The SP number (SPNO) selection can be used when the parameter ZON (zone PID selection) is set to "SP group number selection."

SP Group Number Selection

The PID group which is set in the PID number selection (PIDN) of each SP group is used.

SP number (SPNO)	Target setpoint (SP)	Setting range of PID number selection (PIDN)
1	SP	1 to 8
2	SP	1 to 8
3	SP	1 to 8
4	SP	1 to 8
5	SP	1 to 8
6	SP	1 to 8
7	SP	1 to 8
8	SP	1 to 8

When the SP parameter is displayed, the SP number is shown on Group display.

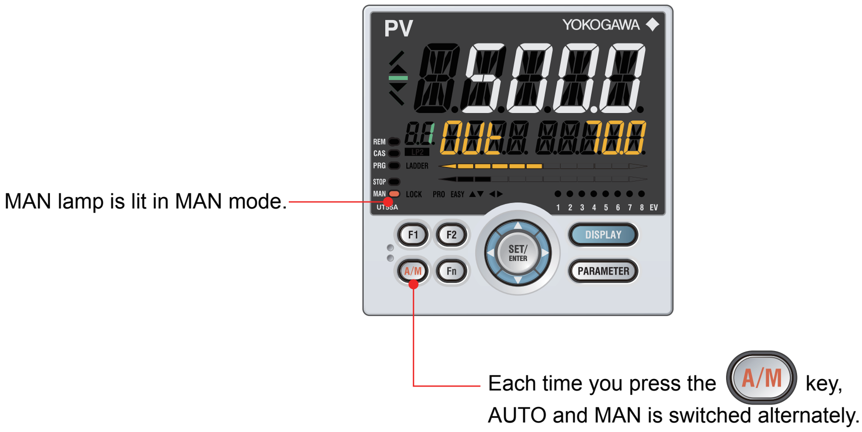
► Selection by contact input: 12.1 Setting Contact Input Function

6.7 Switching Operation Modes

6.7.1 Switching between AUTO and MAN

Direct Operation by A/M Key

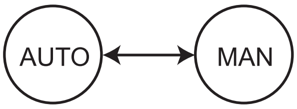
Operation



Description

AUTO/MAN switching can be performed by any of the following:

(1) A/M key
(2) Contact input (status or edge)
(3) Communication
(4) User function key



When the contact input (status) is ON, operation cannot be performed by keystroke or communication.
When the contact input is OFF, and the setting is switched by keystroke or communication, the last switching operation is performed.

► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

Switch	Output action
AUTO→MAN	Holds the control output value from AUTO mode. The control output value can be bump to the manual preset output value by the setting of parameter MPO. The output value can be changed in manual mode.
MAN→AUTO	The control output value does not bump (bumpless). Does not work when Integral time (I) = OFF.

► Switch from AUTO to MAN, and MPON: 10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

Operation Display in AUTO and MAN Modes

"OUT" is displayed on Symbol display and "Output value" is displayed on Data display in MAN mode. (The OUT Display is shown.)

Sub-setting-side OUT Display is shown in Two-position two-level control.

SP Display is shown in AUTO mode.

Operation Display in AUTO and MAN Modes in Heating/cooling Control

In MAN mode, the Display is as follows. Symbol "C" represents the cooling side and "H" represents the heating side. The value on the right of each symbol is the output value.

Lamp Status

Status	MAN lamp
Automatic operation (AUTO)	Unlit
Manual operation (MAN)	Lit

6

Monitoring and Control of Regular Operations

6.7.2 Switching between CAS (Cascade), AUTO, and MAN

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **SET/ENTER** key (The operation mode is displayed.) > **Down arrow** key (The operation mode is displayed.)

Setting Details

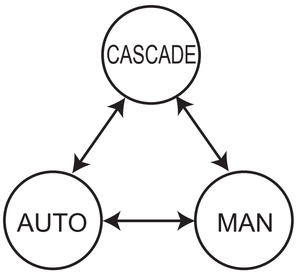
Parameter symbol	Name	Display level	Setting range	Menu symbol
C.A.M	CAS/AUTO/MAN switch	EASY	CAS: Cascade mode AUTO: Automatic mode MAN: Manual mode	MODE Ope

Description

CAS (Cascade), AUTO, and MAN can be switched when the control mode is Cascade secondary-loop control or Cascade control.

CAS/AUTO/MAN switching can be performed by any of the following.

(1) A/M key (MAN → AUTO →CAS →MAN •••)
(2) Parameter
(3) Contact input
(4) Communication
(5) User function key



For the switching operation by using the above, the last switching operation is performed. Operation by user function key is different. See the descriptions in the following.

► A/M key function: 13.2 Assigning Function to User Function Key and A/M key
► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

Output Action in CAS/AUTO/MAN Switch

Switch	Output action
CAS→AUTO	The control output value does not bump (bumpless).
CAS→MAN	The control output value bumps to the manual preset output value. Or holds the control output value from CAS mode.
AUTO→CAS	The control output value does not bump (bumpless).
AUTO→MAN	The control output value bumps to the manual preset output value. Or holds the control output from AUTO mode.
MAN→AUTO	The control output value does not bump (bumpless).
MAN→CAS	The control output value does not bump (bumpless).

► Switch from AUTO to MAN: 10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

Secondary-side SP in CAS/AUTO/MAN Switch

Switch	Secondary SP after switching
CAS→AUTO	Sets the target setpoint specified in SP number selection (SPNO.).
CAS→MAN	
AUTO→CAS	Sets the primary-side control output value as target setpoint.
AUTO→MAN	Sets the target setpoint specified in SP number selection (SPNO.).
MAN→AUTO	
MAN→CAS	Sets the primary-side control output as target setpoint.

Output specification after switching from CAS or AUTO to MAN

The control output can be manipulated by keystroke or via communication in MAN mode.

Lamp Status

Status	MAN lamp	CAS lamp
Cascade (CAS)	Unlit	Lit
Automatic operation (AUTO)	Unlit	Unlit
Manual operation (MAN)	Lit	Unlit

6.7.3 Switching between STOP and RUN

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **SET/ENTER** key (The operation mode is displayed.) > **Down arrow** key (The operation mode is displayed.)

Factory default: The parameter S.R is not displayed because STOP/RUN switch is assigned to the contact input.
To display the parameter, disable the STOP/RUN switch assigned to the contact input.

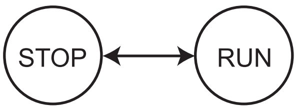
► Switch by contact input: 12.1 Setting Contact Input Function

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
S.R	STOP/RUN switch	EASY	STOP: Stop mode RUN: Run mode	MODE **Ope**

Description

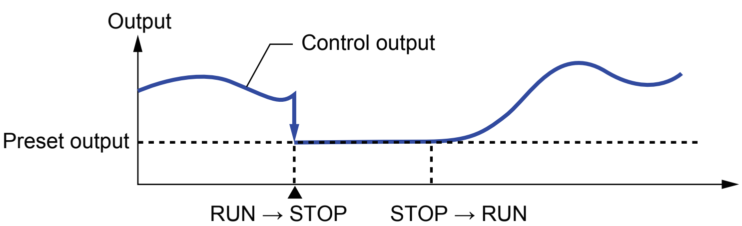
STOP/RUN switching can be performed by any of the following:
(1) Contact input (status or edge)
(2) Parameter
(3) Communication
(4) User function key



When the contact input (status) is ON, operation cannot be performed by parameter, communication, or keystroke.
When the contact input is OFF, and the setting is switched by parameter, communication, or keystroke, the last switching operation is performed.

► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

Switch	Output action
RUN→STOP	The control output bumps.
STOP→RUN	The control output does not bump (bumpless).



► Preset output value: 10.12.1 Setting Output Value in STOP Mode (Preset Output)

Operation Display in STOP and RUN Modes

"STOP" is displayed on Symbol display and "Output value" is displayed on Data display in STOP mode. Preset output value is displayed.

In Two-position two-level control

The display at operation start differs depending on AUTO or MAN mode.
SP Display is shown in AUTO mode and OUT Display is shown in MAN mode.

SP Display

OUT Display

Sub-setting-side OUT Display in Two-position two-level control.

Operation Display in STOP and RUN Modes in Heating/cooling Control

In STOP mode in Heating/cooling control, the display is as follows. The cooling-side preset output is displayed on the left of the symbol "ST" and heating-side preset output is displayed on the right.

The display at operation start differs depending on AUTO or MAN mode.
SP Display is shown in AUTO mode and Heat/cool OUT Display is shown in MAN mode.

SP Display

Heat/cool OUT Display
Symbol "C" represents the cooling side and "H" represents the heating side.

Lamp Status

Status	STOP lamp
Operation start (RUN)	Unlit
Operation Stop (STOP)	Lit

6

Monitoring and Control of Regular Operations

6.7.4 Switching between REM (Remote) and LCL (Local)

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** or **PARA** key for **3 seconds** (to [**MODE**] Menu Display) > **SET/ENTER** key (The operation mode is displayed.) > **Down arrow** key (The operation mode is displayed.)

Setting Details

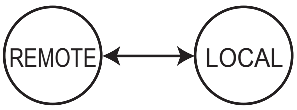
Parameter symbol	Name	Display level	Setting range	Menu symbol
R.L	REMOTE/LOCAL switch	EASY	LCL: Local mode REM: Remote mode	MODE Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Description

REMOTE/LOCAL switching can be performed by any of the following:

(1) Contact input (status or edge)
(2) Parameter
(3) Communication
(4) User function key



When the contact input (status) is ON, operation cannot be performed by parameter, communication, or keystroke.
When the contact input is OFF, and the setting is switched by parameter, communication, or keystroke, the last switching operation is performed.
The last switching operation is performed for all methods, when the action of contact input is detected as rising edge.

► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

The PID group corresponding to the local SP number is used as PID in REM mode.

SP Action in REM/LCL Switch

Switch	SP action
LCL→REM	The local target setpoint bumps to the remote target setpoint.
REM→LCL	The remote target setpoint bumps to the local target setpoint. Or forces the local target setpoint to track the remote target setpoint.

► Tracking: 9.4 Forcing SP to Track Remote Input (SP Tracking)

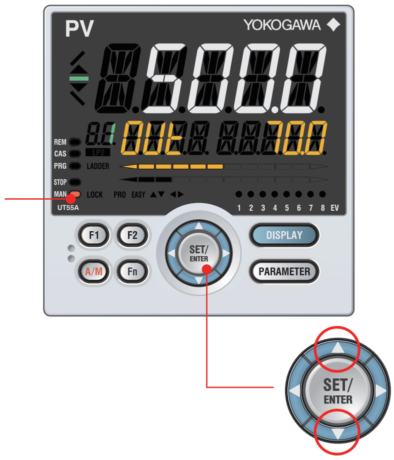
Lamp Status

Status	REM lamp
Local (LCL)	Unlit
Remote (REM)	Lit

6.8 Manipulating Control Output during Manual Operation

Operation

MAN lamp is lit.



Press the Up arrow key to increase control output.
Press the Down arrow key to decrease control output.

In Heating/cooling control,
press the Up arrow key to decrease cooling-side control output and to increase heating-side control output;
press the Down arrow key to increase cooling-side control output and to decrease heating-side control output.

Description

In MAN mode, the control output is manipulated by direct key operation. (The value changed using the Up or Down arrow key is output as is.)
Manipulation of the control output is not possible in STOP mode (the STOP lamp is lit).
Output manipulation differs depending on the ON or OFF setting of the control output limiter (OH, OL).

► 10.4 Disabling Output Limiter in MAN mode

OUT Display

Internal computed value is displayed in Position proportional control.

Sub-setting-side OUT Display in Two-position two-level control.
In Two-position two-level control, main setting-side output can be manipulated individually. Control output limiter is disabled as well as a case of ON/OFF control.

Heating/cooling OUT Display
The heating/cooling control output is manipulated simultaneously on both the heating and cooling sides.
In MAN mode, the display is as follows. The symbol “C” represents the cooling side, and “H” the heating side. The value on the right of each symbol is the output value.

When the control output low limit is set to “SD” while the control output type is 4 to 20 mA, the control output value can be lowered down to 0 mA.

► 10.6 Reducing 4-20 mA Current Output to 0 mA (Tight Shut Function)

6.9 Releasing On-State (Latch) of Alarm Output

Description

Alarm latch can be released by any of the following.

(1) User function key
(2) Communication
(3) Contact input

For the switching operation by using the above, the last switching operation is performed.

Releasing the alarm latch function releases all of the latched alarm outputs.
By factory default, the function is not assigned to the user function key and contact input. Assign and use the function in accordance with the reference sections below.

► Release by user function key: 13.2 Assigning Function to User Function Key and A/M key
► Release by contact input: 12.1 Setting Contact Input Function
► Release via communication: UTAdvanced Series Communication Interface User's Manual

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7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

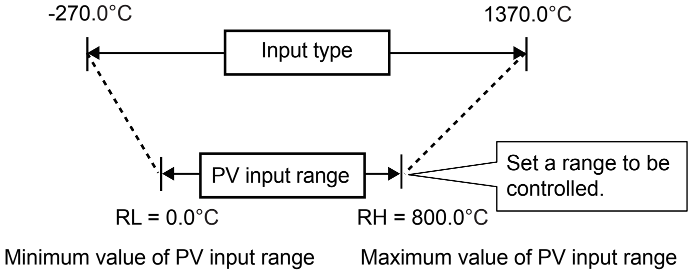
7.1.1 Setting Input Type, Unit, Range, Scale, and Decimal Point Position

Description

The figure below describes the case of PV input. The remote input and auxiliary analog input can be set in the same way.

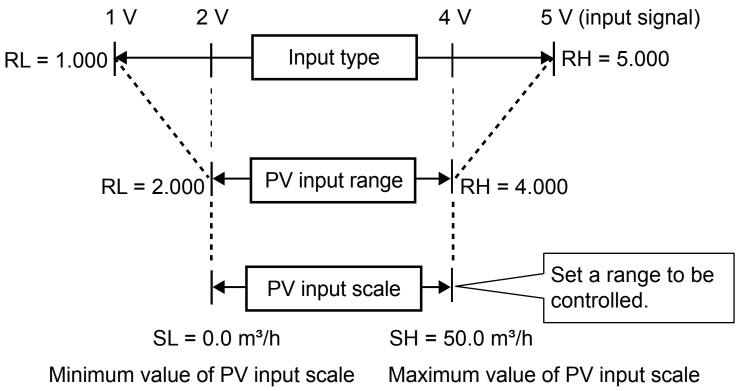
Example of Temperature Input

The figure below is an example of setting Type K thermocouple and a measurement range of 0.0 to 800.0 ºC.



Example of Voltage and Current Inputs

The figure below is an example of setting 2-4 V DC and a scale of 0.0 to 50.0 m³/h.



When using 1-5 V DC signal as is, set RH = 5.000 V, RL = 1.000 V, SDP=1, and SH = 50.0, and SL=0.0.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
IN	PV input type	EASY	OFF: Disable K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F B: 0.0 to 1800.0 °C / 32 to 3300 °F S: 0.0 to 1700.0 °C / 32 to 3100 °F R: 0.0 to 1700.0 °C / 32 to 3100 °F N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F W: 0.0 to 2300.0 °C / 32 to 4200 °F (Note1) PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F P2040: 0.0 to 1900.0 °C / 32 to 3400 °F WRE: 0.0 to 2000.0 °C / 32 to 3600 °F JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F JPT2: -150.0 to 150.0 °C / -200.0 to 300.0 °F PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20 : 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV	PV Set
	RSP remote input type (Note2)	EASY	0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V	RSP Set
	AIN2 aux. analog input type	EASY		AIN2 Set
	AIN4 aux. analog input type	EASY		AIN4 Set
UNIT	PV input unit	EASY	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	PV Set
	RSP remote input unit	EASY		RSP Set
	AIN2 aux. analog input unit	EASY		AIN2 Set
	AIN4 aux. analog input unit	EASY		AIN4 Set

Note1: W: W-5% Re/W-26% Re(Hoskins Mfg. Co.). ASTM E988
WRE: W97Re3-W75Re25

Note2: For remote input with the optional suffix code /DR, RSP remote input type is same as PV input type.

(Continued)

Parameter symbol	Name	Display level	Setting range	Menu symbol
RH (Physical quantity)	Maximum value of PV input range	EASY	Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	PV Set
	Maximum value of RSP remote input range	EASY		RSP Set
	Maximum value of AIN2 aux. analog input range	EASY	Depends on the input type. Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	AIN2 Set
	Maximum value of AIN4 aux. analog input range	EASY		AIN4 Set
RL (Physical quantity)	Mininum value of PV input range	EASY	Same as RH	PV Set
	Minimum value of RSP remote input range	EASY		RSP Set
	Minimum value of AIN2 aux. analog input range	EASY		AIN2 Set
	Minimum value of AIN4 aux. analog input range	EASY		AIN4 Set
SDP (Scaling)	PV input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	PV Set
	RSP remote input scale decimal point position	EASY		RSP Set
	AIN2 aux. analog input scale decimal point position	EASY		AIN2 Set
	AIN4 aux. analog input scale decimal point position	EASY		AIN4 Set
SH (Scaling)	Maximum value of PV input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	PV Set
	Maximum value of RSP remote input scale	EASY		RSP Set
	Maximum value of AIN2 aux. analog input scale	EASY		AIN2 Set
	Maximum value of AIN4 aux. analog input scale	EASY		AIN4 Set

Parameter symbol	Name	Display level	Setting range	Menu symbol
SL (Scaling)	Mininum value of PV input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	PV Set
	Minimum value of RSP remote input range	EASY		RSP Set
	Minimum value of AIN2 aux. analog input scale	EASY		AIN2 Set
	Minimum value of AIN4 aux. analog input scale	EASY		AIN4 Set

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2.
The LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: For remote input with the optional suffix code /DR, setting range for RSP remote input type is same as that for PV input type.
Note 3: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
UT52A suffix code: Type 2=1 or 2
AIN2 and AIN4: Suffix code Type 2=7 (for UT55A only)

IN, UNIT, RH, and RL described above are the parameters to be used for processing before the input ladder calculation program.
The following parameters are used for processing after the input ladder calculation program.

Parameter symbol	Name	Display level	Setting range	Menu symbol
P.UNI	Control PV input unit	STD	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	MPV Set
P.DP	Control PV input decimal point position		0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	
P.RH	Maximum value of control PV input range		-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000	
P.RL	Minimum value of control PV input range			

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

7.1.2 Setting Burnout Detection for Input

Description

The input value when input burnout occurs can be determined.
The input value is 105.0% of the input range when the upscale is set, and -5.0% of the input range when the downscale is set.
Burnout detection is activated for TC, RTD, and standard signal (0.4–2 V or 1–5 V).
For standard signal, burnout is determined to have occurred if it is 0.1 V or less for the range of 0.4–2 V and 1–5V, or if it is 0.4 mA or less for the range of 4–20 mA.

When input burnout occurs, the error preset output (EPO) is output as control output.

► Input error preset output: 10.12.3 Setting Output Value When Error Occurs (Input Error Preset Output)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
BSL	PV input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	PV Set
	RSP remote input bumout action	STD		RSP Set
	AIN2 aux. analog input burnout action	STD		AIN2 Set
	AIN4 aux. analog input burnout action	STD		AIN4 Set

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2.
The LP2 lamp is lit while the Loop-2 parameter is displayed.
Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
UT52A suffix code: Type 2=1 or 2
AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)

7.1.3 Setting Reference Junction Compensation (RJC) or External Reference Junction Compensation (ERJC)

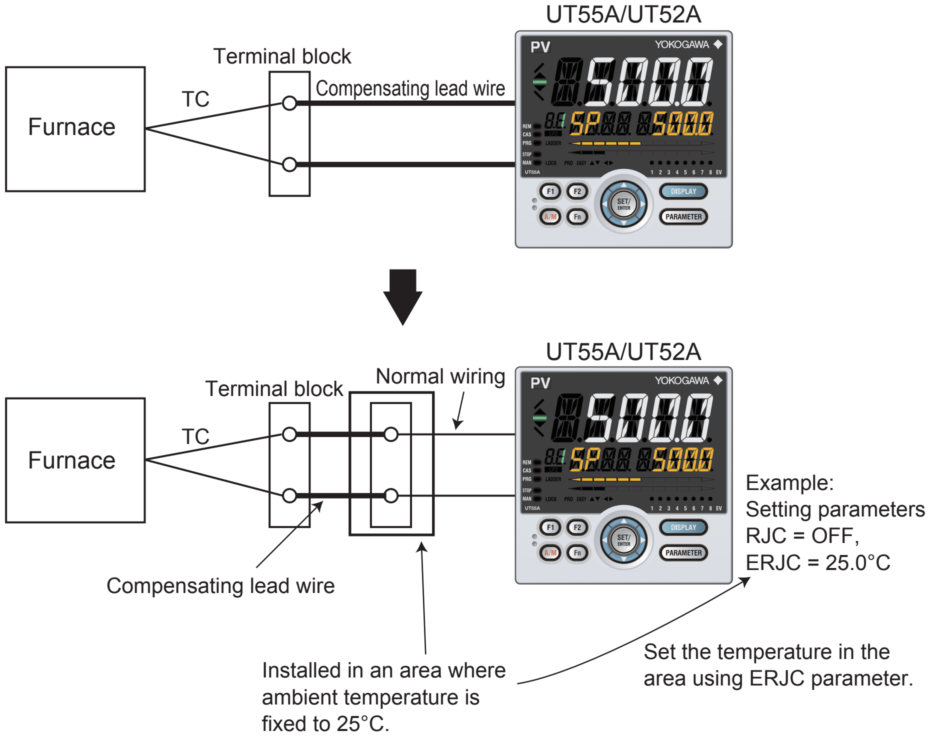
Description

Reference Junction Compensation (RJC)

When TC input is selected, presence/absence of input reference junction compensation can be set.
Usually input values are compensated with the RJC function provided for the controller. However, if it is necessary to rigorously compensate the values with a device other than the function of the controller, for example with a zero-compensator, the RJC function of the controller can be turned off.

External Reference Junction Compensation (ERJC)

For TC input, a temperature compensation value for external device can be set.
The external RJC can be used only when RJC = OFF.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RJC	PV input reference junction compensation	PRO	OFF: RJC OFF ON: RJC ON	PV Set
	RSP remote input reference junction compensation	PRO		RSP Set
ERJC	PV input external RJC setpoint	PRO	-10.0 to 60.0°C	PV Set
	RSP remote input external RJC setpoint	PRO		RSP Set

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.
Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7 and with the optional suffix code /DR
UT52A suffix code: Type 2=1 or 2 and with the optional suffix code /DR

7.1.4 Correcting Input Value

(1) Setting Bias and Filter

Description

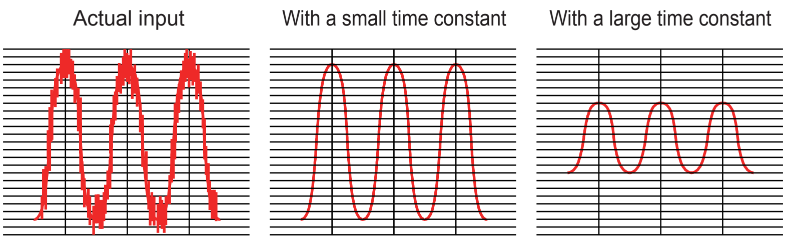
PV Input Bias

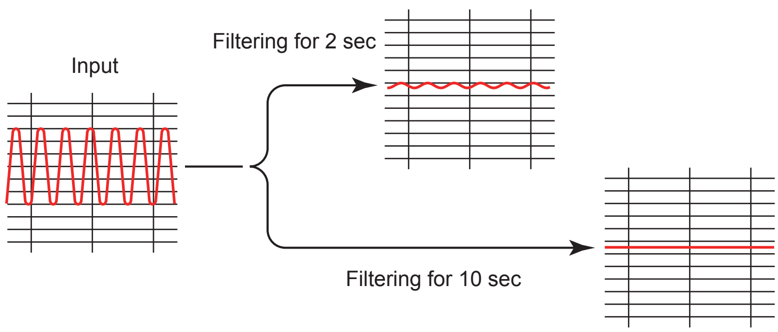
The PV input bias allows bias to be summed with input to develop a measured value for display and control use inside the controller.
This function can also be used for fine adjustment to compensate for small inter-instrument differences in measurement reading that can occur even if all are within the specified instrument accuracies.
PV input bias is used for normal operation.

PV input value	+	PV input bias	=	PV value inside the controller
Temperature sensed by thermocouple		Compensation value		Estimated material temperature

PV Input Filter

If input noise or variations cause the low-order display digits to fluctuate so that the displayed value is difficult to read, a digital filter can be inserted to smooth operation.
This filter provides a first-order lag calculation, which can remove more noise the larger the time constant becomes. However, an excessively large time constant will distort the waveform.
PV input filter is used for normal operation.





Analog Input Bias

Analog input bias is used to correct sensor-input characteristics, compensating lead wire errors, and so on.

Analog Input Filter

The analog input filter is used to remove noise from an input signal. This filter provides a first-order lag calculation, which can remove more noise the larger the time constant becomes. However, an excessively large time constant will distort the waveform.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
BS	PV input bias	EASY	-100.0 to 100.0% of PV input range span (EUS)	PVS Ope
FL	PV input filter	EASY	OFF, 1 to 120 s	

Parameter symbol	Name	Display level	Setting range	Menu symbol
A.BS	PV analog input bias	PRO	-100.0 to 100.0% of each input range span (EUS)	PV Set
	RSP analog input bias	PRO		RSP Set
	AIN2 aux. analog input bias	PRO		AIN2 Set
	AIN4 aux. analog input bias	PRO		AIN4 Set
A.FL	PV analog input filter	PRO	OFF, 1 to 120 s	PV Set
	RSP analog input filter	PRO		RSP Set
	AIN2 aux. analog input filter	PRO		AIN2 Set
	AIN4 aux. analog input filter	PRO		AIN4 Set

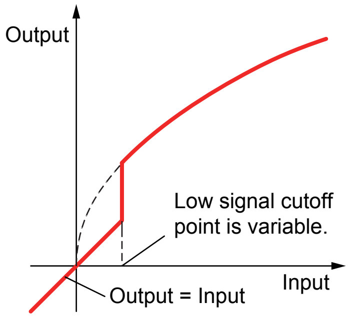
Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.
Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
UT52A suffix code: Type 2=1 or 2
AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)

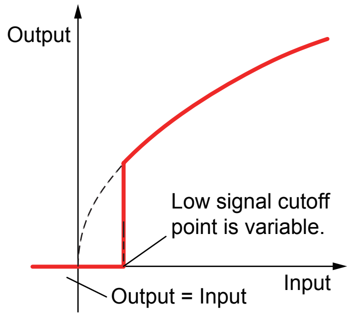
(2) Setting Square Root Extraction and Low Signal Cutoff Point

Description

This calculation is used to convert, for example, a differential pressure signal from a throttling flow meter such as an orifice and nozzle into a flow-rate signal. There is no hysteresis for low signal cutoff point.



The slope equals "1" at levels below the low signal cutoff point (A.SR=1).



The slope equals "0" at levels below the low signal cutoff point (A.SR=2).

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
A.SR	PV analog input square root extraction	PRO	OFF: No square root extraction. 1: Compute the square root. (The slope equals "1.") 2: Compute the square root. (The slope equals "0.")	PV Set
	RSP analog input square root extraction	PRO		RSP Set
	AIN2 aux. analog input square root extraction	PRO		AIN2 Set
	AIN4 aux. analog input square root extraction	PRO		AIN4 Set
A.LC	PV analog input low signal cutoff	PRO	0.0 to 5.0%	PV Set
	RSP analog input low signal cutoff	PRO		RSP Set
	AIN2 aux. analog input low signal cutoff	PRO		AIN2 Set
	AIN4 aux. analog input low signal cutoff	PRO		AIN4 Set

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.
Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.
Note 3: Each parameter is displayed when the input type is voltage or current.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
UT52A suffix code: Type 2=1 or 2
AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)

(3) Setting 10-segment Linearizer

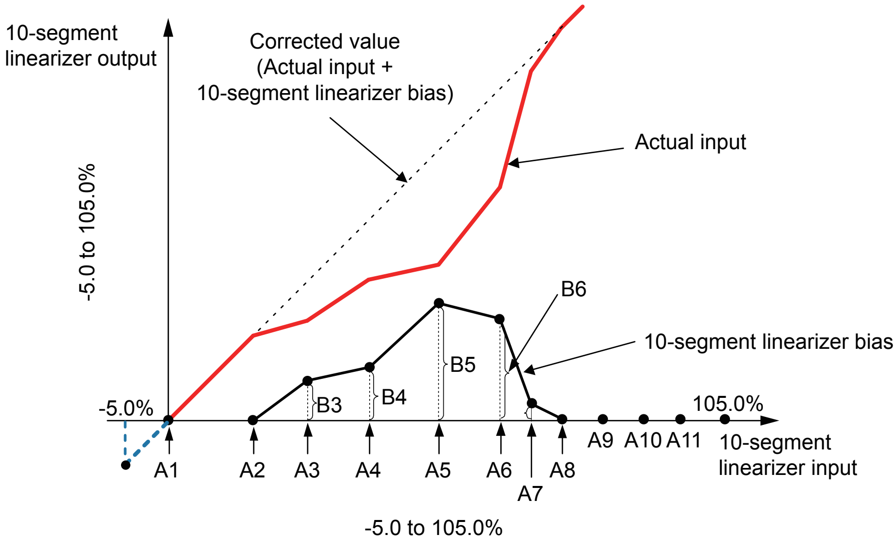
Description

A total of up to four 10-segment linearizers can be used for the input unit and output unit. For the position used by a ten-segment linearizer, see the function block diagram.

► Function block diagram: 8.1 Setting Control Mode (CTLM)
► Output Linearizer: 10.13 Setting 10-segment Linearizer for Output

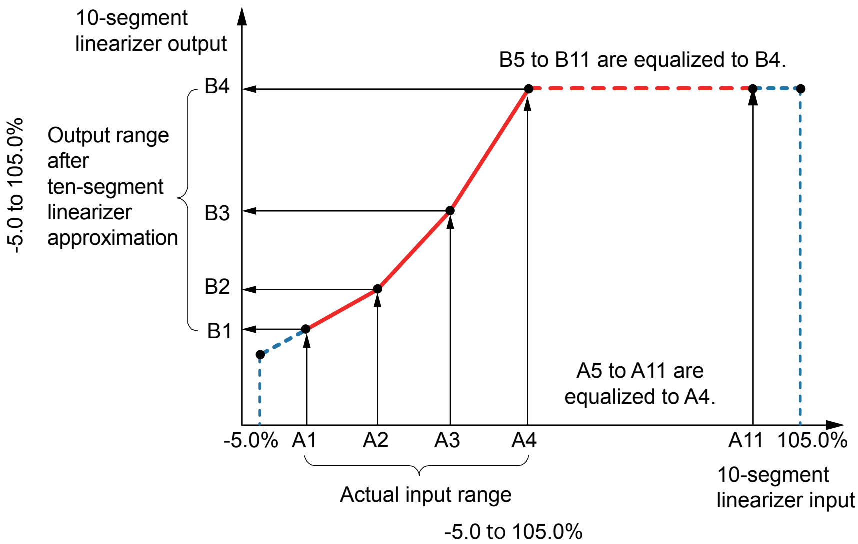
10-segment Linearizer Bias

This function is used to correct an input signal affected by sensor deterioration. The corrected values are obtained by adding the corresponding bias values to each of the 11 points of optionally set input values.
When 10-segment linearizer input is A1 or less, B1 is to be added. When 10-segment linearizer input is A11 or more, B11 is to be added.



10-segment Linearizer Approximation

This function is used when the input signal and the required measurement signal have a non-linear relationship, for example, when trying to obtain the volume from a sphere tank level. As shown in the figure below, the output values can be optionally set to 11 points of the optionally set input values.
When the 10-segment linearizer input is A1 or less, the value of extended line between B1 and B2 is output. Moreover, when the input is A11 or more, the value of extended line between B10 and B11 is output.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PYS	10-segment linearizer selection	Group 1, 2: STD Group 3, 4: PRO	OFF: Disable PV: PV analog input RSP: RSP analog input AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output	PYS1 PYS2 PYS3 PYS4 Ope
A1 to A11	10-segment linearizer input	Group 1, 2: STD Group 3, 4: PRO	-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	
B1 to B11	10-segment linearizer output	Group 1, 2: STD Group 3, 4: PRO	10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	
PMD	10-segment linearizer mode	Group 1, 2: STD Group 3, 4: PRO	0: 10-segment linearizer bias 1: 10-segment linearizer approximation	

Note1: When each parameter is displayed, the group number (1 to 4) is displayed on Group display.

Parameters are set in the following order.

(1) PYS: Specifies where the 10-segment linearizer function is used.
Setpoints PV, RSP, AIN2, and AIN4 function before the input ladder calculation section.
Setpoint PVIN functions after the input ladder calculation section.

► Where the 10-segment linearizer function is used; Function block diagrams in 8.1 Setting Control Mode (CTLM)

(2) PMD: Specifies whether to use it as a 10-segment linearizer bias or a 10-segment linearizer approximation.

(3) A1 to A11, B1 to B11: Sets the 10-segment linearizer input and 10-segment linearizer output.
For the input range and input range span, the range varies depending on where the 10-segment linearizer is used.
PV input and PV analog input: PV input range or PV input range span
RSP analog input: RSP remote input range or RSP remote input range span
AIN2 auxiliary analog input: AIN2 auxiliary analog input range or AIN2 auxiliary analog input range span
AIN4 auxiliary analog input: AIN4 auxiliary analog input range or AIN4 auxiliary analog input range span

Note

- Set the 10-segment linearizer so that it increases monotonically.
- If the same setpoint is set for the two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.

Initial value of eatch control mode

Control mode	Group-1 PYS	Goup-2 PYS	Group-3 and -4 PYS
Single-loop control	PV	OFF	OFF
Cascade primary-loop control	PV	OFF	OFF
Cascade secondary-loop control	PV	OFF	OFF
Cascade control	PV	RSP	OFF
Loop control for backup	PV	OFF	OFF
Loop control with PV switching	PV	OFF	OFF
Loop control with PV auto-selector	PVIN	OFF	OFF
Loop control with PV-hold function	PV	OFF	OFF

7.1.5 Setting Ratio bias/filter

Description

Ratio bias computing performs ratio computation and bias addition for remote setpoints.

SP = Remote input x Remote input ratio (RT) + Remote input bias (RBS)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RT	Remote input ratio	STD	0.001 to 9.999	SPS Ope
RBS	Remote input bias	STD	100.0 to 100.0% of PV input range span (EUS)	
RFL	Remote input filter	STD	OFF, 1 to 120 s	

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

7.2 Setting Input Sampling Period (Control Period)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SMP	Input sampling period (control period)	STD	50: 50 ms 100: 100 ms 200: 200 ms	CTL **Set**

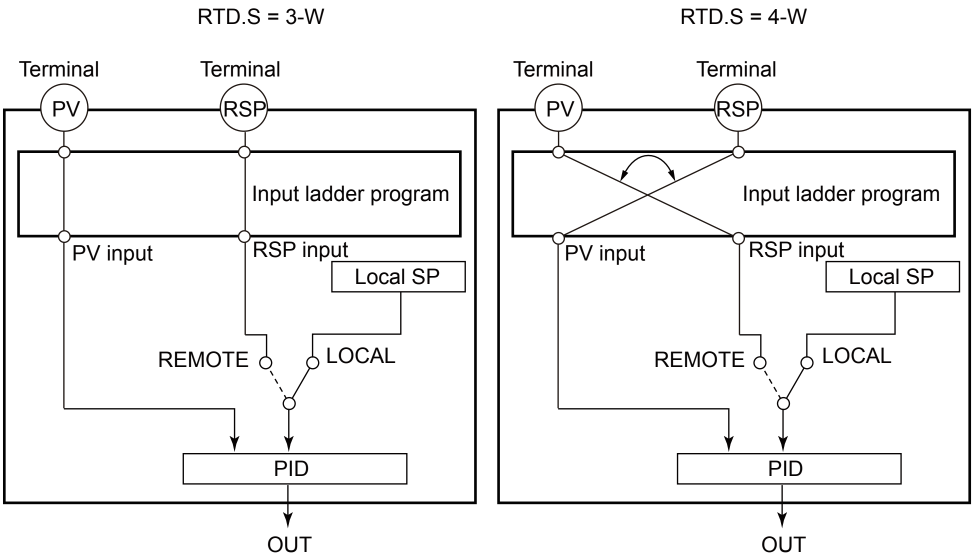
Note: 50 ms; Available when the control mode is not Cascade control (CTLM≠CAS) and the following functions are not used: "SUPER" function, "SUPER 2" function.

7.3 Using 4-wire RTD as PV Input

Description

To use the 4-wire RTD, the optional suffix code /DR is required for remote input (UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2).

Normally, PV terminal input is used as PV.
When RSP terminal is used as PV, use the ladder program of LL50A Parameter Setting Software (sold separately) to switch the functions of the PV terminal and RSP terminal.
► LL50A Parameter Setting Software: LL50A Parameter Setting Software User's Manual



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RTD.S	RTD wiring system	STD	3-W: 3-wire system 4-W: 4-wire system	RSP **Set**

7.4 Using Larger, Smaller, Average, or Difference of Two to Four Inputs as PV

Description

Loop control with PV auto-selector function automatically selects or calculates the larger, smaller, average, or difference of multiple (two to four) inputs and uses the result as PV.

The larger, smaller, and average are automatically computed based on the specified number of inputs.
For the input difference, the difference between input 1 and input 2 is computed.

Input 1: PV terminal input
Input 2: RSP terminal input
Input 3: AIN2 auxiliary analog input (for UT55A only)
Input 4: AIN4 auxiliary analog input (for UT55A only)

► Function block diagram for Loop control with PV auto-selector; 8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector

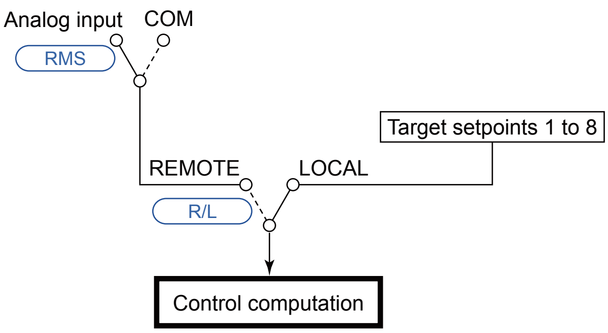
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PV.AS	Input computation selection	STD	0: Max. value 1: Min. value 2: Ave. value 3: Input 1 - Input 2 4: Input 2 - Input 1	MPV **Set**
PV.NU	Number of inputs	STD	2: Use Input 1 and Input 2 3: Use Input 1, Input 2, and Input 3 4: Use 4 inputs	

7.5 Setting Remote Input Method

Description

There are two methods for remote input: analog input and communication.
Decide which to use among two methods in advance.
Analog input: Remote setting using external analog signal (RSP terminal)
Communication: Remote setting via external communication.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RMS	Remote input method	STD	RSP: Via remote (auxiliary analog) input COM: Via communication	SPS **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

RSP is not displayed when the remote (auxiliary analog) input is not provided.
COM is not displayed when communication is not provided.
The parameter is not displayed when the remote (auxiliary analog) input and communication are not provided.

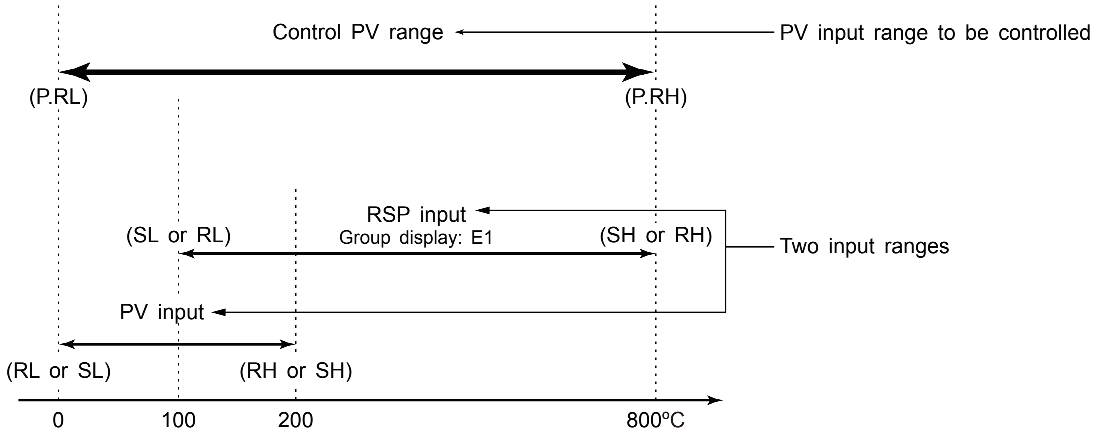
7.6 Adjusting PV Range for Loop Control with PV Switching or Loop Control with PV Auto-selector

Description

Loop control with PV switching and Loop control with PV auto-selector need to determine the PV range for control if the measurement ranges of two input signals are different.

The figure below is an example of setting PV input range of 0 to 200°C, RSP terminal input of 100 to 800°C, and control PV range of 0 to 800°C.

► Block diagram of Loop control with PV switching: 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
P.UNI	Control PV input unit	STD	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	MPV **Set**
P.DP	Control PV input decimal point position	STD	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	
P.RH	Maximum value of control PV input range	STD	-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000	
P.RL	Minimum value of control PV input range	STD		

Note1: Set the input ranges for two inputs consecutively. Set the control PV ranges (P.RL, P.RH) within the actual input range.

7.7 Setting PV Switching Methods of Loop Control with PV Switching

Description

PV switching method of Loop control with PV switching can be set when the control mode is Loop control with PV switching.

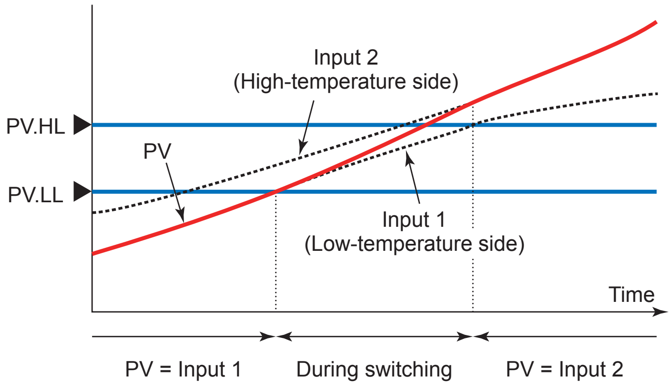
► Block diagram of Loop control with PV switching: 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching

Input 1: PV terminal input
Input 2: RSP input terminal

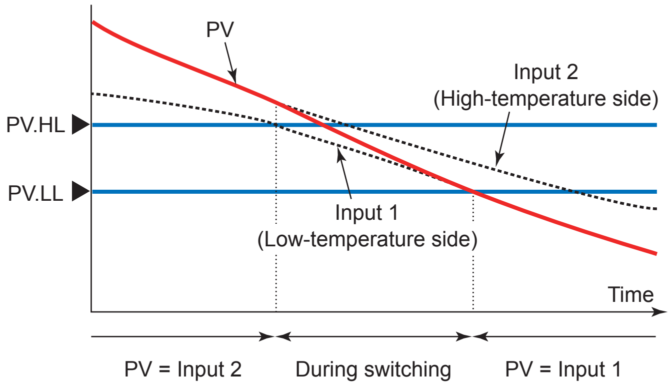
Switching within the Temperature Range (Low-temperature side) (Parameter PV.2C=0)

This method automatically switches PV within the range of input switching PV high limit and low limit.
It should be selected in case where a sudden change in PV must be avoided.

PV rising process



PV falling process



When input 1 ≤ PV.LL, **PV=Input 1**.

When PV.LL < Input 1 < PV.HL

$$\mathbf{PV} = \left(1 - \frac{\text{Input 1} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \cdot \text{Input 1} + \left(\frac{\text{Input 1} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \cdot \text{Input 2}$$

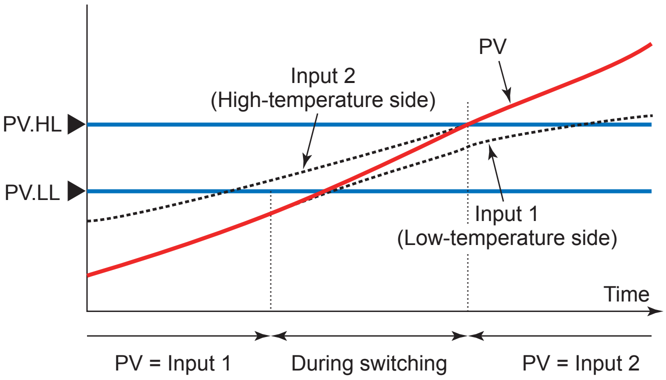
When PV.HL ≤ Input 1, **PV=Input 2**.

Switching within the Temperature Range (High-temperature side) (Parameter PV.2C=3)

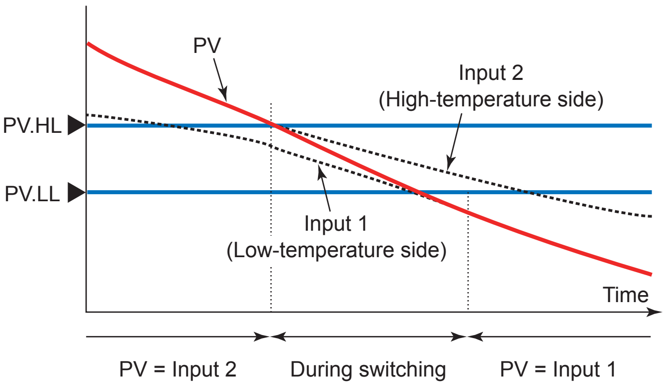
This method automatically switches PV within the range of input switching PV high limit and low limit.

It should be selected in case where a sudden change in PV must be avoided.

PV rising process



PV falling process



When input 2 ≤ PV.LL, **PV=Input 1**.

When PV.LL < Input 2 < PV.HL

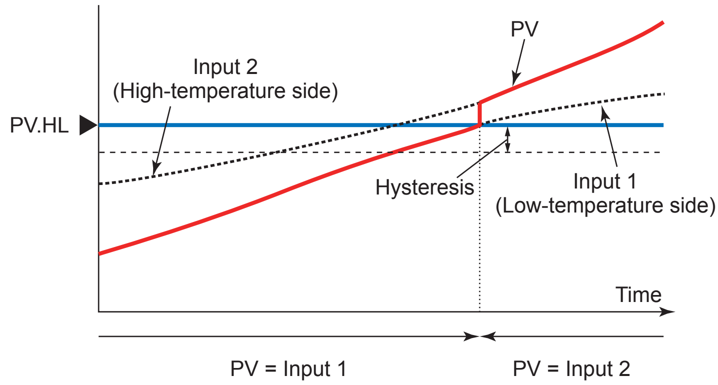
$$\mathbf{PV} = \left(1 - \frac{\text{Input 2} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \cdot \text{Input 1} + \left(\frac{\text{Input 2} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \cdot \text{Input 2}$$

When PV.HL ≤ Input 2, **PV=Input 2**.

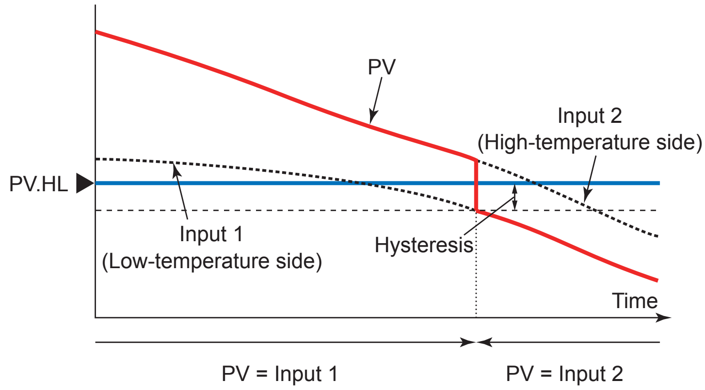
Switching at the Input Switching PV High Limit (Parameter PV.2C=1)

This method automatically switches two inputs at switching point (input switching PV high limit)
It should be selected in case where a sudden change in PV is allowed.
Control output will change smoothly (i.e., without any bumps) when PV switches.
Hysteresis (0.5% of PV range span) is provided around the switching point.

PV rising process



PV falling process

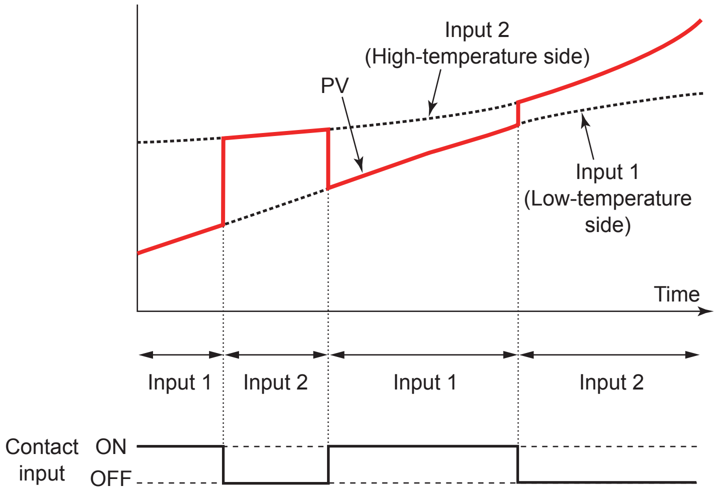


When input 1 < PV.HL – 0.5% of PV input range span, **PV=Input 1**.

When PV.HL ≤ Input 1, **PV=Input 2**.

Switching by Contact Input (Parameter PV.2C=2)

This method switches two inputs by contact input ON/OFF.
When the contact input is OFF, PV = **Input 1 (low-temperature side).**
When the contact input is ON, PV = **Input 2 (high-temperature side).**



The function is assigned to DI16 for the factory default when switched by DI.
Control output will change smoothly (i.e., without any bumps) when PV switches.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PV.2C	Input switching action (in Loop control with PV switching)	STD	0: Switch based on low limit of temperature range 1: Switch using the parameter PV.HL 2: Switch using DI 3: Switch based on high limit of temperature range	MPV Set
PV.HL	Input switching PV high limit (in Loop control with PV switching)	STD	0.0 to 100.0% of control PV input range (EU), (PV.HL>PV.LL)	
PV.LL	Input switching PV low limit (in Loop control with PV switching)	STD		

8.1 Setting Control Mode (CTLM)

8.1.1 Single-loop Control, Single-loop Heating/cooling Control, Single-loop Position Proportional Control, and Single-loop Two-position Two-level Control

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes provide the basic control function having one control computation unit.

Single-loop control can be used for Standard type or Heating/cooling type controller.
Single-loop heating/cooling control can be used for Heating/cooling type controller.
Single-loop position proportional control can be used for Position proportional type controller.
Single-loop two-position two-level control can be used for Heating/cooling type controller.

► PID control, Heating/cooling control, and Two-position two-level control: 8.2 Setting Control Type (CNT)

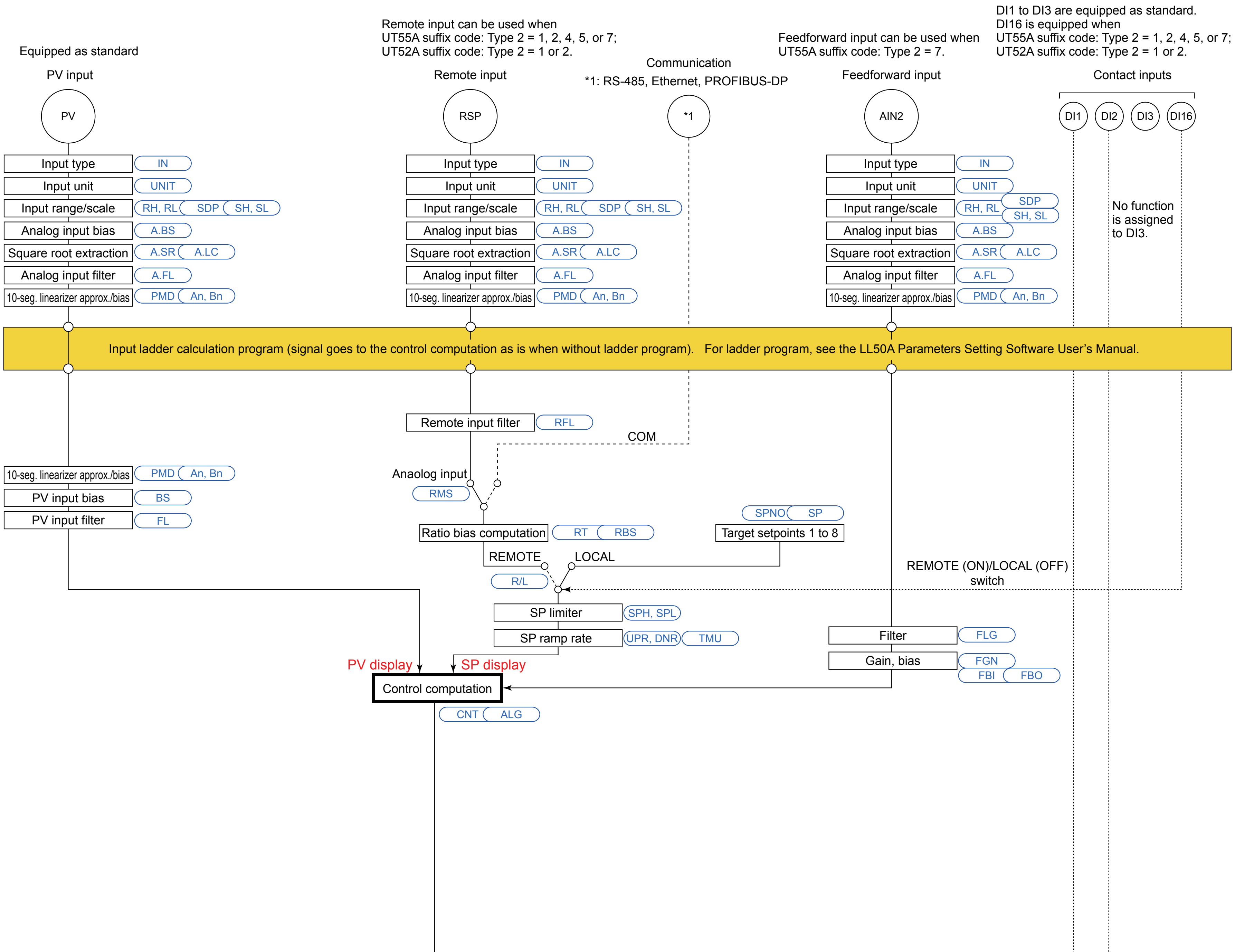
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

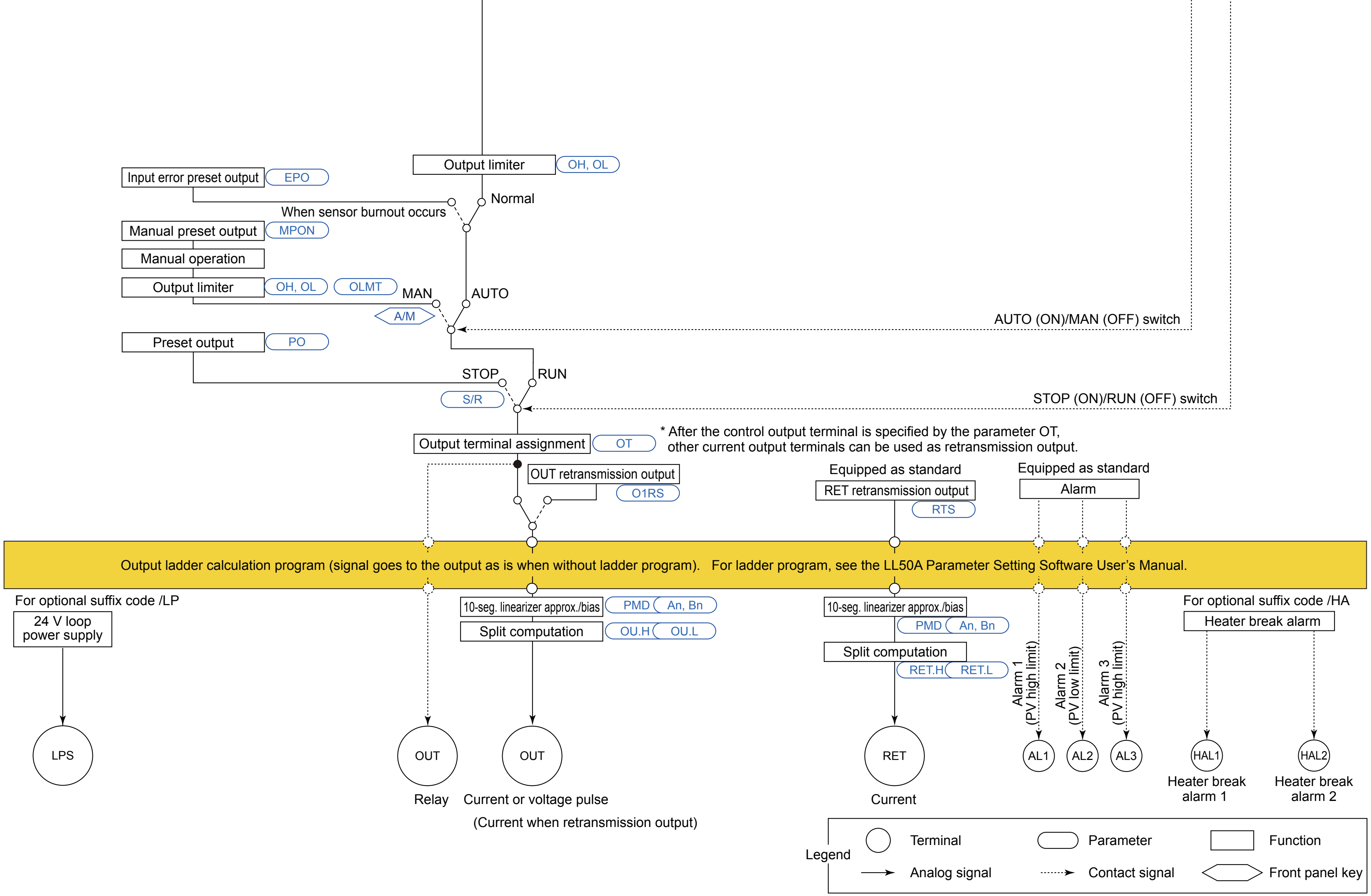
The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

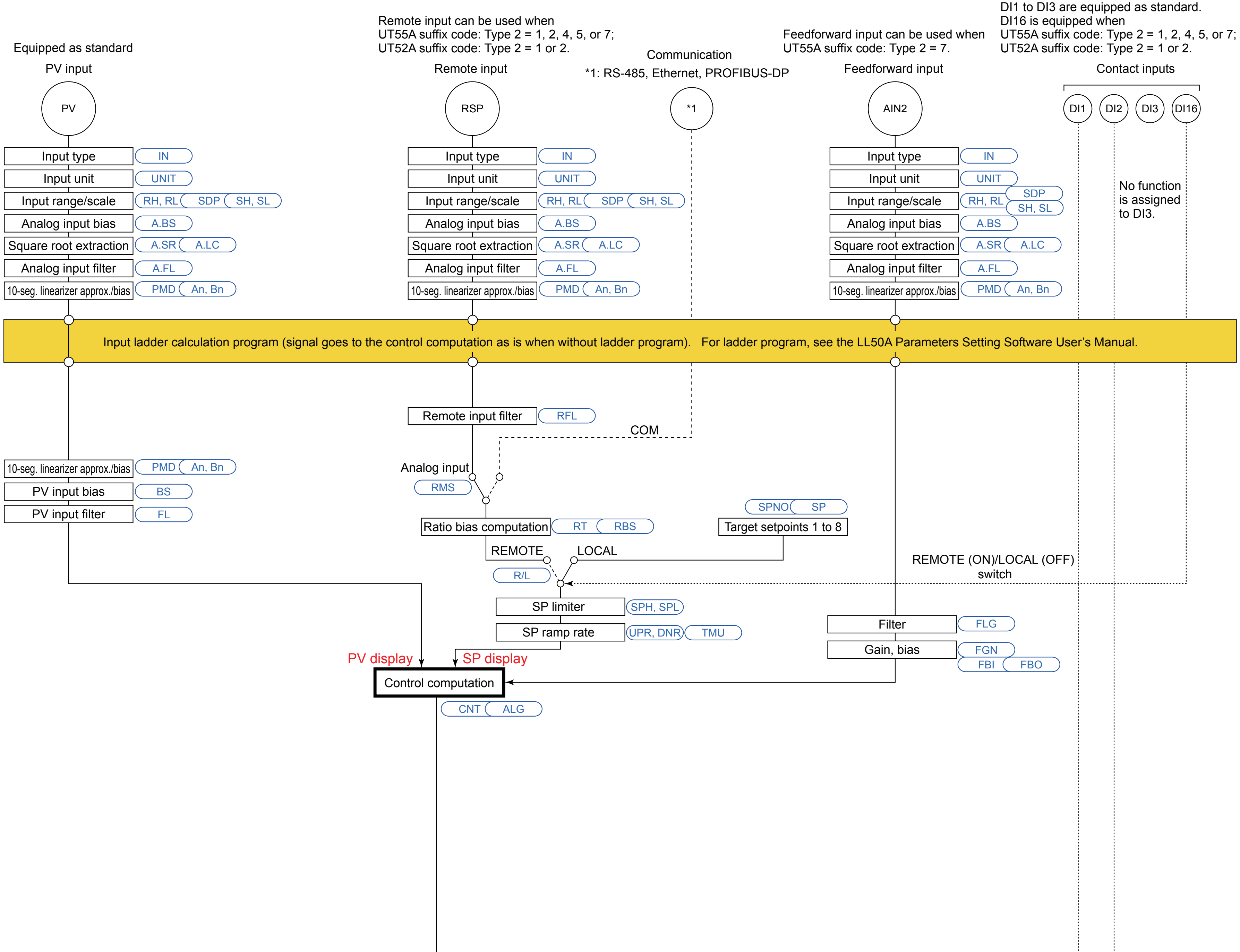
■ Single-loop Control Function Block Diagram

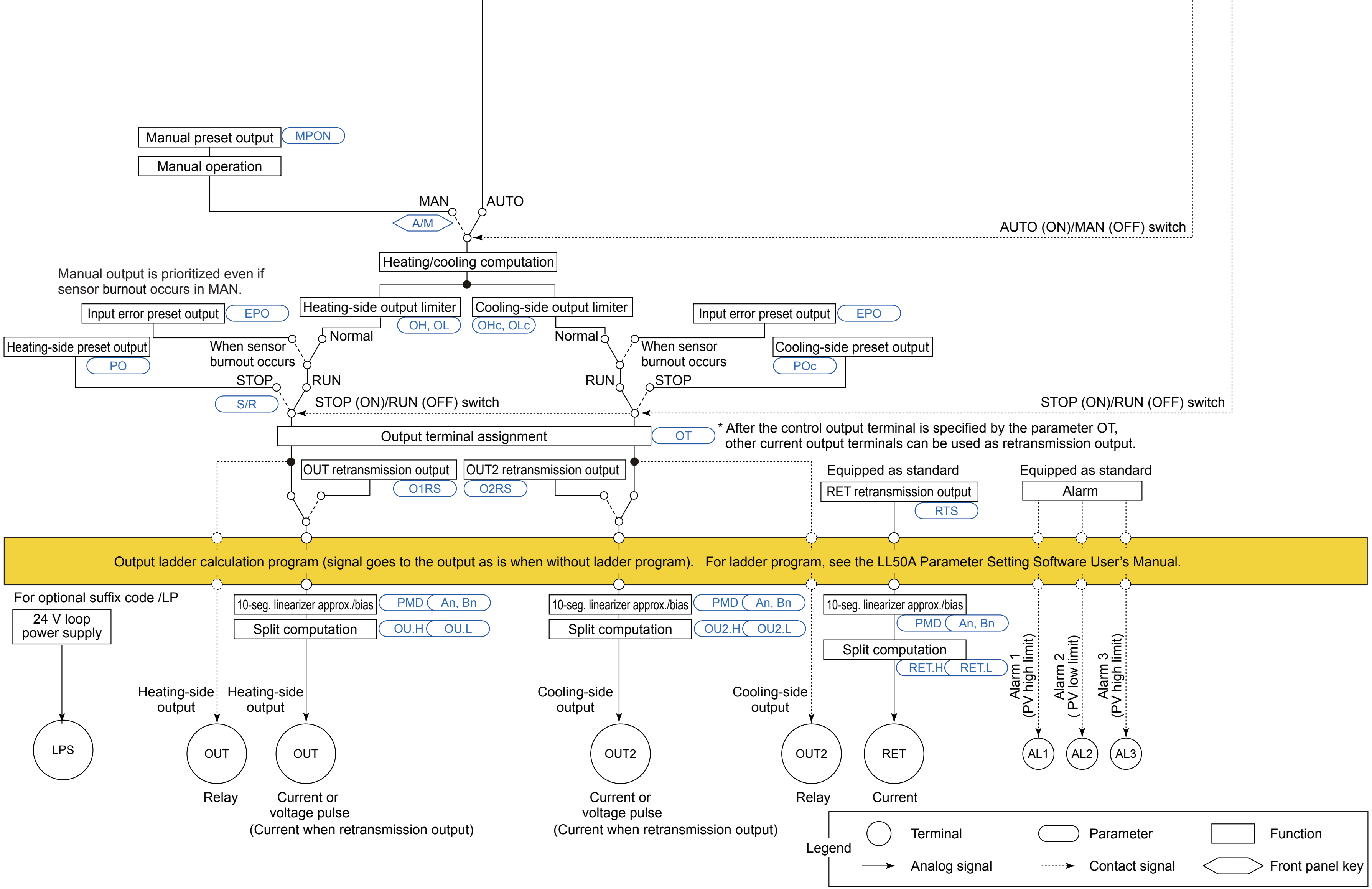




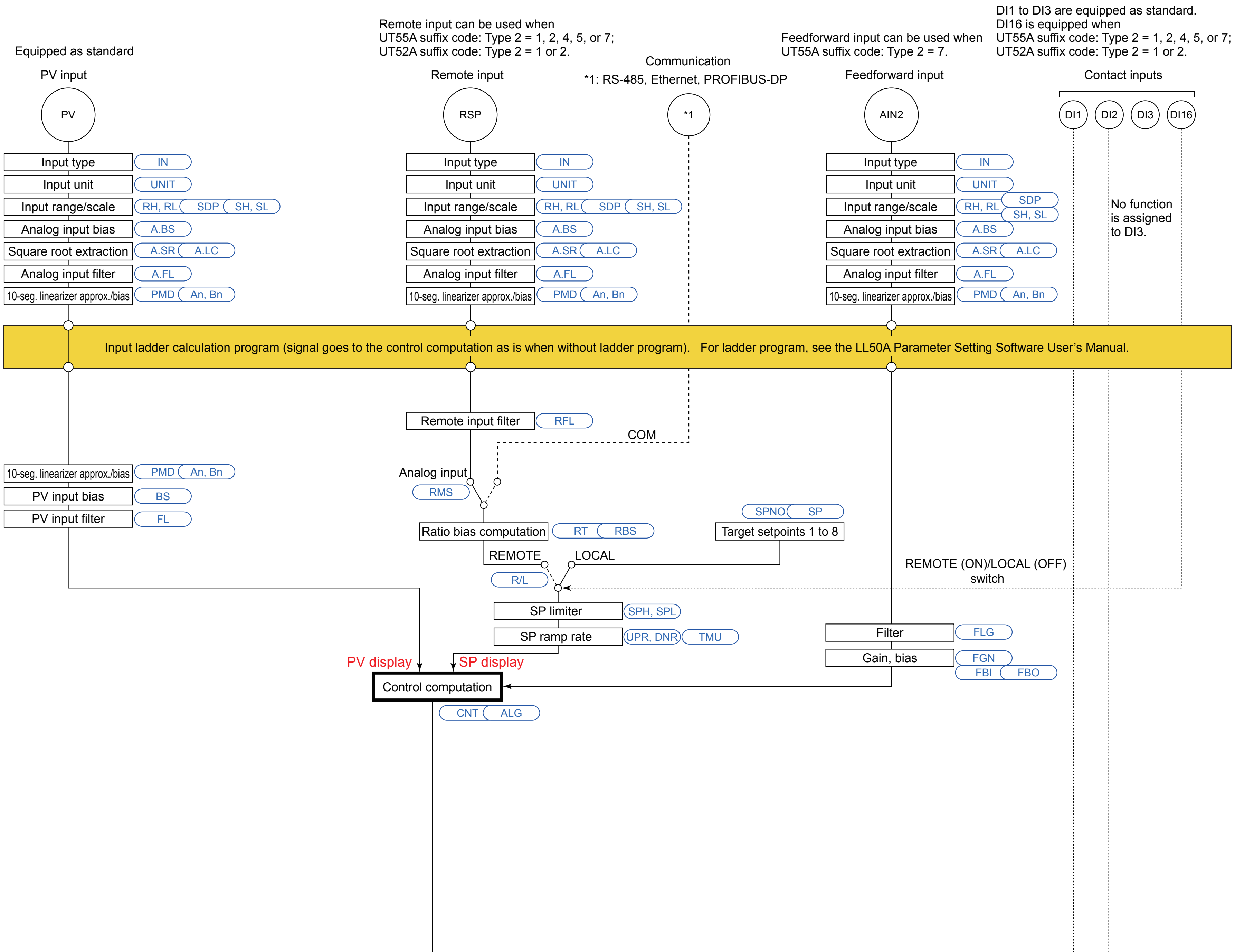
Output limiter
OH, OL
Input error preset output
EPO
Normal
When sensor burnout occurs
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT,
other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop
power supply
LPS
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Relay
OUT
Current or voltage pulse
(Current when retransmission output)
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)
AL1
AL2
AL3
For optional suffix code /HA
Heater break alarm
HAL1
HAL2
Heater break
alarm 1
Heater break
alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

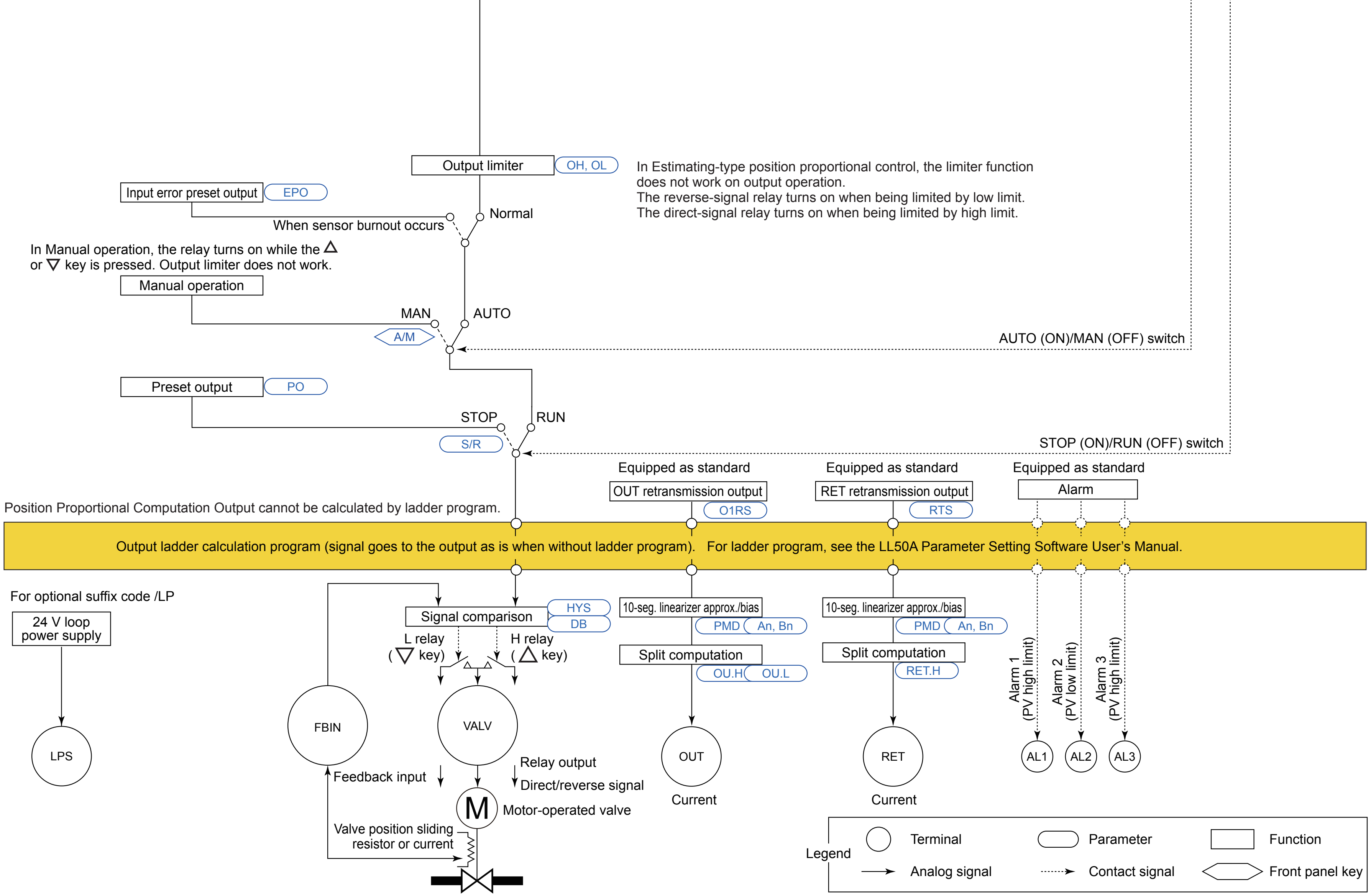
■ Single-loop Heating/cooling Control Function Block Diagram



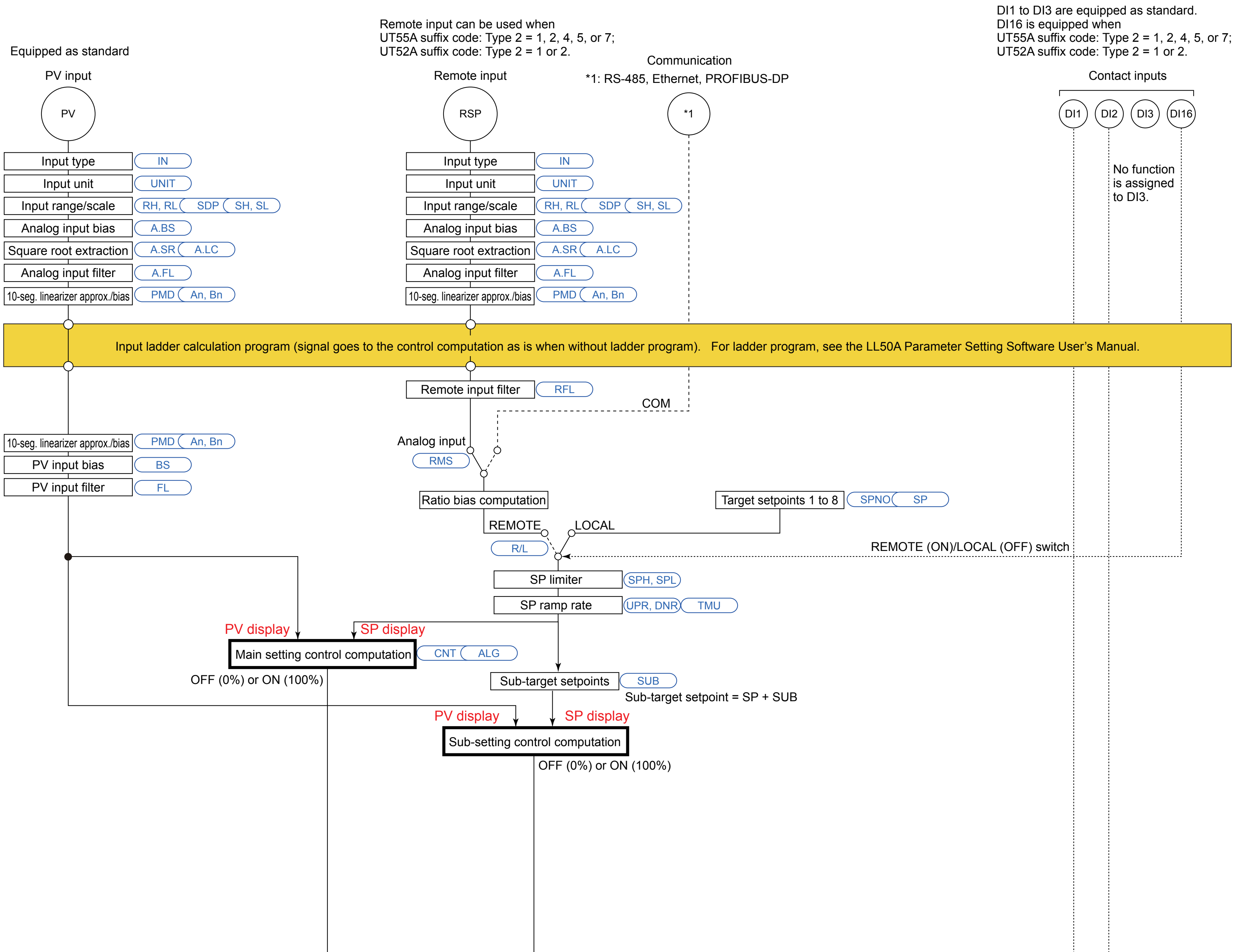

Manual preset output
MPON
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Heating/cooling computation
Manual output is prioritized even if sensor burnout occurs in MAN.
Input error preset output
EPO
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Input error preset output
EPO
Heating-side preset output
PO
Normal
When sensor burnout occurs
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Normal
When sensor burnout occurs
RUN
STOP
Cooling-side preset output
POc
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

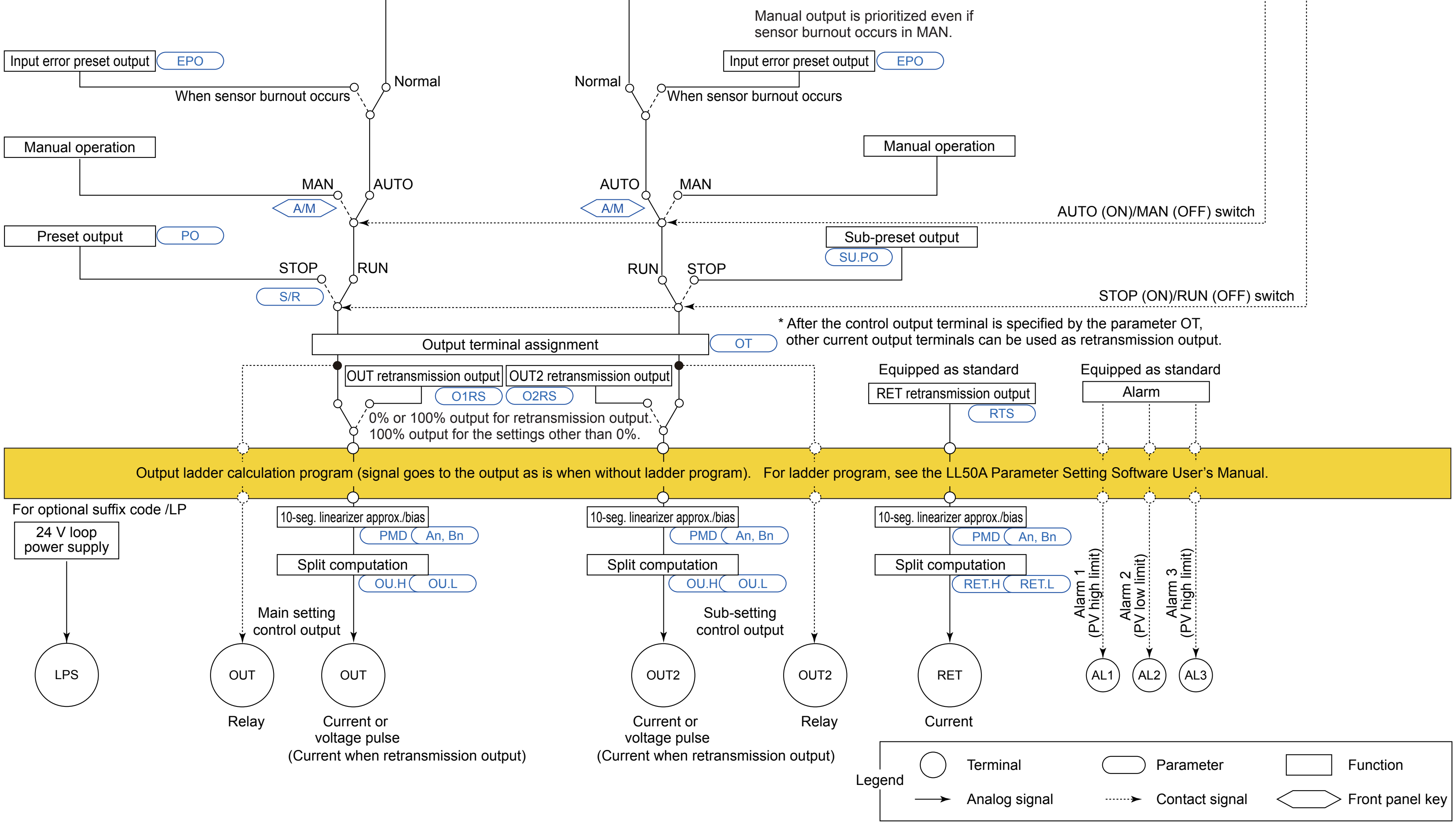
■ Single-loop Position Proportional Control Function Block Diagram




Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Input error preset output
EPO
When sensor burnout occurs
Normal
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Feedback input
Relay output
Direct/reverse signal
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Single-loop Two-position Two-level Control Function Block Diagram




Manual output is prioritized even if sensor burnout occurs in MAN.
Input error preset output
EPO
Normal
When sensor burnout occurs
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
Sub-preset output
SU.PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
OUT2 retransmission output
O1RS
O2RS
0% or 100% output for retransmission output.
100% output for the settings other than 0%.
Equipped as standard
RET retransmission output
RTS
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
RET.H
RET.L
Main setting control output
Sub-setting control output
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
LPS
OUT
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse
(Current when retransmission output)
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Intentionally blank

8.1.2 Cascade Primary-loop Control

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

Cascade primary-loop control sets up a controller as the primary-loop controller when two controllers are used for Cascade control.
It provides the output tracking function and FAIL output to the secondary-loop controller.

Cascade primary-loop control can be used for Standard type or Heating/cooling type controller.
► PID control: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

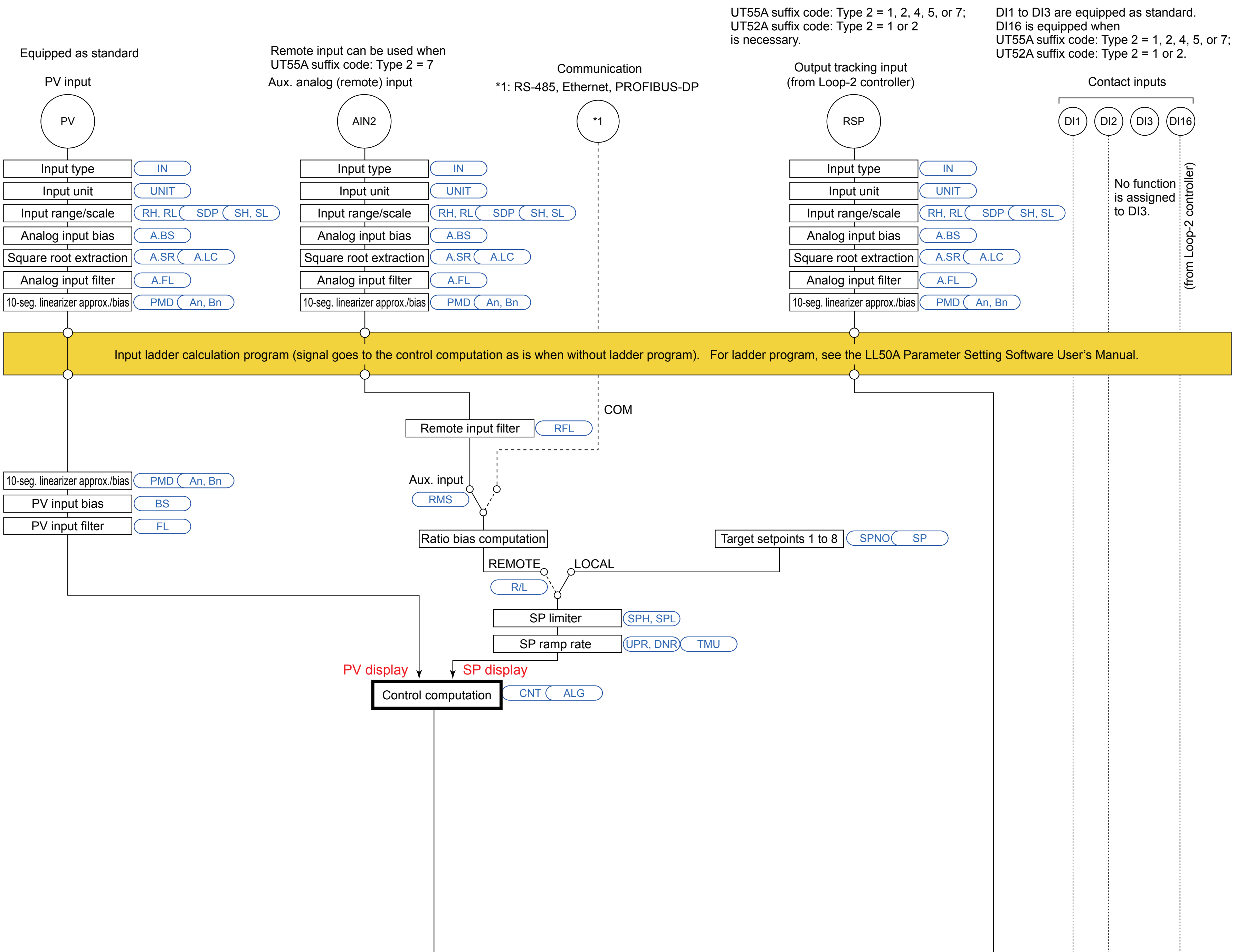
The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

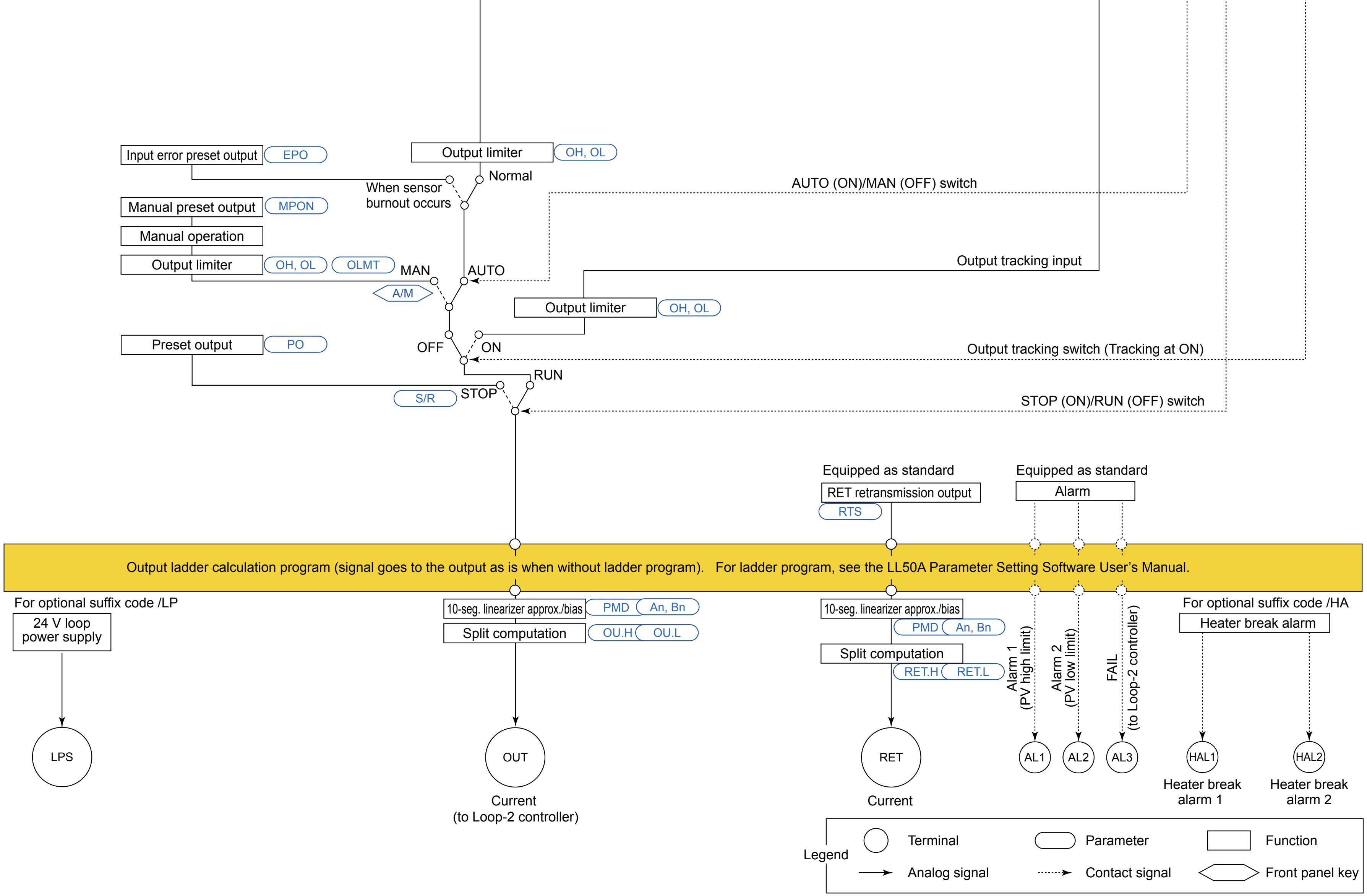
For the functions and parameters which are not described in Function block diagram, see the following.
► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

8

Control Functions

■ Cascade Primary-loop Control Function Block Diagram





Input error preset output
EPO
Output limiter
OH, OL
When sensor burnout occurs
Normal
AUTO (ON)/MAN (OFF) switch
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
Output tracking input
Output limiter
OH, OL
Preset output
PO
OFF
ON
Output tracking switch (Tracking at ON)
RUN
S/R
STOP
STOP (ON)/RUN (OFF) switch
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current (to Loop-2 controller)
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL (to Loop-2 controller)
AL1
AL2
AL3
For optional suffix code /HA
Heater break alarm
HAL1
HAL2
Heater break alarm 1
Heater break alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Intentionally blank

8.1.3 Cascade Secondary-loop Control, Cascade Secondary-loop Heating/cooling Control, and Cascade Secondary-loop Position Proportional Control

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes set up a controller as the secondary-loop controller when two controllers are used for Cascade control.
They provide the target setpoint output function and tracking signal output function to the primary-loop controller.

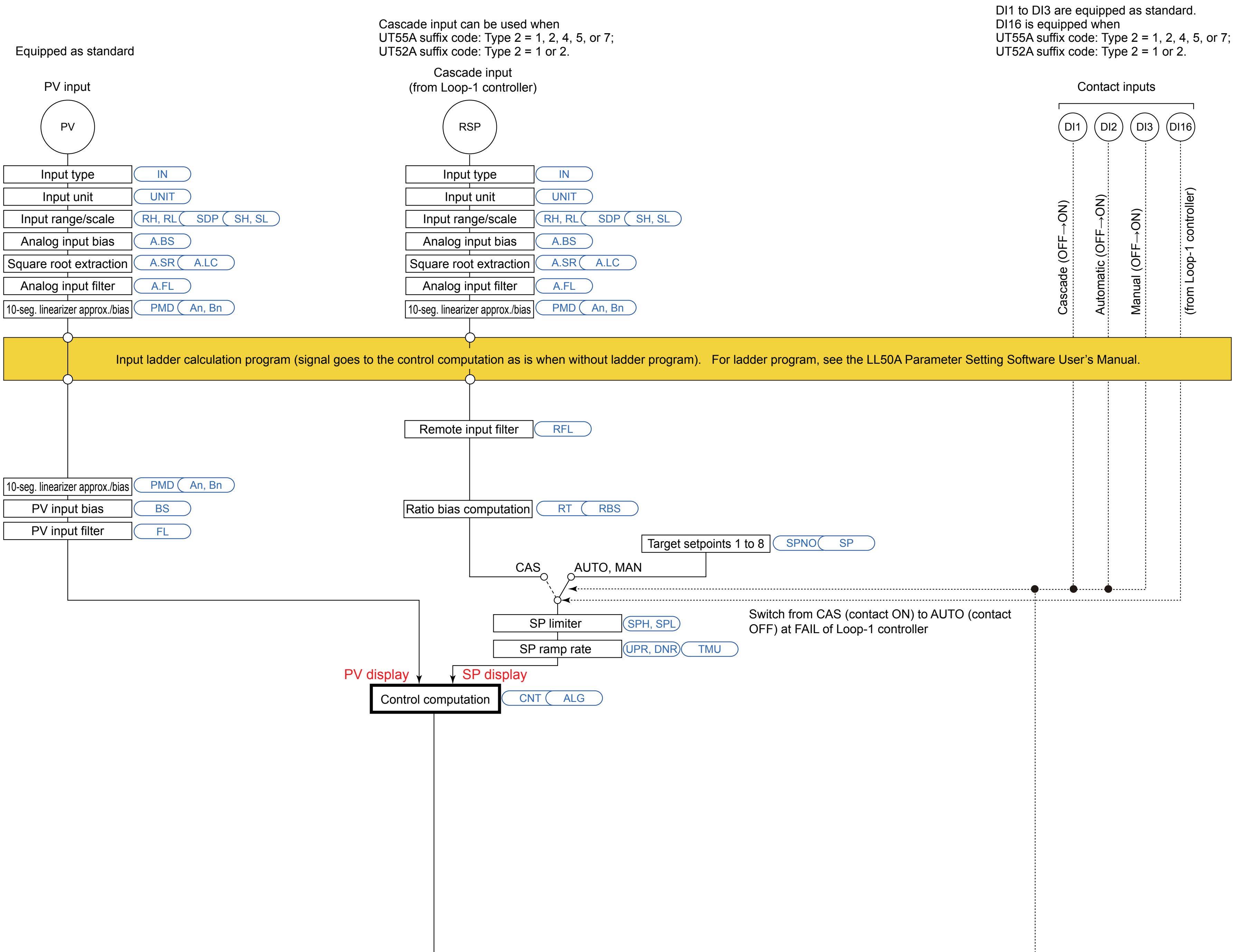
Cascade secondary-loop control can be used for Standard type or Heating/cooling type controller.
Cascade secondary-loop heating/cooling control can be used for Heating/cooling type controller.
Cascade secondary-loop position proportional control can be used for Position proportional type controller.
► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

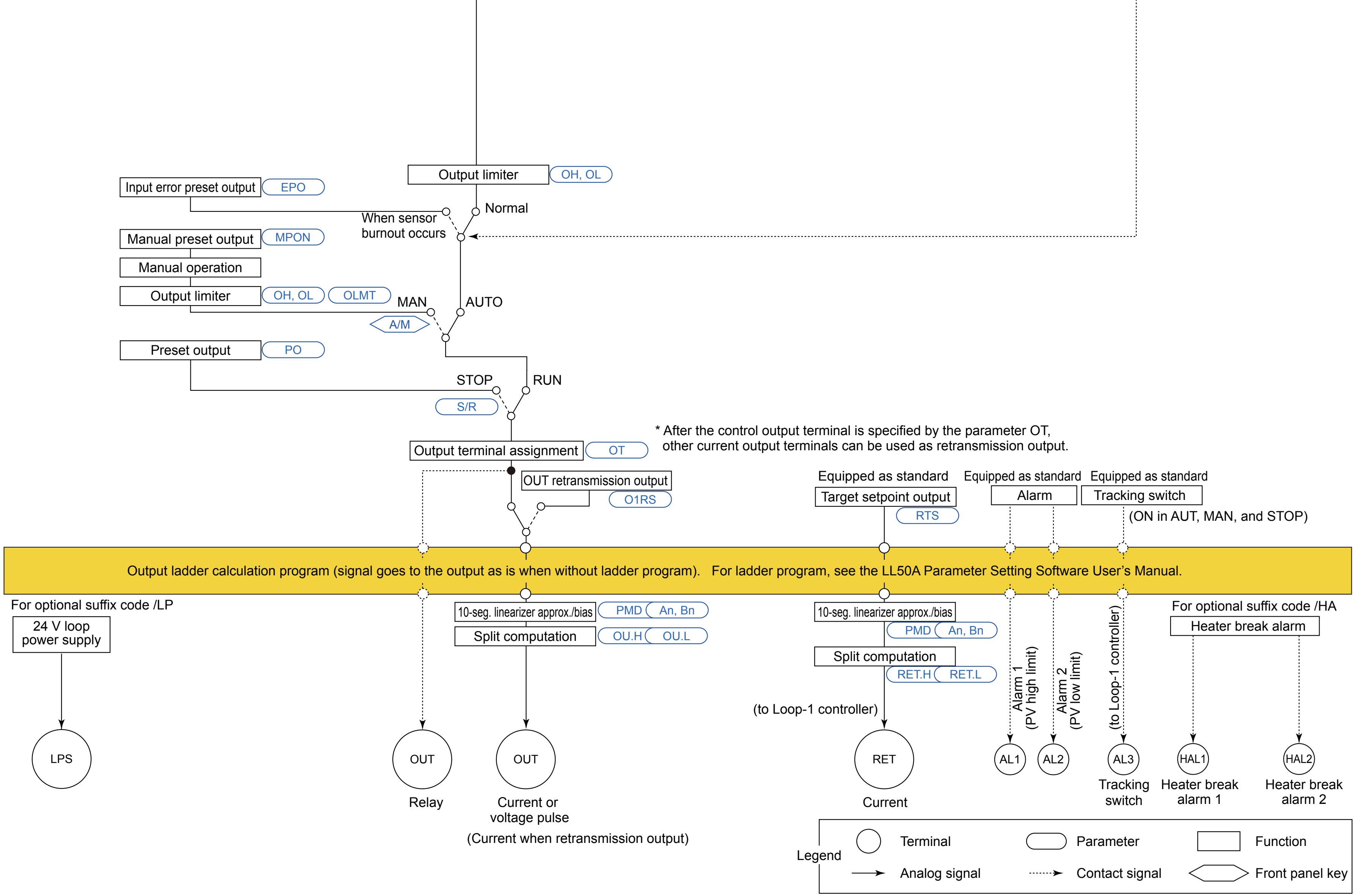
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.
► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

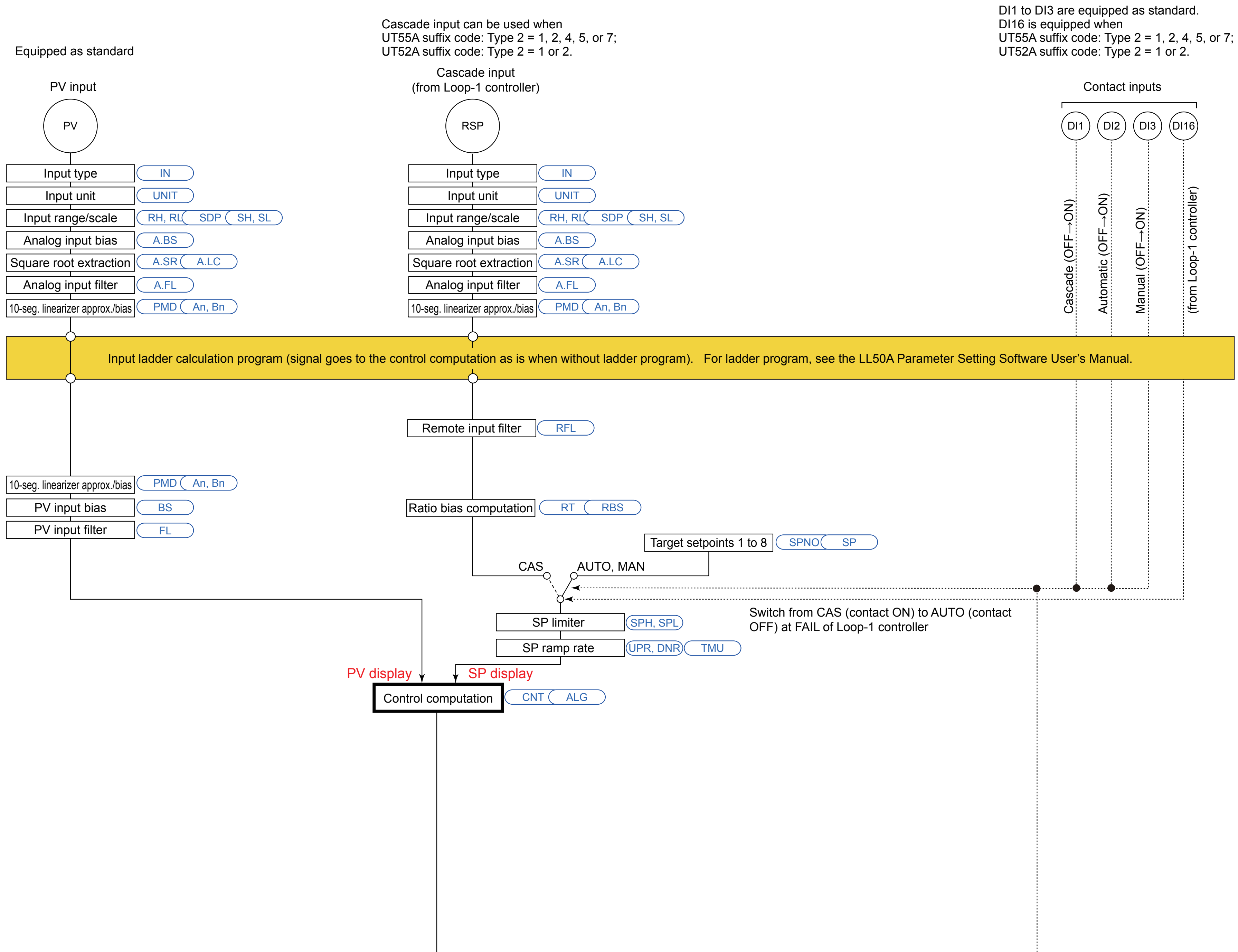
■ Cascade Secondary-loop Control Function Block Diagram

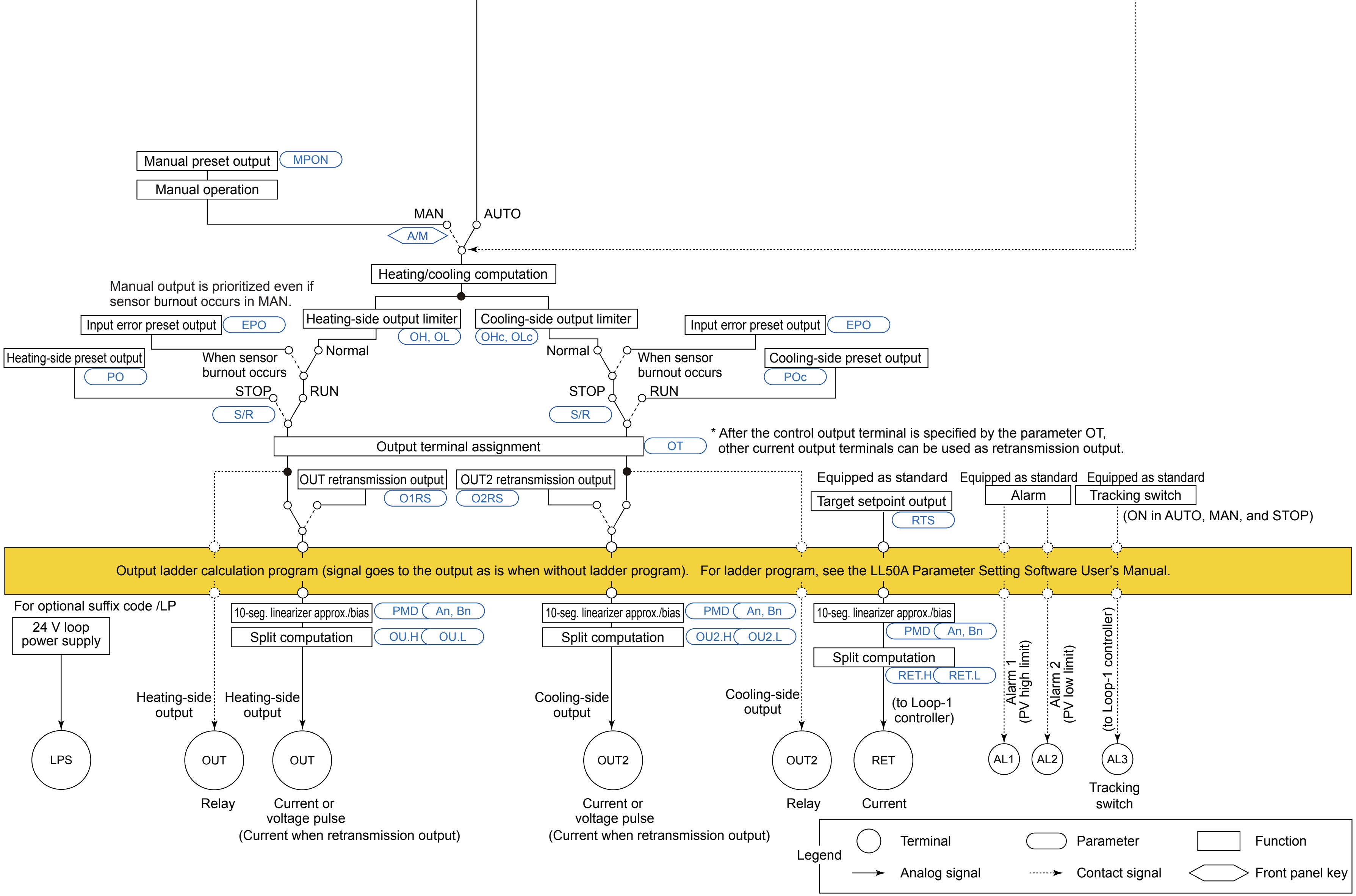




Output limiter
OH, OL
Input error preset output
EPO
Normal
When sensor burnout occurs
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
Preset output
PO
STOP
RUN
S/R
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
Output terminal assignment
OT
OUT retransmission output
O1RS
Equipped as standard
Target setpoint output
RTS
Equipped as standard
Alarm
Equipped as standard
Tracking switch
(ON in AUT, MAN, and STOP)
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
(to Loop-1 controller)
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
(to Loop-1 controller)
For optional suffix code /HA
Heater break alarm
LPS
OUT
Relay
OUT
Current or voltage pulse
(Current when retransmission output)
RET
Current
AL1
AL2
AL3
Tracking switch
HAL1
Heater break alarm 1
HAL2
Heater break alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

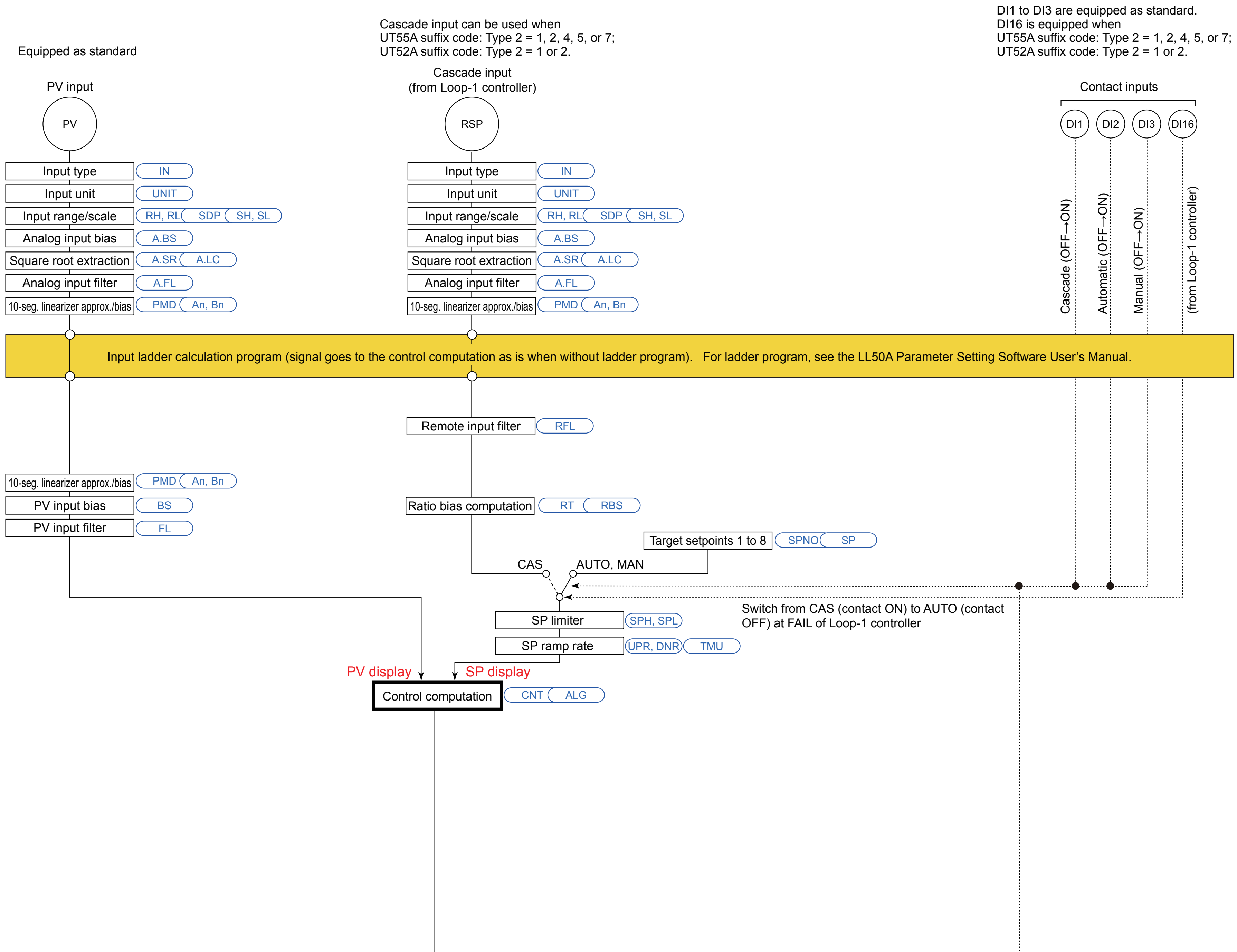
■ Cascade Secondary-loop Heating/cooling Control Function Block Diagram

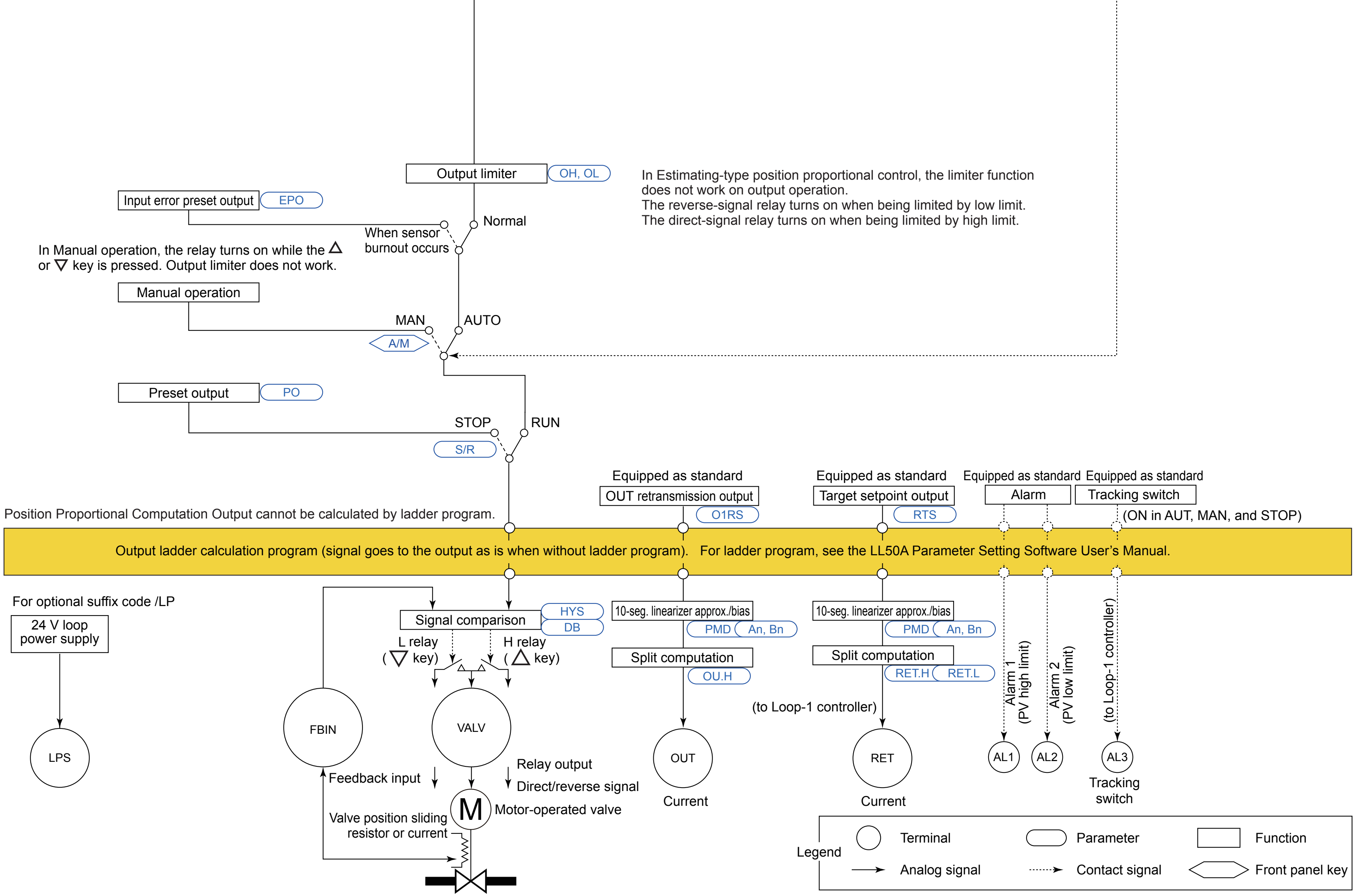




Manual preset output
MPON
Manual operation
MAN
AUTO
A/M
Heating/cooling computation
Manual output is prioritized even if sensor burnout occurs in MAN.
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Input error preset output
EPO
Input error preset output
EPO
Heating-side preset output
PO
Cooling-side preset output
POc
When sensor burnout occurs
Normal
Normal
When sensor burnout occurs
STOP
RUN
STOP
RUN
S/R
S/R
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
Target setpoint output
RTS
Equipped as standard
Alarm
Equipped as standard
Tracking switch
(ON in AUTO, MAN, and STOP)
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
(to Loop-1 controller)
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
(to Loop-1 controller)
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Tracking switch
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Cascade Secondary-loop Position Proportional Control Function Block Diagram





Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Input error preset output
EPO
Normal
When sensor burnout occurs
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
Preset output
PO
STOP
RUN
S/R
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
Target setpoint output
RTS
Equipped as standard
Alarm
Equipped as standard
Tracking switch
(ON in AUT, MAN, and STOP)
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Relay output
Direct/reverse signal
Feedback input
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
(to Loop-1 controller)
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
(to Loop-1 controller)
AL1
AL2
AL3
Tracking switch
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Intentionally blank

8.1.4 Cascade Control, Cascade Heating/cooling Control, and Cascade Position Proportional Control

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes use two control computation units and permits Cascade control using just a single controller.

Cascade control can be used for Standard type or Heating/cooling type controller.
Cascade heating/cooling control can be used for Heating/cooling type controller.
Cascade position proportional control can be used for Position proportional type controller.

► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

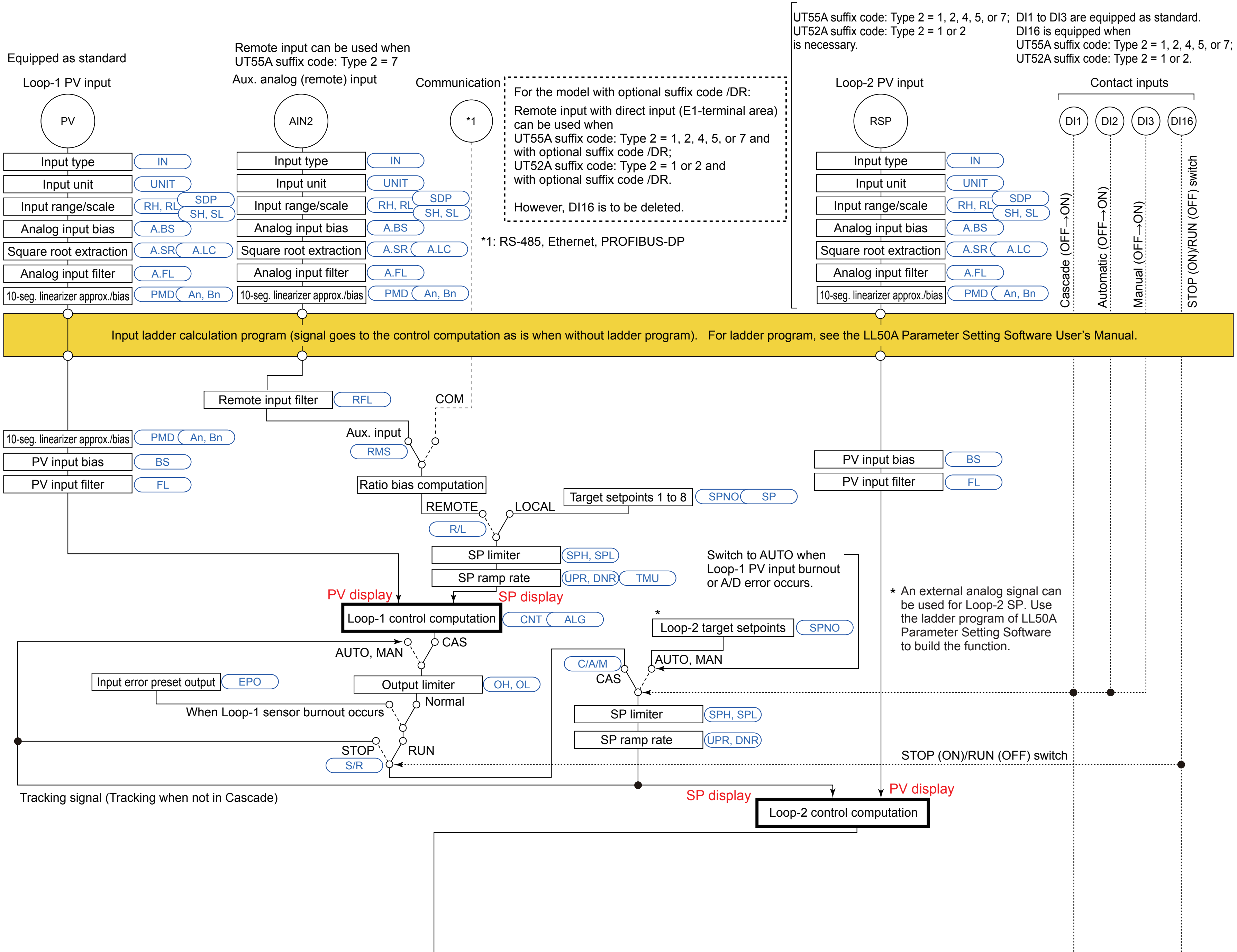
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

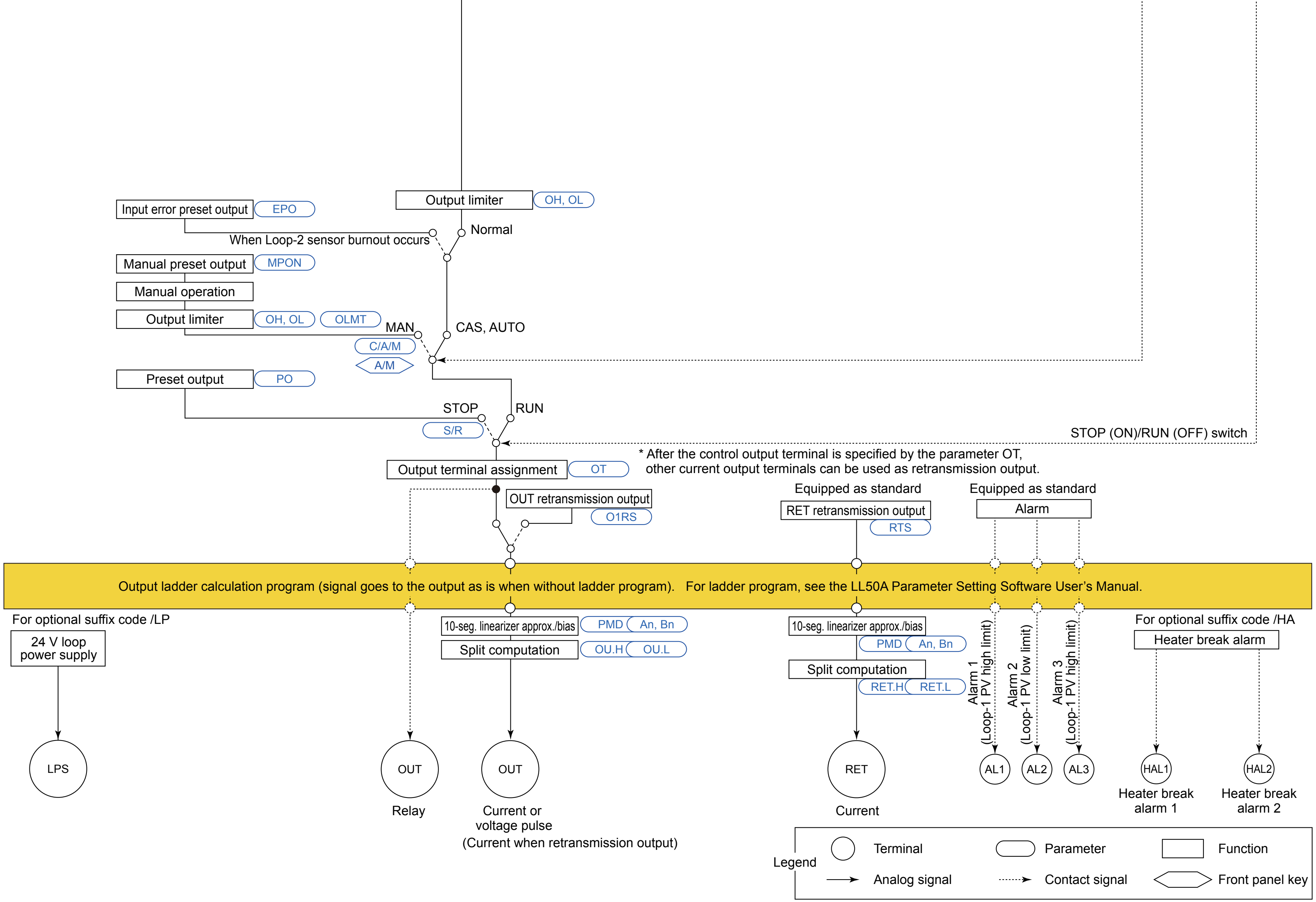
The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

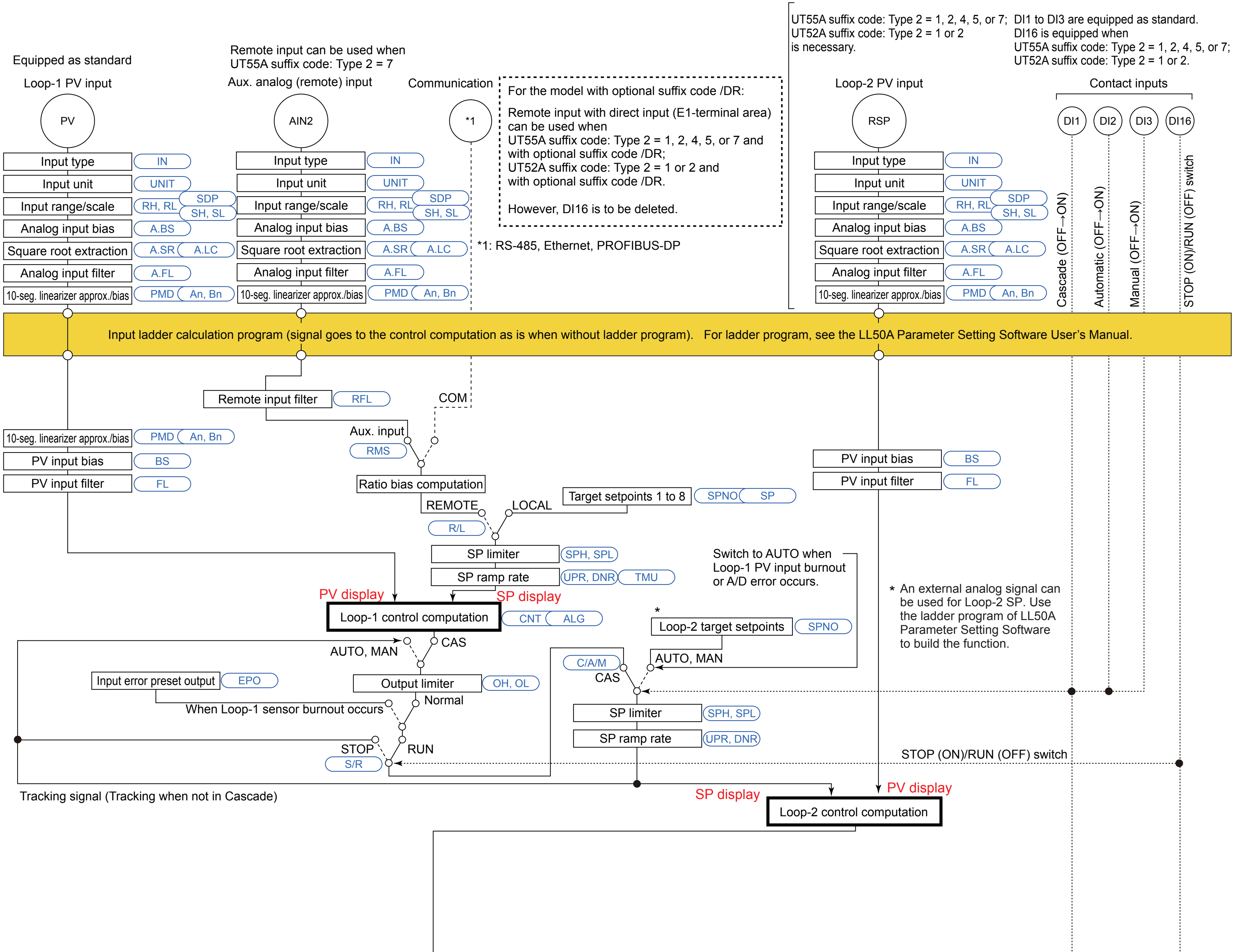
■ Cascade Control Function Block Diagram

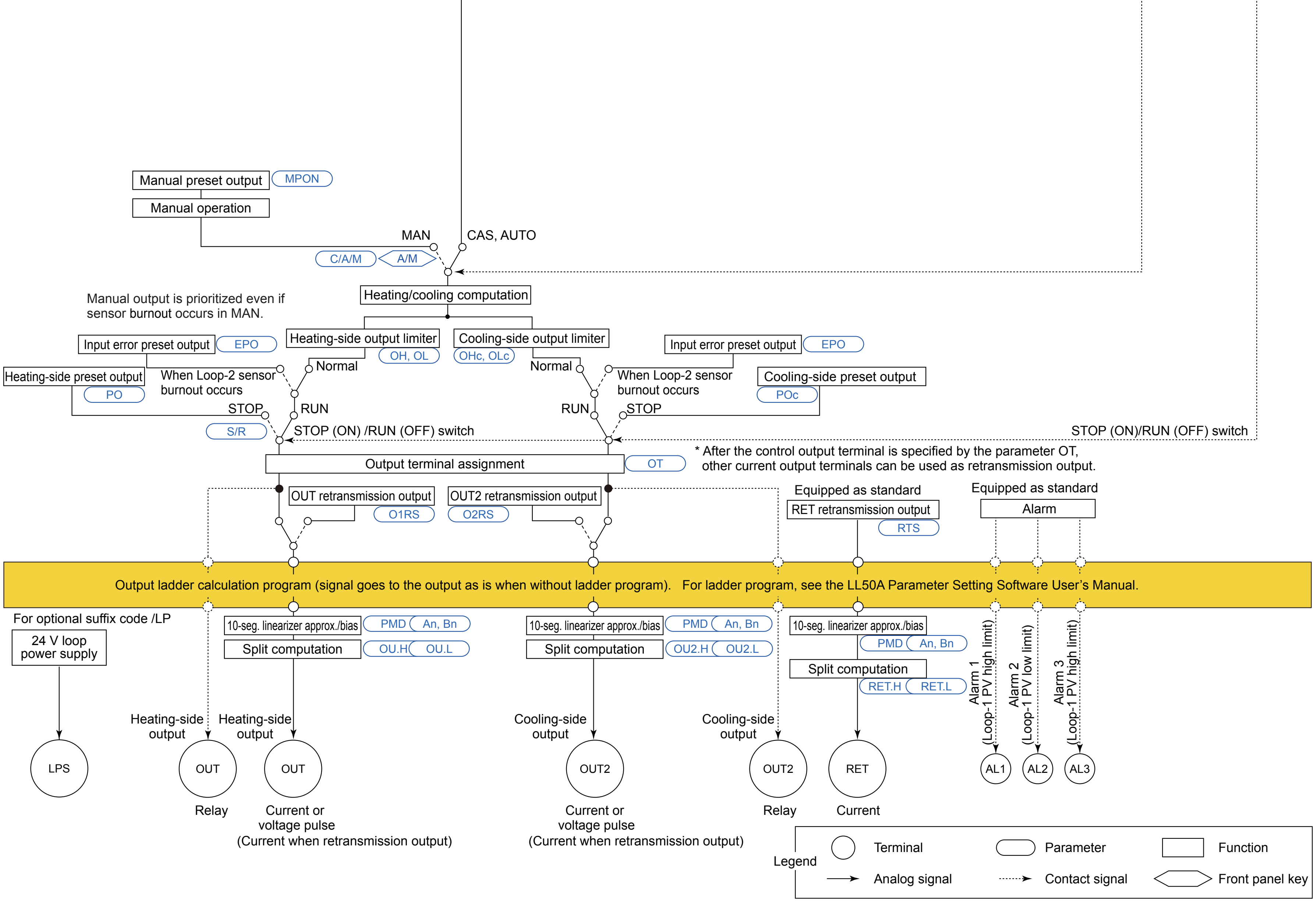




* The LP2 lamp is lit while the Loop-2 parameter is displayed.

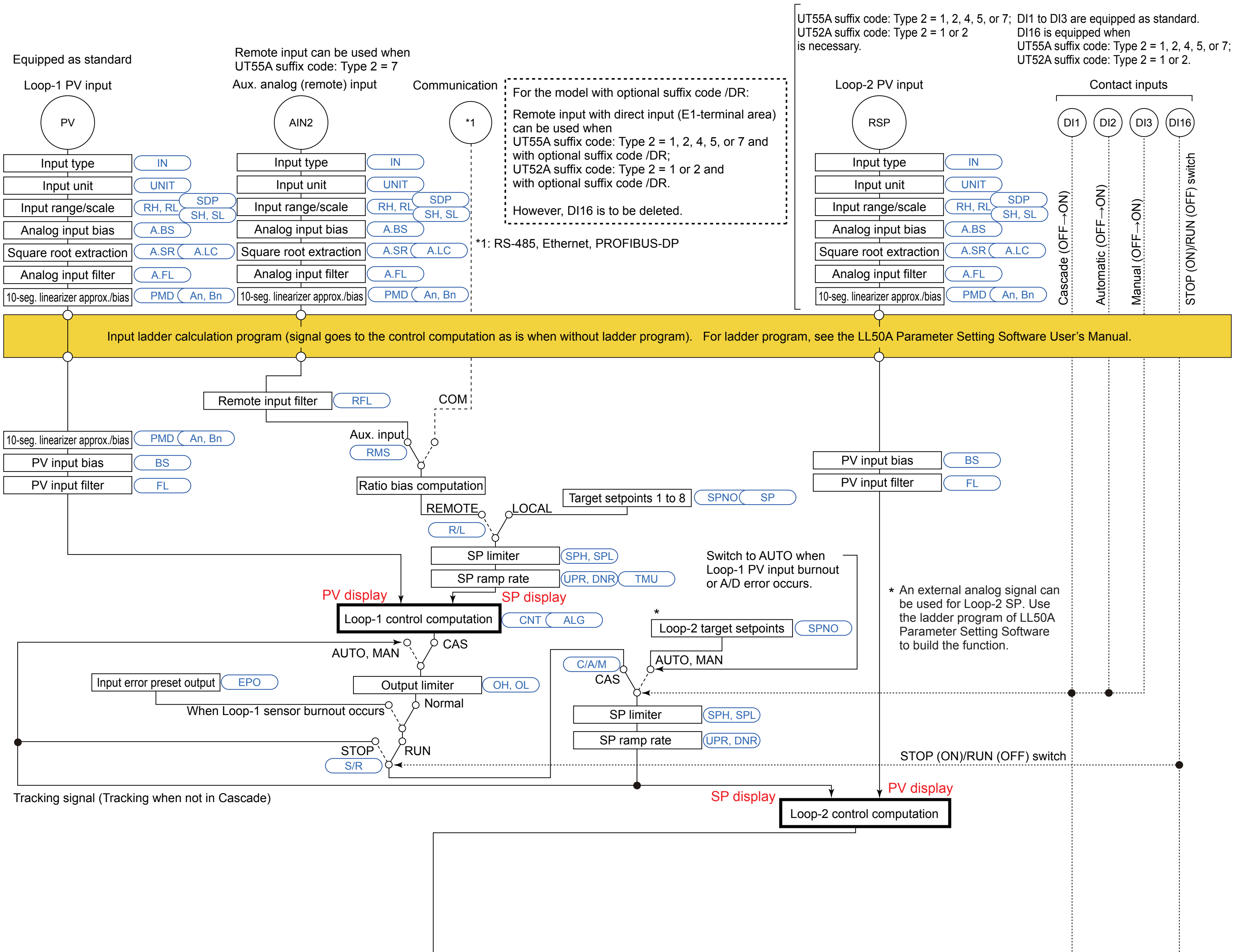
■ Cascade Heating/cooling Control Function Block Diagram

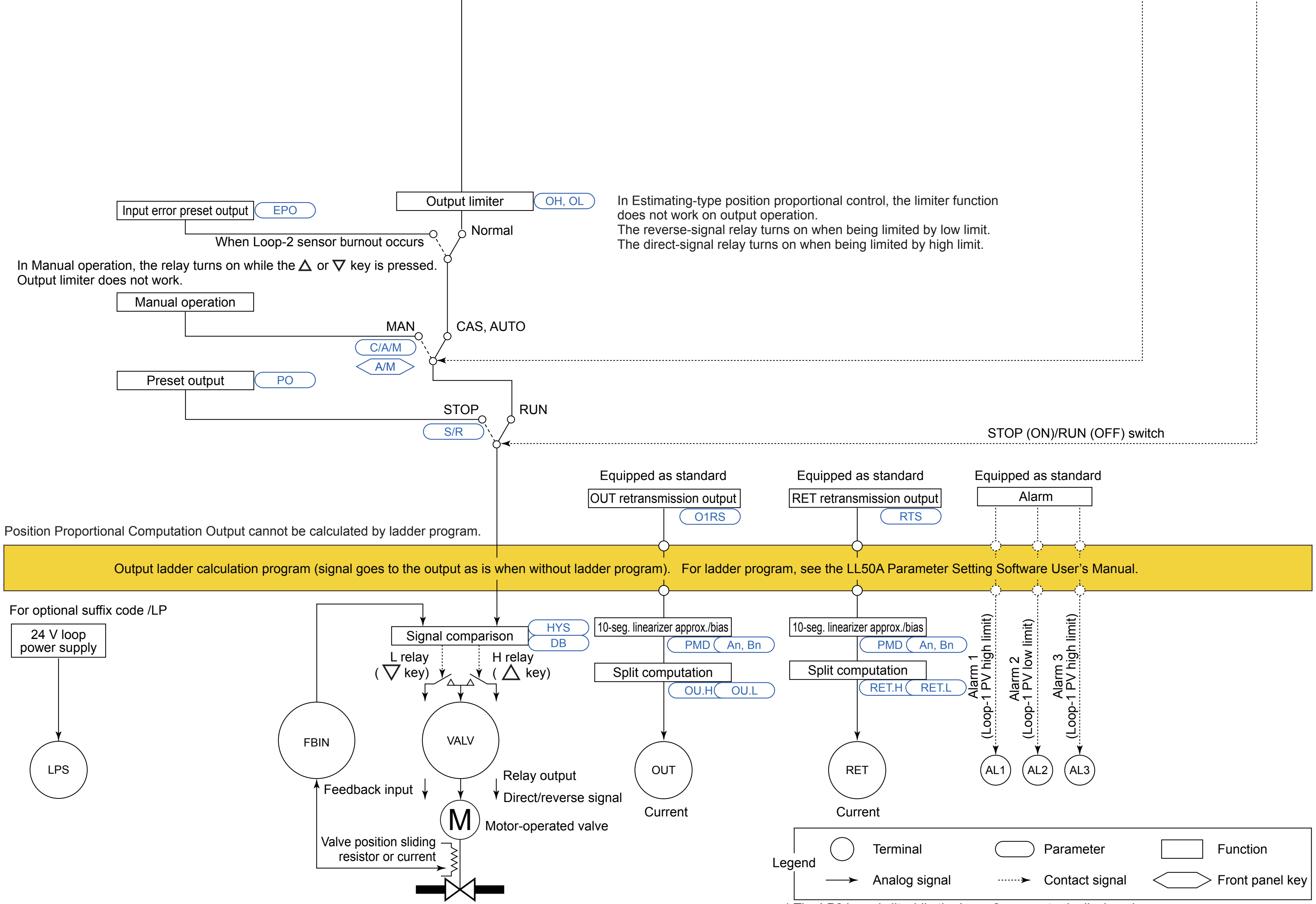




* The LP2 lamp is lit while the Loop-2 parameter is displayed.

■ Cascade Position Proportional Control Function Block Diagram





* The LP2 lamp is lit while the Loop-2 parameter is displayed.

Intentionally blank

8.1.5 Loop Control for Backup, Heating/cooling Loop Control for Backup, and Position Proportional Loop Control for Backup

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes allow control in connection with host control equipment (such as another controller or programmable controller (PLC)). If the host control equipment breaks down and the controller receives the FIAL signal, the controller performs backup control operations.

Loop control for backup can be used for Standard type or Heating/cooling type controller. Heating/cooling loop control for backup can be used for Heating/cooling type controller. Position proportional loop control for backup can be used for Position proportional type controller.

► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

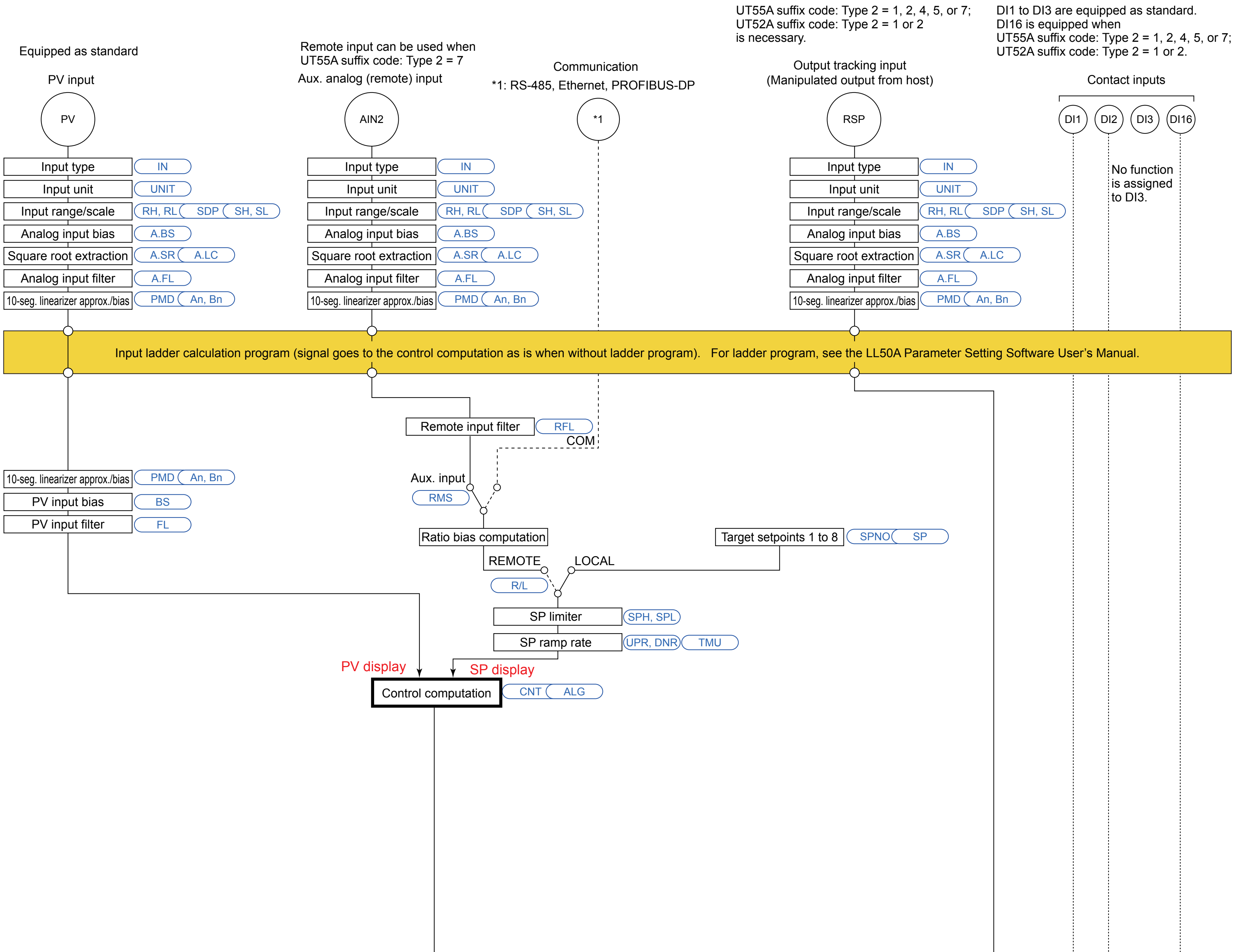
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

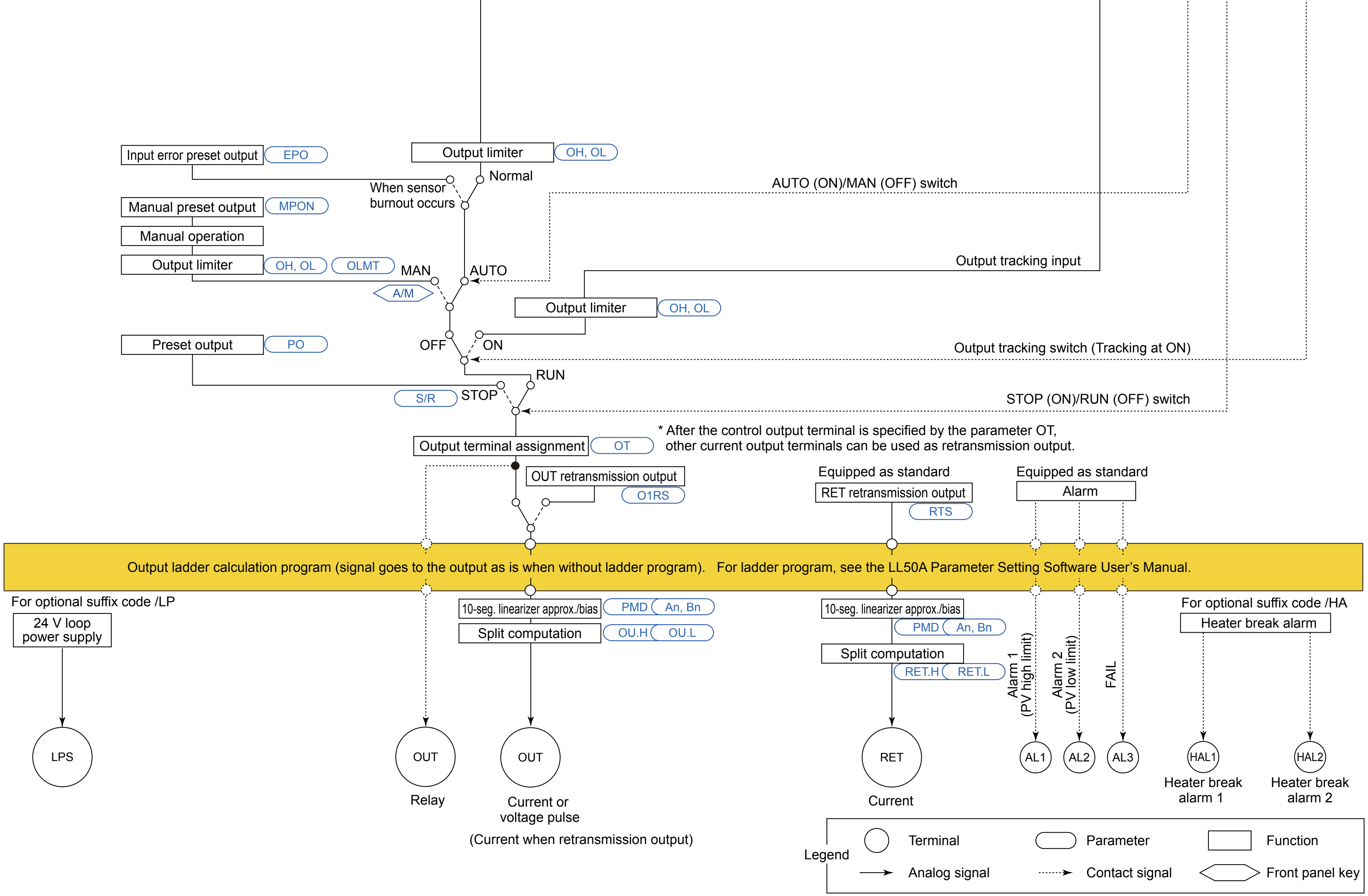
The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

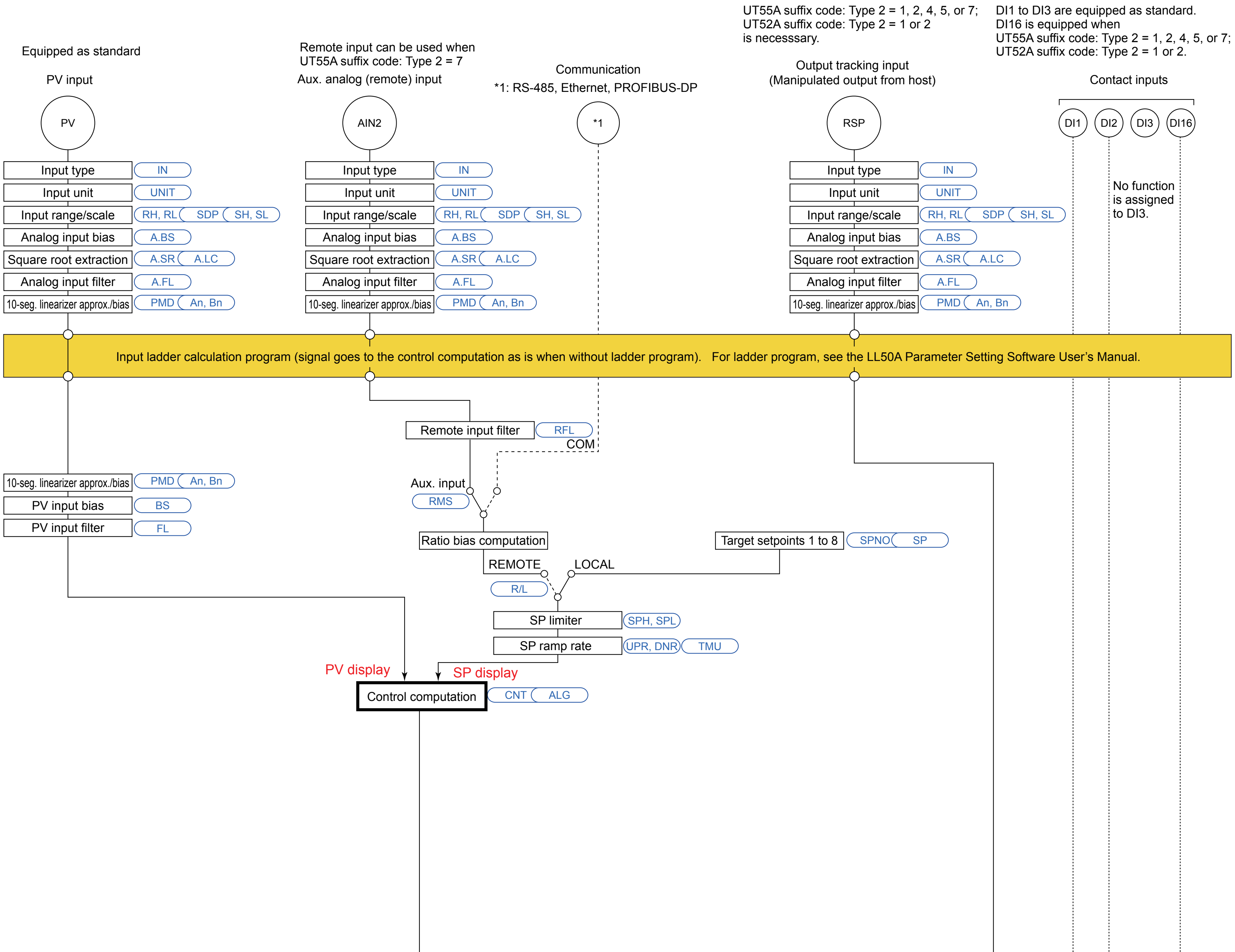
► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

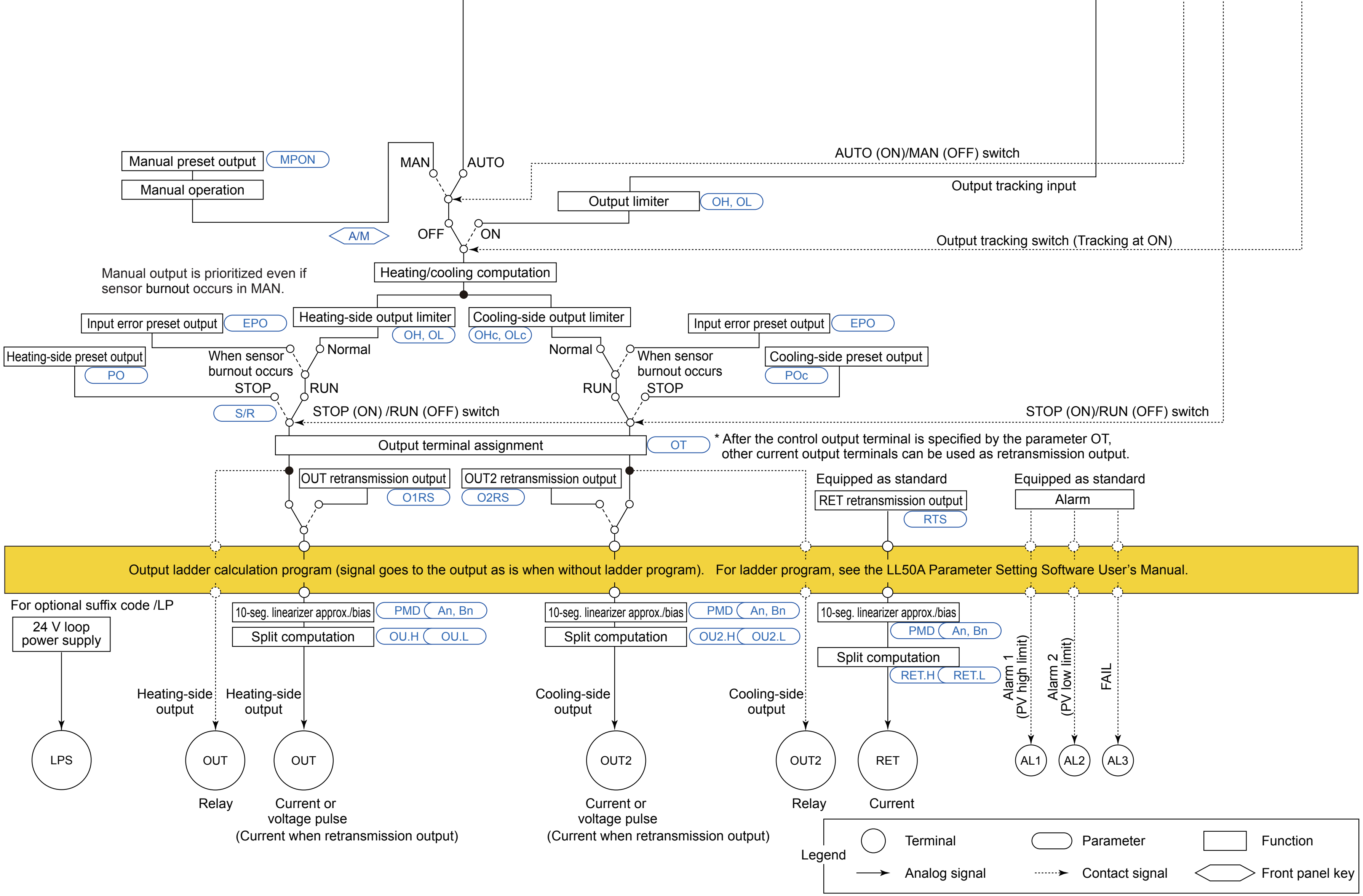
■ Loop Control for Backup Function Block Diagram



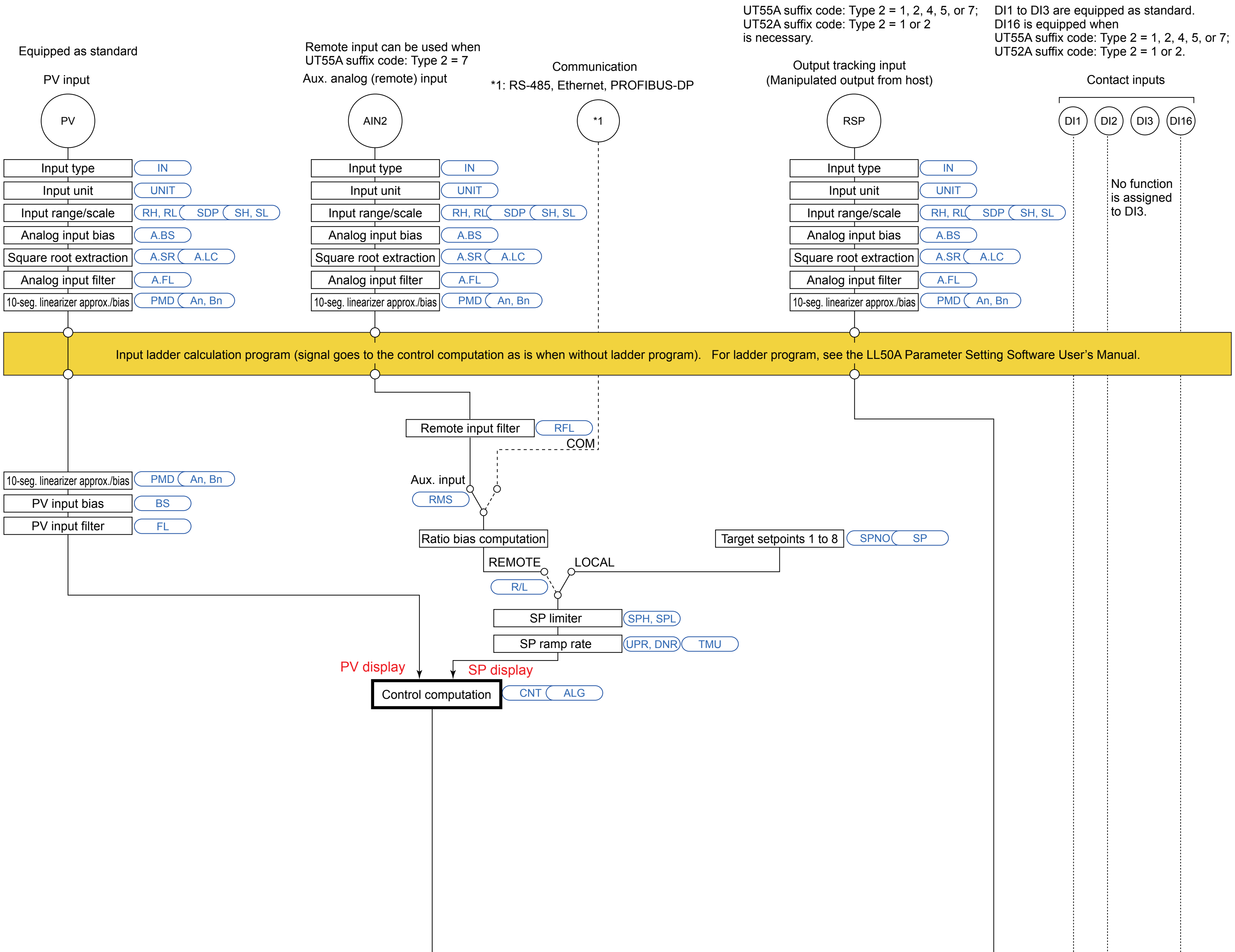

Input error preset output
EPO
Output limiter
OH, OL
Normal
When sensor burnout occurs
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Output tracking input
Output limiter
OH, OL
Preset output
PO
OFF
ON
Output tracking switch (Tracking at ON)
RUN
S/R
STOP
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL
For optional suffix code /HA
Heater break alarm
LPS
OUT
Relay
OUT
Current or voltage pulse
(Current when retransmission output)
RET
Current
AL1
AL2
AL3
HAL1
Heater break alarm 1
HAL2
Heater break alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

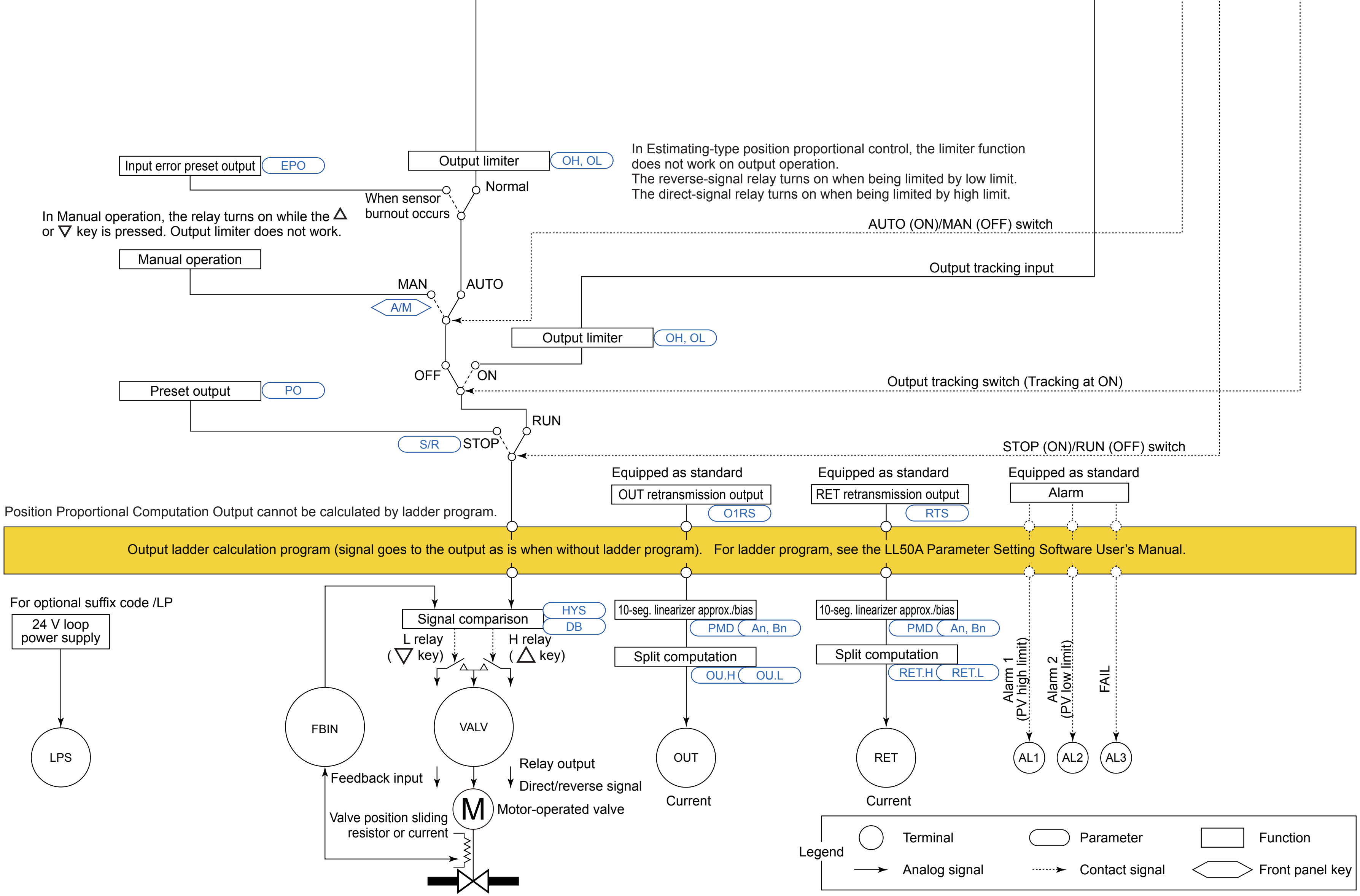
■ Heating/cooling Loop Control for Backup Function Block Diagram




AUTO (ON)/MAN (OFF) switch
Output tracking input
Manual preset output
MPON
Manual operation
MAN
AUTO
Output limiter
OH, OL
A/M
OFF
ON
Output tracking switch (Tracking at ON)
Manual output is prioritized even if sensor burnout occurs in MAN.
Heating/cooling computation
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Input error preset output
EPO
Input error preset output
EPO
Heating-side preset output
PO
When sensor burnout occurs
Normal
Normal
When sensor burnout occurs
Cooling-side preset output
POc
STOP
RUN
RUN
STOP
S/R
STOP (ON) /RUN (OFF) switch
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Position Proportional Loop Control for Backup Function Block Diagram




Input error preset output
EPO
Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Normal
When sensor burnout occurs
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
AUTO (ON)/MAN (OFF) switch
Manual operation
Output tracking input
MAN
AUTO
A/M
Output limiter
OH, OL
OFF
ON
Preset output
PO
Output tracking switch (Tracking at ON)
RUN
S/R
STOP
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Feedback input
Relay output
Direct/reverse signal
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Intentionally blank

8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

Description
These control modes use two PV inputs, which are switched according to input contact signals or measurement ranges.

Loop control with PV switching can be used for Standard type or Heating/cooling type controller.
Heating/cooling loop control with PV switching can be used for Heating/cooling type controller.
Position proportional loop control with PV switching can be used for Position proportional type controller.
► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

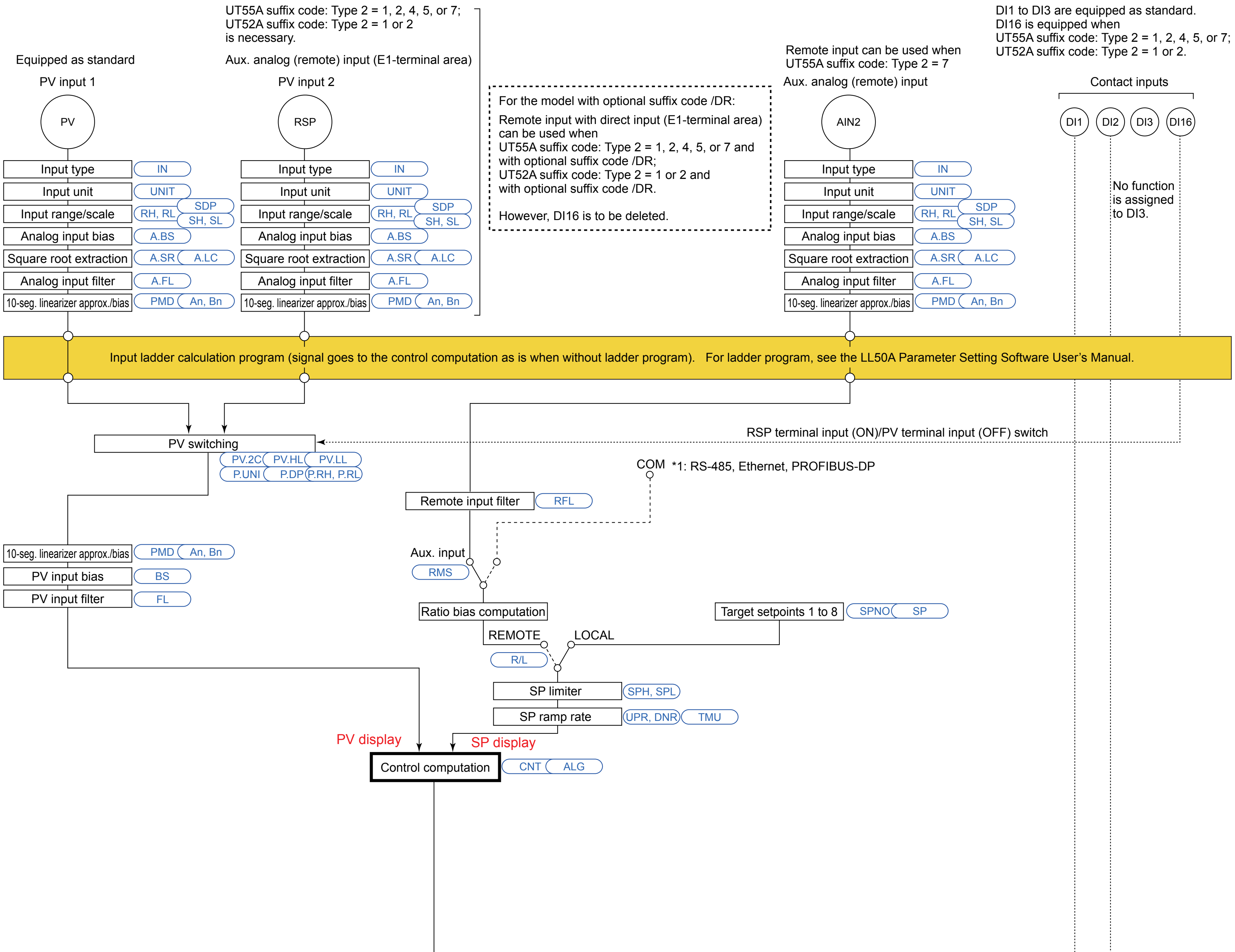
Description about Loop control with PV switching
► PV range: 7.6 Adjusting PV Range for Loop Control with PV Switching
► Switching action: 7.7 Setting PV Switching Methods of Loop Control with PV Switching

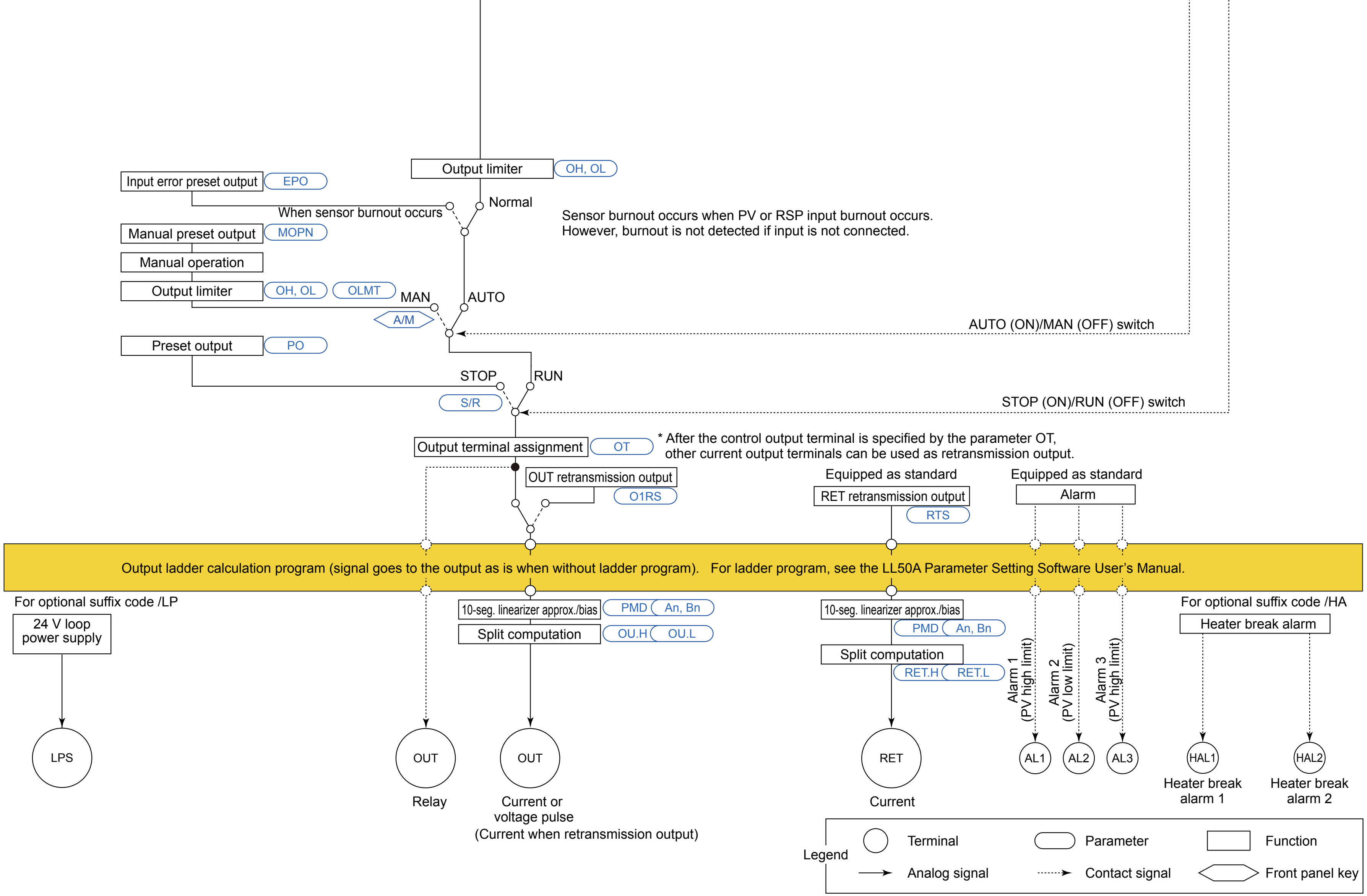
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

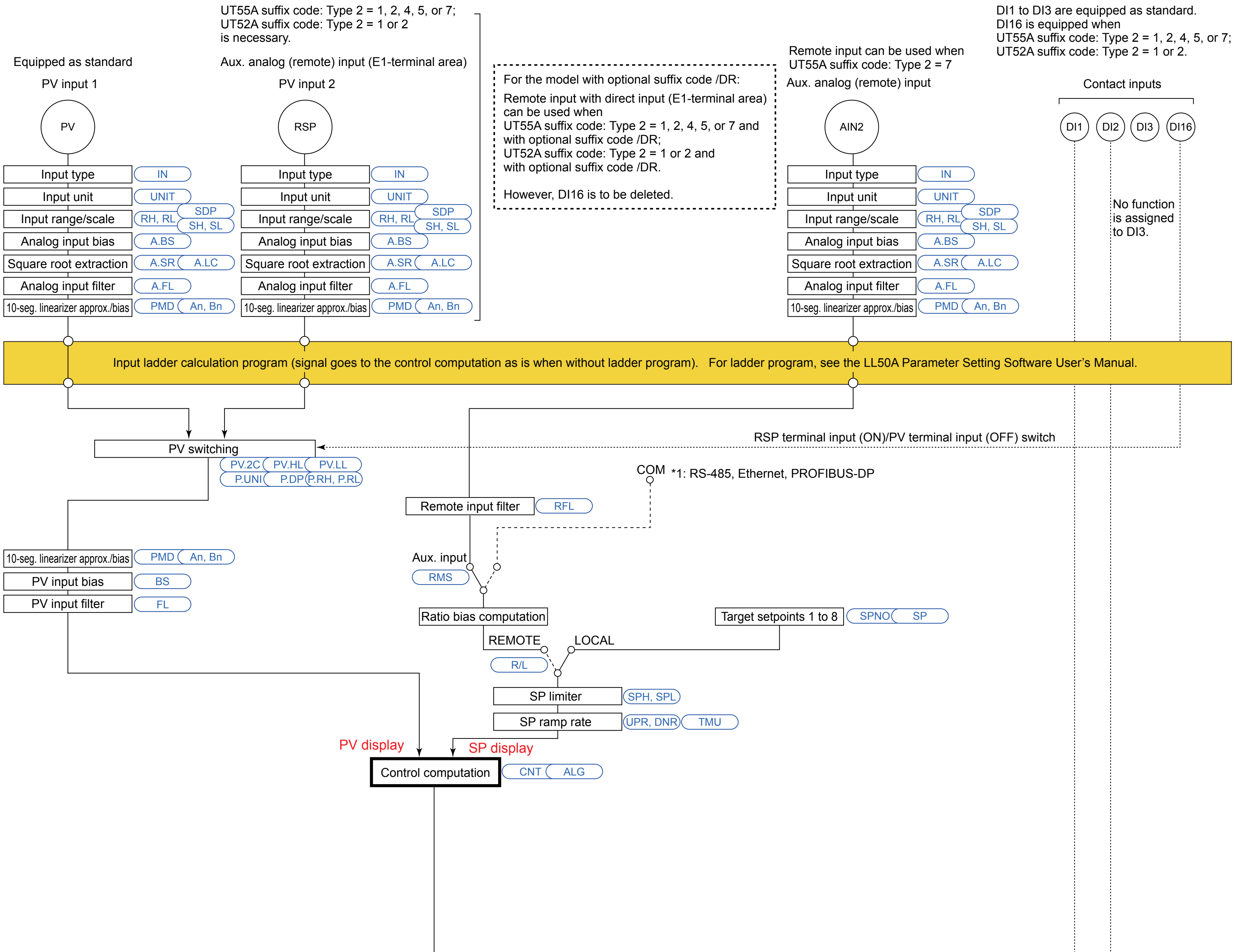
For the functions and parameters which are not described in Function block diagram, see the following.
► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

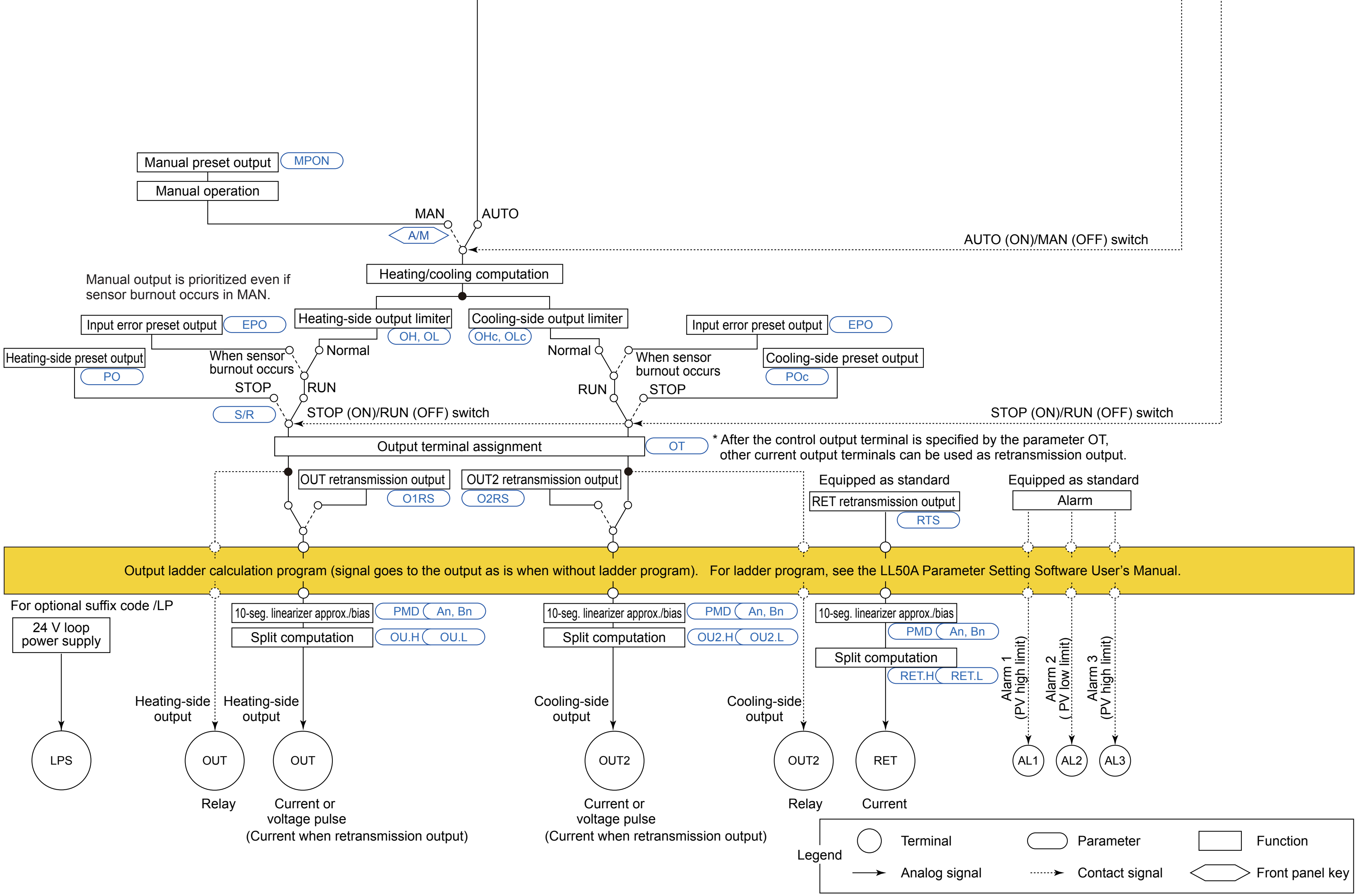
■ Loop Control with PV Switching Function Block Diagram




Output limiter
OH, OL
Input error preset output
EPO
When sensor burnout occurs
Normal
Sensor burnout occurs when PV or RSP input burnout occurs.
However, burnout is not detected if input is not connected.
Manual preset output
MOPN
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT,
other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop
power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)
For optional suffix code /HA
Heater break alarm
LPS
OUT
Relay
OUT
Current or
voltage pulse
(Current when retransmission output)
RET
Current
AL1
AL2
AL3
HAL1
Heater break
alarm 1
HAL2
Heater break
alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

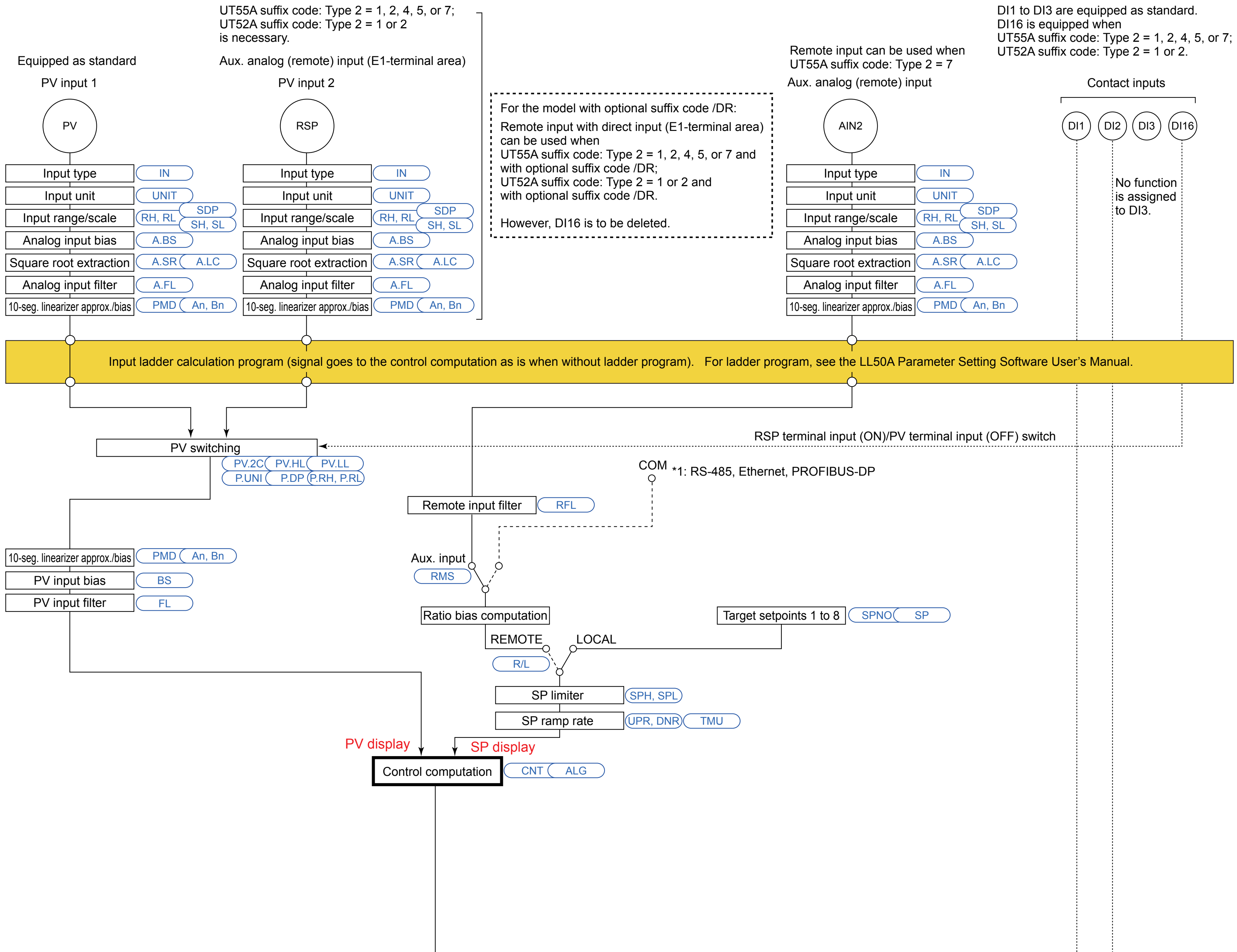
■ Heating/cooling Loop Control with PV Switching Function Block Diagram

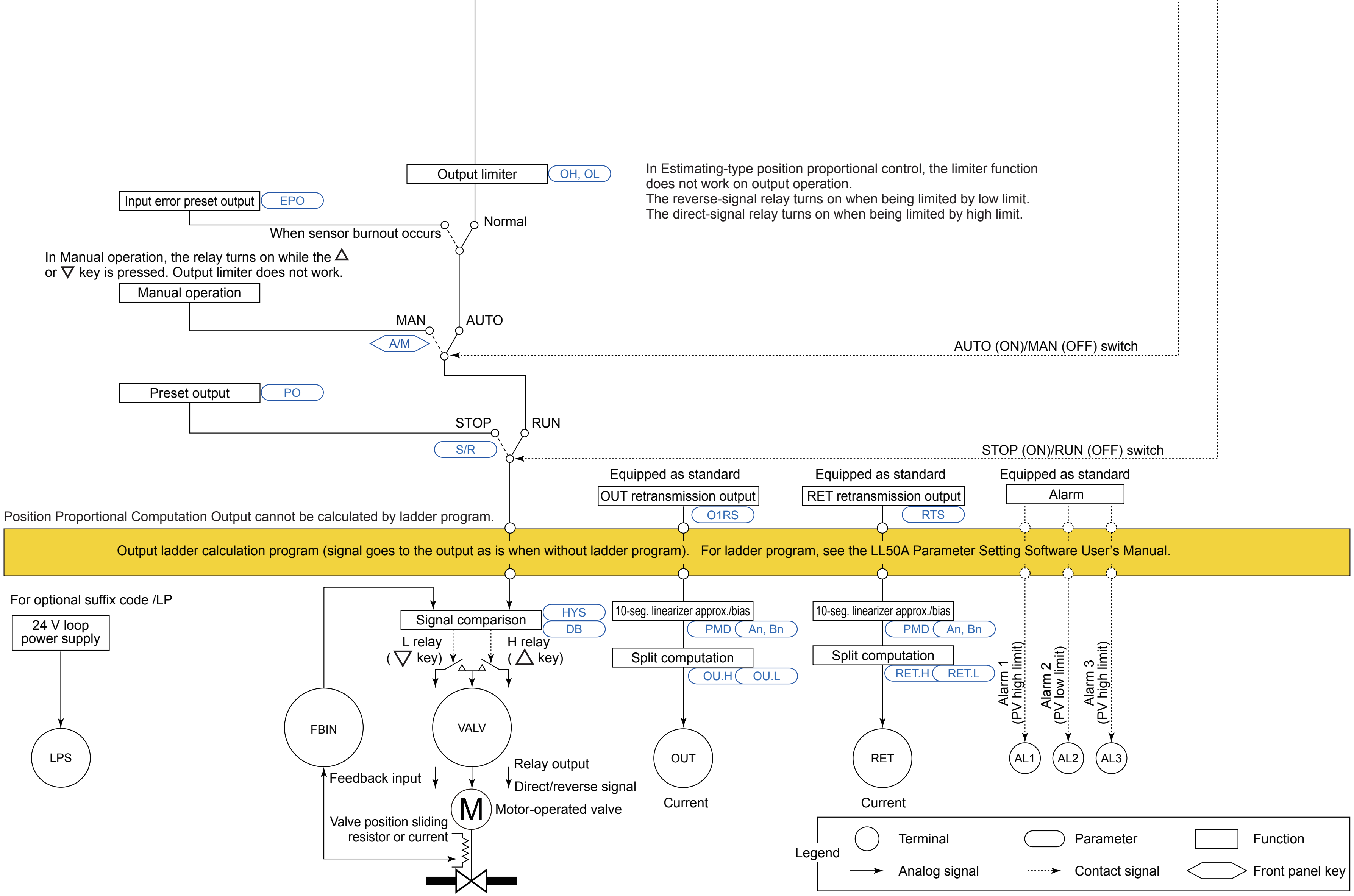




Manual preset output
MPON
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Heating/cooling computation
Manual output is prioritized even if sensor burnout occurs in MAN.
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Input error preset output
EPO
Input error preset output
EPO
Heating-side preset output
PO
When sensor burnout occurs
Normal
Normal
When sensor burnout occurs
Cooling-side preset output
POc
STOP
RUN
RUN
STOP
S/R
STOP (ON)/RUN (OFF) switch
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Position Proportional Loop Control with PV Switching Function Block Diagram




Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Input error preset output
EPO
When sensor burnout occurs
Normal
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Relay output
Direct/reverse signal
Feedback input
Motor-operated valve
M
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

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8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes automatically select or calculate the larger, the smaller, the average, or difference of multiple (two to four) PV inputs for control.

Loop control with PV auto-selector can be used for Standard type or Heating/cooling type controller.
Heating/cooling loop control with auto-selector can be used for Heating/cooling type controller.
Position proportional loop control with auto-selector can be used for Position proportional type controller.

► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Description about Loop control with PV auto-selector

► Input selection: 7.4 Using Larger, Smaller, Average, or Difference of Two to Four Inputs as PV

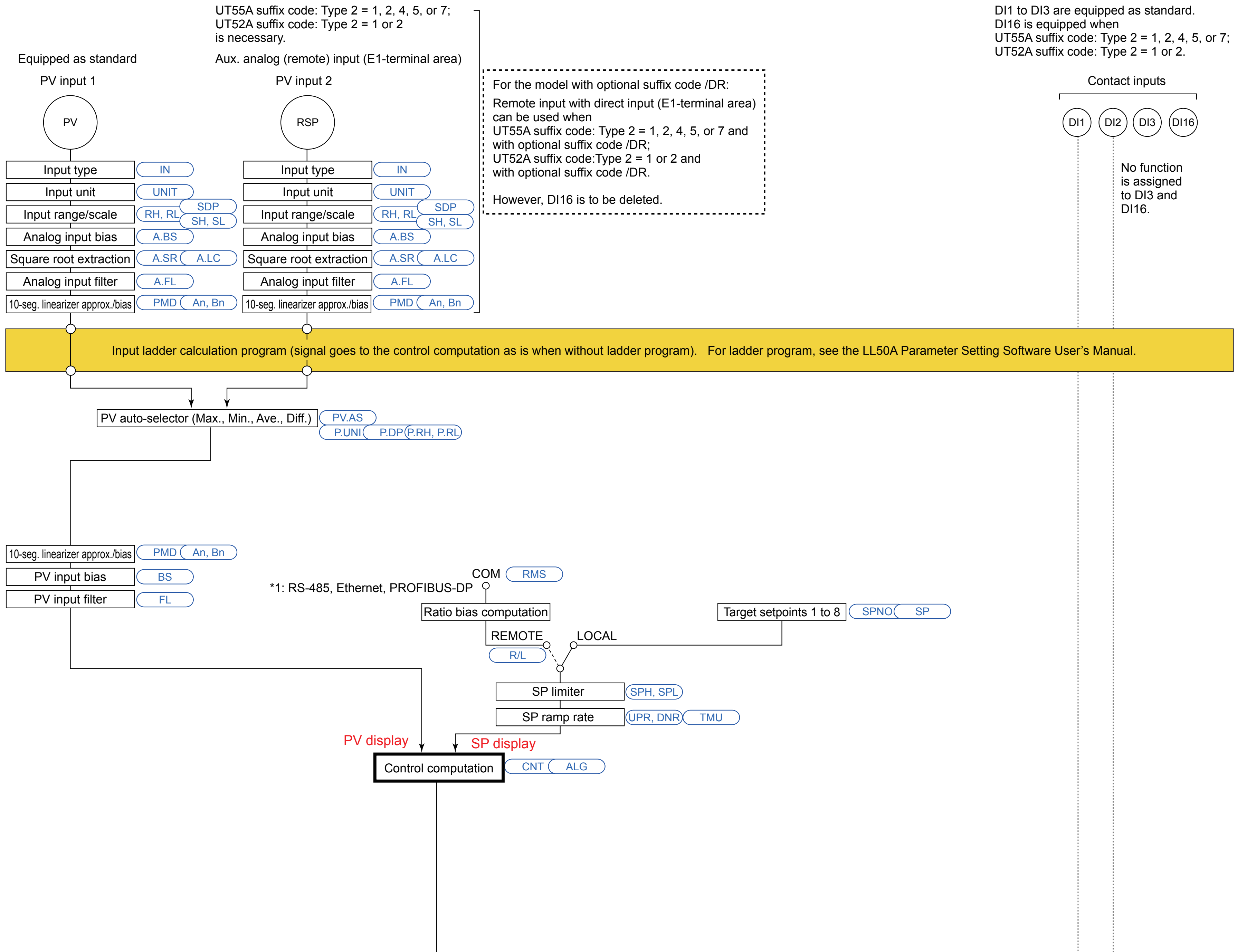
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

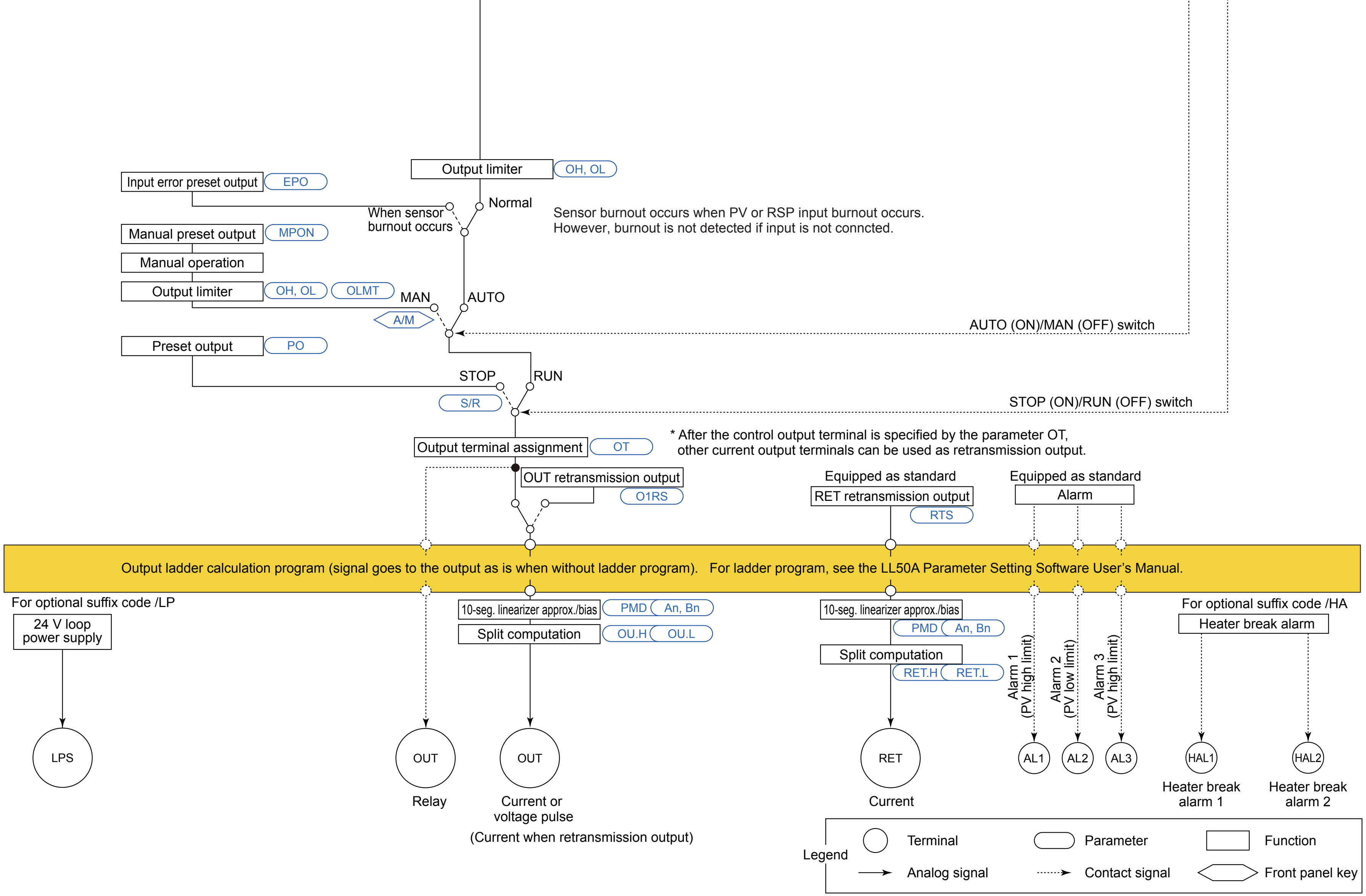
The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

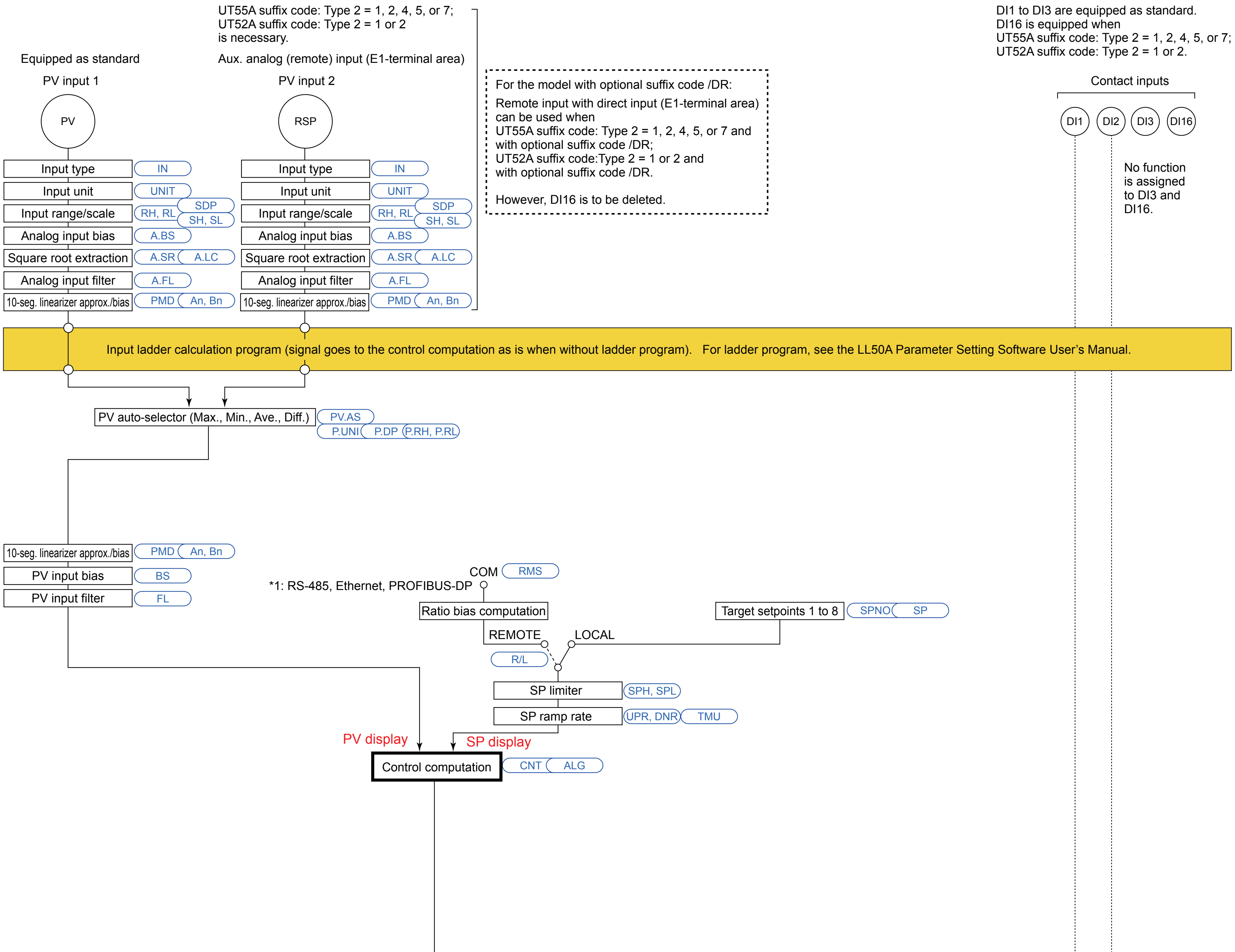
■ Loop Control with PV Auto-selector (2 inputs) Function Block Diagram

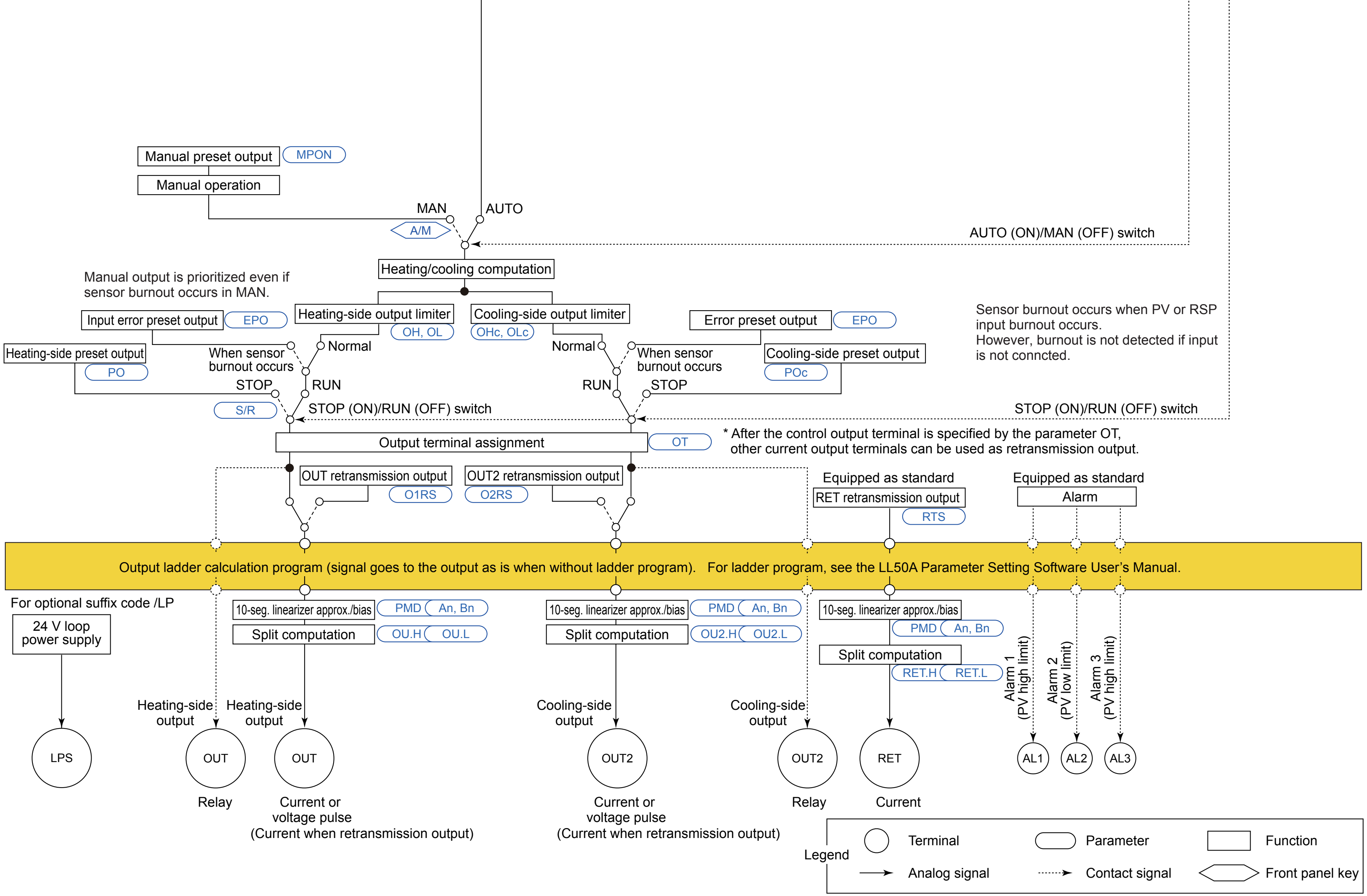




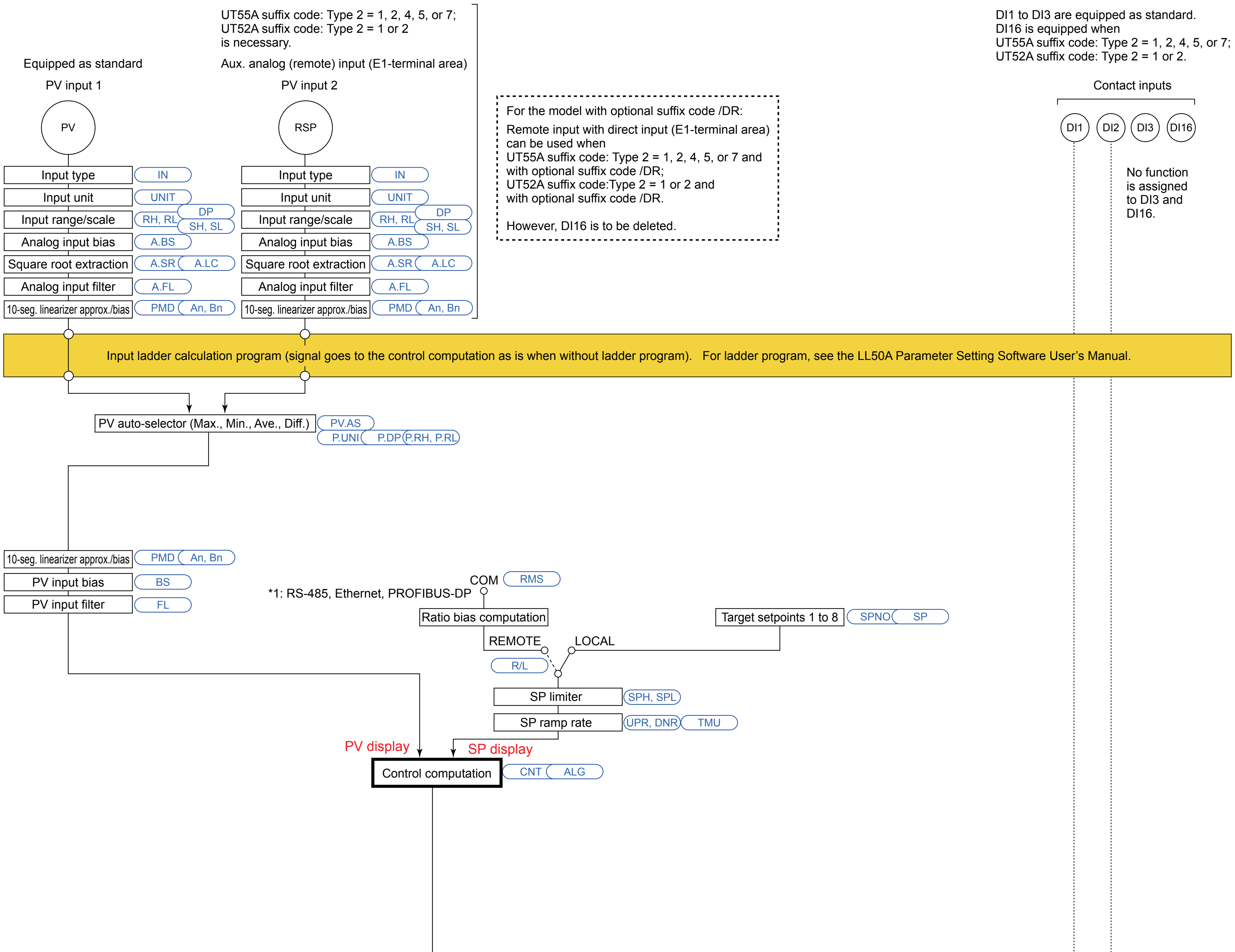
Output limiter
OH, OL
Input error preset output
EPO
When sensor burnout occurs
Normal
Sensor burnout occurs when PV or RSP input burnout occurs.
However, burnout is not detected if input is not conncted.
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT,
other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
For optional suffix code /HA
Heater break alarm
LPS
OUT
Relay
OUT
Current or voltage pulse
(Current when retransmission output)
RET
Current
AL1
AL2
AL3
HAL1
HAL2
Heater break alarm 1
Heater break alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

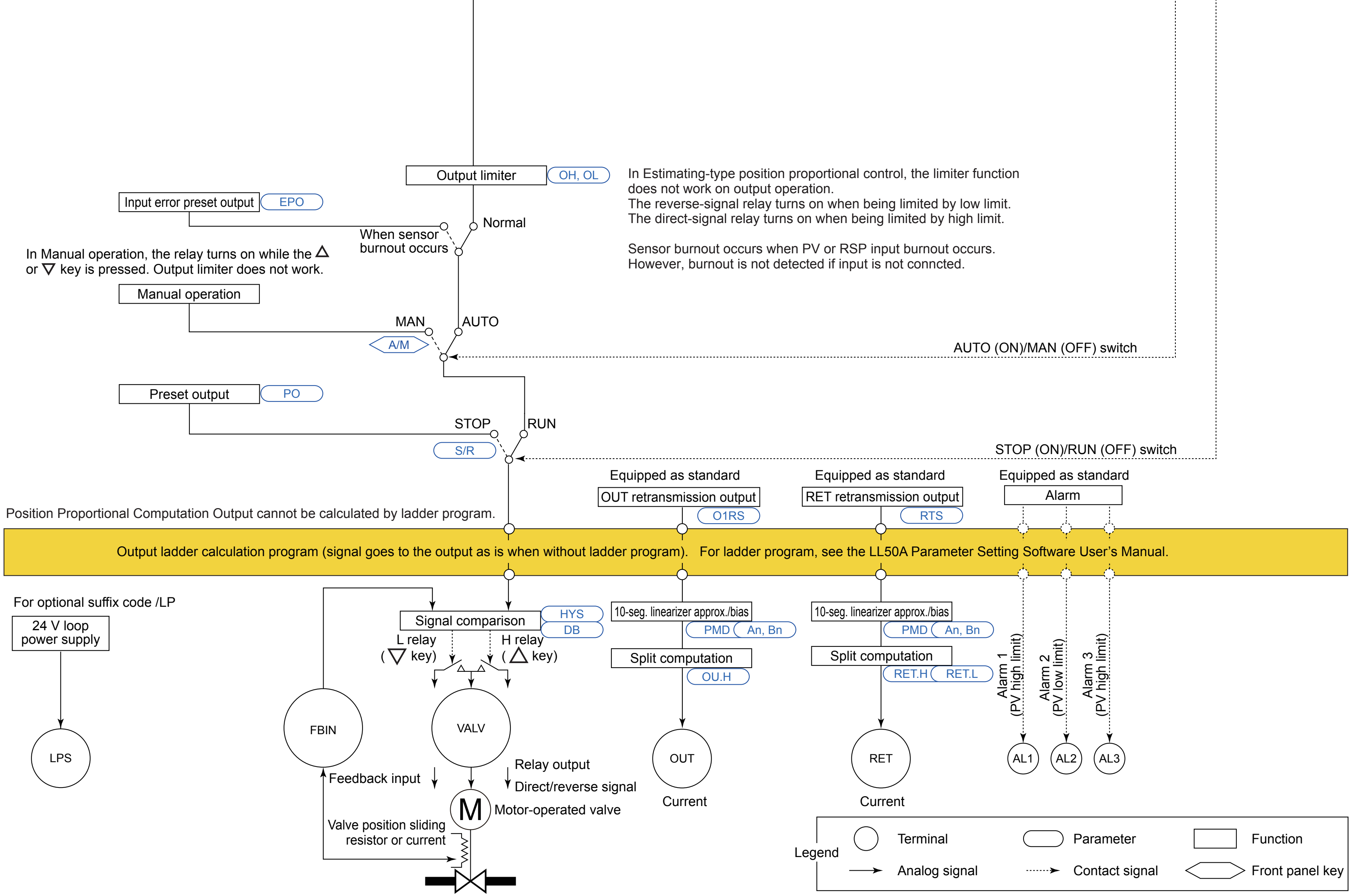
■ Heating/cooling Loop Control with PV Auto-selector (2 inputs) Function Block Diagram



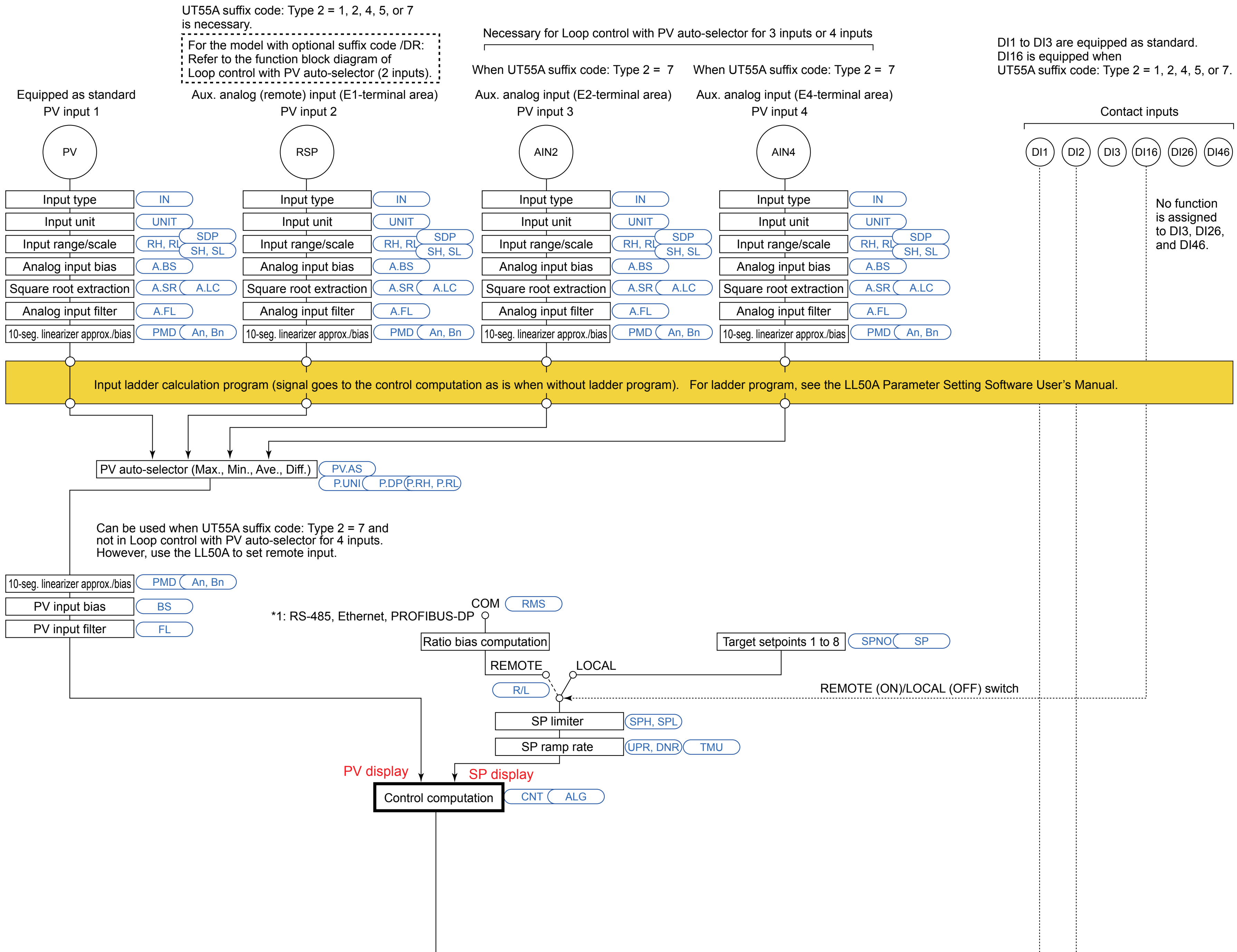

AUTO
AUTO (ON)/MAN (OFF) switch
Manual preset output
MPON
Manual operation
MAN
A/M
Heating/cooling computation
Manual output is prioritized even if sensor burnout occurs in MAN.
Input error preset output
EPO
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Error preset output
EPO
Sensor burnout occurs when PV or RSP input burnout occurs.
However, burnout is not detected if input is not conncted.
Heating-side preset output
PO
When sensor burnout occurs
Normal
Normal
When sensor burnout occurs
Cooling-side preset output
POc
STOP
RUN
RUN
STOP
S/R
STOP (ON)/RUN (OFF) switch
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

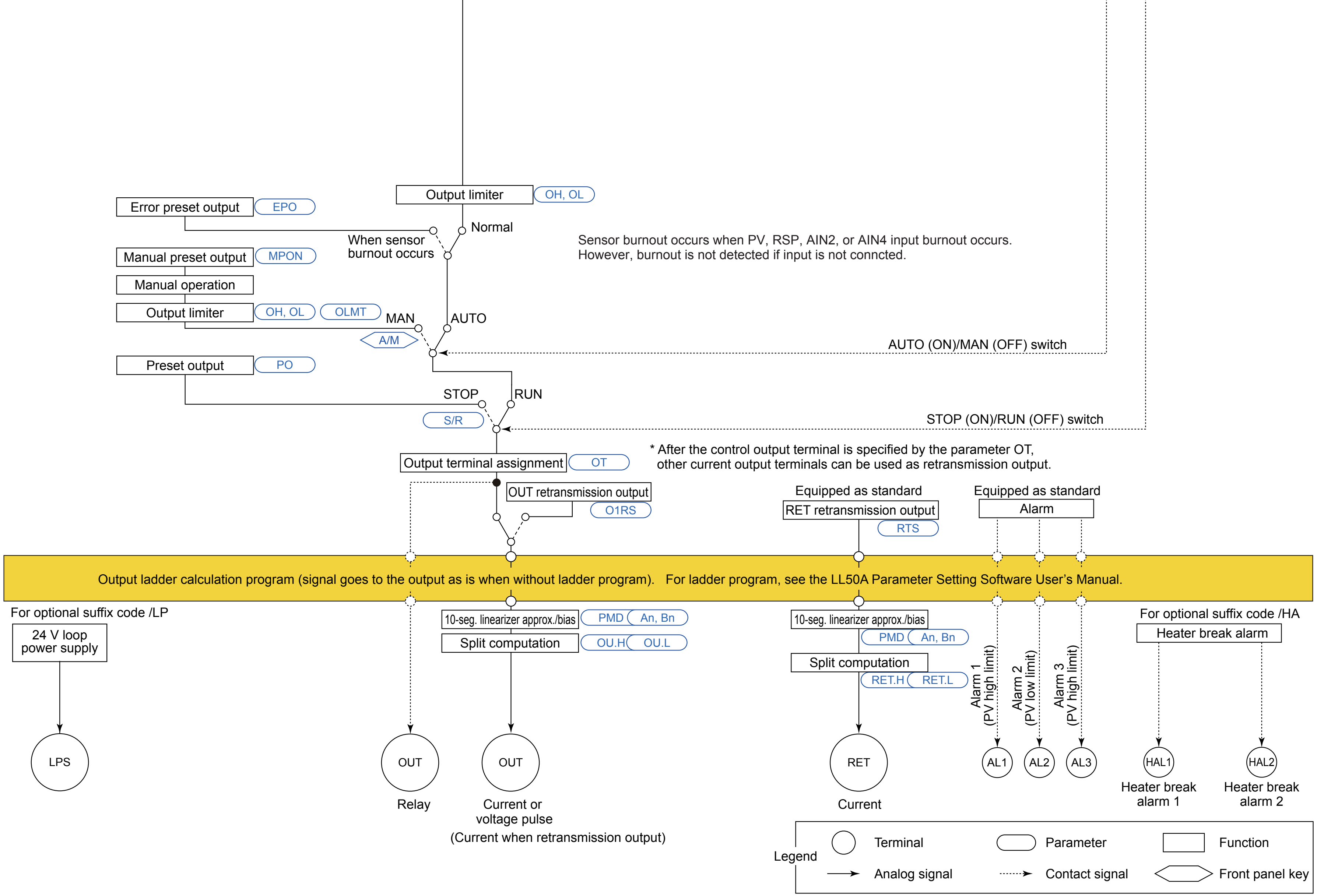
■ Position Proportional Loop Control with PV Auto-selector (2 inputs) Function Block Diagram



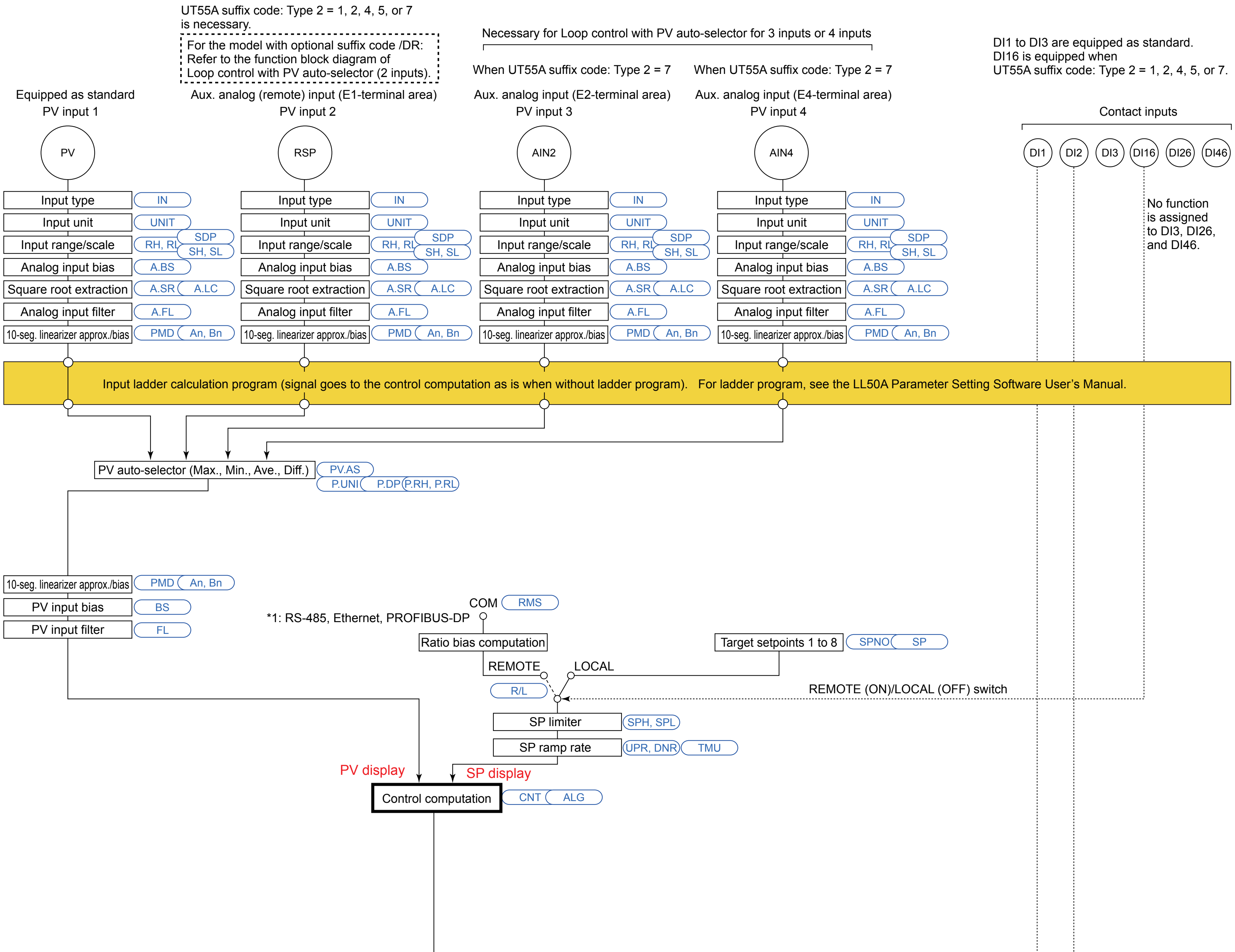

Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Sensor burnout occurs when PV or RSP input burnout occurs.
However, burnout is not detected if input is not conncted.
Input error preset output
EPO
When sensor burnout occurs
Normal
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Feedback input
Relay output
Direct/reverse signal
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

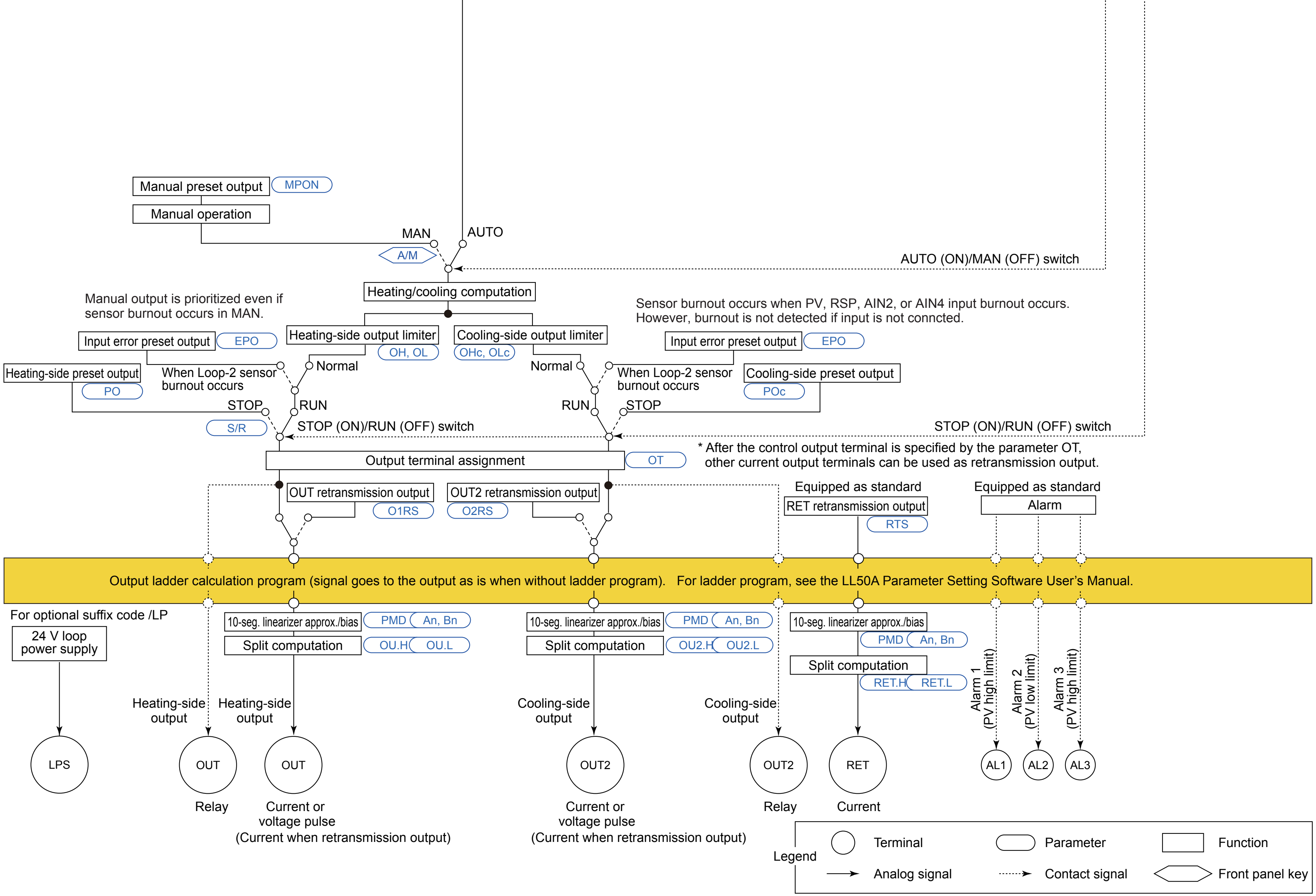
■ Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)



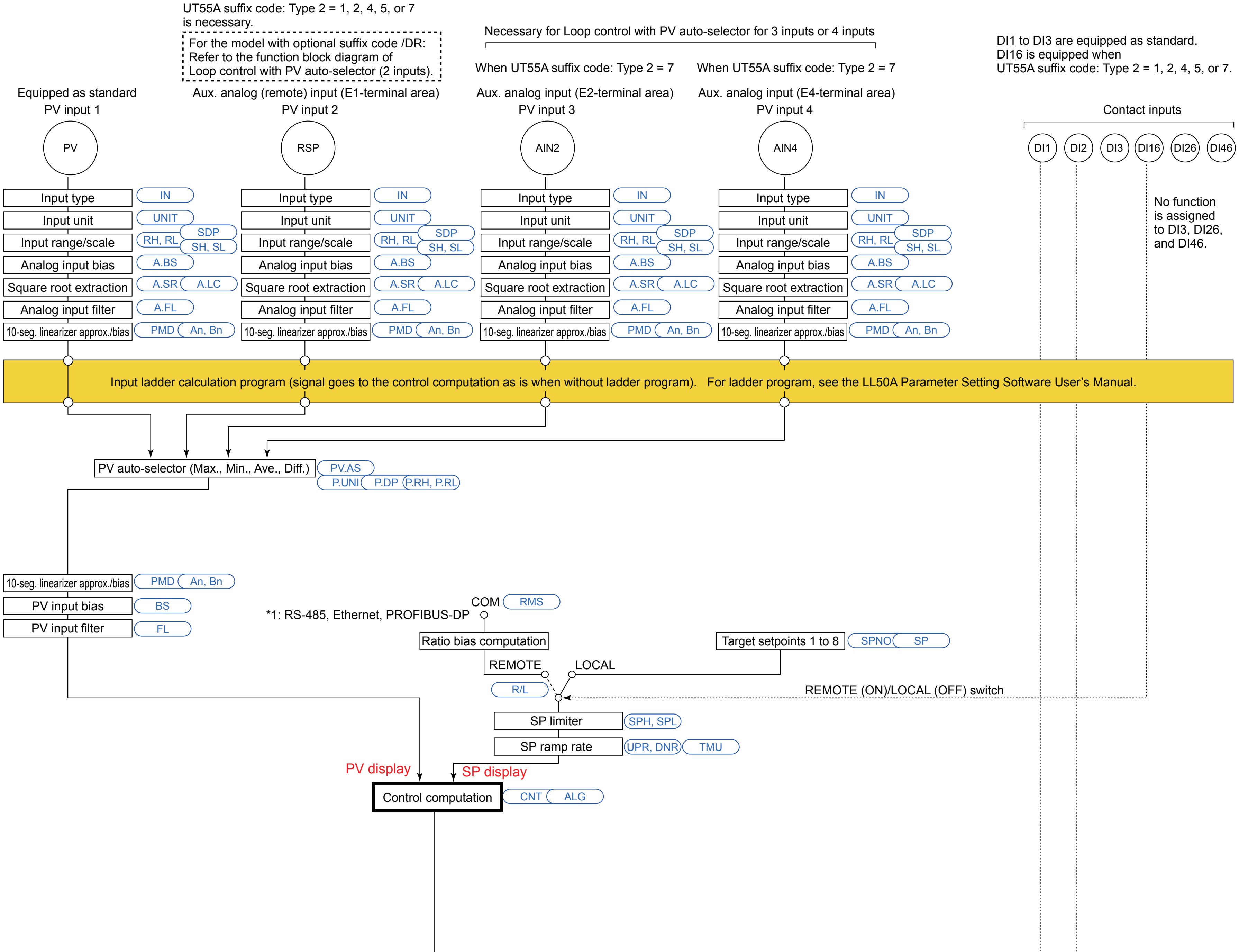

Output limiter
OH, OL
Error preset output
EPO
Normal
When sensor
burnout occurs
Sensor burnout occurs when PV, RSP, AIN2, or AIN4 input burnout occurs.
However, burnout is not detected if input is not conncted.
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT,
other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop
power supply
LPS
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Relay
OUT
Current or
voltage pulse
(Current when retransmission output)
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)
AL1
AL2
AL3
For optional suffix code /HA
Heater break alarm
HAL1
HAL2
Heater break
alarm 1
Heater break
alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

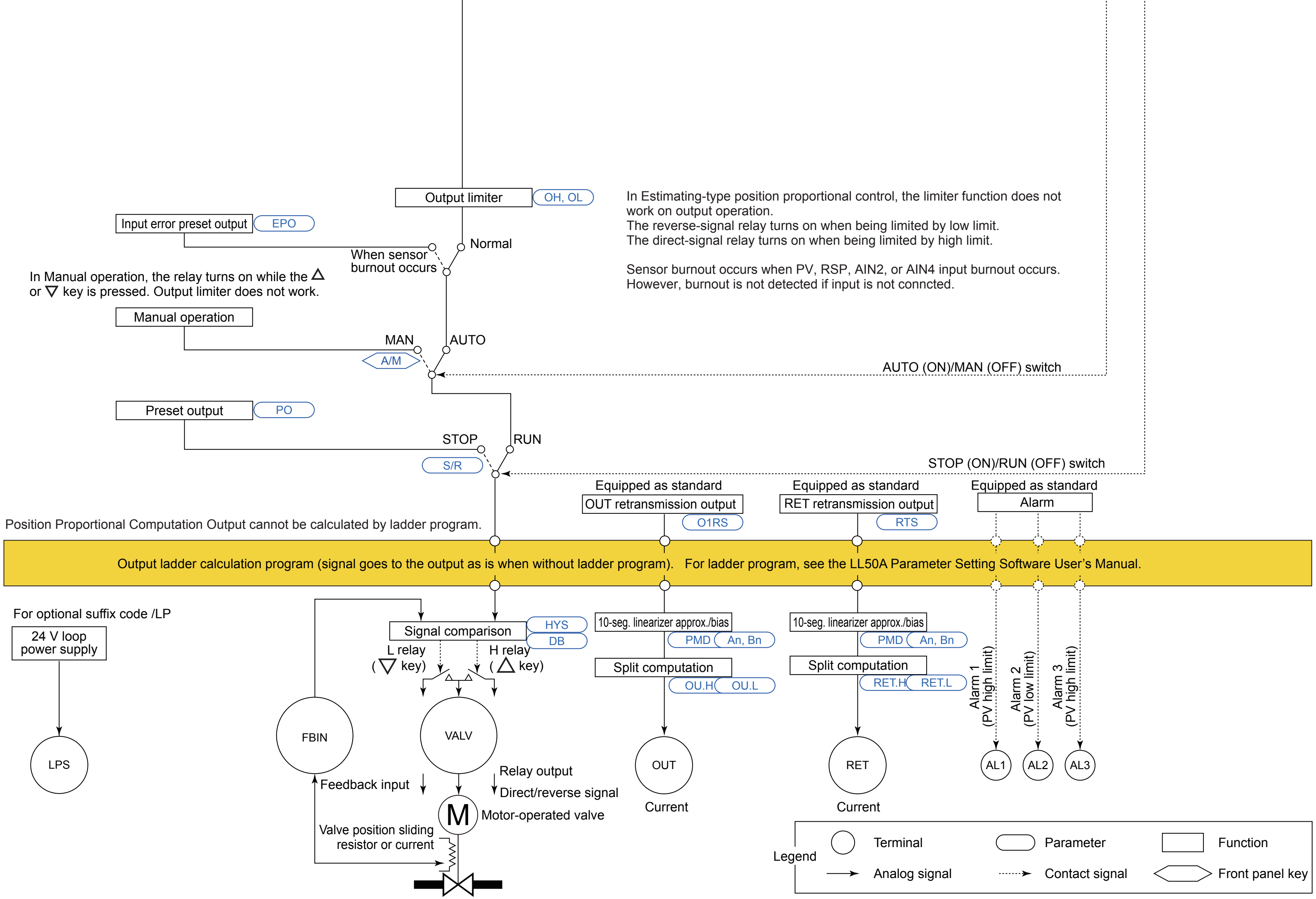
■ Heating/cooling Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)




Manual preset output
MPON
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Heating/cooling computation
Manual output is prioritized even if sensor burnout occurs in MAN.
Sensor burnout occurs when PV, RSP, AIN2, or AIN4 input burnout occurs. However, burnout is not detected if input is not conncted.
Input error preset output
EPO
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Input error preset output
EPO
Heating-side preset output
PO
When Loop-2 sensor burnout occurs
Normal
Normal
When Loop-2 sensor burnout occurs
Cooling-side preset output
POc
STOP
RUN
RUN
STOP
S/R
STOP (ON)/RUN (OFF) switch
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Heating-side output
Heating-side output
Cooling-side output
Cooling-side output
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or voltage pulse (Current when retransmission output)
Current or voltage pulse (Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Position Proportional Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)




Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Sensor burnout occurs when PV, RSP, AIN2, or AIN4 input burnout occurs.
However, burnout is not detected if input is not conncted.
Input error preset output
EPO
Normal
When sensor burnout occurs
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
AUTO (ON)/MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Feedback input
Relay output
Direct/reverse signal
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Intentionally blank

8.1.8 Loop Control with PV-hold Function, Heating/cooling Loop Control with PV-hold Function, and Position Proportional Loop Control with PV-hold Function

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	CTL Set

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

These control modes hold the PV input value and control output value by switching the external sensor using contact input.

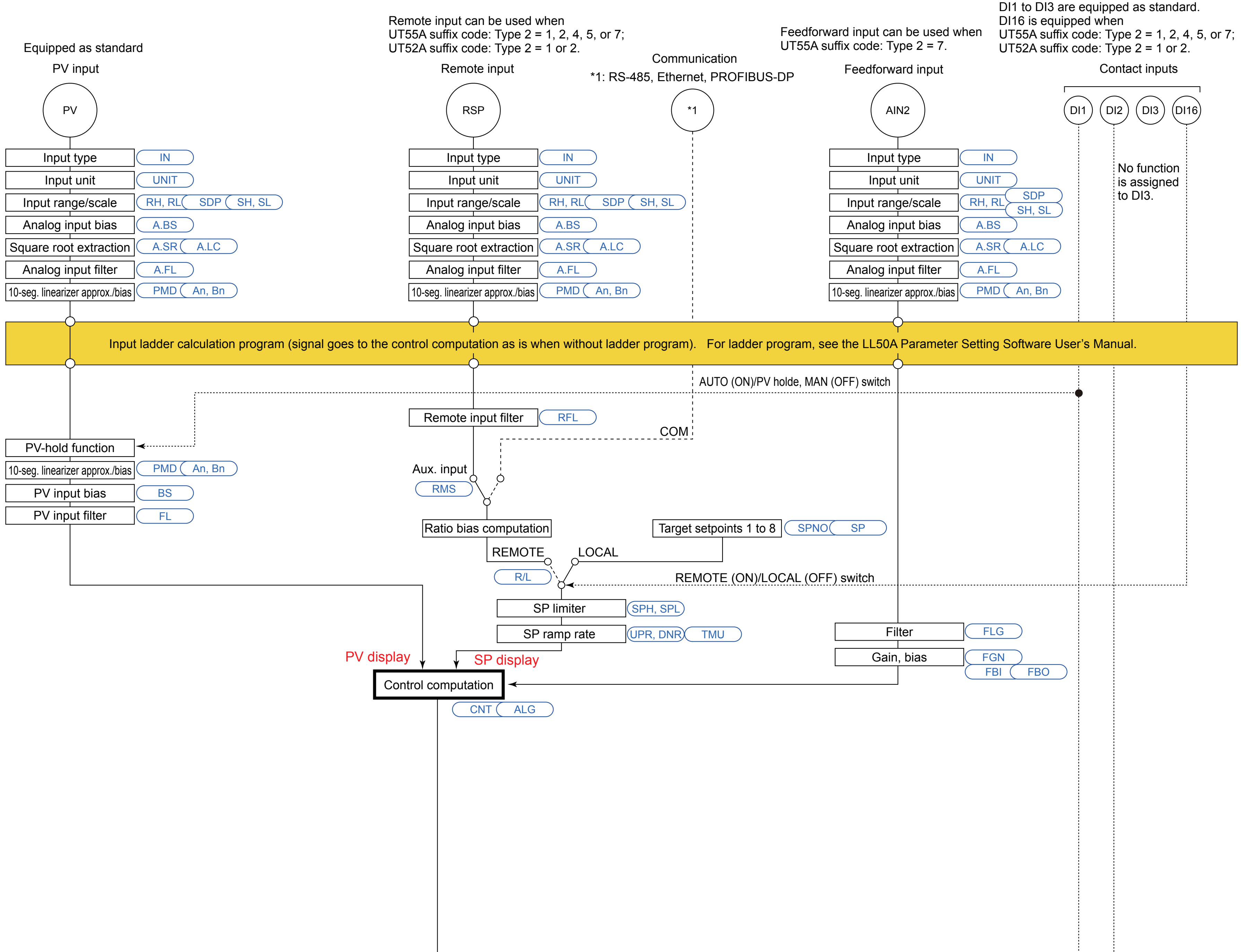
Loop control with PV-hold function can be used for Standard type or Heating/cooling type controller.
Heating/cooling loop control with PV-hold function can be used for Heating/cooling type controller.
Position proportional loop control with PV-hold function can be used for Position proportional type controller.
► PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

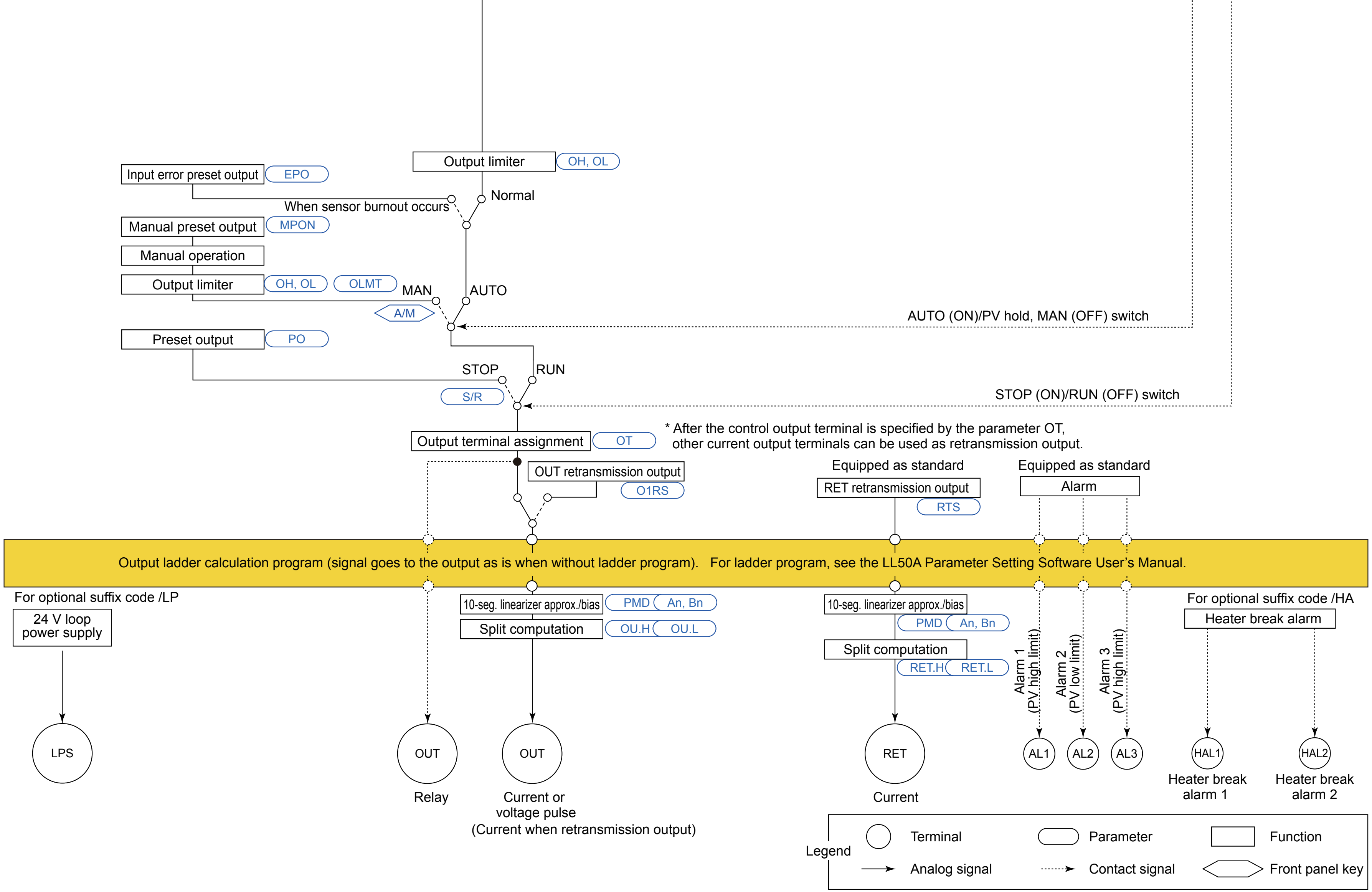
Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.
► Contact input assignment: 12.1 Setting Contact Input Function
► Contact output assignment: 12.2 Setting Contact Output Function
► Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
► Analog output range change: 10.14 Changing Current Output Range

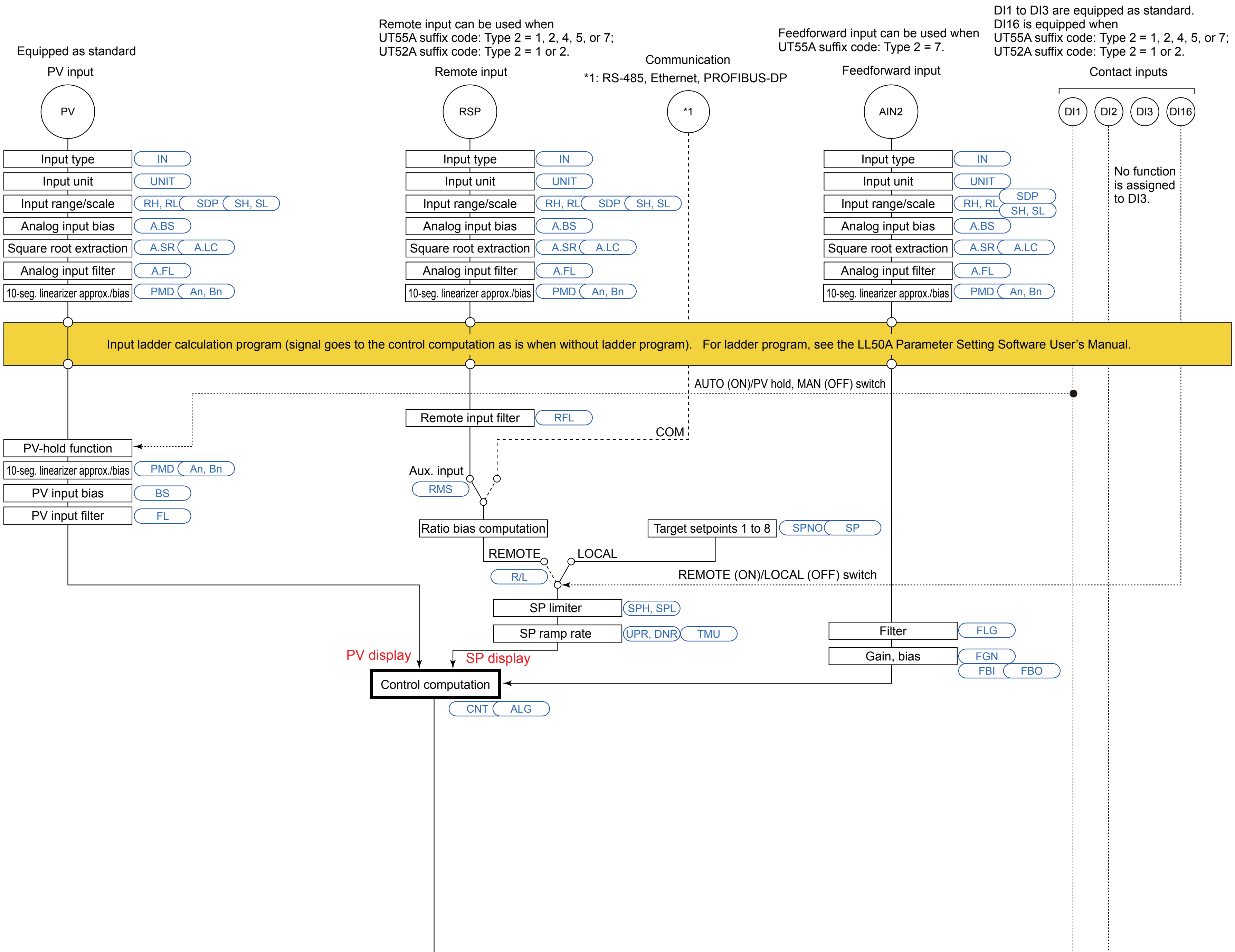
■ Loop Control with PV-hold Function Function Block Diagram

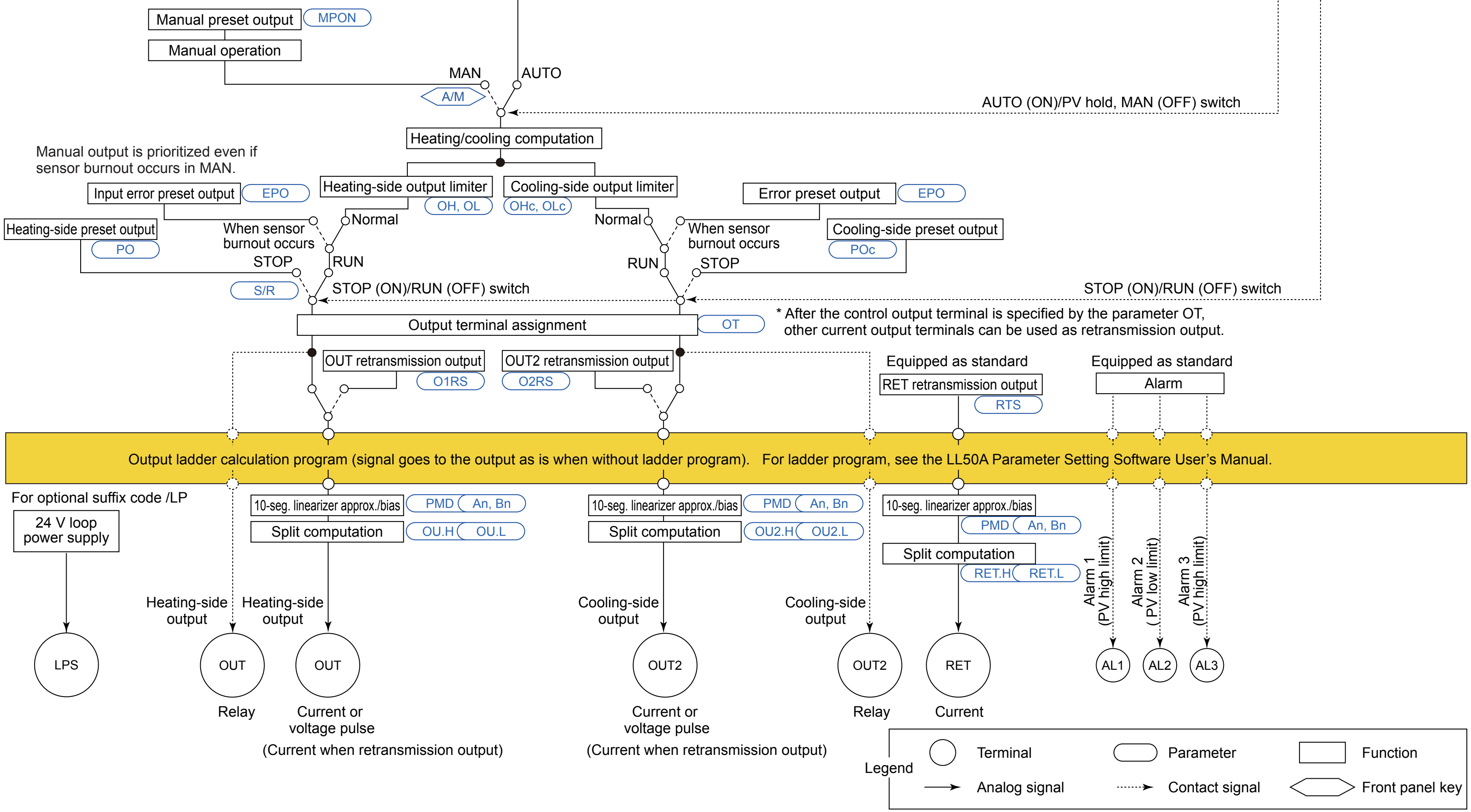




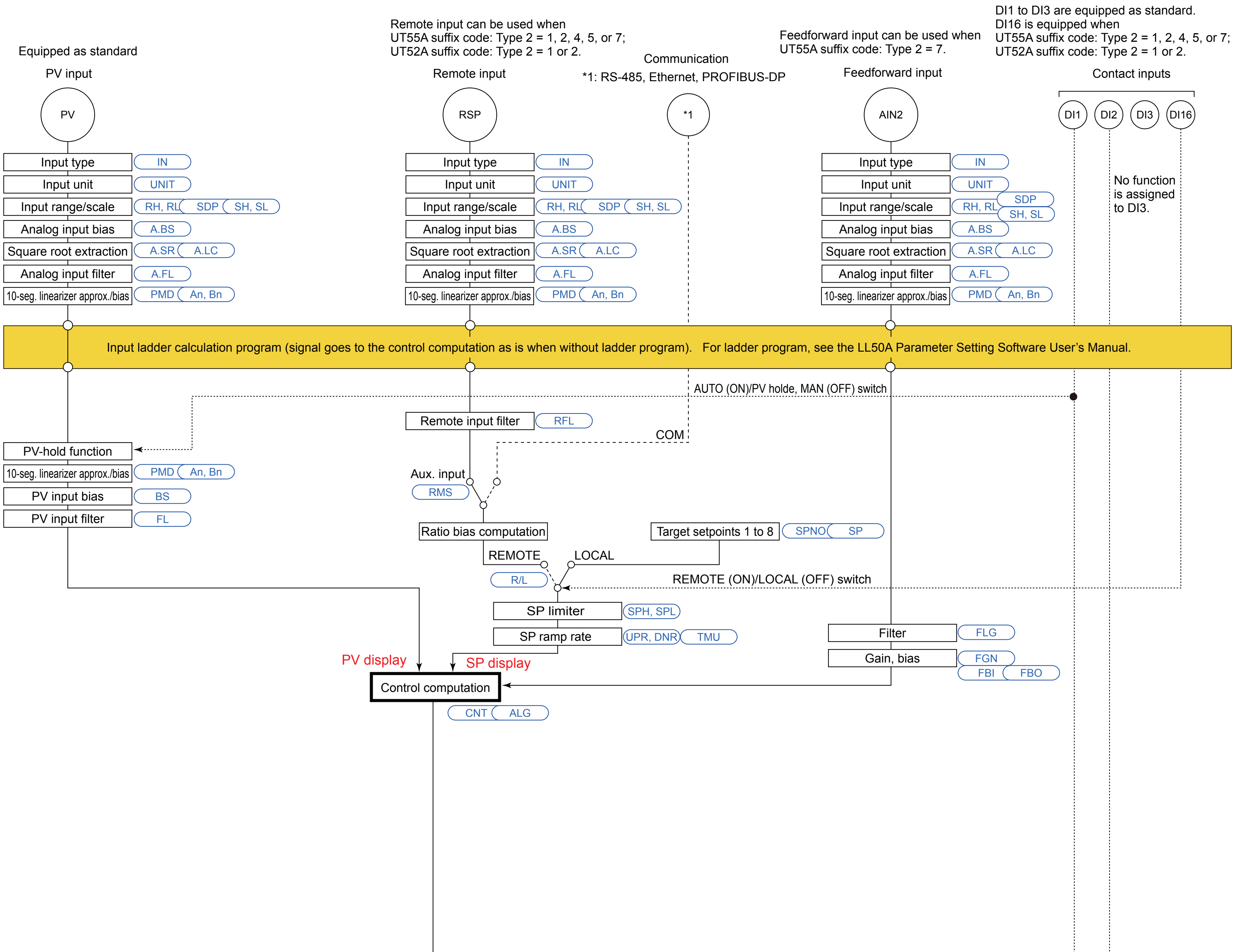
Output limiter
OH, OL
Input error preset output
EPO
Normal
When sensor burnout occurs
Manual preset output
MPON
Manual operation
Output limiter
OH, OL
OLMT
MAN
AUTO
A/M
AUTO (ON)/PV hold, MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
For optional suffix code /HA
Heater break alarm
LPS
OUT
Relay
OUT
Current or voltage pulse (Current when retransmission output)
RET
Current
AL1
AL2
AL3
HAL1
Heater break alarm 1
HAL2
Heater break alarm 2
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

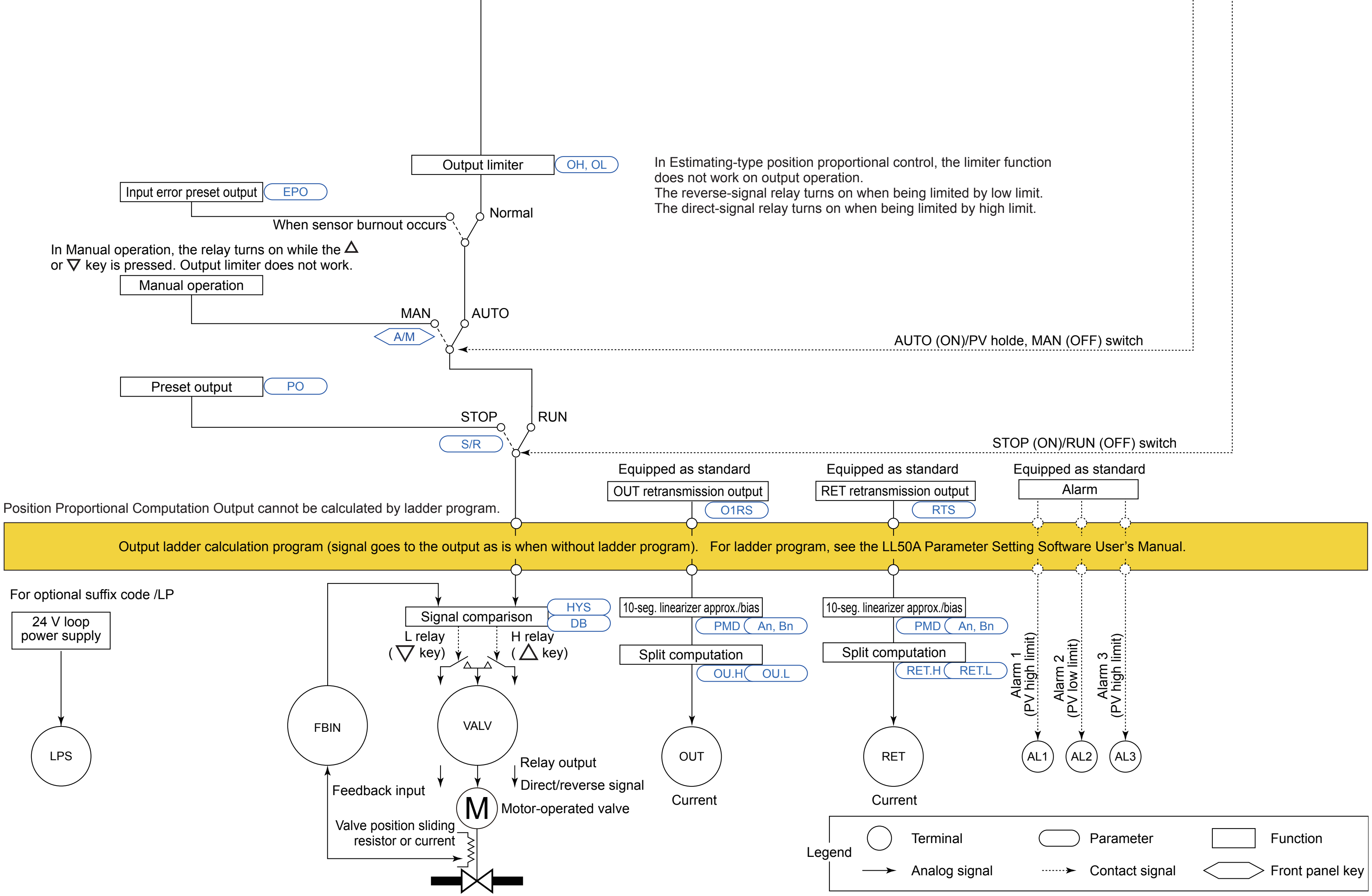
■ Heating/cooling Loop Control with PV-hold Function Function Block Diagram




Manual preset output
MPON
Manual operation
MAN
AUTO
A/M
AUTO (ON)/PV hold, MAN (OFF) switch
Heating/cooling computation
Manual output is prioritized even if
sensor burnout occurs in MAN.
Input error preset output
EPO
Heating-side output limiter
OH, OL
Cooling-side output limiter
OHc, OLc
Error preset output
EPO
Heating-side preset output
PO
Normal
When sensor
burnout occurs
STOP
RUN
Normal
When sensor
burnout occurs
RUN
STOP
Cooling-side preset output
POc
S/R
STOP (ON)/RUN (OFF) switch
STOP (ON)/RUN (OFF) switch
Output terminal assignment
OT
* After the control output terminal is specified by the parameter OT,
other current output terminals can be used as retransmission output.
OUT retransmission output
O1RS
OUT2 retransmission output
O2RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop
power supply
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU2.H
OU2.L
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)
Heating-side
output
Heating-side
output
Cooling-side
output
Cooling-side
output
LPS
OUT
OUT
OUT2
OUT2
RET
AL1
AL2
AL3
Relay
Current or
voltage pulse
(Current when retransmission output)
Current or
voltage pulse
(Current when retransmission output)
Relay
Current
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

■ Position Proportional Loop Control with PV-hold Function Function Block Diagram





Output limiter
OH, OL
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.
Input error preset output
EPO
When sensor burnout occurs
Normal
In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.
Manual operation
MAN
AUTO
A/M
AUTO (ON)/PV holde, MAN (OFF) switch
Preset output
PO
STOP
RUN
S/R
STOP (ON)/RUN (OFF) switch
Equipped as standard
OUT retransmission output
O1RS
Equipped as standard
RET retransmission output
RTS
Equipped as standard
Alarm
Position Proportional Computation Output cannot be calculated by ladder program.
Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.
For optional suffix code /LP
24 V loop power supply
LPS
Signal comparison
HYS
DB
L relay (▽ key)
H relay (△ key)
FBIN
VALV
Relay output
Direct/reverse signal
Feedback input
M
Motor-operated valve
Valve position sliding resistor or current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
OU.H
OU.L
OUT
Current
10-seg. linearizer approx./bias
PMD
An, Bn
Split computation
RET.H
RET.L
RET
Current
Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)
AL1
AL2
AL3
Legend
Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

8.2 Setting Control Type (CNT)

The following table shows combination of Standard type, Heating/cooling type, Position proportional type and control type (CNT).

Control type	Suffix code: Type 1		
	Standard type	Heating/cooling type	Position proportional type
PID control	√	√	√
ON/OFF control (1 point of hysteresis)	√	√	N/A
ON/OFF control (2 points of hysteresis)	√	√	N/A
Two-position two-level control	N/A	√	N/A
Heating/cooling control	N/A	√	N/A
Sample PI control	√	√	√
Batch PID control	√	√	√
Feedforward control	√	√	√

√: Available, N/A: Not available

The following table shows combination of control type (CNT) and control mode (CTLM).

Control type	Control mode (CTLM)							
	SGL	CAS1	CAS2	CAS	BUA	PVSW	PVSEL	PVHD
PID control	√	√*1	√	√	√	√	√	√
ON/OFF control (1 point of hysteresis)	√*1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ON/OFF control (2 points of hysteresis)	√*1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Two-position two-level control	√*2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Heating/cooling control	√*2	N/A	√*2	√*2	√*2	√*2	√*2	√*2
Sample PI control	√	N/A	N/A	N/A	N/A	√	√	√
Batch PID control	√	N/A	N/A	N/A	N/A	√	√	√
Feedforward control	√	N/A	N/A	N/A	N/A	N/A	N/A	√

√: Available, N/A: Not available
*1: Cannot be selected for Position proportional type.
*2: Can be selected only for Heating/cooling type.

The following table shows combination of control type (CNT) and output type.

Control type	Output type			
	Current output	Time proportional output	ON/OFF output	Position proportional output
PID control	√	√	N/A	√
ON/OFF control (1 point of hysteresis)	√	N/A	√	N/A
ON/OFF control (2 points of hysteresis)	√	N/A	√	N/A
Two-position two-level control	√	N/A	√	N/A
Heating/cooling control	√	√	√	N/A
Sample PI control	√	√	N/A	√
Batch PID control	√	√	N/A	√
Feedforward control	√	√	N/A	√

√: Available, N/A: Not available

► Output type: 10.1 Setting Control Output Type

8.2.1 PID Control

Description

PID control is a general control using control-related parameters PID.
When PID control is selected, PID should be obtained by auto-tuning after setting SP or PID should be set manually.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL Set
P	Proportional band Heating-side proportional band (in Heating/cooling control)	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control.	PID Ope
I	Integral time Heating-side integral time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	
D	Derivative time Heating-side derivative time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	
Pc	Cooling-side proportional band	EASY	0.0 to 999.9% Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control.	
Ic	Cooling-side integral time	EASY	OFF: Disable 1 to 6000 s	
Dc	Cooling-side derivative time	EASY	OFF: Disable 1 to 6000 s	
MR	Manual reset	EASY	-5.0 to 105.0%	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note 1: The PID number (1 to 8, or R) is displayed on Group display while the parameter P, I, D, Pc, Ic, Dc, or MR is displayed.
Note 2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note 3: The parameter CNT of Loop 2 displays PID and H/C.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

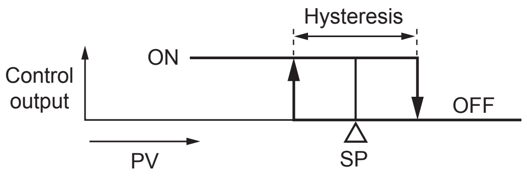
8.2.2 ON/OFF Control (1 point of hysteresis / 2 points of hysteresis)

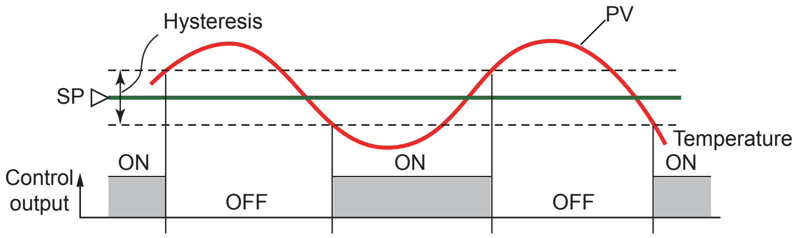
Description

ON/OFF control compares the SP and PV and outputs an on or off signal according to the positive or negative deviation (PV – SP). Hysteresis can be set in the vicinity of the on/off output operating point.
If the SP and PV become close and the polarity of the deviation reverses frequently, the on/off output will cycle repeatedly. The life of the output relay will therefore be dramatically shortened.
In such a case, set a wider hysteresis so that the relay's frequent on/off output (chattering) will not occur.

When the control type (CNT) is set to "ONOF," one point of hysteresis can be set to the operating point.
When the control type (CNT) is set to "ONOF2," two points of hysteresis (deviation positive hysteresis and deviation negative hysteresis) can be set to the operating point.

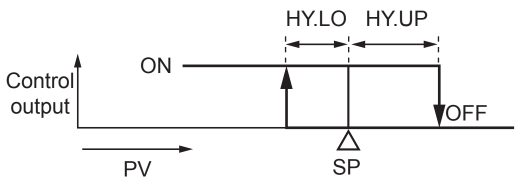
1 point of hysteresis

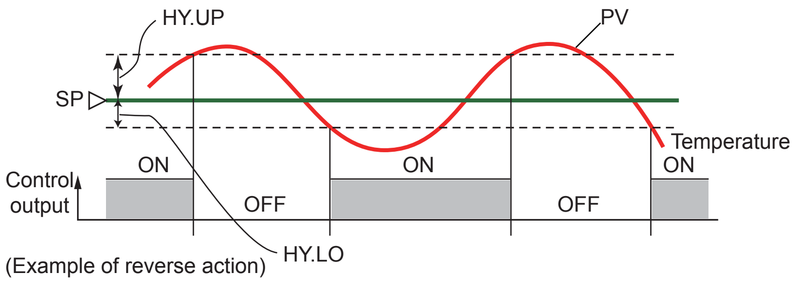




(Example of reverse action)

2 points of hysteresis





(Example of reverse action)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL Set
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID Ope
HY.UP	Upper-side hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EUS)	
HY.LO	Lower-side hysteresis (in ON/OFF control)	EASY		
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	Set a number of PID groups to use. 1 to 8	CTL Set

Note1: The PID number (1 to 8, or R) is displayed on Group display while the parameter HYS, HY.UP or HY.LO is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

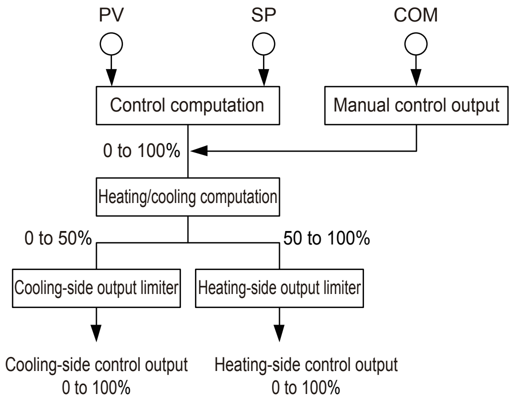
8

Control Functions

8.2.3 Heating/cooling Control

Description

Heating/cooling control can be used only for Heating/cooling type.
In Heating/cooling control, the controller outputs the result of computation after splitting it into heating-purpose and cooling-purpose signals. PID control or ON/OFF control can be selected for each of the heating side and the cooling side.
Set the heating-side proportional band to “0” to perform ON/OFF control on the heating side. Set the cooling-side proportional band to “0” to perform ON/OFF control on the cooling side.



Details of Heating/cooling Control

In Heating/cooling control, PID control or ON/OFF control can be selected for each of the heating side and the cooling side.
Set the proportional band to “0” to perform ON/OFF control.
The following describes the combination of heating side and cooling side.

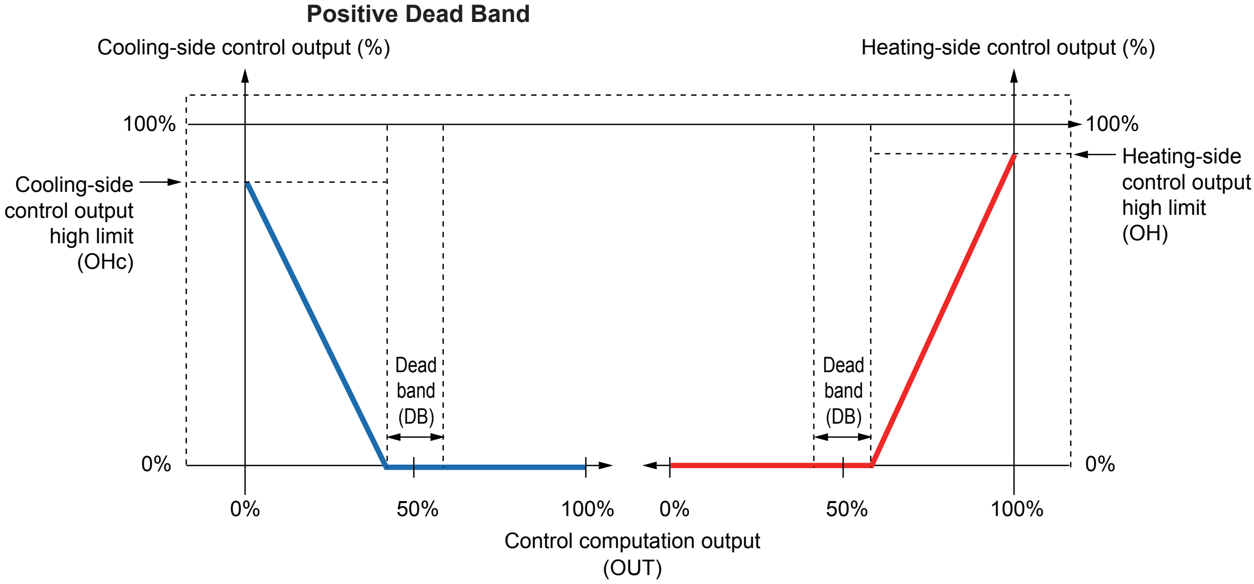
When Both the Heating Side and Cooling Side are in PID Control

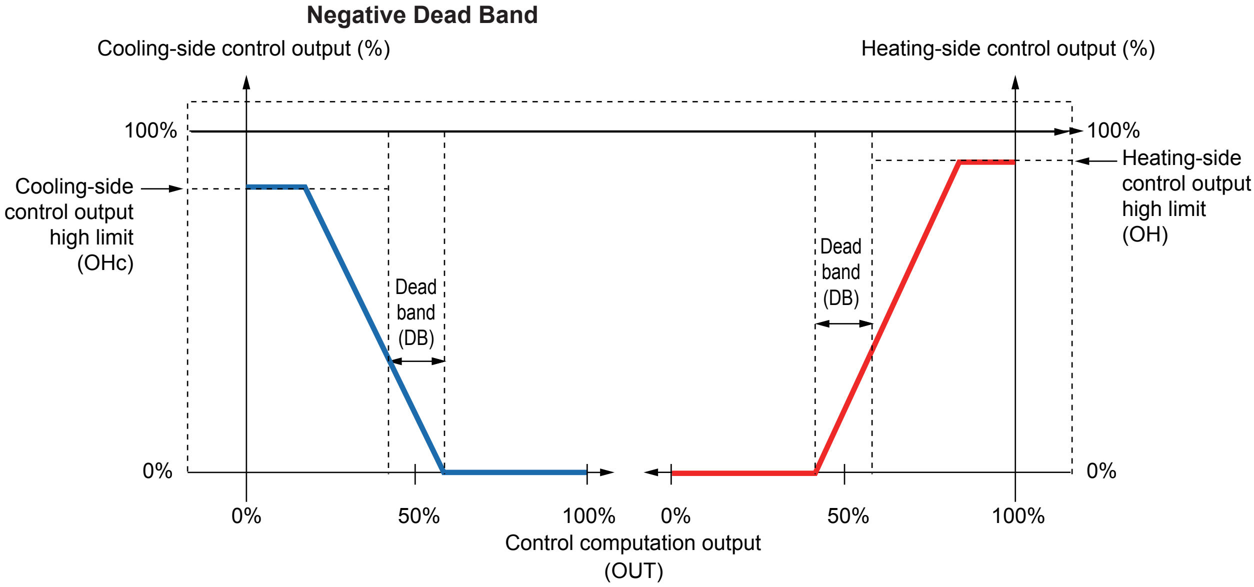
The following shows the formula and operation example.

$$HOUT = \left(OUT - \frac{DB}{2} - 50\% \right) \times 2$$

$$COUT = \left(50\% - OUT - \frac{DB}{2} \right) \times 2 \times \frac{P}{Pc}$$

*: OUT: control output, HOUT: heating-side control output,
COUT: cooling-side control output, P: heating-side proportional band,
Pc: cooling-side proportional band, and DB: dead band





CAUTION

- Set the ratio of the heating-side proportional band (P) to the cooling-side proportional band (Pc) to within 1 to 5.
- Setting the heating-side or cooling-side integral time (I or Ic) to "OFF" results in the integral time of both sides being set to "OFF."

When the Heating Side is in ON/OFF Control and the Cooling Side is in PID Control:

The following shows the formula and operation example.

Output turns on when

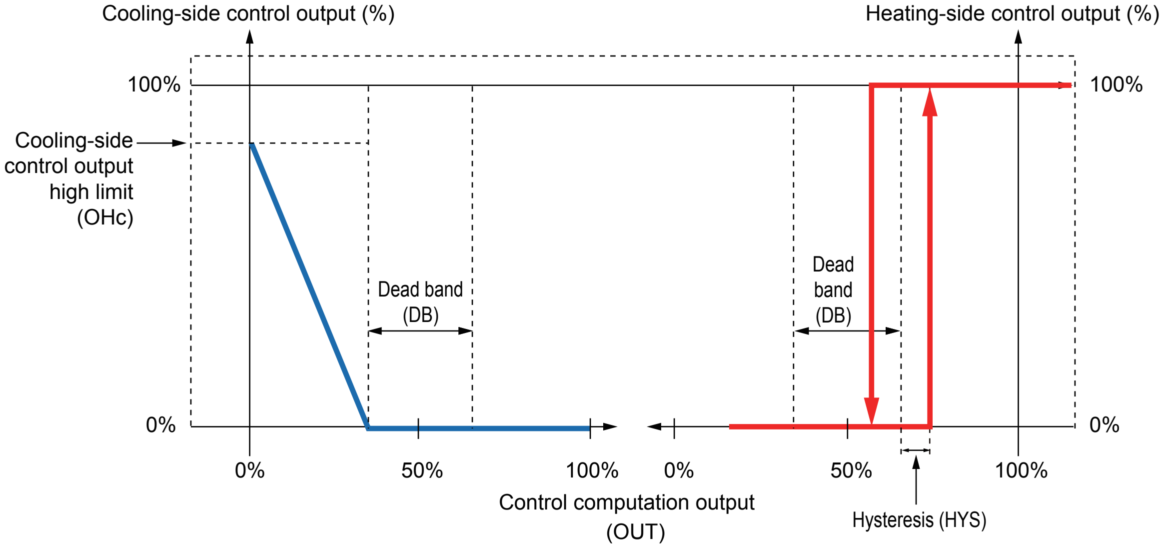
$$HOUT = OUT > \left(50\% + \frac{DB}{2} + \frac{HYS}{2} \right)$$

Other than this case, maintain current state.

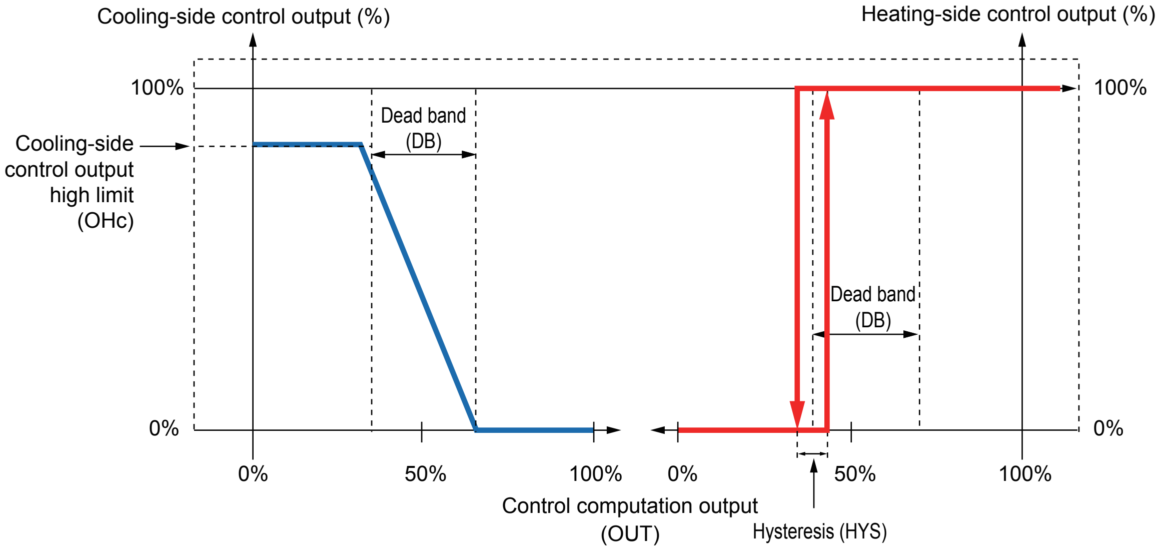
$$COUT = \left(50\% - OUT - \frac{DB}{2} \right) \times 2$$

*: OUT: control output, HOUT: heating-side control output, COUT: cooling-side control output, DB: dead band, and HYS: heating-side hysteresis

Positive Dead Band



Negative Dead Band



When the Heating Side is in PID Control and the Cooling Side is in ON/OFF Control:

The following shows the formula and operation example.

$$\text{HOUT} = \left(\text{OUT} - \frac{\text{DB}}{2} - 50\%\right) \times 2$$

Output turns on when

$$\text{COUT} = \text{OUT} < \left(50\% - \frac{\text{DB}}{2} - \frac{\text{HYSc}}{2}\right)$$

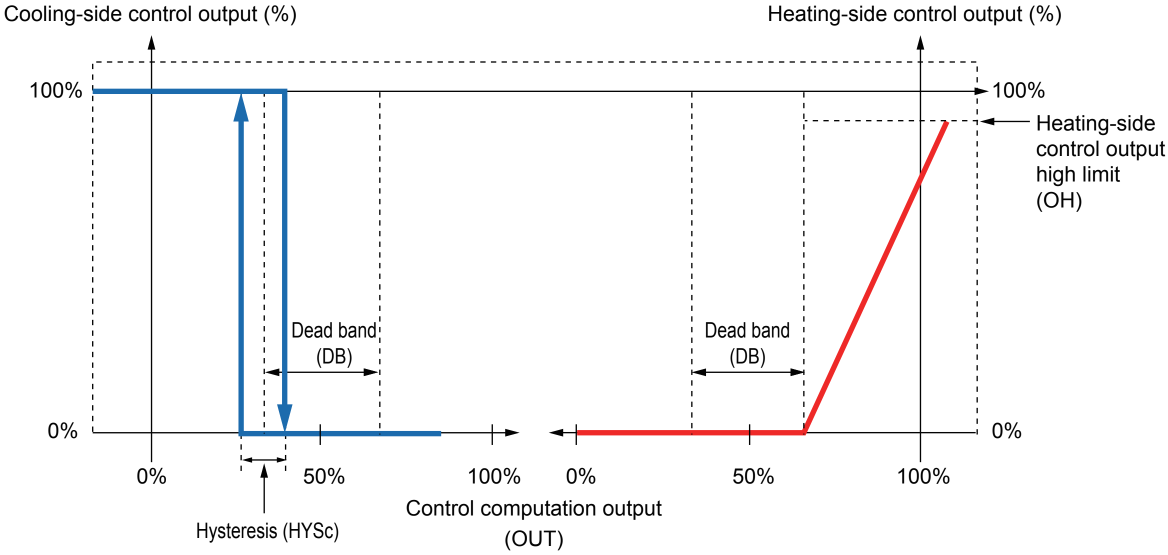
Output turns off when

$$\text{OUT} > \left(50\% + \frac{\text{DB}}{2} + \frac{\text{HYSc}}{2}\right)$$

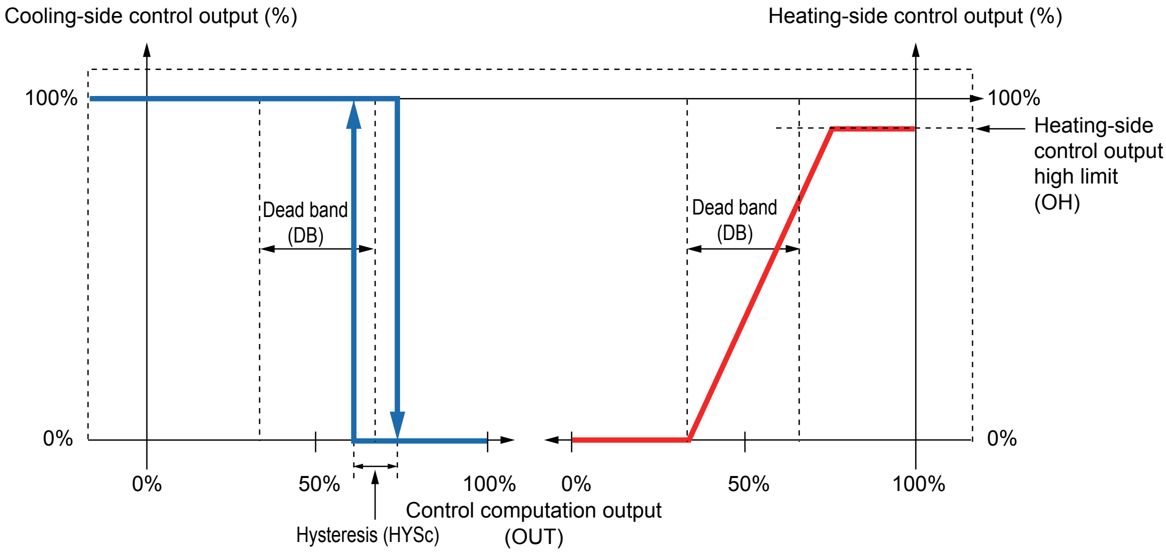
Other than these cases, maintain current state.

*: OUT: control output, HOUT: heating-side control output, COUT: cooling-side control output, DB: dead band, and HYSc: cooling-side hysteresis

Positive Dead Band

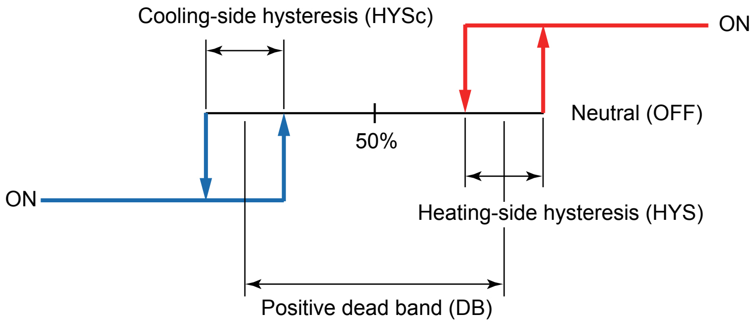


Negative Dead Band



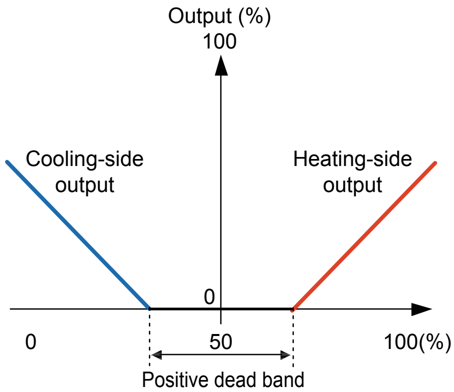
When both the Heating Side and Cooling Side are in ON/OFF Control:

The following shows the operation example.

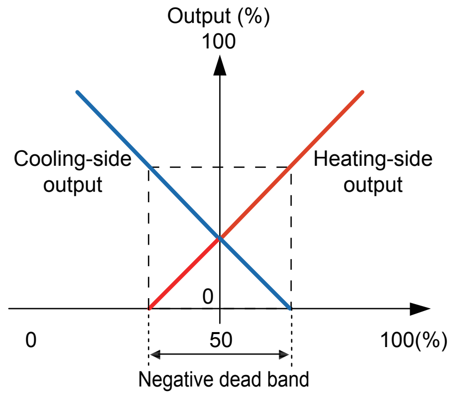


Dead Band (DB)

In Heating/cooling control, the positive dead band denotes the zone where none of the heating-side and cooling-side outputs are presented. The negative dead band denotes the zone where both of the heating-side and cooling-side outputs are presented.



Value of control output before split into heating- and cooling-side outputs



Value of control output before split into heating- and cooling-side outputs

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL Set
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID Ope
HYSc	Cooling-side ON/OFF control hysteresis	EASY	0.0 to 100.0%	
DB	Output dead band (in Heating/cooling control or Position proportional control)	EASY	In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, or R) is displayed on Group display while the parameter HYS, HYSc, or DB is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

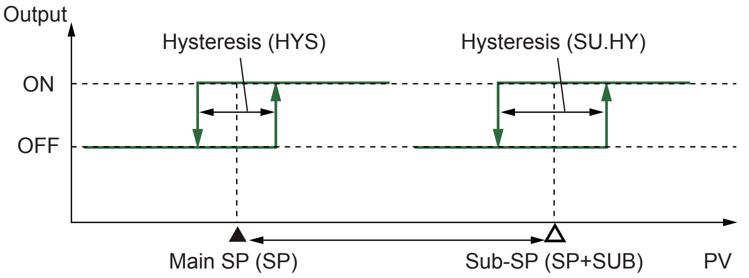
8.2.4 Two-position Two-level Control

Description

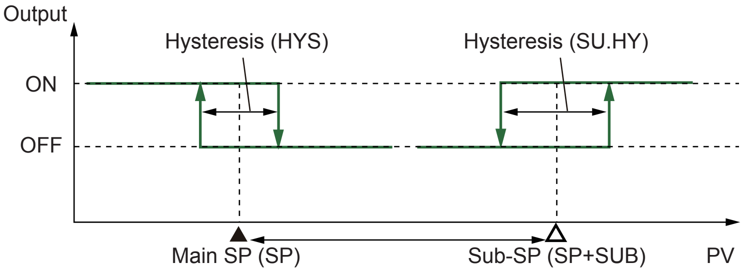
Two-position two-level control outputs the ON signal and OFF signal for the target setpoint (SP) of the main setting and the sub-target setpoint (SP + SUB) of the sub-setting.
The sub-setting is set as a deviation from the main setting.
Hysteresis can be set in the vicinity of the on/off output operating point

► Two-position two-level control: 8.1.1 Single-loop Control, Single-loop Heating/cooling Control, Single-loop Position Proportional Control, and Single-loop Two-position Two-level Control

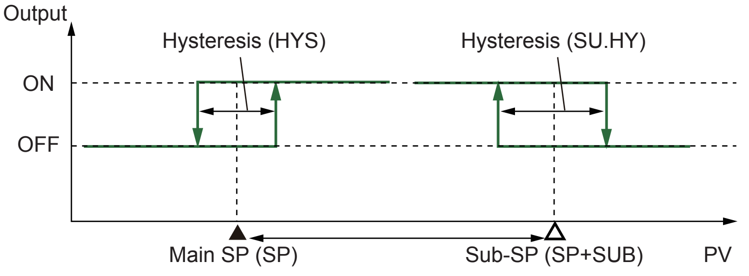
Main setting=Direct and Sub-setting=Direct



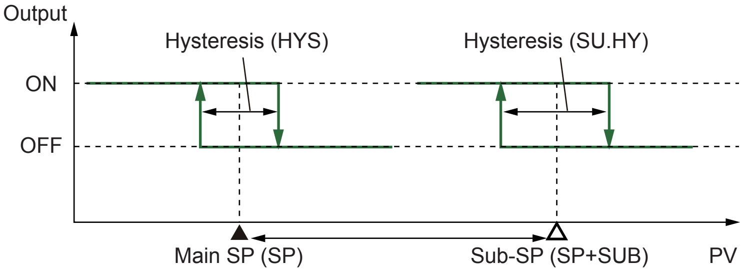
Main setting=Reverse and Sub-setting=Direct



Main setting=Direct and Sub-setting=Reverse



Main setting=Reverse and Sub-setting=Reverse



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL **Set**
SP	Target setpoint	EASY	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)	SP **Ope**
SUB	Sub-target setpoint (in Two-position two-level control)	EASY	Set the offset from SP. -100.0 to 100.0% of PV input range span (EUS)	
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID **Ope**
SU.HY	Sub-hysteresis (in Two-position two-level control)	EASY	0.0 to 100.0% of PV input range span (EUS)	
DR	Direct/reverse action switch	STD	RVS: Reverse action DIR: Direct action	
SU.DR	Sub-direct/reverse action switch (in Two-position two-level control)	STD		
PIDN	PID number selection	EASY	1 to 8	SP **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**

Note1: The PID number (1 to 8, R) is displayed on Group display while the parameter SP, SUB, HYS, SU.HY, DR, or SU.DR is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.2.5 PD Control (Stable Control in Which a Setpoint is not Exceeded)

Description

This control type performs control in which integral action (I action) is excluded from PID action.
Set the integral time (I or Ic) to OFF.
It is useful when stable control in which a setpoint is not exceeded is desired for integral processes in which constant flows are delivered.
The following shows the PID control computation formula.

$$OUT = \frac{100}{P}\left(e + Td\frac{d}{dt} \cdot \Delta PV\right) + MR$$

where OUT: control output, e: deviation (PV-SP), P: proportional band, Td: derivative time, ΔPV: PVn-PVn-1 (n-1: value before one control period), and MR: manual reset

The following table shows combination of PD control and control mode (CTLM).

	Control mode (CTLM)							
	SGL	CAS1	CAS2	CAS	BUM	PVSW	PVSEL	PVHD
PD control	√	N/A	√	√	√	√	√	√

√: Available, N/A: Not available

The following table shows combination of PD control and output method.

	Output method			
	Current output	Time proportional output	ON/OFF output	Position proportional output
PD control	√	√	N/A	√

√: Available, N/A: Not available

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
P	Proportional band	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.	PID **Ope**
D	Derivative time	EASY	OFF: Disable 1 to 6000 s	
MR	Manual reset	EASY	-5.0 to 105.0%	
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**

Note1: The PID number (1 to 8, or R) is displayed on Group display while the parameter P, D, or MR is displayed.

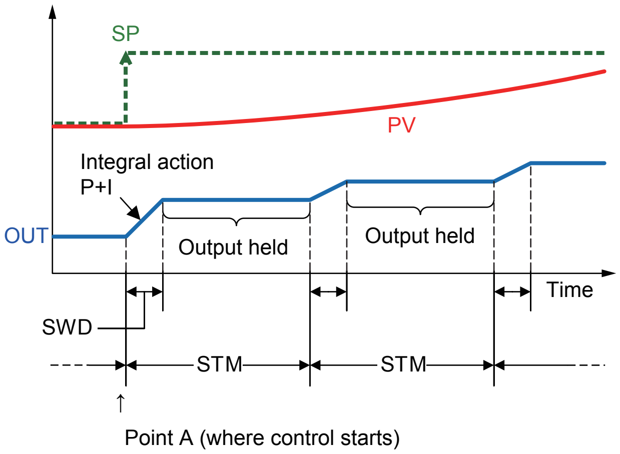
Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.2.6 Sample PI Control (Controlling a Process with Long Dead Time)

Description

Sample PI control performs PI control for a sample PI sampled time (STM) only during the first sample PI control time span (SWD). It subsequently holds a control output when that time elapses.
This control is useful for processes with long dead times where the results of the control output are not quickly reflected on PV.



where OUT: control output, SP: target setpoint, and PV: measured input
Action of Sample PI Control (S-PI)

To reduce overshoots, it is better to lengthen the sample PI sampled time (STM). This results however in the settling time becoming longer.
If the shortest cycle (TN) of the main disturbance imposed on process is smaller than the sample PI sampled time (STM), that disturbance cannot be controlled. A guideline is approximately STM ≤ TN/5.

STM is reset by control start (AUTO and RUN.)
Control starts from the point A when:
- Operation mode is switched from STOP to RUN,
- Operation mode is switched from MAN to AUTO,
- Input has recovered from burnout,
- Output tracking flag is switched from ON to OFF. (Ladder program used), or
- Power is turned on.

* If the sample PI sampled time (STM) or sample PI control time span (SWD) is changed, the operation is continued by the changed value immediately.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	CTL **Set**
P	Proportional band	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.	PID **Ope**
I	Integral time	EASY	OFF: Disable 1 to 6000 s	
PIDN	PID number selection	EASY	1 to 8	SP **Ope**
PIDG.	Number of PID groups	STD	1 to 8	
STM	Sample PI sampled time	EASY	0 to 9999 s	TUNE **Ope**
SWD	Sample PI control time span	EASY		

Note1: Even if the parameter D (derivative time) is set, the setting is invalid.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

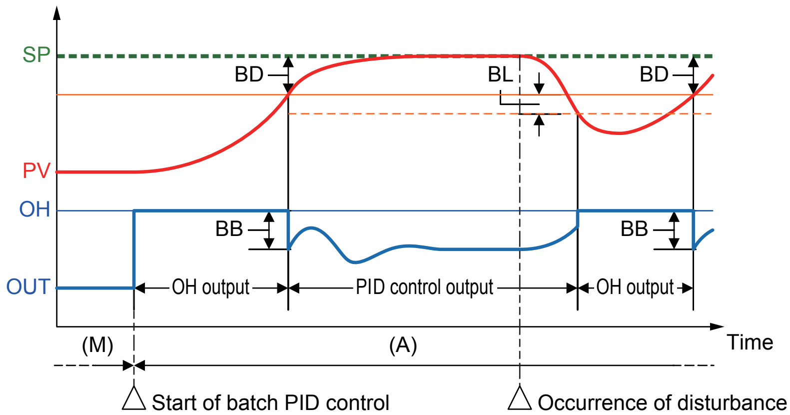
A guideline for STM is LM + TM x (2 to 3).
A guideline for SWD is STM/10.
Control is not executed when SWD = 0.
PI control is always executed when SWD (≠0) ≥ STM.

8.2.7 Batch PID Control (Performing Control with Rapidly Settling Setpoints)

Description

Batch PID control is useful for cases where control is performed causing the PV to settle to a target setpoint (SP) as quickly as possible without overshooting.
If a deviation (E) exceeding a batch PID deviation setpoint (BD) occurs, the controller outputs the control output high limit (OH) to quickly bring the PV to the SP (in the case of reverse action).
If a deviation (E) falls within the batch PID deviation setpoint (BD), the controller determines that the process is in a steady state and changes to PID control.
Upon changing to PID control, the controller starts to output from
OUT = OH − BB
to avoid an overshoot in the PV.
where batch PID bias (BB): Amount of output pulled back

If the deviation (E) exceeds the batch PID deviation setpoint (BD) after the controller has switched to PID control (steady state), no control output high limit (OH) will be output unless the deviation exceeds the batch PID lock-up width (BL).
Moreover, in the case of direct action, the controller outputs the control output low limit (OL) instead of the control output high limit (OH), making the batch PID bias (BB) act in the positive direction.
The following shows the action in Batch PID control.



where OUT: control output, OH: output high limit, SP: target setpoint, and PV: measured input

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward controll	CTL **Set**
P	Proportional band	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.	PID **Ope**
I	Integral time	EASY	OFF: Disable 1 to 6000 s	
D	Derivative time	EASY	OFF: Disable 1 to 6000 s	
PIDN	PID number selection	EASY	1 to 8	SP **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**
BD	Batch PID deviation setpoint	PRO	0.0 to 100.0% of PV input range span (EUS)	TUNE **Ope**
BB	Batch PID bias	PRO	0.0 to 100.0%	
BL	Batch PID lock-up width	PRO	0.0 to 100.0% of PV input range span (EUS)	

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

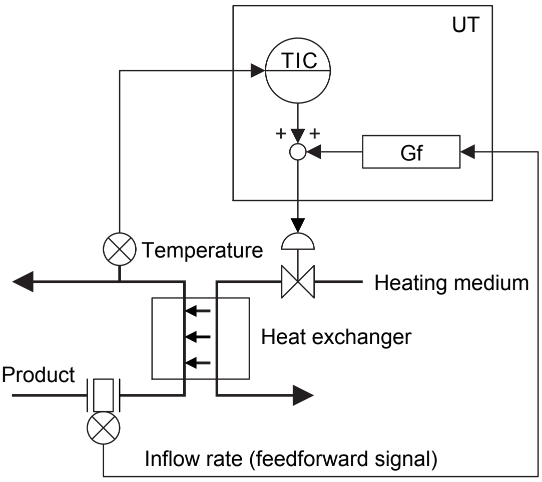
8.2.8 Feedforward Control

Description

Using only the feedback control results in a delay in recovery of the control target to normal status because PID action occurs only when the effects of disturbance appear on a PV.
If disturbance can be measured, a correction signal with respect to the disturbance can be applied in advance to the controller's output (OUT) to cancel out the disturbance before it affects the control target.
This is called feedforward control.

Improving heat exchanger controllability

For simple heat exchanger control, the addition of feedforward control enables compensation to be made for variations in the inflow rate.



Note

For Feedforward control, it is necessary to use the controller (UT55A-x7) equipped with AIN2 aux. analog input or to build the function by LL50A Parameter Setting Software with unused aux. analog input.

► Controller with AIN2 aux. analog input: 8.1 Setting Control Mode (CTLM), Function Block Diagram

Operation Description

The parameters that perform gain operation (feedforward gain (FGN)) and bias operation (feedforward input bias (FBI) and feedforward output bias (FBO)) for a disturbance measurement input signal (feedforward input (FF_CTL)) are provided.
FIN is within the range of -100.0 to 100.0%. FF_CTL is within the range of -5.0 to 105.0%

OUT = OUTc + FIN

$$\text{FIN} = \text{FGN}\left(\frac{1}{1+\text{FLG}\bullet s}\bullet \text{FF\_CTL} + \text{FBI}\right) + \text{FBO}$$

where OUT: control output, OUTc: feedback control output, s: Laplacian operator,
FF_CTL: feedforward input, and FLG: feedforward first-order lag time constant

Feedforward input can be confirmed using LL50A Parameter Setting Software.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward controll	CTL Set
P	Proportional band)	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control.	PID Ope
I	Integral time	EASY	OFF: Disable 1 to 6000 s	
D	Derivative time	EASY	OFF: Disable 1 to 6000 s	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set
FLG	Feedforward first-order lag time constant	PRO	OFF, 1 to 120 s	TUNE Ope
FGN	Feedforward gain		-9.999 to 9.999	
FBI	Feedforward input bias		-100.0 to 100.0%	
FBO	Feedforward output bias		-999.9 to 999.9%	

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.3 Setting PID Control Mode (ALG)

Description

There are two PID control modes: standard PID control mode and fixed-point control mode.
Select a PID control computation formula shown in the following table according to the control mode or operation mode.

Single-loop Control, Loop Control for Backup, Loop Control with PV Switching, Loop Control with PV Auto-selector, and Loop Control with PV-hold Function.

	Operation mode	
	AUTO+Local	AUTO+Remote
Standard PID control mode	PV derivative type (output bump at SP change)	Deviation derivative type
Fixed-point control mode	PV derivative type (output bumpless at SP change)	PV derivative type (output bump at SP change)

Cascade Primary-loop Control

	Operation mode	
	Cascade+Local	Cascade+Remote
Standard PID control mode	PV derivative type (output bump at SP change)	Deviation derivative type
Fixed-point control mode	PV derivative type (output bump at SP change)	PV derivative type (output bump at SP change)

Cascade Secondary-loop Control

	Operation mode		
	AUTO+Local	AUTO+Remote	Cascade
Standard PID control mode	PV derivative type (output bump at SP change)	Deviation derivative type	Deviation derivative type
Fixed-point control mode	PV derivative type (output bumpless at SP change)	PV derivative type (output bump at SP change)	PV derivative type (output bump at SP change)

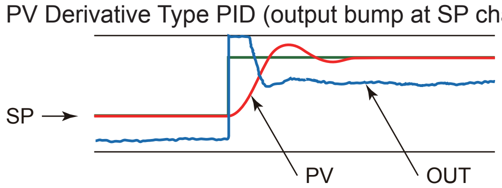
PV Derivative Type PID

This is a PID control method in which the derivative action works only on the PV.
It can also eliminate output bump due to SP changing operation in Local mode.
The following shows the PV derivative type PID control computation formula.

$$OUT = \frac{100}{P}\left(e + \frac{1}{Ti}\int e \bullet dt + Td\frac{d}{dt} \bullet \Delta PV\right)$$

where OUT: control output, e: deviation (PV-SP), P: proportional band, Ti: integral time, Td: derivative time, and ∆PV: PVn-PVn-1 (n-1: value before one control period)

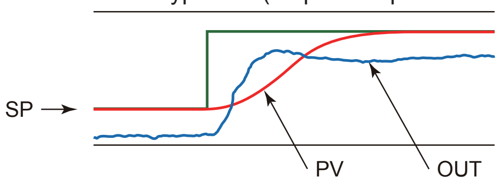
PV Derivative Type PID (output bump at SP change)



8

Control Functions

PV Derivative Type PID (output bumpless at SP change)



Deviation Derivative Type PID

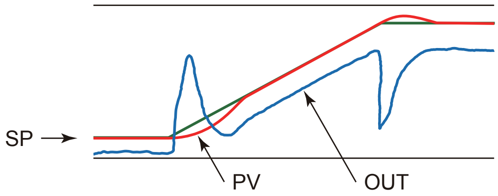
The PID control method in which derivative action works for the deviation value = PV – SP.

The derivative action works for a SP change, so this method is useful for cases like Cascade secondary-loop control where the SP-following capability is important.

The following shows the deviation derivative type PID control computation formula.

$$OUT = \frac{100}{P}\left(e + \frac{1}{Ti}\int e \bullet dt + Td\frac{d}{dt} \bullet e\right)$$

where OUT: control output, e: deviation (PV-SP), P: proportional band, Ti: integral time, and Td: derivative time



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ALG	PID control mode	PRO	0: Standard PID control mode 1: Fixed-point control mode.	CTL Set

8.4 Switching PID

8.4.1 Switching PID According to Target Setpoint Number (SPNO)

Description

The SP group number selection selects a group of target setpoint (SP) and PID parameters by switching the SP number (SPNO).
The PID number selection (PIDN) can be set for each SP group.

SP number (SPNO)	SP	PID parameter group
1	SP of group 1	Specify using the parameter PIDN of group 1
2	SP of group 2	Specify using the parameter PIDN of group 2
3	SP of group 3	Specify using the parameter PIDN of group 3
4	SP of group 4	Specify using the parameter PIDN of group 4
5	SP of group 5	Specify using the parameter PIDN of group 5
6	SP of group 6	Specify using the parameter PIDN of group 6
7	SP of group 7	Specify using the parameter PIDN of group 7
8	SP of group 8	Specify using the parameter PIDN of group 8

When ZON=0 (SP group number selection 1): In coordinated operation, slaves operate with the same PID number as that of the master.
The setpoint in the PID number selection (PIDN) within the SP group is ignored.

When ZON=3 (SP group number selection 2): In coordinated operation, slaves operate with the setpoint in the PID number selection (PIDN) within the SP group.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL Set
PIDN	PID number selection	EASY	1 to 8 (Depends on the setup parameter PIDG. setting.)	SP Ope
PID	PID number (display only)	EASY	1 to 8	MODE Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The initial values for PIDN of the eight groups are same as SP number selection (SPNO.).
Set a PID number to use as necessary.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note3: A currently-used PID number is displayed for the parameter PID.

Note

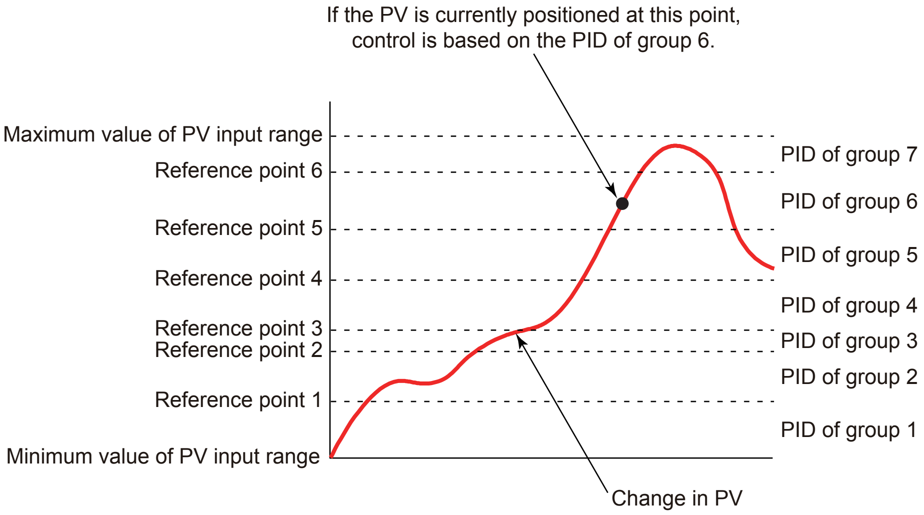
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.4.2 Switching PID According to PV

Description

The PID switching according to PV is a function that switches between the groups of PID parameters according to the PV.
The maximum number of PID groups to be switched is 8. (Set RP1 to RP7.)
This function is useful for reactors in which the chemical reaction gain changes depending on the temperature.

The figure below shows an example of dividing the PV input range from the maximum value to the minimum value into seven zones by reference points 1 to 6. (Set RP1 to RP6.)



The PV input range can be divided into the number of zones that is set in the reference point.
Hysteresis at the time of zone switch can be set.
► Setpoint PD: 8.4.6 Setting Hysteresis at Time of Zone Switch

Reference deviation can be set at the same time.
► Reference deviation: 8.4.5 Switching PID according to Deviation (Reference Deviation)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL **Set**
RP1 to RP7	Reference point 1 to 7	STD	0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)	ZONE **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**
PID	PID number (display only)	EASY	1 to 8, R: PID group for reference deviation	MODE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: A currently-used PID number is displayed for the parameter PID.

Note

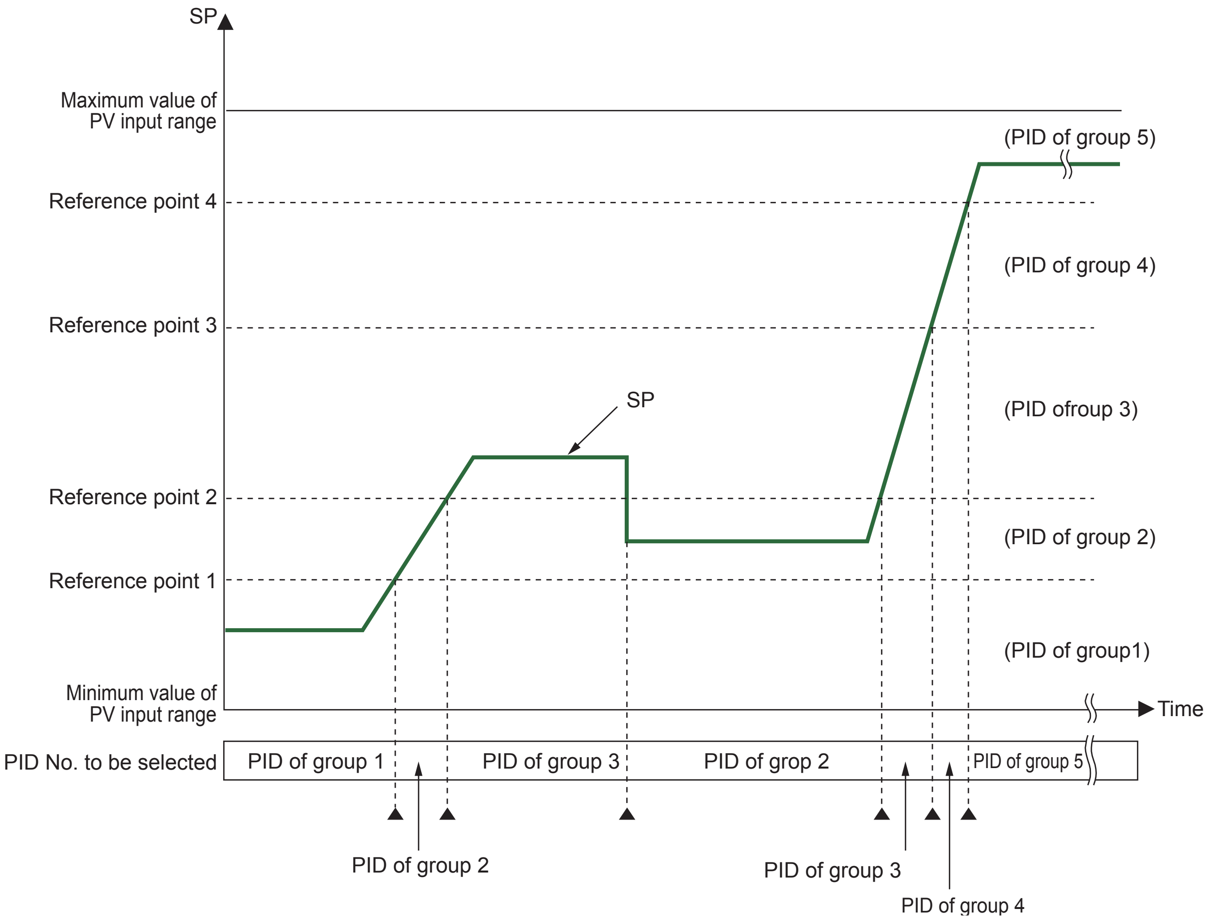
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.4.3 Switching PID According to SP

Description

The zone PID selection by SP switches between the groups of PID parameters according to the SP.
The maximum number of PID groups to be switched is 8. (Set RP1 to RP7)

The figure below shows the example of switching the group of PID parameters according to the SP. It shows an example of dividing the PV input range from the maximum value to the minimum value into five zones by reference points 1 to 4. (Set RP1 to RP4.)



The PV input range can be divided into the number of zones that is set in the reference point.

Reference deviation can be set at the same time.

► Reference deviation: 8.4.5 Switching PID according to Deviation (Reference Deviation)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL **Set**
RP1 to RP7	Reference point 1 to 7	STD	0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)	ZONE **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**
PID	PID number (display only)	EASY	1 to 8, R: PID group for reference deviation	MODE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: A currently-used PID number is displayed for the parameter PID.

Note

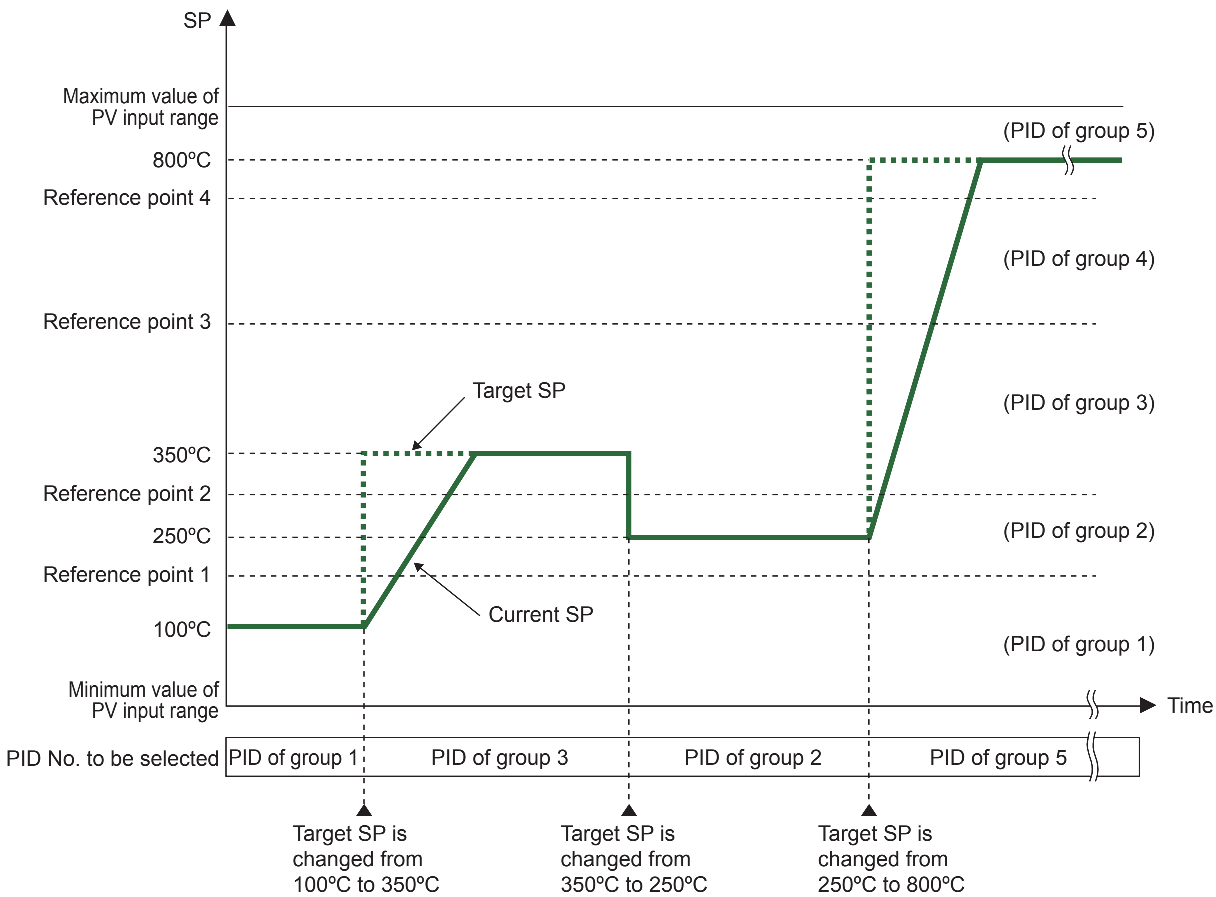
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.4.4 Switching PID According to Target SP

Description

The zone PID selection by target SP switches between the groups of PID parameters according to the target SP.

The figure below shows the example of switching the group of PID parameters according to the target SP. It shows an example of dividing the PV input range from the maximum value to the minimum value into five zones by reference points 1 to 4. (Set RP1 to RP4.)



The PV input range can be divided into the number of zones that is set in the reference point.

Reference deviation can be set at the same time.

► Reference deviation: 8.4.5 Switching PID according to Deviation (Reference Deviation)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL **Set**
RP1 to RP7	Reference point 1 to 7	STD	0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)	ZONE **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**
PID	PID number (display number)	EASY	1 to 8, R: PID group for reference deviation	MODE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: A currently-used PID number is displayed for the parameter PID.

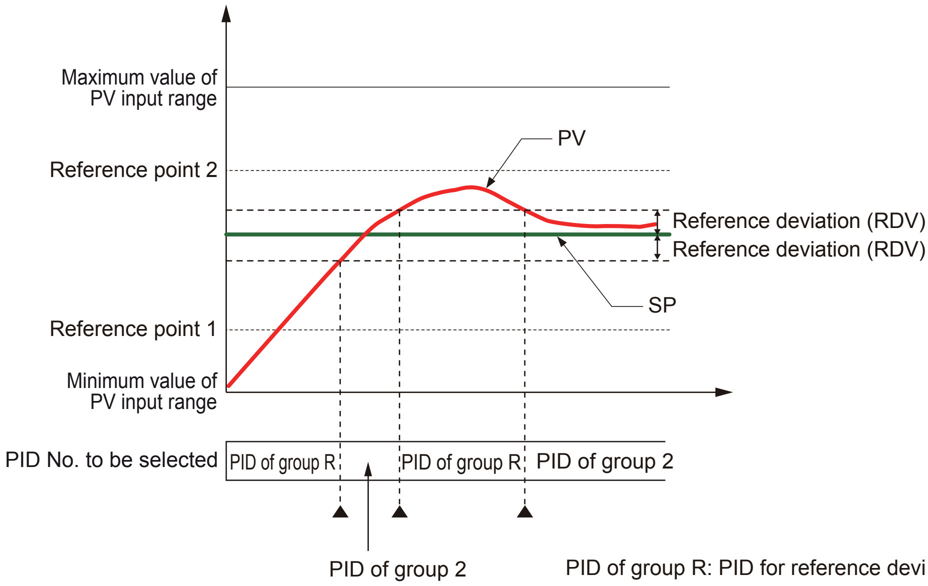
Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

8.4.5 Switching PID According to Deviation (Reference Deviation)

Description

The zone PID selection by deviation switches between the groups of PID parameters according to the amount of deviation.
This function is called “reference deviation.”
In the fixed point control, if the actual amount of deviation exceeds the setpoint of the reference deviation, the controller automatically changes to the PID parameter group (PID of group R) set for the zone. If the actual amount of deviation becomes smaller than the setpoint of reference deviation, the controller changes to the PID parameter group appropriate for the zone.
For example, if the deviation is large, PV can be reached more rapidly to SP by increasing the proportional gain (i.e., narrowing the proportional band). Switching PID according to deviation is effective when ZON is set to 1, 2, 4. The zone PID selection by reference deviation has priority over other zone PID selections.



Setting Details

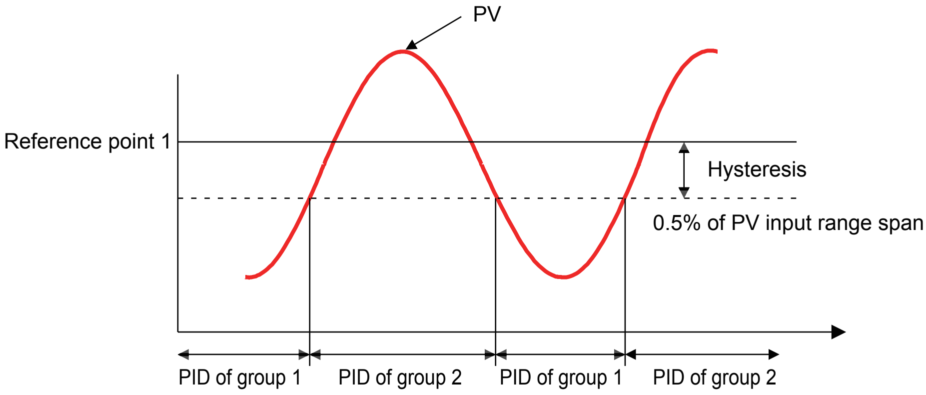
Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL **Set**
RDV	Reference deviation	STD	OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EUS)	ZONE **Ope**
PID	PID number (display only)	EASY	1 to 8, R: PID group for reference deviation	MODE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note2: A currently-used PID number is displayed for the parameter PID.

8.4.6 Setting Hysteresis at Time of PID Switch

Description

When the zone PID selection is selected, hysteresis at time of each zone switch can be set.
The following shows the operation example of hysteresis at time of zone switch.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RHY	Zone PID switching hysteresis	STD	0.0 to 10.0% of PV input range span (EUS)	ZONE Ope

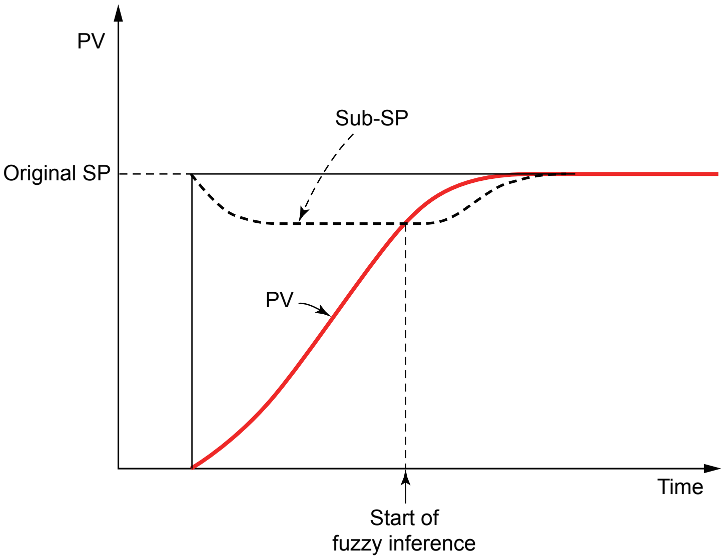
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

8.5 Suppressing Overshoot (Super Function)

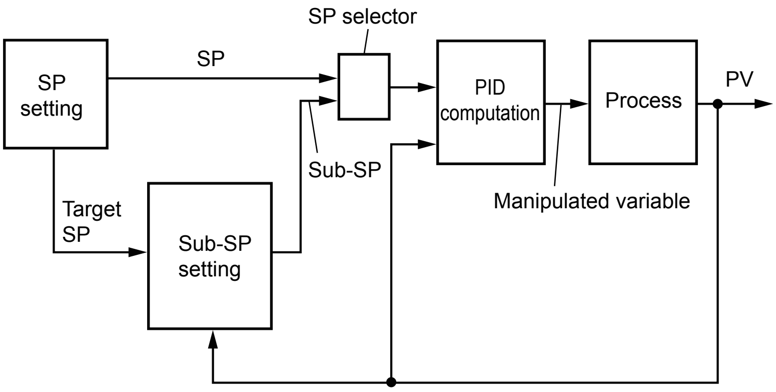
Description

The Super function monitors the deviation for evidence that there is a danger of overshoot, and on sensing such danger automatically changes the setpoint temporarily to a somewhat lower value (sub-SP).
Once the danger of overshoot appears diminished, the function returns the effective SP gradually to the true SP. "Fuzzy ratiocination" techniques are employed in the algorithms used to change the SP to the lower temporary value, and to return it gradually to the true SP.

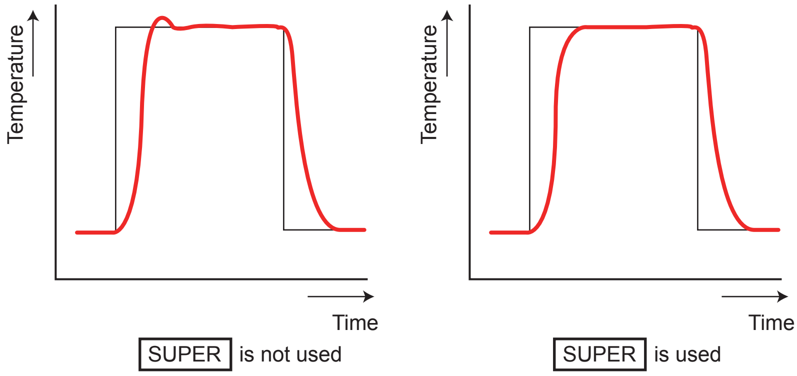
Operation Diagram



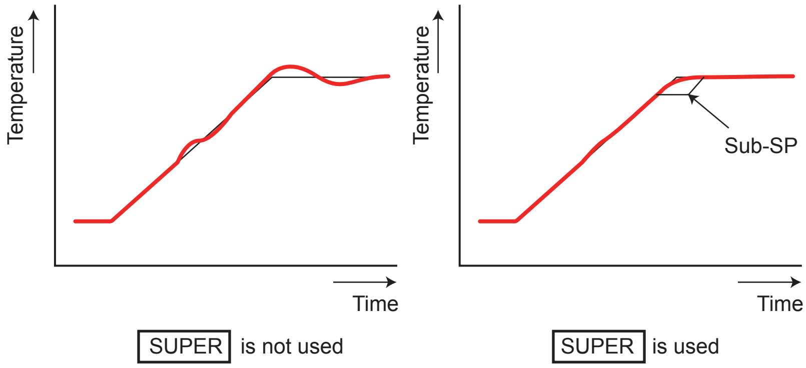
Control System Block Diagram



Example of Overshoot Suppression Control for Setpoint Changes



Example of Overshoot Suppression Control for Ramp-to-soak Transition



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SC	Super function	EASY	OFF: Disable 1: Overshoot suppressing function (normal mode) 2: Hunting suppressing function (stable mode) 3: Hunting suppressing function (response mode) 4: Overshoot suppressing function (strong suppressing mode)	TUNE Ope

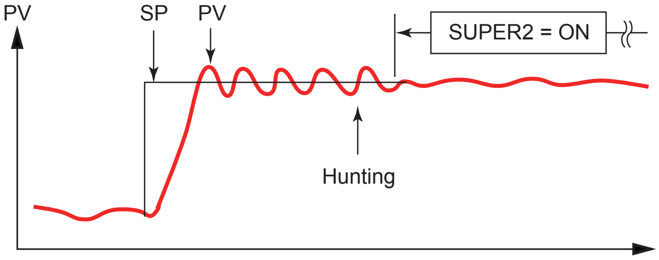
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

The setting SC=4 is effective compared with SC=1. However, the hunting may occur until the PV reaches SP. Use it as usage.
Do not use the Super function for the Sample PI control.

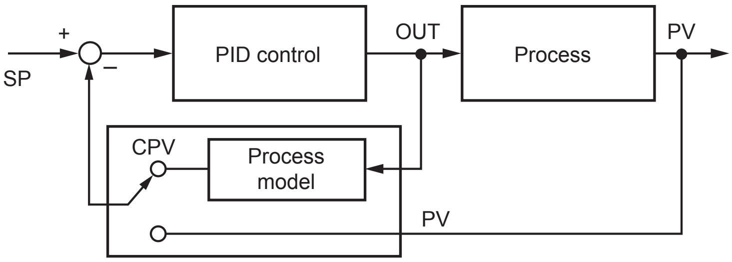
8.6 Suppressing Hunting (Super2 Function)

Description

The Super2 function suppresses the hunting effect of the controller without re-tuning the PID parameters.
Hunting means the PV becomes unstable and oscillates around SP.

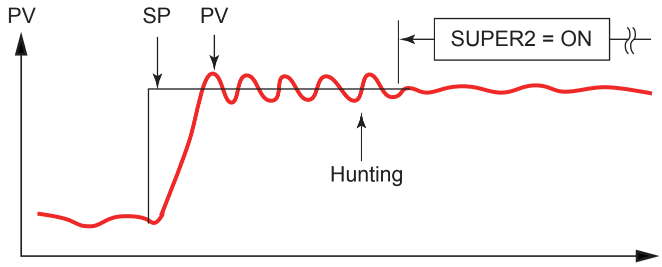


- In hunting condition, the Super2 function selects the output from process model as PV signal.
- The process model removes a factor of dead time from the actual process.
- The real process is under the open-loop condition.
- After hunting is suppressed, the Super2 function selects real PV signal, and carry out the standard feedback control.

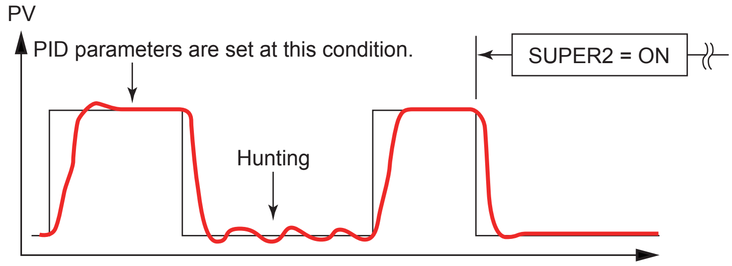


Effects of Super2

Load change



Temperature change



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SC	Super function	EASY	OFF: Disable 1: Overshoot suppressing function (normal mode) 2: Hunting suppressing function (stable mode) 3: Hunting suppressing function (response mode) 4: Overshoot suppressing function (strong suppressing mode).	TUNE Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

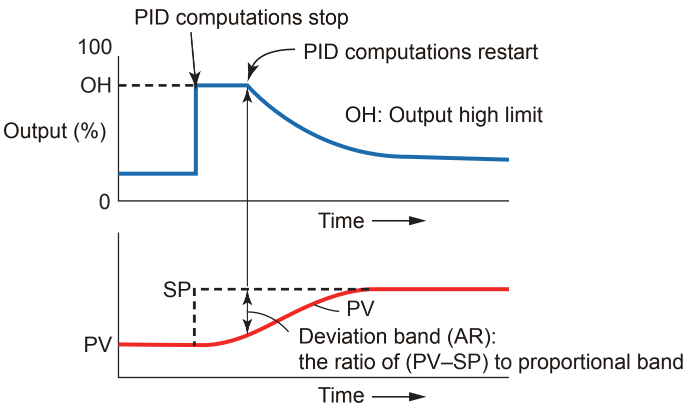
Set SC=2 when there are a lot of disturbances, and much hunting occurs.
Set SC=3 when SP is changed frequently. Hunting suppressing effect is smaller than that of SC=2, however, responsiveness is good.

Do not use the Super function for the Sample PI control.
The Super function does not work in direct action.

8.7 Suppressing Integral Action (Anti-reset Wind-up)

Description

Where there is a large deviation at the start of the control operation, for example, integral outputs are accumulated and the PV exceeds the SP, thereby causing the output to overshoot. To avoid this, the controller provides an anti-reset wind-up function for suppressing an extreme integral output by stopping PID computations. Same applies to the case of undershoot.



The parameter AR sets the point (by deviation band (%)) to restart the PID computation that is suspended by the controller's anti-reset windup function. PID computation restarts when the deviation band has decreased to the AR setpoint. When the parameter AR is set to AUTO, the controller automatically determines the point at which to restart the PID computation.

$$\text{Deviation band (= Setpoint of AR)} = \frac{|\,PV - SP\,|}{\text{Proportional band}} \times 100\ (\%)$$

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
AR	Anti-reset windup	STD	AUTO, 50.0 to 200.0%	TUNE Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

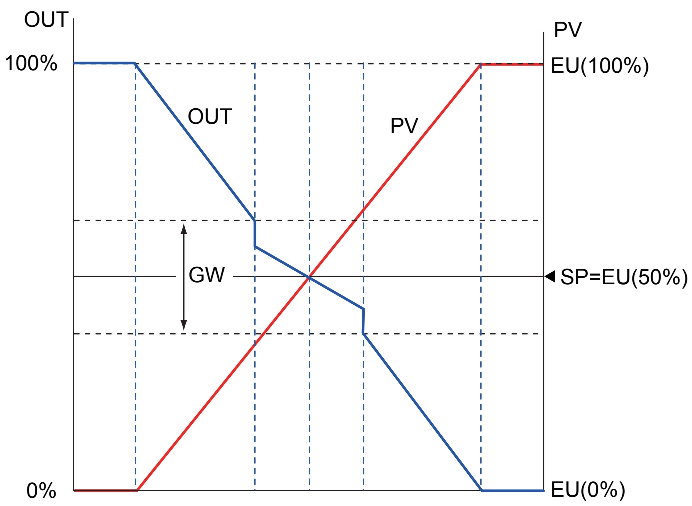
8.8 Performing Non-linear PID Control

Description

If a deviation (E) is smaller than the non-linear control gap width (GW), it is computed as a proportional added the non-lenear control gain (GG).

Proportional Band (CPB) = Proportional Band (P) / GG

* | E | ≤ GW / 2
However, CPB is limited by 0.1 to 999.9%.



Control output will change smoothly (i.e., without any bumps) when CPB switches.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
GW	Non-linear control gap width	PRO	OFF, 0.0%+1digit to 50.0% of PV input range span (EUS)	TUNE **Ope**
GG	Non-linear control gain	PRO	0.000 to 1.000	

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

8

Control Functions

8.9 Adjusting Auto-tuning Operation

Description

Auto-tuning Type

“Normal” of auto-tuning type requires a rapidly rising PID constant. This type is useful for processes that allow some overshooting.
On the other hand, “stable” of auto-tuning type requires a slowly rising PID constant.

Auto-tuning Output Limiter

When executing auto-tuning, the control output high and low limits can be set.
When the control output low limit > AT.OL, or AT.OH < control output high limit, auto-tuning is limited by the control output low or high limit.
In Heating/cooling control, AT.OH and AT.OL do not work.

Setting Details

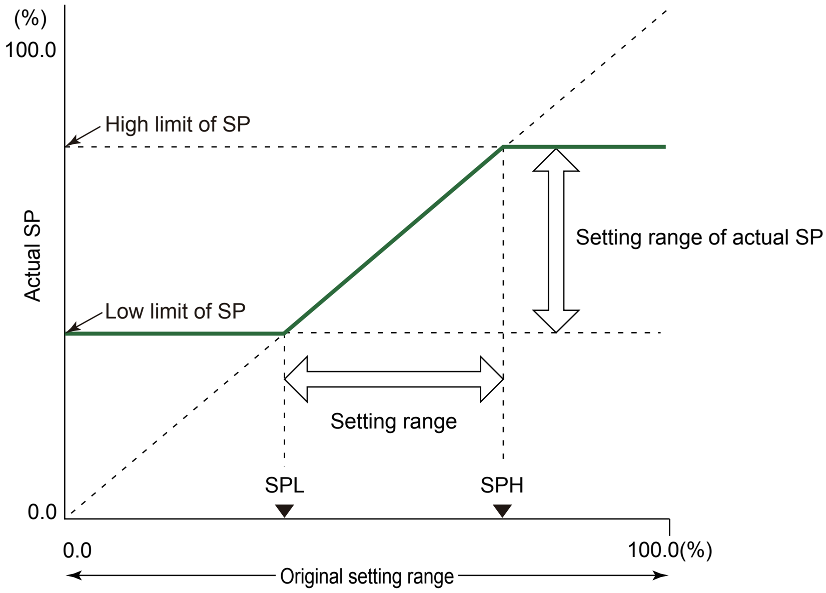
<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>AT.TY</td><td>Auto-tuning type</td><td>STD</td><td>0: Normal
1: Stability</td><td rowspan="3">TUNE Ope</td></tr>
<tr><td>AT.OH</td><td>Output high limit in auto-tuning</td><td>PRO</td><td rowspan="2">-5.0 to 105.0% (Disabled in Heating/cooling control)</td></tr>
<tr><td>AT.OL</td><td>Output low limit in auto-tuning</td><td>PRO</td></tr>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

9.1 Setting SP Limiter

Description

The SP high and low limits can be set to restrict the SP to the range between those limits whether in REM (remote) or LCL (local) mode. They works to the SP of all SP groups.
In Cascade control, the SP high and low limits can be set for both Loop1 and Loop 2.



► SP group: 6.2 Setting Target Setpoint

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SPH	SP high limit	STD	0.0 to 100.0% of PV input range (EU), (SPL<SPH)	MPV **Set**
SPL	SP low limit	STD		

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

9.2 Changing SP at a Fixed Rate (SP Ramp-Rate Setting Function)

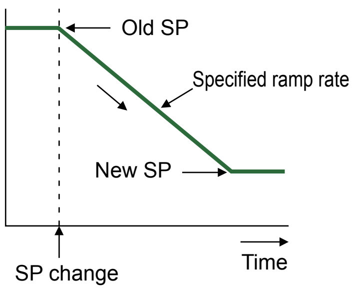
Description

SP ramp-rate setting function forces SP to change at a fixed rate when SP is changed in order to prevent abrupt changes in SP.
Velocity (rate-of-change) can be set for both the SP ramp-up rate (UPR) and SP ramp-down rate (DNR). Set the ramp–rate time unit (TMU) per hour or minute.

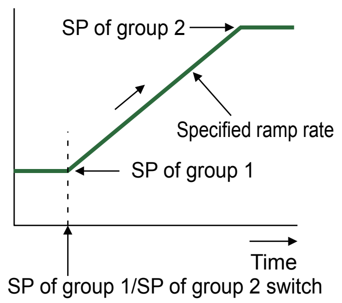
The SP ramp-rate setting function works when:
(1) SP is changed.
(2) SP is changed by switching SP number (SPNO).
(3) Power is turned on or has recovered from a failure (PV tracking=ON); or
(4) Operation mode is switched from MAN to AUTO (PV tracking=ON).

SP ramp-rate setting action starts from PV when the PV tracking function is used.

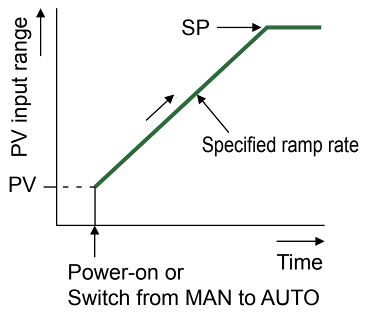
(1) When SP is changed

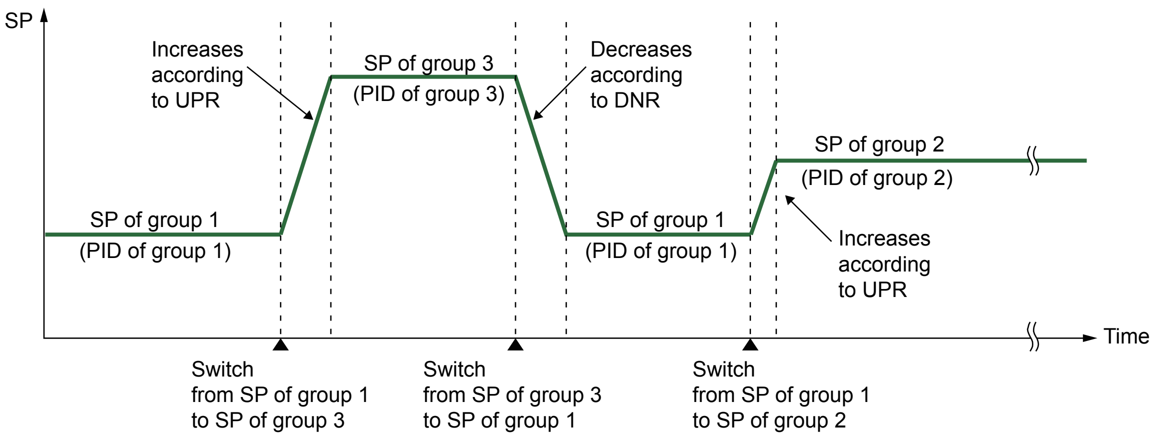


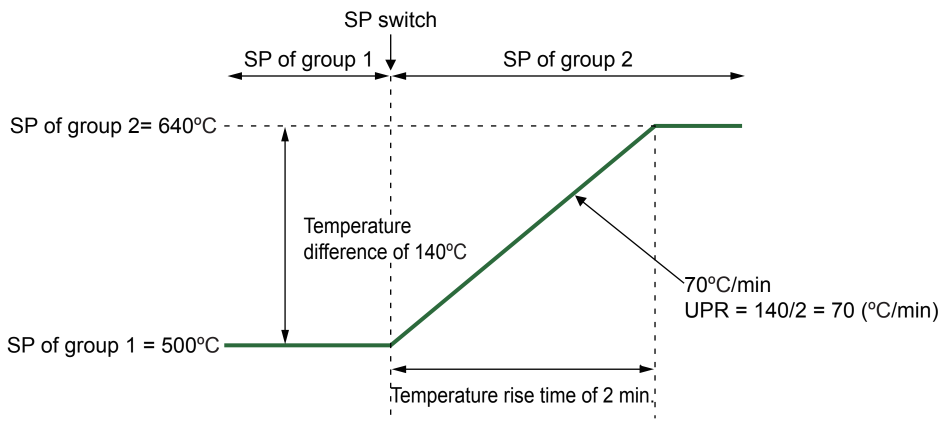
(2) When SP No. (SPNO) is switched



(3) When power is turned on (or power has recovered)
(4) When operation mode is switched from MAN to AUTO







$$\text{UPR} = \frac{\text{Temperature difference (°C)}}{\text{Time (min)}} = \frac{140°\text{C}}{2\text{ min}} = 70\ (°\text{C/min})$$

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
UPR	SP ramp-up rate	EASY	OFF, 0.0 + 1 digit to 100.0% of PV input range span (EUS)	SPS **Ope**
DNR	SP ramp-down rate	EASY		
TMU	SP ramp-rate time unit	EASY	HOUR: Ramp-up rate or ramp-down rate per hour MIN: Ramp-up rate or ramp-down rate per minute	

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

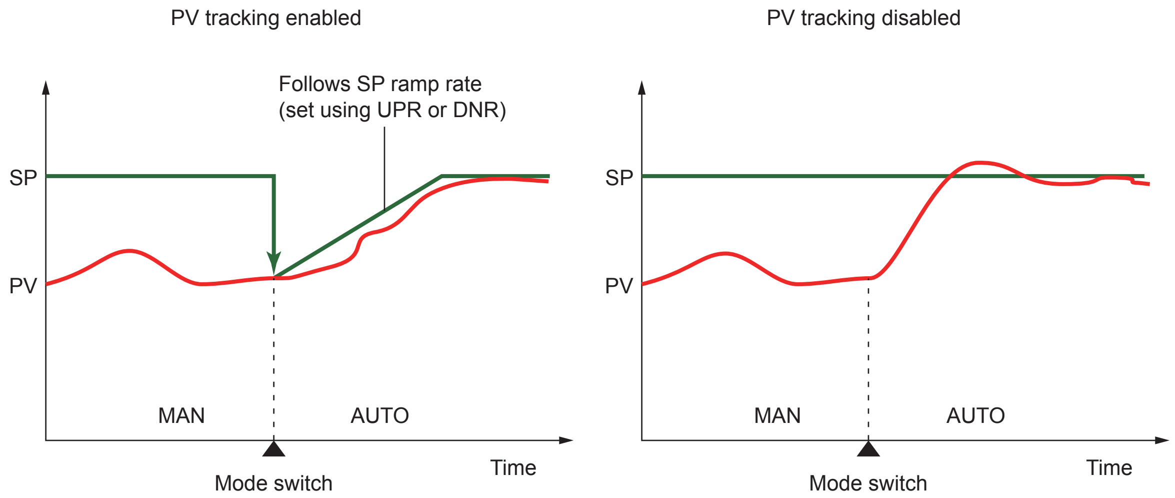
9.3 Forcing SP to Track PV (PV Tracking)

Description

PV tracking function is used to prevent abrupt PV changes.
With PV tracking, SP is first aligned with PV and then changed to its original SP at the SP ramp rate.

► SP ramp-rate setting function: 9.2 Changing SP at a Fixed Rate (SP Ramp-Rate Setting Function)

PV tracking function works when:
(1) Power is turned on or has recovered from a failure,
(2) SP number (SPNO) is changed,
(3) Operation mode is switched from STOP to RUN,
(4) Operation mode is switched from MAN to AUTO,
(5) Operation mode is switched from MAN to CAS (in Cascade control); or
(6) Output tracking flag is switched from ON to OFF (in Cascade primary-loop control or Loop control for backup)



Setting Details

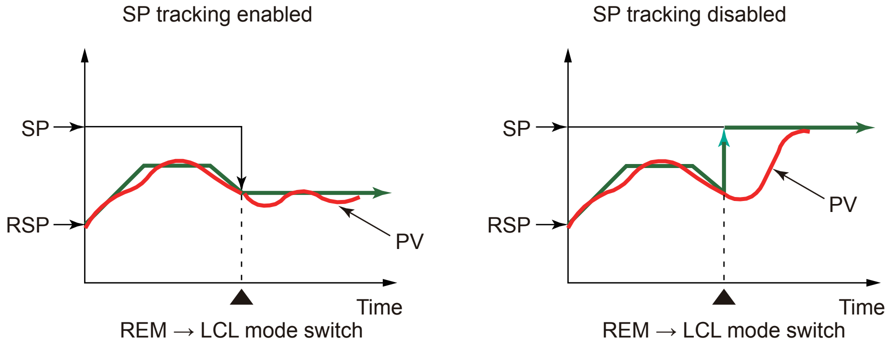
Parameter symbol	Name	Display level	Setting range	Menu symbol
PVT	PV tracking selection	STD	OFF, ON	SPS **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

9.4 Forcing SP to Track Remote Input (SP Tracking)

Description

SP tracking function is the function to force the local setpoint (SP) to track the remote setpoint (RSP) when the operation mode is switched from REM (remote) to LCL (local) mode.
The function is effective to prevent abrupt PV changes.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SPT	SP tracking selection	STD	OFF, ON	SPS **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

9.5 Setting Controller Action at Power ON (Restart Mode)

Description

For details, see Chapter 15, “Power Failure Recovery Processing.”

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
R.MD	Restart Mode	STD	Set how the controller should recover from a power failure of 5 seconds or more. CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.	SYS Set

The preset output (PO) is output in MAN or AUTO mode.

9.6 Setting Time between Powering on Controller and Starting Control (Restart Timer)

Description

The time between power on and the instant where controller starts control computation can be set.

Operation start time = Operating time of controller initialization after power on.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
R.TM	Restart Timer	STD	0 to 10 s	SYS Set

Blank Page

10.1 Setting Control Output Type

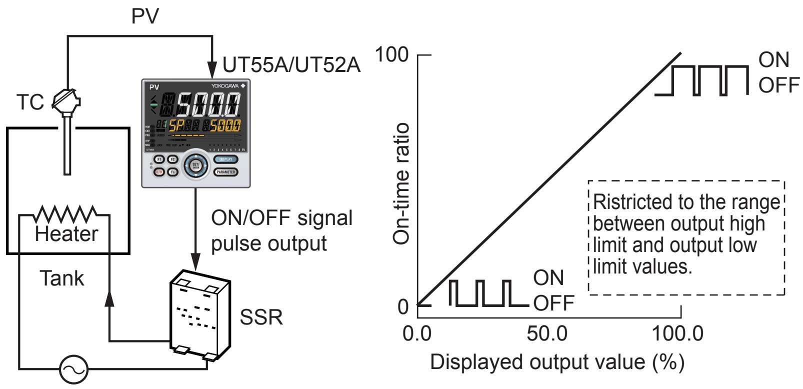
Description

Time Proportional Relay Output/ Time Proportional Voltage Pulse Output

In time proportional output, the control computation result is output in the form of an on/off signal pulse width proportional to the time. The pulse width is calculated as follows with the cycle time (control output cycle) at 100%.

Control output pulse width = Control output (%) x Cycle time

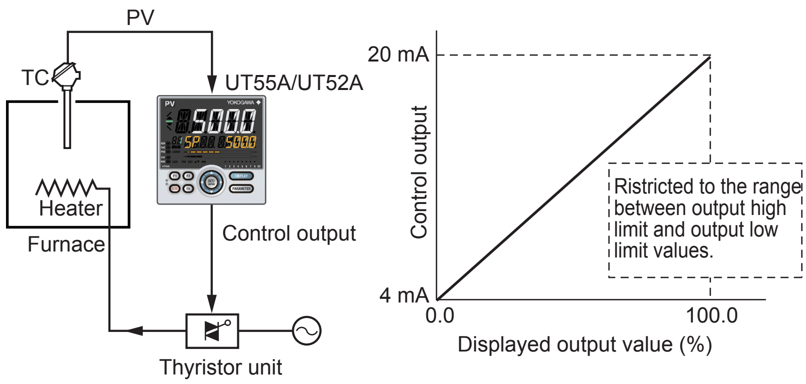
The output type is selected as either the relay output or the voltage pulse output.



► Cycle time: 10.2 Setting Control Output Cycle Time

Current Output

In current output, the control computation result is output as a current signal. (Example of 4 to 20 mA)



ON/OFF Output

ON/OFF control compares the SP and PV and outputs an on or off signal according to the positive or negative deviation (PV – SP).

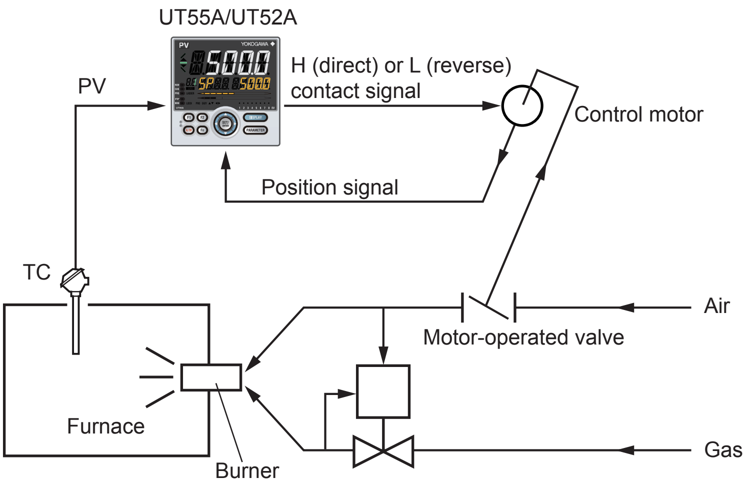
10

Output (Control and Retransmission) Functions

Position Proportional Output

Position proportional output is equipped only with Position proportional type (Suffix code: Type 1 = 1).

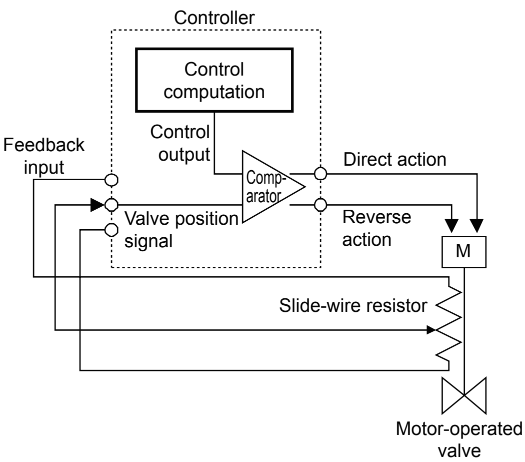
In position proportional output, valve opening is made proportional to the control computation results. The controller outputs direct and reverse signals (relay) to control motor movement and valve opening.



Feedback-type Position Proportional Output

In feedback-type position proportional output, the controller obtains a valve position signal from a feedback slide-wire resistor (overall resistance: 100 Ω to 2.5 kΩ) attached to a valve or feedback current input (4 to 20 mA).

The following shows an example using feedback slide-wire resistor.



When current is used for feedback input, only wiring is different

► Wiring for current: 17.4.5 Valve Position Output and Feedback Input Wiring

Estimating-type Position Proportional Output

In estimating-type position proportional output, set the operating time required for a valve to change from the fully-closed position to the fully-open position beforehand. With the preset operating time, the controller controls the valve by estimating its position.

Estimating-type position proportional output is used when feedback input signal cannot be obtained. (Feedback input wiring is not necessary.)

Note: When the control output is: upper limit=direct signal, lower limit=reverse signal.

Heating/cooling Output

Heating/cooling output is equipped only with Heating/cooling type (Suffix code: Type 1 = -2).

► Heating/cooling output: 8.2.3 Heating/cooling Control

Two-position Two-level Control Output

Two-position Two-level Control is equipped only with Heating/cooling type (Suffix code: Type 1 = -2).

► Two-position two-level control output: 8.1.1 Single-loop Control, Single-loop Heating/cooling Control, Single-loop Position Proportional Control, and Single-loop Two-position Two-level Control
► Two-position two-level control: 8.2.4 Two-position Two-level Control

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OT	Output type selection	EASY	Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay)	OUT Set

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

CAUTION

No output is generated even if the terminal which is not provided is selected. Confirm that the terminal to be selected is provided.

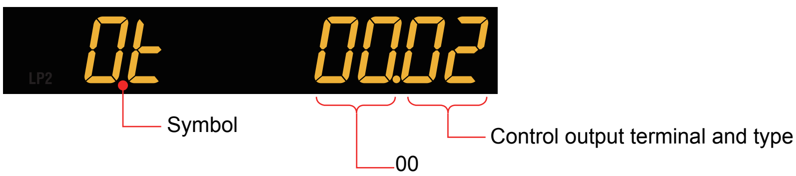
For each output terminal number, see 17.4, "Wiring."

Set a control mode, control type, and an input type before setting an output type.

► Control mode: 8.1 Setting Control Mode (CTLM)
► Control type: 8.2 Setting Control Type (CNT)
► Input type: 7.1.1 Setting Input Type, Unit, Range, Scale, and Decimal Point Position

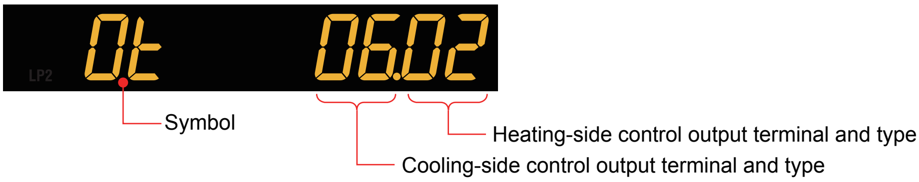
Control Output (PID Control, ON/OFF Control, Sample PI Control, Batch PID Control, or Feedforward Control) of Standard type

The figure below shows an example of setting the current output of the OUT terminal to the control output terminal and type. Set "02" to lower two digits and "00" to upper two digits.



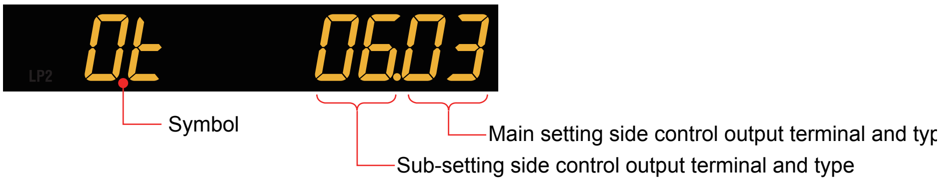
Heating/cooling Control Output of Heating/cooling Type

The figure below shows an example of setting the current output of the OUT terminal to the heating-side control output terminal and type, and setting the relay output of the OUT2 terminal to the cooling-side control output terminal and type.
Heating side: Set “02” to lower two digits. Cooling side: Set “06” to upper two digits.



Two-position Two-level Control Output (for Heating/cooling Type Only)

The figure below shows an example of setting the relay output of the OUT terminal to the control output terminal and type of main setting, and setting the relay output of the OUT2 terminal to the control output terminal and type of sub-setting.
Main setting side: Set “03” to lower two digits. Sub-setting side: Set “06” to upper two digits.



Position Proportional Output (for Position Proportional Type Only)

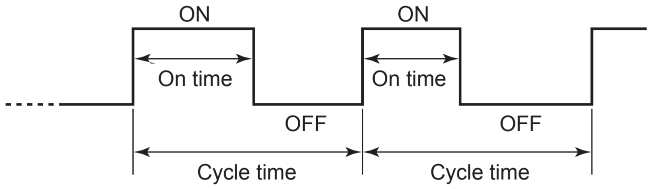
When Position proportional type is specified, the output form is fixed to the position proportional output and setting is not necessary. Adjustment of the valve position is necessary.

► Valve position adjustment: 10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)

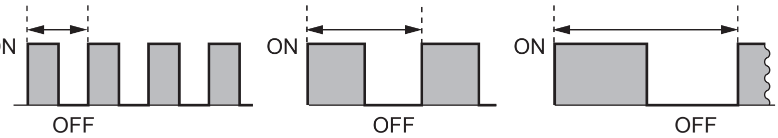
10.2 Setting Control Output Cycle Time

Description

Cycle time is the basic cycle period for a signal full cycle of ON/OFF operation for a relay or voltage pulse output. Reducing cycle time results in faster cycling and finer control. In contrast, reducing the ON/OFF period also reduces relay life. For relay output, set the control output cycle time to 30 to 200 seconds according to the process speed.



Comparison of operations for the same control output (50%)



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CT	Control output cycle time Heating-side control output cycle time (in Heating/cooling control)	EASY	0.5 to 1000.0 s	OUT Set
CTc	Cooling-side control output cycle time	EASY		

10

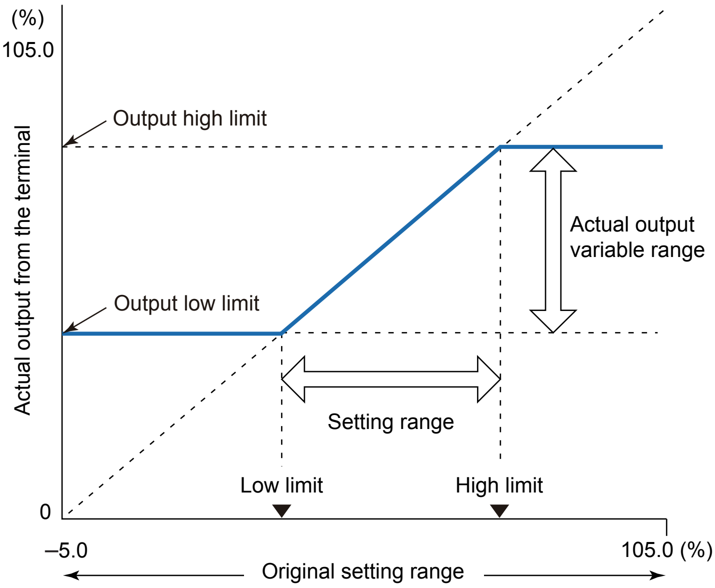
Output (Control and Retransmission) Functions

10.3 Setting Limiter to Control Output

Description

Control output high and low limits can be set to restrict the control output to the operation range between those limits.
The output limiter is prepared for each PID group, and works according to the selected PID group.
This, however, excludes preset output in STOP mode.

► PID group: 6.4 Adjusting PID Manually



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OH	Control output high limit Heating-side control output high limit (in Heating/cooling control)	EASY	-4.9 to 105.0%, (OL<OH) In Heating/cooling control: 0.1 to 105.0% (OL<OH)	PID Ope
OL	Control output low limit Heating-side control output low limit (in Heating/cooling control)	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL<OH)	
OHc	Cooling-side control output high limit	EASY	0.1 to 105.0%, (OLc<OHc)	
OLc	Cooling-side control output low limit	EASY	0.0 to 104.9%, (OLc<OHc)	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
Note3: When the setting is low limit ≥high limit, the controller operates as low limit = high limit -1 digit.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

10.4 Disabling Output Limiter in MAN mode

Description

Output limiter can be released when in MAN mode.
However, cannot be released when in Heating/cooling control.
Note that the output bump is caused if the operation mode is changed from AUTO to MAN or STOP to RUN while the control output is out of the range between the control output high limit (OH) and control output low limit (OL).
Control output bumps to OH in MAN mode when it is larger than OH.
Moreover, it bumps to OL when smaller than OL.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OLMT	Output limiter switch	PRO	OFF: Disable output limiter in MAN mode ON: Enable output limiter in MAN mode	TUNE Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

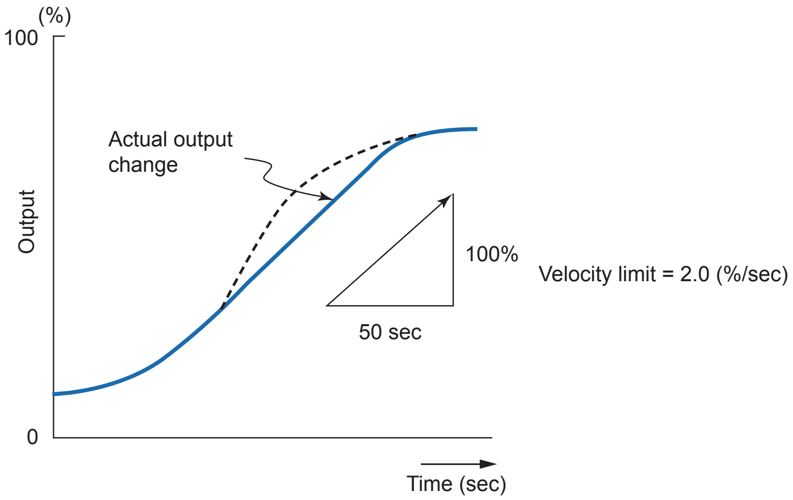
10

Output (Control and Retransmission) Functions

10.5 Setting Velocity Limiter to Control Output

Description

Output velocity limiter prevents the control output signal from changing suddenly in order to protect the control valves (or other actuators) and controlled process.
The output velocity limiter does not work in MAN or STOP mode or when input burnout or A/D error occurs.
Note that setting an output velocity limit may cancel the effects of derivative action.
The following shows the operation example of output velocity limiter.



In Heating/cooling control, the output velocity limiter can be set to the control computation result before split into heating-and cooling-side outputs.
In ON/OFF control or Two-position two-level control, the setting is invalid even if the output velocity limiter is set.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OPR	Output velocity limiter	STD	OFF: Disable 0.1 to 100.0%/s	TUNE **Ope**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

10.6 Reducing 4-20 mA Current Output to 0 mA (Tight Shut Function)

Description

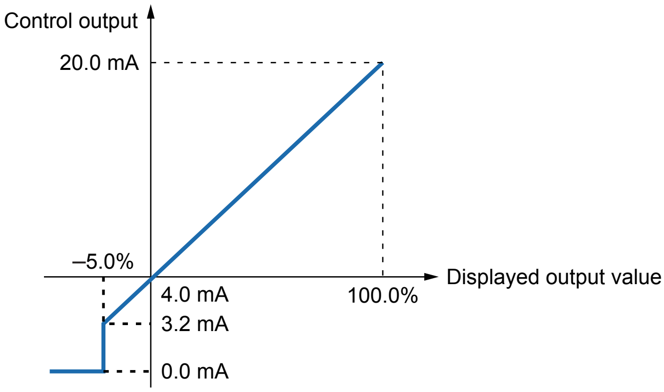
Tight shut function fully closes the control valve (or other actuators) (i.e., so that output is zero) beyond its positioner dead band.
When the output low limit is set to “SD,” the output is as follows in MAN or AUTO mode.

• In MAN mode

When the output is reduced with the Down arrow key and “SD” is displayed as the output value, the output level reaches tight shut level. The control output delivers a tight shut signal (about 0.0 mA).

• In AUTO mode

The output is limited by the output low limit (OL). It does not decrease to 0.0 mA.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OL	Control output low limit Heating-side control output low limit (in Heating/cooling control)	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut (0 mA output in MAN mode) In Heating/cooling control: 0.0 to 104.9% (OL<OH)	PID Ope
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

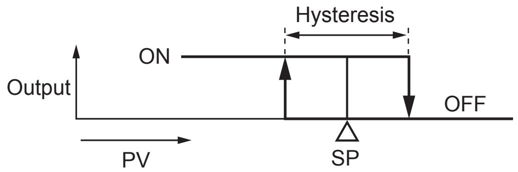
10.7 Setting ON/OFF Control Hysteresis

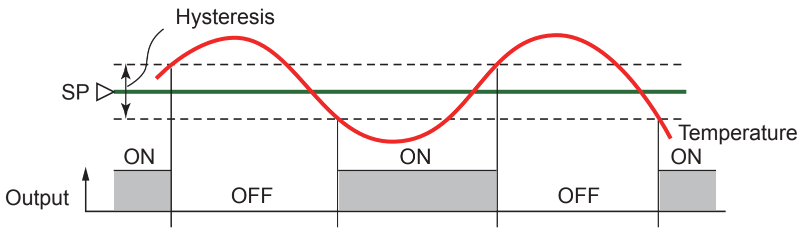
Description

In ON/OFF control, since the only two possible output states are ON and OFF, the control output cycles are as shown in the figure below. ON/OFF becomes quite narrow, so that if relay output is used, chattering occurs. In this case, the hysteresis should be set wider to prevent relay chattering and for the service life of the relay.

One Point of Hysteresis

For one point of hysteresis, set one point of hysteresis. In Heating/cooling control, set heating-side ON/OFF control hysteresis and cooling-side ON/OFF control hysteresis.

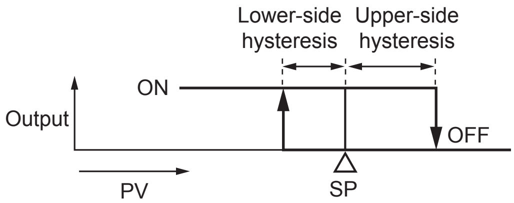


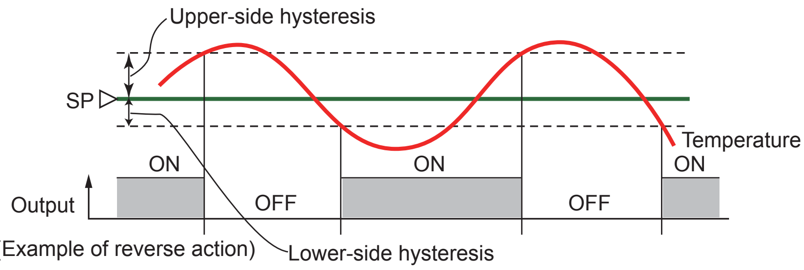


(Example of reverse action)

Two Points of Hysteresis

For two points of hysteresis, set two points of hysteresis (upper-side hysteresis and lower-side hysteresis).
Two points of hysteresis cannot be used for Heating/cooling control and Two-position two-level control.





(Example of reverse action)

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID Ope
HY.UP	Upper-side hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EUS)	PID Ope
HY.LO	Lower-side hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EUS)	PID Ope
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

10.8 Canceling Offset of PV and SP (Manual Reset)

Description

Manual reset can be used when the integral action is disabled.
When the integral action is disabled, there will be an offset of PV and SP. Manual reset cancels this offset.
The manual reset value equals the output value when PV = SP is true.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
MR	Manual reset	EASY	-5.0 to 105.0%	PID Ope
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, or R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

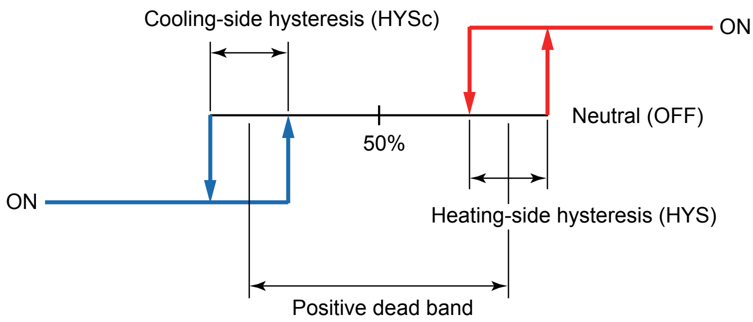
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

10.9 Setting Hysteresis and Dead Band for Heating/cooling Control Output

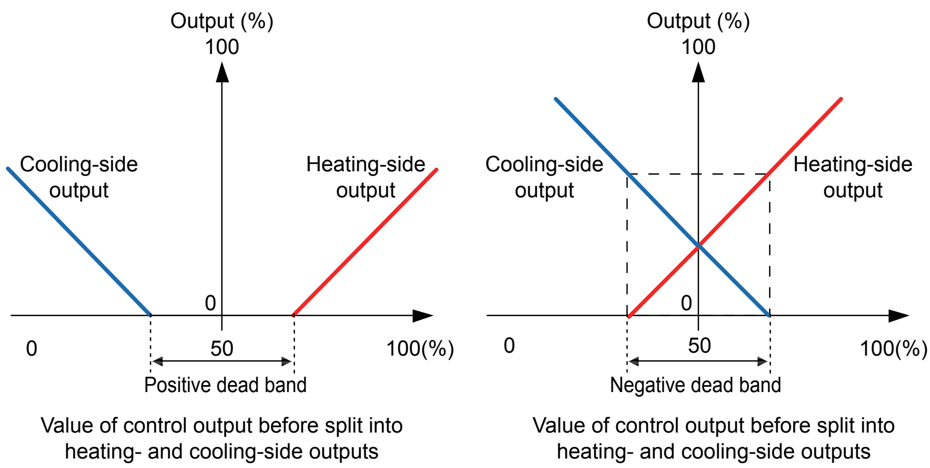
Description

In Heating/cooling control, the positive dead band denotes the zone where none of the heating-side and cooling-side outputs are presented. The negative dead band denotes the zone where both of the heating-side and cooling-side outputs are presented.

The following shows the case when both the heating side and cooling side are ON/OFF control.



The following shows the case when both the heating side and cooling side are PID control.



10

Output (Control and Retransmission) Functions

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID Ope
HYSc	Cooling-side ON/OFF control hysteresis	EASY	0.0 to 100.0%	
DB	Output dead band (in Heating/cooling control or Position proportional control)	EASY	In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, or R) is displayed on Group display while each parameter is displayed.

Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

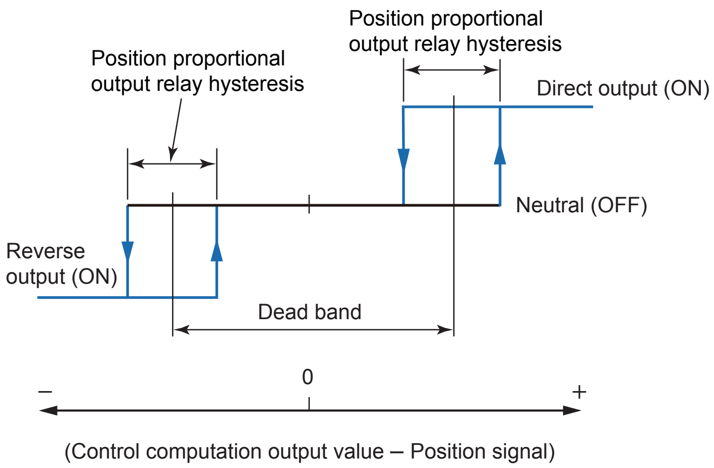
Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

10.10 Setting Hysteresis and Dead Band for Position Proportional Control Output

Description

To prevent excessively frequent operation of the motor and relays, a dead band is provided between two relay output operating points, and hysteresis is provided for each relay output.
If position signal differs from the control computation output by less than the dead band value, neither the “direct” nor “reverse” relay turns ON. If the difference is large enough on the plus side, the direct relay turns ON; if on the minus side, the reverse relay turns ON (in reverse action).



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	PID **Ope**
DB	Output dead band (in Heating/cooling control or Position proportional control)	EASY	In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%	
PIDN	PID number selection	EASY	1 to 8	SP **Ope**
PIDG.	Number of PID groups	STD	1 to 8	CTL **Set**

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

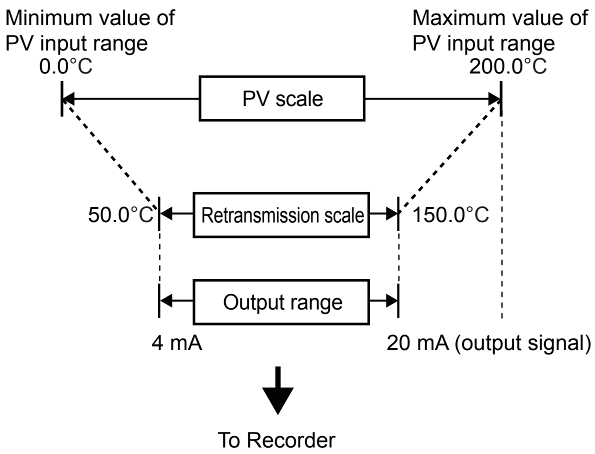
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

10.11 Setting Retransmission Output Terminal, Type, and Scales

Description

The retransmission output can be used when the control output is not assigned to the analog output terminal. Confirm the output type selection (OT) before setting the retransmission output. The range can be changed.

► Control output terminal: 10.1 Setting Control Output Type
► Current output range: 10.14 Changing Current Output Range



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RTS	Retransmission out type of RET	EASY	OFF: Disable PV1: PV SP1: SP OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control) LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Heating-side OUT COUT1: Cooling-side OUT MV1: Position proportional output (internal computed value) TSP2: Loop-2 target SP HOUT2: Loop-2 heating-side OUT COUT2: Loop-2 cooling-side OUT MV2: Loop-2 position proportional output (internal computed value) PV: PV terminals analog input RSP: RSP terminals analog input AIN2: AIN2 terminals analog input AIN4: AIN4 terminals analog input	OUT **Set**

(Continued)

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>RTH</td><td>Maximum value of retransmission output scale of RET</td><td>STD</td><td rowspan="2">When RTS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4,
RTL + 1 digit to 30000
-19999 to RTH - 1 digit

Decimal point position:
When RTS=PV1, SP1, or TSP1, decimal point position is same as that of PV input.
When RTS=PV2, SP2, or TSP2, decimal point position is same as that of RSP input.
When RTS=PV, decimal point position is same as that of PV input scale.
When RTS=RSP, decimal point position is same as that of RSP input scale.
When RTS=AIN2, decimal point position is same as that of AIN2 scale.
When RTS=AIN4, decimal point position is same as that of AIN4 scale.</td><td rowspan="5">OUT Set</td></tr>
<tr><td>RTL</td><td>Minimum value of retransmission output scale of RET</td><td>STD</td></tr>
<tr><td>O1RS</td><td>Retransmission output type of OUT current output</td><td>STD</td><td>Same as RTS</td></tr>
<tr><td>O1RH</td><td>Maximum value of retransmission output scale of OUT current output</td><td>STD</td><td rowspan="2">When O1RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4,
O1RL + 1 digit to 30000
-19999 to O1RH - 1 digit

Decimal point position:
When O1RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input.
When O1RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input.
When O1RS =PV, decimal point position is same as that of PV input scale.
When O1RS =RSP, decimal point position is same as that of RSP input scale.
When O1RS =AIN2, decimal point position is same as that of AIN2 scale.
When O1RS =AIN4, decimal point position is same as that of AIN4 scale</td></tr>
<tr><td>O1RL</td><td>Minimum value of retransmission output scale of OUT current output</td><td>STD</td></tr>
</table>

(Continued)

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>O2RS</td><td>Retransmission output type of OUT2 current output</td><td>STD</td><td>Same as RTS</td><td rowspan="3">OUT Set</td></tr>
<tr><td>O2RH</td><td>Maximum value of retransmission output scale of OUT2 current output</td><td>STD</td><td rowspan="2">When O2RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4,
O2RL + 1 digit to 30000
-19999 to O2RH - 1 digit

Decimal point position:
When O2RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input.
When O2RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input.
When O2RS =PV, decimal point position is same as that of PV input scale.
When O2RS =RSP, decimal point position is same as that of RSP input scale.
When O2RS =AIN2, decimal point position is same as that of AIN2 scale.
When O2RS =AIN4, decimal point position is same as that of AIN4 scale.</td></tr>
<tr><td>O2RL</td><td>Minimum value of retransmission output scale of OUT2 current output</td><td>STD</td></tr>
</table>

Setpoints PV2, SP2 and OUT2: Can be used in Cascade control.
Setpoints HOUT1 and COUT1: Can be used in Heating/cooling control.
Setpoint MV1: Can be used in Position proportional control.
(When opening or closing a valve by key operation in manual mode opration, the transmission output becomes -5.0 %.)
Setpoint TSP2: Can be used in Cascade control.
Setpoints HOUT2 and COUT2: Can be used in Cascade control of Heating/cooling type.
Setpoint MV2: Can be used in Cascade control of Position proportional type.
(When opening or closing a valve by key operation in manual mode opration, the transmission output becomes -5.0 %.)
Setpoint RSP: Can be used when equipped with remote input.
Setpoints AIN2 and AIN4: Can be used when the UT55A suffix code: Type 2 = 7.

Parameters and Corresponding Terminals

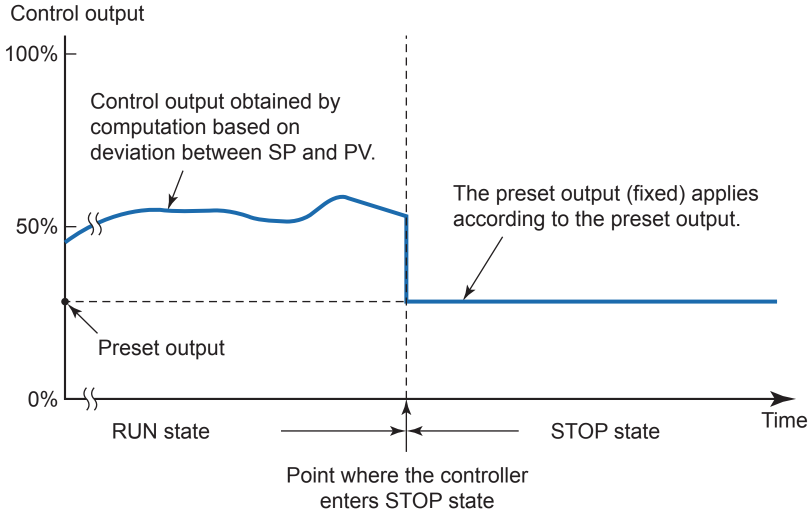
RTS, RTH, RTL	RET terminal
O1RS, O1RH, O1RL	OUT terminal
O2RS, O2RH, O2RL	OUT2 terminal

10.12 Setting Preset Output Value

10.12.1 Setting Output Value in STOP Mode (Preset Output)

Description

Preset output becomes the output when the operation mode is switched from RUN to STOP.
The preset output is not limited by the output high and low limits.
The preset output is prepared for each PID parameter group, and works according to the selected PID parameter group.



► Output limiter: 10.3 Setting Limiter to Control Output

Preset Output in Heating/cooling Control

The preset output can be set for both of the heating and cooling sides.
The computation starts from the value of 50% of internal computed value (value before split into heating- and cooling-side outputs) when the operation mode is switched from STOP to RUN.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PO	Preset output Heating-side preset output (in Heating/ cooling control)	EASY	In STOP mode, fixed control output can be generated. In Position proportional control, Valve opening can be set; -5.0 to 105.0%	PID Ope
POc	Cooling-side preset output	EASY		
SU.PO	Sub-preset output (in Two-position two-level control)	EASY	In STOP mode, fixed sub-control output can be generated. 0%, 100%	
PIDN	PID number selection	EASY	1 to 8	SP Ope
PIDG.	Number of PID groups	STD	1 to 8	CTL Set

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

For ON/OFF output (ON/OFF output or ON/OFF output in Two-position two-level control or Heating/cooling control), 0.0% is output when the setting value is 0.0% or less and 100.0% is output when 0.1% or more.

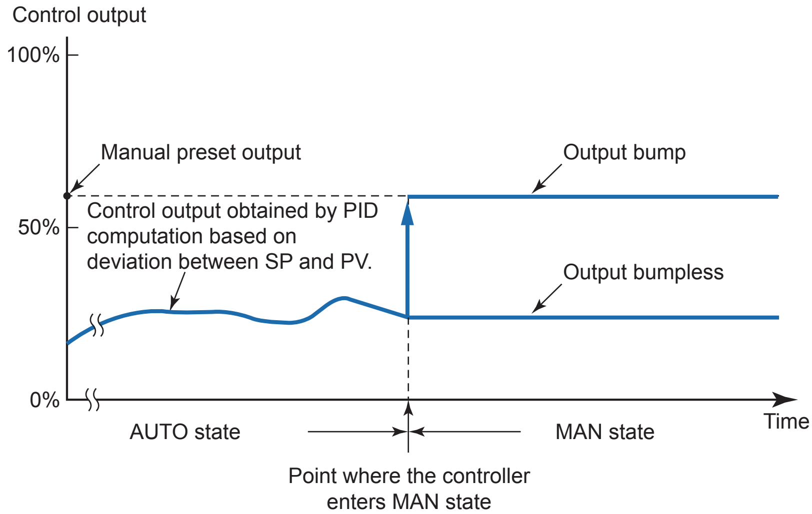
10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

Description

When the operation mode is switched from AUTO to MAN, each of the following can be selected.

- The control output takes over the control output as is.
- The control output bumps to the manual preset output.

When the manual preset output is output, the manual operation is possible after the bump.
Manual preset output is limited by the output high and low limits. (when Output limiter switch (OLMT) = ON)



When the operation mode is switched from MAN to AUTO, transferred without bump from the manual output to the control output.

► Output limiter: 10.3 Setting Limiter to Control Output
► Output limiter switch: 10.4 Disabling Output Limiter in MAN mode

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
MPON	Manual preset output number selection	STD	OFF: Hold the control output in AUTO mode (bumpless) 1: Use manual preset output 1 (output bump) 2: Use manual preset output 2 (output bump) 3: Use manual preset output 3 (output bump) 4: Use manual preset output 4 (output bump) 5: Use manual preset output 5 (output bump)	TUNE **Ope**
MPO1 to MPO5	Manual preset output 1 to 5	STD	-5.0 to 105.0%	

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

10.12.3 Setting Output Value When Error Occurs (Input Error Preset Output)

Description

The 0% control output, 100% control output, or input preset output can be selected and output as input error preset output in the following conditions.

- The input burnout occurs during operation in AUTO or CAS mode and RUN mode.
- The ADC error occurs during operation in AUTO or CAS mode and RUN mode.

However, the manual output becomes the output when the input burnout occurs in MAN mode and RUN mode.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
EPO	Input error preset output	STD	0: Preset output 1: 0% output 2: 100% output	SYS Set

10.13 Setting 10-segment Linearizer for Output

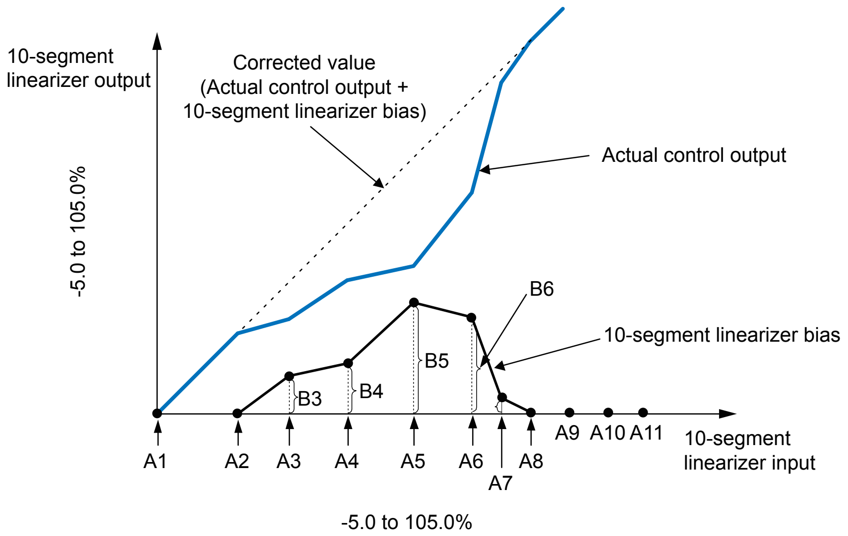
Description

A total of up to four 10-segment linearizers can be used for the input unit and output unit. For the position used by a 10-segment linearizer, see the function block diagram.

► Function block diagram: 8.1 Setting Control Mode (CTLM)
► 10-segment linearizer input: 7.1.4 (3) Setting 10-segment Linearizer

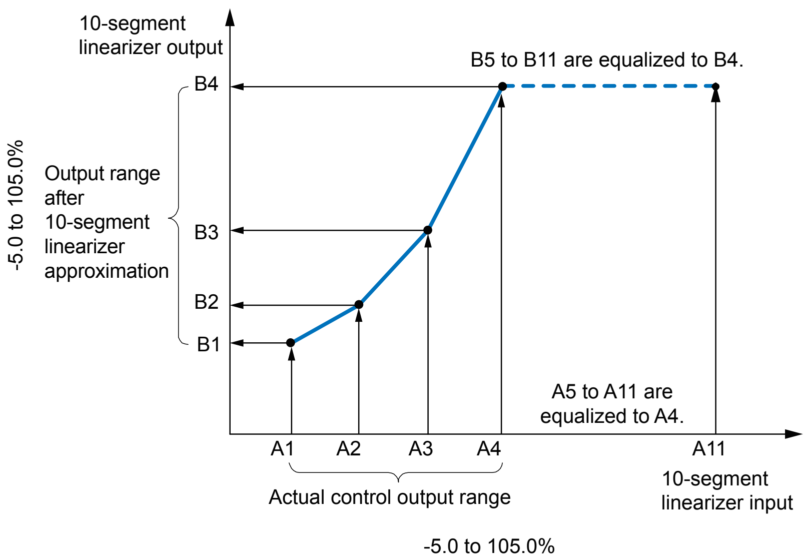
10-segment Linearizer Biasing

This function is used to correct the control output by adding the corresponding bias values to each of the 11 points of optionally set input values. When the 10-segment linearizer input is A1 or less, B1 is added. Moreover, the input is A11 or more, B11 is added.



10-segment Linearizer Approximation

This function is used to correct the control output.
As shown in the figure below, the output values can be optionally set to 11 points of the optionally set input values. When the 10-segment linearizer input is A1 or less, the value of extended line between B1 and B2 is output. Moreover, when the input is A11 or more, the value of extended line between B10 and B11 is output.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PYS	10-segment linearizer selection	Group 1, 2: STD Group 3, 4: PRO	OFF: Disable PV: PV analog input RSP: RSP analog input AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output	PYS1 PYS2 PYS3 PYS4 Ope
A1 to A11	10-segment linearizer input 1	Group 1, 2: STD Group 3, 4: PRO	-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	
B1 to B11	10-segment linearizer output 1	Group 1, 2: STD Group 3, 4: PRO	10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	
PMD	10-segment linearizer mode	Group 1, 2: STD Group 3, 4: PRO	0: 10-segment linearizer bias 1: 10-segment linearizer approximation	

Note1: The group number (1 to 4) is displayed on Group display while each parameter is displayed.

Set it in the following orders.

(1)PYS: Specifies where the 10-segment linearizer function is used.
Setpoint OUT functions before output to OUT terminal.
Setpoint OUT2 functions before output to OUT2 terminal. (for Heating/cooling type only)
Setpoint RET functions before output to RET terminal.

(2)PMD: Specifies whether to use it as a 10-segment linearizer bias or a 10-segment linearizer approximation.

(3)A1 to A11, B1 to B11: Sets the 10-segment linearizer input and 10-segment linearizer output.

Note

- Set the 10-segment linearizer so that it increases monotonically.
- If the same setpoint is set for the two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.

10.14 Changing Current Output Range

Description

The analog output type can be selected from among 4 to 20, 0 to 20, 20 to 4, or 20 to 0 mA.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OU.A	OUT current output range	STD	4-20: 4 to 20 mA, 0-20: 0 to 20 mA, 20-4: 20 to 4 mA, 20-0: 20 to 0 mA	OUT **Set**
OU2.A	OUT2 current output range	STD		
RET.A	RET current output range	STD		

Parameters and Corresponding Terminals

OU.A	OUT terminal
OU2.A	OUT2 terminal
RET.A	RET terminal

10.15 Setting Split Computation Output Function

Description

Split computation output is useful for the case where multiple (up to 3) operating units for switching, for example, hot and cool water are linked for control. There are two characteristics of split computations: V-mode characteristics and Parallel-mode characteristics. The current output range can be changed.

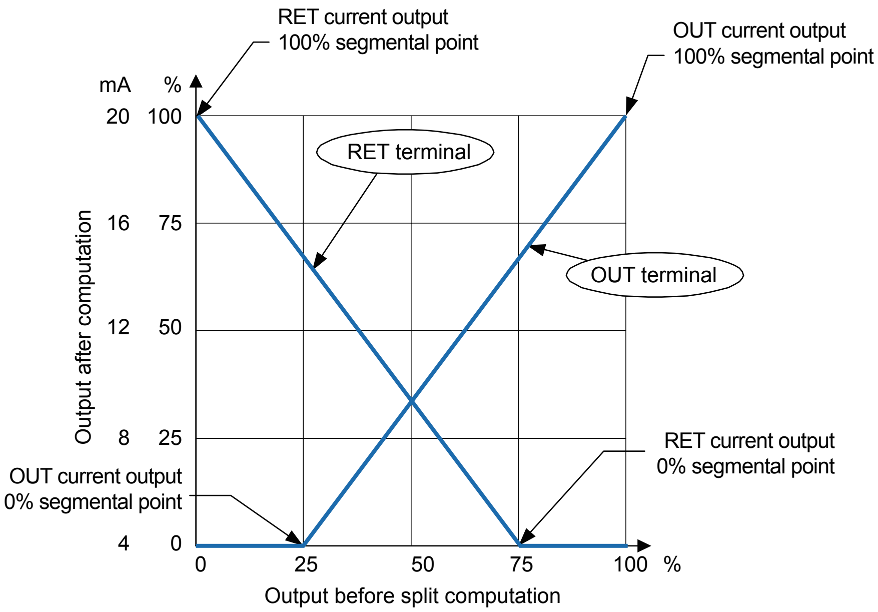
► Current output range: 10.14 Changing Current Output Range

V-mode Characteristics

The following explains an example of letting OUT terminal and RET terminal present the V-mode characteristics of split computations.

Setting Example

	OUT terminal	RET terminal
Control output type/Retransmission output type	OT = 00.02 (current)	RTS=PV1
Current output 100% segmental point	OU.H=100.0%	OU.L=25.0%
Current output 0% segmental point	RET.H=0.0%	RET.L=75.0%
Current output range	OU.A=4-20	RET.A=4-20

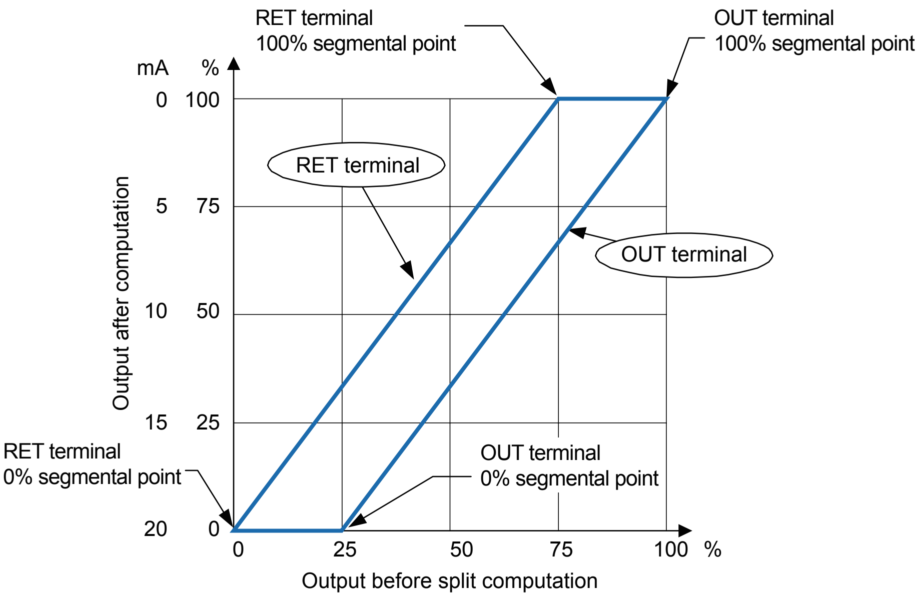


Parallel-mode Characteristics

The following explains an example of letting OUT terminal and RET terminal present the Parallel-mode characteristics of split computations.

Setting Example

	OUT terminal	RET terminal
Control output type/Retransmission output type	OT = 00.02 (current)	RTS=PV1
Current output 100% segmental point	OU.H=100.0%	OU.L=25.0%
Current output 0% segmental point	RET.H=75.0%	RET.L=0.0%
Current output range	OU.A=4-20	RET.A=4-20



Setting Details

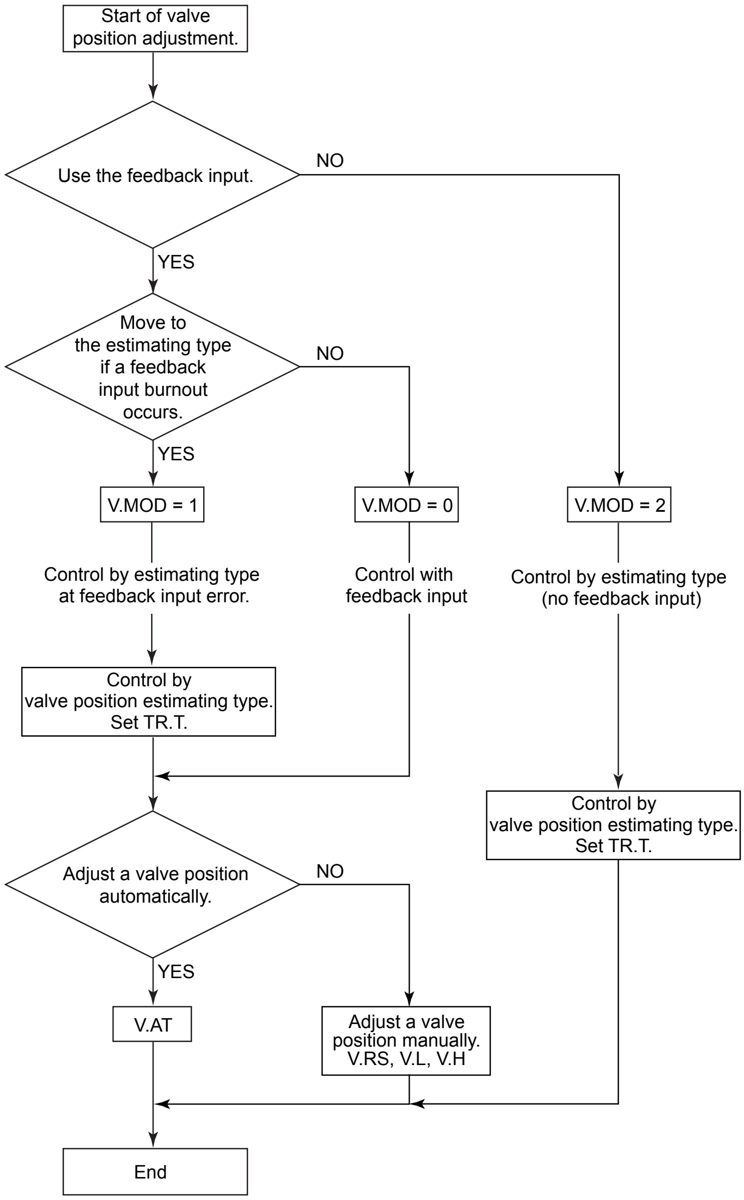
Parameter symbol	Name	Display level	Setting range	Menu symbol
OU.H	100% segmental point of OUT current output	PRO	-100.0 to 200.0%	OUT Set
OU.L	0% segmental point of OUT current output	PRO		
OU2.H	100% segmental point of OUT2 current output	PRO		
OU2.L	0% segmental point of OUT2 current output	PRO		
RET.H	100% segmental point of RET current output	PRO		
RET.L	0% segmental point of RET current output	PRO		

Parameters and Corresponding Terminals

OU.H, OU.L	OUT terminal
OU2.H, OU2.L	OUT2 terminal
RET.H, RET.L	RET terminal

10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)

When performing control using the motor-operated valve position, adjustment of the valve position is necessary.



When controlling by estimating type, set TR.T corresponding to the valve characteristic.

10.16.1 Setting Valve Operation Mode

Description

Position proportional control monitors the control output signals and the feedback signals from the control valve and regulates to keep the valve opening and the control output signal in agreement.
Position proportional control (output) operation mode has feedback type and estimating type.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
V.MOD	Valve adjusting mode	STD	0: Valve position feedback type 1: Valve position feedback type (moves to the estimating type if a feedback input error or break occurs.) 2: Valve position estimating type	OUT Set

10.16.2 Adjusting Valve Position Automatically

Description

The fully-closed and fully-opened positions of a valve can be set automatically by the feedback input signal from a valve.
The following describes the procedure of adjusting the valve position automatically.
(1) Verify that the wirings are correct.
(2) Set the operation mode to MAN.
(3) Set the automatic valve position adjustment (V.AT) to ON. (V.AT blinks during the automatic adjustment.)
(4) When the adjustment is completed, V.AT returns to OFF.
When the adjustment fails, VAT.E appears on PV display.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
V.AT	Automatic valve position adjustment	EASY	OFF: Stop automatic adjustment ON: Start automatic adjustment	OUT Set

10.16.3 Adjusting Valve Position Manually

Description

The following procedure describes how to adjust valve position manually.

(1) Verify that the wirings are correct.
(2) Set the operation mode to MAN.
(3) Reset the valve position (Set V.RS=ON).
(4) Display the fully-closed valve position setting (V.L), determine the fully-closed position while holding down the Down arrow (▽) key, and press the SET/ENTER key.
(5) Display the fully-opened valve position setting (V.H), determine the fully-opened position while holding down the Up arrow (△) key, and press the SET/ENTER key.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
V.RS	Valve position setting reset	EASY	Setting V.RS to ON resets the valve adjustment settings and causes the indication “V.RS” to blink.	OUT Set
V.L	Fully-closed valve position setting	EASY	Pressing the SET/ENTER key with valve position set to the fully-closed position by Down arrow key causes the adjusted value to be stored. When V.L adjustment is complete, V.L stops blinking.	
V.H	Fully-opened valve position setting	EASY	Pressing the SET/ENTER key with valve position set to the fully-opened position by Up arrow key causes the adjusted value to be stored. When V.H adjustment is complete, V.H stops blinking	

10.16.4 Setting Valve Traveling Time (Estimating Type)

Description

In the estimating type, a traveling time required to fully open the valve from its fully-closed position is set and valve positions are estimated according to the time consumed for valve operation.
The valve position estimating type is used when the feedback input of valve positions cannot be obtained.
(Wiring for feedback input is not necessary.)
The fully-opened side relay keeps ON-state when the output is 100%, and the fully-closed side relay keeps ON-state when the output is 0%.

Operating Principles

In the estimating type, the valve position is obtained by calculating the virtual feedback input based on the valve traveling time.
However, the virtual feedback input starts calculation from 50% at power-on.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
TR.T	Valve traveling time	STD	5 to 300 s	OUT Set

10.16.5 Selecting Feedback Input (Resistor/Current)

Description

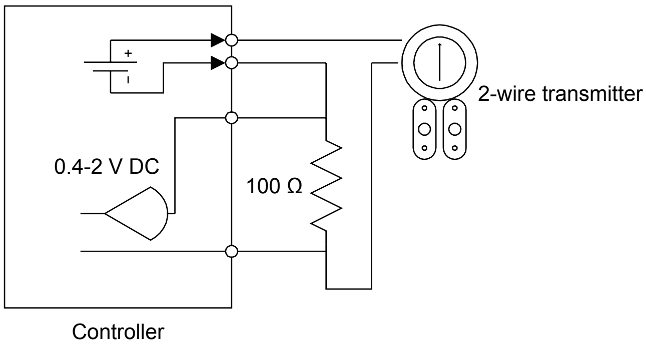
Only the wiring for resistor or current is necessary for feedback input. There is no setting.
► Wiring: 17.4.5 Valve Position Output and Feedback Input Wiring

10.17 Using 15 V DC Loop Power Supply

Description

The 15 V DC loop power supply is a function to supply DC power (14.5 to 18.0 V DC (21 mA DC)) to a 2-wire transmitter.
The loop power supply block is isolated from the controller's internal circuitry. In addition, the block is equipped with a current limiting circuit. Therefore, accidental short-circuits that may occur in the field do not adversely affect the rest of the controller's internal circuitry.
Note that the loop power supply function cannot be used for digital communication where the supply voltage is superposed on the signal line.

The following shows the examples of loop power supply connection to a 2-wire transmitter.



Setting Details

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>RTS</td><td>Retransmission output type of RET</td><td>EASY</td><td rowspan="3">OFF: Disable
PV1: PV
SP1: SP
OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control)
LPS: 15 V DC loop power supply
PV2: Loop-2 PV
SP2: Loop-2 SP
OUT2: Loop-2 OUT
TSP1: Target SP
HOUT1: Heating-side OUT
COUT1: Cooling-side OUT
MV1: Position proportional output (internal computed value)
TSP2: Loop-2 target SP
HOUT2: Loop-2 heating-side OUT
COUT2: Loop-2 cooling-side OUT
MV2: Loop-2 position proportional output (internal computed value)
PV: PV terminals analog input
RSP: RSP terminals analog input
AIN2: AIN2 terminals analog input
AIN4: AIN4 terminals analog input</td><td rowspan="3">OUT Set</td></tr>
<tr><td>O1RS</td><td>Retransmission output type of OUT current output</td><td>EASY</td></tr>
<tr><td>O2RS</td><td>Retransmission output type of OUT2 current output</td><td>EASY</td></tr>
</table>

Parameters and Corresponding Terminals

RTS	RET terminal
O1RS	OUT terminal
O2RS	OUT2 terminal

11.1 Setting Alarm Type

Description

The alarm-related parameters consist of the alarm type (type, stand-by action, energized/de-energized, and latch function), PV velocity alarm time setpoint, alarm hysteresis, alarm (On-/Off-) delay timer, and alarm setpoint.
In Cascade control, both of Loop 1 and Loop 2 have these parameters.

Alarm-related parameter	Number of settings
Alarm type	8 (number of settings) x 2 (number of loops)
PV velocity alarm time setpoint	8 (number of settings) x 2 (number of loops)
Alarm hysteresis	8 (number of settings) x 2 (number of loops)
Alarm (on-/off-) delay timer	8 (number of settings) x 2 (number of loops)
Alarm setpoint	8 (number of settings) x 8 (number of groups) x 2 (number of loops)

► Alarm hysteresis: 11.3 Setting Hysteresis to Alarm Operation
► Alarm delay timer: 11.4 Delaying Alarm Output (Alarm Delay Timer)
► Alarm setpoint: 6.5 Setting Alarm Setpoint

Both of Loop-1 and Loop-2 have eight groups of alarms. The alarms are assigned to the terminals for each control mode (parameter CTLM).
Factory default: Only four groups of alarm-related parameters are displayed.

► Terminal function: 17.4.7 Contact Output Wiring

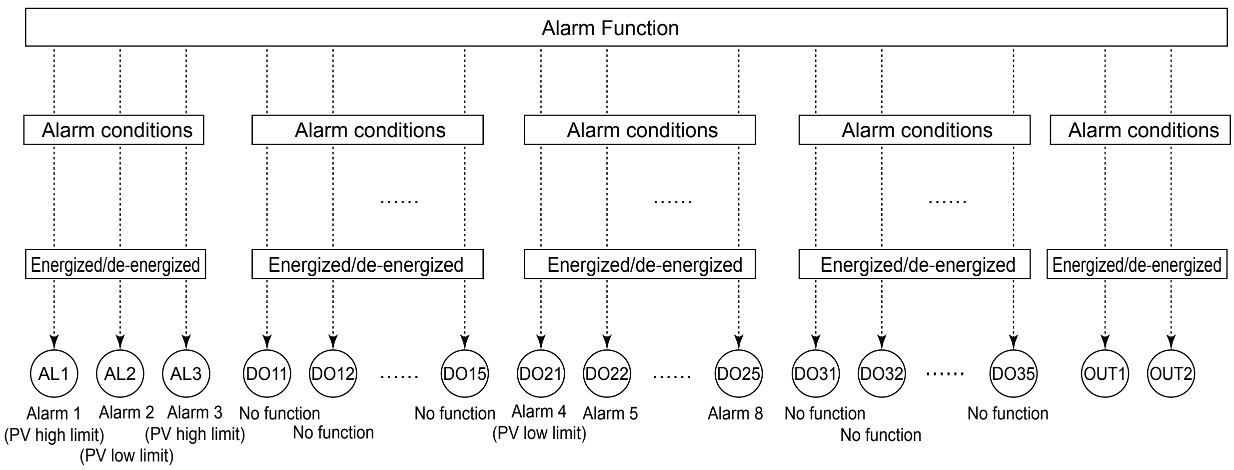
Alarm output can be assigned to the unused control relay output or contact output.

► Control relay output: 11.5 Setting Alarm Output to Control Relay Terminal
► Contact output: 12.2.1 Setting Function of Contact Output

Energized/de-energized of alarm output can be changed.

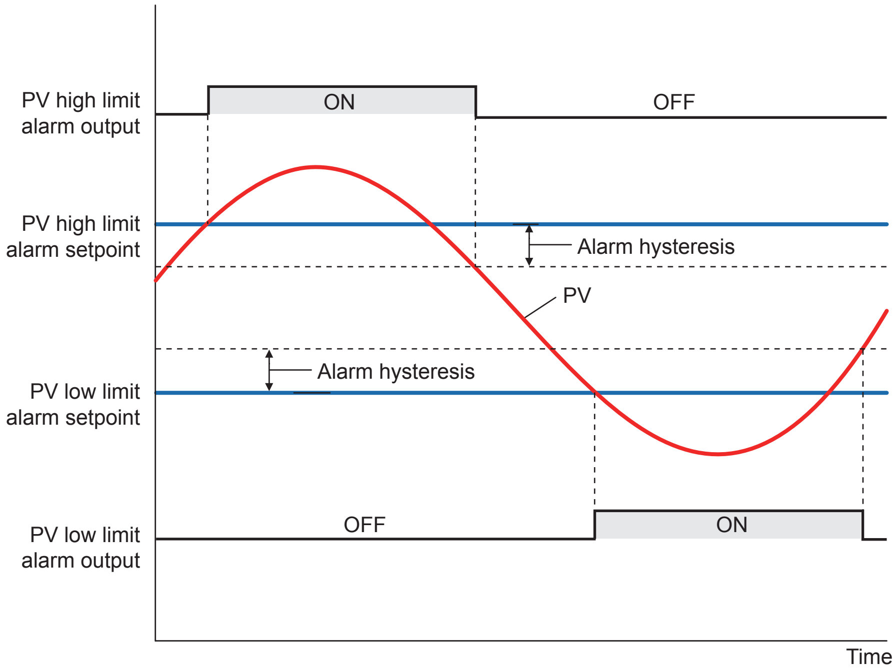
► Energized/de-energized: 12.2.2 Changing Contact Type of Contact Output

To read the conditions of alarms, outputs, or latches via communication, see Communication Interface User's Manual.



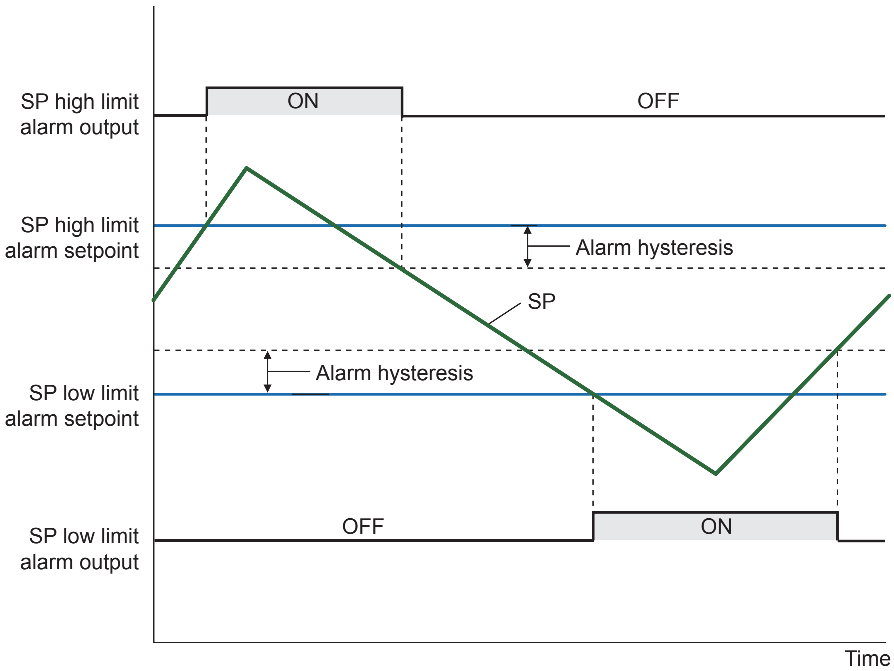
* The above figure shows the case of single-loop control mode.
* See “Appendix 1 Input and Output Table of Standard Model and Suffix Codes” for presence/absence of the terminals DO11 to DO15, DO21 to DO25, and DO31 to DO35.
* OUT1 and OUT2 can be used for alarm output when the relay outputs are not used for control otuput.

PV High Limit Alarm and PV Low Limit Alarm



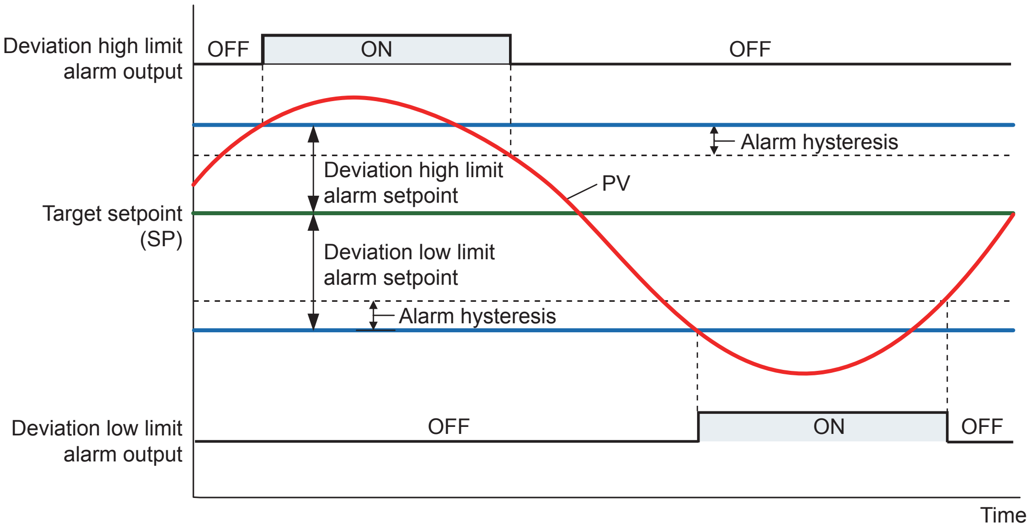
Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

SP High Limit Alarm and SP Low Limit Alarm



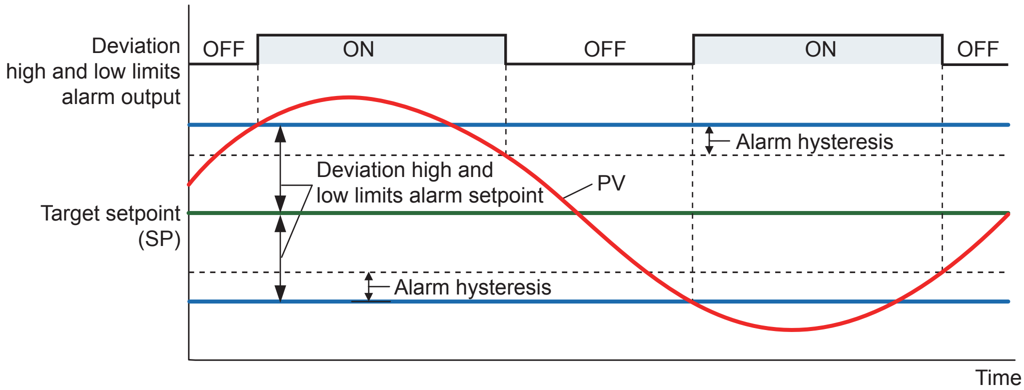
Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Deviation High Limit Alarm and Deviation Low Limit Alarm



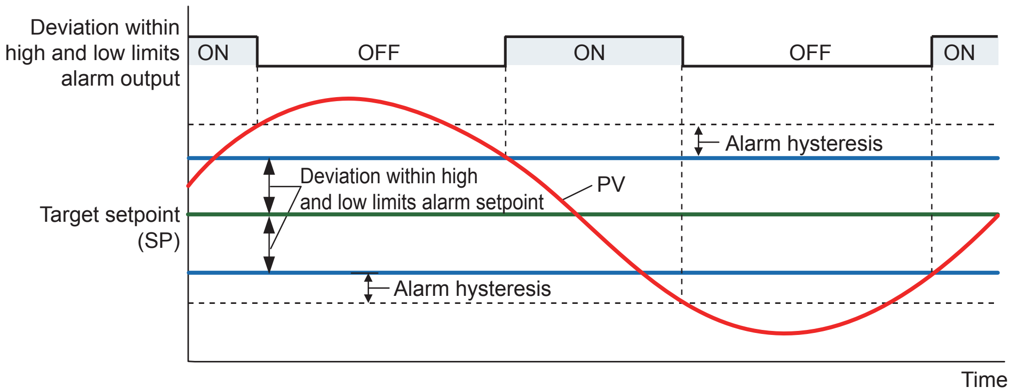
Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Deviation High and Low Limits Alarm



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Deviation within High and Low Limits Alarm

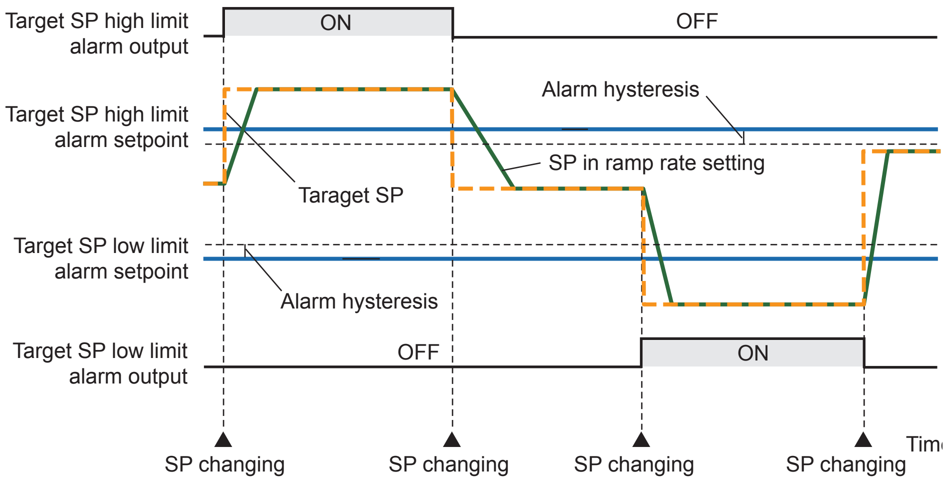


Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

11

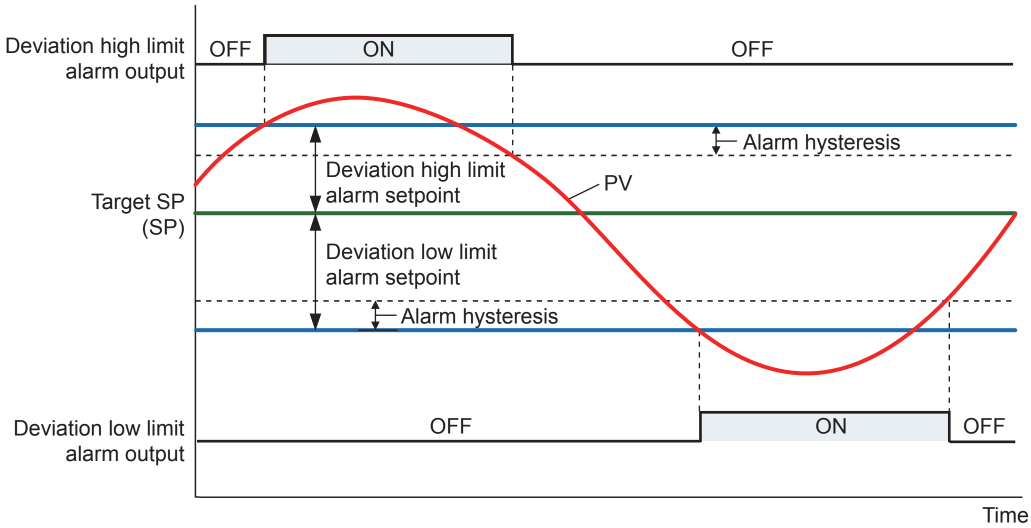
Alarm Functions

Target SP High Limit Alarm and Target SP Low Limit Alarm



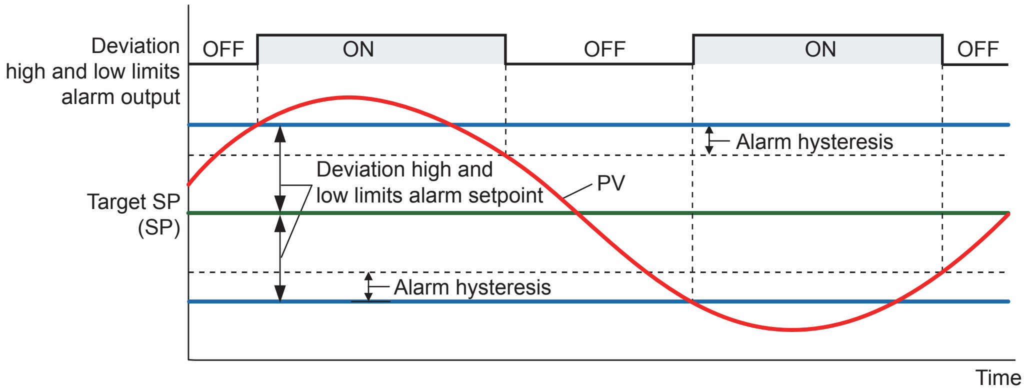
Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Target SP Deviation High Limit Alarm and Target SP Deviation Low Limit Alarm



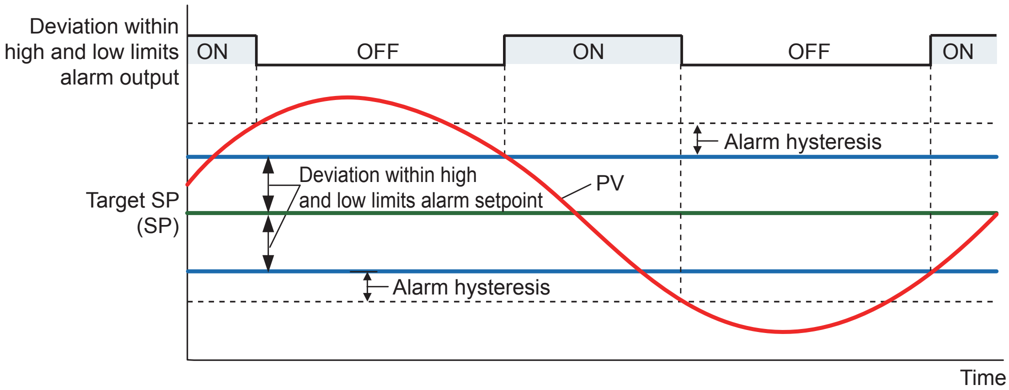
Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
* Target SP: a set target setpoint. When the ramp-rate is set, it becomes a final target setpoint.

Target SP Deviation High and Low Limits Alarm



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

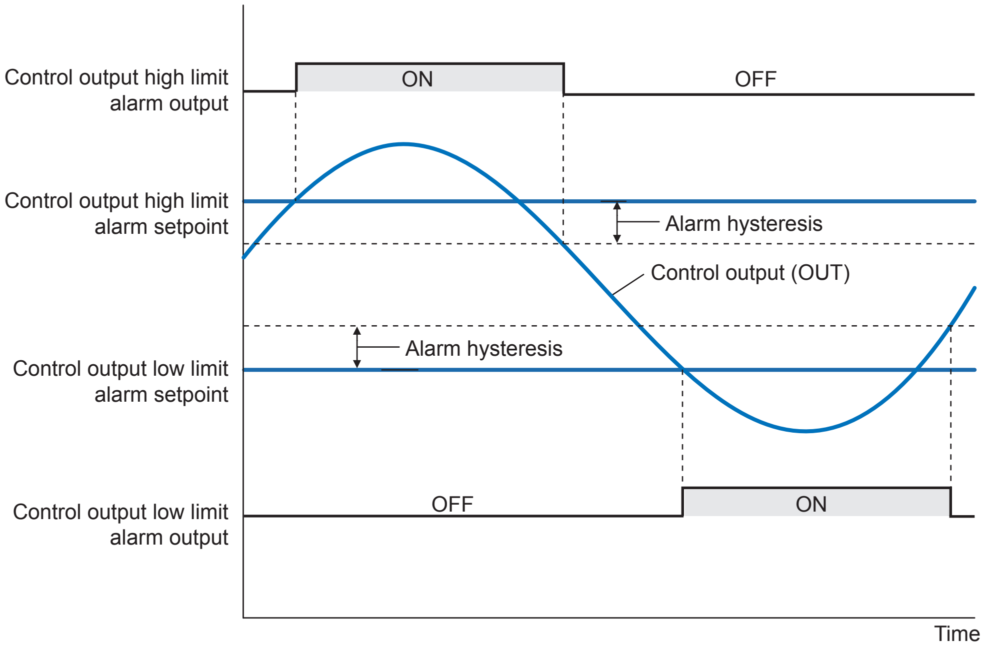
Target SP Deviation within High and Low Limits Alarm



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

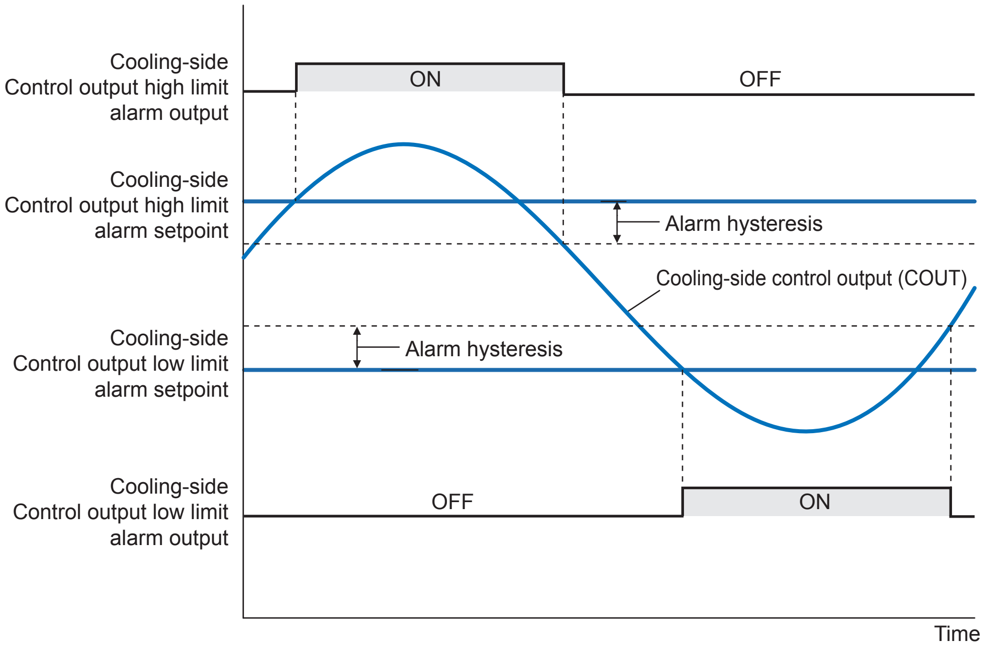
Control Output High Limit Alarm and Control Output Low Limit Alarm

In Heating/cooling control, alarms are heating-side control output high limit alarm and heating-side control output low limit alarm.



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

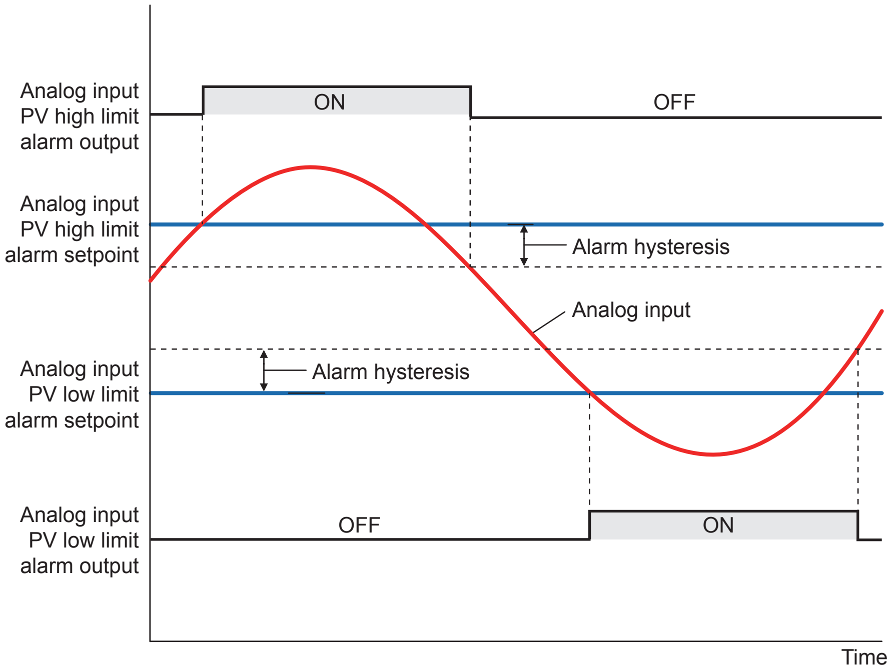
Cooling-side Control Output High Limit Alarm and Cooling-side Control Output Low Limit Alarm



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input PV High Limit Alarm and Analog Input PV Low Limit Alarm

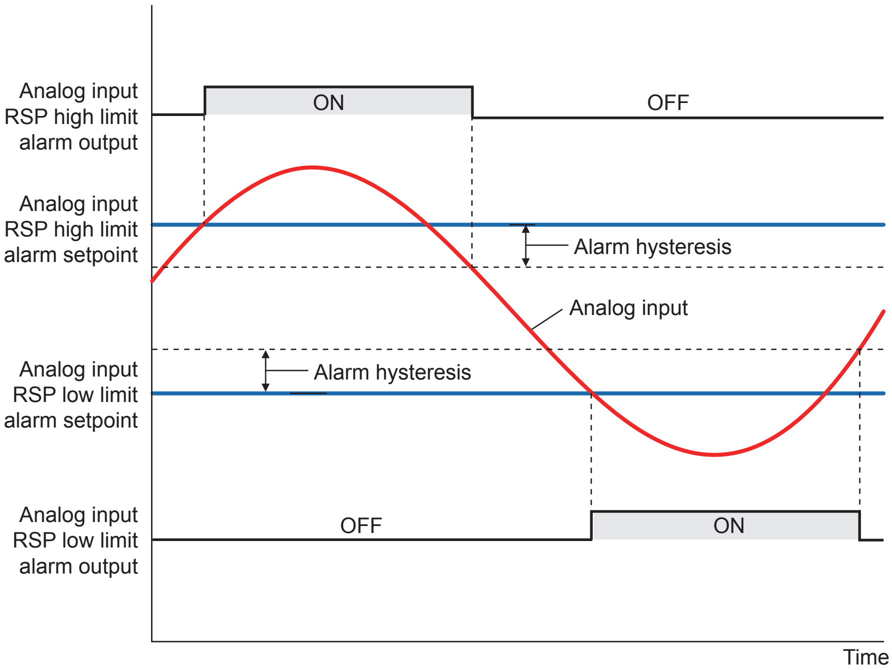
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input RSP High limit Alarm and Analog Input RSP Low Limit Alarm

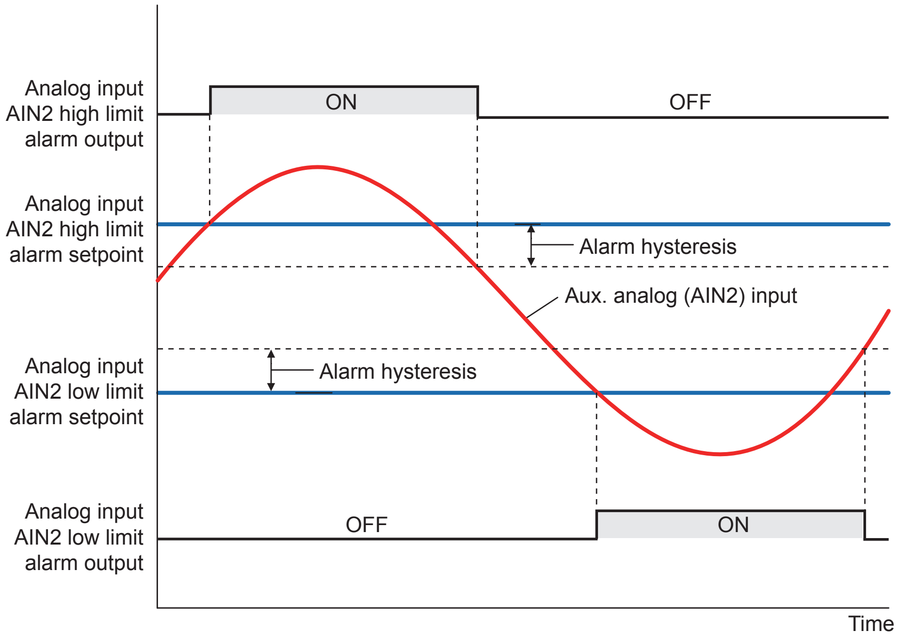
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input AIN2 High Limit Alarm and Analog Input AIN2 Low Limit Alarm

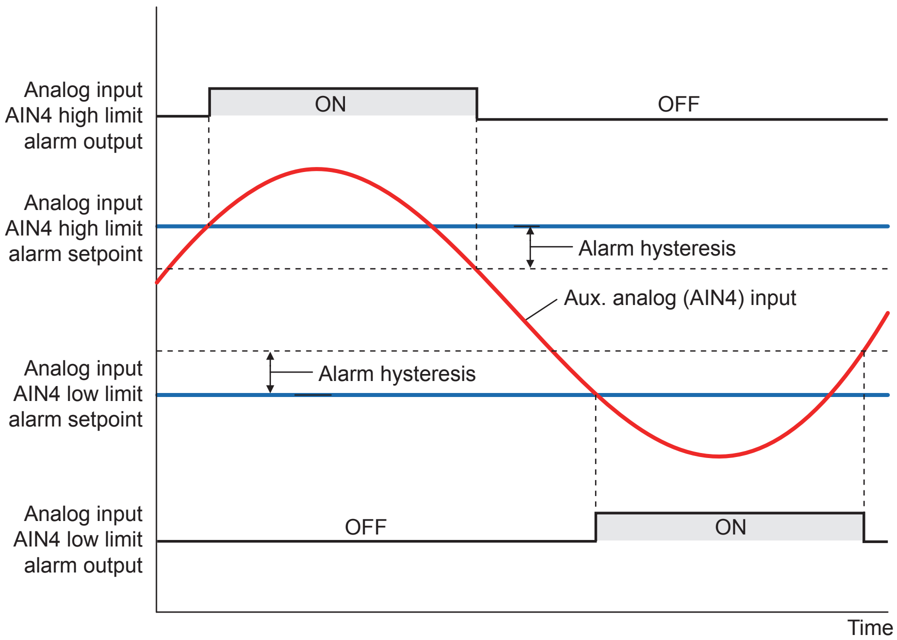
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input AIN4 High Limit Alarm and Analog Input AIN4 Low Limit Alarm

These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.

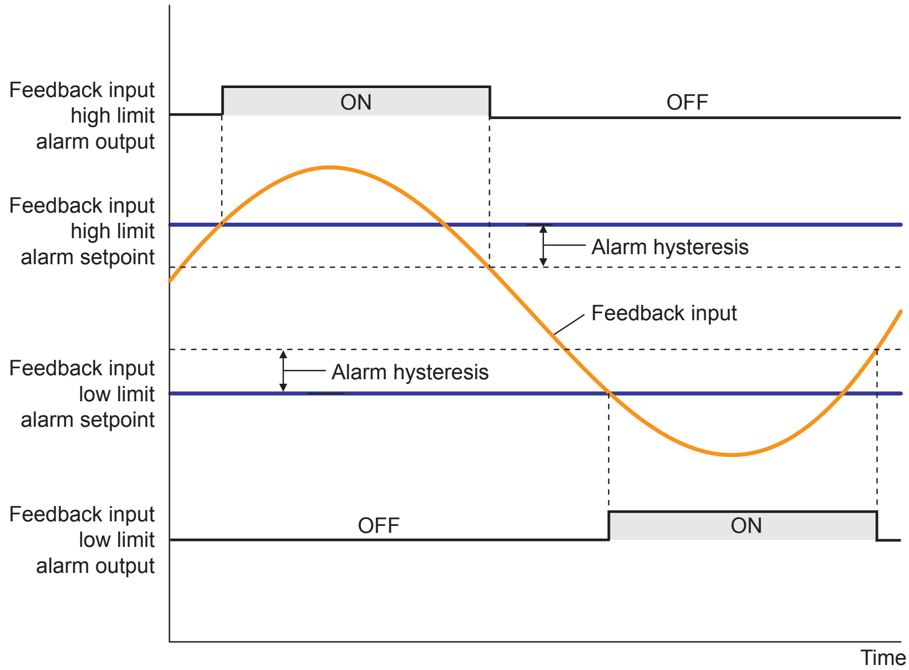


Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Feedback Input High Limit Alarm and Feedback Input Low Limit Alarm

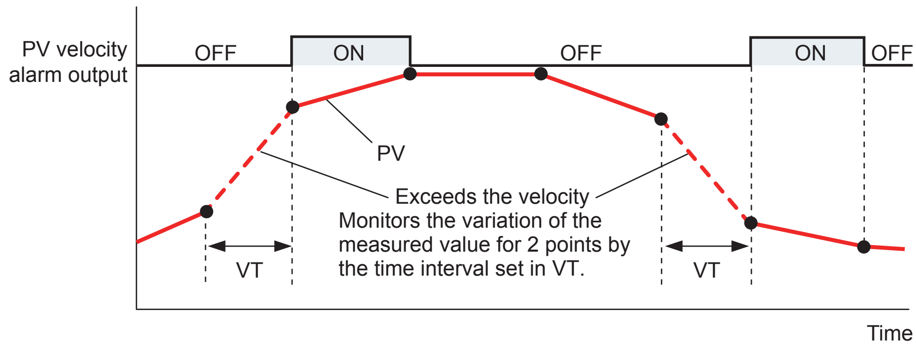
These alarms can be used only for Position proportional type..
These alarms monitor the feedback input (resistance or current) value.
The setting range for these alarms is 0.0 to 100.0%.
However, the setting range varies depending on whether the feedback input is a current value (4 to 20 mA) or resistance value (100 Ω to 2.5 kΩ).

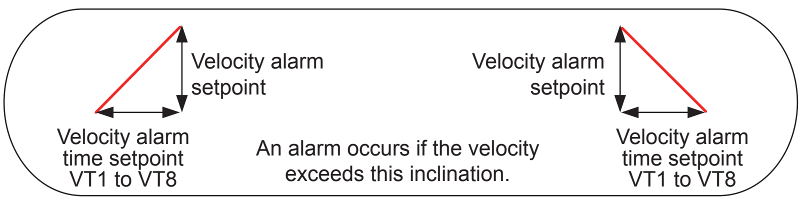
Current value: 4 mA corresponds to 0.0%, and 20 mA to 100.0%.
Resistance value (e.g., 1 kΩ): The resistance value when the valve is fully closed after the valve position adjustment corresponds to 0.0%, and the resistance value when the valve is fully opened corresponds to 100.0%. 0 Ω does not correspond to 0.0%, and 1 kΩ does not correspond to 100.0%.



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

PV Velocity Alarm





Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

The PV velocity alarm function does not work the alarm hysteresis, the stand-by action and the alarm delay timer functions.

Fault diagnosis Alarm

The function outputs an alarm signal in the following cases.
The corresponding event (EV) lamp is lit and the contact output turns on (when the contact type is CLS (energized)).

- Burnout of PV input, RSP remote input, or auxiliary analog input
- ADC failure of PV input, RSP remote input, or auxiliary analog input
- Reference junction compensation (RJC) error of PV input, RSP remote input

FAIL output

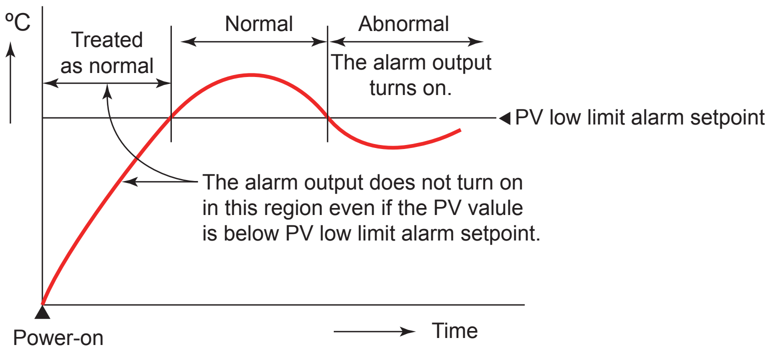
When the FAIL condition is caused (faulty MCU or system data error), DO (alarm output) turned off regardless of contact type.

Stand-by Action

The stand-by action is a function for ignoring the alarm condition and keeps the alarm off until the alarm condition is removed. Once the alarm condition is removed, the stand-by action is cancelled.
It is effective in the following cases where;

- The power is turned on
- SP is changed
- SP number is switched (however, except for remote setpoint) (The SP must be changed.)
- The alarm type is changed
- Forced stand-by via communication or contact input

The following shows the behavior of an alarm with the stand-by action at power ON.



Alarm Latch Function

The alarm latch function is a function for keeping the alarm output (keeping the alarm output on) after entering the alarm condition (alarm output is turned on) until an order to release the alarm latch is received.

The alarm latch function has the following four types of action.

Latch 1

Cancels the alarm output when an order to release the alarm latch is received. (Alarm output OFF.)
However, an order to release the alarm latch is ignored if the order is received during alarm condition.

Latch 2

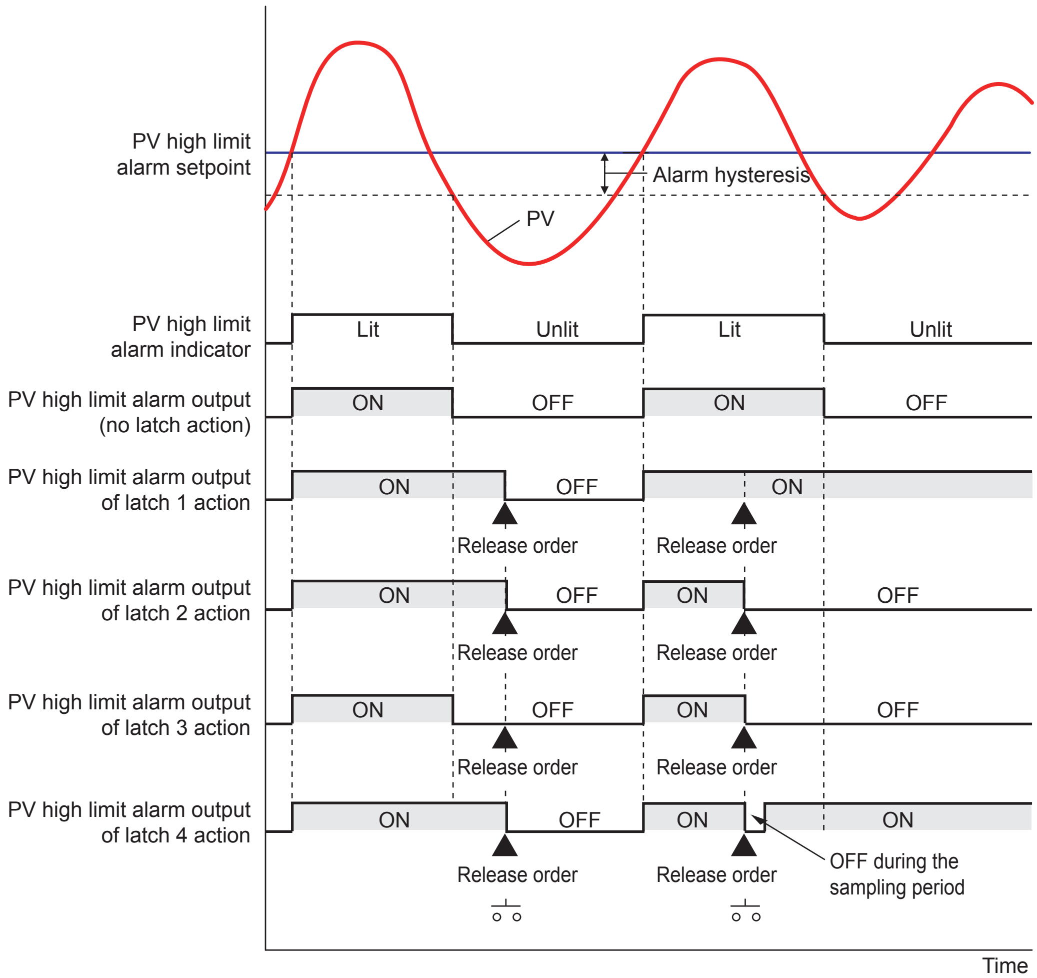
Always forces cancelling of the alarm output when an order to release the alarm latch is received. (Alarm output OFF)

Latch 3

Cancels the alarm output when an order to release the alarm latch is received or when the alarm condition is removed. (Alarm output OFF.)

Latch 4

Cancels the alarm output when an order to release the alarm latch is received. (Alarm output OFF.)
However, cancels the alarm output for the duration of the sampling period (control period) if an order to release the alarm latch is received during alarm condition. (Alarm output OFF)



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Release of Alarm Latch

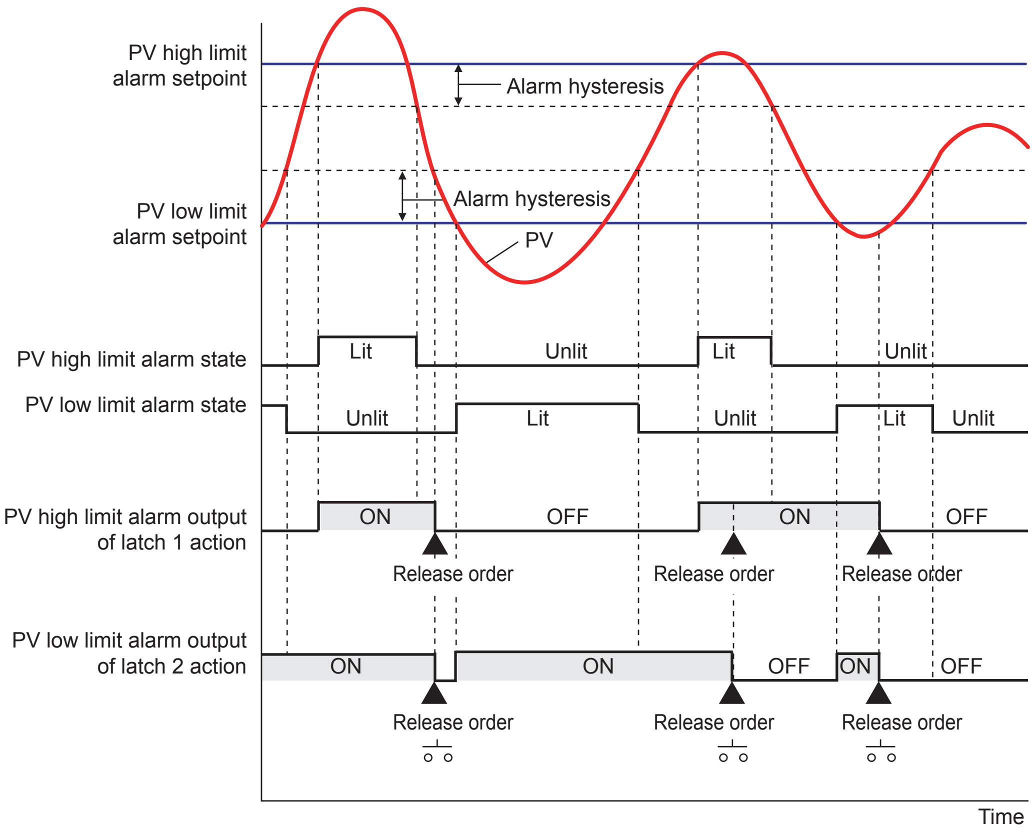
The alarm latch function can be cancelled by the user function key, via communication/ladder program, or by contact input.

Cancelling the alarm latch function cancels all latched alarm outputs.

► Release by user function key: 13.2 Assigning Function to User Function Key and A/M key

► Release by contact input: 12.1.1 Setting Contact Input Function

► Release via communication: UTAdvanced Series Communication Interface User's Manual



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Operation of Alarm Output and Display Lamp (EV)

The contact output and display lamp (EV) are usually output and displayed according to the setpoint of the alarm type. However, the alarm conditions (operations) of the normal action, and latch action can be assigned to the contact output and display lamp (EV), regardless of the setpoint of the alarm type. (Two operations can be assigned simultaneously.)

► Display lamp action: 13.1 Setting Display Functions

► Contact output action: 12.2.1 Setting Function of Contact Output

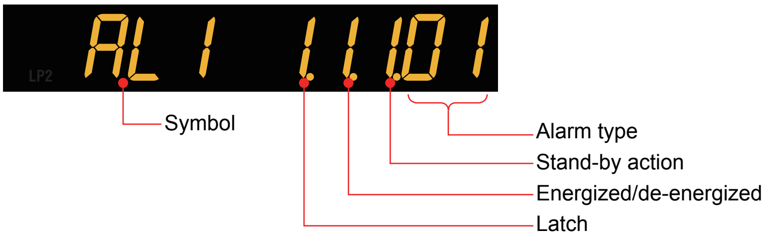
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
AL1 to AL8	Alarm-1 to -8 type	EASY	See the table below.	ALRM Ope
VT1 to VT8	PV velocity alarm time setpoint 1 to 8	EASY	00.01 to 99.59 (minute.second)	

Note1: The initial values of the parmeters AL1 to AL8 and VT1 to VT8 are "4".
Only AL1 to AL4 and VT1 to VT4 are displayed. The number of alarms can be changed using the parameter ALNO.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11.1 Setting Alarm Type

The following shows the example of setting PV high limit (01), With stand-by action (1), De-energized (1), and Latch 1 action (1).



Name	Latch action (Note)	Energized (0) / de-energized (1)	Stand-by action Without (0) / with (1)	Alarm type
Disable	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	00
PV high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	01
PV low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	02
SP high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	03
SP low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	04
Deviation high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	05
Deviation low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	06
Deviation high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	07
Deviation within high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	08
Target SP high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	09
Target SP low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	10
Target SP deviation high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	11
Target SP deviation low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	12
Target SP deviation high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	13
Target SP deviation within high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	14
Control output high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	15
Control output low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	16
Cooling-side Control output high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	17
Cooling-side Control output low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	18
Analog input PV high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	19
Analog input PV low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	20
Analog input RSP high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	21
Analog input RSP low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	22
Analog input AIN2 high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	23
Analog input AIN2 low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	24
Analog input AIN4 high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	25
Analog input AIN4 low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	26
Feedback input high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	27
Feedback input low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	28
PV velocity	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	29
Fault diagnosis	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	30
FAIL	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	31

Note: 0: No latch function, 1: Latch 1, 2: Latch 2, 3: Latch 3, 4: Latch 4

11.2 Setting Number of Alarm Groups to Use

Description

Up to eight alarm groups of alarm type, alarm hysteresis, alarm (On-/Off-) delay timer, and alarm setpoint are available.
Unused alarm parameters can be hidden and their functions can be turned off.
The initial value of parameter ALNO. is “4.”
When ALNO. = 4, for example, only the four groups of alarm type, PV velocity alarm time setpoint, alarm hysteresis, alarm delay timer, and alarm setpoint are displayed.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ALNO.	Number of alarm groups	PRO	1 to 8	CTL Set

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11

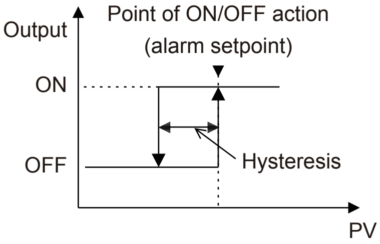
Alarm Functions

11.3 Setting Hysteresis to Alarm Operation

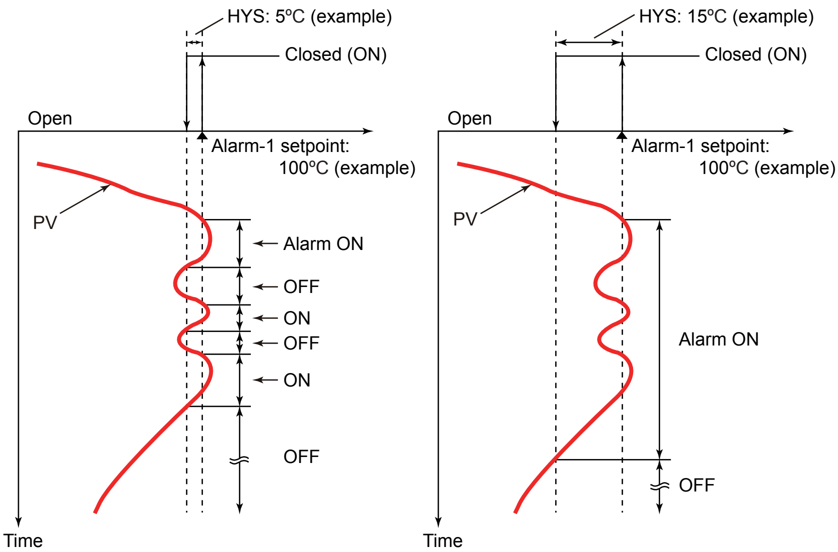
Description

If the On/Off switch of the alarm output is too busy, you can alleviate the busyness by increasing the alarm hysteresis.

Hysteresis for PV High Limit Alarm



When Setting Hysteresis of 5ºC and 15ºC for PV High Limit Alarm



Setting Details

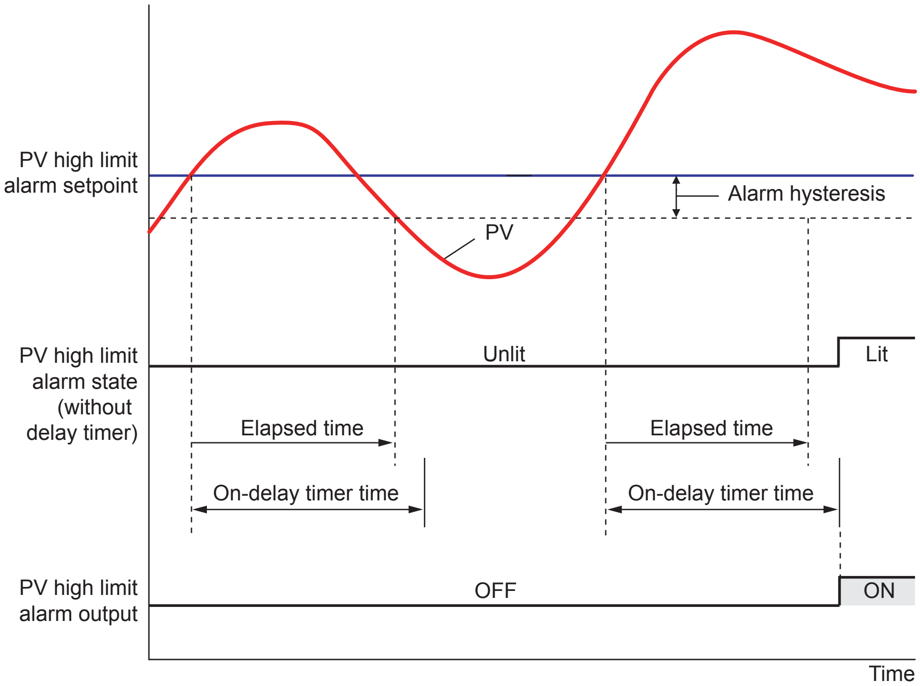
Parameter symbol	Name	Display level	Setting range	Menu symbol
HY1 to HY8	Alarm-1 to -8 hysteresis	EASY	Sets the hysteresis setpoint as a display value. -19999 to 30000 (set it within the input range) The decimal point position depends on the input type.	ALRM Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11.4 Delaying Alarm Output (Alarm Delay Timer)

Description

The alarm on-delay timer is a function for turning on the alarm when the alarm condition occurs, and the timer starts and the set time elapses.
The timer is reset if the alarm condition is removed while the timer is running. No alarm is generated.
The figure below shows the example of the On-delay timer



Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

The alarm Off-delay timer is a function for turning off the alarm when the alarm condition is removed (normal condition), and the timer starts and the set time elapses.
The timer is reset if the alarm condition occurs again while the timer is running. The alarm is not cancelled.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
DYN1 to DYN8	Alarm-1 to -8 On-delay timer	STD	0.00 to 99.59 (minute.second)	ALRM **Ope**
DYF1 to DYF8	Alarm-1 to -8 Off-delay timer	PRO		

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11

Alarm Functions

11.5 Setting Alarm Output to Control Relay Terminal

Description

The control relay terminal can be used for alarm output when it is not used for control output.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OR.S	OUT relay function selection	STD	Same as the setpoint for the contact output function. See 12.2.1, "Setting Function of Contact Output."	ALM **Set**
OR.D	OUT relay contact type	PRO	CLS: Closes the contact when an event occurs OPN: Opens the contact when an event occurs.	
OR2.S	OUT2 relay function selection	STD	Same as OR.S.	
OR2.D	OUT2 relay contact type	PRO	Same as OR.D	

Parameters and Corresponding Terminals

OR.S, OR.D	OUT terminal
OR2.S, OR2.D	OUT2 terminal

11.6 Setting Alarm Action According to Operation Mode

Description

The alarm action usually functions regardless of operation modes.
Setting the alarm mode allows the alarm action to be disabled in STOP or in STOP or MAN mode.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
AMD	Alarm mode	STD	0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode	ALRM Ope

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11

Alarm Functions

11.7 Setting Heater Break Alarm

Description

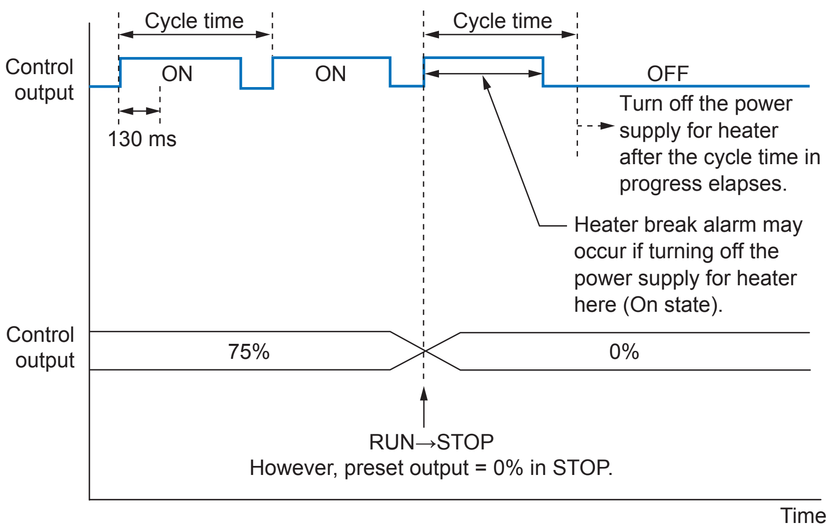
Either of heater break alarm function or heater current measurement function can be selected.

Heater Break Alarm Function

The heater break alarm function measures the heater current, and outputs the heater break alarm if the current is less than the heater break detecting point.
The heater break alarm function can be used only for ON/OFF output (relay output) or for time proportional output (relay output, voltage pulse output). It cannot be used for current output.

Timing which detects the heater break alarm is as follows.

- For ON/OFF output:
  Heater break is detected when control output is in On-state. (Heater break is not detected when control output is in Off-state.)
- For time proportional output:
  When On-state time of control output is 130 ms or longer, heater break is detected.
  Heater break is detected between 20 ms and 120 ms after control output turns on.
  Heater current value is detected every 200 ms while control output turns on.



Heater break detecting point
Set a detecting point (setpoint) of heater break alarm.
The heater break alarm is output if the measured current is less than the detecting point (setpoint).

Current Transformer Winding Number Ratio
The coil winding number ratio of current transformer (CT ratio) can be set.
Example: Set the CT ratio "800" for the CTL-6-S-H manufactured by U.R.D. Co., Ltd.

Heater Current Measured Value

A measured heater current value can be confirmed by a displayed value on operaiton display.

► Heater current measured value: 6.1 Monitoring and Control of Operaiotn Displays

Heater Break Alarm Delay Timer

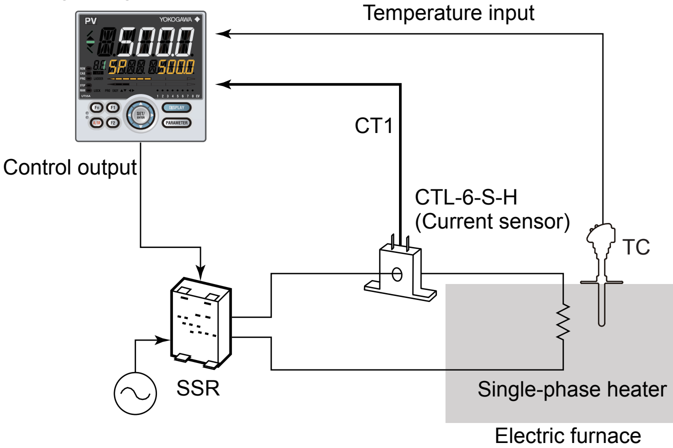
The delay timer (On-delay timer, Off-delay timer) can be set for the heater break alarm function.

► Delay timer: 11.4 Delaying Alarm Output (Alarm Delay Timer)

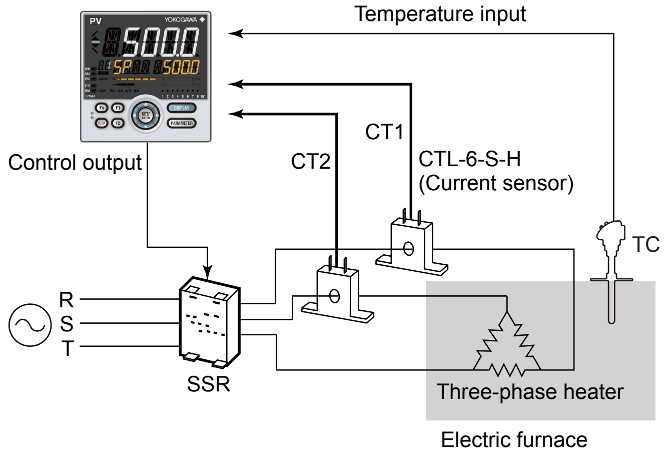
Heater Break Alarm Output Contact Type

The heater break alarm output contact type sets an action direction of contact output (ON/OFF) when an event occurs.

Using a single-phase heater



Using a three-phase heater



Heater Current Measurement Function

The heater current value can be confirmed by a displayed value on operaiton display.

► Heater current measured value: 6.1 Monitoring and Control of Operaiotn Displays

The heater break alarm function can be used only for ON/OFF output (relay output), for time proportional output (relay output, voltage pulse output) or for current output.

Heater current value is detected every 200 ms.

Setting Details

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>HB1.S, HB2.S</td><td>Heater break alarm function selection</td><td>EASY</td><td>0: Heater current measurement
1: Heater break alarm</td><td rowspan="6">HBA Set</td></tr>
<tr><td>HB1, HB2</td><td>Heater break alarm current setpoint</td><td>EASY</td><td>OFF, 0.1 to 300.0 Arms</td></tr>
<tr><td>CT1.T, CT2.T</td><td>CT coil winding number ratio</td><td>EASY</td><td>1 to 3300</td></tr>
<tr><td>HDN1, HDN2</td><td>Heater break alarm On-delay timer</td><td>STD</td><td rowspan="2">0.00 to 99.59 (minute.second)</td></tr>
<tr><td>HDF1, HDF2</td><td>Heater break alarm Off-delay timer</td><td>PRO</td></tr>
<tr><td>HB1.D, HB2.D</td><td>Heater break alarm contact type</td><td>PRO</td><td>CLS: When the event occurs, the contact is closed.
OPN: When the event occurs, the contact is opened.</td></tr>
</table>

Note1: In cases where the current transformer manufactured by U.R.D Co., Ltd. are used, set the following value for the CT coil winding number ratio.
CTL-6-S-H: 800
CTL-12L-30: 3000

12.1 Setting Contact Input Function

12.1.1 Setting Contact Input Function

Description

The contact input function works by setting the contact input number (I relay) to functions such as the operation mode.
This explanation assumes that the contact type is energized (CLS). (The function is executed when the contact is turned on)

AUTO/MAN Switch (A/M)

AUTO/MAN mode can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	AUTO	Switch by keystroke or via communication is disabled.
OFF	MAN	Switch by keystroke or via communication is enabled.

AUTO/MAN switch is disabled in Cascade control or Cascade secondary-loop control.

REMOTE/LOCAL Switch (R/L)

REMOTE/LOCAL mode can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	REMOTE	Switch by keystroke or via communication is disabled.
OFF	LOCAL	Switch by keystroke or via communication is enabled.

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

STOP/RUN Switch (S/R)

STOP/RUN mode can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	STOP	When the STOP/RUN switch is assigned (S/R ≠ 0), switch by keystroke or via communication is disabled.
OFF	RUN	–

Switch to Cascade (CAS)

In Cascade control, the mode can be switched to CAS (cascade) using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Switch to CAS (cascade)	–
ON→OFF	Maintains the current operation status	–

Switch to AUTO (AUTO)

In Cascade control, the mode can be switched to AUTO using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Switch to AUTO	–
ON→OFF	Maintains the current operation status	–

Switch to MAN (MAN)

The mode can be switched to MAN using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Switch to MAN	–
ON→OFF	Maintains the current operation status	–

Switch to REMOTE (REM)

The mode can be switched to REMOTE using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Switch to REMOTE	–
ON→OFF	Maintains the current operation status	–

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Switch to LOCAL (LCL)

The mode can be switched to LOCAL using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Switch to LOCAL	–
ON→OFF	Maintains the current operation status	–

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Auto-tuning START/STOP Switch (AT)

Auto-tuning START/STOP can be switched using contact input.
Auto-tuning is executed to the PID group currently specified. (Switch by the rising edge and the falling edge)

Contact status	Operation	Remark
OFF→ON	Starts auto-tuning	–
ON→OFF	Stops auto-tuning	–

Output Tracking Switch (TRK)

Output tracking can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	Turns the output tracking on	–
OFF	Turns the output tracking off	–

Can be used in Cascade primary-loop control or Loop control for backup.

PV Switch (SW)

Two PV inputs can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	Switches to input 2	–
OFF	Switches to input 1	–

Can be used in Loop control with PV switching.

PV Hold (PVHD)

PV can be held using contact input. (Status switch)

Contact status	Operation	Remark
ON	Switches to MAN, holds PV	AUTO/MAN switch by keystroke or via communication is disabled. Holds the PV status.
OFF	Switches to AUTO	AUTO/MAN switch by keystroke or via communication is enabled.

Can be used in Loop control with PV-hold function.

Latch Release (LAT)

Latch can be released using contact input. (Switch by the rising edge)

Contact status	Operation	Remark
OFF→ON	Releases the latch	The latch release by keystroke or via communication is disabled.
ON→OFF	Maintains the current operation status	The latch release by keystroke or via communication is enabled.

Releasing the latch function releases all latched contact (alarm) outputs.

LCD Backlight ON/OFF Switch (LCD)

LCD backlight ON/OFF can be switched using contact input. (Switch by the rising edge and the falling edge)

Contact status	Operation	Remark
OFF→ON	Turns off the LCD backlight	–
ON→OFF	Turns on the LCD backlight	–

CAS to AUTO Switch (CTOA)

The mode is switched from CAS to AUTO when the primary-side controller fails. (Status switch) CAS to AUTO Switch can be set when the control mode (CTLM) is Cascade secondary-loop control.

Contact status	Operation	Remark
ON	Does not work.	–
OFF	Switches to AUTO when the operation mode is CAS (cascade).	AUTO/MAN switch by keystroke or via communication is enabled.

Message Display Interruption 1 to 4 (MG 1 to 4)

The message set using LL50A Parameter Setting Software can be interrupt-displayed on PV display using contact input. The messages are limited to 20 alphanumeric characters. A maximum of four displays can be registered. (Switch by the rising edge)

► Message: LL50A Parameter Setting Software User's Manual

Contact status	Operation	Remark
OFF→ON	Interrupt-displays the message	Pressing the DISPLAY key erases the message.
ON→OFF	Displays the current PV	–

Bit-0 to Bit-3 of SP Number (SP.B0 to SP.B03)

The SP number can be switched using contact input. There are two methods to specify SP number.

- Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

SP number	Contact status			
	SP.B3	SP.B2	SP.B1	SP.B0
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF

*1: “1” when the contact input is turned on and “0” when turned off.
*2: SP number can be switched by keystroke or via communication when all contact inputs of SP.B0 to SP.B3 are turned off.
*3: SP number cannot be switched by keystroke or via communication when any contact input of SP.B0 to SP.B3 is turned on.
*4: The contact input is turned off when the bit of SP number is not assigned to the contact input.
*5: The immediately preceding SP number is held when all contact inputs are turned off.

- Status switch 2 (Operation by keystroke or via communication is disabled.)

SP number	Contact status		
	SP.B2	SP.B1	SP.B0
1	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	ON	OFF
4	OFF	ON	ON
5	ON	OFF	OFF
6	ON	OFF	ON
7	ON	ON	OFF
8	ON	ON	ON

*1: “1” when the contact input is turned on and “0” when turned off.
*2: SP number cannot be switched by keystroke or via communication when the contact input is assigned to any of SP.B0 to SP.B3.
*3: Contact input is turned off when the bit of SP number is not assigned to the contact input.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SP.BC	Bit changing method of SP number	PRO	0: Status switch 1 1: Status switch 2	DI.NU Set

Bit-0 to Bit-3 of PID Number (PN.B0 to PN.B03)

The PID number can be switched using contact input. There are two methods to specify a PID number.

- Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

PID number	Contact status			
	PN.B3	PN.B2	PN.B1	PN.B0
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF

*1: "1" when the contact input is turned on and "0" when turned off.
*2: PID number can be switched by keystroke or via communication when all contact inputs of PN.B0 to PN.B3 are turned off.
*3: PID number cannot be switched by keystroke or via communication when any contact input of PN.B0 to PN.B3 is turned on.
*4: The contact input is turned off when the bit of PID number is not assigned to the contact input.

- Status switch 2 (Operation by keystroke or via communication is disabled.)

PID number	Contact status		
	PN.B2	PN.B1	PN.B0
1	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	ON	OFF
4	OFF	ON	ON
5	ON	OFF	OFF
6	ON	OFF	ON
7	ON	ON	OFF
8	ON	ON	ON

*1: "1" when the contact input is turned on and "0" when turned off.
*2: PID number cannot be switched by keystroke or via communication when the contact input is assigned to any of PN.B0 to PN.B3.
*3: Contact input is turned off when the bit of PID number is not assigned to the contact input.

In Cascade control, PID number selection is only for Loop 1.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PN.BC	Bit changing method of PID number	PRO	0: Status switch 1 1: Status switch 2	DI.NU Set

Bit-0 to Bit-2 of Manual Preset Output Number (MP.B0 to MP.B02)

The manual preset output number can be switched using contact input. There are two methods to specify a manual preset output number.

- Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

Manual preset output number	Contact status		
	MP.B2	MP.B1	MP.B0
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON

*1: “1” when the contact input is turned on and “0” when turned off.
*2: Manual preset output number can be switched by keystroke via communication when all contact inputs of MP.B0 to MP.B2 are turned off.
*3: Manual preset output number cannot be switched by keystroke or via communication when any contact input of MP.B0 to MP.B2 is turned on.
*4: The contact input is turned off when the bit of manual preset output number is not assigned to the contact input.

- Status Switch 2 (Operation by keystroke or via communication is disabled.)

Manual preset output number	Contact status		
	MP.B2	MP.B1	MP.B0
1	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	ON	OFF
4	OFF	ON	ON
5	ON	OFF	OFF

*1: “1” when contact input is turned on and “0” when turned off.
*2: Manual preset output number cannot be switched by keystroke or via communication when contact input is assigned to any of MP.B0 to MP.B2.
*3: Manual preset output number can be switched by keystroke or via communication when contact input is not assigned to all of MP.B0 to MP.B2.
*4: The contact input is turned off when the bit of manual preset output number is not assigned to the contact input.

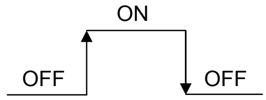
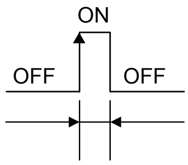
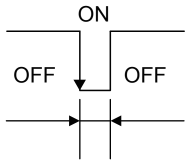
In Cascade control, the manual preset output number selection is only for Loop 2.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
MP.BC	Bit changing method of manual preset output number	PRO	0: Status switch 1 1: Status switch 2	DI.NU Set

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Contact Action

Type	Operation	Description
Status		Receiving a contact input signal changes the status to the specified operation, and a release changes the status back to the original action.
Rising edge	Rising edge  Detection time: Control period + 50 ms	Receiving an OFF-to-ON contact input signal changes the status to the specified operation. The minimum detection time is the control period + 50 ms. Pulse width is 50 ms or more.
Falling edge	Falling edge  Detection time: Control period + 50 ms	Receiving an ON-to-OFF contact input signal changes the status to the specified operation. The minimum detection time is the control period + 50 ms. Pulse width is 50 ms or more.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
A/M	AUTO/MAN switch	STD	See the following section, "UT55A DI and Setpoint" or "UT52A DI and Setpoint".	DI.SL Set
R/L	REMOTE/LOCAL switch	STD		
S/R	STOP/RUN switch	STD		
CAS	Switch to CAS	STD		
AUTO	Switch to AUTO	STD		
MAN	Switch to MAN	STD		
REM	Switch to REMOTE	STD		
LCL	Switch to LOCAL	STD		
AT	Auto-tuning START/STOP switch	STD		
TRK	Output tracking switch	PRO		
SW	PV switch	PRO		
PVHD	PV hold	PRO		
CTOA	CAS to AUTO switch	PRO		
LAT	Latch release	STD		
LCD	LCD backlight ON/OFF switch	STD		
MG1	Message display interruption 1	PRO		
MG2	Message display interruption 2	PRO		
MG3	Message display interruption 3	PRO		
MG4	Message display interruption 4	PRO		
SP.B0	Bit-0 of SP number	EASY		DI.NU Set
SP.B1	Bit-1 of SP number	EASY		
SP.B2	Bit-2 of SP number	EASY		
SP.B3	Bit-3 of SP number	EASY		
PN.B0	Bit-0 of PID number	STD		
PN.B1	Bit-1 of PID number	STD		
PN.B2	Bit-2 of PID number	STD		
PN.B3	Bit-3 of PID number	STD		
MP.B0	Bit-0 of manual preset output number	STD		
MP.B1	Bit-1 of manual preset output number	STD		
MP.B2	Bit-2 of manual preset output number	STD		

UT55A DI and Setpoint (I relay number)

DI equipped as standard

DI symbol	Setpoint
DI1	5025
DI2	5026
DI3	5027

Additional DI

DI symbol	Setpoint	DI symbol	Setpoint	DI symbol	Setpoint	DI symbol	Setpoint
DI11	5041	–	–	DI31	5073	DI41	5089
DI12	5042	–	–	DI32	5074	DI42	5090
DI13	5043	–	–	DI33	5075	DI43	5091
DI14	5044	–	–	DI34	5076	DI44	5092
DI15	5045	–	–	DI35	5077	DI45	5093
DI16	5046	DI26	5062	–	–	DI46	5094

DI16 can be used when the suffix code: Type 2 = 1, 2, 4, 5, or 7, and without the optional suffix code /DR.

UT52A DI and Setpoint (I relay number)

DI equipped as standard

DI symbol	Setpoint
DI1	5025
DI2	5026
DI3	5027

Additional DI

DI symbol	Setpoint
DI11	5041
DI12	5042
DI16	5046

DI16 can be used when the suffix code: Type 2 = 1, 2, or 3, and without the optional suffix code /DR.

12.1.2 Changing Contact Type of Contact Input

Description

The contact type can set the action direction of contact input assigned to the function.

Setting Details

Contact Input Equipped as Standard

Parameter symbol	Name	Display level	Setting range	Menu symbol
DI1.D	DI1 contact type	PRO	CLS: The assigned function is enabled when the contact input is closed. OPN: The assigned function is enabled when the contact input is opened.	DI.D Set
DI2.D	DI2 contact type	PRO		
DI3.D	DI3 contact type	PRO		

Note1: Nothing is displayed on Group display when each parameter is displayed.

Additional Contact Input

Parameter symbol	Name	Display level	Setting range	Menu symbol
DI1.D	DIn1 contact type	PRO	CLS: The assigned function is enabled when the contact input is closed. OPN: The assigned function is enabled when the contact input is opened.	DI.D Set
DI2.D	DIn2 contact type	PRO		
DI3.D	DIn3 contact type	PRO		
DI4.D	DIn4 contact type	PRO		
DI5.D	DIn5 contact type	PRO		
DI6.D	DIn6 contact type	PRO		RSP, AIN2, or AIN4 Set

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code. "n" denotes the position of the terminal area. (n = 1 to 4)

Refer to the table below for presence/absence of UT55A contact input.

Terminal area	Suffix code: Type 2							
	0	1	2	3	4	5	6	7
E1-terminal area	–	DI16	DI16	DI11 to DI15	DI16	DI16	–	DI16
E2-terminal area	–	–	–	–	–	–	–	DI26
E3-terminal area	–	DI31 to DI35	–	–	–	–	DI31 to DI35	–
E4-terminal area	–	–	–	–	–	DI41 to DI45	DI41 to DI45	DI46

DI16 of E1-terminal area can be used when the suffix code: Type 2 = 1, 2, 4, 5, or 7, and without the optional suffix code /DR.

Refer to the table below for presence/absence of UT52A contact input.

Terminal area	Suffix code: Type 2			
	0	1	2	3
E1-terminal area	–	DI16	DI16	DI11 to DI12

DI16 of E1- terminal area can be used when the suffix code: Type 2 = 1, 2, or 3, and without the optional suffix code /DR.

► Terminal arrangement: 17.4 Wiring

12.2 Setting Contact Output Function

12.2.1 Setting Function of Contact Output

Description

The contact output function works by setting a status such as an alarm to the contact output.
This explanation assumes that the contact type is energized (CLS). (The contact is turned on when an event occurs.)

Setting Details

Contact Output Equipped as Standard

Parameter symbol	Name	Display level	Setting range	Menu symbol
AL1.S	AL1 function selection	STD	See the following section.	ALM Set
AL2.S	AL2 function selection	STD		
AL3.S	AL3 function selection	STD		

Note1: Nothing is displayed on Group display when each parameter is displayed.

Additional Contact Output

Parameter symbol	Name	Display level	Setting range	Menu symbol
DO1.S	DOn1 function selection	STD	See the following section.	DO Set
DO2.S	DOn2 function selection	STD		
DO3.S	DOn3 function selection	STD		
DO4.S	DOn4 function selection	STD		
DO5.S	DOn5 function selection	STD		

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code. "n" denotes the position of the terminal area. (n = 1 to 4)

Contact Output for Control

Parameter symbol	Name	Display level	Setting range	Menu symbol
OR.S	OUT relay function selection	STD	See the following section.	ALM Set
OR2.S	OUT2 relay function selection	STD		

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.S and OR2.S can be used as status output when they are not used as control output. OR2.S can be used for Heating/cooling type.

Alarm Status

The alarm status can be output to the contact output. (The setpoints below are I relay numbers.)

► I relay: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

Setpoint		Function
Alarm status	Alarm output status	
4321	4353	Alarm 1
4322	4354	Alarm 2
4323	4355	Alarm 3
4325	4357	Alarm 4
4326	4358	Alarm 5
4327	4359	Alarm 6
4329	4361	Alarm 7
4330	4362	Alarm 8
4337	4369	Loop-2 alarm 1 (in Cascade control)
4338	4370	Loop-2 alarm 2 (in Cascade control)
4339	4371	Loop-2 alarm 3 (in Cascade control)
4341	4373	Loop-2 alarm 4 (in Cascade control)
4342	4374	Loop-2 alarm 5 (in Cascade control)
4343	4375	Loop-2 alarm 6 (in Cascade control)
4345	4377	Loop-2 alarm 7 (in Cascade control)
4346	4378	Loop-2 alarm 8 (in Cascade control)

- Alarm status: The internal alarm status is turned on when an alarm occurs and turned off in normal condition
- Alarm output status: Contact output status when an alarm occurs (ON in alarm condition and OFF in normal condition)

However, the output status depends on the settings of energized/de-energized of alarm, latch action, and contact type.

The above assumes that the contact type is energized (CLS). (Then contact is turned on when an event occurs.)
To output the normal alarm to the contact output, assign the alarm output status.

► Alarm action: 11.1 Setting Alarm Type

Alarm Latch Status

The alarm latch status can be output to another contact output irrespective of the setting of alarm-1 to -8 type (AL1 to AL8). (The setpoints below are I relay numbers.)

► I relay: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

Setpoint				Function
Alarm output latch 1 status	Alarm output latch 2 status	Alarm output latch 3 status	Alarm output latch 4 status	
4385	4417	4449	4481	Alarm 1
4386	4418	4450	4482	Alarm 2
4387	4419	4451	4483	Alarm 3
4389	4421	4453	4485	Alarm 4
4390	4422	4454	4486	Alarm 5
4391	4423	4455	4487	Alarm 6
4393	4425	4457	4489	Alarm 7
4394	4426	4458	4490	Alarm 8
4401	4433	4465	4497	Loop-2 alarm 1 (in Cascade control)
4402	4434	4466	4498	Loop-2 alarm 2 (in Cascade control)
4403	4435	4467	4499	Loop-2 alarm 3 (in Cascade control)
4405	4437	4469	4501	Loop-2 alarm 4 (in Cascade control)
4406	4438	4470	4502	Loop-2 alarm 5 (in Cascade control)
4407	4439	4471	4503	Loop-2 alarm 6 (in Cascade control)
4409	4441	4473	4505	Loop-2 alarm 7 (in Cascade control)
4410	4442	4474	4506	Loop-2 alarm 8 (in Cascade control)

- Alarm output latch 1, 2, 3, and 4 status: ON in the latch status of the contact output when an alarm occurs and OFF in the latch release status of the contact output in normal condition

However, the output status depends on the settings of contact type.

► Alarm latch action: 11.1 Setting Alarm Type

Key and Display Status

The key and display status can be output to the contact output. (The setpoints below are I relay numbers.)

Setpoint	Function	Contact status	
		ON	OFF
4705	PARAMETER key	Key is pressed	Key is not pressed
4706	DISPLAY key		
4707	Right arrow key		
4708	Down arrow key		
4709	SET/ENTER key		
4710	Up arrow key		
4711	Left key		
4712	F2 key		
4713	F1 key		
4714	A/M key		
4715	Fn key		

Operation Mode and Status

Setpoint	Function	Contact status	
		ON	OFF
4193	AUTO/MAN	MAN	AUTO
4194	Remote/Local	Remote	Local
4226	Remote/Local (Loop 2)	Remote	Local
4195	STOP/RUN	STOP	RUN
4197	Cascade (in Cascade control)	Cascade (OFF→ON)	AUTO or MAN
4198	AUTO (in Cascade control)	AUTO (OFF→ON)	Cascade or MAN
4199	MAN (in Cascade control)	MAN (OFF→ON)	Cascade or AUTO
4201	Output tracking status	Tracking ON	Tracking OFF
4207	During auto-tuning	During AT	–
4239	During auto-tuning (Loop 2)	During AT	–
4209	During automatic valve adjustment	During adjustment	–
4210	During operartion by the valve position estimating type	During operation by estimating type	During operation by feedback input
4213	Valve is open	Open	–
4214	Valve is closed	Closed	–
4256	FAIL output	Normal status	FAIL status

System Error Status

Setpoint	Function	Contact status	
		ON	OFF
4529	Heater break alarm 1 status	Alarm occurs	Normal
4530	Heater break alarm 2 status	Alarm occurs	Normal
4769	Message display interruption 1 status	With interruption	Without interruption
4770	Message display interruption 2 status	With interruption	Without interruption
4771	Message display interruption 3 status	With interruption	Without interruption
4773	Message display interruption 4 status	With interruption	Without interruption
5457	Power ON → Initialization status	During operation	Initializing the system

Error Status

Setpoint	Function	Contact status	
		ON	OFF
4065	PV input ADC error	Error occurs	Normal
4066	RSP input (E1-terminal area) ADC error		
4067	AIN2 input (E2-terminal area) ADC error		
4069	AIN4 input (E4-terminal area) ADC error		
4073	PV input burnout error		
4074	RSP input (E1-terminal area) burnout error		
4075	AIN2 input (E2-terminal area) burnout error		
4077	AIN4 input (E4-terminal area) burnout error		
4070	PV input RJC error		
4071	RSP input RJC error		
4081	Feedback resistance/current burnout		
4082	Automatic valve position adjustment error		
4097	PV input burnout error (Loop 1)		
4098	RSP input burnout error (Loop 1)		
4101	PV input over-scale (Loop 1)		
4102	PV input under-scale (Loop 1)		
4111	Auto-tuning time out (Loop 1)		
4113	PV input burnout (Loop 2)		
4114	RSP input burnout (Loop 2)		
4117	PV input over-scale (Loop 2)		
4118	PV input under-scale (Loop 2)		
4127	Auto-tuning time out (Loop 2)		

System Error Status

Setpoint	Function	Contact status	
		ON	OFF
4001	System data error	Error occurs	Normal
4002	Calibration value error		
4003	User (parameter) default value error		
4005	Setup parameter error		
4006	Operation parameter error		
4017	Corrupted ladder program		
4018	Ladder calculation overflow		
4019	Ladder program error		
4021	Load factor over 100%		
4022	Load factor over 200%		
4009	Faulty FRAM		

12.2.2 Changing Contact Type of Contact Output

Description

The contact type can set the action direction of contact output assigned to the function.

Setting Details

Contact Output Equipped as Standard

Parameter symbol	Name	Display level	Setting range	Menu symbol
AL1.D	AL1 contact type	PRO	CLS: When the event of assigned function occurs, the contact output is closed. OPN: When the event of assigned function occurs, the contact output is opened.	ALM Set
AL2.D	AL2 contact type	PRO		
AL3.D	AL3 contact type	PRO		

Note1: Nothing is displayed on Group display when each parameter is displayed.

Additional Contact Output

Parameter symbol	Name	Display level	Setting range	Menu symbol
DO1.D	DOn1 contact type	PRO	CLS: When the event of assigned function occurs, the contact output is closed. OPN: When the event of assigned function occurs, the contact output is opened.	DO Set
DO2.D	DOn2 contact type	PRO		
DO3.D	DOn3 contact type	PRO		
DO4.D	DOn4 contact type	PRO		
DO5.D	DOn5 contact type	PRO		

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code. “n” denotes the position of the terminal area. (n = 1 to 4)

Refer to the table below for presence/absence of UT55A contact output.

Terminal area	Suffix code: Type 2							
	0	1	2	3	4	5	6	7
E1-terminal area	–	–	–	–	–	–	DO11 to DO15	–
E2-terminal area	–	DO21 to DO25	–	DO21 to DO25	–	DO21 to DO25	DO21 to DO25	–
E3-terminal area	–	–	–	–	–	–	DO31 to DO35	–
E4-terminal area	–	–	–	–	–	–	–	–

Refer to the table below for presence/absence of UT52A contact output.

Terminal area	Suffix code: Type 2			
	0	1	2	3
E1-terminal area	–	–	–	DO11 to DO12

12

Contact Input/Output Functions

Contact Output for Control

Parameter symbol	Name	Display level	Setting range	Menu symbol
OR.D	OUT relay contact type	PRO	CLS: When the event of assigned function occurs, the contact output is closed. OPN: When the event of assigned function occurs, the contact output is opened.	ALM **Set**
OR2.D	OUT2 relay contact type	PRO		

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.D and OR2.D can be used as status output when they are not used as control output.
OR2.D can be used for Heating/cooling type.

► Terminal arrangement: 17.4 Wiring
► Contact type of Heater break alarm output: 11.7 Setting Heater Break Alarm

13.1 Setting Display Functions

13.1.1 Setting Active Color PV Display Function

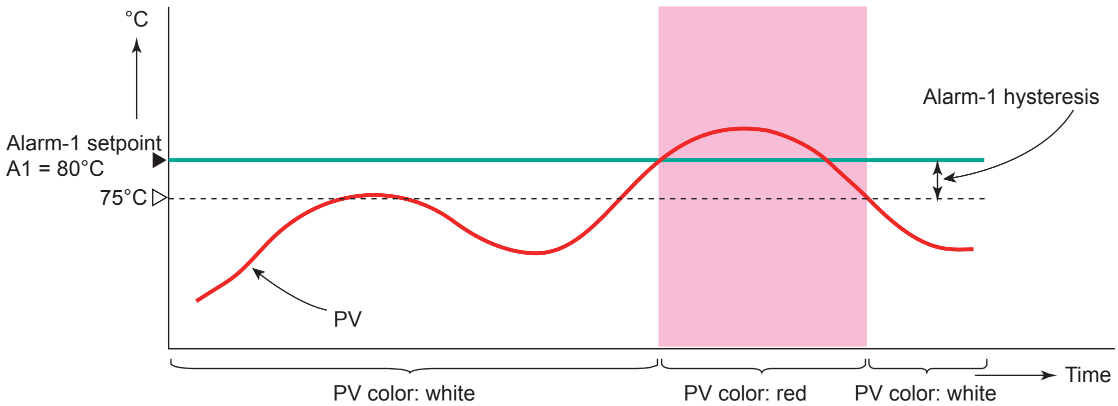
The active color PV display function changes the PV display color when an event occurs.

Description

Link to Alarm

The PV display color changes by linking to the alarm 1 or alarm 2.

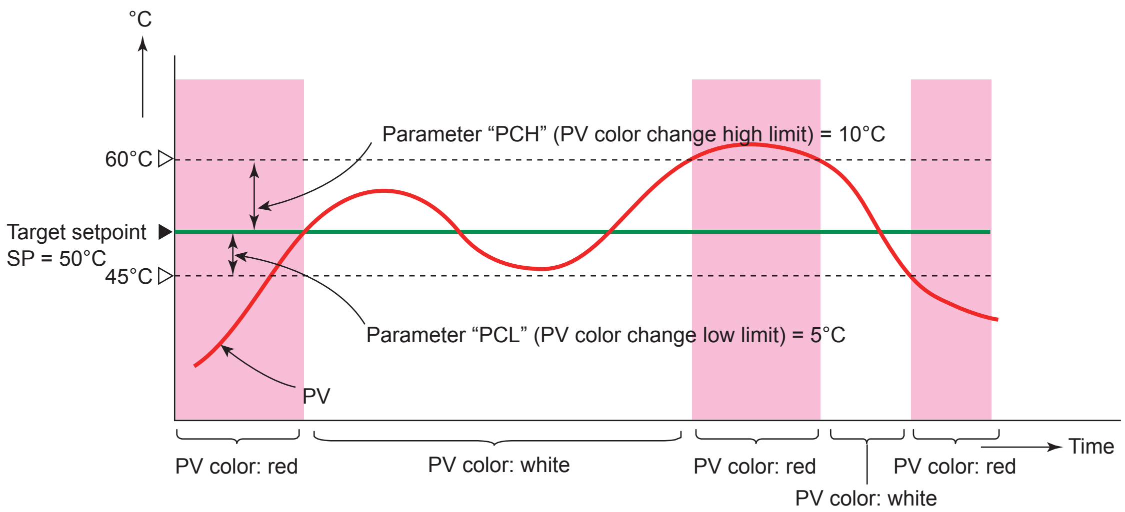
The following is an example of operation linking to alarm 1.
Set the alarm-1 type to “PV high limit alarm” and alarm-1 setpoint to “80°C.”
When the active color PV display switch is set to”2,” PV display color changes from white to red if PV exceeds the alarm-1 setpoint.
The red-to-white switching action can be set.



Change by Deviation

The PV display color changes by deviation (PV – SP).

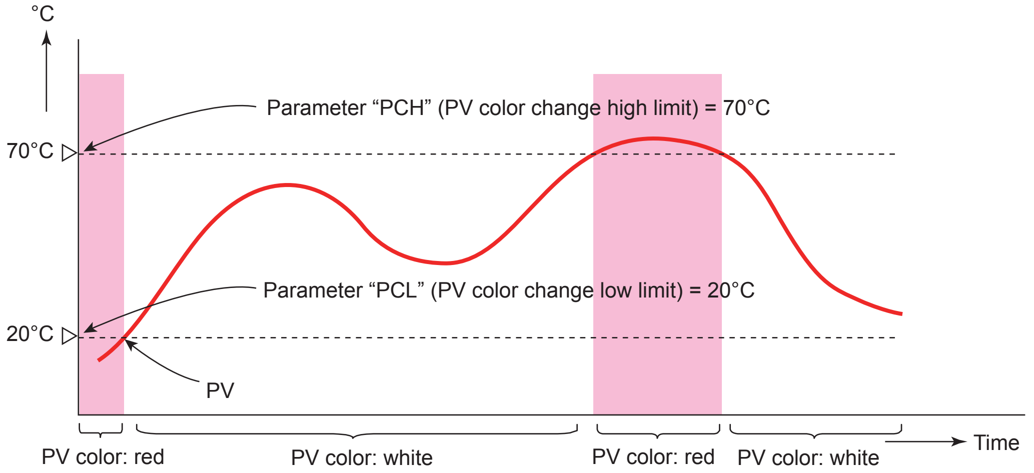
Set the PV color change high limit to “10°C” and the PV color change low limit to “5°C” as deviation band for the current target setpoint “50°C.” PV display color changes from white to red if PV is out of the deviation.
The red-to-white switching action can be set. There is no hysteresis.



Link to PV

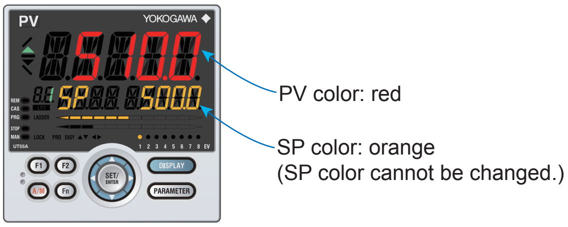
The PV display color changes by linking to PV.

Set the PV color change high limit to “70°C” and the PV color change low limit to “20°C.”
PV display color changes from white to red if PV is out of the range.
The red-to-white switching action can be set. There is no hysteresis.



Use in Fixed Color

PV display color can be fixed in red. It can also be fixed in white.



Setting Details

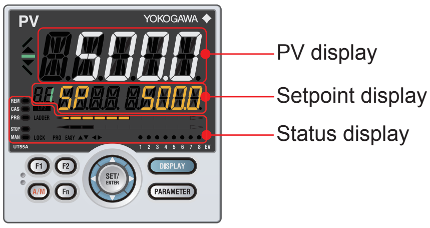
Parameter symbol	Name	Display level	Setting range	Menu symbol
PCMD	Active color PV display switch	EASY	0: Fixed in white 1: Fixed in red 2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red) 3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white) 4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red) 5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white) 6: PV limit (Within range: white, Out of range: red) 7: PV limit (Within range: red, Out of range: white) 8: SP deviation (Within deviation: white, Out of deviation: red) 9: SP deviation (Within deviation: red, Out of deviation: white)	DISP **Set**
PCH	PV color change high limit	EASY	Set a display value when in PV limit or SP deviation. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	
PCL	PV color change low limit	EASY		

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

13.1.2 Masking Arbitrary Display Value in Operation Display

Description

Display/non-display of the PV display, Setpoint display, and Status display in the Operation Display can be set.
Items that you do not want to display can be set to non-display. For example, when the Setpoint display is set to non-display, SP of the SP Display and OUT of the OUT Display are not displayed.



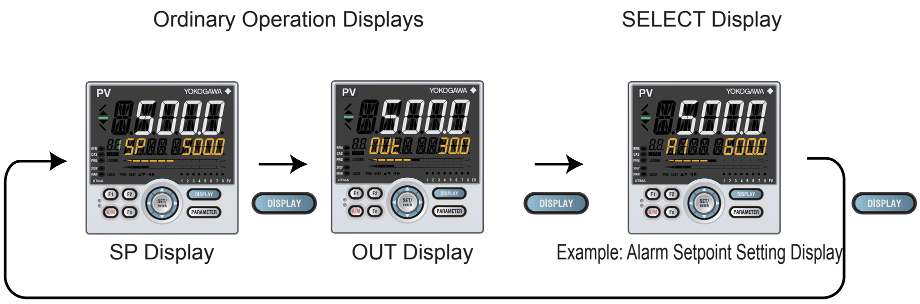
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PV.D	PV display area ON/OFF	PRO	OFF: Nondisplay ON: Display	DISP **Set**
SP.D	Setpoint display area ON/OFF	PRO		
STS.D	Status display area ON/OFF	PRO		

13.1.3 Registering SELECT Display (Up to 5 Displays)

Description

Registering frequently changed-operation parameters (except for the operation mode) in the SELECT Display of the Operation Displays will allow you to change parameter settings easily. A maximum of five Displays can be registered.
Set the D register number of the parameter you wish to register for the registration to the SELECT Display.
However, the parameters in the following menu cannot be set:
MODE, CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, DO, I/O, SYS, INIT, VER, and LVL.
When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CS1 to CS5	SELECT Display-1 to -5 registration	STD	OFF: No registration D register number (2501 to 5000)	CSEL **Set**

For D register numbers, see sections 6.4.3 to 6.4.6 in the UTAdvanced Series Communication Interface User's Manual.

Resistor Number	Category	Description	Reference in Communication Interface User's Manual
D2501 to D2700	Loop-1 Operation Parameters	SP and alarm setpoint setting	Section 6.4.3
D2701 to D2800		SP-related settings	
D2801 to D2900		Alarm function settings	
D2901 to D3000		PV-related settings	
D3001 to D3500		PID settings	
D3501 to D3600		Control action-related settings	
D3601 to D3800	Loop-2 Operation Parameters	SP and alarm setpoint setting	Section 6.4.4
D3801 to D3900		SP-related settings	
D3901 to D4000		Alarm function settings	
D4001 to D4100		PV-related settings	
D4101 to D4600		PID settings	
D4601 to D4700		Control action-related settings	
D4701 to D4800	P Parameters	P parameters	Section 6.4.5
D4801 to D5000	10-segment Linearizer Setting Parameters	10-segment linearizer settings	Section 6.4.6

13.1.4 Changing Event Display

Description

The UT55A has eight event (EV) lamps. The UT52A has four event (EV) lamps.
The default values are assigned to EV1 to EV8 lamps on the front of the controller according to each control mode.
The alarms 1 to 8 are assigned to EV1 to EV8 in the control modes other than Cascade control.
The alarms 1 to 8 are assigned to EV1 to EV 8 of Loop1, and the Loop-2 alarms 1 to 8 are assigned to EV1 to EV8 of Loop 2 (the LP2 lamp is lit) in Cascade control.
Loop-2 EV lamps are lit when the control mode is cascade and the operation mode is automatic or manual.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
EV1 to EV8	EV1 to EV8 display condition registration	PRO	Setting range: 4001 to 6304 OFF: Disable 4321: Link to alarm 1 (Lit when the alarm occurs) 4322: Link to alarm 2 (Lit when the alarm occurs) 4323: Link to alarm 3 (Lit when the alarm occurs) 4325: Link to alarm 4 (Lit when the alarm occurs) 4326: Link to alarm 5 (Lit when the alarm occurs) 4327: Link to alarm 6 (Lit when the alarm occurs) 4329: Link to alarm 7 (Lit when the alarm occurs) 4330: Link to alarm 8 (Lit when the alarm occurs) 4337: Link to Loop-2 alarm 1 (Lit when the alarm occurs) 4338: Link to Loop-2 alarm 2 (Lit when the alarm occurs) 4339: Link to Loop-2 alarm 3 (Lit when the alarm occurs) 4341: Link to Loop-2 alarm 4 (Lit when the alarm occurs) 4342: Link to Loop-2 alarm 5 (Lit when the alarm occurs) 4343: Link to Loop-2 alarm 6 (Lit when the alarm occurs) 4345: Link to Loop-2 alarm 7 (Lit when the alarm occurs) 4346: Link to Loop-2 alarm 8 (Lit when the alarm occurs) 4529: Heater break alarm 1 (Lit when the alarm occurs) 4530: Heater break alarm 2 (Lit when the alarm occurs) 5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed) 5041 to 5046: Link to DI11-DI16 (E1-terminal area) (Lit when the contact is closed) 5062: Link to DI26 (E2-terminal area) (Lit when the contact is closed) 5073 to 5077: Link to DI31-DI35 (E3-terminal area) (Lit when the contact is closed) 5089 to 5094: Link to DI41-DI46 (E4-terminal area) (Lit when the contact is closed) 5153 to 5155: Link to AL1-AL3 (Lit when the contact is closed) 5169 to 5173: Link to DO11-DO15 (E1-terminal area) (Lit when the contact is closed) 5185 to 5189: Link to DO21-DO25 (E2-terminal area) (Lit when the contact is closed) 5201 to 5205: Link to DO31-DO35 (E3-terminal area) (Lit when the contact is closed) For other functions, see the UTAdvanced Series Communication Interface User's Manual.	DISP Set

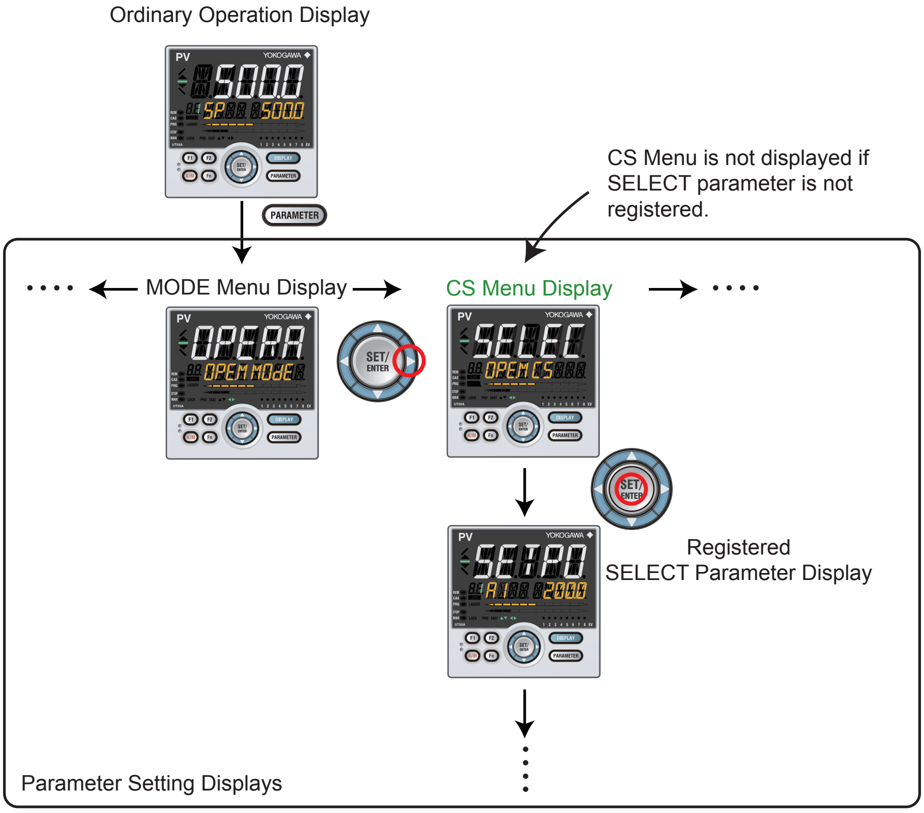
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Relay Number	Description	Reference in Communication Interface User's Manual
4001 to 4064	System error	Section 7.3.1
4065 to 4128	Input error	
4129 to 4192	Free area	
4193 to 4256	Operation mode	
4257 to 4320	Free area	
4321 to 4384	Alarm	
4385 to 4528	Alarm latch	
4529 to 4576	Heater break alarm	
4577 to 4640	SP number and PID number	
4641 to 4704	Free area	
4705 to 4768	Key	
4769 to 4832	Display	
4833 to 4896	Event lamp/Bar-graph display	
4897 to 5024	Free area	
5025 to 5152	Input relay	Section 7.3.2
5153 to 5280	Output relay	
5281 to 5408	Control computation output	
5409 to 5472	Special relay	
5473 to 5536	Free area	
5537 to 5792	Internal relay	
5793 to 6048	Free area	
6305 to 6432	DI terminals	Section 7.3.3
6433 to 6560	DO terminals	

13.1.5 Registering SELECT Parameter Display (Up to 10 Displays)

Description

Registering frequently changed operation parameters (change frequency is lower than SELECT Display) in the SELECT Parameter Display will allow you to change parameter settings easily. A maximum of ten Displays can be registered.
Set the D register number of the parameter you wish to register for the registration to the SELECT Parameter Display.
However, the parameters in the following menus cannot be set:
MODE, CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, DO, I/O, SYS, INIT, VER, and LVL.
When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CS10 to CS19	SELECT parameter-10 to -19 registration	PRO	OFF: No registration D register number (2501 to 5000)	CSEL **Set**

For D register numbers, see sections 6.4.3 to 6.4.6 of UTAdvanced Series Communication Interface User's Manual.

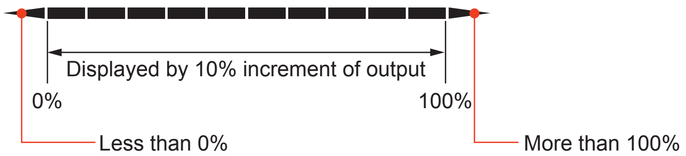
D Resistor Number	Category	Description	Reference in Communication Interface User's Manual
2501 to 2700	Loop-1 Operation Parameters	SPs and alarm setpoints setting	Section 6.4.3
2701 to 2800		SP-related settings	
2801 to 2900		Alarm function settings	
2901 to 3000		PV-related settings	
3001 to 3500		PID settings	
3501 to 3600		Control action-related settings	
3601 to 3800	Loop-2 Operation Parameters	SPs and alarm setpoints setting	Section 6.4.4
3801 to 3900		SP-related settings	
3901 to 4000		Alarm function settings	
4001 to 4100		PV-related settings	
4101 to 4600		PID settings	
4601 to 4700		Control action-related settings	
4701 to 4800	P Parameters	P parameters	Section 6.4.5
4801 to 5000	10-segment Linearizer Setting Parameters	10-segment linearizer settings	Section 6.4.6

13.1.6 Setting Bar-graph Display Function

Description

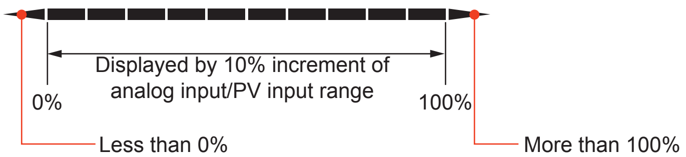
The upper and lower bar-graph displays are provided on the front of the controller.
PV or OUT can be displayed. Data which can be displayed on Bar-graph display are as follows.

OUT, Output



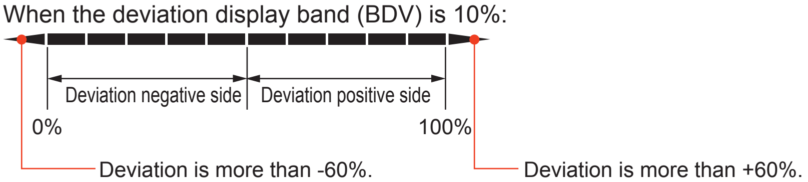
For relay, OFF is equivalent to 0% and ON is equivalent to 100%.

PV, SP, and Analog Input



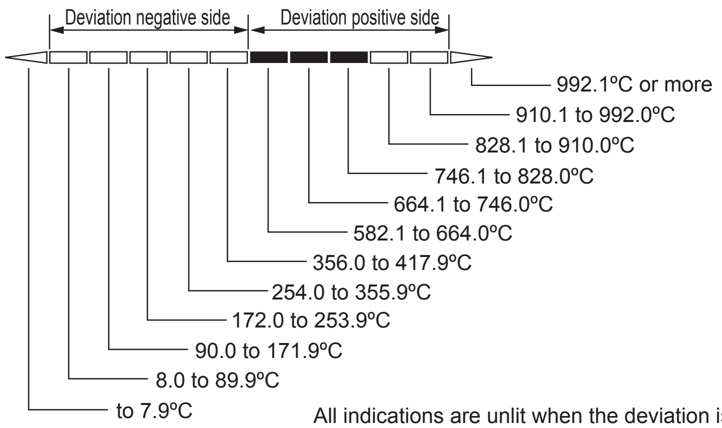
Deviation

When the deviation display band (BDV) is 10%:



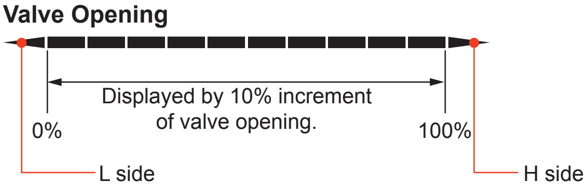
Deviation negative side and deviation positive side are displayed by 10% increment of deviation.
Indication is unlit when SP – (deviation display band (BDV)) ≤ PV ≤ SP + (deviation display band (BDV)).

IN = TC Type K -270.0 to 1370.0ºC
BDV = 82ºC (5%), SP = 500.0ºC, PV = 800.0ºC



All indications are unlit when the deviation is 418 ≤ PV ≤ 582ºC.

Valve Opening



Setting Details

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Menu symbol</th></tr>
<tr><td>BAR1</td><td>Upper bar-graph display registration</td><td>STD</td><td rowspan="2">0: Disable
1:OUT, Heating-side OUT, Internal value in Position proportional control
2: Cooling-side OUT
3: PV
4: SP
5: Deviation
6: Loop-2 OUT, Loop-2 heating-side OUT
7: Loop-2 cooling-side OUT
8: Loop-2 PV
9: Loop-2 SP
10: Loop-2 deviation
11 to 16: Disable
17: Feedback input (valve opening)
18: PV terminals analog input
19: RSP terminals analog input
20: AIN2 terminals analog input
21: AIN4 terminals analog input</td><td rowspan="3">DISP Set</td></tr>
<tr><td>BAR2</td><td>Lower bar-graph display registration</td><td>STD</td></tr>
<tr><td>BDV</td><td>Bar-graph deviation display band</td><td>STD</td><td>0.0 to 100.0% of PV input range span (EUS)</td></tr>
</table>

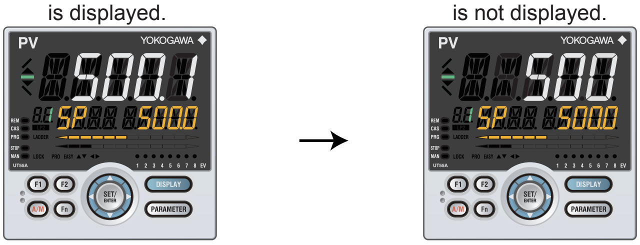
Note1: The bar-graph deviation display band (BDV) is enabled when the deviation is set to the BAR1 or BAR2.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

13.1.7 Masking Least Significant Digit of PV Display

Description

With and without least significant digit of the PV in the Operation Display can be set. When without least significant digit is set, the value of the least significant digit is truncated and not displayed.
The internal value is not changed depending on whether with or without least significant digit (the value is for display only). This parameter does not function for the PV without decimal point.

Least significant digit is displayed. → Least significant digit is not displayed.



The following shows the example of with and without least significant digit

PV display	
With least significant digit	**Without least significant digit**
1.4999	1.499
1.5000	1.500
1.9999	1.999
2.0000	2.000
3000.0	3000
3000.9	3000
3001.0	3001

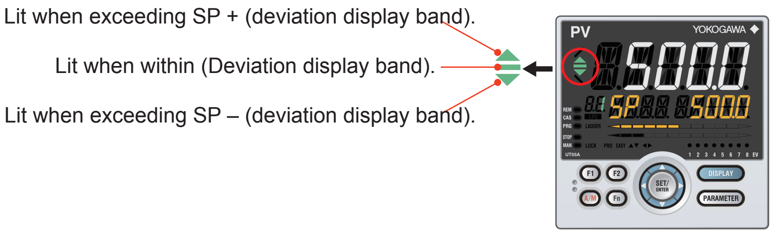
Setting Details

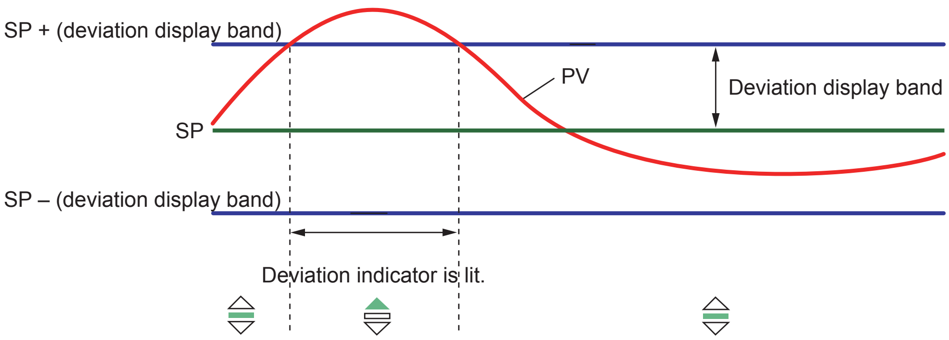
Parameter symbol	Name	Display level	Setting range	Menu symbol
MLSD	Least significant digital mask of PV display	STD	OFF: With least significant digit ON: Without least significant digit	DISP **Set**

13.1.8 Changing Deviation Display Lamp Action

Description

The deviation display shows the condition of (PV – SP).
The deviation display is only for the UT55A.





Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
DVB	Deviation display band	STD	0.0 to 100.0% of PV input range span (EUS).	DISP **Set**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

13.1.9 Setting Economy Mode

Description

The LCD backlight ON/OFF can be set in the following methods.
Setting the LCD backlight to OFF saves energy.

User Function Keys

The LCD backlight ON/OFF switch can be assigned to the user function key.

► User function key: 13.2 Assigning Function to User Function Key and A/M Key

Backlight OFF timer

The backlight OFF timer sets the economy mode parameter to ON.
If no keys are pressed for 30 minutes, the LCD backlight goes off automatically.
The backlight OFF can be set to turn off the backlight for the whole display or a display other than the PV display.
To turn on the LCD backlight, press any key.

Contact Input

The LCD backlight ON/OFF switch can be assigned to the contact input

► Contact input: 12.1 Setting Contact Input Function

In the following cases, the LCD backlight does not go off.
- when an alarm occurs
- when an error at power-on occurs

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ECO	Economy mode	STD	OFF: Disable 1: Economy mode ON (All indications except PV display OFF) 2: Economy mode ON (All indications OFF) 3: Brightness 10 % (all indications)	DISP **Set**

13.1.10 Selecting the Initial Operation Display that Appears at Power ON

Description

The initial Operation Display that appears when the power is turned on can be set.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
HOME	Home Operation Display setting	PRO	SP1: SP Display SP2: Loop-2 SP Display OUT1: OUT Display OUT2: Loop-2 OUT Display HCO: Heating/cooling OUT Display VP: Valve Position Display MV: Position Proportional Computation Output Display PID1: PID Number Display PID2: Loop-2 PID Number Display HC1: Heater Break Alarm-1 Current Display HC2: Heater Break Alarm-2 Current Display PV1: PV2/PV1 Display PV2: PV1/PV2 Display PV: PV Analog Input Display RSP: RSP Analog Input Display AIN2: AIN2 Analog Input Display AIN4: AIN4 Analog Input Display CS1 to CS5: SELECT Display 1 to 5	DISP Set

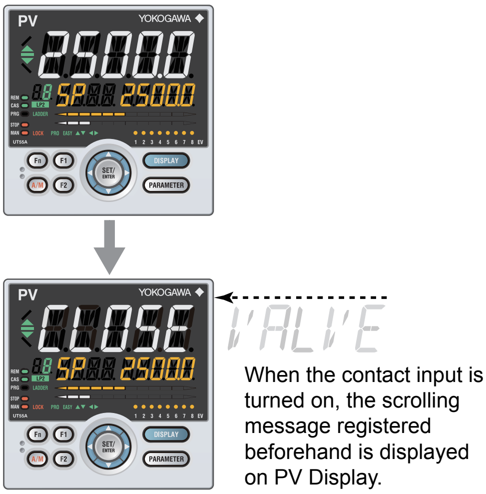
13.1.11 Setting Message Function

Description

Using the message function and turning the contact input on/off, the message registered beforehand can be displayed on PV display by interrupt.
The message is registered using LL50A Parameter Setting Software.
The messages are limited to 20 alphanumeric characters. A maximum of four messages can be registered.
If a number of messages occur simultaneously, the priority is as follows:
(high) MG1>MG2>MG3>MG4 (low)

► Message registration: LL50A Parameter Setting Software User's Manual
► Registration of contact input: 12.1.1 Setting Contact Input Function
► Registration symbols: 3.3 List of Display Symbols

Operation Display



13.1.12 Switching Guide Display Language

Description

The guide display language that appears when the parameter or the menu is displayed can be switched.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
LANG	Guide display language	EASY	ENG: English FRA: French GER: German SPA: Spanish	SYS Set

13.1.13 Changing Guide Scroll Speed

Description

The scroll speed can be changed when the guide for the parameter or menu is displayed.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SPD	Scroll speed	PRO	(Slow) 1 to 8 (Quick)	DISP Set

13.1.14 Turning Guide Display ON/OFF

Description

The guide display that appears when the parameter or the menu is displayed can be switched.
The guide display can be turned on and off by the Fn key in the Menu Display and Parameter Setting Display.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
GUID	Guide display ON/OFF	STD	OFF: Nondisplay ON: Display	DISP Set

13.1.15 Setting Automatic Return to Operation Display

Description

The Display will automatically revert to the Operation Display if no keys are pressed for 5 minutes in Menu Display or Parameter Setting Display.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OP.JP	Automatic return to Operation Display	PRO	ON: Automatically returned to the Operation Display. OFF: Not automatically returned to the Operation Display. OFF, ON	DISP Set

13

Display, Key, and Security Functions

13.1.16 Setting Brightness and Contrast Adjustment of LCD and Display Update Cycle

Description

The brightness and contrast for PV, Setpoint, Bar-graph, and Status indicator can be adjusted.
Brightness ranges for each display can be set.
The LCD has a characteristic that the display action becomes late at the low temperature. This can be solved by adjusting the display update cycle (D.CYC).

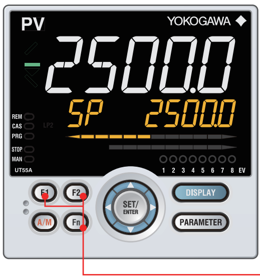
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
BRI	Brightness	EASY	(Dark) 1 to 5 (Bright)	DISP Set
B.PVW	White brightness adjustment of PV display	PRO	Adjusts the white brightness of PV display. (Dark) -4 to 4 (Bright)	
B.PVR	Red brightness adjustment of PV display	PRO	Adjusts the red brightness of PV display. (Dark) -4 to 4 (Bright)	
BSP	Brightness adjustment of Setpoint display	PRO	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)	
B.BAR	Brightness adjustment of Bar-graph display	PRO	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)	
B.STS	Brightness adjustment of Status indicator	PRO	Adjusts the brightness of Status indicator. (Dark) -4 to 4 (Bright)	
CTRS	Contrast	PRO	(Low) 1 to 6 (High)	
D.CYC	Display update cycle	PRO	1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s	

13.2 Assigning Function to User Function Key and A/M Key

Description

The UT55A has three user function keys on the front panel. The UT52A has one user function key.
Various functions (operation mode switch etc.) can be assigned to the user function key.
Press the user function key to perform the assigned function.



User function keys

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
F1 to Fn	User function key action setting	EASY	See the table below	KEY Set
A/M	A/M key action setting	PRO		

Setpoint	Function	Action	Availability			
			F1	F2	Fn	A/M
OFF	Unassigned	–	√	√	√	√
A/M	AUTO/MAN switch	AUTO and MAN switches every time the user function key is pressed.	√	√	√	√√
C/A/M	CAS/AUTO/MAN switch	MAN→AUTO→Cascade is repeated every time the user function key is pressed.	√	√	√	√√
R/L1	REM/LCL switch	Remote and Local switches every time the user function key is pressed.	√	√	√	√
R/L2	Loop-2 REM/LCL switch	Remote and Local of Loop 2 switches every time the user function key is pressed.	√	√	√	√
S/R	STOP/RUN switch	STOP and START switches every time the user function key is pressed.	√	√	√	√
CAS	Switch to CAS	Pressing the user function key switches to Cascade.	√	√	√	√
AUTO	Switch to AUTO	Pressing the user function key switches to AUTO.	√	√	√	√
MAN	Switch to MAN	Pressing the user function key switches to MAN.	√	√	√	√
REM1	Switch to REM	Pressing the user function key switches to Remote.	√	√	√	–
LCL1	Switch to LCL	Pressing the user function key switches to Local.	√	√	√	–
REM2	Switch to Loop-2 REM	Pressing the user function key switches to Loop-2 Remote.	√	√	√	–
LCL2	Switch to Loop-2 LCL	Pressing the user function key switches to Loop-2 Local.	√	√	√	–
STOP	Switch to STOP	Pressing the user function key stops the operation.	√	√	√	–
RUN	Switch to RUN	Pressing the user function key starts the operation.	√	√	√	–
AT	Auto-tuning	Pressing the user function key executes auto-tuning	√	√	√	–
LTUP	LCD brightness UP	The current brightness gradually increases every time the function key is pressed.	√	√	√	–
LTDN	LCD brightness DOWN	The current brightness gradually decreases every time the function key is pressed.	√	√	√	–
BRI	Adjust LCD brightness	The current brightness gradually increases every time the function key is pressed. Pressing the function key after reaching the maximum brightness changes to the minimum brightness. Thereafter, minimum brightness→maximum brightness→maximum brightness is repeated.	√	√	√	–
LCD	LCD Backlight ON/OFF switch	The LCD backlight turns on and off every time the user function key is pressed.	√	√	√	–

(Continued)

Setpoint	Function	Action	Availability			
			F1	F2	Fn	A/M
LAT	Latch release	Latch 1 to latch 4 are released every time the user function key is pressed.	√	√	√	–
PID	PID Tuning switch	Pressing the function key during operation displays the first parameter (proportional band) of the currently selected PID parameter group and enables the setting to be changed. As with the operation to change the parameter setpoint, the sequence is P→I→D→...→P→.... Pressing the function key again, or pressing the DISPLAY key or DISP key returns to the initial Operation Display. The PARAMETER key or PARA key does not switch to the Menu Display.	√	√	√√	–

Note 1: √ indicates available, – indicates unavailable, and √√ indicates initial value.
Note 2: The initial value of the A/M key is CAS/AUTO/MAN switch when the control mode (CTLM) is Cascade control, and AUTO/MAN switch when CTLM is other than Cascade control.

Status of user function key

The status of the user function key can be identified by communication.

(1) User function key 0 ↔ 1 toggles
0 or 1 can be read every time the user function key is pressed. (Initial value: 0)

(2) User function key status
"1" can be read while the user function key is held down, and "0" can be read when the user function key is released. (Initial value: 0)

► Reading via communication: UTAdvanced Series Communication Interface User's Manual

Fn key operation in the Parameter Setting Display

In the Menu Display and Parameter Setting Display, the guide is displayed on PV display. At this time, use the Fn key to turn on and off the guide display on PV display. A measured input value (PV) is displayed in the ON state.

13.3 Setting Security Functions

13.3.1 Setting a Password

Description

The password function can prevent inadvertent changes to the parameter settings.
If a password is set, the checking is required when moving to the Setup Parameter Setting Display. When the password is verified, can be changed to the Setup Parameter Setting Display. The parameters in the following menus can be set only when the password is verified.
CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, DO, I/O, SYS, INIT, VER, and LVL.
When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Always remember your password when using the password function.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PASS	Password setting	EASY	0 (No password) to 65535	SYS Set

13.3.2 Setting Parameter Display Level

Description

Parameter display level can be set according to the setting level.
► Parameter display level: Chapter 18 Parameters

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
LEVL	Parameter display level	EASY	EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode	LVL Set

13.3.3 Locking (Hiding) Parameter Menu Display

Description

The parameter menu display lock function hides the following Parameter Menu Displays.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CTL	[CTL] menu lock	PRO	OFF: Display ON: Nondisplay	MLOC Set
PV	[PV] menu lock	PRO		
RSP	[RSP] menu lock	PRO		
AIN2	[AIN2] menu lock	PRO		
AIN4	[AIN4] menu lock	PRO		
MPV	[MPV] menu lock	PRO		
OUT	[OUT] menu lock	PRO		
HBA	[HBA] menu lock	PRO		
R485	[R485] menu lock	PRO		
ETHR	[ETHR] menu lock	PRO		
PROF	[PROF] menu lock	PRO		
KEY	[KEY] menu lock	PRO		
DISP	[DISP] menu lock	PRO		
CSEL	[CSEL] menu lock	PRO		
KLOC	[KLOC] menu lock	PRO		
DI.SL	[DI.SL] menu lock	PRO		
DI.NU	[DI.NU] menu lock	PRO		
DI.D	[DI.D] menu lock	PRO		
ALM	[ALM] menu lock	PRO		
DO	[DO] menu lock	PRO		
I/O	[I/O] menu lock	PRO		
SYS	[SYS] menu lock	PRO		
INIT	[INIT] menu lock	PRO		
VER	[VER] menu lock	PRO		
LVL	[LVL] menu lock	PRO		

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

(Continued)

Parameter symbol	Name	Display level	Setting range	Menu symbol
MODE	[MODE] menu lock	PRO	OFF: Display ON: Nondisplay	MLOC **Set**
CS	[CS] menu lock	PRO		
SP	[SP] menu lock	PRO		
SPS	[SPS] menu lock	PRO		
ALRM	[ALRM] menu lock	PRO		
PVS	[PVS] menu lock	PRO		
PID	[PID] menu lock	PRO		
TUNE	[TUNE] menu lock	PRO		
ZONE	[ZONE] menu lock	PRO		
PPAR	[PPAR] menu lock	PRO		
PYS1	[PYS1] menu lock	PRO		
PYS2	[PYS2] menu lock	PRO		
PYS3	[PYS3] menu lock	PRO		
PYS4	[PYS4] menu lock	PRO		

Note 1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.
Note 2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

13.3.4 Key Lock

Description

The key lock function locks the key on the front panel to prohibit key operation.
It can prohibit the operation mode switch or parameter setting change.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
DATA	Front panel parameter data key lock	STD	OFF: Unlock ON: Lock	KLOCK Set
A/M	Front panel A/M key lock	STD		

13.3.5 Setting Display/Non-display of Operation Display

Description

Display/non-display of the Operation Display can be set.

► Operation Display: Chapter 6 Monitoring and Control of Regular Operations

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
U.SP	SP Display lock	PRO	OFF: Display ON: Nondisplay	KLOC Set
U.OUT	OUT Display lock	PRO		
U.HCO	Heating/cooling OUT Display lock	PRO		
U.VP	Valve Position Display lock	PRO		
U.MV	Position Proportional Computation Output Display lock	PRO		
U.PID	PID Number Display lock	PRO		
U.HC	Heater Break Alarm Current Value Display lock	PRO		
U.PV1	PV2/PV1 Display lock	PRO		
U.PV2	PV1/PV2 Display lock	PRO		
U.PV	PV Analog Input Display lock	PRO		
U.RSP	RSP Analog Input Display lock	PRO		
U.AI2	AIN2 Analog Input Display lock	PRO		
U.AI4	AIN4 Analog Input Display lock	PRO		

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

13.3.6 Prohibiting Writing via Communication

Description

Writing data to each register via all communication methods can be permitted or prohibited. However, writing data via light-loader (front) or maintenance port (upper) is possible using LL50A Parameter Setting Software.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
COM.W	Communication write enable/ disable	STD	OFF: Enable ON: Disable	KLOC Set

13.4 Confirmation of Key and I/O Condition and Version

13.4.1 Confirmation of Key and I/O Condition

Description

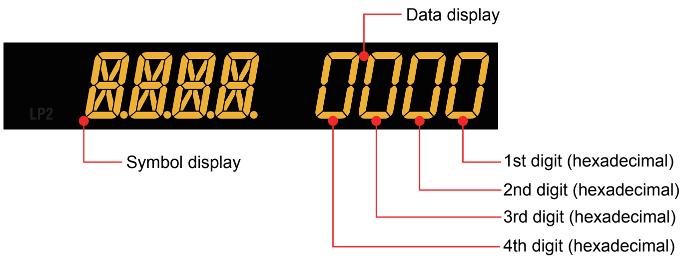
Can be confirm the Key and I/O condition.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
KEY	Key status	PRO	Read only.	I/O **Set**
X000	DI1-DI3 status (equipped as standard)	PRO		
X100	DI11-DI16 status (E1-terminal area)	PRO		
X300	DI31-DI35 status (E3-terminal area)	PRO		
X400	DI41-DI46 status (E4-terminal area)	PRO		
Y000	AL1-AL3 status (equipped as standard)	PRO		
Y100	DO11-DO15 status (E1-terminal area)	PRO		
Y200	DO21-DO25 status (E2-terminal area)	PRO		
Y300	DO31-DO35 status (E3-terminal area)	PRO		

Note: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Key confirmation parameters are displayed in hexadecimal.
When the error occurs, "1" is set on the bit of corresponding error , and the bit data is displayed in hexadecimal.



Parameter KEY

Displayed digit	bit	Description
1st digit	0	PARAMETER (or PARA) key (0: OFF, 1: ON)
	1	DISPLAY (or DISP) key (0: OFF, 1: ON)
	2	RIGHT arrow key (0: OFF, 1: ON)
	3	DOWN arrow key (0: OFF 1: ON)
2nd digit	4	SET/ENTER key (0: OFF, 1: ON)
	5	UP arrow key (0: OFF, 1: ON)
	6	LEFT arrow key (0: OFF, 1: ON)
	7	F2 key (0: OFF, 1: ON)
3rd digit	8	F1 key (0: OFF, 1: ON)
	9	A/M key (0: OFF, 1: ON)
	10	Fn key (0: OFF, 1: ON)
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter X000

Displayed digit	bit	Description
1st digit	0	DI1 status (0: OFF, 1: ON)
	1	DI2 status (0: OFF, 1: ON)
	2	DI3 status (0: OFF, 1: ON)
	3	–
2nd digit	4	–
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter X100

Displayed digit	bit	Description
1st digit	0	DI11 status (0: OFF, 1: ON)
	1	DI12 status (0: OFF, 1: ON)
	2	DI13 status (0: OFF, 1: ON)
	3	DI14 status (0: OFF, 1: ON)
2nd digit	4	DI15 status (0: OFF, 1: ON)
	5	DI16 status (0: OFF, 1: ON)
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter X300

Displayed digit	bit	Description
1st digit	0	DI31 status (0: OFF, 1: ON)
	1	DI32 status (0: OFF, 1: ON)
	2	DI33 status (0: OFF, 1: ON)
	3	DI34 status (0: OFF, 1: ON)
2nd digit	4	DI35 status (0: OFF, 1: ON)
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter X400

Displayed digit	bit	Description
1st digit	0	DI41 status (0: OFF, 1: ON)
	1	DI42 status (0: OFF, 1: ON)
	2	DI43 status (0: OFF, 1: ON)
	3	DI44 status (0: OFF, 1: ON)
2nd digit	4	DI45 status (0: OFF, 1: ON)
	5	DI46 status (0: OFF, 1: ON)
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter Y000

Displayed digit	bit	Description
1st digit	0	AL1 status (0: OFF, 1: ON)
	1	AL2 status (0: OFF, 1: ON)
	2	AL3 status (0: OFF, 1: ON)
	3	–
2nd digit	4	–
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter Y100

Displayed digit	bit	Description
1st digit	0	DO11 status (0: OFF, 1: ON)
	1	DO12 status (0: OFF, 1: ON)
	2	DO13 status (0: OFF, 1: ON)
	3	DO14 status (0: OFF, 1: ON)
2nd digit	4	DO15 status (0: OFF, 1: ON)
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter Y300

Displayed digit	bit	Description
1st digit	0	DO31 status (0: OFF, 1: ON)
	1	DO32 status (0: OFF, 1: ON)
	2	DO33 status (0: OFF, 1: ON)
	3	DO34 status (0: OFF, 1: ON)
2nd digit	4	DO35 status (0: OFF, 1: ON)
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

13.4.2 Confirmation of Version

Description

Can be confirm the version of the controller.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
MCU	MCU version	EASY	Read only.	VER Set
DCU	DCU version	EASY		
ECU1	ECU-1 version	EASY		
ECU2	ECU-2 version	EASY		
ECU3	ECU-3 version	EASY		
ECU4	ECU-4 version	EASY		
PARA	Parameter version	EASY		
H.VER	Product version	EASY		
SER1	Serial number 1	EASY		
SER2	Serial number 2	EASY		
MAC1	MAC address 1	EASY		
MAC2	MAC address 2	EASY		
MAC3	MAC address 3	EASY		

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14.1 Initializing Parameter Settings to Factory Default Values

Description

Parameter settings can be initialized to the factory default values.
The ladder program is also initialized to the factory default.
Use the key or LL50A Parameter Setting Software to execute it.

Note

The user setting values (defaults) are not initialized even if the parameter setting values are initialized to the factory default values.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
F.DEF	Initialization to factory default value	PRO	-12345: Initialization, automatically returned to "0" after initialization.	INIT Set

14.2 Registering and Initializing User Default Values

14.2.1 Registering as User Setting (Default) Values

Description

The user default values can be registered as parameter default values.
The ladder program can not be registered as user default values.
Use the LL50A Parameter Setting Software to register user setting (default) values.

CAUTION

Before registering the user default value, make sure that the user setting value is set to the parameter.

14.2.2 Initializing to User Setting (Default) Values

Description

Parameter settings can be initialized to the user setting (default) values.
The ladder program is not initialized to the factory default.
Use the LL50A Parameter Setting Software to execute it.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
U.DEF	Initialization to user default value	PRO	12345: Initialization, automatically returned to "0" after initialization.	INIT Set

15.1 Remedies if Power Failure Occurs during Operations

Description

The operation status and remedies after a power failure differ with the length of power failure time:

- 100–240 V AC: Instantaneous power failure of 20 ms or less
- 24 V AC/DC: Instantaneous power failure of 1 ms

A power failure is not detected. Normal operation continues.

- Power failure of about less than 5 seconds

The following shows effects caused in “settings” and “operation status.”

Alarm action	Does not continue. Alarm with stand-by function will enter stand-by status.
Setting parameter	Set contents of each parameter are retained.
Auto-tuning	Cancelled.
Control action	Action before power failure continues.
Timer, counter (ladder program)	Initialized.

- Power failure of about 5 seconds or more

The following shows effects caused in “settings” and “operation status.”

<table>
<tr><td>Alarm action</td><td>Does not continue. Alarm with stand-by function will enter stand-by status.</td></tr>
<tr><td>Setting parameter</td><td>Set contents of each parameter are retained.</td></tr>
<tr><td>Auto-tuning</td><td>Cancelled.</td></tr>
<tr><td>Control action</td><td>Differs with setting of the parameter “R.MD” (restart mode).
<table>
<tr><td>R.MD setting</td><td>Control action after recovery from power failure</td></tr>
<tr><td>CONT</td><td>Continues action before power failure. (Factory default)</td></tr>
<tr><td>MAN (*)</td><td>Outputs the preset output value (PO) of the PID group used as control output and continues action in MAN mode.</td></tr>
<tr><td>AUTO (*)</td><td>The control computation is executed in AUTO mode based on the preset output value (PO) of the PID group used as control output.</td></tr>
</table>
* In Heating/cooling control, starts action from 50% of control computation output.</td></tr>
<tr><td>Timer, counter (ladder program)</td><td>Initialized.</td></tr>
</table>

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
R.MD	Restart mode	STD	CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.	SYS Set

15.2 Power Frequency Setting

Description

The power frequency can be set by automatic detection or manually.
However, when the /DC option is specified, only manual setting is available.

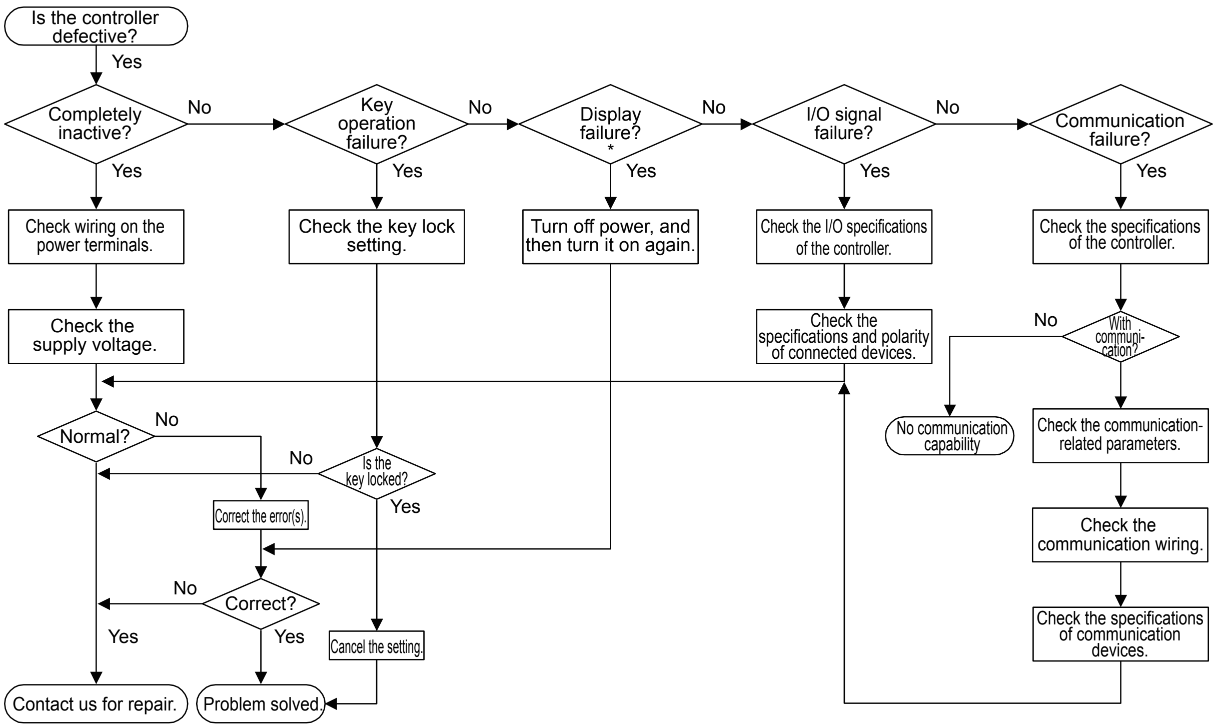
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
FREQ	Power frequency	EASY	AUTO 60: 60 Hz 50: 50 Hz	SYS **Set**

16.1 Troubleshooting

16.1.1 Troubleshooting Flowchart

If the Operation Display does not appear after turning on the controller's power, follow the measures in the procedure below.
If a problem appears complicated, contact our sales representative.



*: The LCD (a liquid crystal display) is used for a display portion of this product. The LCD has a characteristic that the display action becomes late at the low temperature. Additionally, the luminance and contrast degradation are caused due to aged deterioration. However, the control function is not affected.

16

Troubleshooting, Maintenance, and Inspections

16.1.2 Errors at Power On

The errors shown below may occur in the fault diagnosis when the power is turned on.

PV display (Operation Display)	Setpint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Indication off	Indication off	–	–	Faulty MCU RAM / MCU ROM	MCU RAM / MCU ROM are failed.	Faulty. Contact us for repair.
ERR	SYS -----	–	–	System data error	System data is corrupted.	Faulty. Contact us for repair.
ERR	PAR 0004 (for user default value error only)	–	Setup parameter (PA.ER)	User (parameter) default value error	User parameter is corrupted. Initialized to factory default value.	Check and reconfigure the initialized parameters. Error indication is erased when the power is turned on again.
ERR	PAR 0010 (for setup parameter error only)	–	Setup parameter (PA.ER)	Setup parameter error	Setup parameter data is corrupted. Initialized to factory default value.	Check and reconfigure the initialized parameters. Error indication is erased when the power is turned on again.
ERR	PAR 0020 (for operation parameter error only)	–	Setup parameter (PA.ER)	Operation parameter error	Operation parameter data is corrupted. Initialized to user default value.	Check and reconfigure the initialized parameters. Error indication is erased when the power is turned on again.
ERR	PAR 0400	–	Setup parameter (PA.ER)	Control parameter (operation mode, output) error	Control parameter data is corrupted. Initialized to user default value.	Check and reconfigure the initialized parameters. Error indication is erased when the power is turned on again.
ERR	SLOT 0017 (0017: Error occurs to all hardware of E1 to E4-terminal areas.)	–	Setup parameter (OP.ER)	Non responding hardware of extended function (E1 to E4-terminal areas)	Inconsistence of system data and hardware of extended function. Non responding communication between hardware of extended function (E1 to E4-terminal areas).	Faulty. Contact us for repair.
Normal indication	Normal indication	Rightmost decimal point on PV display blinks.	Setup parameter (PA.ER)	Calibration value error	Initialized to calibrated default value because of corrupted factory default value.	Faulty. Contact us for repair.
Normal indication	Normal indication	Right most decimal point on Symbol display blinks.	Setup parameter (PA.ER)	Faulty FRAM	Writing (storing) data to FRAM is impossible.	Faulty. Contact us for repair.
Normal indication	Normal indication	LADDER lamp blinks.	Setup parameter (LA.ER)	Corrupted ladder program	Ladder program is corrupted. Operates without ladder program.	Download the ladder program again.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	User profile error (PROFIBUS-DP communication)	User profile is corrupted.	Download the user profile again.

Errors at Power On (Input/output Action)

Error description	PV input, RSP input, and aux. analog input	Ladder calculation	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output, position proportional output)	Feedback input (for Position proportional type)	Contact input	Contact (alarm) output	Communication
Faulty MCU RAM Faulty MCU ROM	Undefined	Stopped	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	Undefined	OFF	OFF	Stopped
System data error	Undefined	Stopped	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	Undefined	OFF	OFF	Normal action
User (parameter) default value error	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Setup parameter error													
Operation parameter error													
Control parameter error													
Non responding hardware of extended function (E1 to E4-terminal areas)	Undefined	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Calibration value error	Normal action (out of accuracy)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action (out of accuracy)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Faulty FRAM	Normal action						Normal action						
Corrupted ladder program	Normal action	Normal action (without ladder program)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
User profile error (PROFIBUS-DP communication)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	PROFIBUS-DP communication disabled

16.1.3 Errors during Operation

Errors during Operation (1)

The errors shown below may occur during operation.

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
AD.ERR	Normal indication (Note)	–	Setup parameter (AD1.E)	Analog input terminal ADC error • PV input • RSP input (E1-terminal area) • AIN2 input (E2-terminal area) • AIN4 input (E4-terminal area)	Analog input terminal AD value error	Faulty Contact us for repair.
RJC.E (Displays RJC.E and PV alternately.)	Normal indication (Note)	–	Setup parameter (AD1.E)	Universal input terminal RJC error • PV input • RSP input (E1-terminal area)	Universal input terminal RJC error	Faulty Contact us for repair. Set the parameter RJC to OFF to erase error indication.
B.OUT	Normal indication (Note)	–	Setup parameter (AD1.E)	Analog input terminal burnout error • PV input • RSP input (E1- terminal area) • AIN2 input (E2-terminal area) • AIN4 input (E4-terminal area)	Analog input terminal sensor burnout	Check wiring and sensor. Error indication is erased in normal operation.
			Setup parameter (PV1.E/PV2.E)	PV input burnout error (Loop1, Loop2)	Burnout of analog input connected to PV	Check wiring and sensor of connected analog input terminal. Error indication is erased in normal operation.
OVER -OVER	Normal indication	–	Setup parameter (PV1.E/PV2.E)	PV input over-scale PV input under-scale (PV values out of -5 to 105%) (Loop1, Loop 2)	PV input is out of -5 to 105%. Also occurs when the data out of range which is the ladder computation result is input.	Check analog input value or ladder program.
Normal indication	Normal indication	–	Setup parameter (PV1.E/PV2.E)	RSP input burnout error (Loop 1, Loop 2)	Burnout of analog input connected to RSP	Check wiring and sensor. Error indication is erased in normal operation.

Note: When an error occurs in input shown in Analog input display (Operation display).
Setpoint display shows the same symbol as the PV display.

Errors during Operation (Input/output Action)

<table>
<tr><th>Error description</th><th>PV input, RSP input, and aux. analog input</th><th>Ladder calcula-tion</th><th>Control compu-tation</th><th>Control output</th><th>Retrans-mission output</th><th>Alarm action</th><th>Analog out-put (control output, retransmis-sion output)</th><th>Voltage pulse output (control output)</th><th>Relay output (control out-put, position proportional output)</th><th>Feedback input (for Position proportional type)</th><th>Contact input</th><th>Contact (alarm) output</th><th>Com-munica-tion</th></tr>
<tr><td>Analog input terminal ADC error
• PV input
• RSP input (E1-terminal area)
• AIN2 input (E2-terminal area)
• AIN4 input (E4-terminal area)</td><td>105%</td><td>Normal action</td><td>Normal action</td><td>When in AUTO and RUN modes: Error preset output</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td></tr>
<tr><td>Universal input terminal RJC error
• PV input
• RSP input (E1-terminal area)</td><td>Normal action (without reference junction compensation)</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td></tr>
<tr><td>Analog input terminal burnout error
• PV input
• RSP input (E1- terminal area)
• AIN2 input (E2-terminal area)
• AIN4 input (E4-terminal area)</td><td>Depends on the parameter BSL.
Upscale: 105%
Downscale: -5%</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td>Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td><td rowspan="2">Normal action</td></tr>
<tr><td>PV input burnout error (Loop1, Loop2)</td><td>Depends on the setting of the parameter BSL of the analog terminal connected to the PV where the error occurs.
Upscale: 105%
Downscale: -5%</td><td>When in AUTO and RUN modes: Error preset output</td></tr>
<tr><td>PV input over-scale
PV input under-scale
(PV values out of -5 to 105%)
(Loop1, Loop 2)</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td></tr>
<tr><td>RSP input burnout error (Loop 1, Loop 2)</td><td>Depends on the setting of the parameter BSL of the analog terminal connected to the RSP where the error occurs.
Upscale: 105%
Downscale: -5%</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td><td>Normal action</td></tr>
</table>

Errors during Operation (2)

The errors shown below may occur during operation.

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Normal indication	RSP B.OUT	–	Setup parameter (PV1.E/PV2.E)	Burnout error when RSP input is used for control (Loop 1, Loop 2)	Burnout error of analog input connected to RSP when RSP is used for control computation	Check wiring and sensor. Error indication is erased in normal operation.
Normal indication	OUT -----	–	Setup parameter (AD2.E)	Feedback input resistor/ current burnout	Feedback input burnout	Check wiring of feedback input resistor/current. Error indication is erased in normal operation.
Normal indication	Normal indication	LADDER lamp blinks	Setup parameter (LA.ER)	Ladder calculation overflow	Floating point computation in ladder calculation is infinite.	Check the ladder program.
				Load factor over 100%	Computation does not end within the control period (load factor is 100% or more and less than 200%).	Change the control period or reduce the number of steps for the ladder program.
				Load factor over 200%. (Forced end)	Computation does not end within the control period (load factor is 200% or more).	Change the control period or reduce the number of steps for the ladder program.
				Ladder program error	Ladder program is corrupted.	Download the ladder program again. If the error indication is still not erased, there is a fault. Contact us for repair.

Errors during operation (Input/output Action)

Error description	PV input, RSP input, and aux. analog input	Ladder calcula-tion	Control compu-tation	Control output	Retrans-mission output	Alarm action	Analog out-put (control output, retrans-mission output)	Voltage pulse out-put (control output)	Relay out-put (control output, position proportion-al output)	Feedback input (for Position proportion-al type)	Contact input	Contact (alarm) output	Commu-nication
Burnout error when RSP input is used for control (Loop 1, Loop 2)	Depends on the setting of the parameter BSL of the analog terminal connected to the RSP where the error occurs. Upscale: 105% Downscale: -5%	Normal action	Normal action	When in AUTO and RUN modes: Error preset output	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Feedback input resistor/current burnout	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	-	Position proportional output: OFF	105%	Normal action	Normal action	Normal action
Ladder calculation overflow	Normal action	Undefined (calculation with max. value)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Load factor is over 100%	Normal action	Does not work according to the control period.	Does not work according to the control period.	Does not work according to the control period.	Does not work according to the control period.	Does not work according to the control period.	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	The response from the main unit slows.
Load factor is over 200%. (Forced termination)	Normal action	Forced end at 200%	Does not work according to the control period.	Does not work according to the control period.	Does not work according to the control period.	Does not work according to the control period.	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	
Ladder program error	Normal action	Undefined (Stopped at the error detection)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action

Errors during Operation (3)

The errors shown below may occur during operation.

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	Peer-to-peer communication error	Peer-to-peer communication error	Check that the target devices are connected correctly. Recovery at normal receipt.
AT,E	Normal indication	–	Setup parameter (PV1.E/PV2.E)	Auto-tuning time-out (Loop 1, Loop 2)	Auto-tuning does not end even when 24 hours have elapsed after the start of tuning.	Check the process. Hold down any key to erase the error indication
VAT,E	Normal indication	–	Setup parameter (AD2.E)	Automatic valve position adjustment error	Fully-closed valve position is equal to or larger than the fully-open valve position after automatic valve position adjustment is performed.	Check wiring and valve. Hold down any key to erase the error indication.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	Communication error (RS-485 communication)	Framing parity error Buffer overflow Inter-character time-out Checksum error (PC link communication with checksum) CRC check error (Modbus/RTU) LRC check error (Modbus/ASCII)	Check the communication parameters. Recovery at normal receipt. Hold down any key to stop blinking.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	Communication error (coordinated operation)	Inconsistence of loop between coordinated master and slaves Communication from coordinated master is interrupted for 2 seconds.	Check the communication parameters. Recovery at normal receipt. Change from remote to local mode to stop blinking. When the mode is changed from remote to local, SP tracking does not work even if it is set to ON.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	User profile error (PROFIBUS-DP communication)	User profile is corrupted.	Download the user profile again.
Normal indication	Normal indication	Rightmost decimal point on Symbol display blinks.	Setup parameter (PA.ER)	Faulty FRAM	Writing (storing) data to FRAM is impossible.	Faulty. Contact us for repair.

Errors during Operation (Input/output Action)

Error description	PV input, RSP input, and aux. analog input	Ladder calculation	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output, position proportional output)	Feedback input (for Position proportional type)	Contact input	Contact (alarm) output	Communication
Peer-to-peer communication error	Normal action	Normal action (However, the peer-to-peer communication register is not updated.)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Auto-tuning time-out (Loop 1, Loop 2)	Normal action	Normal action	Auto-tuning stopped, normal action	Auto-tuning stopped, Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Automatic valve position adjustment error	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	105%	Normal action	Normal action	Normal action
Communication error (RS485 communication)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Communication error (coordinated operation) Inconsistence of loop between coordinated master and slaves	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Communication error (coordinated operation) Communication from coordinated master is interrupted for 2 seconds.	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
User profile error (PROFIBUS-DP communication)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	PROFIBUS-DP communication disabled
Faulty FRAM	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action

Errors during Operation (4)

The errors shown below may occur during operation.

PV display (Operation Display)	Data display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Undefined	Undefined	–	–	Faulty MCU	MCU is corrupted.	Faulty Contact us for repair.
Undefined	Undefined	–	–	Faulty DCU (ROM/RAM error, corrupted)	DCU is corrupted.	Faulty Contact us for repair.

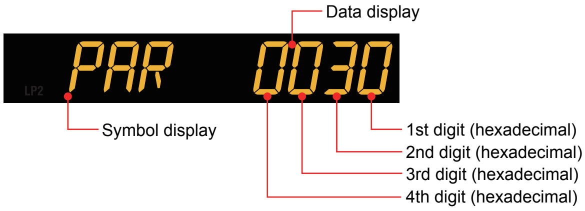
Errors during Operaiton On (Input/output Action)

Error description	PV input, RSP input, and aux. analog input	Ladder calculation	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output, position proportional output)	Feedback input (for Position proportional type)	Contact input	Contact (alarm) output	Communicatio
Faulty MCU	Undefined	Stopped	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	Undefined	OFF	OFF	Stopped
Faulty DCU (ROM/RAM error, corrupted)	Undefined	Stopped	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	Undefined	OFF	OFF	Stopped

Hexadecimal Display on Setpoint Display (Operation Display)

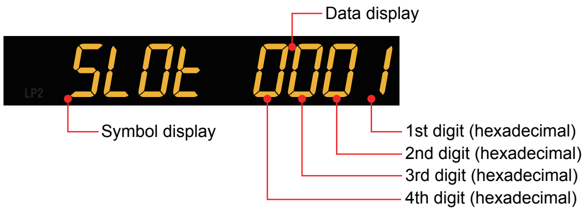
Some error codes are displayed in hexadecimal.
When the error occurs, "1" is set on the bit of corresponding error , and the bit data is displayed in hexadecimal.

If the setup parameter error or the operation parameter errors occur, it is displayed as follows:



Displayed digit	bit	Description
1st digit	0	System data error
	1	Calibration value error
	2	User (parameter) default value error
	3	–
2nd digit	4	Setup parameter error
	5	Operation parameter error
	6	–
	7	–
3rd digit	8	Faulty FRAM
	9	–
	10	Control parameter error
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

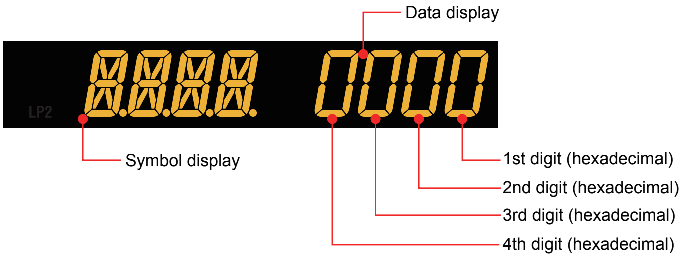
If the hardware in E1-terminal area does not respond, it is displayed as follows:



Displayed digit	bit	Description
1st digit	0	Non responding hardware in E1-terminal area
	1	Non responding hardware in E2-terminal area
	2	Non responding hardware in E3-terminal area
	3	–
2nd digit	4	Non responding hardware in E4-terminal area
	5	–
	6	–
	7	–
3rd digit	8	Communication error in E1-terminal area
	9	–
	10	Communication error in E3-terminal area
	11	–
4th digit	12	Communication error in E4-terminal area
	13	–
	14	–
	15	–

Hexadecimal Display of the Parameter which Shows the Error Details

Error confirmation parameters are displayed in hexadecimal.
When the error occurs, "1" is set on the bit of corresponding error.



Parameter PA.ER

Displayed digit	bit	Description
1st digit	0	System data error
	1	Calibration value error
	2	User (parameter) default value error
	3	–
2nd digit	4	Setup parameter error
	5	Operation parameter error
	6	–
	7	–
3rd digit	8	Faulty FRAM
	9	–
	10	Control parameter error
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter LA.ER

Displayed digit	bit	Description
1st digit	0	Ladder program corruption
	1	Ladder calculation overflow
	2	Ladder program error
	3	–
2nd digit	4	Load factor over 100%
	5	Load factor over 200%
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter OP.ER

Displayed digit	bit	Description
1st digit	0	Non responding hardware in E1-terminal area
	1	Non responding hardware in E2-terminal area
	2	Non responding hardware in E3-terminal area
	3	–
2nd digit	4	Non responding hardware in E4-terminal area
	5	–
	6	–
	7	–
3rd digit	8	Communication error in E1-terminal area
	9	–
	10	Communication error in E3-terminal area
	11	–
4th digit	12	Communication error in E4-terminal area
	13	–
	14	–
	15	–

Parameter AD1.E

Displayed digit	bit	Description
1st digit	0	ADC error of PV input
	1	ADC error of RSP input (E1-terminal area)
	2	ADC error of AIN2 input (E2-terminal area)
	3	–
2nd digit	4	ADC error of AIN4 input (E4-terminal area)
	5	RJC error of PV input
	6	RJC error of RSP input
	7	–
3rd digit	8	PV input burnout error
	9	RSP input (E1-terminal area) burnout error
	10	AIN2 input (E2-terminal area) burnout error
	11	–
4th digit	12	AIN4 input (E4-terminal area) burnout error
	13	–
	14	–
	15	–

Parameter AD2.E

Displayed digit	bit	Description
1st digit	0	Feedback input resistor/current burnout
	1	Automatic valve position adjustment error
	2	–
	3	–
2nd digit	4	–
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	–
	15	–

Parameter PV1.E

Displayed digit	bit	Description
1st digit	0	Loop-1 PV input burnout error
	1	Loop-1 RSP input burnout error
	2	Burnout error when Loop-1 RSP input is used for control
	3	–
2nd digit	4	Loop-1 PV input over-scale
	5	Loop-1 PV input under-scale
	6	–
	7	–
3rd digit	8	–
	9	–
	10	–
	11	–
4th digit	12	–
	13	–
	14	Loop-1 auto-tuning time-out
	15	–

Parameter AD2.E

Displayed digit	bit	Description
1st digit	0	Loop-2 PV input burnout error
	1	Loop-2 RSP input burnout error
	2	Burnout error when Loop-2 RSP input is used for control
	3	–
2nd digit	4	Loop-2 PV input over-scale
	5	Loop-2 PV input under-scale
	6	
	7	–
3rd digit	8	
	9	
	10	
	11	–
4th digit	12	
	13	–
	14	Loop-2 auto-tuning time-out
	15	–

16.2 Maintenance

16.2.1 Cleaning

The front panel and operation keys should be gently wiped with a cloth soaked with water and squeezed firmly.

CAUTION

In order to prevent LCD from static electricity damage, do not wipe with dry cloth.
(When LCD is electrified, it returns to normal in several minutes.)
Do not use alcohol, benzene, or any other solvents.

16.2.2 Packaging when Shipping the Product for Repair

Should the instrument break down and need to be shipped to our sales representative for repair, handle it as noted below:

CAUTION

Write down the settings of parameters for a repair request.

WARNING

Prior to shipping the instrument, put it into an antistatic bag and repackage it using the original internal packaging materials and packaging container.

16.2.3 Replacing Parts

Do not replace any parts inside the unit.

16.3 Periodic Maintenance

Check the operating condition periodically to use this instrument with good condition.

16.4 Disposal

When disposing of this instrument, arrange for appropriate disposal as industrial waste according to the rules of a country, the area, or a local government.

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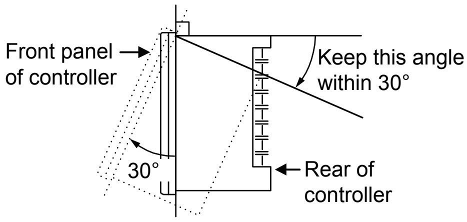
17.1 Installation Location

The instrument should be installed in indoor locations meeting the following conditions:

- Instrumented panel
  This instrument is designed to be mounted in an instrumented panel. Mount the instrument in a location where its terminals will not inadvertently be touched.
- Well ventilated locations
  Mount the instrument in well ventilated locations to prevent the instrument's internal temperature from rising. However, make sure that the terminal portions are not exposed to wind. Exposure to wind may cause the temperature sensor accuracy to deteriorate. To mount multiple indicating controllers, see the external dimensions/panel cutout dimensions which follow. If mounting other instruments adjacent to the instrument, comply with these panel cutout dimensions to provide sufficient clearance between the instruments.
- Locations with little mechanical vibration
  Install the instrument in a location subject to little mechanical vibration.
- Horizontal location
  Mount the instrument horizontally and ensure that it is level, with no inclination to the right or left.



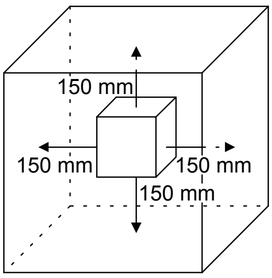
Note

If the instrument is moved from a location with low temperature and low humidity to a place with high temperature and high humidity, or if the temperature changes rapidly, condensation will result. Moreover, in the case of thermocouple inputs, measurement errors will result. To avoid such a situation, leave the instrument in the new environment under ambient conditions for more than 1 hour prior to using it.

17.1 Installation Location

Do not mount the instrument in the following locations:

- Outdoors
- Locations subject to direct sunlight, ultrared rays, ultraviolet rays, or close to a heater
  Install the instrument in a location with stable temperatures that remain close to an average temperature of 23°C. Do not mount it in locations subject to direct sunlight or close to a heater. Doing so adversely affects the instrument and LCD.
- Locations with substantial amounts of oily fumes, steam, moisture, dust, or corrosive gases
  The presence of oily fumes, steam, moisture, dust, or corrosive gases adversely affects the instrument. Do not mount the instrument in locations subject to any of these substances.
- Areas near electromagnetic field generating sources
  Do not place magnets or tools that generate magnetism near the instrument. If the instrument is used in locations close to a strong electromagnetic field generating source, the magnetic field may cause measurement errors.
- Locations where the display is difficult to see
  The instrument uses an LCD for the display unit, and this can be difficult to see from extremely oblique angles. Mount the instrument in a location where it can be seen as much as possible from the front.
- Areas close to flammable articles
  Absolutely do not place the instrument directly on flammable surfaces. If such a circumstance is unavoidable and the instrument must be placed close to a flammable item, provide a shield for it made of 1.43 mm thick plated steel or 1.6 mm thick unplated steel with a space of at least 150 mm between it and the instrument on the top, bottom and sides.



- Areas subject to being splashed with water

17.2 Mounting Method

WARNING

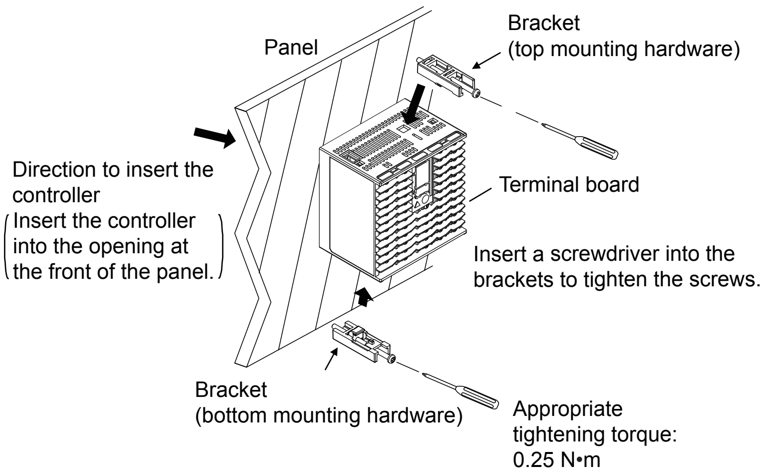
Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.

Mounting the Instrument Main Unit

Provide an instrumented panel steel sheet of 1 to 10 mm thickness.

After opening the mounting hole on the panel, follow the procedures below to install the controller:

1. Insert the controller into the opening from the front of the panel so that the terminal board on the rear is at the far side.
2. Set the brackets in place on the top and bottom of the controller as shown in the figure below, then tighten the screws of the brackets. Take care not to overtighten them.



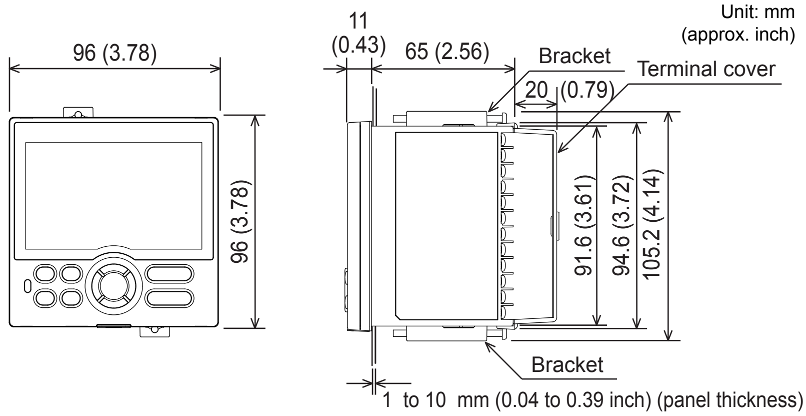
To uninstall the controller, perform the procedure in the reverse order.

CAUTION

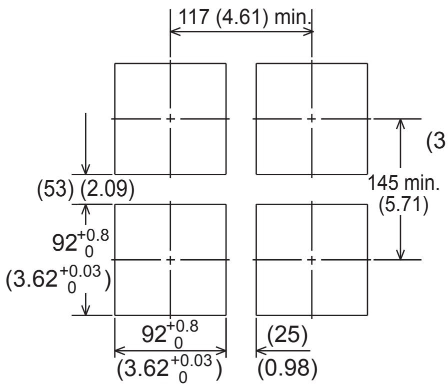
1) Tighten the screws with appropriate tightening torque within 0.25 N•m. Otherwise it may cause the case deformation or the bracket damage.
2) Make sure that foreign materials do not enter the inside of the instrument through the case's slit holes.

17.3 External Dimensions and Panel Cutout Dimensions

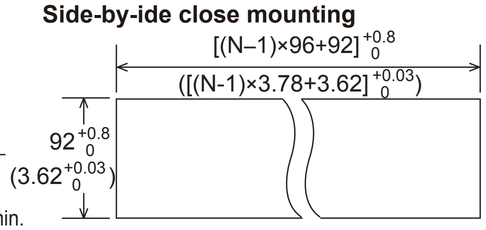
UT55A



General mounting



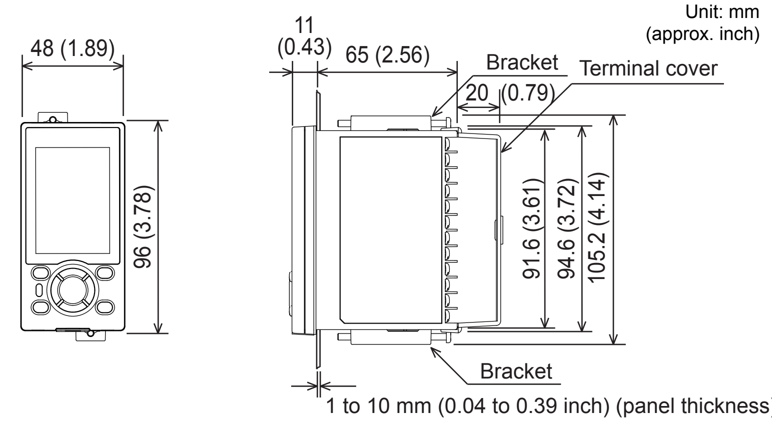
Side-by-ide close mounting



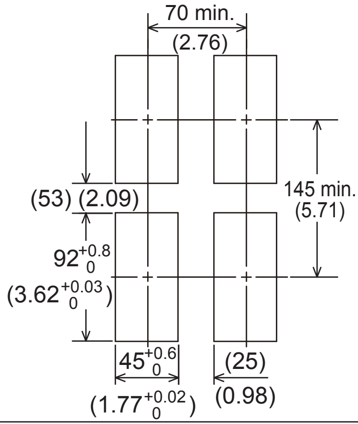
“N” stands for the number of controllers to be installed.
However, the measured value applies if N≥5.

Normal tolerance:
±(value of JIS B 0401-1999 tolerance class IT18)/2

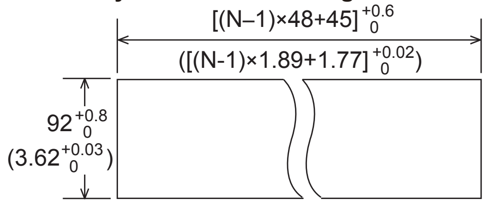
UT52A



General mounting



Side-by-ide close mounting



“N” stands for the number of controllers to be installed.
However, the measured value applies if N≥5.

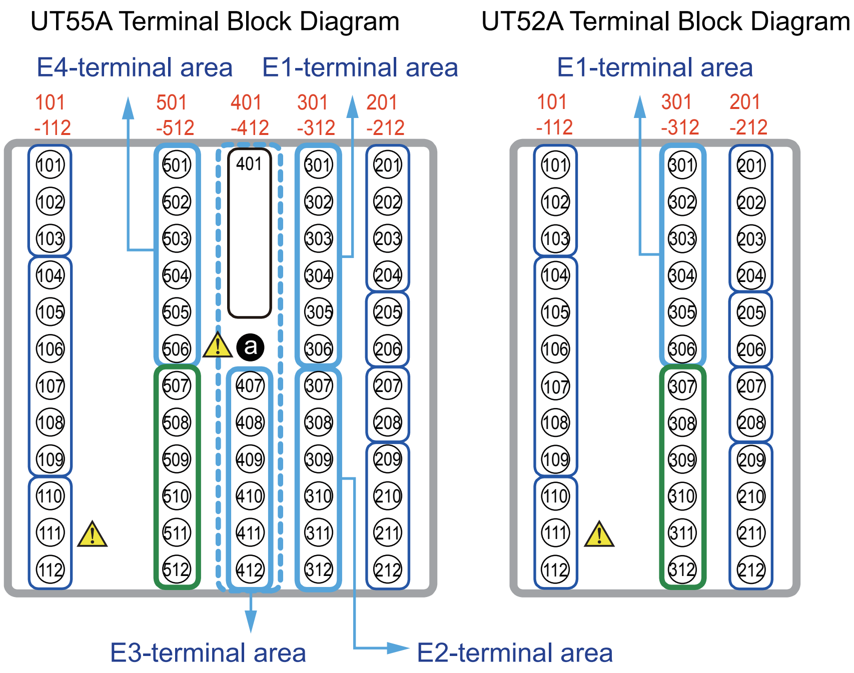
Normal tolerance:
±(value of JIS B 0401-1999 tolerance class IT18)/2

17.4 Wiring

17.4.1 Important Information on Wiring

WARNING

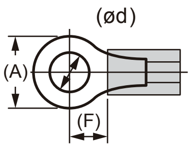
1) Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.
2) Wiring work must be carried out by a person with basic electrical knowledge and practical experience.
3) When the open network is provided, do not touch the screw in location (a) shown in the wiring diagrams. It is an essential part of the structure of the UT55A. Loosening or tightening it may cause a malfunction or failure of the unit.



CAUTION

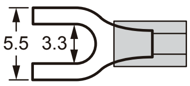
Do not use an unassigned terminal as the relay terminal.

Recommended Crimp-on Terminal Lugs



Recommended tightening torque: 0.6 N·m
Applicable wire size: Power supply wiring 1.25 mm^2 or more

Applicable terminal lug	Applicable wire size mm^2 (AWG#)	(ød)	(A)	(F)
M3	0.25 to 1.65 (22 to 16)	3.3	5.5	4.2



Cable Specifications

Purpose	Name and Manufacturer
Power supply, relay contact output	600 V Grade heat-resistant PVC insulated wires, JIS C 3317(HIV), 0.9 to 2.0 mm^2
Thermocouple	Shielded compensating lead wire JISC1610
RTD	Shielded wire (three/four conductors) UL2482 (Hitachi Cable)
Other signals (other than contact input/output)	Shielded wires
Other signals (contact input/output)	Non shielded wires
RS485 communication	Shielded wires
Ethernet communication	100 BASE-TX (CAT-5) / 10 BASE-T
PROFIBUS-DP communication	Dedicated cable for PROFIBUS-DP (Shielded two-wires)

PROFIBUS-DP Connector (wiring side) (Part number: A1987JT)

Recommended tightening torque: 0.5 to 0.6 N·m
Applicable wire size: 0.2 to 2.5 mm^2 (AWG24 to 12)

Note

Communication wires of cross-sectional area less than or equal to 0.34 mm^2 may not be secured firmly to the terminals.
Check that the wire is firmly connected to the terminal by folding the conductor of the wire connected to the climp-on lug.
Recommended length of the stripped wire: 7 mm

Note

Terminating registors are separately needed for the PROFIBUS-DP communication wiring, and these are to be prepared by users. (390 Ω: 2 pcs. 220 Ω: 1 pc.)

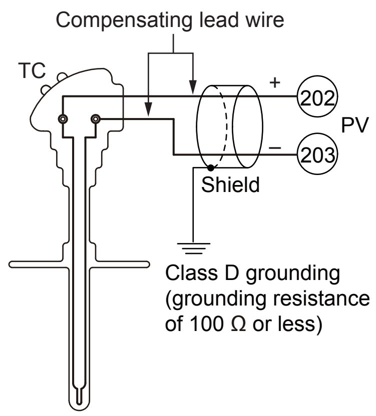
17.4.2 PV Input Wiring

CAUTION

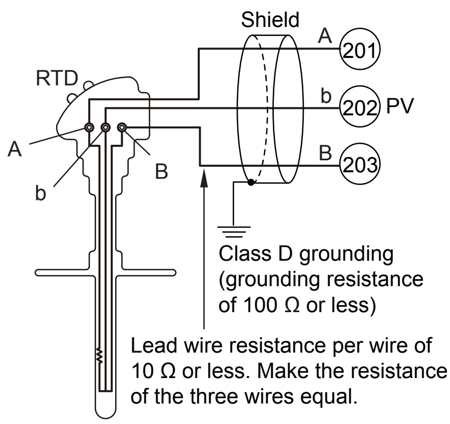
1) Be careful of polarity when wiring inputs. Reversed polarity can damage the UT.
2) Keep the PV input signal line as far away as possible from the power supply circuit and ground circuit.
3) For TC input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

UT55A/UT52A

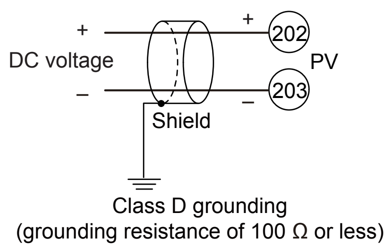
TC Input



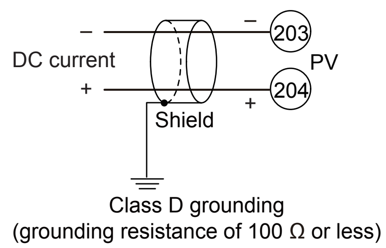
RTD Input (3-wire system)



DC Voltage (mV, V) Input



DC Current (mA) Input



Use

In Single-loop control, Cascade primary-loop control, Cascade secondary-loop control, Loop control for backup, or Loop control with PV-hold function, PV input is used for PV input.
In Loop control with PV switching or Loop control with PV auto-selector, PV input is used for PV input 1. Remote input (E1-terminal area) is used for PV input 2. In Loop control with PV auto-selector for 3 inputs or 4 inputs, auxiliary analog inputs are used for PV input 3 and PV input 4.
In Cascade control, PV input is used for Loop-1 PV input. Remote input (E1-terminal area) is used for Loop-2 PV input.

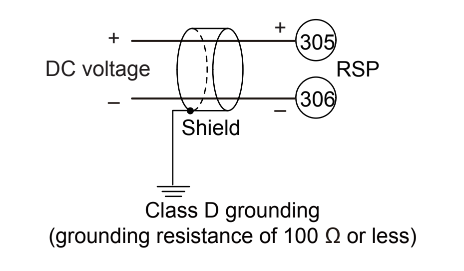
17.4.3 Remote (Auxiliary Analog) Input Wiring

CAUTION

1) Be careful of polarity when wiring inputs. Reversed polarity can damage the UT.
2) Keep the remote (auxiliary analog) input signal line as far away as possible from the power supply circuit and ground circuit.
3) For TC input (remote input with direct input), use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

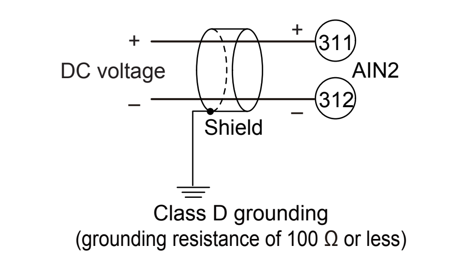
UT55A/UT52A

Remote input (E1-terminal area)

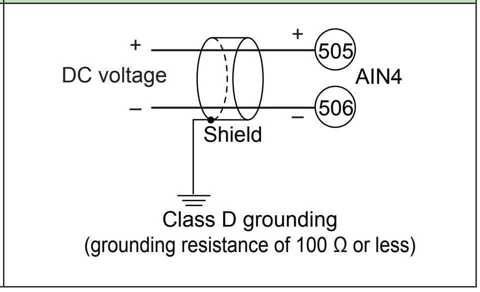


UT55A

Auxiliary analog input (E2-terminal area)



Auxiliary analog input (E4-terminal area)



Use

RSP Remote Input (E1-terminal area)

In Single-loop control or Loop control with PV-hold function, used for remote input.
In Cascade primary-loop control, remote input is used for output tracking input.
In Cascade secondary-loop control, remote input is used for cascade input.
In Cascade control, remote input is used for Loop-2 PV input.
In Loop control for backup, remote input is used for output tracking input.
In Loop control with PV switching or Loop control with PV auto-selector, remote input is used for PV input 2.

AIN2 Auxiliary Analog Input (E2-terminal area)

In Loop control with PV auto-selector for 3 inputs or 4 inputs, auxiliary analog input (E-2 terminal area) is used for PV input 3.

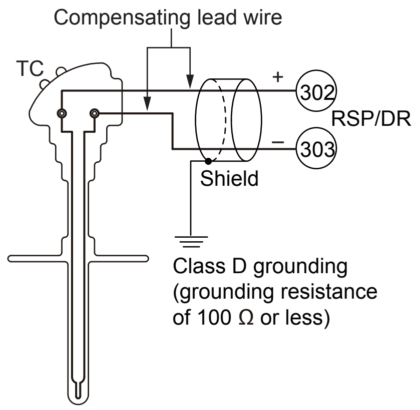
AIN4 Auxiliary Analog Input (E4-terminal area)

In Loop control with PV auto-selector for 4 inputs, auxiliary analog input (E4-terminal area) is used for PV input 4.
In Single-loop control or Single-loop position proportional control, auxiliary analog input (E4-terminal area) is used for feedforward input.

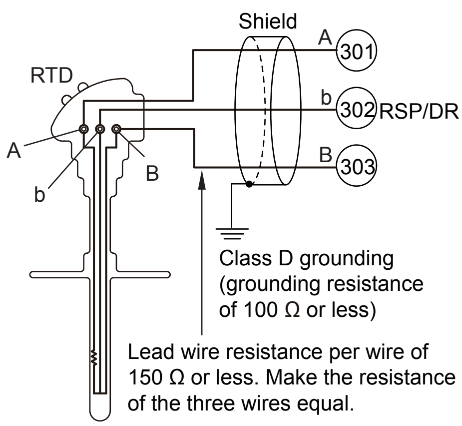
UT55A/UT52A

Remote Input with Direct Input (Optional suffix code /DR) (E1-terminal area)

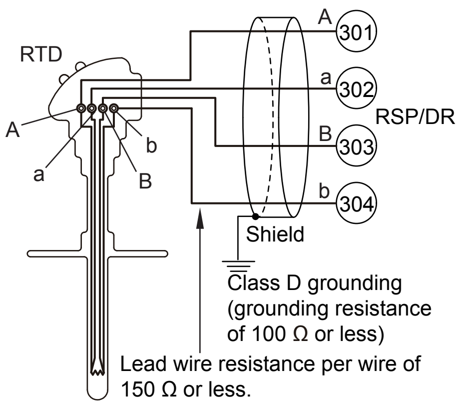
TC input



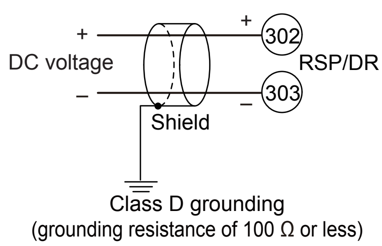
RTD input (3-wire system)



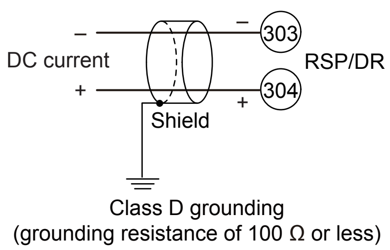
RTD input (4-wire system)



DC voltage (mV, V) input



DC current (mA) input



17

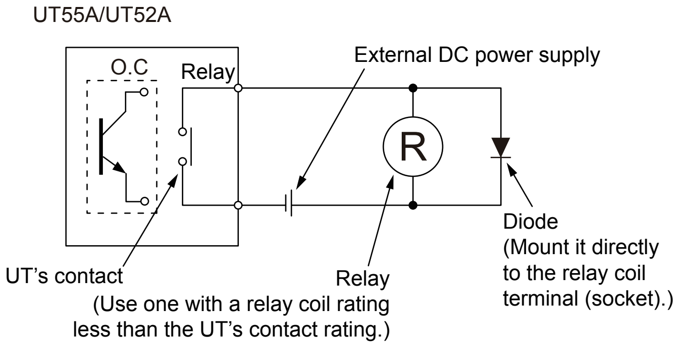
Installation and Wiring

17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

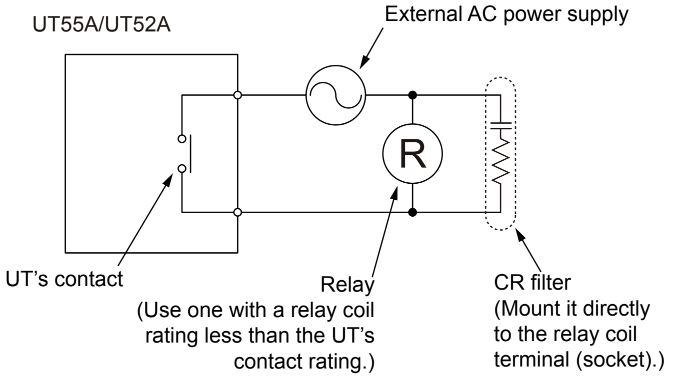
CAUTION

1) The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.
2) If there is a risk of external lightning surges, use a lightning arrester etc.
3) Relays cannot be used for a small load of 10 mA or less.

DC Relay Wiring

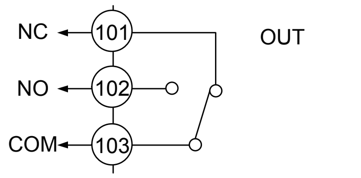


AC Relay Wiring



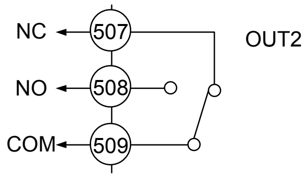
UT55A/UT52A
Relay Output

Standard type output (UT55A, UT52A) or Heating/cooling type heating-side output (UT55A)



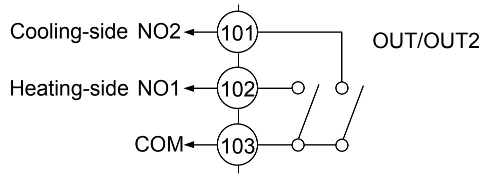
Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

Heating/cooling type cooling-side output (UT55A)



Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

Heating/cooling type heating/cooling output (UT52A)

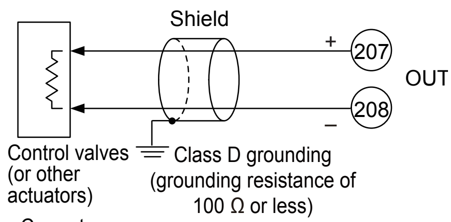


Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

Note: Cannot be used for a small load of 10 mA or less.

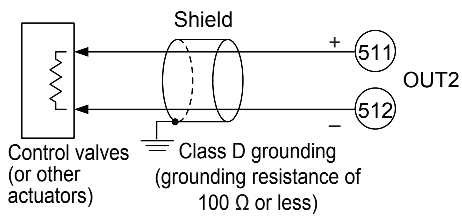
UT55A/UT52A
Current and Voltage Pulse Output

Standard type or Heating/cooling type heating-side output (UT55A/UT52A)



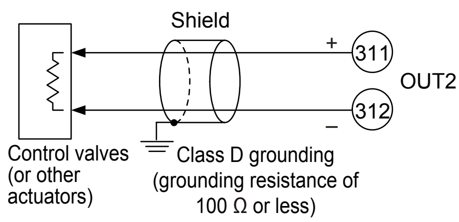
Current:
4 to 20 mA DC or 0 to 20 mA DC
(resistance load: 600 Ω or less)
Voltage pulse:
On-voltage: 12 V DC or more
(load resistance: 600 Ω or more)
Off-voltage: 0.1 V DC or less

Heating/cooling type cooling-side output (UT55A)



Current:
4 to 20 mA DC or 0 to 20 mA DC
(resistance load: 600 Ω or less)
Voltage pulse:
On-voltage: 12 V DC or more
(load resistance: 600 Ω or more)
Off-voltage: 0.1 V DC or less

Heating/cooling type cooling-side output (UT52A)



Current:
4 to 20 mA DC or 0 to 20 mA DC
(resistance load: 600 Ω or less)
Voltage pulse:
On-voltage: 12 V DC or more (load resistance: 600 Ω or more)
Off-voltage: 0.1 V DC or less

Use

When current/voltage pulse output is not used for control output, it can be used for retransmission output.
When retransmission output terminal is not used for retransmission output, it can be used for optional control output. The current output range can be changed.
For control output setting, set the control mode (CTLM) and the control type (CNT), then set the output terminal and output type in the output type selection (OT).

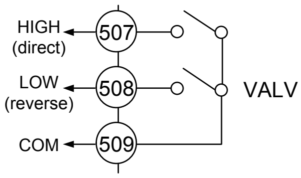
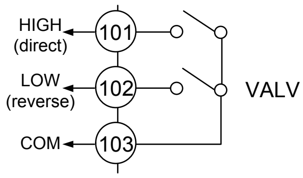
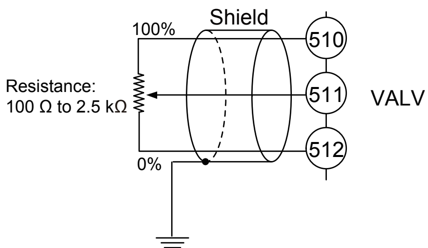
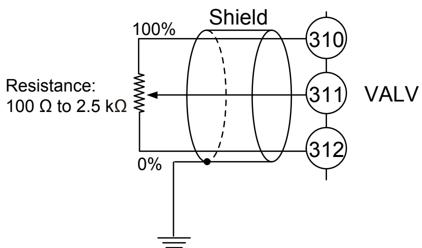
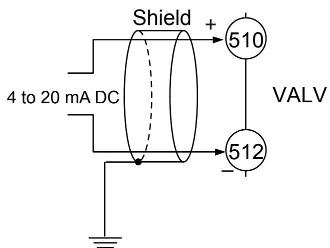
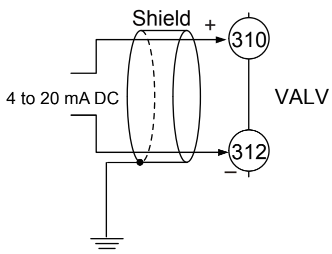
► Control output type: 10.1 Setting Control Output Type

17.4.5 Valve Position Output and Feedback Input Wiring

CAUTION

1) Use an auxiliary relay for load-switching if the contact rating is exceeded.
2) Keep the relay output wires and the feedback input wires at least 30 cm apart.
3) The output relay has a limited service life. Be sure to connect a CR filter (for AC) or diode (for DC) to the load.
4) If there is a risk of external lightning surges, use a lightning arrester etc.
5) Relays cannot be used for a small load of 10 mA or less.

► When using auxiliary relay: 17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

Relay contact output (UT55A)	Relay contact output (UT52A)
 Contact rating: 250 V AC, 3 A 30 V DC, 3 A (resistance load) Note: Cannot be used for a small load of 10 mA or less.	 Contact rating: 250 V AC, 3 A 30 V DC, 3 A (resistance load) Note: Cannot be used for a small load of 10 mA or less.
Feedback input (resistor) (UT55A)	**Feedback input (resistor) (UT52A)**
 Class D grounding (grounding resistance of 100 Ω or less)	 Class D grounding (grounding resistance of 100 Ω or less)
Feedback input (current) (UT55A)	**Feedback input (current) (UT52A)**
 Class D grounding *: Always set the terminal 511 in open state.	 Class D grounding * Always set the terminal 311 in open state.

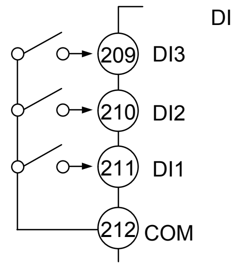
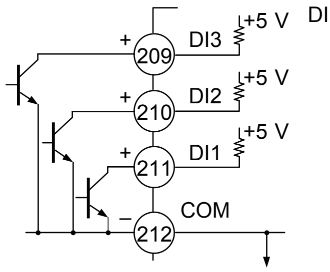
17.4.6 Contact Input Wiring

CAUTION

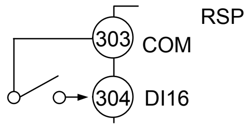
1) Use a no-voltage contact (relay contact etc.) for external contacts.
2) Use a no-voltage contact which has ample switching capacity for the terminal's OFF voltage (approx. 5V) and ON current (approx 1mA).
3) When using a transistor contact, the voltage at both terminals must be 2 V or less when the contact is ON and the leakage current must be 100 µA or less when it is OFF.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

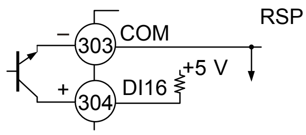
UT55A/UT52A

Contact Input Equipped as Standard

No-voltage contact	Transistor contact
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

Additional Contact Input According to the UT55A Suffix Codes

<table>
<tr><th colspan="2">UT55A suffix codes: Type 2=1, 2, 4, 5 or 7; however, without optional suffix code /DR</th></tr>
<tr><th>Non-voltage contact</th><th>Transistor contact</th></tr>
<tr><td>


Contact rating: 12 V DC, 10 mA or more
</td><td>


Contact rating: 12 V DC, 10 mA or more
</td></tr>
<tr><th colspan="2">UT55A suffix code: Type 2=3</th></tr>
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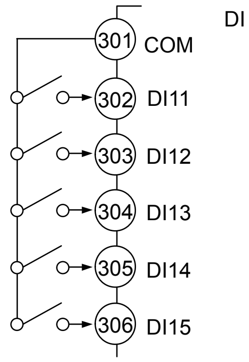
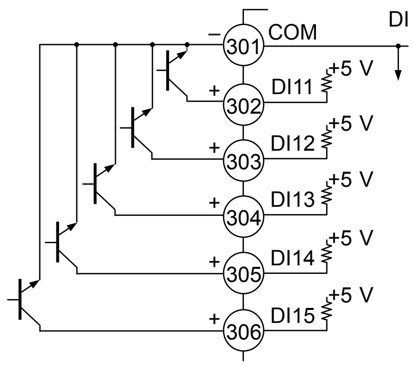


Contact rating: 12 V DC, 10 mA or more
</td><td>


Contact rating: 12 V DC, 10 mA or more
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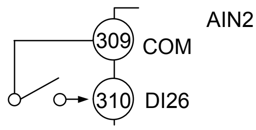
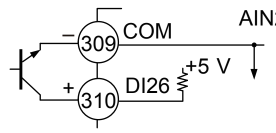


Contact rating: 12 V DC, 10 mA or more
</td><td>


Contact rating: 12 V DC, 10 mA or more
</td></tr>
</table>

<table>
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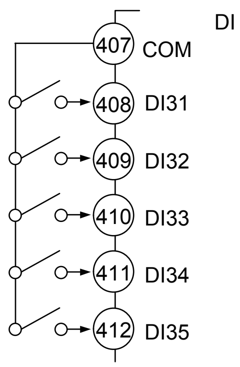
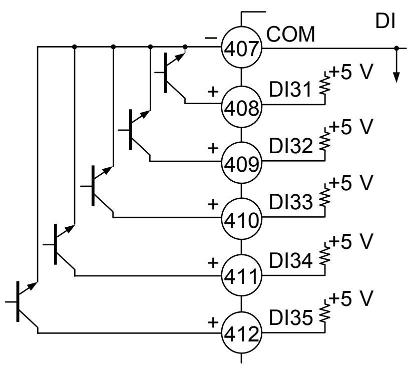
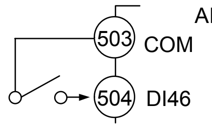
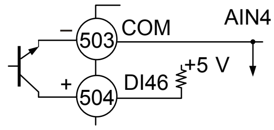
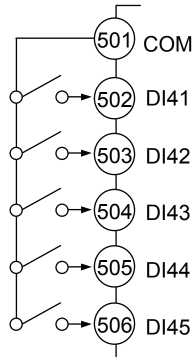
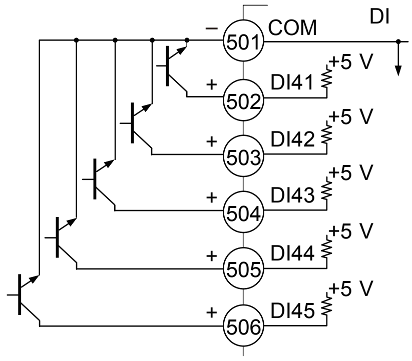
<tr><th>Non-voltage contact</th><th>Transistor contact</th></tr>
<tr><td>


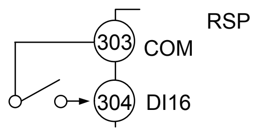
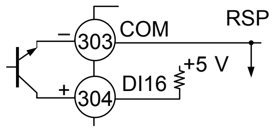
Contact rating: 12 V DC, 10 mA or more
</td><td>


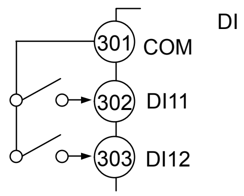
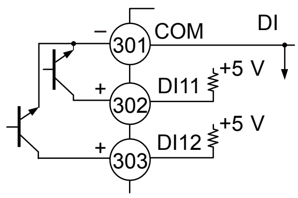
Contact rating: 12 V DC, 10 mA or more
</td></tr>
</table>

UT55A suffix code: Type 2=7	
No-voltage contact	**Transistor contact**
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

UT55A suffix code: Type 2=5 or 6	
No-voltage contact	**Transistor contact**
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

Additional Contact Input According to the UT52A Suffix Codes

UT52A suffix code: Type 2=1 or 2 (However, when Type2=2, applicable when without optional suffix code /DR)	
No-voltage contact	**Transistor contact**
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

UT52A suffix code: Type 2=3	
No-voltage contact	**Transistor contact**
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

The following table shows the initial status for each control mode and control type. No function is assigned to contact inputs other than those listed below.

► Contact input function registration: 12.1 Setting Contact Input Function

Control mode and control type	DI1	DI2	DI3	DI16
Single-loop Control Single-loop Heating/cooling Control Single-loop Position Proportional Control Single-loop Two-position Two-level Control Loop Control with PV Auto-selector (4 inputs) Heating/cooling Loop Control with PV Auto-selector (4 inputs) Position Proportional Loop Control with PV Auto-selector (4 inputs) Loop Control with PV-hold Function Heating/cooling Loop Control with PV-hold Function Position Proportional Loop Control with PV-hold Function	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	Remote (ON)/ Local (OFF) switch
Cascade Primary-loop Control Loop Control for Backup Heating/cooling Loop Control for Backup Position Proportional Loop Control for Backup	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	Output tracking switch (tracking in ON sate)
Cascade Secondary-loop Control Cascade Secondary-loop Heating/cooling Control Cascade Secondary-loop Position Proportional Control	Cascade (OFF→ON) switch	AUTO (OFF→ON) switch	MAN (OFF→ON) switch	Cascade switches to AUTO in the event of FAIL of Loop 1 controller
Cascade Control Cascade Heating/cooling Control Cascade Position Proportional Control	Cascade (OFF→ON) switch	AUTO (OFF→ON) switch	MAN (OFF→ON) switch	STOP (ON)/ RUN (OFF) switch
Loop Control with PV Switching Heating/cooling Loop Control with PV Switching Position Proportional Loop Control with PV Switching	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	RSP terminal Input (ON)/PV terminal input (OFF) switch
Loop Control with PV Auto-selector (2 inputs) Heating/cooling Loop Control with PV Auto-selector (2 inputs) Position Proportional Loop Control with PV Auto-selector (2 inputs)	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	None

17.4.7 Contact Output Wiring

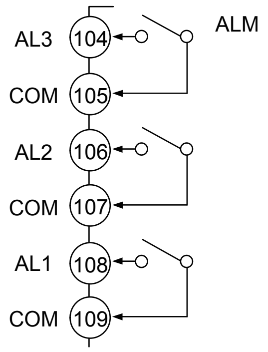
CAUTION

1) Use an auxiliary relay for load-switching if the contact rating is exceeded.
2) Connect a bleeder resistor when a small current is used, so that a current exceeding 10 mA can be supplied.
3) The output relay has a limited service life. Be sure to connect a CR filter (for AC) or diode (for DC) to the load.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

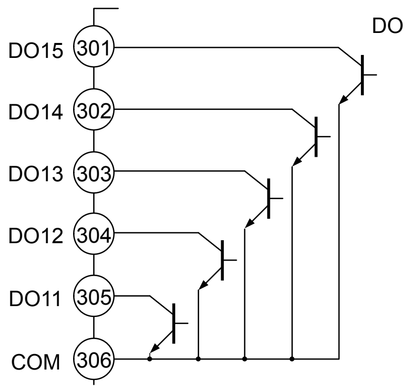
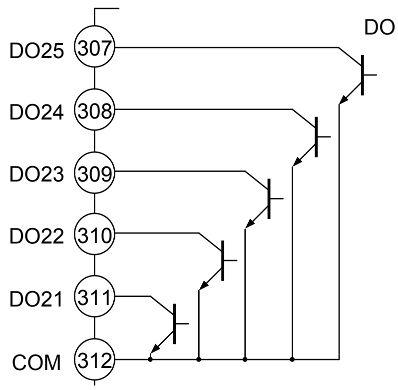
► When using auxiliary relay: 17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

UT55A/UT52A

Contact Output Equipped as Standard

Relay contact
 Contact rating: 240 V AC, 1 A 30 V DC, 1 A (resistance load)

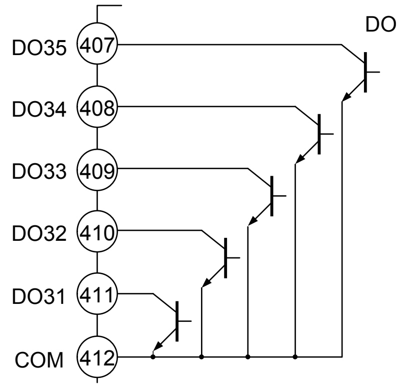
Additional Contact Output According to the UT55A Suffix Codes

UT55A suffix code: Type 2=6	UT55A suffix codes: Type 2=1, 3, 5 or 6
 Transistor contact rating: 24 V DC, 50 mA	 Transistor contact rating: 24 V DC, 50 mA

Factory default: Function is not assigned to the additional contact outputs (DO11 to DO15).

Additional Contact Output According to the UT55A Suffix Codes

UT55A suffix code: Type 2=6



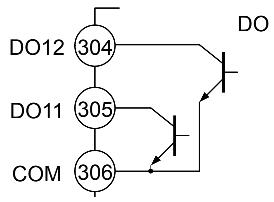
Transistor contact rating: 24 V DC, 50 mA

Factory default: Function is not assigned to the additional contact outputs.

► Contact output function registration: 12.2 Setting Contact Output Function

Additional Contact Output According to the UT52A suffix codes

UT52A suffix code: Type 2=3



Transistor contact rating: 24 V DC, 50 mA

Factory default: Function is not assigned to the additional contact outputs.

► Contact output function registration: 12.2 Setting Contact Output Function

The following table shows the initial status for each control mode and control type.

Control mode and control type	AL1 terminal	AL2 terminal	AL3 terminal
Single-loop Control Single-loop Heating/cooling Control Single-loop Position Proportional Control Single-loop Two-position Two-level Control Loop Control with PV Switching Heating/cooling Loop Control with PV Switching Position Proportional Loop Control with PV Switching Loop Control with PV Auto-selector Heating/cooling Loop Control with PV Auto-selector Position Proportional Loop Control with PV Auto-selector Loop Control with PV-hold Function Heating/cooling Loop Control with PV-hold Function Position Proportional Loop Control with PV-hold Function	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	Alarm 3 (PV high limit)
Cascade Primary-loop Control Loop Control for Backup Heating/cooling Loop Control for Backup Position Proportional Loop Control for Backup	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	FAIL
Cascade Secondary-loop Control Cascade Secondary-loop Heating/cooling Control Cascade Secondary-loop Position Proportional Control	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	Tracking switch (to Loop-1 controller)
Cascade Control Cascade Heating/cooling Control Cascade Position Proportional Control	Alarm 1 (Loop-1 PV high limit)	Alarm 2 (Loop-1 PV low limit)	Alarm 3 (Loop-1 PV high limit)

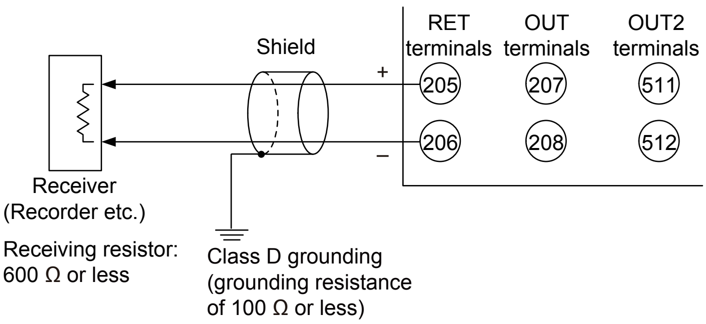
When the suffix code: Type 2 = 1, 3, 5, or 6, the following function is assigned to DO21 to DO25. However, alarms 5 to 8 are not displayed for the factory default.

DO21: Alarm 4 (PV low limit)
DO22: Alarm 5 (PV high limit)
DO23: Alarm 6 (PV low limit)
DO24: Alarm 7 (PV high limit)
DO25: Alarm 8 (PV low limit)

17.4.8 Retransmission Output Wiring

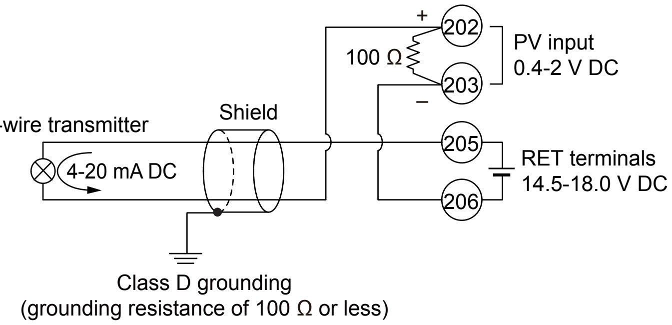
When retransmission output is not used for retransmission output, it can be used for 15 V DC loop power supply.

The current output range can be changed.



17.4.9 15 V DC Loop Power Supply Wiring

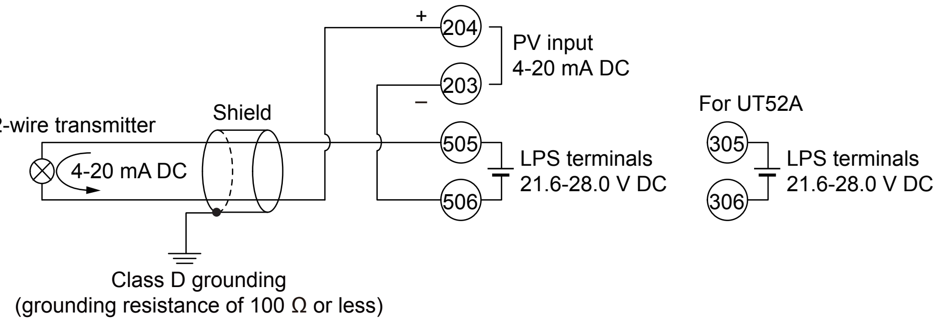
This can be used when it is not used for retransmission output or control output.
The controller is equipped with a non-isolated loop power supply (14.5 to 18.0 V DC) for connecting a 2-wire transmitter.



OUT terminal and OUT2 terminal also can be used.

17.4.10 24 V DC Loop Power Supply Wiring

This can be used when the optional suffix code /LP is specified.
The controller with the optional suffix code /LP is equipped with an isolated loop power supply (21.6 to 28.0 V DC) for connecting a 2-wire transmitter.



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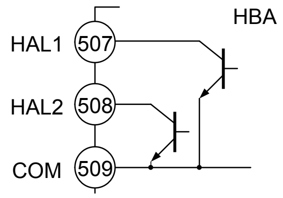
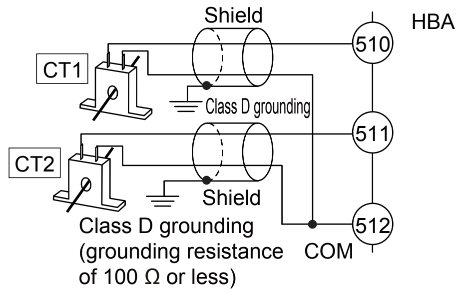
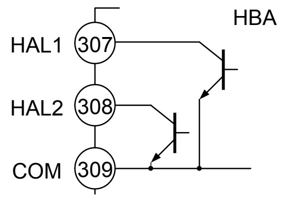
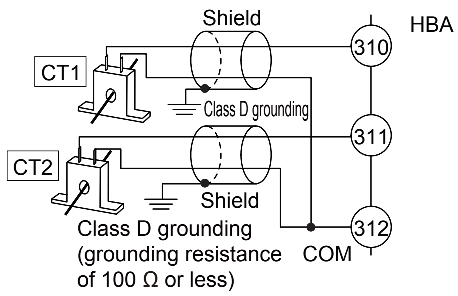
Installation and Wiring

17.4.11 Heater Break Alarm Wiring

Heater break alarm can be used for the UT55A with the optional suffix code /HA.

Heater break alarm	Heater break detection
 Contact raging: 24 V DC, 50 mA	

Heater break alarm can be used for the UT52A with the optional suffix code /HA.

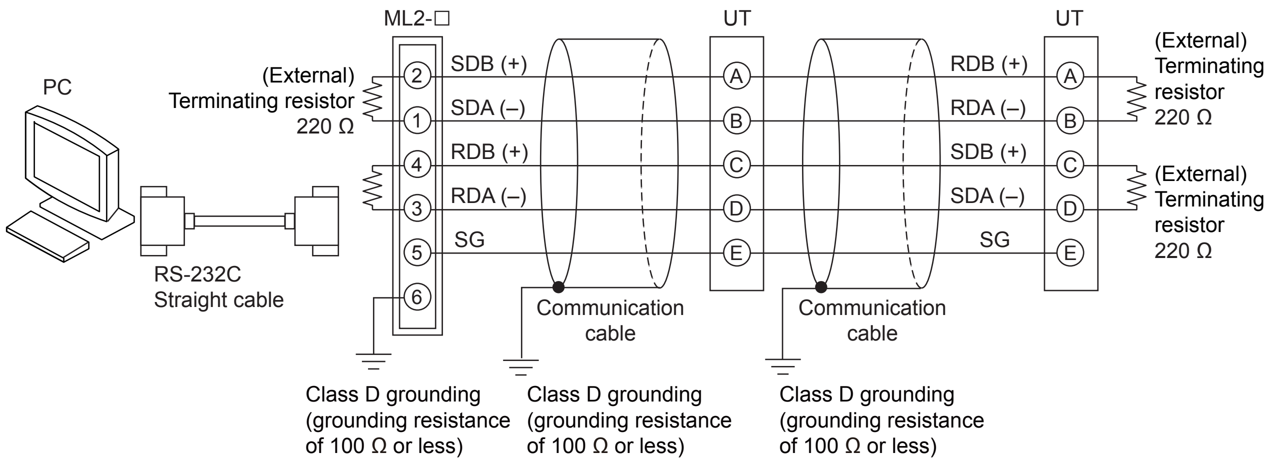
Heater break alarm	Heater break detection
 Contact raging: 24 V DC, 50 mA	

17.4.12 RS-485 Communication Interface Wiring

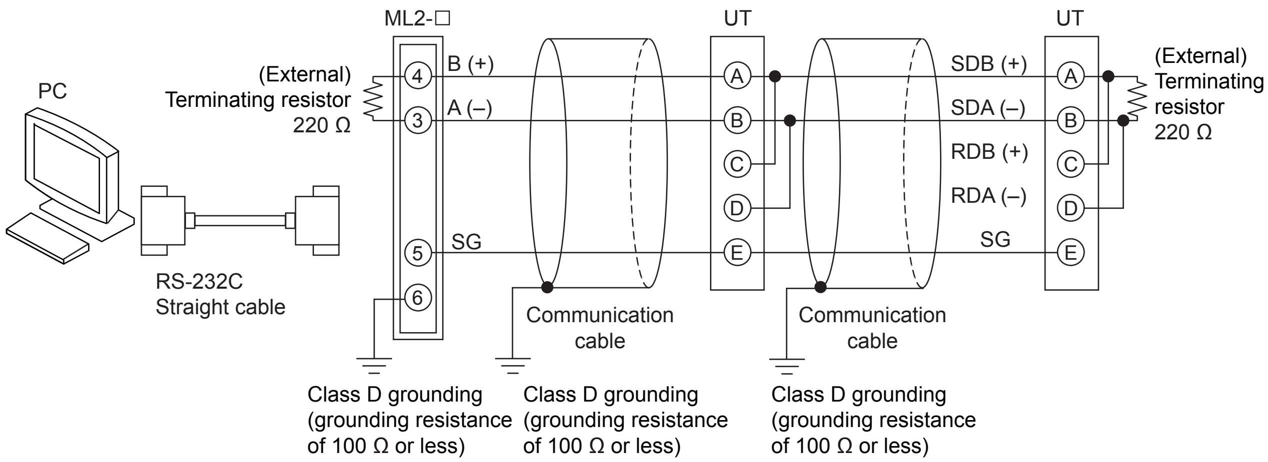
Wire as follows for Modbus communication, PC link communication, or ladder communication.
Always connect a terminating resistor to the station at the end of the communication line.

► Details of communication parameter settings and communication functions: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual

4-wire Wiring (for UT55A only)



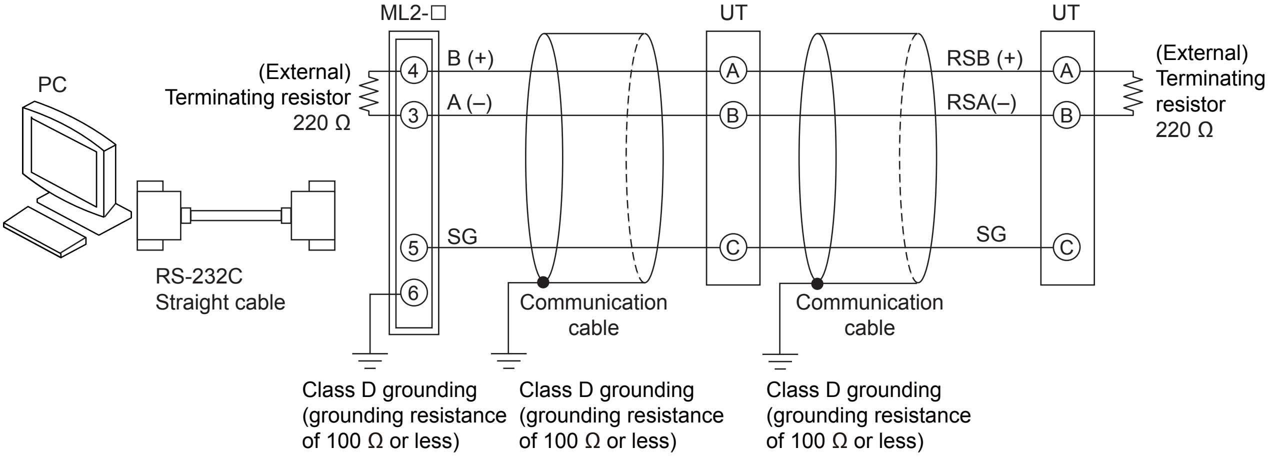
2-wire Wiring of 4-wire Terminal (for UT55A only)



UT55A

Terminal symbol above.	Applicable to suffix code: Type 3 = 1; however, Type 2 = 1 or 6 excluded	Applicable to suffix code: Type 2 = 1 or 2; however, without optional suffix code /LP
A	410	504
B	411	505
C	407	501
D	408	502
E	409	503

2-wire Wiring



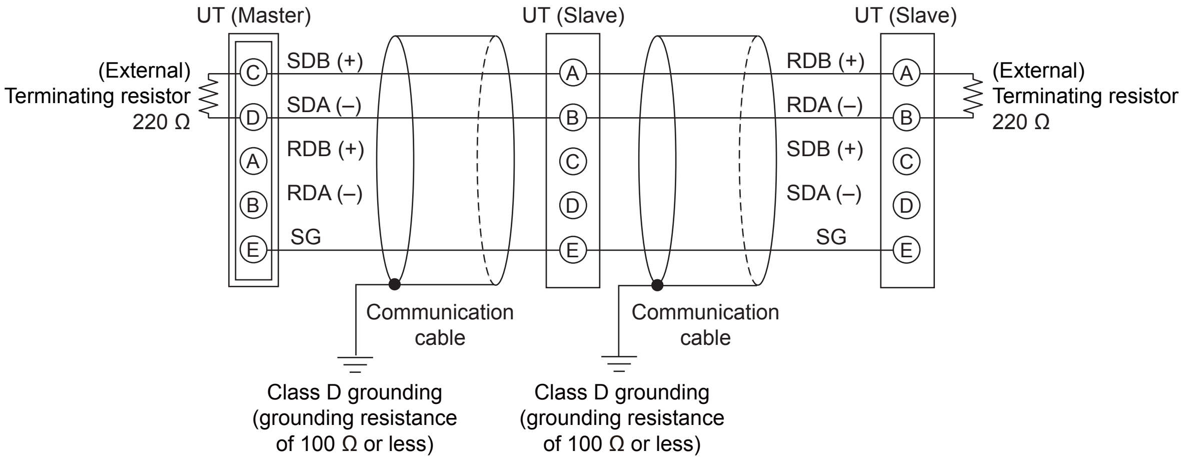
Terminal symbol above.	UT55A Applicable to suffix code: Type 2=1 or 2, and with optional suffix code /LP	UT52A Applicable to suffix code: Type 2=1
A	501	301
B	502	302
C	503	303

Note

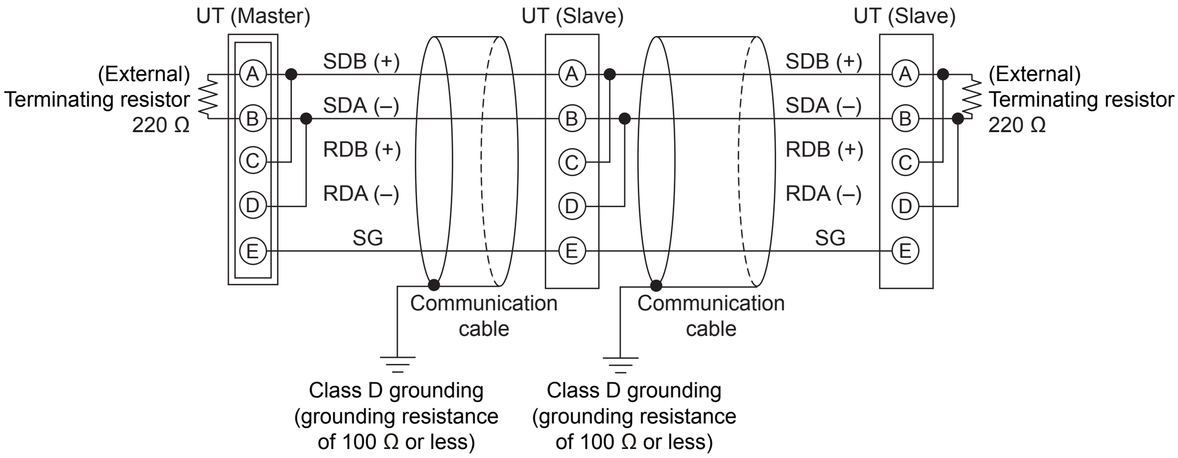
ML2-x indicates a converter of YOKOGAWA. Other than this, RS232C/RS485 converters can also be used. If another converter is to be used, check the electrical specifications of the converter before using it.

17.4.13 Coordinated Operation Wiring

4-wire Wiring (for UT55A only)

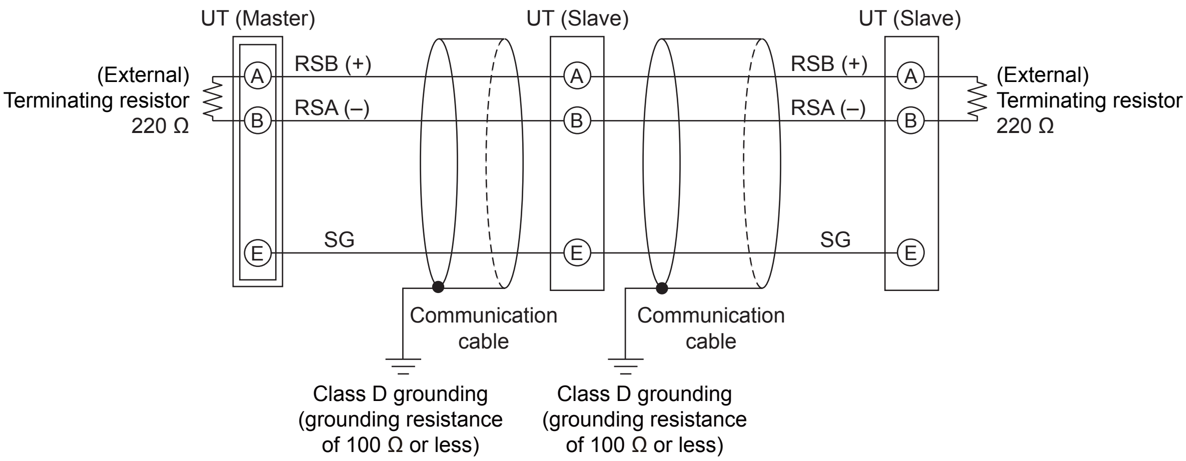


2-wire Wiring of 4-wire Terminal (for UT55A only)



Terminal symbol above.	Applicable to suffix code: Type 3 = 1; however, Type 2 = 1 or 6 excluded	Applicable to suffix code: Type 2 = 1 or 2; however, without optional suffix code /LP
A	410	504
B	411	505
C	407	501
D	408	502
E	409	503

2-wire Wiring

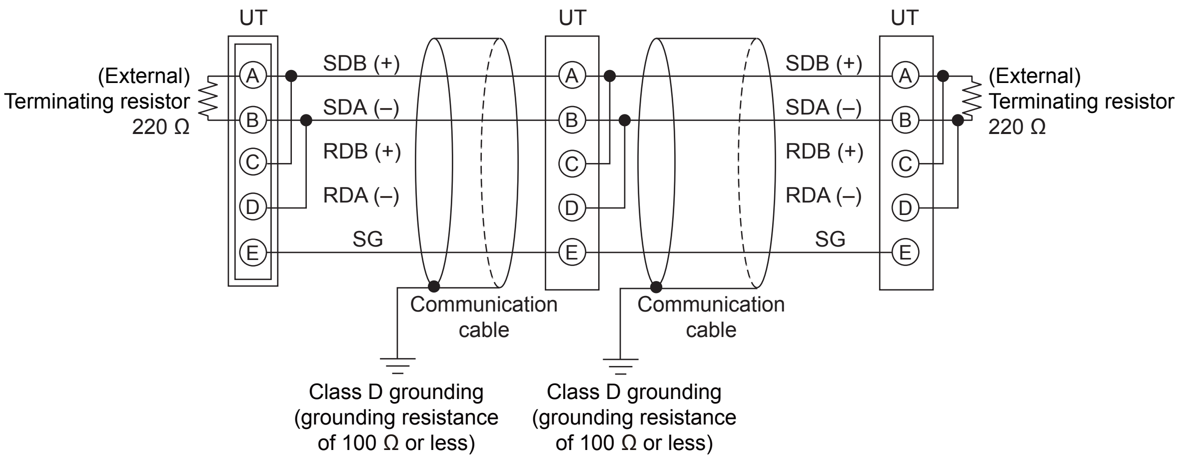


Terminal symbol above.	UT55A Applicable to suffix code: Type 2=1 or 2, and with optional suffix code /LP	UT52A Applicable to suffix code: Type 2=1
A	501	301
B	502	302
E	503	303

17.4.14 Peer-to peer Communication Wiring

Peer-to-peer communication can be used on ladder program of UT55A/UT52A.

2-wire Wiring of 4-wire Terminal (for UT55A only)



UT55A

Terminal symbol above.	Applicable to suffix code: Type 3=1; however, Type 2=1 or 6 excluded	Applicable to suffix code: Type 2=1 or 2; however, without optional suffix code /LP
A	410	504
B	411	505
C	407	501
D	408	502
E	409	503

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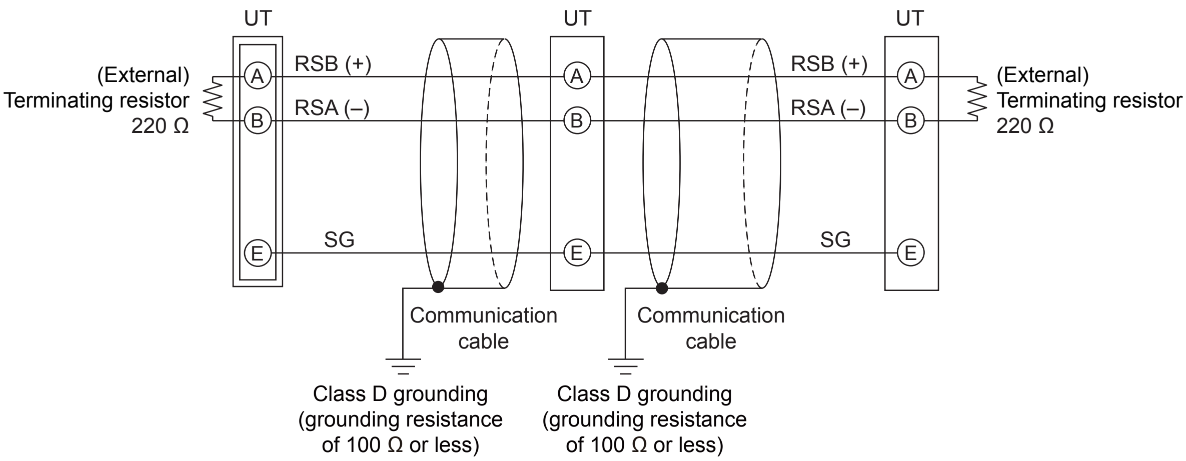
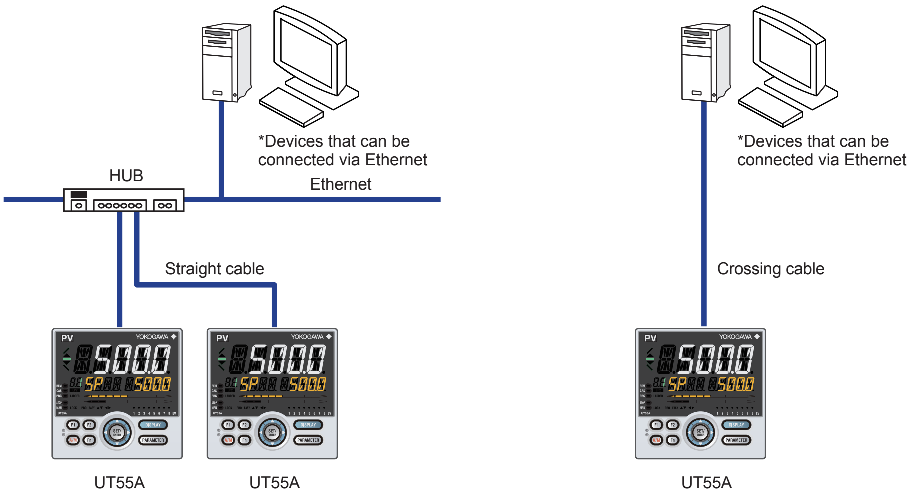
2-wire Wiring

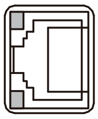


Terminal symbol above.	UT55A Applicable to suffix code: Type 2=1 or 2, and with optional suffix code /LP	UT52A Applicable to suffix code: Type 2=1
A	501	301
B	502	302
E	503	303

► Details of communication parameter settings and communication functions: UTAdvanced Series Communication Interface (RS-485, Ethernet) User's Manual
► Details of Peer-to-peer communication: LL50A Parameter Setting Software User's Manual

17.4.15 Ethernet Communication Interface Wiring





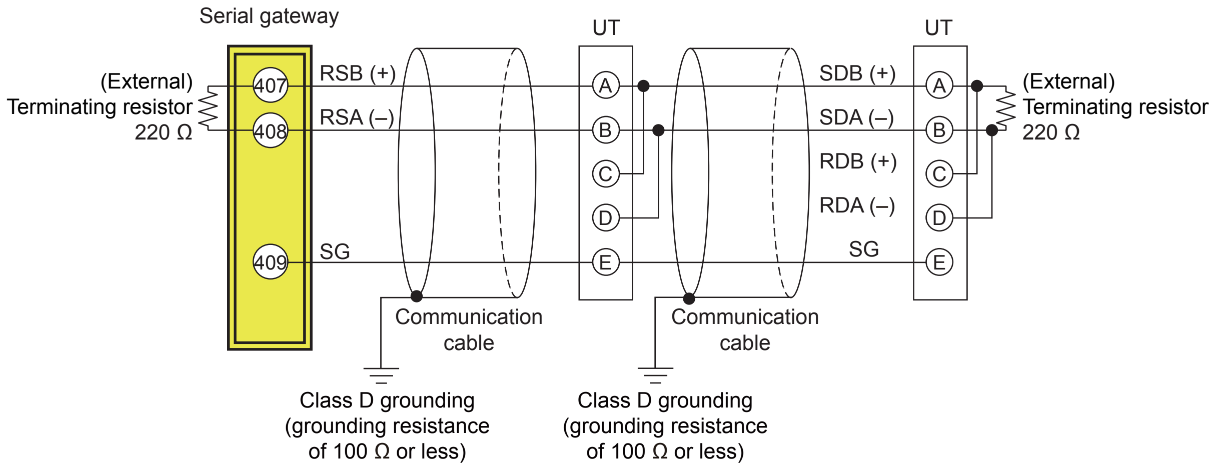
Upper side LED (baud rate)		Lower side LED (link activity)	
Color	Amber	Color	Green
Lit	100M bps	Lit	Linked
Unlit	10M bps	Blink	Active
		Unlit	Link failure

CAUTION

Be sure to connect a lightning arrester for Ethernet (100BASE-TX/10BASE-T) in an environment where a surge voltage may be induced by a lightning discharge.

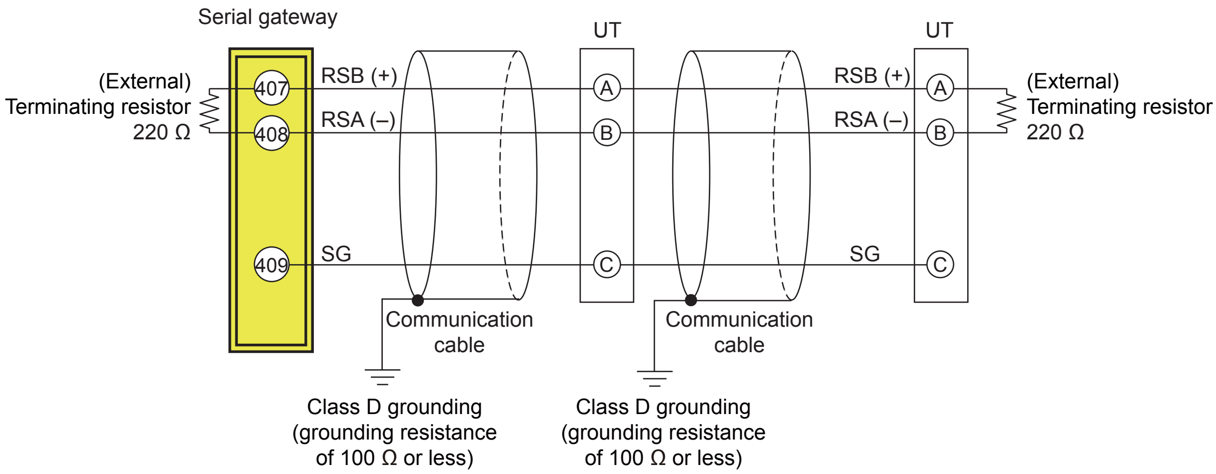
RS-485 communication wiring for the serial gateway function is as follows.

2-wire Wiring of 4-wire Terminal (for UT55A only)



Terminal symbol above.	Applicable to suffix code: Type 3=1; however, Type 2 = 1 or 6 excluded	Applicable to suffix code: Type 2=1 or 2; however, without optional suffix code /LP
A	410	504
B	411	505
C	407	501
D	408	502
E	409	503

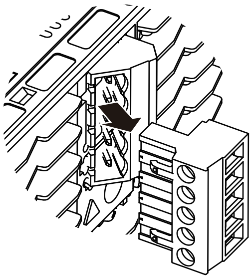
2-wire Wiring



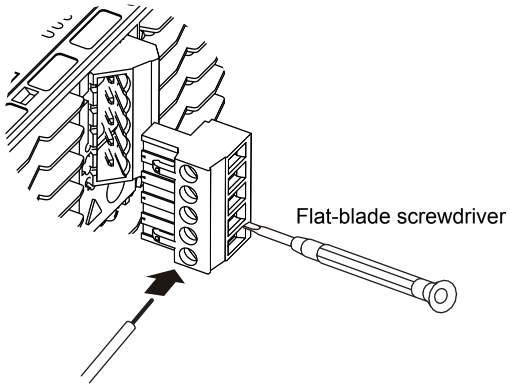
Terminal symbol above.	Applicable to suffix code: Type 2 = 1 or 2, and with optional suffix code /LP	UT52A Applicable to suffix code: Type 2=1
A	501	301
B	502	302
C	503	303

17.4.16 PROFIBUS-DP Communication Interface Wiring

(1) Remove the terminal block
Hold both ends of the terminal block and pull straight.

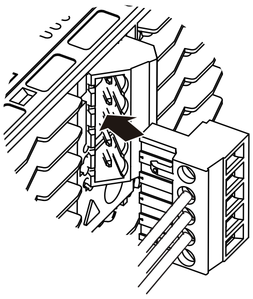


(2) Connect the wires



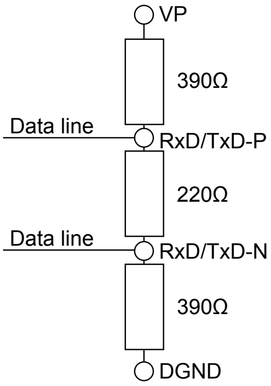
Applicable wire size
0.2 to 2.5 mm2 (AWG24 to 12)
Recommended length of stripped wire: 7mm

(3) Connect the terminal block
Hold both ends of the terminal block, align with the connector on the UT side, and push the terminal block into the connector.

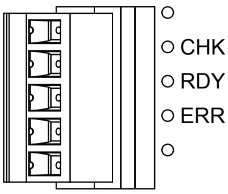


Number of Pin	Singnal name	Description
1	VP	+5V bus power
2	RxD/TxD-P	Data signal (positive data receive/transmit)
3	RxD/TxD-N	Data signal (negative data recive/transmit)
4	DGND	Signal ground
5	SHIELD	Shield ground

Terminating Resister of Bus



PROFIBUS-DP communication connector and LED



LED	Lit	Unlit
CHK (red)	User profile error	Normal
RDY (green)	Normal. Communicating successfully.	No electricity, or Communication failure
ERR (red)	Communication failure; however, flashing in trial.	Normal

Modbus slave wiring

Modbus slave wiring is same as RS-485 communication wiring for Ethernet-serial gateway function.

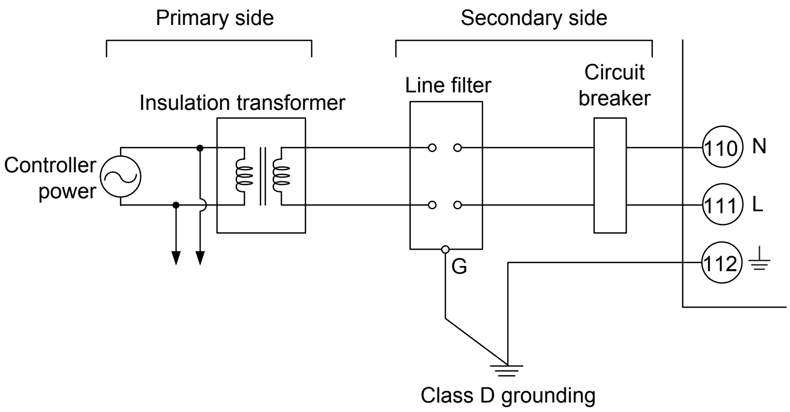
17.4.17 Power Supply Wiring

WARNING

1) Wiring work must be carried out by a person with basic electrical knowledge and practical experience.
2) Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.
3) As a safety measure, always install a circuit breaker (an IEC 60947-compatible product, 5 A, 100 V or 220 V AC) in an easily accessible location near the instrument. Moreover, provide indication that the switch is a device for turning off the power to the instrument.
4) Install the power cable keeping a distance of more than 1 cm from other signal wires.
5) The power cable is required to meet the IEC standards concerned or the requirements of the area in which the instrument is being installed.
6) Wiring should be installed to conform to NEC (National Electrical Code: ANSI/NFPA-70) or the wiring construction standards in countries or regions where wiring will be installed.
7) Be sure to use a heat-resistant cable for control output, alarm output, and power wiring.

CAUTION

1) Provide electricity from a single-phase power supply. If the power is noisy, install an isolation transformer on the primary side, and use a line filter on the secondary side. When measures against noise are taken, do not install the primary and secondary power cables close to each other.
2) If there is a risk of external lightning surges, use a lightning arrester etc.

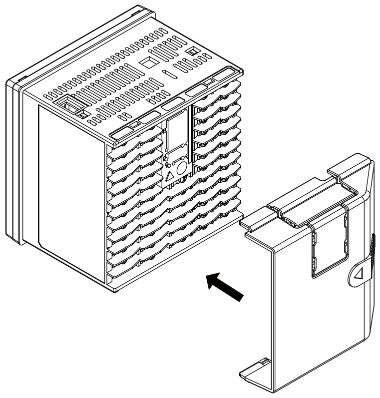


17.5 Attaching and Detaching Terminal Cover

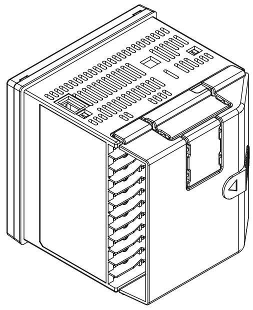
After completing the wiring, the terminal cover is recommended to use for the instrument.

Attaching Method

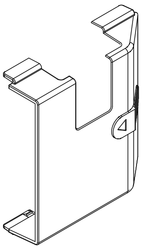
(1) Attach the terminal cover to the rear panel of the main unit horizontally.



(2) The following figure is a mounting image.

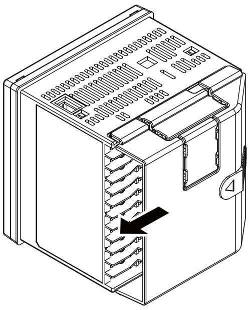


When Ethernet communication is specified, cut and use a terminal cover as follows.
Cut the cover carefully using nippers etc. so that sharp edge does not remain.



Detaching Method

(1) Slide the terminal cover to the direction of the printed arrow.



18.1 Parameter Map

Brief Description of Parameter Map

Group Display

"E1 to E4" and "1 to 8, R" appearing in the parameter map are displayed on Group display (7 segments, 2 digits) while the menu or parameter is displayed.

E1: indicates the parameter in E1-terminal area
E2: indicates the parameter in E2-terminal area
E3: indicates the parameter in E3-terminal area
E4: indicates the parameter in E4-terminal area
1 to 8, R: indicate the group numbers

► E1 to E4: Terminal assignments in 17.4 Wiring

Loop-2 Display

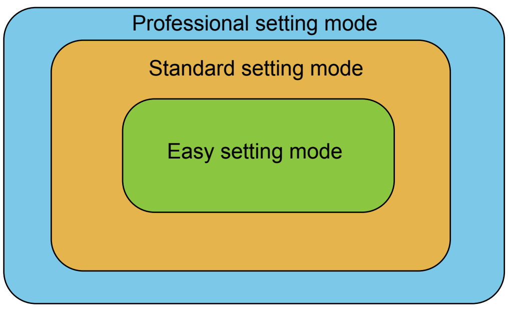
"LP2" appearing in the parameter map indicates that the LP2 lamp (green) is lit.

LP2: indicates that the parameter is for Loop 2. Loop 2 is used when the control mode is Cascade control.

Parameter Display Level

The marks below appearing next to the menu symbol and parameter symbol in the parameter map indicate the display/non-display level.

Mark	Display	Display level	Description
None	EASY	Easy setting mode: Displays the minimum parameters.	Corresponding parameters are displayed in all modes.
S	STD	Standard setting mode: Displays a wider range of parameters than displayed in the Easy setting mode.	Corresponding parameters are displayed only in Standard setting mode and Professional setting mode. Parameter display level indicators "EASY" and "PRO" are unlit in Standard setting mode. *: "STD" is the symbol used in this manual only.
P	PRO	Professional setting mode: Displays all parameters.	Corresponding parameters are displayed only in Professional setting mode.



► Display level: 13.3.2 Setting Parameter Display Level

Function of Each Menu

Menu symbol	Function
MODE	Operation mode (STOP/RUN switch, REMOTE/LOCAL switch, Auto-tuning switch, SP number selection, etc.)

The parameters in the menu of the following table indicate the parameters to set the functions necessary for operation. The symbol in parentheses are shown on Group display.

Menu symbol	Function
CS	SELECT parameter
SP	SP and alarm setpoint
SPS	SP-related function
ALRM	Alarm function
PVS	PV-related function
PID	PID setting
TUNE	Super, Super 2, Sample PI control, non-linear PID control, Feedforward control, anti-reset windup, output velocity limiter, and manual preset output
ZONE	Zone control
SP (LP2)	SP and alarm setpoint (Loop 2)
SPS (LP2)	SP-related function (Loop 2)
ALRM (LP2)	Alarm function (Loop 2)
PVS (LP2)	PV-related function (Loop 2)
PID (LP2)	PID setting (Loop 2)
TUNE (LP2)	Super, Super 2, non-linear PID control, anti-reset windup, output velocity limiter, manual preset output (Loop 2)
ZONE (LP2)	Zone control (Loop 2)
PPAR	P parameter (for ladder program)
PYS1 (1)	10-segment linearizer 1
PYS2 (2)	10-segment linearizer 2
PYS3 (3)	10-segment linearizer 3
PYS4 (4)	10-segment linearizer 4

The parameters in the menu of the following table indicate the parameters to set the basic functions of the controller. The symbol in parentheses are shown on Group display.

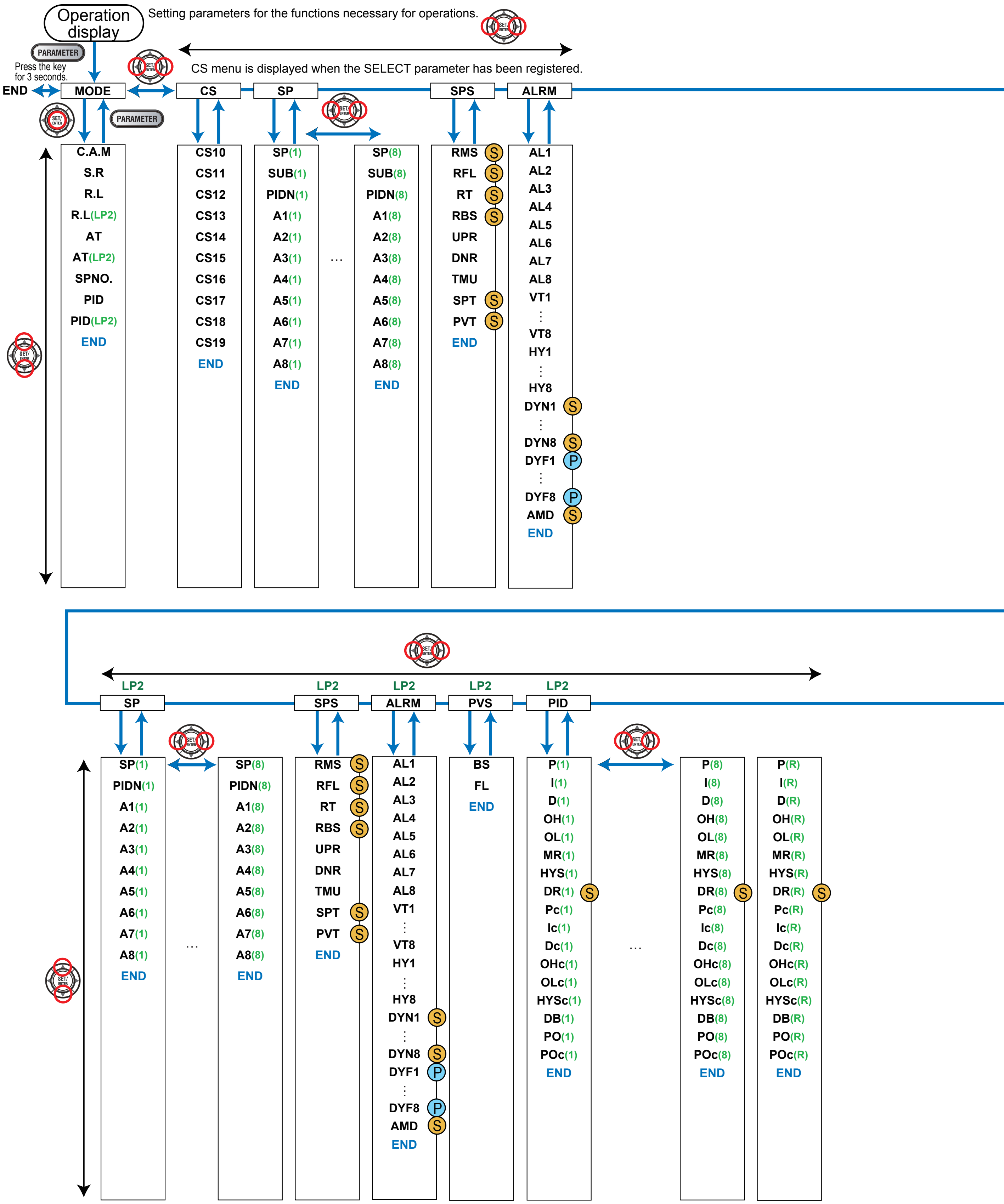
Menu symbol	Functions
PASS	Password setting (Displayed only when the password has been sent.)

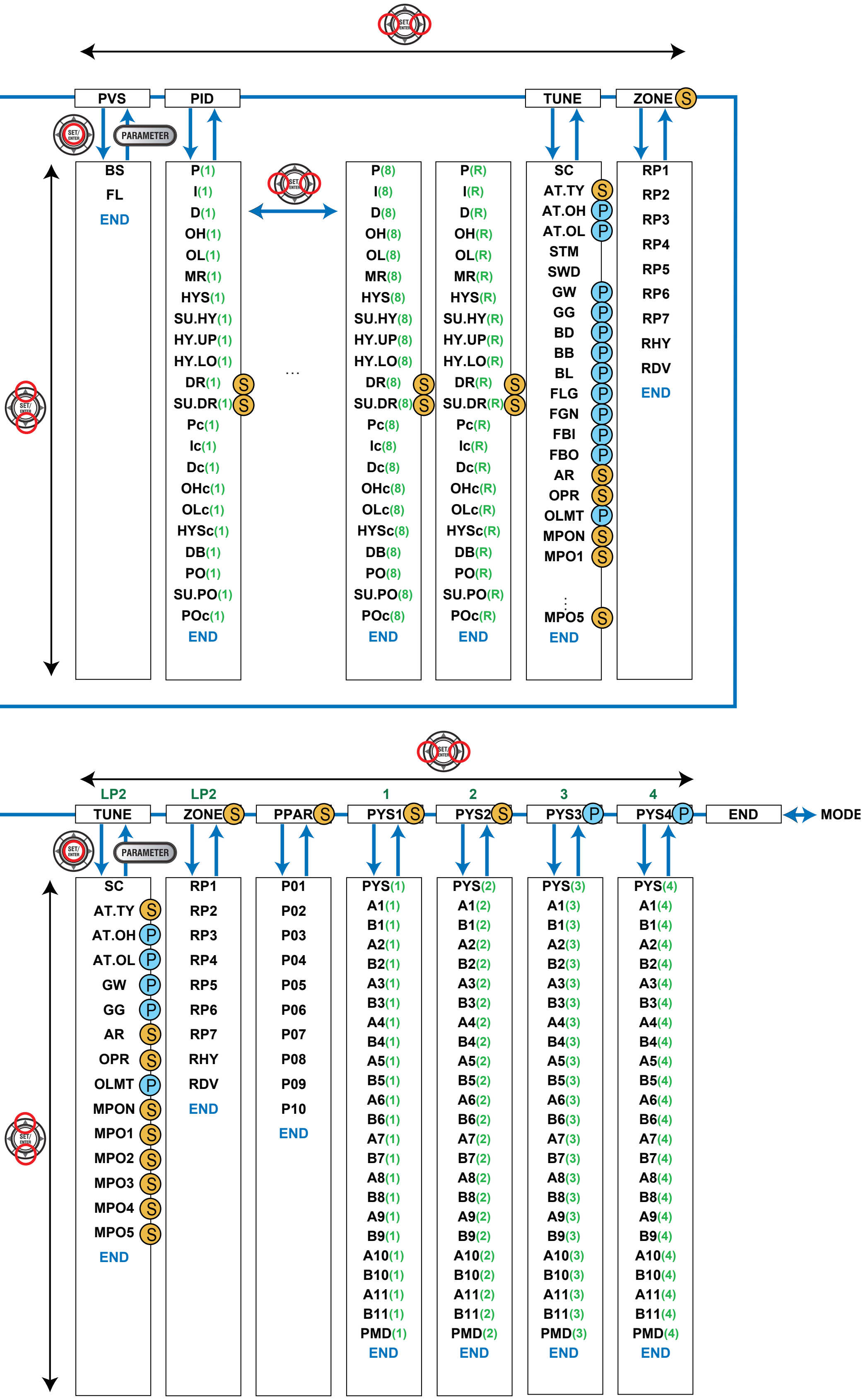
Menu symbol	Functions
CTL	Control mode, control type, sampling period, number of SP groups, number of PID groups, etc
PV	PV input type, range, scale, etc
RSP	RSP remote input type, scale, etc
AIN2	AIN2 aux. analog input type, scale, etc
AIN4	AIN4 aux. analog input type, scale, etc
MPV	Input function in Loop control with PV switching and Loop control with PV auto-selector, SP limiters, etc.
MPV (LP2)	Loop-2 input function, SP limiters (Loop 2), etc in Cascade control.
OUT	Control output type, valve position adjustment, retransmission output, etc.
HBA	Heater break alarm
R485 (E1)	RS-485 communicaiton (E1-terminal area)
R485 (E3)	RS-485 communicaiton (E3-terminal area)
R485 (E4)	RS-485 communicaiton (E4-terminal area)
ETHR (E3)	Ethernet communication, gateway setting, IP access restriction, etc. (E3-terminal area)
PROF (E3)	PROFIBUS-DP communication (E3-terminal area)
KEY	Function of User function key
DISP	Display functions
CSEL	SELECT Display, SELECT parameter registration
KLOC	Key lock
MLOC	Parameter menu lock
DI.SL	Contact input function
DI.NU	Contact input function (bit selection)
DI.D	Contact input type (equipped as standard)
DI.D (E1)	Contact input type (E1-terminal area)
DI.D (E3)	Contact input type (E3-terminal area)
DI.D (E4)	Contact input type (E4-terminal area)
ALM	Alarm output function, contact output type (equipped as standard)
DO (E1)	Contact output function, contact output type (E1-terminal area)
DO (E2)	Contact output function, contact output type (E3-terminal area)
DO (E3)	Contact output function, contact output type (E4-terminal area)
I/O	Input / output data display
SYS	Action setting when recovering from a power failure, guide display language, password setting, etc
INIT	Initialization of parameter
VER	Error status, version, MAC address, etc
LVL	Parameter display level

Note

Some parameters are not displayed according to the setting such as control mode, control type, or input and output.

18.1 Parameter Map





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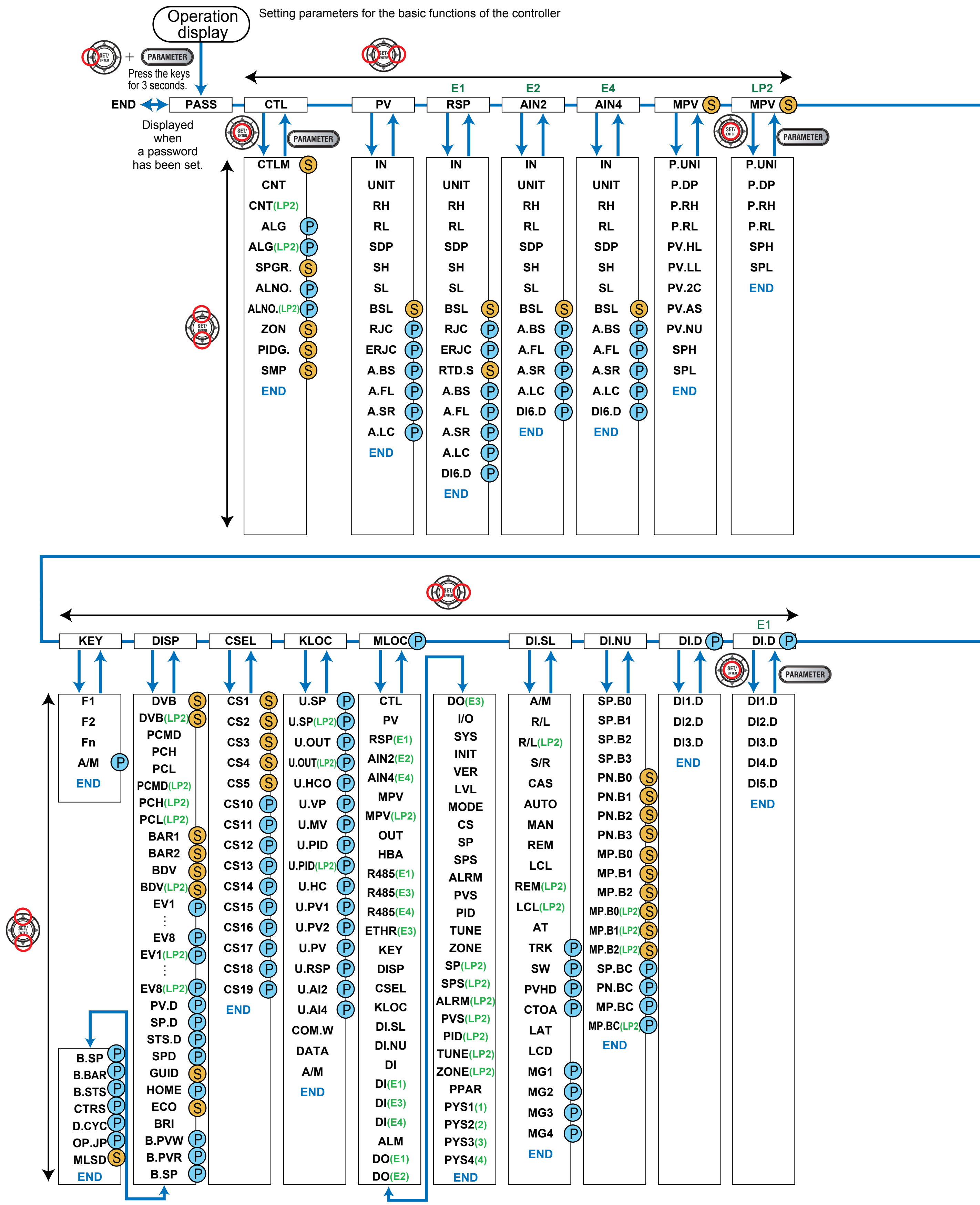
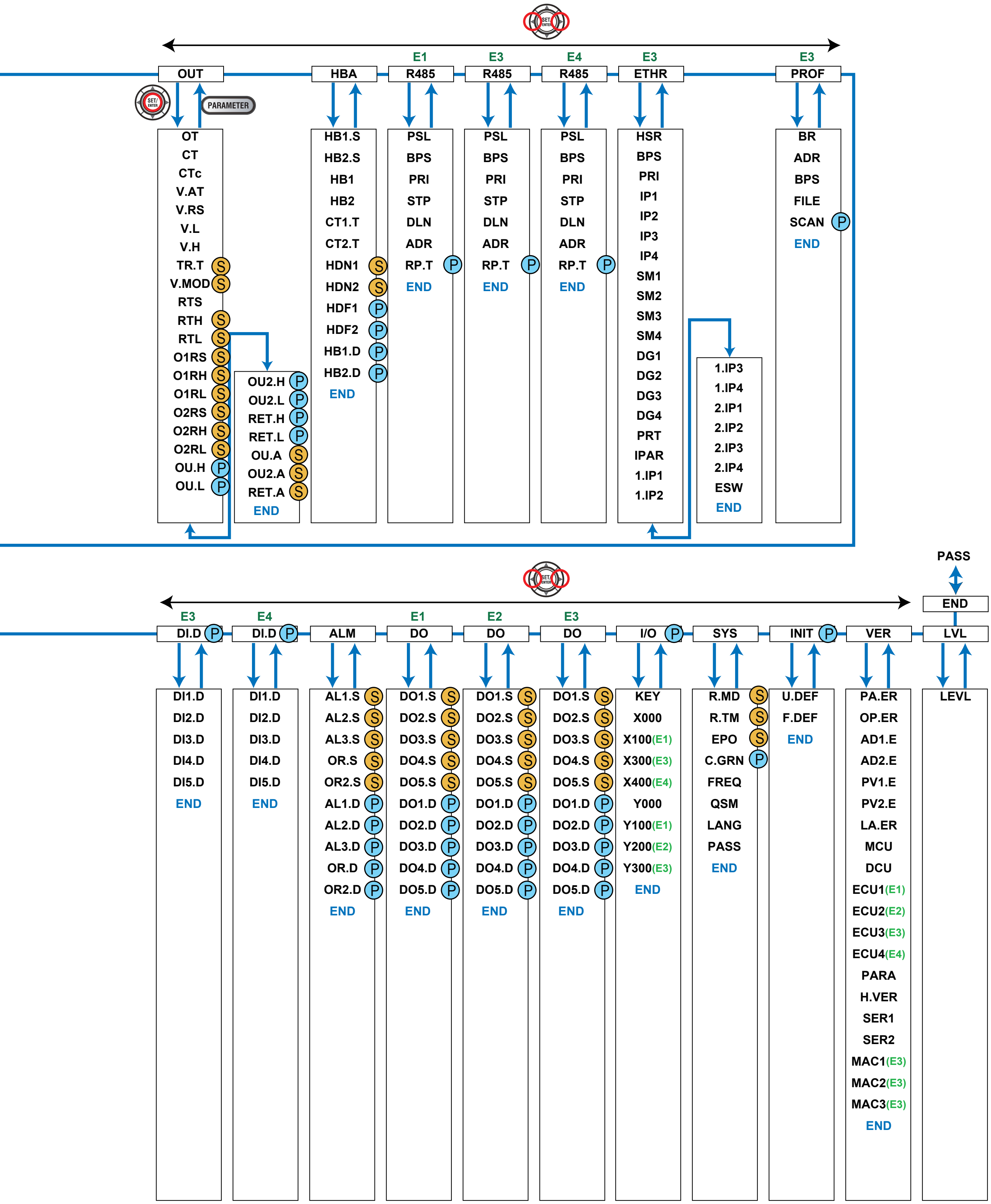
Parameters

18.1 Parameter Map





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Parameters

18.2 List of Parameters

18.2.1 Operation Parameters

Operaiton Mode Menu (Menu: MODE)

Parameter symbol	Name	Display level	Setting range	Initial value
C.A.M	CAS/AUTO/MAN switch	EASY	CAS: Cascade mode AUTO: Automatic mode MAN: Manual mode * Parameter C.A.M is displayed when the control mode is Cascade control or Cascade secondary-loop control.	MAN
S.R	STOP/RUN switch	EASY	STOP: Stop mode RUN: Run mode Preset output (PO) is generated in STOP mode. Default: Not displayed. STOP/RUN switch is assigned to contact input.	RUN
R.L	REMOTE/LOCAL switch	EASY	LCL: Local mode REM: Remote mode Select a remote input method for acquiring the target setpoint from remote input, program operation, or communication using the parameter RMS.	LCL
AT	Auto-tuning switch	EASY	OFF: Disable 1 to 8: Perform auto-tuning. Tuning result is stored in the specified numbered PID. R: Tuning result is stored in the PID for reference deviation.	OFF
SPNO.	SP number selection	EASY	1 to 8 (Depends on the setup parameter SPGR. setting.)	1
PID	PID number	EASY	The PID group number being selected is displayed. 1 to 8, R: PID group for reference deviation	1

In Cascade control, the following operation modes are also displayed for secondary loop. (the LP2 lamp is lit)

• Operaiton mode: R.L, AT, PID

SELECT Parameter Menu (Menu: CS)

Parameter symbol	Name	Display level	Setting range	Initial value
CS10 to CS19	SELECT parameter 10 to 19	EASY	Setting range of a registered parameter.	0

SP and Alarm Setpoint Setting Menu (Menu: SP)

Parameter symbol	Name	Display level	Setting range	Initial value
SP	Target setpoint	EASY	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)	SPL
SUB	Sub-target setpoint (in Two-position two-level control)	EASY	Set the offset from SP. -100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span
PIDN	PID number selection	EASY	1 to 8 (Depends on the PIDG. setting.)	Same as SP number.
A1 to A8	Alarm-1 to -8 setpoint	EASY	Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	0

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: SP, SUB, PIDN, A1 to A8

SP-related Setting Menu (Menu: SPS)

Parameter symbol	Name	Display level	Setting range	Initial value
RMS	Remote input method	STD	RSP: Via remote (aux. analog) input COM: Via communication	RSP
RFL	Remote input filter	STD	OFF, 1 to 120 s	OFF
RT	Remote input ratio	STD	0.001 to 9.999	1.000
RBS	Remote input bias	STD	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span
UPR	SP ramp-up rate	EASY	OFF, 0.0 + 1 digit to 100.0% of PV input range span (EUS)	OFF
DNR	SP ramp-down rate	EASY		OFF
TMU	SP ramp-rate time unit	EASY	HOUR: Ramp-up rate or ramp-down rate per hour MIN: Ramp-up rate or ramp-down rate per minute	HOUR
SPT	SP tracking selection	STD	OFF, ON	ON
PVT	PV tracking selection	STD	OFF, ON	OFF

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: RMS, RFL, RT, RBS, UPR, DNR, TMU, SPT, PVT

Alarm Function Setting Menu (Menu: ALRM)

Parameter symbol	Name	Display level	Setting range	Initial value
AL1 to AL8	Alarm-1 to -8 type	EASY	Set a 5-digit value in the following order. [Alarm type: 2 digits (see below)] + [Without (0) or With (1) Stand-by action] + [Energized (0) or De-energized (1)] + [Latch action (0/1/2/3/4)] For latch action, see chapter 11. Alarm type: 2 digits 00: Disable 01: PV high limit 02: PV low limit 03: SP high limit 04: SP low limit 05: Deviation high limit 06: Deviation low limit 07: Deviation high and low limits 08: Deviation within high and low limits 09: Target SP high limit 10: Target SP low limit 11: Target SP deviation high limit 12: Target SP deviation low limit 13: Target SP deviation high and low limits 14: Target SP deviation within high and low limits 15: OUT high limit 16: OUT low limit 17: Cooling-side OUT high limit 18: Cooling-side OUT low limit 19: Analog input PV high limit 20: Analog input PV low limit 21: Analog input RSP high limit 22: Analog input RSP low limit 23: Analog input AIN2 high limit 24: Analog input AIN2 low limit 25: Analog input AIN4 high limit 26: Analog input AIN4 low limit 27: Feedback input high limit 28: Feedback input low limit 29: PV velocity 30: Fault diagnosis 31: FAIL	AL1, AL3: PV high limit (01) Without Stand-by action (0) Energized (0) Latch action (0) AL2, AL4: PV low limit (02) Without Stand-by action (0) Energized (0) Latch action (0)
VT1 to VT8	PV velocity alarm time setpoint 1 to 8	EASY	0.01 to 99.59 (minute.second)	1.00
HY1 to HY8	Alarm-1 to -8 hysteresis	EASY	Set a display value of setpoint of hysteresis. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	10
DYN1 to DYN8	Alarm-1 to -8 On-delay timer	STD	0.00 to 99.59 (minute.second)	0.00
DYF1 to DYF8	Alarm-1 to -8 Off-delay timer	PRO		0.00
AMD	Alarm mode	STD	0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode	0

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: AL1 to AL8, VT1 to VT8 HY1 to HY8, DYN1 to DYN8, DYF1 to DYF8, AMD

PV-related Setting Menu (Menu: PVS)

Parameter symbol	Name	Display level	Setting range	Initial value
BS	PV input bias	EASY	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span
FL	PV input filter	EASY	OFF, 1 to 120 s	OFF

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
Parameter: BS, FL

PID Setting Menu (Menu: PID)

Parameter symbol	Name	Display level	Setting range	Initial value
P	Proportional band Heating-side proportional band (in Heating/cooling control)	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control	5.0%
I	Integral time Heating-side integral time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	240 s
D	Derivative time Heating-side derivative time (in Heating/cooling control)	EASY	OFF: Disable 1 to 6000 s	60 s
OH	Control output high limit Heating-side control output high limit (in Heating/cooling control)	EASY	-4.9 to 105.0%, (OL<OH) In Heating/cooling control: 0.1 to 105.0% (OL<OH)	100.0%
OL	Control output low limit Heating-side control output low limit (in Heating/cooling control)	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL<OH)	0.0%
MR	Manual reset	EASY	Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%	50.0%
HYS	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	EASY	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	In ON/OFF control or Two-position two-level control: 0.5 % of PV input range span In Heating/cooling control or Position proportional control: 0.5 %

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: P, I, D, OH, OL, MR, HYS

PID Setting Menu (Menu: PID) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
SU.HY	Sub-hysteresis (in Two-position two-level control)	EASY	0.0 to 100.0% of PV input range span (EUS)	0.5 % of PV input range span
HY.UP	Upper-side hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EUS)	0.5 % of PV input range span
HY.LO	Lower-side hysteresis (in ON/OFF control)	EASY		0.5 % of PV input range span
DR	Direct/reverse action switch	STD	RVS: Reverse action, DIR: Direct action	RVS
SU.DR	Sub-direct/reverse action switch (in Two-position two-level control)	STD		DIR
Pc	Cooling-side proportional band	EASY	0.0 to 999.9% (Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control)	5.0%
Ic	Cooling-side integral time	EASY	OFF: Disable 1 to 6000 s	240 s
Dc	Cooling-side derivative time	EASY	OFF: Disable 1 to 6000 s	60 s
OHc	Cooling-side control output high limit	EASY	0.1 to 105.0%, (OLc<OHc)	100.0%
OLc	Cooling-side control output low limit	EASY	0.0 to 104.9%, (OLc<OHc)	0.0%
HYSc	Cooling-side ON/OFF control hysteresis	EASY	0.0 to 100.0%	0.5%
DB	Output dead band (in Heating/cooling control or Position proportional control)	EASY	In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%	3.0%
PO	Preset output Heating-side preset output (in Heating/cooling control)	EASY	-5.0 to 105.0%	0.0%
SU.PO	Sub-preset output (in Two-position two-level control)	EASY	0%, 100%	0%
POc	Cooling-side preset output	EASY	-5.0 to 105.0%	0.0%

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: DR, Pc, Ic, Dc, OHc, OLc, HYSc, DB, PO, POc

Tuning Menu (Menu: TUNE)

Parameter symbol	Name	Display level	Setting range	Initial value
SC	Super function	EASY	OFF: Disable 1: Overshoot suppressing function (normal mode) 2: Hunting suppressing function (stable mode) Enables to answer the wider characteristic changes compared with response mode. 3: Hunting suppressing function (response mode) Enables quick follow-up and short converging time of PV for the changed SP. 4: Overshoot suppressing function (strong suppressing mode)	OFF
AT.TY	Auto-tuning type	STD	0: Normal 1: Stability	0
AT.OH	Output high limit in auto-tuning	PRO	-5.0 to 105.0% (Disabled in Heating/cooling control)	100.0%
AT.OL	Output low limit in auto-tuning	PRO		0.0%
STM	Sample PI sampled time	EASY	0 to 9999 s	60 s
SWD	Sample PI control time span	EASY	0 to 9999 s	30 s
GW	Non-linear control gap width	PRO	OFF, 0.0%+1digit to 50.0% of PV input range span (EUS)	OFF
GG	Non-linear control gain	PRO	0.000 to 1.000	1.000
BD	Batch PID deviation setpoint	PRO	0.0 to 100.0% of PV input range span (EUS)	0.0% of PV input range span
BB	Batch PID bias	PRO	0.0 to 100.0%	0.0%
BL	Batch PID lock-up width	PRO	0.0 to 100.0% of PV input range span (EUS)	0.0% of PV input range span
FLG	Feedforward first-order lag time constant	PRO	OFF, 1 to 120 s	OFF
FGN	Feedforward gain	PRO	-9.999 to 9.999	1.000
FBI	Feedforward input bias	PRO	-100.0 to 100.0%	0.0%
FBO	Feedforward output bias	PRO	-999.9 to 999.9%	0.0%
AR	Anti-reset windup (excess integration prevention)	STD	AUTO, 50.0 to 200.0%	AUTO
OPR	Output velocity limiter	STD	OFF: Disable 0.1 to 100.0%/s	OFF
OLMT	Output limiter switch	PRO	OFF: Disable output limiter in MAN mode ON: Enable output limiter in MAN mode	ON

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: SC, AT.TY, AT.OH, AT.OL, GW, GG, AR, OPR, OLMT

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Parameters

Tuning Menu (Menu: TUNE) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
MPON	Manual preset output number selection	STD	OFF: Hold the control output in AUTO mode (bumpless) 1: Use manual preset output 1 (output bump) 2: Use manual preset output 2 (output bump) 3: Use manual preset output 3 (output bump) 4: Use manual preset output 4 (output bump) 5: Use manual preset output 5 (output bump)	OFF
MPO1 to MPO5	Manual preset output 1 to 5	STD	-5.0 to 105.0%	0.0%

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: MPON, MPO1 to MPO5

Zone Control Menu (Menu: ZONE)

Parameter symbol	Name	Display level	Setting range	Initial value
RP1 to RP7	Reference point 1 to 7	STD	0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)	100.0 % of PV input range
RHY	Zone PID switching hysteresis	STD	0.0 to 10.0% of PV input range span (EUS)	0.5 % of PV input range span
RDV	Reference deviation	STD	OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EUS)	OFF

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: RP1 to RP7, RHY, RDV

P Parameter Menu (Menu: PPAR)

Parameter symbol	Name	Display level	Setting range	Initial value
P01 to P10	P01 to P10 parameter	STD	-19999 to 30000 (Set a decimal point position using LL50A Parameter Setting Software.)	0

10-segment Linearizer Setting Menu (Menu: PYS1 to PYS4)

Parameter symbol	Name	Display level	Setting range	Initial value
PYS	10-segment linearizer selection	Group 1, 2: STD Group 3, 4: PRO	OFF: Disable PV: PV analog input RSP: RSP analog input AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output	PV (CTLM: SGL)
A1 to A11	10-segment linearizer input 1 to 11	Group 1, 2: STD Group 3, 4: PRO	-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	0.0%
B1 to B11	10-segment linearizer output 1 to 11	Group 1, 2: STD Group 3, 4: PRO	10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	0.0%
PMD	10-segment linearizer mode	Group 1, 2: STD Group 3, 4: PRO	0: 10-segment linearizer bias 1: 10-segment linearizer approximation	0

10-segment linearizer parameters are four groups, the group number (1 to 4) is displayed on Group display.

Initial value of each control mode

Control mode	Group-1 PYS	Goup-2 PYS	Group-3 and -4 PYS
Single-loop control	PV	OFF	OFF
Cascade primary-loop control	PV	OFF	OFF
Cascade secondary-loop control	PV	OFF	OFF
Cascade control	PV	RSP	OFF
Loop control for backup	PV	OFF	OFF
Loop control with PV switching	PV	OFF	OFF
Loop control with PV auto-selector	PVIN	OFF	OFF
Loop control with PV-hold function	PV	OFF	OFF

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Parameters

18.2.2 Setup Parameters

Control Function Setting Menu (Menu: CTL)

Parameter symbol	Name	Display level	Setting range	Initial value
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function * When using the ladder program, the control mode cannot be changed.	SGL
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	PID
ALG	PID control mode	PRO	0: Standard PID control mode 1: Fixed-point control mode	0
SPGR.	Number of SP groups	PRO	1 to 8	8
ALNO.	Number of alarms	PRO	1 to 8	4
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	0
PIDG.	Number of PID groups	STD	1 to 8	8
SMP	Input sampling period (control period)	STD	50: 50 ms (Note) 100: 100 ms 200: 200 ms	100

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: CNT, ALG, ALNO.
The parameter CNT of Loop 2 displays PID and H/C.

Note: Available when the control mode is not Cascade control (CTLM≠CAS) and the following functions are not used: "SUPER" function, "SUPER 2" function.

PV Input Setting Menu (Menu: PV)

Parameter symbol	Name	Display level	Setting range	Initial value
IN	PV input type	EASY	OFF: Disable K1: -270.0 to 1370.0 (°C) / -450.0 to 2500.0 (°F) K2: -270.0 to 1000.0 (°C) / -450.0 to 2300.0 (°F) K3: -200.0 to 500.0 (°C) / -200.0 to 1000.0 (°F) J: -200.0 to 1200.0 (°C) / -300.0 to 2300.0 (°F) T1: -270.0 to 400.0 (°C) / -450.0 to 750.0 (°F) T2: 0.0 to 400.0 (°C) / -200.0 to 750.0 (°F) B: 0.0 to 1800.0 (°C) / 32 to 3300 (°F) S: 0.0 to 1700.0 (°C) / 32 to 3100 (°F) R: 0.0 to 1700.0 (°C) / 32 to 3100 (°F) N: -200.0 to 1300.0 (°C) / -300.0 to 2400.0 (°F) E: -270.0 to 1000.0 (°C) / -450.0 to 1800.0 (°F) L: -200.0 to 900.0 (°C) / -300.0 to 1600.0 (°F) U1: -200.0 to 400.0 (°C) / -300.0 to 750.0 (°F) U2: 0.0 to 400.0 (°C) / -200.0 to 1000.0 (°F) W: 0.0 to 2300.0 (°C) / 32 to 4200 (°F) PL2: 0.0 to 1390.0 (°C) / 32.0 to 2500.0 (°F) P2040: 0.0 to 1900.0 (°C) / 32 to 3400 (°F) WRE: 0.0 to 2000.0 (°C) / 32 to 3600 (°F) JPT1: -200.0 to 500.0 (°C) / -300.0 to 1000.0 (°F) JPT2: -150.00 to 150.00 (°C) / -200.0 to 300.0 (°F) PT1: -200.0 to 850.0 (°C) / -300.0 to 1560.0 (°F) PT2: -200.0 to 500.0 (°C) / -300.0 to 1000.0 (°F) PT3: -150.00 to 150.00 (°C) / -200.0 to 300.0 (°F) 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20: 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV Note: W: W-5% Re/W-26% Re (Hoskins Mfg. Co.), ASTM E988 WRE: W97Re3-W75Re25	OFF
UNIT	PV input unit	EASY	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	C
RH	Maximum value of PV input range	EASY	Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type
RL	Minimum value of PV input range	EASY		Depends on the input type

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Parameters

PV Input Setting Menu (Menu: PV) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
SDP	PV input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type
SH	Maximum value of PV input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type
SL	Minimum value of PV input scale	EASY		Depends on the input type
BSL	PV input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type
RJC	PV input reference junction compensation	PRO	OFF: RJC OFF ON: RJC ON	ON
ERJC	PV input external RJC setpoint	PRO	-10.0 to 60.0 (°C)	0.0
A.BS	PV analog input bias	PRO	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span
A.FL	PV analog input filter	PRO	OFF, 1 to 120 s	OFF
A.SR	PV analog input square root extraction	PRO	OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)	OFF
A.LC	PV analog input low signal cutoff	PRO	0.0 to 5.0%	1.0%

RSP Setting Menu (Menu: RSP) (E1 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
IN	RSP remote input type	EASY	0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V For option /DR, RSP remote input type is same as PV input type.	1-5V
UNIT	RSP remote input unit	EASY	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	C
RH	Maximum value of RSP remote input range	EASY	Depends on the input type. - For temperature input (with /DR option) - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current (with /DR option) input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type
RL	Minimum value of RSP remote input range	EASY		Depends on the input type
SDP	RSP remote input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type
SH	Maximum value of RSP remote input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type
SL	Minimum value of RSP remote input scale	EASY		Depends on the input type
BSL	RSP remote input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type
RJC	RSP remote input reference junction compensation (for /DR option)	PRO	OFF: RJC OFF ON: RJC ON	ON
ERJC	RSP remote input external RJC setpoint (for /DR option)	PRO	-10.0 to 60.0 (°C)	0.0
RTD.S	RTD wiring system	STD	3-W: 3-wire system 4-W: 4-wire system	3-W

When each parameter is displayed, the terminal area (E1) is displayed on Group display.

RSP Input Setting Menu (Menu: RSP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
A.BS	RSP aux. analog input bias	PRO	-100.0 to 100.0% of RSP input range span (EUS)	0.0 % of RSP input range span
A.FL	RSP aux. analog input filter	PRO	OFF, 1 to 120 s	OFF
A.SR	RSP aux. analog input square root extraction	PRO	OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)	OFF
A.LC	RSP aux. analog input low signal cutoff	PRO	0.0 to 5.0%	1.0%
DI6.D	DI16 contact type	PRO	CLS: The assigned function is enabled when the contact is closed. OPN: The assigned function is enabled when the contact is opened.	CLS

When each parameter is displayed, the terminal area (E1) is displayed on Group display.

AIN2 Aux. Analog Input Setting Menu (Menu: AIN2) (E2 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
IN	AIN2 aux. analog input type	EASY	0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V	1-5V
UNIT	AIN2 aux. analog input unit	EASY	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	C
RH	Maximum value of AIN2 aux. analog input range	EASY	Depends on the input type. Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type
RL	Minimum value of AIN2 aux. analog input range	EASY		Depends on the input type
SDP	AIN2 aux. analog input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type
SH	Maximum value of AIN2 aux. analog input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type
SL	Minimum value of AIN2 aux. analog input scale	EASY		Depends on the input type
BSL	AIN2 aux. analog input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type
A.BS	AIN2 aux. analog input bias	PRO	-100.0 to 100.0% of AIN2 input range span (EUS)	0.0 % of AIN2 input range span
A.FL	AIN2 aux. analog input filter	PRO	OFF, 1 to 120 s	OFF
A.SR	AIN2 aux. analog input square root extraction	PRO	OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)	OFF
A.LC	AIN2 aux. analog input low signal cutoff	PRO	0.0 to 5.0%	1.0%
DI6.D	DI26 contact type	PRO	CLS: The assigned function is enabled when the contact is closed. OPN: The assigned function is enabled when the contact is opened.	CLS

When each parameter is displayed, the terminal area (E2) is displayed on Group display.

AIN4 Aux. Analog Input Setting Menu (Menu: AIN4) (E4 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
IN	AIN4 aux. analog input type	EASY	0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V	1-5V
UNIT	AIN4 aux. analog input unit	EASY	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	C
RH	Maximum value of AIN4 aux. analog input range	EASY	Depends on the input type. Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type
RL	Minimum value of AIN4 aux. analog input range	EASY		Depends on the input type
SDP	AIN4 aux. analog input scale decimal point position	EASY	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type
SH	Maximum value of AIN4 aux. analog input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type
SL	Minimum value of AIN4 aux. analog input scale	EASY		Depends on the input type
BSL	AIN4 aux. analog input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type
A.BS	AIN4 aux. analog input bias	PRO	-100.0 to 100.0% of AIN4 input range span (EUS)	0.0 % of AIN4 input range span
A.FL	AIN4 aux. analog input filter	PRO	OFF, 1 to 120 s	OFF
A.SR	AIN4 aux. analog input square root extraction	PRO	OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)	OFF
A.LC	AIN4 aux. analog input low signal cutoff	PRO	0.0 to 5.0%	1.0%
DI6.D	DI46 contact type	PRO	CLS: The assigned function is enabled when the contact is closed. OPN: The assigned function is enabled when the contact is opened.	CLS

When each parameter is displayed, the terminal area (E4) is displayed on Group display.

Input Range/SP Limiter/Input Switch/Input Auto-selector Setting Menu (Menu: MPV)

Parameter symbol	Name	Display level	Setting range	Initial value
P.UNI	Control PV input unit	STD	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	Same as PV input unit
P.DP	Control PV input decimal point position	STD	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1
P.RH	Maximum value of control PV input range	STD	-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000	Depends on the input type
P.RL	Minimum value of control PV input range	STD		Depends on the input type
PV.HL	Input switching PV high limit (in Loop control with PV switching)	STD	0.0 to 100.0% of control PV input range (EU), (PV.HL>PV.LL)	100.0 % of control PV input range
PV.LL	Input switching PV low limit (in Loop control with PV switching)	STD		0.0 % of control PV input range
PV.2C	Input switching action (in Loop control with PV switching)	STD	0: Switch based on low limit of temperature range 1: Switch using the parameter PV.HL 2: Switch using DI 3: Switch based on high limit of temperature range	0
PV.AS	Input computation selection (in Loop control with PV auto-selector)	STD	0: Max. value 1: Min. value 2: Ave. value 3: Input 1 - Input 2 4: Input 2 - Input 1	0
PV.NU	Number of inputs (in Loop control with PV auto-selector)	STD	2: Use Input 1 and Input 2 3: Use Input 1, Input 2, and Input 3 4: Use 4 inputs	2
SPH	SP high limit	STD	0.0 to 100.0% of PV input range (EU), (SPL<SPH)	100.0 % of PV input range
SPL	SP low limit	STD		0.0 % of PV input range

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: P.UNI, P.DP, P.RH, P.RL, SPH, SPL

Output Setting Menu (Menu: OUT)

Parameter symbol	Name	Display level	Setting range	Initial value
OT	Output type selection	EASY	Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) 07: RET terminals (voltage pulse) Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) 07: RET terminals (voltage pulse)	Standard type: 00.03 Heating/cooling type: 06.03
CT	Control output cycle time Heating-side control output cycle time (in Heating/cooling control)	EASY	0.5 to 1000.0 s	30.0 s
CTc	Cooling-side control output cycle time	EASY		30.0 s
V.AT	Automatic valve position adjustment	EASY	OFF: Stop automatic adjustment ON: Start automatic adjustment	OFF
V.RS	Valve position setting reset	EASY	Setting V.RS to ON resets the valve adjustment settings and causes the indication "V.RS" to blink.	OFF
V.L	Fully-closed valve position setting	EASY	Pressing the SET/ENTER key with valve position set to the fully-closed position by Down arrow key causes the adjusted value to be stored. When V.L adjustment is complete, V.L stops blinking.	-
V.H	Fully-open valve position setting	EASY	Pressing the SET/ENTER key with valve position set to the fully-opened position by Up arrow key causes the adjusted value to be stored. When V.H adjustment is complete, V.H stops blinking.	-
TR.T	Valve traveling time	STD	5 to 300 s	60 s
V.MOD	Valve adjusting mode	STD	0: Valve position feedback type 1: Valve position feedback type (moves to the estimating type if a feedback input error or break occurs.) 2: Valve position estimating type	0

Output Setting Menu (Menu: OUT) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
RTS	Retransmission output type of RET	EASY	OFF: Disable PV1: PV SP1: SP OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control) LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Heating-side OUT COUT1: Cooling-side OUT MV1: Position proportional output internal computed value) TSP2: Loop-2 target SP HOUT2: Loop-2 heating-side OUT COUT2: Loop-2 cooling-side OUT MV2: Loop-2 position proportional output (internal computed value) PV: PV terminals analog input RSP: RSP terminals analog input AIN2: AIN2 terminals analog input AIN4: AIN4 terminals analog input Loop-2 setting values are unavailable in Single-loop control.	PV1
RTH	Maximum value of retransmission output scale of RET	STD	When RTS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, RTL + 1 digit to 30000 -19999 to RTH - 1 digit Decimal point position: When RTS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When RTS=PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When RTS=PV, decimal point position is same as that of PV input scale. When RTS=RSP, decimal point position is same as that of RSP input scale. When RTS=AIN2, decimal point position is same as that of AIN2 scale. When RTS=AIN4, decimal point position is same as that of AIN4 scale.	100 % of PV input range
RTL	Minimum value of retransmission output scale of RET	STD		0 % of PV input range

Output Setting Menu (Menu: OUT) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
O1RS	Retransmission output type of OUT current output	STD	Same as RTS	OFF
O1RH	Maximum value of retransmission output scale of OUT current output	STD	When O1RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O1RL + 1 digit to 30000 -19999 to O1RH - 1 digit Decimal point position: When O1RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O1RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O1RS =PV, decimal point position is same as that of PV input scale. When O1RS =RSP, decimal point position is same as that of RSP input scale. When O1RS =AIN2, decimal point position is same as that of AIN2 scale. When O1RS =AIN4, decimal point position is same as that of AIN4 scale.	-
O1RL	Minimum value of retransmission output scale of OUT current output	STD		-
O2RS	Retransmission output type of OUT2 current output	STD	Same as RTS	OFF
O2RH	Maximum value of retransmission output scale of OUT2 current output	STD	When O2RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O2RL + 1 digit to 30000 -19999 to O2RH - 1 digit Decimal point position: When O2RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O2RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O2RS =PV, decimal point position is same as that of PV input scale. When O2RS =RSP, decimal point position is same as that of RSP input scale. When O2RS =AIN2, decimal point position is same as that of AIN2 scale. When O2RS =AIN4, decimal point position is same as that of AIN4 scale.	-
O2RL	Minimum value of retransmission output scale of OUT2 current output	STD		-

Output Setting Menu (Menu: OUT) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
OU.H	100% segmental point of OUT current output	PRO	-100.0 to 200.0%	100.0%
OU.L	0% segmental point of OUT current output	PRO		0.0%
OU2.H	100% segmental point of OUT2 current output	PRO		100.0%
OU2.L	0% segmental point of OUT2 current output	PRO		0.0%
RET.H	100% segmental point of RET current output	PRO		100.0%
RET.L	0% segmental point of RET current output	PRO		0.0%
OU.A	OUT current output range	PRO	4-20: 4 to 20 mA 0-20: 0 to 20 mA 20-4: 20 to 4 mA 20-0: 20 to 0 mA	4-20
OU2.A	OUT2 current output range	PRO		4-20
RET.A	RET current output range	PRO		4-20

Heater Break Alarm Setting Menu (Menu: HBA)

Parameter symbol	Name	Display level	Setting range	Initial value
HB1.S, HB2.S	Heater break alarm-1, -2 function selection	EASY	0: Heater current measurement 1: Heater break alarm	1
HB1, HB2	Heater break alarm-1, -2 current setpoint	EASY	OFF, 0.1 to 300.0 Arms	OFF
CT1.T, CT2.T	CT1, CT2 coil winding number ratio	EASY	1 to 3300	800
HDN1, HDN2	Heater break alarm-1, -2 On-delay timer	STD	0.00 to 99.59 (minute.second)	0.00
HDF1, HDF2	Heater break alarm-1, -2 Off-delay timer	PRO		0.00
HB1.D, HB2.D	Heater break alarm-1, -2 contact type	PRO	CLS: When the event occurs, the contact is closed. OPN: When the event occurs, the contact is opened.	CLS

RS-485 Communication Setting Menu (Menu: R485) (E1, E3 and E4 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
PSL	Protocol selection	EASY	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication	MBRTU
BPS	Baud rate	EASY	600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps (except for communication of E4 terminal area)	19200
PRI	Parity	EASY	NONE: None EVEN: Even ODD: Odd	EVEN
STP	Stop bit	EASY	1: 1 bit, 2: 2 bits	1
DLN	Data length	EASY	7: 7 bits, 8: 8 bits	8
ADR	Address	EASY	1 to 99	1
RP.T	Minimum response time	PRO	0 to 10 (x10ms)	0

When each parameter is displayed, the terminal area (E1, E2 or E4) is displayed on Group display.
• Parameter: PSL, BPS, STP, DLN, ADR, RP.T

Ethernet Communication Setting Menu (Menu: ETHR) (E3 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
HSR	High-speed response mode	EASY	OFF, 1 to 8	1
BPS	Baud rate	EASY	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400
PRI	Parity	EASY	NONE: None EVEN: Even ODD: Odd	EVEN
IP1 to IP4	IP address 1 to 4	EASY	0 to 255 Initial value: 192.168.1.1	See left
SM1 to SM4	Subnet mask 1 to 4	EASY	0 to 255 Initial value: 255.255.255.0	See left
DG1 to DG4	Default gateway 1 to 4	EASY	0 to 255 Initial value: 0.0.0.0	See left
PRT	Port number	EASY	502, 1024 to 65535	502
IPAR	IP access restriction	EASY	OFF: Disable, ON: Enable	OFF
1.IP1 to 1.IP4	Permitted IP address 1-1 to 1-4	EASY	0 to 255 Initial value: 255.255.255.255	See left
2.IP1 to 2.IP4	Permitted IP address 2-1 to 2-4	EASY	0 to 255 Initial value: 255.255.255.255	See left
ESW	Ethernet setting switch	EASY	OFF, ON	OFF

When each parameter is displayed, the terminal area (E3) is displayed on Group display.

PROFIBUS-DP Communication Setting Menu (Menu: PROF) (E3 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
BR	Baud rate	STD	9.6K: 9.6k bps 19.2K: 19.2k bps 93.75K: 93.75k bps 187.5K: 187.5k bps 0.5M: 0.5M bps 1.5M: 1.5M bps 3M: 3M bps 6M: 6M bps 12M: 12M bps AUTO 45.45K: 45.45k bps	AUTO
ADR	Address	STD	0 to 125	3
BPS	Baud rate	STD	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400
FILE	Profile number	STD	0 to 5	0
SCAN	Automatic rescan time	STD	OFF 1M: 1 minute 10M: 10 minutes 30M: 30 minutes 60M: 60 minutes	OFF

When each parameter is displayed, the terminal area (E3) is displayed on Group display.

Key Action Setting Menu (Menu: KEY)

Parameter symbol	Name	Display level	Setting range	Initial value
F1 to F2	User function key-1, -2 action setting	EASY	OFF: Disable A/M: AUTO/MAN switch C/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN REM1: Switch to REM LCL1: Switch to LCL REM2: Switch to Loop-2 REM LCL2: Switch to Loop-2 LCL STOP: Switch to STOP RUN: Switch to RUN AT: Auto-tuning LTUP: LCD brightness UP LTDN: LCD brightness DOWN BRI: Adjust LCD brightness LCD: LCD backlight ON/OFF switch LAT: Latch release PID: PID tuning switch Loop-2 setting values are unavalable in Single-loop control.	OFF
Fn	User function key-n action setting	EASY		PID
A/M	A/M key action setting	PRO	OFF: Disable A/M: AUTO/MAN switch C/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN	A/M

Display Function Setting Menu (Menu: DISP)

<table>
<tr><th>Parameter symbol</th><th>Name</th><th>Display level</th><th>Setting range</th><th>Initial value</th></tr>
<tr><td>DVB</td><td>Deviation display band</td><td>STD</td><td>0.0 to 100.0% of PV input range span (EUS)</td><td>1.0 % of PV input range span</td></tr>
<tr><td>PCMD</td><td>Active color PV display switch</td><td>EASY</td><td>0: Fixed in white
1: Fixed in red
2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red)
3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white)
4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red)
5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white)
6: PV limit (Within range: white, Out of range: red)
7: PV limit (Within range: red, Out of range: white)
8: SP deviation (Within deviation: white, Out of deviation: red)
9: SP deviation (Within deviation: red, Out of deviation: white)</td><td>0</td></tr>
<tr><td>PCH</td><td>PV color change high limit</td><td>EASY</td><td rowspan="2">Set a display value when in PV limit or SP deviation.
-19999 to 30000 (Set a value within the input range.)
Decimal point position depends on the input type.</td><td>0</td></tr>
<tr><td>PCL</td><td>PV color change low limit</td><td>EASY</td><td>0</td></tr>
<tr><td>BAR1</td><td>Upper bar-graph display registration</td><td>STD</td><td rowspan="2">0: Disable
1:OUT, Heating-side OUT, Internal value in Position proportional control
2: Cooling-side OUT
3: PV
4: SP
5: Deviation
6: Loop-2 OUT, Loop-2 heating-side OUT
7: Loop-2 cooling-side OUT
8: Loop-2 PV
9: Loop-2 SP
10: Loop-2 deviation
11 to 16: Disable
17: Feedback input (valve opening)
18: PV terminals analog input
19: RSP terminals analog input
20: AIN2 terminals analog input
21: AIN4 terminals analog input
22: Segment progression of program pattern operation</td><td>5
(Heating/cooling type: 1)</td></tr>
<tr><td>BAR2</td><td>Lower bar-graph display registration</td><td>STD</td><td>1
(Heating/cooling type: 2)
(Position proportional type: 17)</td></tr>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter:DVB, PCMD, PCH, PCL

Display Function Setting Menu (Menu: DISP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
BDV	Bar-graph deviation display band	STD	0.0 to 100.0% of PV input range span (EUS)	10.0 % of PV input range span
EV1 to EV8	EV1 to EV8 display condition registration	PRO	Setting range: 4001 to 6304 OFF: Disable 4321: Link to alarm 1 (Lit when the alarm occurs) 4322: Link to alarm 2 (Lit when the alarm occurs) 4323: Link to alarm 3 (Lit when the alarm occurs) 4325: Link to alarm 4 (Lit when the alarm occurs) 4326: Link to alarm 5 (Lit when the alarm occurs) 4327: Link to alarm 6 (Lit when the alarm occurs) 4329: Link to alarm 7 (Lit when the alarm occurs) 4330: Link to alarm 8 (Lit when the alarm occurs) 4337: Link to Loop-2 alarm 1 (Lit when the alarm occurs) 4338: Link to Loop-2 alarm 2 (Lit when the alarm occurs) 4339: Link to Loop-2 alarm 3 (Lit when the alarm occurs) 4341: Link to Loop-2 alarm 4 (Lit when the alarm occurs) 4342: Link to Loop-2 alarm 5 (Lit when the alarm occurs) 4343: Link to Loop-2 alarm 6 (Lit when the alarm occurs) 4345: Link to Loop-2 alarm 7 (Lit when the alarm occurs) 4346: Link to Loop-2 alarm 8 (Lit when the alarm occurs) 4529: Heater break alarm 1 (Lit when the alarm occurs) 4530: Heater break alarm 2 (Lit when the alarm occurs) 5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed) 5041 to 5046: Link to DI11-DI16 (E1-terminal area) (Lit when the contact is closed) 5062: Link to DI26 (E2-terminal area) (Lit when the contact is closed) 5073 to 5077: Link to DI31-DI35 (E3-terminal area) (Lit when the contact is closed) 5089 to 5094: Link to DI41-DI46 (E4-terminal area) (Lit when the contact is closed) 5153 to 5155: Link to AL1-AL3 (Lit when the contact is closed) 5169 to 5173: Link to DO11-DO15 (E1-terminal area) (Lit when the contact is closed) 5185 to 5189: Link to DO21-DO25 (E2-terminal area) (Lit when the contact is closed) 5201 to 5205: Link to DO31-DO35 (E3-terminal area) (Lit when the contact is closed) For other functions, see the UTAdvanced Series Communication Interface User's Manual.	Loop 1 EV1: 4321 EV2: 4322 EV3: 4323 EV4: 4325 EV5: 4326 EV6: 4327 EV7: 4329 EV8: 4330 Loop 2 EV1: 4337 EV2: 4338 EV3: 4339 EV4: 4341 EV5: 4342 EV6: 4343 EV7: 4345 EV8: 4346

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: BDV, EV1 to EV8

Display Function Setting Menu (Menu: DISP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
PV.D	PV display area ON/OFF	PRO	OFF: Nondisplay, ON: Display	ON
SP.D	Setpoint display area ON/OFF	PRO		ON
STS.D	Status display area ON/OFF	PRO		ON
SPD	Scroll speed	PRO	(Slow) 1 to 8 (Quick)	4
GUID	Guide display ON/OFF	STD	OFF: Nondisplay ON: Display	ON
HOME	Home Operation Display setting	PRO	SP1: SP Display SP2: Loop-2 SP Display OUT1: OUT Display OUT2: Loop-2 OUT Display HCO: Heating/cooling OUT Display VP: Valve Position Display MV: Position Proportional Computation Output Display PTN: Program Pattern Number Display PID1: PID Number Display PID2: Loop-2 PID Number Display HC1: Heater Break Alarm-1 Current Display HC2: Heater Break Alarm-2 Current Display PV1: PV2/PV1 Display PV2: PV1/PV2 Display PV: PV Analog Input Display RSP: RSP Analog Input Display AIN2: AIN2 Analog Input Display AIN4: AIN4 Analog Input Display CS1 to CS5: SELECT Display 1 to 5	SP1
ECO	Economy mode	STD	OFF: Disable 1: Economy mode ON (All indications except PV display OFF) 2: Economy mode ON (All indications OFF) 3: Brightness 10 % (All indications)	OFF
BRI	Brightness	EASY	(Dark) 1 to 5 (Bright)	3
B.PVW	White brightness adjustment of PV display	PRO	Adjusts the white brightness of PV display. (Dark) -4 to 4 (Bright)	0
B.PVR	Red brightness adjustment of PV display	PRO	Adjusts the red brightness of PV display. (Dark) -4 to 4 (Bright)	0
B.SP	Brightness adjustment of SP display	PRO	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)	0
B.BAR	Brightness adjustment of Bar-graph display	PRO	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)	0
B.STS	Brightness adjustment of Status indicator	PRO	Adjusts the brightness of Status indicator. (Dark) -4 to 4 (Bright)	0
CTRS	Contrast	PRO	(Low) 1 to 6 (High)	6
D.CYC	Display update cycle	PRO	1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s	2

Display Function Setting Menu (Menu: DISP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
OP.JP	Autoreturn to operaiton display	PRO	Automatically returned to the Operation Display when there has been no keystroke operation for 5 minutes. OFF, ON	ON
MLSD	Least significant digital mask of PV display	STD	OFF: With least significant digit ON: Without least significant digit	OFF

SELECT Display Setting Menu (Menu: CSEL)

Parameter symbol	Name	Display level	Setting range	Initial value
CS1 to CS5	SELECT Display-1 to -5registration	STD	OFF, 2501 to 5000	OFF
CS10 to CS19	SELECT parameter-10 to -19 registration	PRO		OFF

Key Lock Setting Menu (Menu: KLOC)

Parameter symbol	Name	Display level	Setting range	Initial value
U.SP	SP Display lock	PRO	OFF: Display ON: Nondisplay	OFF
U.OUT	OUT Display lock	PRO		OFF (Position proportional type: ON)
U.HCO	Heating/cooling OUT Display lock	PRO		OFF (Heating/ cooling type: ON)
U.VP	Valve Position Display lock	PRO		OFF
U.MV	Position Proportional Computation Output Display lock	PRO		ON
U.PID	PID Number Display lock	PRO		ON
U.HC	Heater Break Alarm Current Value Display lock	PRO		OFF
U.PV1	PV2/PV1 Display lock	PRO		OFF
U.PV2	PV1/PV2 Display lock	PRO		OFF
U.PV	PV Analog Input Display lock	PRO		OFF
U.RSP	RSP Analog Input Display lock	PRO		OFF
U.AI2	AIN2 Analog Input Display lock	PRO		OFF
U.AI4	AIN4 Analog Input Display lock	PRO		OFF
COM.W	Communication write enable/disable	STD	OFF: Enable, ON: Disable	OFF
DATA	Front panel parameter data key lock	STD	OFF: Unlock ON: Lock	OFF
A/M	Front panel A/M key lock	STD		OFF

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: U.SP, U.OUT, U.PID, U.PV2

Menu Lock Setting Menu (Menu: MLOC)

Parameter symbol	Name	Display level	Setting range	Initial value
CTL	[CTL] menu lock	PRO	OFF: Display ON: Nondisplay	OFF
PV	[PV] menu lock	PRO		
RSP	[RSP] menu lock	PRO		
AIN2	[AIN2] menu lock	PRO		
AIN4	[AIN4] menu lock	PRO		
MPV	[MPV] menu lock	PRO		
OUT	[OUT] menu lock	PRO		
HBA	[HBA] menu lock	PRO		
R485	[R485] menu lock	PRO		
ETHR	[ETHR] menu lock	PRO		
PROF	[PROF] menu lock	PRO		
KEY	[KEY] menu lock	PRO		
DISP	[DISP] menu lock	PRO		
CSEL	[CSEL] menu lock	PRO		
KLOC	[KLOC] menu lock	PRO		
DI.SL	[DI.SL] menu lock	PRO		
DI.NU	[DI.NU] menu lock	PRO		
DI.D	[DI.D] menu lock	PRO		
ALM	[ALM] menu lock	PRO		
DO	[DO] menu lock	PRO		
I/O	[I/O] menu lock	PRO		
SYS	[SYS] menu lock	PRO		
INIT	[INIT] menu lock	PRO		
VER	[VER] menu lock	PRO		
LVL	[LVL] menu lock	PRO		
MODE	[MODE] menu lock	PRO	OFF: Display ON: Nondisplay	OFF
CS	[CS] menu lock	PRO		
SP	[SP] menu lock	PRO		
SPS	[SPS] menu lock	PRO		
ALRM	[ALRM] menu lock	PRO		
PVS	[PVS] menu lock	PRO		
PID	[PID] menu lock	PRO		
TUNE	[TUNE] menu lock	PRO		
ZONE	[ZONE] menu lock	PRO		
PPAR	[PPAR] menu lock	PRO		
PYS1	[PYS1] menu lock	PRO		
PYS2	[PYS2] menu lock	PRO		
PYS3	[PYS3] menu lock	PRO		
PYS4	[PYS4] menu lock	PRO		

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: MPV, SP, SPS, ALRM, PVS, PID, TUNE, ZONE

When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display.
• Parameter: RSP, AIN2, AIN4, R485, ETHR, DI.D, DO

DI Function Registration Menu (Menu: DI.SL)

Parameter symbol	Name	Display level	Setting range	Initial value
A/M	AUTO/MAN switch	STD	Set an I relay number of contact input. Set “0” to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI11: 5041, DI12: 5042, DI13: 5043, DI14: 5044, DI15: 5045, DI16: 5046 E2 -terminal area DI26: 5062 E3-terminal area DI31: 5073, DI32: 5074, DI33: 5075, DI34: 5076, DI35: 5077 E4-terminal area DI41: 5089, DI42: 5090, DI43: 5091, DI44: 5092, DI45: 5093, DI46: 5094	5025
R/L	REMOTE/LOCAL switch	STD		5046
S/R	STOP/RUN switch	STD		5026
CAS	Switch to CAS	STD		0
AUTO	Switch to AUTO	STD		0
MAN	Switch to MAN	STD		0
REM	Switch to REMOTE	STD		0
LCL	Switch to LOCAL	STD		0
AT	Auto-tuning START/STOP switch	STD		0
TRK	Output tracking switch	PRO		0
SW	PV switch	PRO		0
PVHD	PV hold	PRO		0
CTOA	CAS to AUTO switch	PRO		0
LAT	Latch release	STD		0
LCD	LCD backlight ON/OFF switch	STD		0
MG1	Message display interruption 1	PRO		0
MG2	Message display interruption 2	PRO		0
MG3	Message display interruption 3	PRO		0
MG4	Message display interruption 4	PRO		0

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: R/L, REM, LCL

DI Function Numbering Menu (Menu: DI.NU)

Parameter symbol	Name	Display level	Setting range	Initial value
SP.B0	Bit-0 of SP number	EASY	Set an I relay number of contact input. Set “0” to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI11: 5041, DI12: 5042, DI13: 5043, DI14: 5044, DI15: 5045, DI16: 5046 E2 -terminal area DI26: 5062 E3-terminal area DI31: 5073, DI32: 5074, DI33: 5075, DI34: 5076, DI35: 5077 E4-terminal area DI41: 5089, DI42: 5090, DI43: 5091, DI44: 5092, DI45: 5093, DI46: 5094	0
SP.B1	Bit-1 of SP number	EASY		0
SP.B2	Bit-2 of SP number	EASY		0
SP.B3	Bit-3 of SP number	EASY		0
PN.B0	Bit-0 of PID number	STD		0
PN.B1	Bit-1 of PID number	STD		0
PN.B2	Bit-2 of PID number	STD		0
PN.B3	Bit-3 of PID number	STD		0
MP.B0	Bit-0 of manual preset output number	STD		0
MP.B1	Bit-1 of manual preset output number	STD		0
MP.B2	Bit-2 of manual preset output number	STD		0
SP.BC	Bit changing method of SP number	PRO	0: Status switch 1 1: Status switch 2	0
PN.BC	Bit changing method of PID number	PRO	0: Status switch 1 1: Status switch 2	0
MP.BC	Bit changing method of manual preset output number	PRO	0: Status switch 1 1: Status switch 2	0

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter MP.B0, MP.B1, MP.B2, MP.BC

DI1-DI3 Contact Type Setting Menu (Menu: DI.D)

Parameter symbol	Name	Display level	Setting range	Initial value
DI1.D	DI1 contact type	PRO	CLS: The assigned function is enabled when the contact input is closed. OPN: The assigned function is enabled when the contact input is opened.	CLS
DI2.D	DI2 contact type	PRO		CLS
DI3.D	DI3 contact type	PRO		CLS

DI Setting Menu (Menu: DI.D) (E1, E3 and E4 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
DI1.D	DIn1 contact type	PRO	CLS: The assigned function is enabled when the contact input is closed. OPN: The assigned function is enabled when the contact input is opened.	CLS
DI2.D	DIn2 contact type	PRO		CLS
DI3.D	DIn3 contact type	PRO		CLS
DI4.D	DIn4 contact type	PRO		CLS
DI5.D	DIn5 contact type	PRO		CLS

n: Terminal area number (1, 3 or 4)

AL1-AL3 Function Registration Menu (Menu: ALM)

Parameter symbol	Name	Display level	Setting range	Initial value
AL1.S	AL1 function selection	STD	Set an I relay number. Setting range: 4001 to 6000 No function: 0 Alarm 1: 4353 Alarm 2: 4354 Alarm 3: 4355 Alarm 4: 4357 Alarm 5: 4358 Alarm 6: 4359 Alarm 7: 4361 Alarm 8: 4362 AUTO (ON) / MAN (OFF) status: 4193 REM (ON) / LCL (OFF) status: 4194 STOP (ON) / RUN (OFF) status: 4195 Output tracking (ON) switching signal: 4201 FAIL (Normally ON) output: 4256	4353
AL2.S	AL2 function selection	STD		4354
AL3.S	AL3 function selection	STD		4355
OR.S	OUT relay function selection	STD		0
OR2.S	OUT2 relay function selection	STD		0
AL1.D	AL1 contact type	PRO	CLS: When the event of assigned function occurs, the contact output is closed. OPN: When the event of assigned function occurs, the contact output is opened.	CLS
AL2.D	AL2 contact type	PRO		CLS
AL3.D	AL3 contact type	PRO		CLS
OR.D	OUT relay contact type	PRO		CLS
OR2.D	OUT2 relay contact type	PRO		CLS

DO Setting Menu (Menu: DO) (E1 to E3 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
DO1.S	DOn1 function selection	STD	Same as AL1.S. Initial value of E1 and E3 teminal area All DO settings are 0. Initial value of E2 terminal area DO1.S: 4357, DO2.S: 4358, DO3.S: 4359, DO4.S: 4361, DO5.S: 4362	See left
DO2.S	DOn2 function selection	STD		See left
DO3.S	DOn3 function selection	STD		See left
DO4.S	DOn4 function selection	STD		See left
DO5.S	DOn5 function selection	STD		See left
DO1.D	DOn1 contact type	PRO	CLS: When the event of assigned function occurs, the contact output is closed. OPN: When the event of assigned function occurs, the contact output is opened.	CLS
DO2.D	DOn2 contact type	PRO		CLS
DO3.D	DOn3 contact type	PRO		CLS
DO4.D	DOn4 contact type	PRO		CLS
DO5.D	DOn5 contact type	PRO		CLS

n: Terminal area number (1, 2 or 3)

I/O Display Menu (Menu: I/O)

Parameter symbol	Name	Display level	Read only
KEY	Key status	PRO	See Chapter 13.
X000	DI1-DI3 status (equipped as standard)	PRO	
X100	DI11-DI16 status (E1-terminal area)	PRO	
X300	DI31-DI35 status (E3-terminal area)	PRO	
X400	DI41-DI46 status (E4-terminal area)	PRO	
Y000	AL1-AL3 status (equipped as standard)	PRO	
Y100	DO11-DO15 status (E1-terminal area)	PRO	
Y200	DO21-DO25 status (E2-terminal area)	PRO	
Y300	DO31-DO35 status (E3-terminal area)	PRO	

System Setting Menu (Menu: SYS)

Parameter symbol	Name	Display level	Setting range	Initial value
R.MD	Restart mode	STD	CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.	CONT
R.TM	Restart timer	STD	0 to 10 s	0
EPO	Input error preset output	STD	0: Preset output 1: 0% output 2: 100% output	0
C.GRN	Response as GREEN Seires	PRO	OFF: Works as UT55A/UT52A in communication of device information response or broadcasting. ON: Works as GREEN Series in communication of device information response or broadcasting.	OFF
FREQ	Power frequency	EASY	AUTO, 60: 60 Hz, 50: 50 Hz	AUTO
QSM	Quick setting mode	EASY	OFF: Disable ON: Enable	ON
LANG	Guide display language	EASY	ENG: English FRA: French GER: German SPA: Spanish ITA: Italian	Depends on the Model and Suffix Codes
PASS	Password setting	EASY	0 (No password) to 65535 Once a password is set, you can no longer choose not to set a password.	0

Initialization Menu (Menu: INIT)

Parameter symbol	Name	Display level	Setting range	Initial value
U.DEF	Initialization to user default value	PRO	12345: Initialization, automatically returned to "0" after initialization.	0
F.DEF	Initialization to factory default value	PRO	-12345: Initialization, automatically returned to "0" after initialization.	0

Error and Version Confirmation Menu (Menu: VER)

Parameter symbol	Name	Display level	Read only
PA.ER	Parameter error status	EASY	See Chapter 16.
OP.ER	Option error status	EASY	
AD1.E	A/D converter error status 1	EASY	
AD2.E	A/D converter error status 2	EASY	
PV1.E	Loop-1 PV input error status	EASY	
PV2.E	Loop-2 PV input error status	EASY	
LA.ER	Ladder error status	EASY	
MCU	MCU version	EASY	See Chapter 13.
DCU	DCU version	EASY	
ECU1	ECU-1 version	EASY	
ECU2	ECU-2 version	EASY	
ECU3	ECU-3 version	EASY	
ECU4	ECU-4 version	EASY	
PARA	Parameter version	EASY	
H.VER	Product version	EASY	
SER1	Serial number 1	EASY	
SER2	Serial number 2	EASY	
MAC1	MAC address 1	EASY	
MAC2	MAC address 2	EASY	
MAC3	MAC address 3	EASY	

When the following parameters are displayed, the terminal area (E1 to E4) is displayed on Group display.
• Parameter: ECU1, ECU2, ECU3, MAC1, MAC2 and MAC3

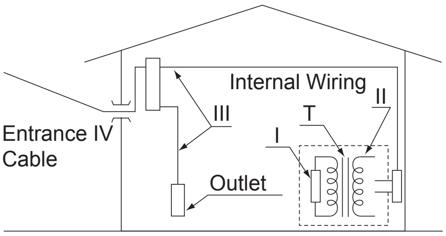
Parameter Display Level Menu (Menu: LVL)

Parameter symbol	Name	Display level	Setting range	Initial value
LEVL	Parameter display level	EASY	EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode	STD

19.1 Hardware Specifications

WARNING

This instrument is for Measurement Category I (CAT.I). Do not use it for measurements in locations falling under Measurement Categories II, III, and IV.



Category	Measurement category	Description	Remarks
I	CAT.I	For measurements performed on circuits not directly connected to MAINS.	-
II	CAT.II	For measurements performed on circuits directly connected to the low-voltage installation.	Appliances, portable equipments, etc.
III	CAT.III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
IV	CAT.IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.

19.1.1 Input Specifications

Universal Input

- Number of inputs: 1
- Input type, instrument range, and measurement accuracy: See the table below.

Input Type		Instrument Range (°C)	Instrument Range (°F)	Accuracy
Thermo-couple	K	-270.0 to 1370.0°C	-450.0 to 2500.0°F	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C ±2% of instrument range ±1 digit for less than -200.0°C of thermocouple K ±1% of instrument range ±1 digit for less than -200.0°C of thermocouple T
		-270.0 to 1000.0°C	-450.0 to 2300.0°F	
		-270.0 to 500.0°C	-200.0 to 1000.0°F	
	J	-200.0 to 1200.0°C	-300.0 to 2300.0°F	
	T	-270.0 to 400.0°C	-450.0 to 750.0°F	
		0.0 to 400.0°C	-200.0 to 750.0°F	
	B	0.0 to 1800.0°C	32 to 3300°F	±0.15% of instrument range ±1 digit for 400°C or more ±5% of instrument range ±1 digit for less than 400°C
	S	0.0 to 1700.0°C	32 to 3100°F	±0.15% of instrument range ±1 digit
	R	0.0 to 1700.0°C	32 to 3100°F	
	N	-200.0 to 1300.0°C	-300.0 to 2400.0°F	±0.1% of instrument range ±1 digit ±0.25% of instrument range ±1 digit for less than 0°C
	E	-270.0 to 1000.0°C	-450.0 to 1800.0°F	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C ±1.5% of instrument range ±1 digit for less than -200.0°C of thermocouple E.
	L	-200.0 to 900.0°C	-300.0 to 1600.0°F	
	U	-200.0 to 400.0°C	-300.0 to 750.0°F	
		0.0 to 400.0°C	-200.0 to 1000.0°F	
	W	0.0 to 2300.0°C	32 to 4200°F	±0.2% of instrument range ±1 digit (Note 2)
	Platinel 2	0.0 to 1390.0°C	32.0 to 2500.0°F	±0.1% of instrument range ±1 digit
	PR20-40	0.0 to 1900.0°C	32 to 3400°F	±0.5% of instrument range ±1 digit for 800°C or more Accuracy is not guaranteed for less than 800°C.
	W97Re3-W75Re25	0.0 to 2000.0°C	32 to 3600°F	±0.2% of instrument range ±1 digit
RTD	JPt100	-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.1% of instrument range ±1 digit
	Pt100	-200.0 to 850.0°C	-300.0 to 1560.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-200.0 to 500.0°C	-300.0 to 1000.0°F	
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.1% of instrument range ±1 digit
Standard signal		0.400 to 2.000 V		±0.1% of instrument range ±1 digit
		1.000 to 5.000 V		
		4.00 to 20.00 mA		
DC voltage/current		0.000 to 2.000 V		
		0.00 to 10.00 V		
		0.00 to 20.00 mA		
		-10.00 to 20.00 mV		
		0.0 to 100.0 mV		

The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.

Note 1: ±0.3°C ±1 digit in the range between 0 and 100°C, ±0.5°C ±1 digit in the range between -100 and 200°C.

Note 2: W: W-5% Re/W-26% Re(Hoskins Mfg.Co.). ASTM E988

- Input sampling (control) period: Select from among 50, 100, and 200 ms
- Burnout detection:
  Functions at TC, RTD, and standard signal
  Upscale, downscale, and off can be specified.
  For standard signal, burnout is determined to have occurred if it is 0.1 V or 0.4 mA or less.
- Input bias current: 0.05 μA (for TC or RTD)
- Measurement current (RTD): About 0.16 mA
- Input resistance:
  TC or mV input: 1 MΩ or more
  V input: About 1 MΩ
  mA input: About 250 Ω
- Allowable signal source resistance:
  TC or mV input: 250 Ω or less
    Effects of signal source resistance: 0.1 μV/Ω or less
  DC voltage input: 2 kΩ or less
    Effects of signal source resistance: About 0.01%/100 Ω
- Allowable wiring resistance:
  RTD input: Max. 150 Ω/wire (The conductor resistance between the three wires shall be equal.)
  Wiring resistance effect: ±0.1ºC/10 Ω
- Allowable input voltage/current:
  TC, mV, mA or RTD input: ±10 V DC
  V input: ±20 V DC
  mA input: ±40 mA
- Noise rejection ratio:
  Normal mode: 40 dB or more (50/60 Hz)
  Common mode: 120 dB or more (50/60 Hz)
  For 100-240 V AC, the power frequency can be set manually. Automatic detection is also available.
  For 24 V AC/DC, the power frequency can be set manually.
- Reference junction compensation error:
  ±1.0ºC (15 to 35ºC)
  ±1.5ºC (-10 to 15ºC, 35 to 50ºC)
- Applicable standards: JIS/IEC/DIN (ITS-90) for TC and RTD

Auxiliary Analog Input

- Use: Remote setpoint setting, external compensating input, auxiliary input for computation, etc.
- Number of inputs: See the table of Model and Suffix Codes
- Input type, instrument range, and measurement accuracy: See the table below.

Input Type	Instrument Range			Accuracy
Standard Signal	0.400	to	2.000 V	±0.2% of instrument range ±1 digit
	1.000	to	5.000 V	±0.1% of instrument range ±1 digit
DC Voltage	0.000	to	2.000 V	±0.2% of instrument range ±1 digit
	0.00	to	10.00 V	±0.1% of instrument range ±1 digit
DC voltage for high-input impedance	0.000	to	1.250 V	±0.1% of instrument range ±1 digit

- Input sampling (control) period: Same as universal input
- Input resistance: About 1 MΩ
  However, 10 MΩ or more for DC voltage for high-input impedance range

Remote Input with Direct Input

- Number of inputs: See the table of Model and Suffix Codes.
- Input type, instrument range, and measurement accuracy: Same as universal input except the table below.

Input Type		Instrument Range (°C)	Instrument Range (°F)	Accuracy
4-wire RTD	JPt100	-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.5°C ±1 digit
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2°C ±1 digit
	Pt100	-200.0 to 850.0°C	-300.0 to 1560.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.5°C ±1 digit
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2°C ±1 digit

Note 1: ±0.5°C ±1 digit in the range between -200.0 and 500.0°C/-300.0 and 1000.0°F.

- Input sampling (control) period: Same as universal input

19.1.2 Analog Output Specifications

- Number of outputs:
  Control output: 1
  Cooling-side control output of Heating/cooling type: 1
- Output type: Current output or voltage pulse output
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less.)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
- Voltage pulse output:
  Use: Time proportional output
  On-voltage: 12 V or more/load resistance of 600 Ω or more
  Off-voltage: 0.1 V DC or less
  Time resolution: 10 ms or 0.1% of output, whichever is larger

19.1.3 Step Response Time Specifications

Within 500 ms (when the control period is 50 ms or 100 ms)
Within 1 s (when the control period is 200 ms)
(63% of analog output response time when a step change of 10 to 90% of input span is applied)

19.1.4 Relay Contact Output Specifications

- Contact type and number of outputs:
  Control output: contact point 1c; 1 point
  Cooling-side control output of Heating/cooling type: contact point 1c; 1 point (for UT55A only)
  For UT52A, contact point 1a; 2 points for both heating and cooling sides
  Alarm output: contact point 1a; 3 points (common is independent)
- Contact rating:
  Contact point 1c (control output): 250 V AC, 3 A or 30 V DC, 3A (resistance load)
  Contact point 2a (control output): 240 V AC, 3A or 30 V DC, 3A (resistance load) (for UT52A only)
  Contact point 1a (alarm output): 240 V AC, 1A or 30 V DC, 1 A (resistance load)
- Use: Time proportional output, alarm output, FAIL output, etc.
- Time resolution of control output: 10 ms or 0.1% of output, whichever is larger

Note: Cannot be used for a small load of 10 mA or less.

19.1.5 Position Proportional Output Specifications

- Position signal input:
  - Slide resistance: 100 Ω to 2.5 kΩ of total resistance
    - 100% side and slide line: with disconnection detection
    - 0% side: without disconnection detection
  - Current input: 4 to 20 mA (with disconnection detection)
- Sampling period: 50 ms
- Measurement resolution: 0.1% of input span
- Position proportional relay output:
  - UT55A: contact point 1a; 2 points, 250 V AC, 3 A or 30 V DC, 3 A (resistance load)
  - UT52A: contact point 1a; 2 points, 240 V AC, 3 A or 30 V DC, 3 A (resistance load)

Note: Cannot be used for a small load of 10 mA or less.

19.1.6 Retransmission Output Specifications

- Number of outputs: Retransmission output; 1, shared with 15 V DC loop power supply
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/ load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less.)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.

19.1.7 15 V DC Loop Power Supply Specifications

(Shared with retransmission output)

- Power supply: 14.5 to 18.0 V DC
- Maximum power supply: About 21 mA (with short-circuit current limiting circuit)

19.1.8 Contact Input Specifications

- Number of inputs: See the table of Model and Suffix Codes.
- Input type: No-voltage contact input or transistor contact input
- Input contact rating: 12 V DC, 10 mA or more
  Use a contact of a minimum on-current of 1 mA or more
- ON/OFF detection:
  - No-voltage contact input:
    Contact resistance of 1 kΩ or less is determined as “ON” and contact resistance of 50 kΩ or more as “OFF.”
  - Transistor contact input:
    Input voltage of 2 V or less is determined as “ON” and leakage current must not exceed 100 μA when “OFF.”
- Minimum status detection hold time: Control period +50 ms
- Use: SP switch, operation mode switch, and event input

19.1.9 Transistor Contact Output Specifications

- Number of outputs: See the table of Model and Suffix Codes.
- Output type: Open collector (SINK current)
- Output contact rating: Max. 24 V DC, 50 mA
- Output time resolution: Min. 50 ms

19.1.10 Heater Break Alarm Specifications

- Number of inputs: 2
- Number of outputs: 2 (transistor contact output)
- Use: Measures the heater current using an external current transformer (CT) and generates a heater break alarm when the measured value is less than the break detection value.
- Current transformer input resistance: About 9.4 Ω
- Current transformer input range: 0.0 to 0.1 Arms (0.12 Arms or more cannot be applied.)
- Heater current setting range: OFF, 0.1 to 300.0 Arms
  Heater current measured value display range: 0.0 to 360.0 Arms
  Note: The CT ratio can be set. CT ratio setting range: 1 to 3300
- Recommended CT: CT from U.R.D., Ltd.
  CTL-6-S-H: CT ratio 800, measurable current range: 0.1 to 80.0 Arms
  CTL-12L-30: CT ratio 3000, measurable current range: 0.1 to 180.0 Arms
- Heater current measurement period: 200 ms
- Heater current measurement accuracy: ±5% of current transformer input range span ± 1 digit (CT error is not included.)
  Ex.: CTL-12L-30
  0.1 (Max. of current transformer input range) × 3000 (CT ratio) × ±0.05 (±5%) ± 1digit = ±15 Arms ± 1 digit
- Heater current detection resolution: Within 1/250 of current transformer input range span
  Ex.: CTL-12L-30
  0.1 (Max. of current transformer input range) × 3000 (CT ratio) / 250 = 1.2 Arms
- Break detection On-time: Min. 0.2 second. (for time proportional output)

19.1.11 24 V DC Loop Power Supply Specifications

- Use: Power is supplied to a 2-wire transmitter.
- Power supply: 21.6 to 28.0 V DC
- Rated current: 4 to 20 mA DC
- Maximum power supply: About 30 mA (with short circuit current limiting circuit)

19.1.12 Safety and EMC Standards

- Safety: Compliant with IEC/EN61010-1 (CE), approved by CAN/CSA C22.2 No.61010-1 (CSA). UL61010-1 is now under application.
  Installation category: CAT. II Pollution degree: 2
  Measurement category: I (CAT. I)
  Rated measurement input voltage: Max. 10 V DC
  Rated transient overvoltage: 1500 V (Note)

Note: This is a reference safety standard value for Measurement Category I of IEC/EN/CSA/UL61010-1. This value is not necessarily a guarantee of instrument performance.

- EMC Conformity standards:
  CE marking
  EN61326-1 Class A, Table 2 (For use in industrial locations)
  EN61326-2-3
  EN 55011 Class A, Group1
  EN 61000-3-2 Class A
  EN 61000-3-3
  C-tick mark
  EN 55011 Class A, Group1

The instrument continues to operate at a measurement accuracy of within ±20% of the range during testing

19.1.13 Construction, Installation, and Wiring

- Dust-proof and drip-proof: IP56 (for front panel) (Not available for side-by-side close mounting.)
- Material: Polycarbonate (Flame retardancy: UL94V-0)
- Case color: Light gray
- Weight: 0.5 kg or less
- External dimensions (mm):
  UT55A: 96 (W) × 96 (H) × 65 (depth from the panel face)
  UT52A: 48 (W) × 96 (H) × 65 (depth from the panel face)
  (Depth except the projection on the rear panel)
- Installation: Direct panel mounting; mounting bracket, one each for upper and lower mounting
- Panel cutout dimensions (mm):
  UT55A: $92^{+0.8/0}$ (W) × $92^{+0.8/0}$ (H)
  UT52A: $45^{+0.6/0}$ (W) × $92^{+0.8/0}$ (H)
- Mounting attitude: Up to 30 degrees above the horizontal. No downward titling allowed.
- Wiring: M3.0 screw terminal with square washer (for signal wiring and power wiring)

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Specifications

19.1.14 Power Supply Specifications and Isolation

- Power supply:
  Rated voltage: 100 – 240 V AC (+10%/-15%), 50/60 Hz
  24 V AC/DC (+10%/-15%) (for /DC option)
- Power consumption:
  UT55A: 18 VA (DC:9 VA, AC: 14 VA if /DC option is specified)
  UT52A: 15 VA (DC:7 VA, AC: 11 VA if /DC option is specified)
- Data backup: Nonvolatile memory
- Power holdup time: 20 ms (for 100 V AC drive)
- Withstanding voltage
  - Between primary terminals and secondary terminals: 2300 V AC for 1 minute
  - Between primary terminals: 1500 V AC for 1 minute
  - Between secondary terminals: 500 V AC for 1 minute

    (Primary terminals: Power (*) and relay output terminals; Secondary terminals: Analog I/O signal terminals, contact input terminals, communication terminals, and functional grounding terminals.)

  (*): Power terminals for 24V AC/DC models are the secondary terminals.

- Isolation specifications

PV (universal) input terminals	Internal circuits	Power supply
Remote (universal) input terminals with direct input		
Remote input terminals / Aux. analog input terminals		
Control, retransmission (analog) output terminals (not isolated between the analog output terminals) Valve position (feedback) input terminals		
Control relay (contact point c) output terminals		
Alarm-1 relay (contact point a) output terminals		
Alarm-2 relay (contact point a) output terminals		
Alarm-3 relay (contact point a) output terminals		
Position proportional relay output terminals		
Contact input terminals RS-485 communication terminals		
24 V DC loop power supply terminals		
Contact output (transistor) terminals		
Ethernet communication terminal		
PROFIBUS-DP communication terminals		
Current transformer input terminals		

The circuits divided by lines are insulated multually.

19.1.15 Environmental Conditions

Normal Operating Conditions

- Ambient temperature: -10 to 50ºC (-10 to 40ºC for side-by-side close mounting)
- Ambient humidity: 20 to 90% RH (no condensation allowed)
- Magnetic field: 400 A/m or less
- Continuous vibration at 5 to 9 Hz: Half amplitude of 1.5 mm or less, 1oct/min for 90 minutes each in the three axis directions
  Continuous vibration at 9 to 150 Hz: 4.9 m/s^2 or less, 1oct/min for 90 minutes each in the three axis directions
- Short-period vibration: 14.7 m/s^2, 15 seconds or less
- Shock: 98 m/s^2 or less, 11 ms
- Altitude: 2000 m or less above sea level
- Warm-up time: 30 minutes or more after the power is turned on
- Startup time: Within 10 seconds

*: The LCD (a liquid crystal display) is used for a display portion of this product.
The LCD has a characteristic that the display action becomes late at the low temperature. However, the control fuction is not affected.

Transportation and Storage Conditions

- Temperature: -25 to 70ºC
- Temperature change rate: 20ºC/h or less
- Humidity: 5 to 95% RH (no condensation allowed)

Effects of Operating Conditions

- Effect of ambient temperature:
  Voltage or TC input: ±1 μV/ºC or ±0.01% of F.S./ºC, whichever is larger
  Current input: ±0.01% of F.S./ºC
  RTD input: ±0.05ºC/ºC (ambient temperature) or less
  Analog output: ±0.02% of F.S./ºC or less
- Effect of power supply voltage fluctuation
  Analog input: ±0.05% of F.S. or less
  Analog output: ±0.05% of F.S. or less
  (Each within rated voltage range)

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Appendix 1 Input and Output Table of Standard Model and Suffix Codes

See the next page.

UT55A Standard Model and Suffix Codes

Model	Suffix code					Optional suffix code	INPUT				OUTPUT			
							PV	RSP	AIN2	AIN4	OUT	OUT2	VALV	RET
UT55A	-x	x	x	-x0	-00	/x	●							●
Type 1: Basic control	-0										●			
	-1												●	
	-2										●	●		
Type 2: Functions		0												
		1						●						
		2						●						
		3												
		4						●						
		5						●						
		6												
		7						●	●	●				
Type 3: Open networks			x											
Display language				-x0										
Fixed code					-00									
Optional suffix codes						/DR		♦						
						/HA								

●: Equipped

♦: If the /DR option is additionally specified to the remote input, RSP terminal can be used as universal input. However, DI16 is deleted.

UT52A Standard Model and Suffix Codes

Model	Suffix code					Optional suffix code	INPUT		OUTPUT			
							PV	RSP	OUT	OUT2	VALV	RET
UT55A	-x	x	x	-x0	-00	/x	●					●
Type 1: Basic control	-0								●			
	-1										●	
	-2								●	●		
Type 2: Functions		0										
		1						●				
		2						●				
		3										
Type 3: Open networks			x									
Display language				-x0								
Fixed code					-00							
Optional suffix codes						/DR		♦				
						/HA						

●: Equipped

♦: If the /DR option is additionally specified to the remote input, RSP terminal can be used as universal input. However, DI16 is deleted.

UT55A (Continued)

DI																				
DI1	DI2	DI3	DI11	DI12	DI13	DI14	DI15	DI16	DI26	DI31	DI32	DI33	DI34	DI35	DI41	DI42	DI43	DI44	DI45	DI46
●	●	●																		
								●		●	●	●	●	●						
								●												
			●	●	●	●	●													
								●												
								●							●	●	●	●	●	
															●	●	●	●	●	
								●	●											●
								♦												

UT55A (Continued)

DO																			
AL1	AL2	AL3	DO11	DO12	DO13	DO14	DO15	DO21	DO22	DO23	DO24	DO25	DO31	DO32	DO33	DO34	DO35	HAL1	HAL2
●	●	●																	
								●	●	●	●	●							
								●	●	●	●	●							
								●	●	●	●	●							
			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
																		●	●

UT52A (Continued)

DI						DO						
DI1	DI2	DI3	DI11	DI12	DI16	AL1	AL2	AL3	DO11	DO12	HAL1	HAL2
●	●	●				●	●	●				
					●							
					●							
			●	●					●	●		
					♦							
											●	●

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