User Manual

ProSense Advanced Process Controllers PPC5 Series

Models:

PPC5-1000

PPC5-1001

PPC5-1002

PPC5-1100

PPC5-1101

PPC5-1102

ProSense
Advanced Process
Controllers

Please include the Manual Number and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

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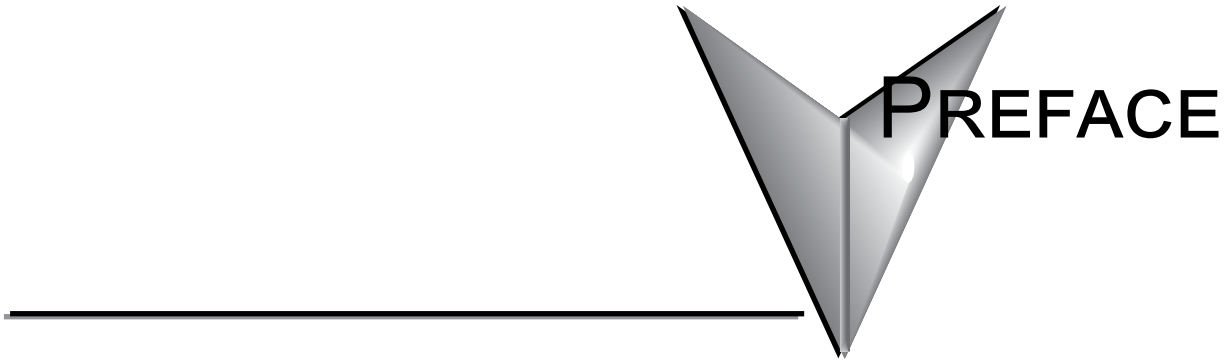
Issue	**Date**	**Description of Changes**
1st Edition	04/20	Original Issue



Contents

Overview of this Publication

This User Manual describes the installation, configuration, and methods of operation of the PPC5 series Prosense Advanced Process Controller.

Who Should Read This Manual

This manual contains important information for those who will install, maintain, and/or operate any of the PPC5 series advanced process controllers.
Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call technical support at 770-844-4200. We are available weekdays Monday through Friday, 9:00 a.m.to 6:00 p.m. E.T.
We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company. Visit us at www.automationdirect.com.

Safety Precautions

This instrument is a product of Installation Category II of IEC/EN/CSA/UL61010-1, IEC/EN61010-2-201, IEC/EN61010-2-030 Safety Standards and Class A of EN61326-1, EN55011 (EMC Standards). For use in Pollution Degree 2 environments.

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 O (other).

* Measurement Category O (other)
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.

1st Edition : April 2020

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 O (other) 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.
- 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.
- This product is intended to be handled by skilled/trained personnel for electric devices.
- This product is UL Recognized Component. In order to comply with UL standards, end-products are necessary to be designed by those who have knowledge of the requirements.

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
- Damage to the Protective Construction
  Operation of the instrument in a manner not specified in this user's manual may damage its protective construction.

Handling Precautions for the Controller

- 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 AutomationDirect Technical Support.

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 AutomationDirect.

PPC5 Controller
The PPC5 controllers have nameplates affixed to the side of the case.
Check the model inscribed on the nameplate to confirm that the product received is that which was ordered.

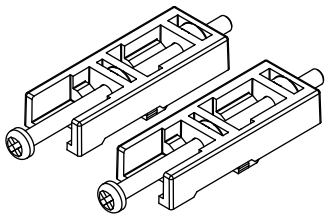
PPC5 Models and Description

Model	Description
PPC5-1000	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage.
PPC5-1001	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage, RS-485.
PPC5-1002	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage, Ethernet.
PPC5-1100	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete, auxiliary analog input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage.
PPC5-1101	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete, auxiliary analog input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage, RS-485.
PPC5-1102	ProSense advanced process controller, 1/4 DIN, 2-line alpha-numeric LCD, bar graph LCD, current, voltage, RTD, thermocouple, discrete, auxiliary analog input, current, voltage pulse, relay, retransmission output, 100-240 VAC operating voltage, Ethernet.

Accessories

The product is provided with the following accessories. Check that none of them are missing or damaged.

1



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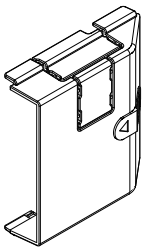

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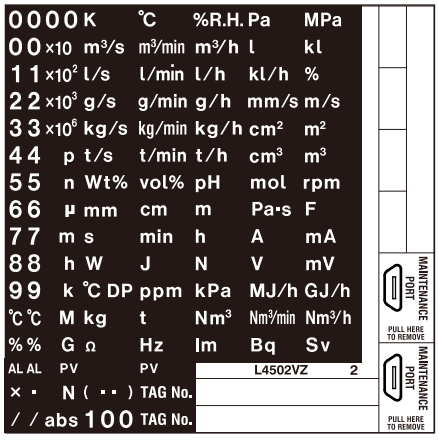

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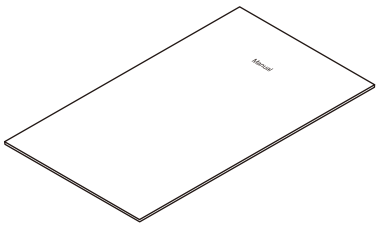


No.	Product Name	Quantity
1	Brackets	2
2	Terminal cover	1
3	Unit label	1
4	Installation Instructions and User’ s Guide	1

How to use the unit label

- Affix the unit label to the front panel. If necessary, combine with unit prefixes. Affix it so that the LCD area is not blocked.
- Maintenance port seals (two spares) are available. Use them if the seal affixed to the controller loses its adhesiveness.

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

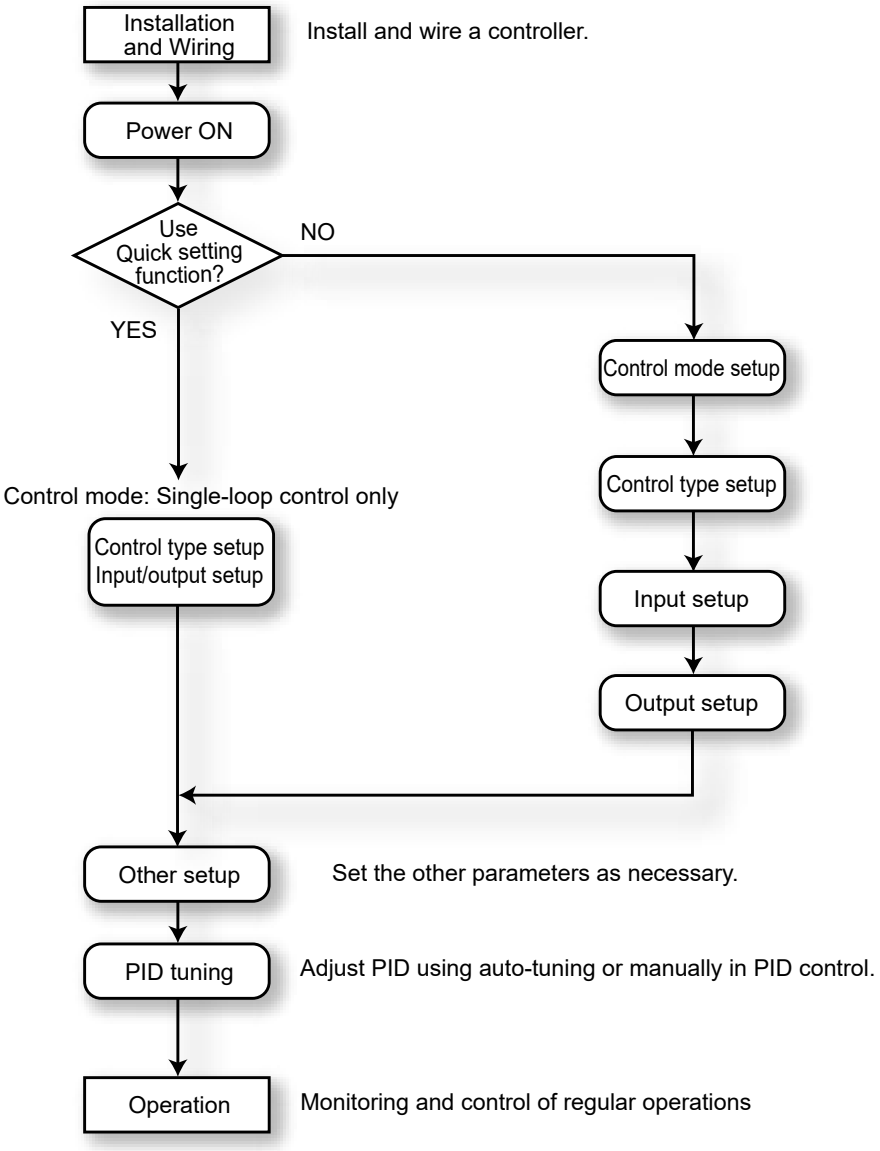
Provides the descriptions of settings.

Description

Describes restrictions etc. regarding a relevant operation.

Setup Procedure

The following flowchart shows the setup procedure for the PPC5 controller.



CHAPTER 1

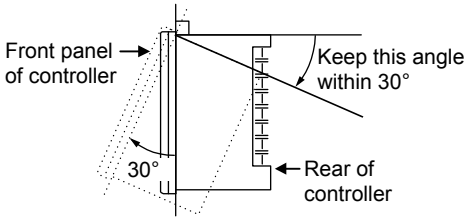
INSTALLATION AND WIRING

Contents

1.1 Installation Location

The instrument should be installed in indoor locations meeting the following conditions:

- 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.
- 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.
- Install the instrument in a location subject to little mechanical vibration.
- Mount the instrument horizontally and ensure that it is level, with no inclination to the right or left.
  The instrument can be mounted in panel faces tilted up to 30 degrees.



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.

Do not mount the instrument in the following locations:

- Outdoors
- Locations subject to direct sunlight, infrared rays, ultraviolet rays, or close to a heater

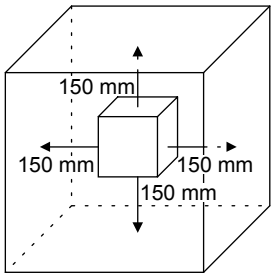
  Install the instrument in a location with stable temperatures that remain close to an average temperature of 23°C. Do not mount it in locations subject to direct sunlight or close to a heater. Doing so adversely affects the instrument and LCD.
- Locations with substantial amounts of oily fumes, steam, 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

1.2 Mounting Method

WARNING

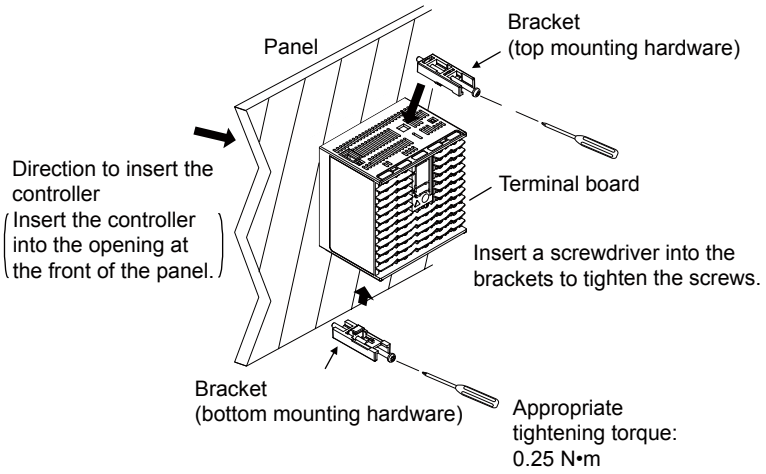
Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.

Mounting the Controller

Provide an instrumented panel steel sheet of 1 to 10 mm thickness.

After cutting 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.



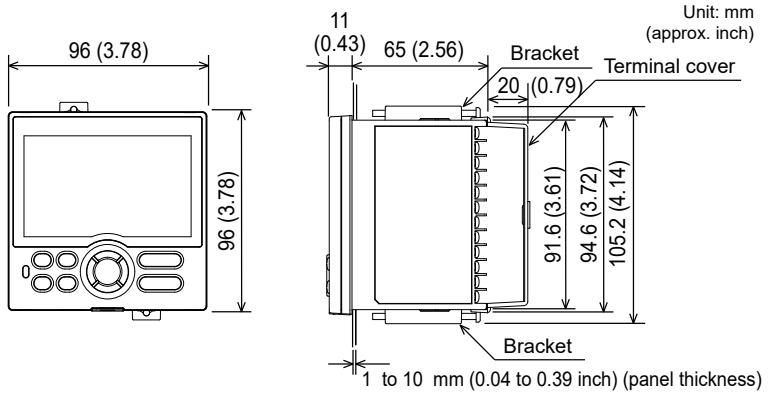
To uninstall the controller, perform the procedure in the reverse order.

CAUTION

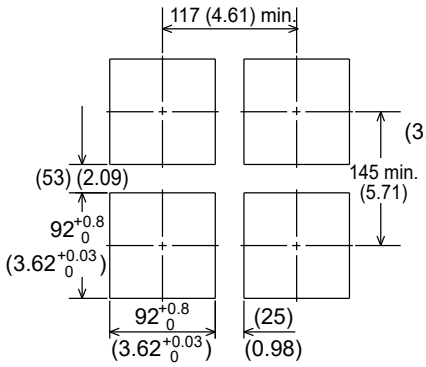
1) Tighten the screws with appropriate tightening torque within 0.25 N•m. Otherwise it may cause the case deformation or the bracket damage.
2) Make sure that foreign materials do not enter the inside of the instrument through the case's slit holes.

1.3 External Dimensions and Panel Cutout Dimensions

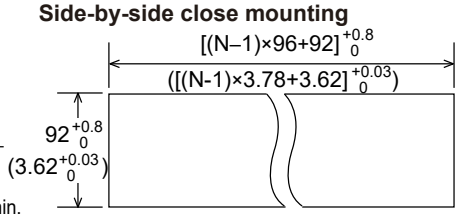
Mounting the Controller



General mounting



Side-by-side close mounting



"N" stands for the number of controllers to be installed. However, the measured value applies if N≥5. General mounting should be used when N<5.

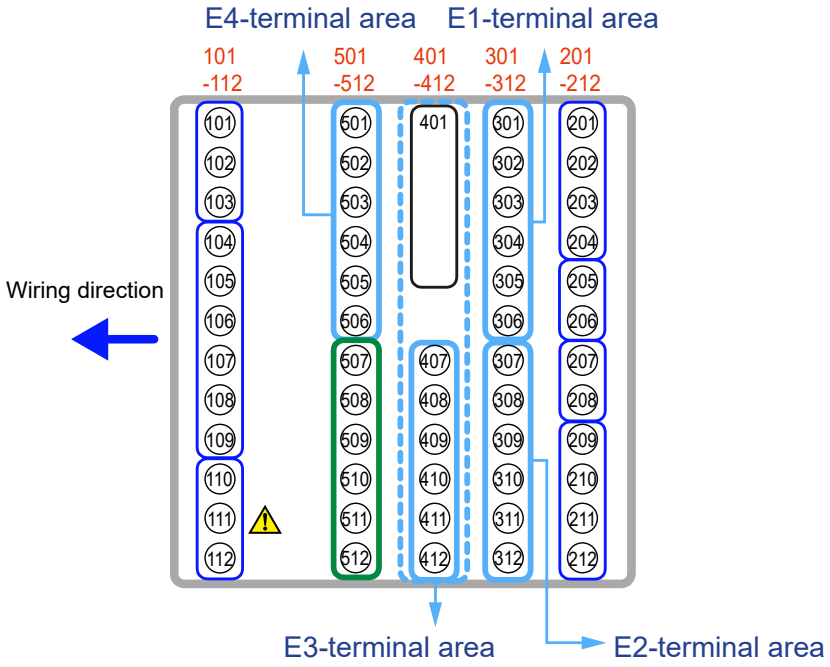
Normal tolerance:
±(value of JIS B 0401-1998 tolerance class IT18)/2

1.4 Wiring

1.4.1 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) For the wiring cable, the temperature rating is 75 °C or more.



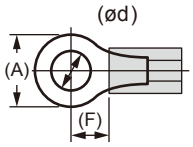
CAUTION

- When connecting two or more crimp-on terminal lugs to the single terminal block, bend the crimp-on terminal lugs so that they sit flush with the terminal before tightening the screw.
- Do not wire two or more crimp-on terminal lugs to the single **high-voltage terminal of the power supply, control relay, or alarm relays.**

CAUTION

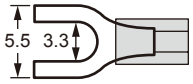
Do not use an unassigned terminal as a relay terminal.

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	Description
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 JIS C 1610 For thermocouple input (PV input), shielded compensating lead wire of cross-sectional area less than or equal to 0.75 mm2 is recommended. If the crosssectional area is wide, the reference junction compensation error may be large.
RTD	Shielded wire (three/four conductors)
Other signals (other than contact input/output)	Shielded wires
Other signals (contact input/output)	Unshielded wires
RS485 communication	Shielded wires
Ethernet communication	100 BASE-TX (CAT-5) / 10 BASE-T

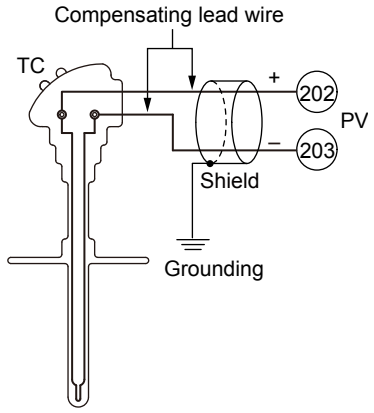
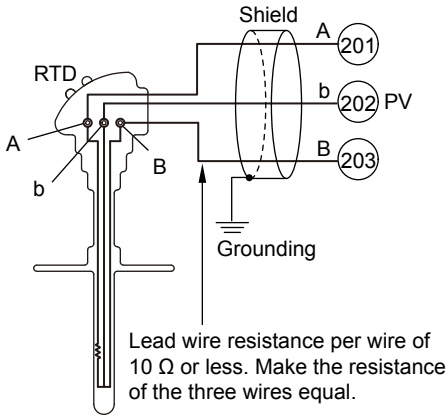
Note

Communication wires of cross-sectional area less than or equal to 0.34 mm^2 may not be secured firmly to the terminals.
Recommended length of the stripped wire: 7 mm

1.4.2 PV Input Wiring

CAUTION

1) Be careful of polarity, for voltage and milliamp input, when wiring inputs. Reversed polarity can damage the controller.
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.

<table>
<tr><th>TC Input</th><th>RTD Input (3-wire system)</th></tr>
<tr><td> 
</td><td> 
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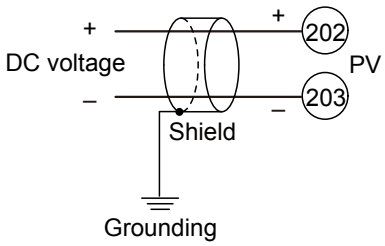
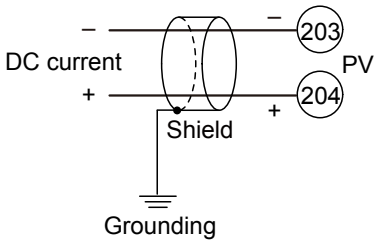
<tr><th>DC Voltage (mV, V) Input</th><th>DC Current (mA) Input</th></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

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 auxiliary analog input (E1-terminal area) is used for PV input 2.

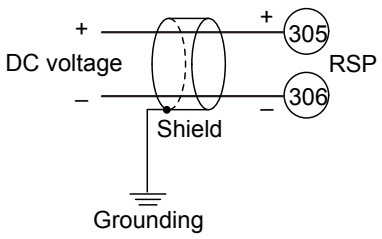
In Cascade control, PV input is used for Loop-1 PV input. Remote auxiliary analog input (E1-terminal area) is used for Loop-2 PV input.

1.4.3 Remote Auxiliary Analog Input Wiring (PPC5-110x models)

CAUTION

1) Be careful of polarity when wiring inputs. Reversed polarity can damage the controller.
2) Keep the remote auxiliary analog input signal line as far away as possible from the power supply circuit and ground circuit.
3) If there is a risk of external lightning surges, use a lightning arrester etc.

Remote auxiliary analog input (E1-terminal area)



Use

RSP Remote Auxiliary Analog Input (E1-terminal area)

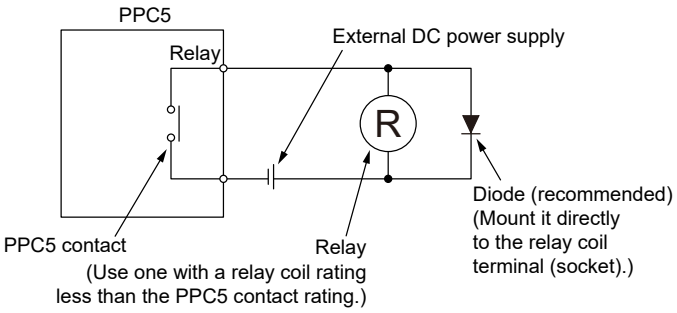
In Single-loop control, Loop control with PV-hold function, remote auxiliary analog input is used for remote input.
In Cascade primary-loop control, remote auxiliary analog input is used for output tracking input.
In Cascade secondary-loop control, remote auxiliary analog input is used for cascade input.
In Cascade control, remote auxiliary analog input is used for Loop-2 PV input.
In Loop control for backup, remote auxiliary analog input is used for output tracking input.
In Loop control with PV switching or Loop control with PV auto-selector, remote auxiliary analog input is used for PV input 2.

1.4.4 Control Output (Relay, Current and Voltage Pulse) Wiring

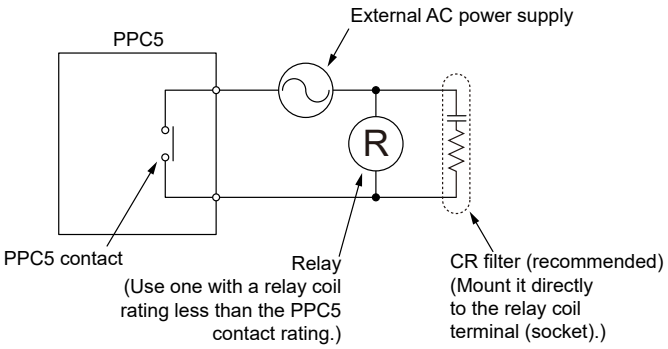
CAUTION

1) The use of inductive (L) loads such as auxiliary relays, motors and solenoid valves may cause malfunction or relay failure; it is recommended to 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) The control output should always be used with a load of 10 mA or more.
4) The insulation provided to each relay output terminal is functional insulation.
5) To prevent electric shock, do not touch any terminals while power is supplied to the controller.

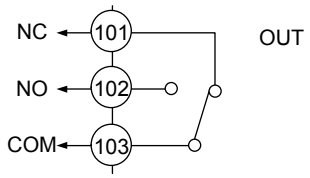
DC Relay Wiring



AC Relay Wiring



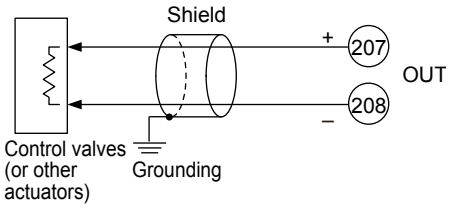
Relay Output



Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

Note: The control output should always be used with a load of 10 mA or more.

Current and Voltage Pulse Output



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

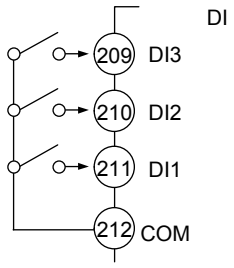
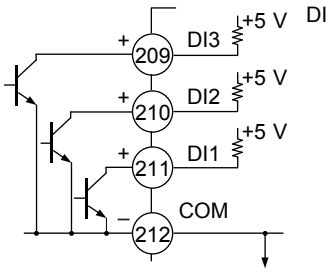
When current/voltage pulse output is not used for control output, it can be used for retransmission output or 15VDC loop power supply.
When retransmission output terminal is not used for retransmission output, it can be used for optional control output. The current output range can be changed.
For control 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).

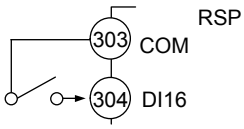
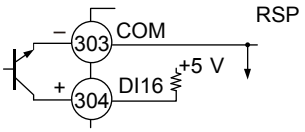
1.4.5 Contact Input Wiring

CAUTION

1) Use a dry contact (relay contact etc.) for external contacts.
2) Use a dry 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.

Contact Input

Dry contact	Transistor contact
 Contact rating: 12 V DC, 10 mA or more	 Contact rating: 12 V DC, 10 mA or more

Additional Contact Input (PPC5-110x models)	
Dry 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 setting for each control mode. No function is assigned to contact inputs other than those listed below.

Control mode	DI1	DI2	DI3	DI16 (PPC5-110x models)
Single-loop Control 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	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	Output tracking switch (tracking in ON state)
Cascade Secondary-loop 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 (OFF→ON) switch	AUTO (OFF→ON) switch	MAN (OFF→ON) switch	STOP (ON)/ RUN (OFF) switch
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	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	None

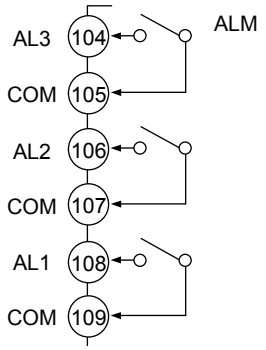
1.4.6 Alarm Contact Output Wiring

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 1 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.
5) The insulation provided to each relay output terminal is functional insulation necessary only for the correct functioning of the controller and does not protect or isolate against electrical shock.
6) To prevent electric shock, do not touch any terminals while power is supplied to the controller.

Alarm Contact Output

Relay contact



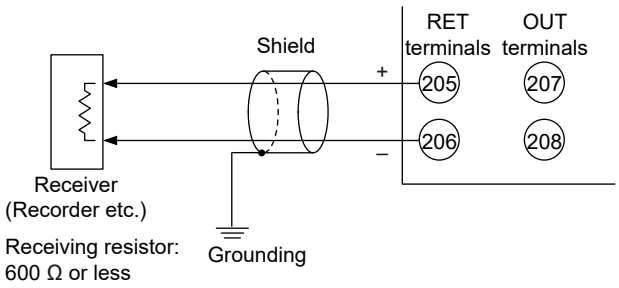
Contact rating: 240 V AC, 1 A
30 V DC, 1 A (resistance load)

Note: The alarm output should always be used with a load of 1 mA or more.

The following table shows the initial setting for each control mode.

Control mode	AL1 terminal	AL2 terminal	AL3 terminal
Single-loop Control Loop Control with PV Switching Loop Control with PV Auto-selector 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	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	FAIL
Cascade Secondary-loop Control	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	Tracking switch (to Loop-1 controller)
Cascade Control	Alarm 1 (Loop-1 PV high limit)	Alarm 2 (Loop-1 PV low limit)	Alarm 3 (Loop-1 PV high limit)

1.4.7 Retransmission Output Wiring

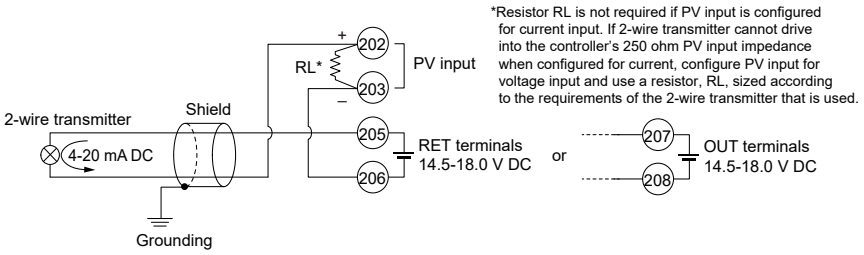


The current output range can be changed.

When retransmission output is not used for retransmission output, it can be used for 15 V DC loop power supply. Output terminals can also be used as a DC power source when not used for control.

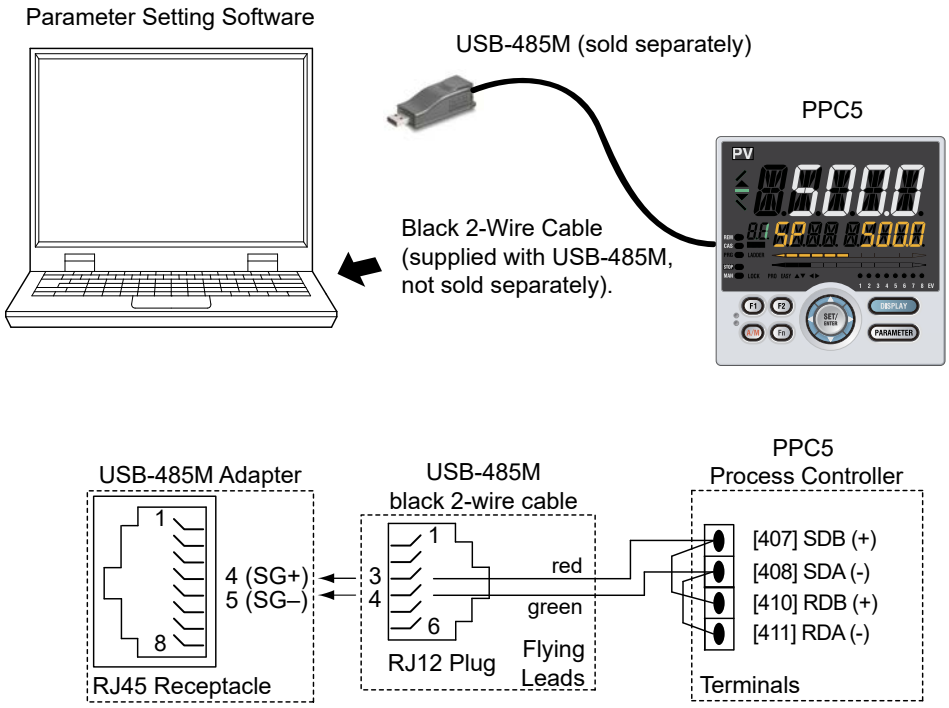
1.4.8 15 V DC Loop Power Supply Wiring

Available when RET terminals are not used for retransmission output or OUT terminals are not used for control..
The controller is equipped with a non-isolated loop power supply (14.5 to 18.0 V DC) for connecting a 2-wire transmitter.



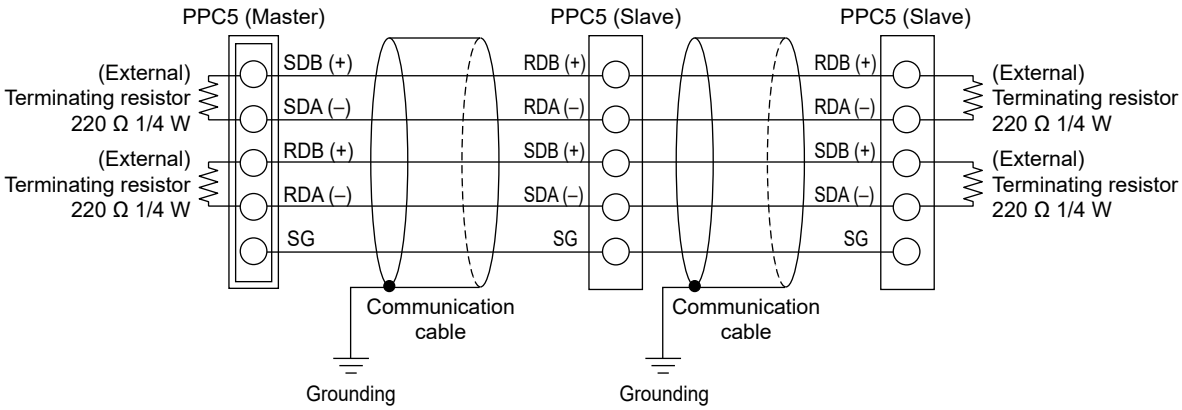
1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models)

Connection to a PC

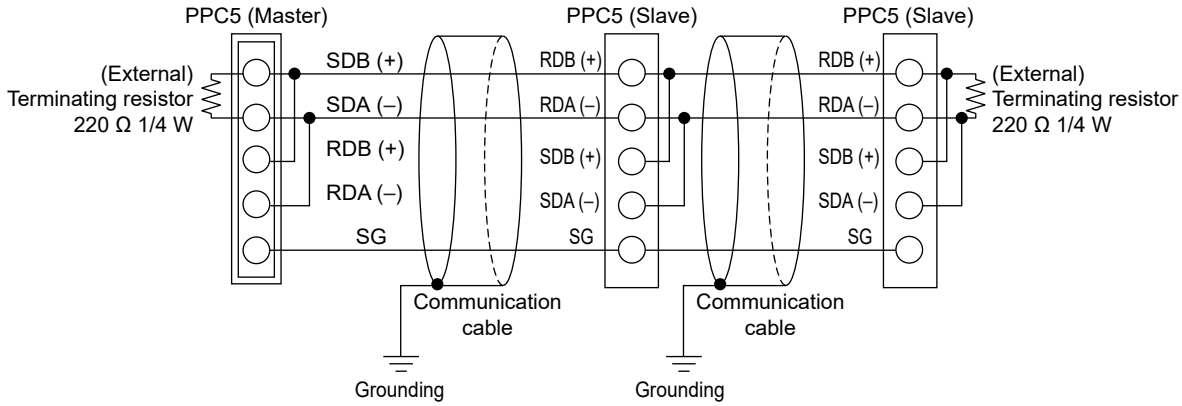


1.4.10 Coordinated Operation Wiring (PPC5-1x01 Models)

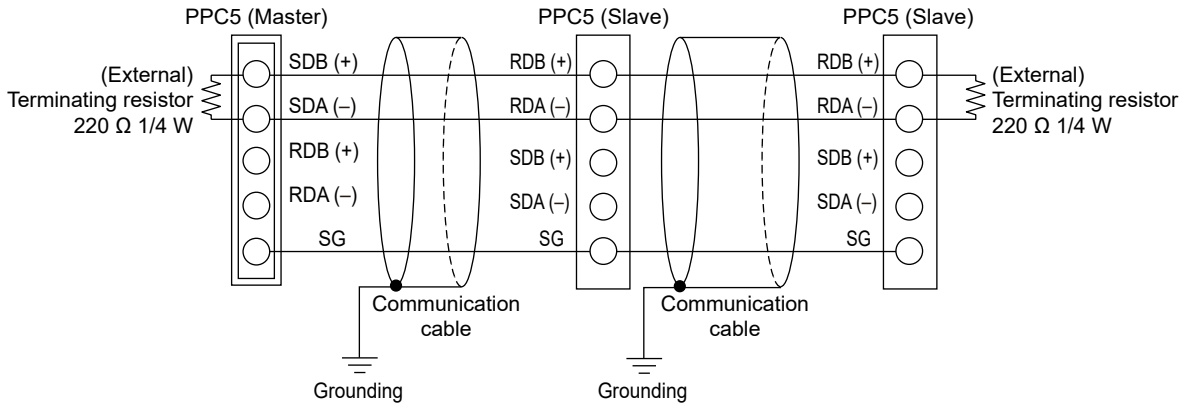
4-wire Wiring



2-wire Wiring of 4-wire Terminal (1)

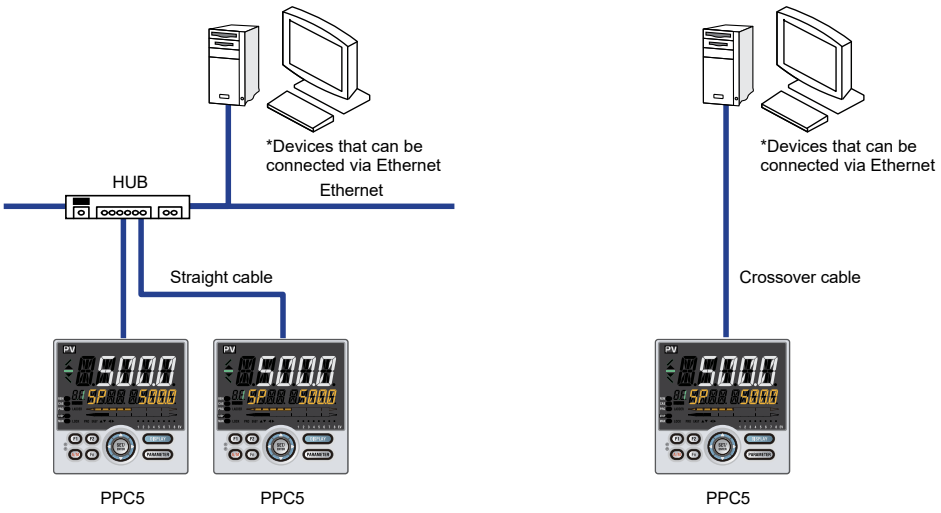


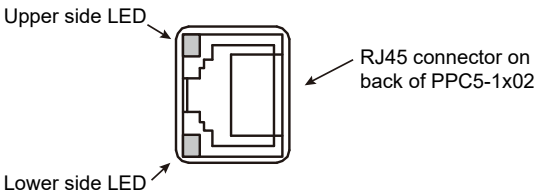
2-wire Wiring of 4-wire Terminal (2)



Terminal symbol above	
RDB (+)	410
RDA (–)	411
SDB (+)	407
SDA (–)	408
SG	409

1.4.11 Ethernet Communication Interface Wiring (PPC5-1x02 Models)





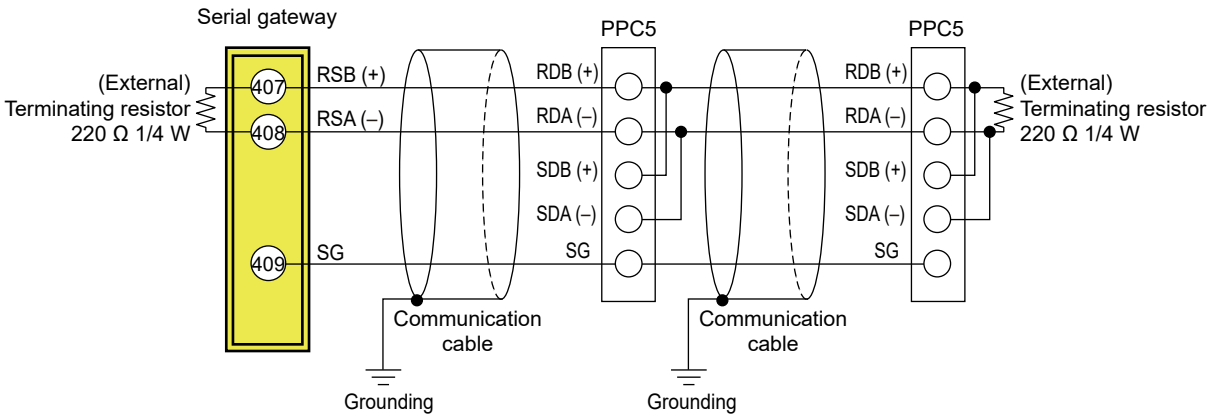
Upper side LED (baud rate)		Lower side LED (link activity)	
Color	Amber	Color	Green
Lit	100M bps	Lit	Linked
Unlit	10M bps	Blink	Active
		Unlit	Link failure

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



Terminal symbol above	Slave terminals
RDB (+)	410
RDA (–)	411
SDB (+)	407
SDA (–)	408
SG	409

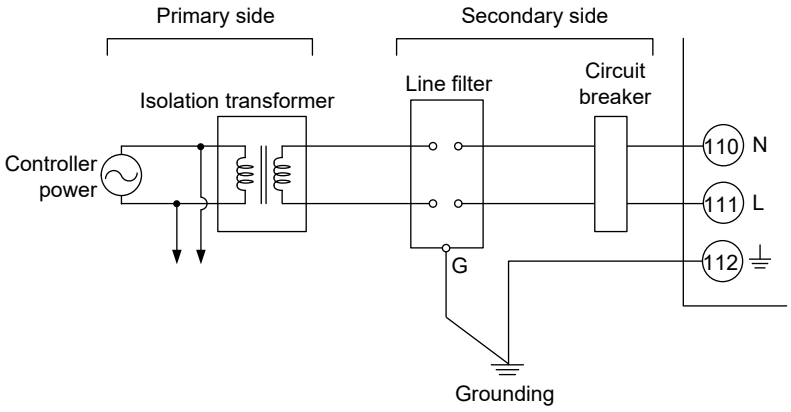
1.4.12 Power Supply Wiring

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.

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.



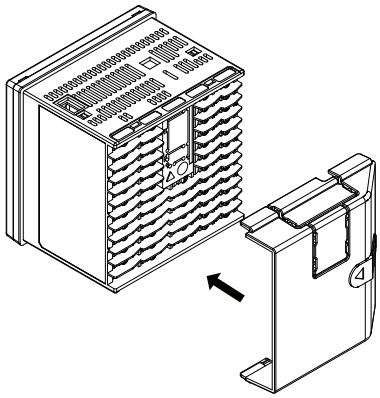
1.5 Attaching and Detaching Terminal Cover

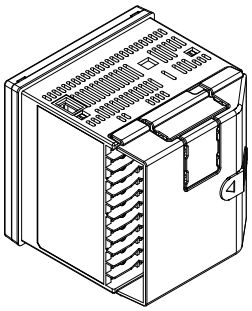
After completing the wiring, the terminal cover is recommended to use for the instrument.

Attaching Method

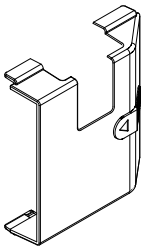
(1) Attach the terminal cover to the rear panel of the controller unit horizontally.

(2) The following figure is a mounting image.



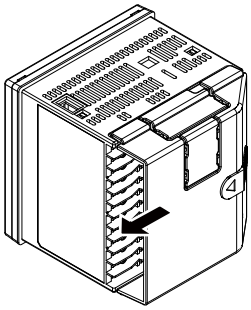


When Ethernet is specified, cut and use a terminal cover as follows.
Cut the cover carefully using nippers etc. so that sharp edge does not remain.



Detaching Method

(1) Slide the terminal cover to the direction of the printed arrow.



CHAPTER 2

INTRODUCTION TO UNIT, KEY, AND DISPLAY FUNCTIONS

Contents

2.1 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

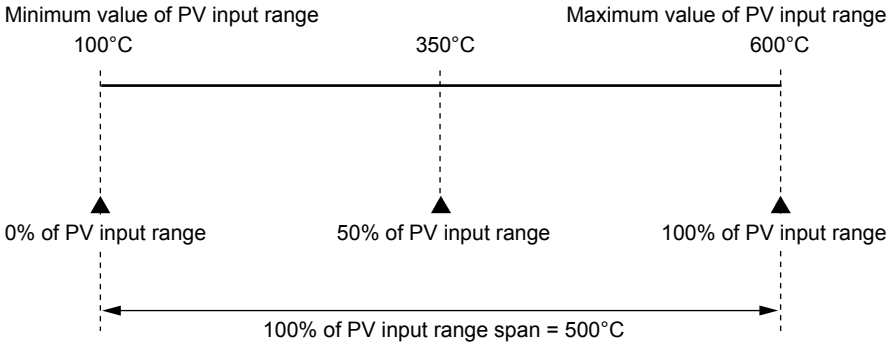
E1, E2, E3, and E4: Terminal areas

Engineering Units (EU)

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.

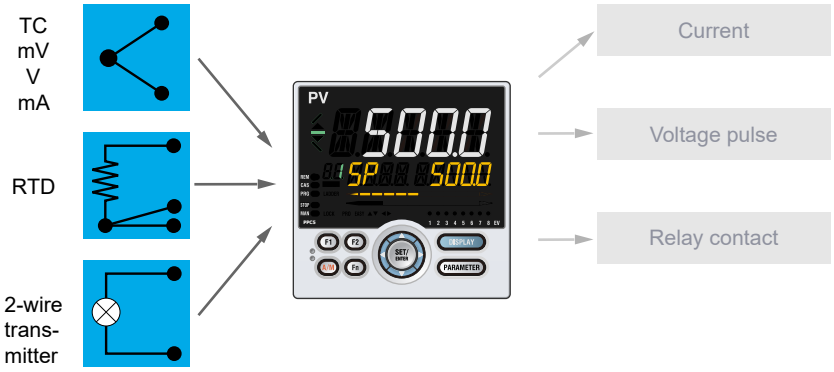


The above applies to the scale for voltage and current input.

2.2 Input/Output Function

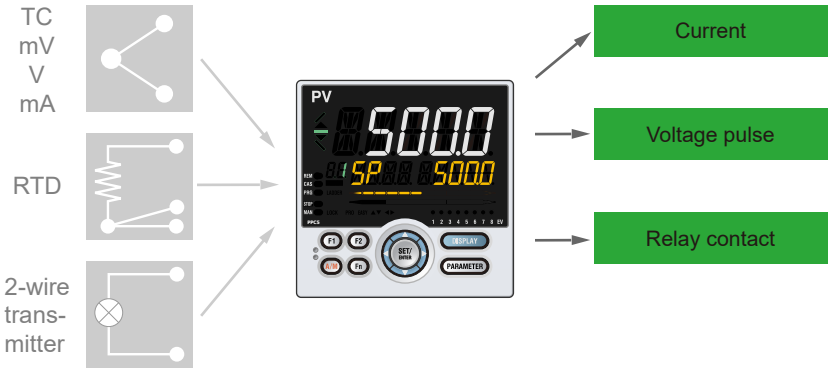
PV Input

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.



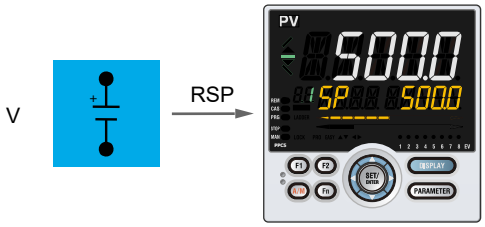
Control Output

Control output (OUT) is a universal output to arbitrarily set the type for the current, voltage pulse, and relay.



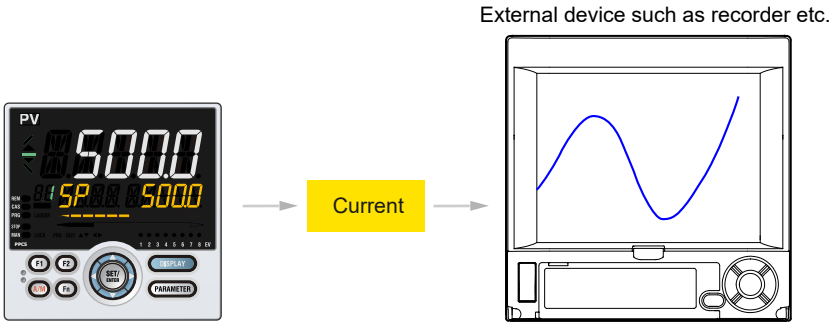
Remote Auxiliary Analog Input

Remote auxiliary analog input (RSP) is external analog signal used for remote setpoint. Available on PPC5-11xx models.



Retransmission Output

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, a recorder.



Contact Input

3 (PPC5-10xx) or 4 (PPC5-11xx) contact inputs are available. The operation modes can be switched.

Contact Output

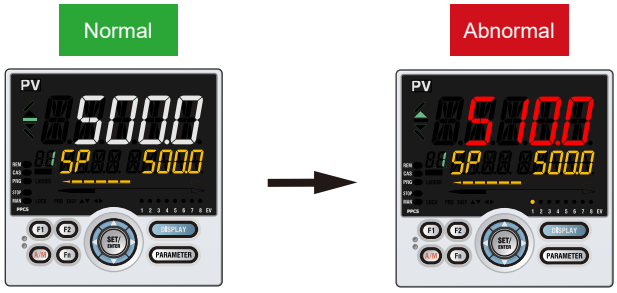
3 contact outputs are available. Contact output can output events such as alarms. The Control Output relay can also be used when not used for control.

2.3 Display and Key Functions

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

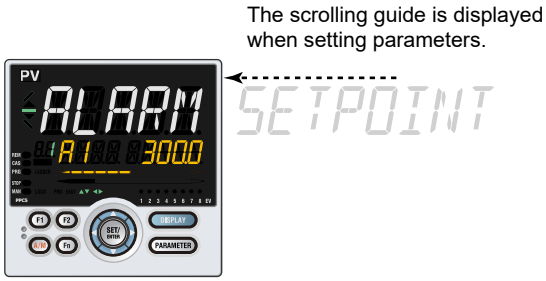
Active Color PV Display (display color change)

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



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.

Parameter Display Level

There are three parameter display levels that can be selected. Easy, Standard, and Professional.

User Function Keys

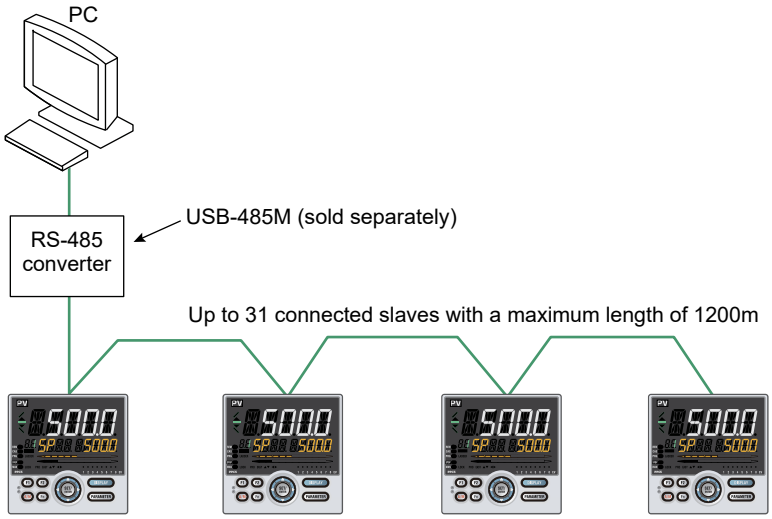
User function keys (F1, F2, and Fn).
Assign a function to a user function key to use it as an exclusive key.

2.4 Communication Functions

The PPC5 series is available without communication or with RS-485 communication or Ethernet communication depending on the model.

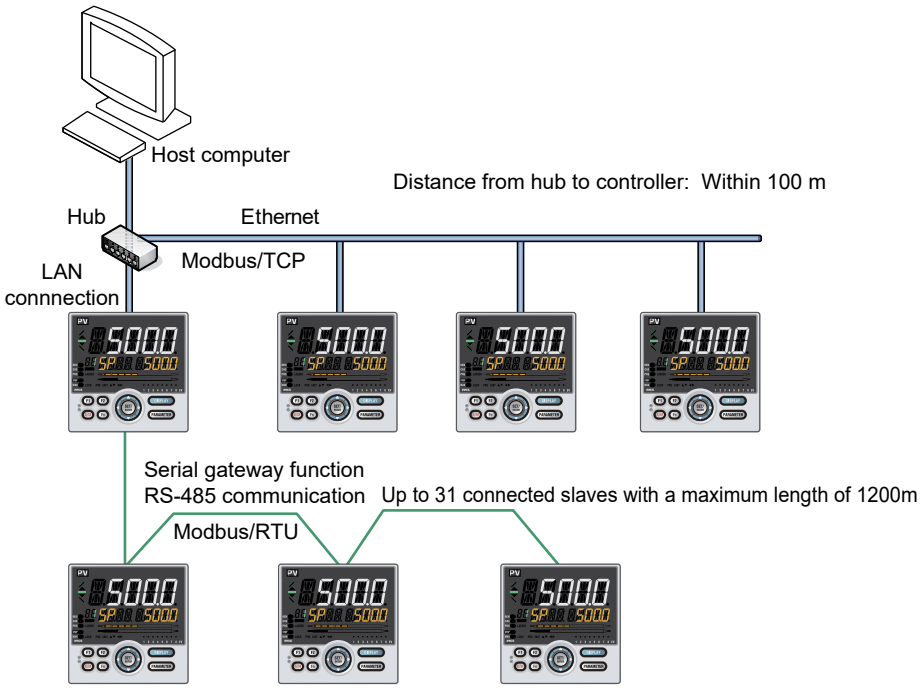
RS-485 Communication Modbus (PPC5-1x01 models)

The PPC5 can communicate with PCs, PLCs, touch panels, and other devices.
Reference Section 1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models)



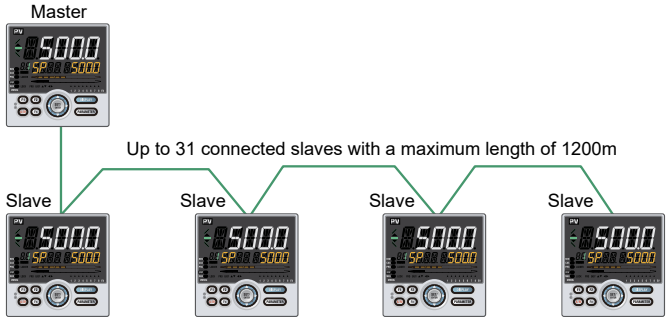
Ethernet Communication Modbus/TCP (PPC5-1x02 models)

The PPC5 can be connected to IEEE802.3-compliant network (10BASE-T/100BASE-TX - Auto negotiated). A serial gateway function can increase the number of connected controllers.



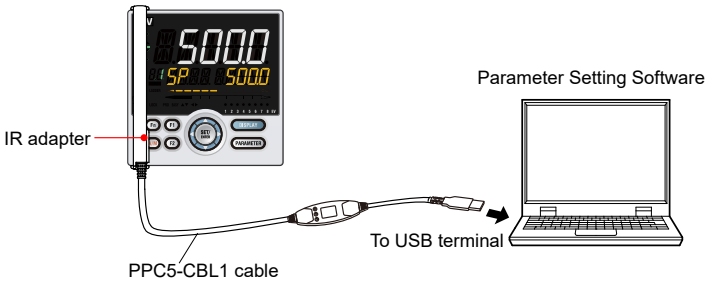
Coordinated Operation

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.



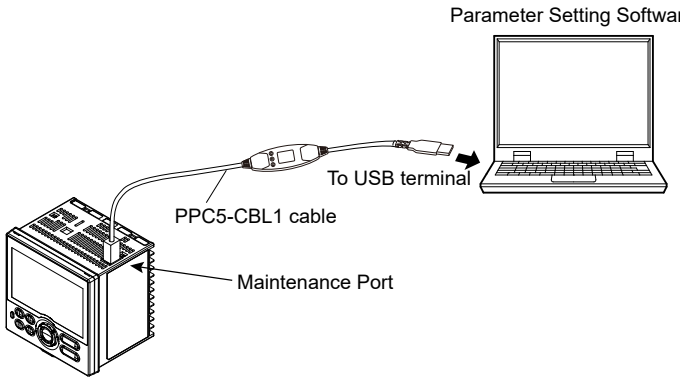
IR Adapter Communication

Use the IR adapter provided with the PPC5-CBL1 configuration cable to set parameters. Attach the adapter to the front of the controller to communicate.



Maintenance Port Communication (Power supply is not required for the PPC5)

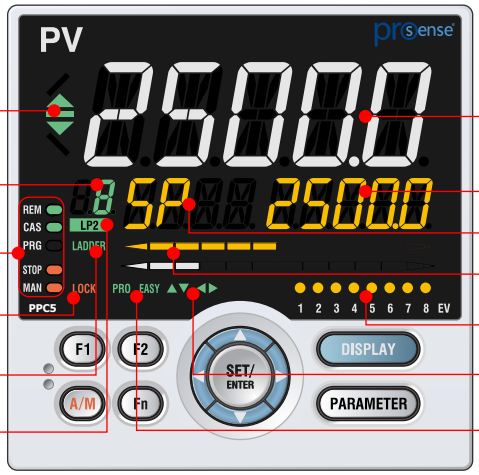
Maintenance port is used to connect with the dedicated cable when using Parameter Setting Software. The parameters can be set without supplying power to the PPC5.



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.

2.5 Names and Functions of Display Parts



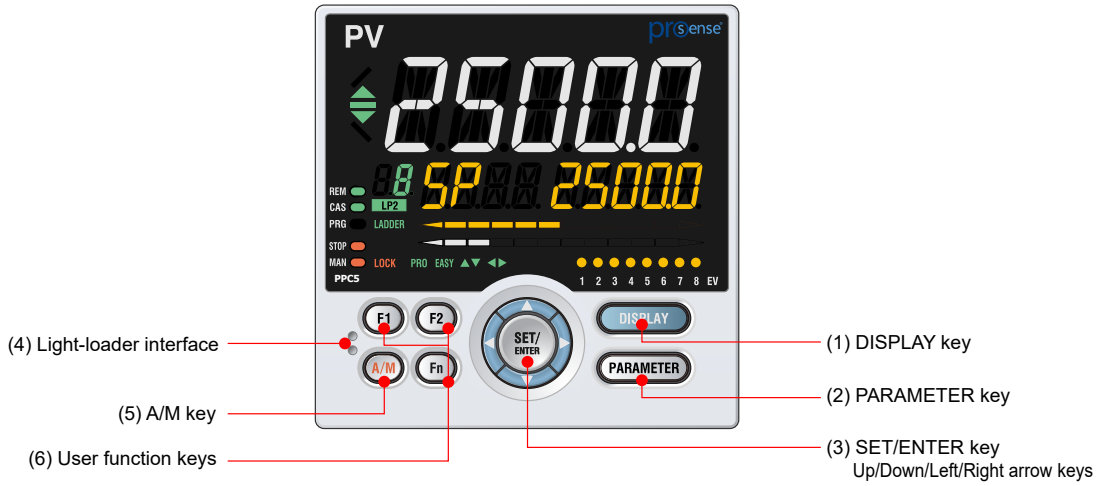
(9) Deviation indicator
(2) Group display
(10) Status indicator
(11) Security indicator
(12) Ladder - Not used in PPC5 Controller
(13) Loop 2 indicator

(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

<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 or E3).
1 to 8 represent SP numbers in the Operation Display.
R and E1 or E3 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).</td></tr>
<tr><td>(6)</td><td>Event indicator
(orange)</td><td>Lit when the alarms 1 to 8 occur. (Initial value: 1 to 4)
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
(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</td><td>Not used in PPC5 Controller.</td></tr>
<tr><td>(13)</td><td>Loop 2 indicator
(LP2 lamp)
(green)</td><td>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>

2.6 Names and Functions of Keys



No. in figure	Name	Description
(1)	**DISPLAY 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)	**PARAMETER 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)	**IR interface**	Communication interface to the IR adapter and configuration cable (PPC5-CBL1) when setting and storing parameters via PC.
(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**	F1, F2, and Fn keys. The user can assign a function to each key through parameters using the keypad or configuration software.

2.7 List of Display Symbols

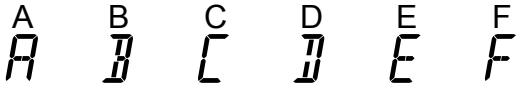
The following shows the parameter symbols, menu symbols, alphanumeric of guide, and symbols which are displayed on the PPC5 controller.

Figure (common to all display area)

0 1 2 3 4 5 6 7 8 9

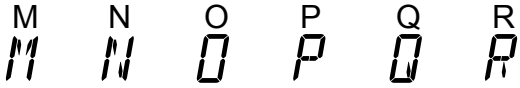
PV display (14 segments): Alphabet

A B C D E F



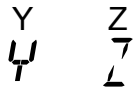
G H I J K L

M N O P Q R



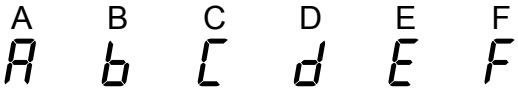
S T U V W X

Y Z



Symbol display and Data display (11 segments): Alphabet

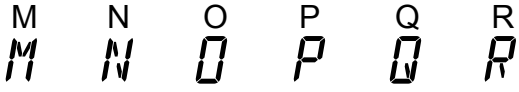
A B C D E F



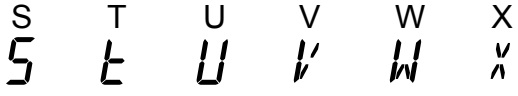
c (lower-case)

G H I J K L

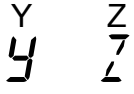
M N O P Q R



S T U V W X



Y Z



Group display (7 segments): Alphabet

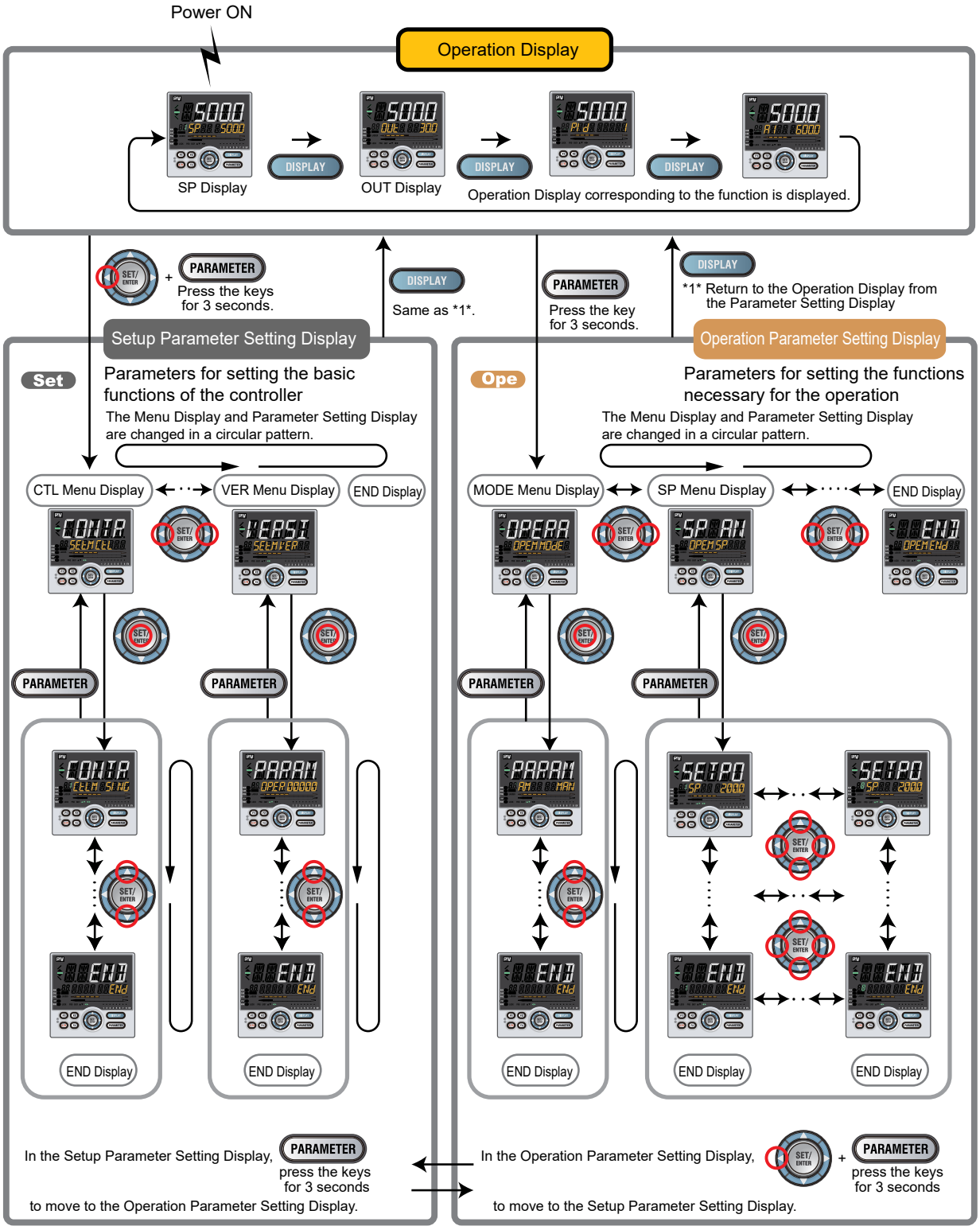
A	B	C	D	E	F
					
G	H	I	J	K	L
					
M	N	O	P	Q	R
					
S	T	U	V	W	X
					None
Y	Z				
					

PV display (14 segments): Symbol

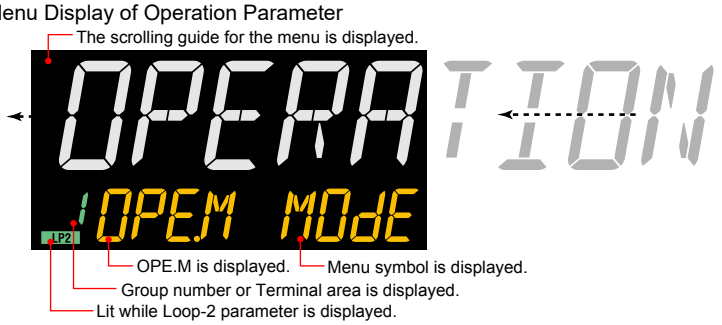
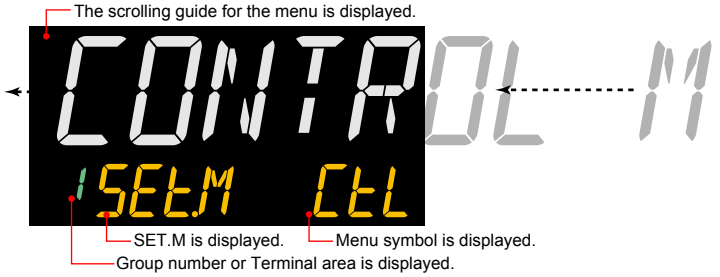
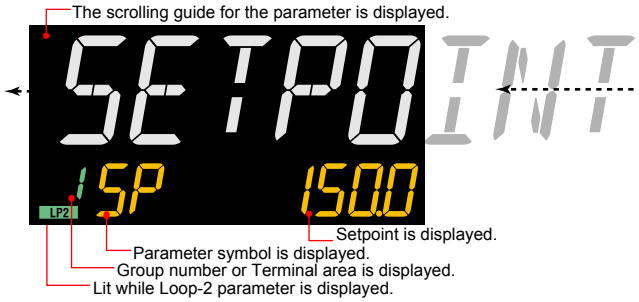
Space	-	/	‘	,
				

2.8 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.

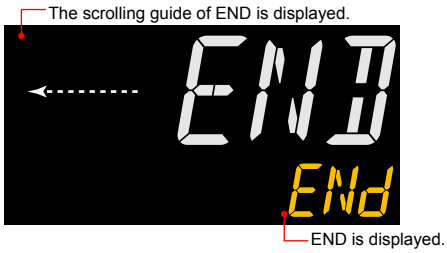


The display pattern of the PPC5 series is as follows; the Menu Display and Parameter Setting Display.

Display	Description
Menu Display	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 
Parameter Setting Display	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) 

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

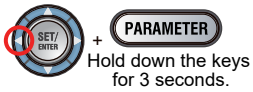
As shown in the figure below, the END Display is shown to indicate the end of the Menu Display and Parameter Setting Display. There are no setting items.



Basic Key Operation Sequence

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

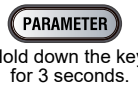
Hold down the PARAMETER key and the Left arrow key simultaneously for 3 seconds.



Set Icon for "Setup Parameter Setting Display"

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

Hold down the PARAMETER key for 3 seconds.



Ope Icon for "Operation Parameter Setting Display"

- **To move to the Operation Display**

Press the DISPLAY key once.

Parameter Setting Display Example

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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	CTL Set

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

Menu Symbol

Parameter Setting Display Icon

2.9 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.
(Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.)

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.

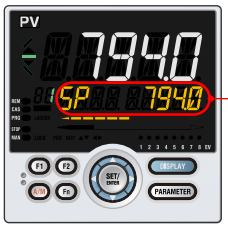
This completes the setting procedure.

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

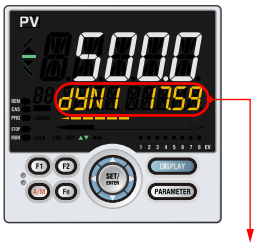
1. Display the Parameter Setting Display.

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.

CHAPTER 3

QUICK SETTING FUNCTION

Contents

3.1 Setting Using Quick Setting Function

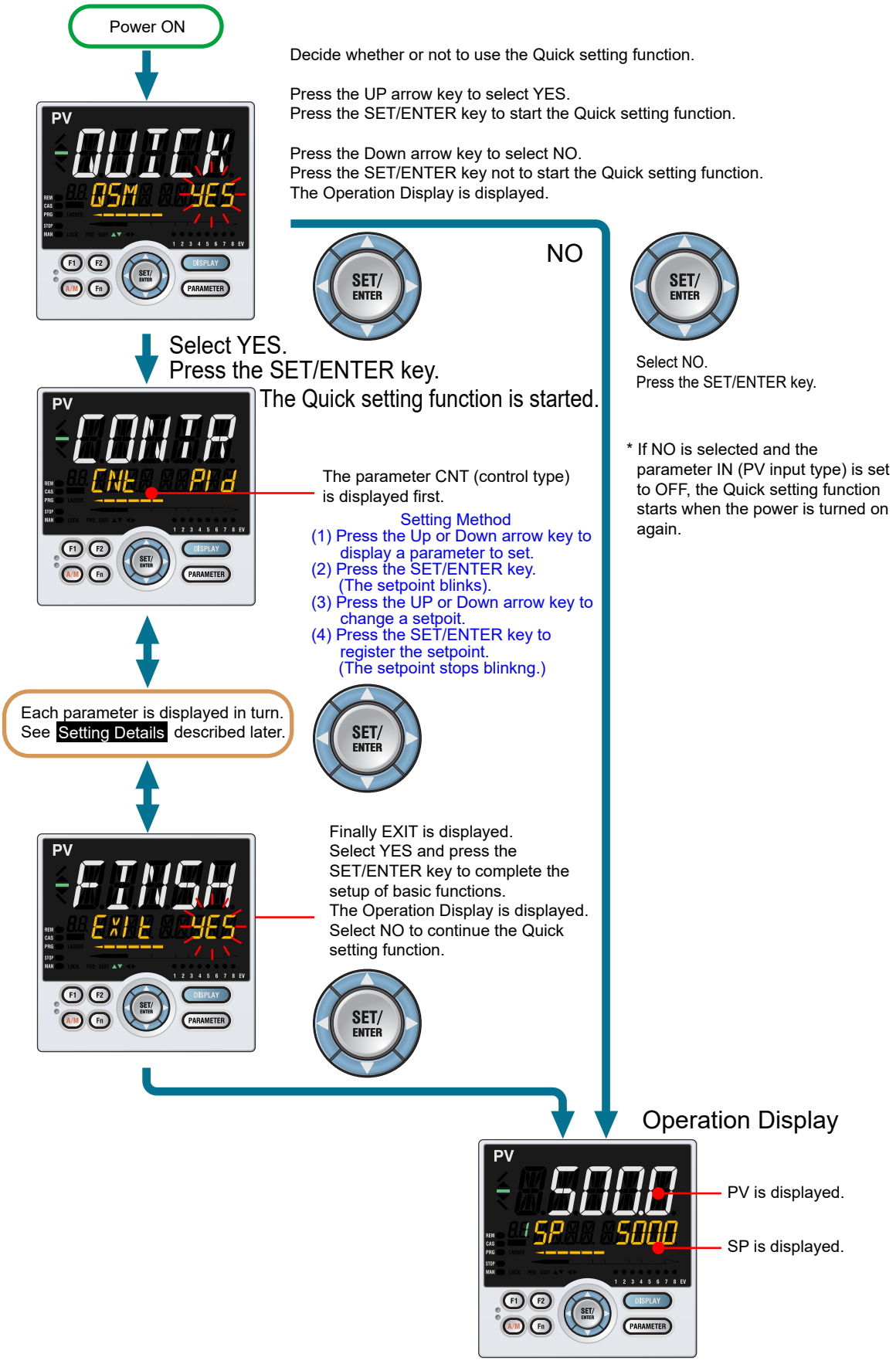
Description

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, On/Off, 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 500.0ºC), 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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	CTL Set

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

Input Function

Parameter symbol	Name	Display level	Setting range	Menu symbol
IN	PV input type	EASY	OFF: Disable K1: -270.0 to 1370.0 ºC / -450.0 to 2500.0 ºF K2: -270.0 to 1000.0 ºC / -450.0 to 2300.0 ºF K3: -200.0 to 500.0 ºC / -200.0 to 1000.0 ºF J: -200.0 to 1200.0 ºC / -300.0 to 2300.0 ºF T1: -270.0 to 400.0 ºC / -450.0 to 750.0 ºF T2: 0.0 to 400.0 ºC / -200.0 to 750.0 ºF B: 0.0 to 1800.0 ºC / 32 to 3300 ºF S: 0.0 to 1700.0 ºC / 32 to 3100 ºF R: 0.0 to 1700.0 ºC / 32 to 3100 ºF N: -200.0 to 1300.0 ºC / -300.0 to 2400.0 ºF E: -270.0 to 1000.0 ºC / -450.0 to 1800.0 ºF L: -200.0 to 900.0 ºC / -300.0 to 1600.0 ºF U1: -200.0 to 400.0 ºC / -300.0 to 750.0 ºF U2: 0.0 to 400.0 ºC / -200.0 to 1000.0 ºF W: 0.0 to 2300.0 ºC / 32 to 4200 ºF PL2: 0.0 to 1390.0 ºC / 32.0 to 2500.0 ºF P2040: 0.0 to 1900.0 ºC / 32 to 3400 ºF WRE: 0.0 to 2000.0 ºC / 32 to 3600 ºF JPT1: -200.0 to 500.0 ºC / -300.0 to 1000.0 ºF JPT2: -150.0 to 150.0 ºC / -200.0 to 300.0 ºF PT1: -200.0 to 850.0 ºC / -300.0 to 1560.0 ºF PT2: -200.0 to 500.0 ºC / -300.0 to 1000.0 ºF PT3: -150.00 to 150.00 ºC / -200.0 to 300.0 ºF 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
UNIT	PV input unit	EASY	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	
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.)	
RL	Minimum value of PV input range	EASY		

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	Minimum value of PV input scale	EASY		

SDP, SH, and SL are displayed only for voltage/current input.

Output Function

Parameter symbol	Name	Display level	Setting range	Menu symbol
OT	Output type selection	EASY	Control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay)	OUT Set
CT	Control output cycle time	EASY	0.5 to 1000.0 s	

3.2 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 are initialized if the PV input 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

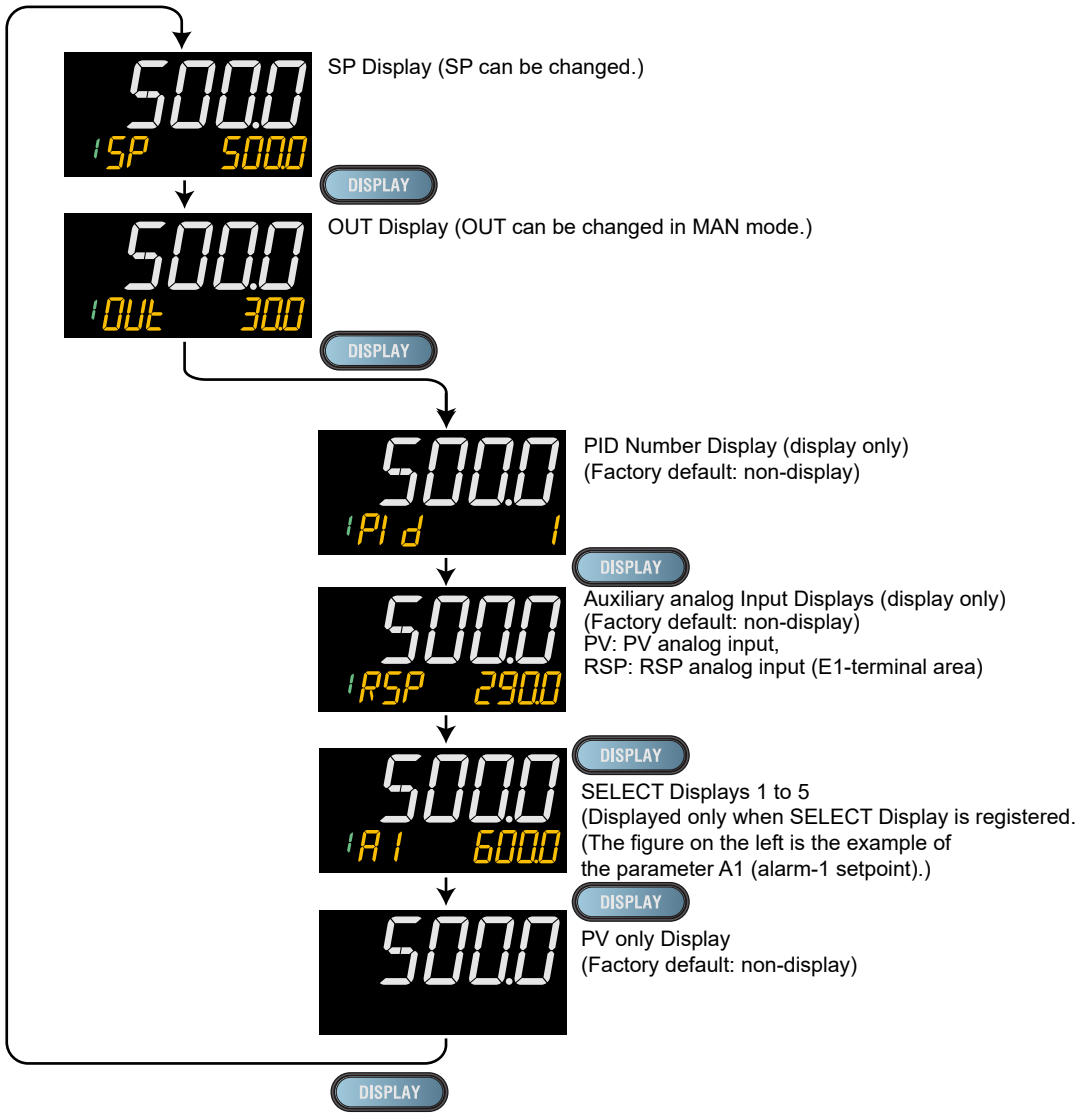
Parameter symbol	Name	Display level	Setting range	Menu symbol
IN	PV input type	EASY	OFF: Disable	PV Set
QSM	Quick setting mode	EASY	OFF: Disable ON: Enable	SYS Set

CHAPTER 4
OPERATION MONITORING AND CONTROL

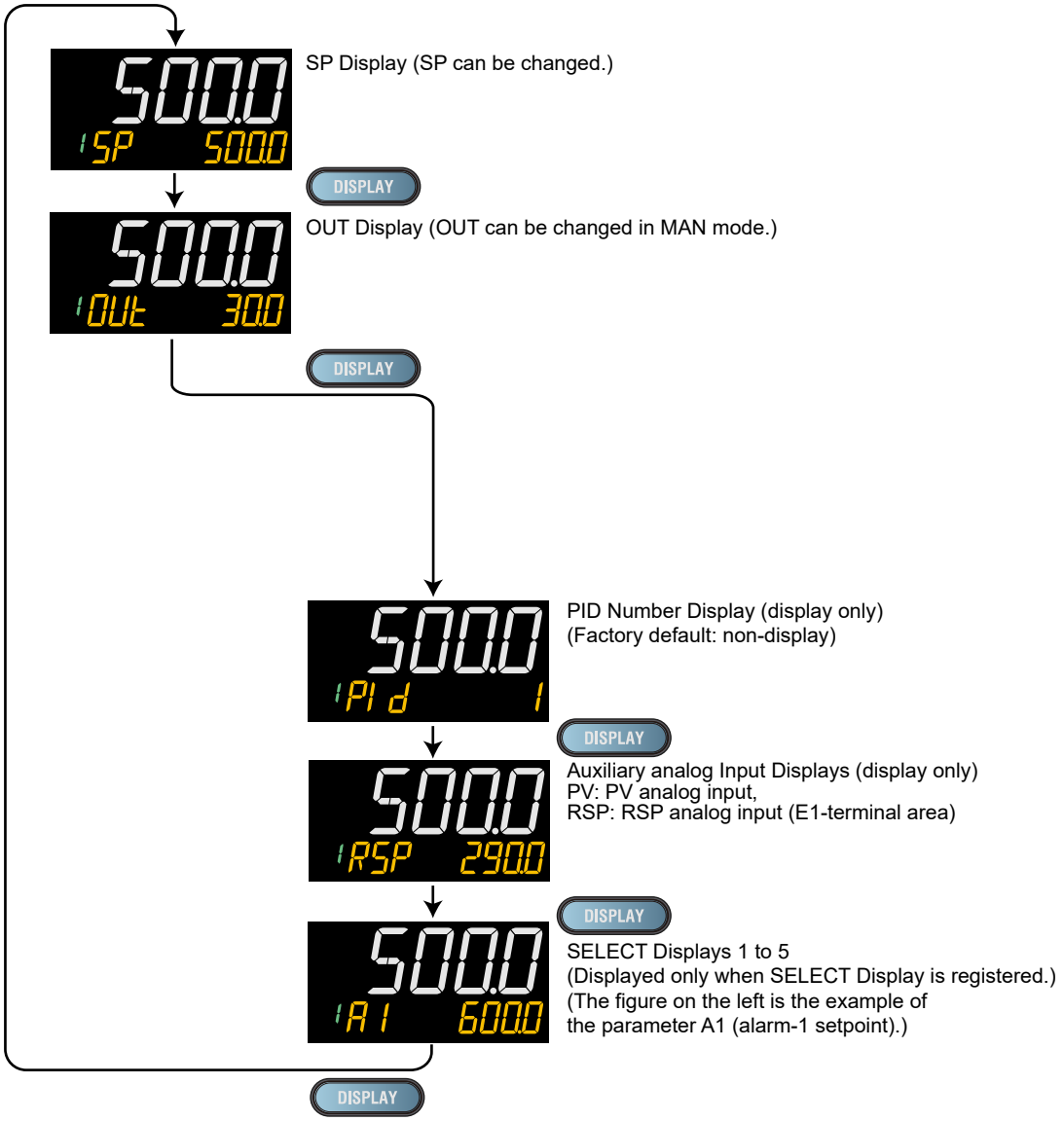
Contents

4.1 Monitoring and Control of Operation Displays

4.1.1 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.

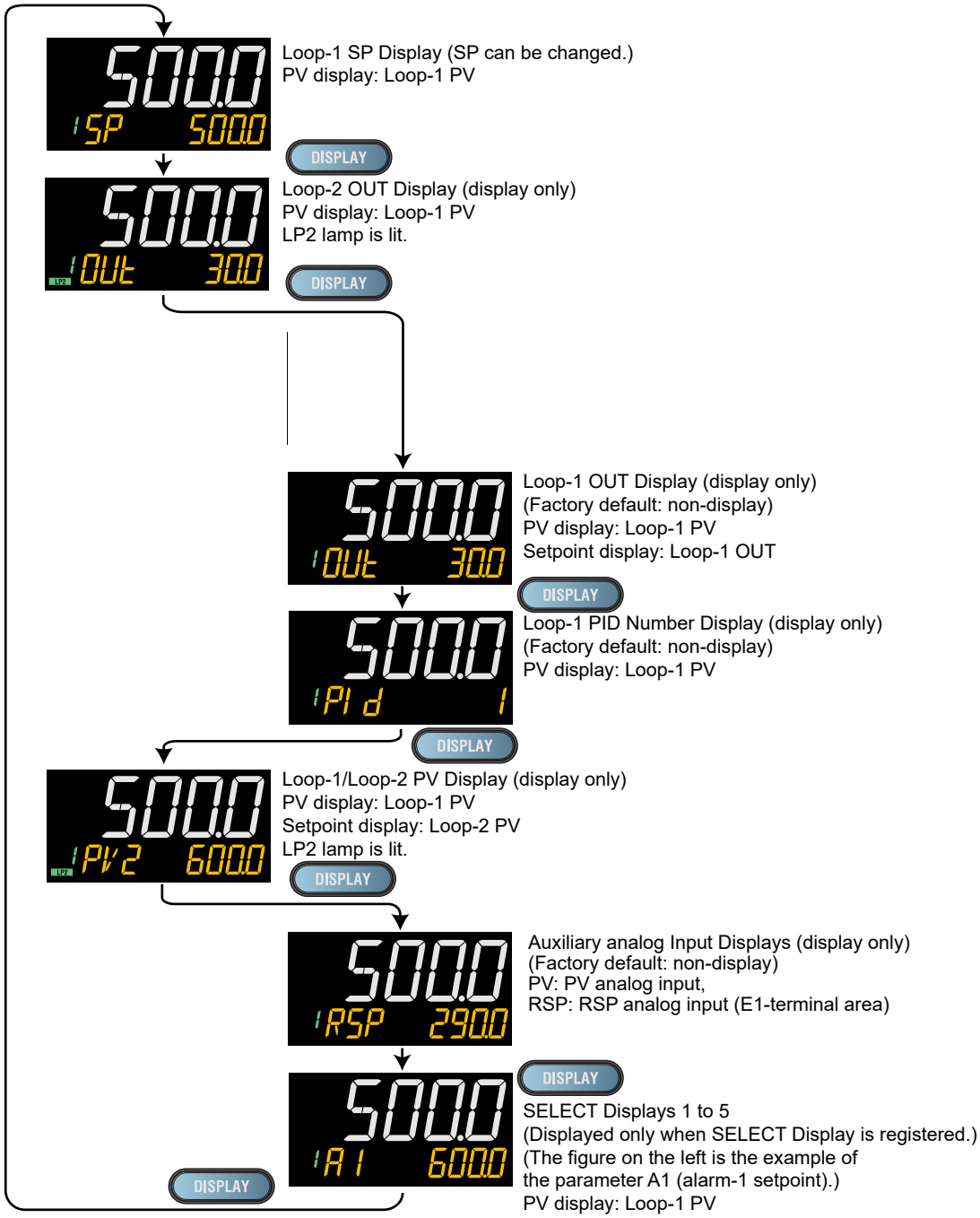


4.1.2 Operation Display Transitions in Loop Control with PV Switching and Loop Control with PV Auto-selector

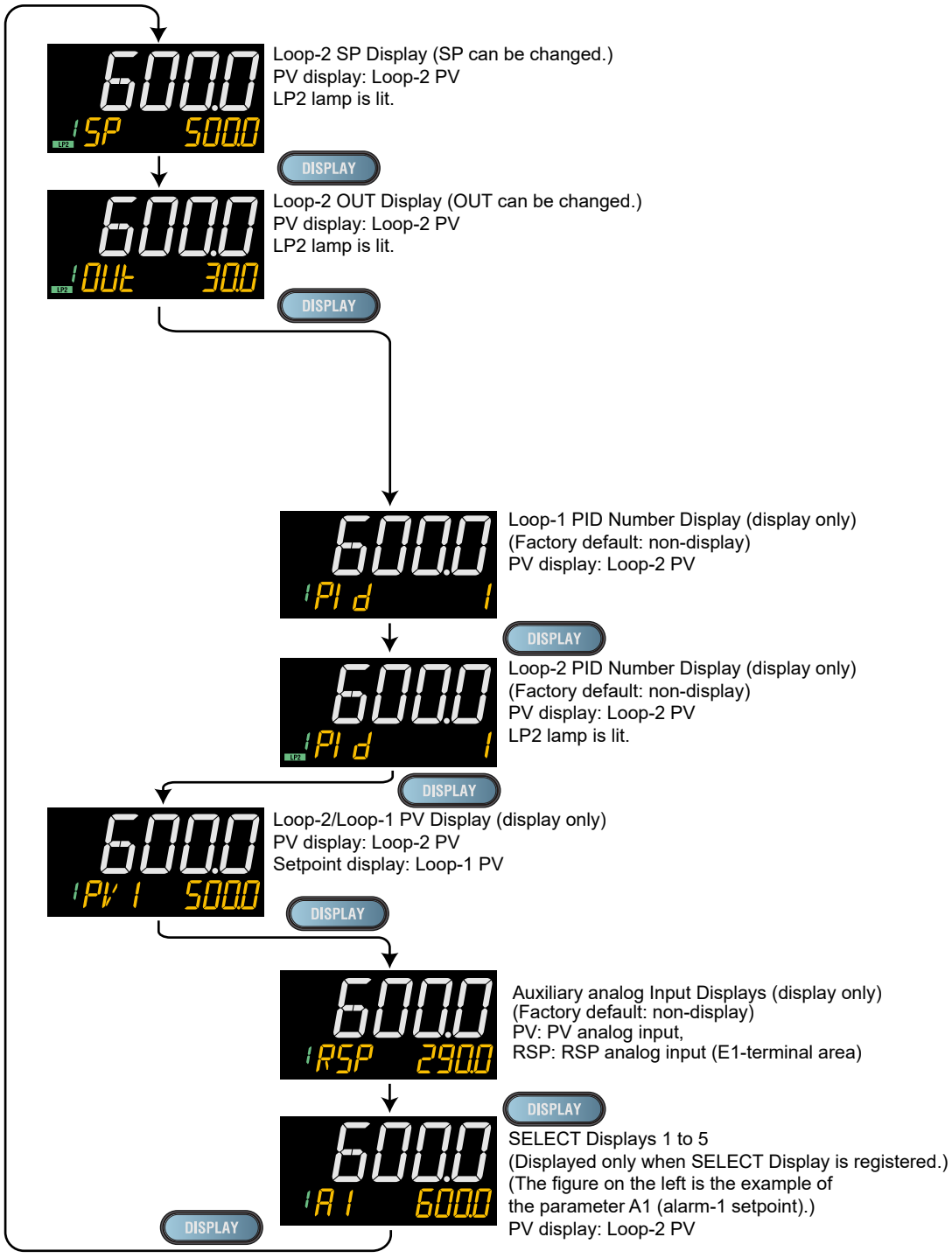


4.1.3 Operation Display Transitions in Cascade Control

When the operation mode is Cascade:

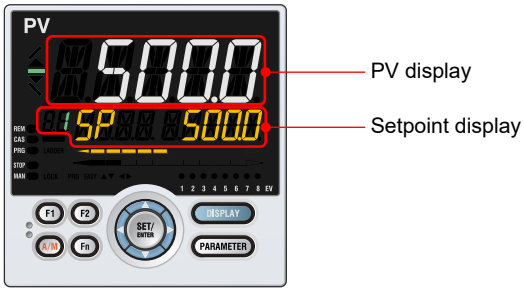


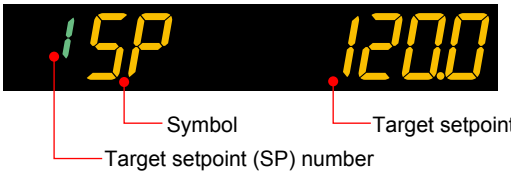
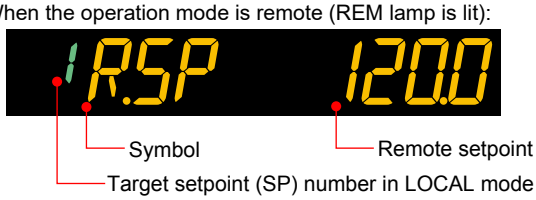
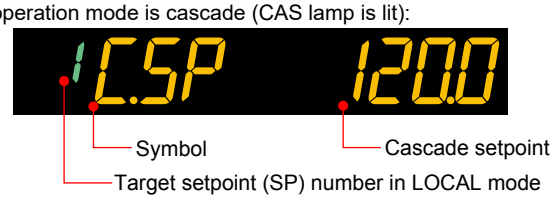
When the operation mode is AUTO or MAN:



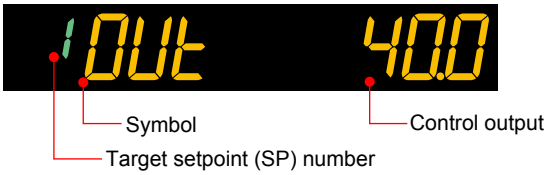
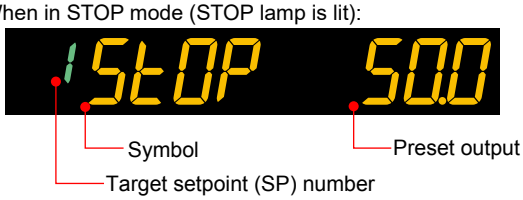
Details of the Operation Display

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

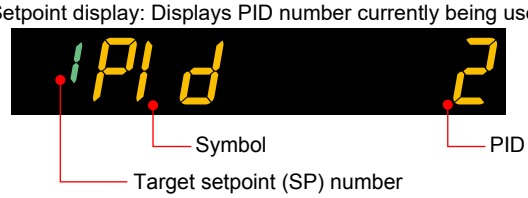
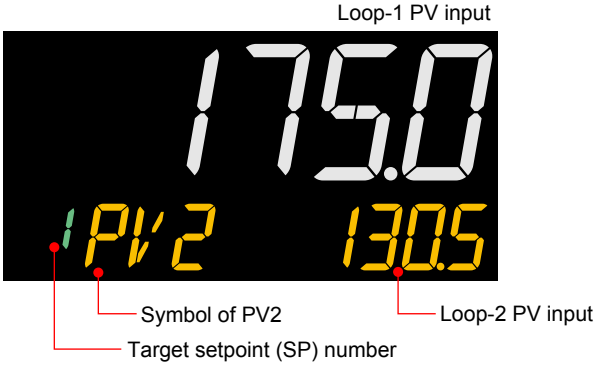
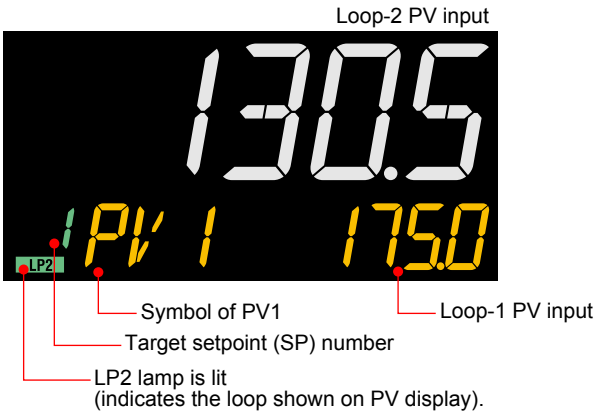


Operation Display	Display and operation description
SP Display	PV display: Displays measured input value (PV). Setpoint display: Displays and changes target setpoint (SP).  The Display is switched to the SP Display if the operation mode is switched to AUTO, CAS, LCL, or REM when other Operation Display 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.

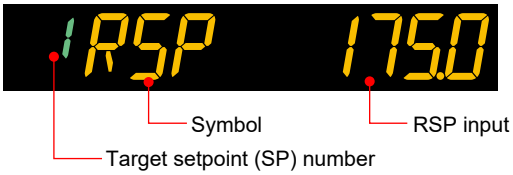
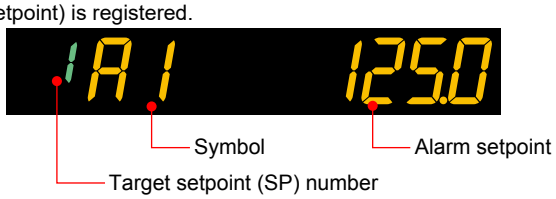
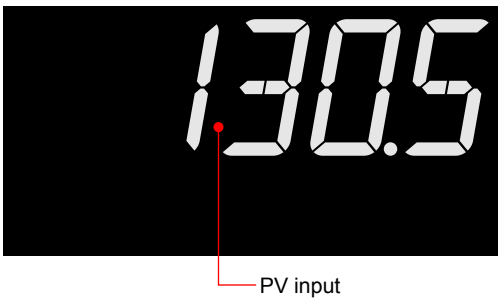
(Continued)

Operation Display	Display and operation description
OUT Display	PV display: Displays measured input value (PV). Setpoint display: Displays control output value and changes control output value in MAN mode.  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. **[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. When in STOP mode (STOP lamp is lit): 

(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: 

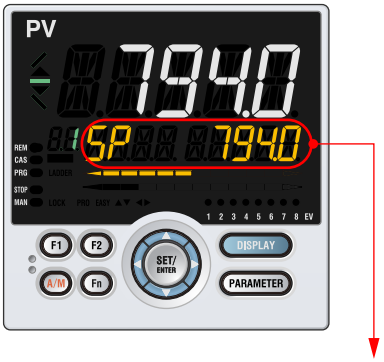
(Continued)

Operation Display	Display and operation description
Analog Input Display	PV display: Displays measured input value (PV). Setpoint display: Displays PV or RSP auxiliary analog input value. RSP auxiliary analog input value 
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. 
PV only Display	PV display: Displays measured input value (PV). 

4.2 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 rig

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** 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.

4.3 Performing and Canceling Auto-tuning

Setting Display

Operation Mode Setting Display

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

The parameter AT is displayed when the operation mode is AUTO.

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
AT.BS	SP bias in auto-tuning	PRO	-100.0 to 100.0% of PV input range span (EU)	TUNE 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

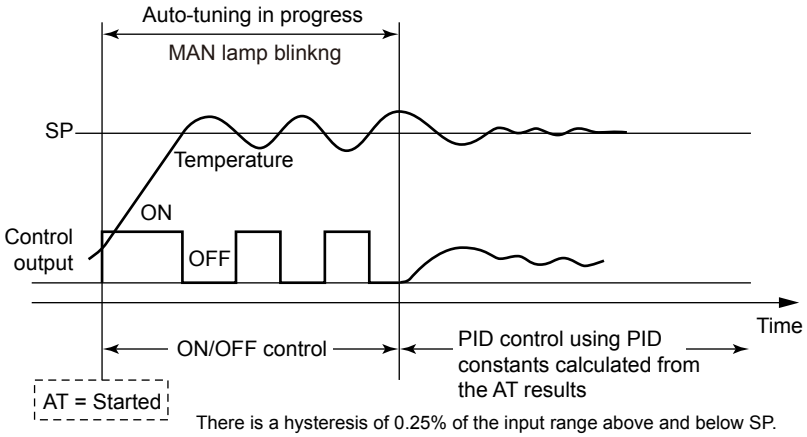
Description

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

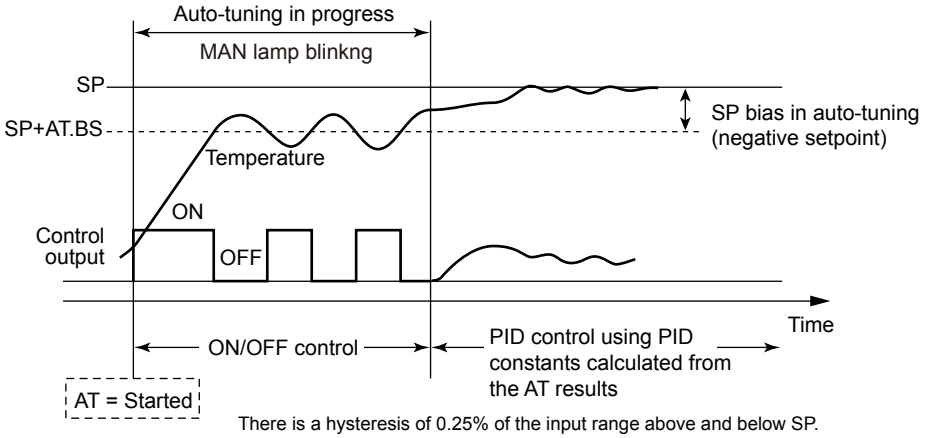
Do not perform auto-tuning for the following processes.
Tune PID manually.

- 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.



There is a hysteresis of 0.25% of the input range above and below SP.

When SP bias in auto-tuning is set



There is a hysteresis of 0.25% of the input range above and below SP.

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.
Remote	1 to 8, R	Remote setpoint	P, I, and D of the PID group specified in AT.

When the setpoint of AT is “R,” the AT result is stored in the PID group for reference deviation.
When performing auto-tuning in AT setpoint "R", set the parameter ZON to other than 0 and 3, and set the parameter RDV to other than 0.

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)
- 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.

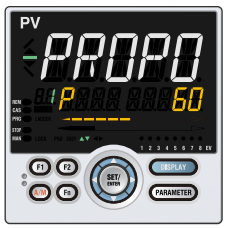
The time-out detection time is about 24 hours.

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

4.4 Adjusting PID Manually

Setting Display

Parameter Setting Display



Operation Display > **PARAMETER** 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	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

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.

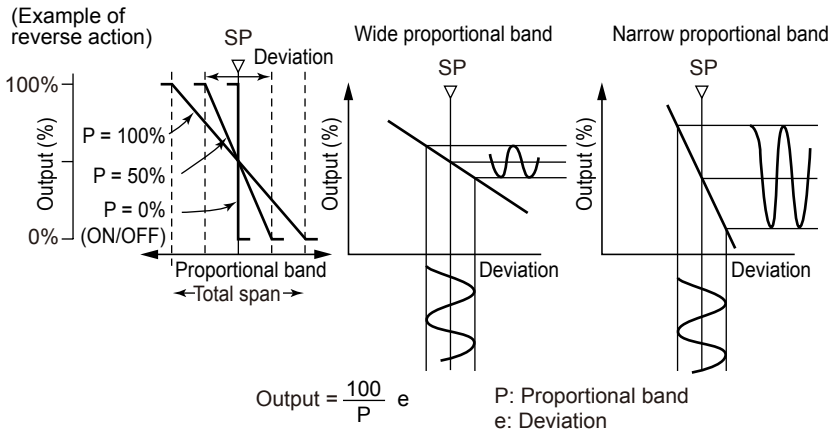
(2) Zone PID selection

The PID group can be selected based on variations of the PV, target SP, and SP.
See ZON settings in Section 6.4 Switching PID

Description

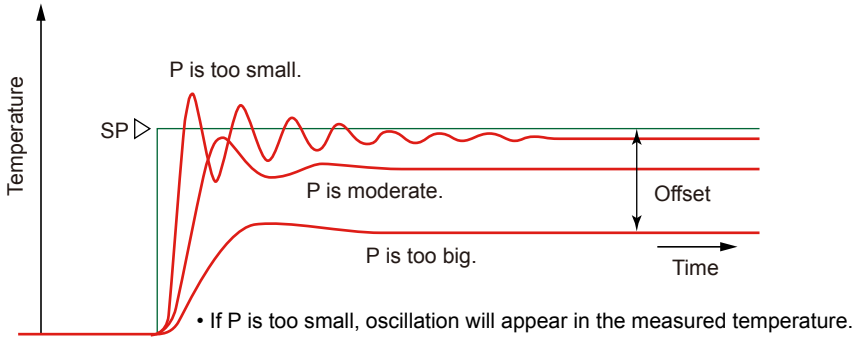
Description and Tuning of Proportional Band

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.



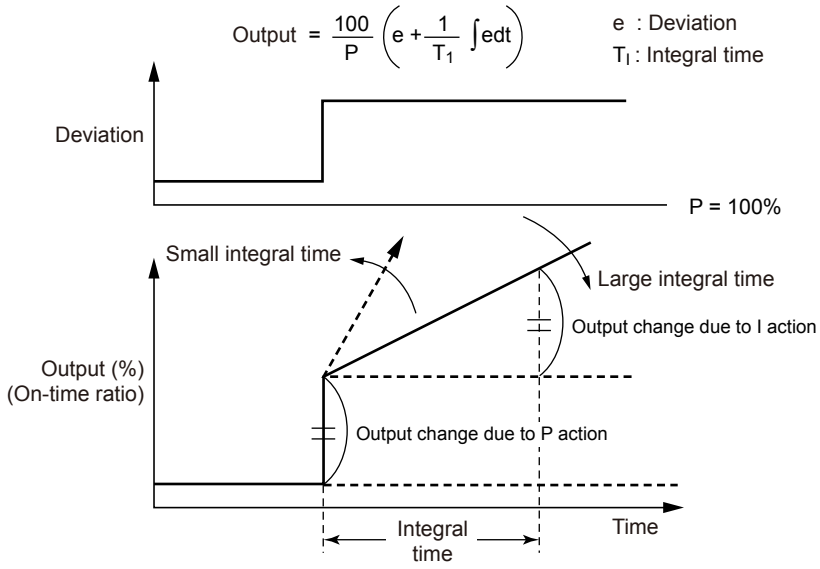
To fine-tune a proportional band obtained using auto-tuning, or to manually tune the proportional band:

- 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.



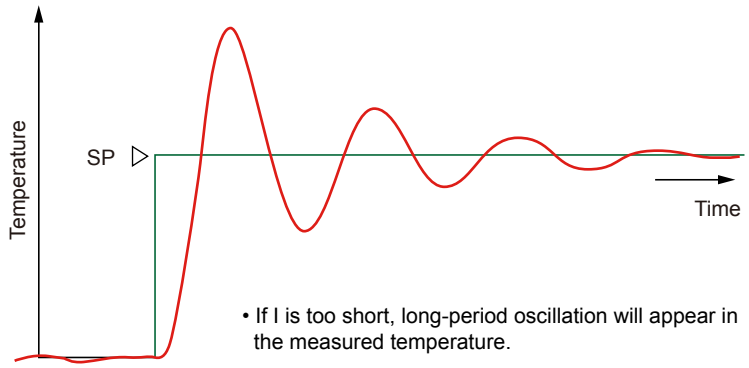
Description and Tuning of Integral Time

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.



To manually tune the integral time

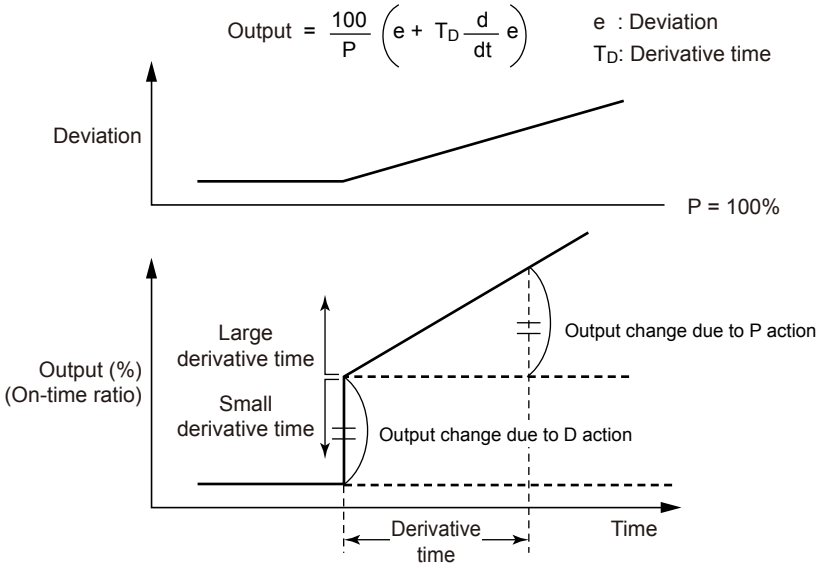
- The main goal is to reduce the offset.
- Adjust from longer time to shorter time.
- If you see an oscillation at a longer period than that seen when the proportional band is too narrow, then you have made the integral time too short.



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

Description and Tuning of Derivative Time

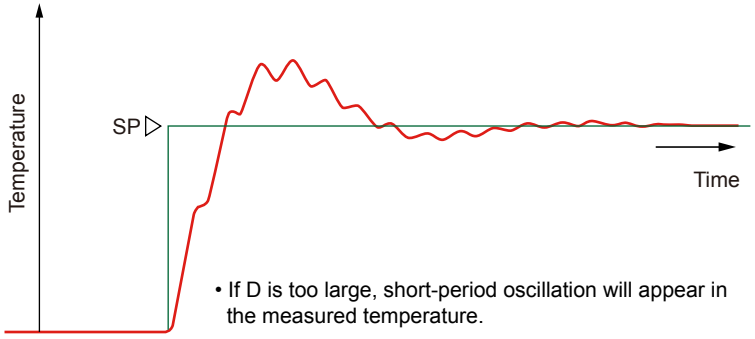
If the control object has a large time constant or dead time, the corrective action will be too slow with proportional action or proportional-plus-integral action alone, causing overshoot. However, even just sensing whether the deviation is on an increasing or a decreasing trend and adding some early 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.



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) 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.
(2) Gradually reduce P from a larger value. When the PV value begins to oscillate, stop tuning and increase the value somewhat.
(3) 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.
(4) Gradually increase D from a smaller value. When the PV value begins to oscillate (with short period), stop tuning and lower the value slightly.

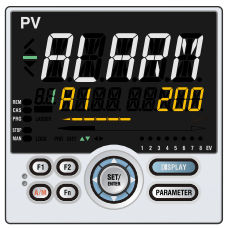
Reference Values for Manual Tuning of Temperature, Pressure, and Flow Rate

		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

4.5 Setting Alarm Setpoint

Setting Display

Parameter Setting Display



Operation Display > **PARAMETER** 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)

4.6 Selecting Target Setpoint Number (SPNO)

Setting Display

Parameter Setting Display

Operation Display > **PARAMETER** 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

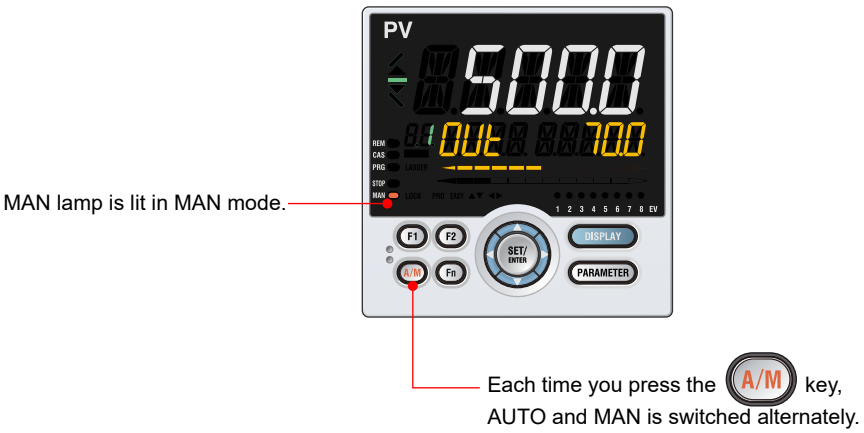
When the SP parameter is displayed, the SP number is shown on Group display.

4.7 Switching Operation Modes

4.7.1 Switching between AUTO and MAN

Direct Operation by A/M Key

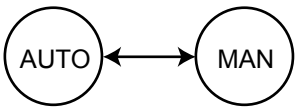
Operation



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	Output action
AUTO→MAN	Holds the control output value from AUTO mode. The control output value can be bumped 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.

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.)

SP Display is shown in AUTO mode.

Lamp Status

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

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

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** 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

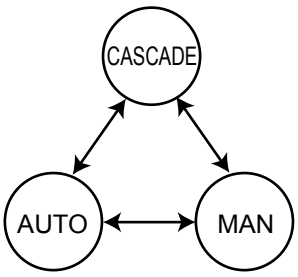
Parameter symbol	Name	Display level	Setting range	Menu symbol
C.A.M	CAS/AUTO/MAN switch	EASY	CAS: Cascade mode AUTO: Automatic mode MAN: Manual mode	MODE Ope

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.

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).

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

4.7.3 Switching between STOP and RUN

Setting Display

Operation Mode Setting Display

Operation Display > **PARAMETER** 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.

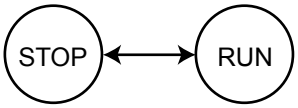
Setting Details

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

Description

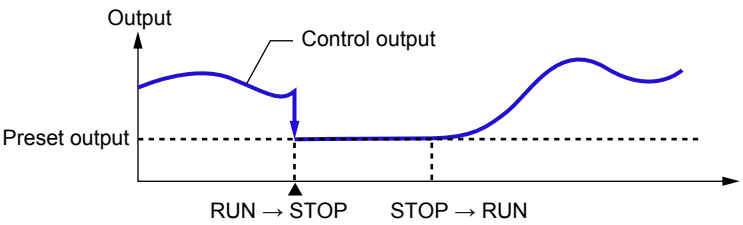
STOP/RUN switching can be performed by any of the following:

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



When the STOP/RUN switch is set to the contact input (S/R≠0), switch by keystroke or via communication is disabled. Disable the setting if the STOP/RUN switch parameter (S/R) is assigned to the contact input.
When the contact input is OFF, and the setting is switched by parameter, communication, or keystroke, the last switching operation is performed.

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



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.

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

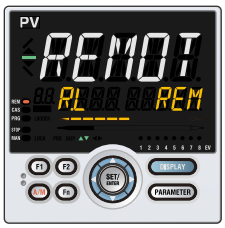
Lamp Status

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

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

Setting Display

Operation Mode Setting Display



Operation Display > **PARAMETER** 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

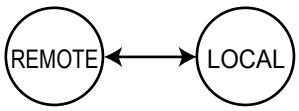
Parameter symbol	Name	Display level	Setting range	Menu symbol
R.L	REMOTE/LOCAL switch	EASY	LCL: Local mode REM: Remote mode	MODE Ope

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.

The PID group before switching from LOCAL to REMOTE is applied to the PID in remote operation.

SP Action in REM/LCL Switch

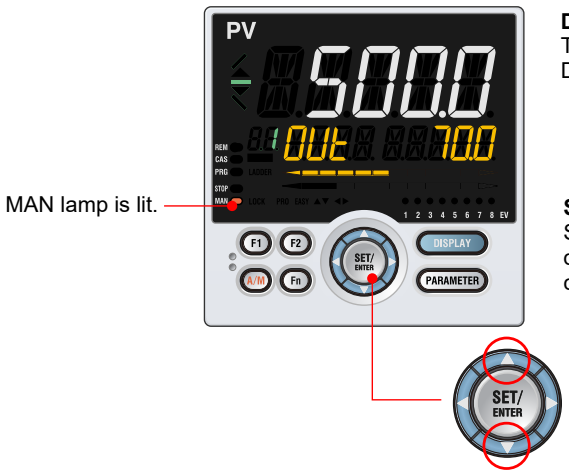
Switch	SP action
LCL→REM	The local target setpoint bumps to the remote target setpoint.
REM→LCL	The remote target setpoint bumps to the local target setpoint. Or forces the local target setpoint to track the remote target setpoint.

Lamp Status

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

4.8 Manipulating Control Output during Manual Operation

Operation



Direct key method
The value specified by the Up and Down arrow keys is output as is.
Press the Up arrow key to increase the control output.
Press the Down arrow key to decrease the control output.

SET/ENT key method
Set the control output on the setting display and press the SET/ENT key to confirm the value to output it.

Description

In manual operation mode, you can use the direct key method or the SET/ENT key method to control the output value.
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).

OUT Display

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.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
MAN.T	Manual output operation type	PRO	In manual operation mode, you can use the direct key method or the SET/ENT key method to control the output value. (Note) DT.ET: Direct key method The value specified by the Up and Down arrow keys is output as is. ST.ET: SET/ENT key method Set the control output on the setting display and press the SET/ENT key to confirm the value to output it.	OUT Ope

Note: When the control type (CNT) is set to ON/OFF control, only the DT.ET setting can be used.

4.9 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.

CHAPTER 5
INPUT SETTING FUNCTIONS

Contents

5.1 Setting Functions of PV Input and Remote Auxiliary Analog Input

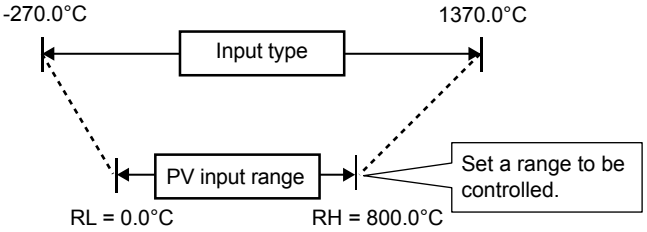
5.1.1 Setting Input Type, Unit, Range, Scale, and Decimal Point Position

Description

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

Example of Temperature Input

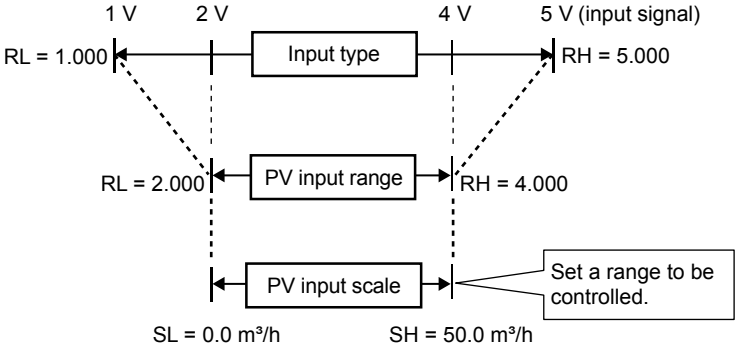
The figure below is an example of setting Type K thermocouple and a measurement range of 0.0 to 800.0 ºC.



Minimum value of PV input range Maximum value of PV input range

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.



Minimum value of PV input scale Maximum value of PV input scale

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 ºC / -450.0 to 2500.0 ºF K2: -270.0 to 1000.0 ºC / -450.0 to 2300.0 ºF K3: -200.0 to 500.0 ºC / -200.0 to 1000.0 ºF J: -200.0 to 1200.0 ºC / -300.0 to 2300.0 ºF T1: -270.0 to 400.0 ºC / -450.0 to 750.0 ºF T2: 0.0 to 400.0 ºC / -200.0 to 750.0 ºF B: 0.0 to 1800.0 ºC / 32 to 3300 ºF S: 0.0 to 1700.0 ºC / 32 to 3100 ºF R: 0.0 to 1700.0 ºC / 32 to 3100 ºF N: -200.0 to 1300.0 ºC / -300.0 to 2400.0 ºF E: -270.0 to 1000.0 ºC / -450.0 to 1800.0 ºF L: -200.0 to 900.0 ºC / -300.0 to 1600.0 ºF U1: -200.0 to 400.0 ºC / -300.0 to 750.0 ºF U2: 0.0 to 400.0 ºC / -200.0 to 1000.0 ºF W: 0.0 to 2300.0 ºC / 32 to 4200 ºF (Note1) PL2: 0.0 to 1390.0 ºC / 32.0 to 2500.0 ºF P2040: 0.0 to 1900.0 ºC / 32 to 3400 ºF WRE: 0.0 to 2000.0 ºC / 32 to 3600 ºF JPT1: -200.0 to 500.0 ºC / -300.0 to 1000.0 ºF JPT2: -150.0 to 150.0 ºC / -200.0 to 300.0 ºF PT1: -200.0 to 850.0 ºC / -300.0 to 1560.0 ºF PT2: -200.0 to 500.0 ºC / -300.0 to 1000.0 ºF PT3: -150.00 to 150.00 ºC / -200.0 to 300.0 ºF 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 auxiliary analog 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
UNIT	PV input unit	EASY	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	PV Set
	RSP remote auxiliary analog input unit	EASY		RSP Set

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

(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 auxiliary analog input range	EASY		RSP Set
RL (Physical quantity)	Minimum value of PV input range	EASY	Same as RH	PV Set
	Minimum value of RSP remote auxiliary analog input range	EASY		RSP 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 auxiliary analog input scale decimal point position	EASY		RSP 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 auxiliary analog input scale	EASY		RSP Set
SL (Scaling)	Minimum value of PV input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	PV Set
	Minimum value of RSP remote auxiliary analog input scale	EASY		RSP Set
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.

5.1.2 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.

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 auxiliary analog input burnout action	STD		RSP Set

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

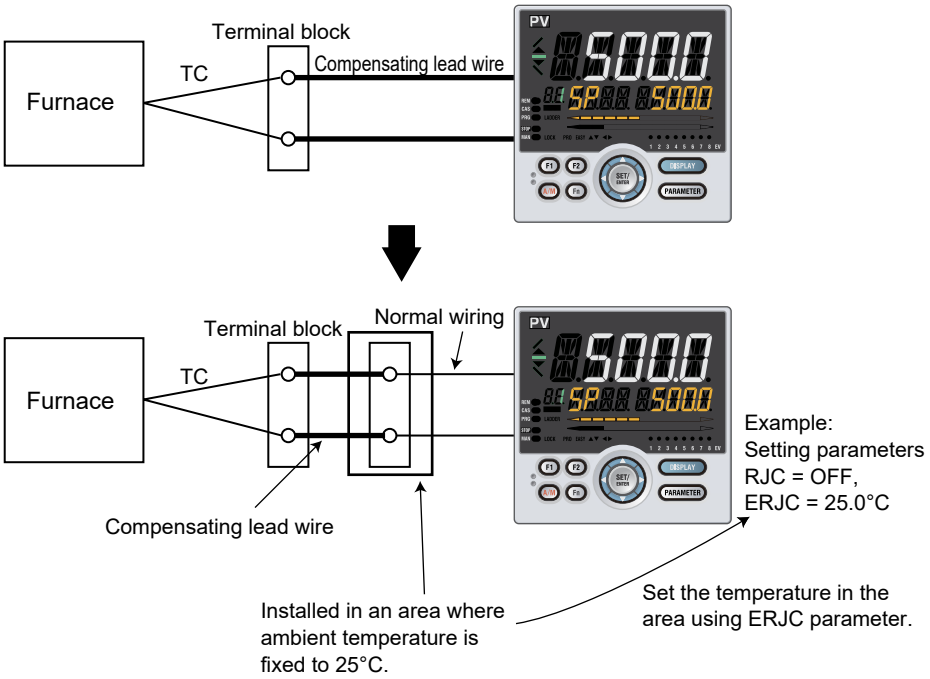
Description

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
ERJC	PV input external RJC setpoint	PRO	-10.0 to 60.0°C	PV Set

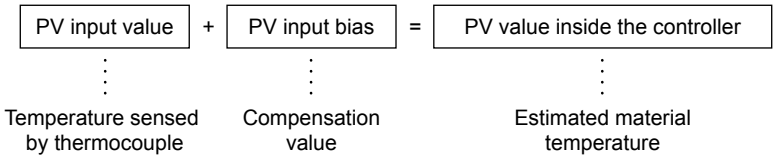
5.1.4 Correcting Input Value

(1) Setting Bias and Filter

Description

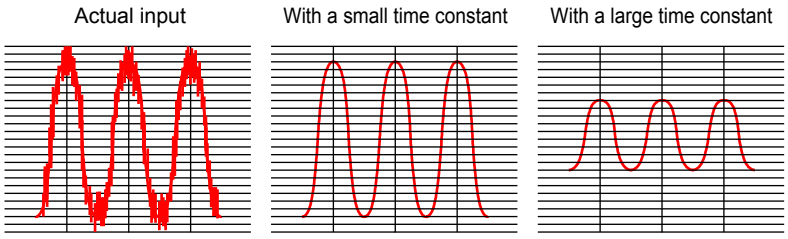
PV Input Bias

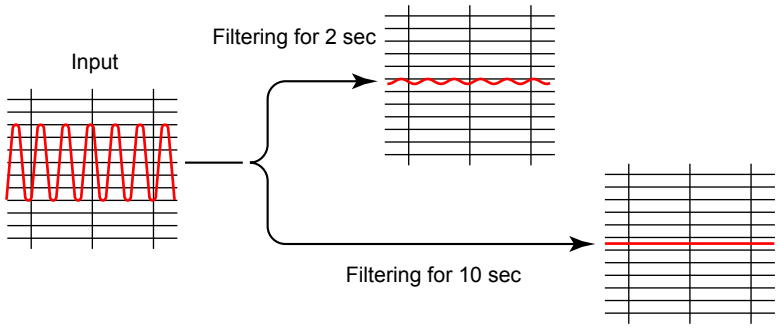
The PV input bias allows bias to be summed with input to develop a measured value for display and control use inside the controller.
This function can also be used for fine adjustment to compensate for small inter-instrument differences in measurement reading that can occur even if all are within the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



PV Input 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 (EU)	PVS Ope
FL	PV input filter	EASY	OFF, 1 to 120 s	

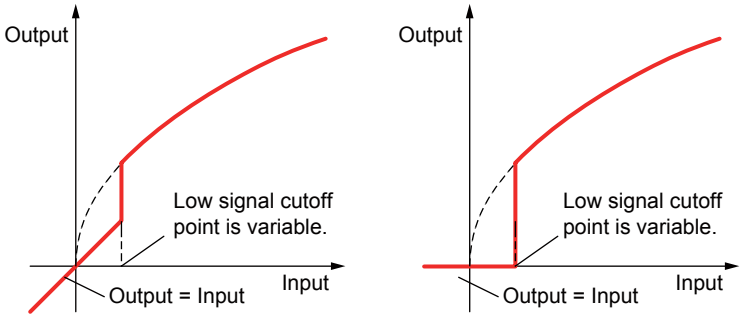
Parameter symbol	Name	Display level	Setting range	Menu symbol
A.BS	PV analog input bias	STD	-100.0 to 100.0% of each input range span (EU)	PV Set
	RSP remote auxiliary analog input bias	PRO		RSP Set
A.FL	PV analog input filter	STD	OFF, 1 to 120 s	PV Set
	RSP remote auxiliary analog input filter	PRO	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

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

(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 remote auxiliary analog input square root extraction	PRO		RSP Set
A.LC	PV analog input low signal cutoff	PRO	0.0 to 5.0%	PV Set
	RSP remote auxiliary analog input low signal cutoff	PRO		RSP Set

Note 1: Each parameter is displayed when the input type is voltage or current.

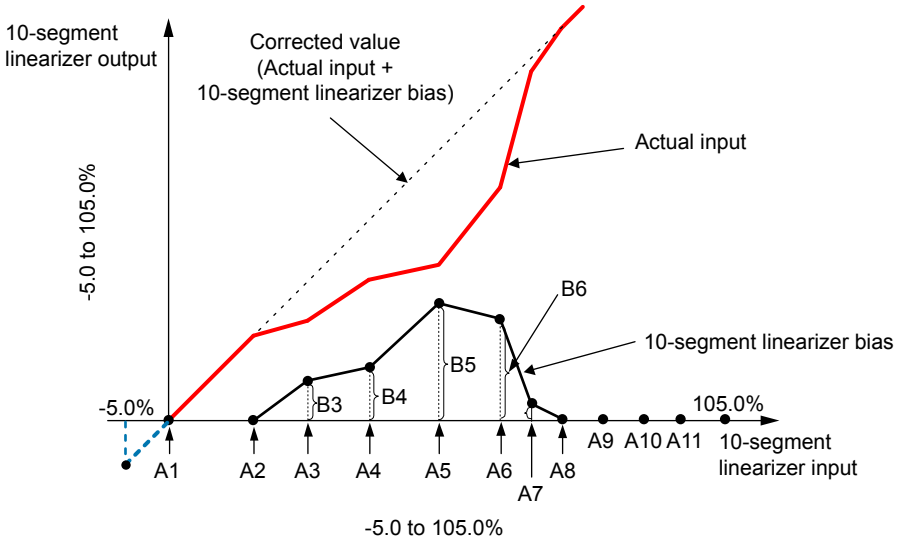
(3) Setting 10-segment Linearizer

Description

A total of up to four 10-segment linearizers can be used for the input unit and output unit.

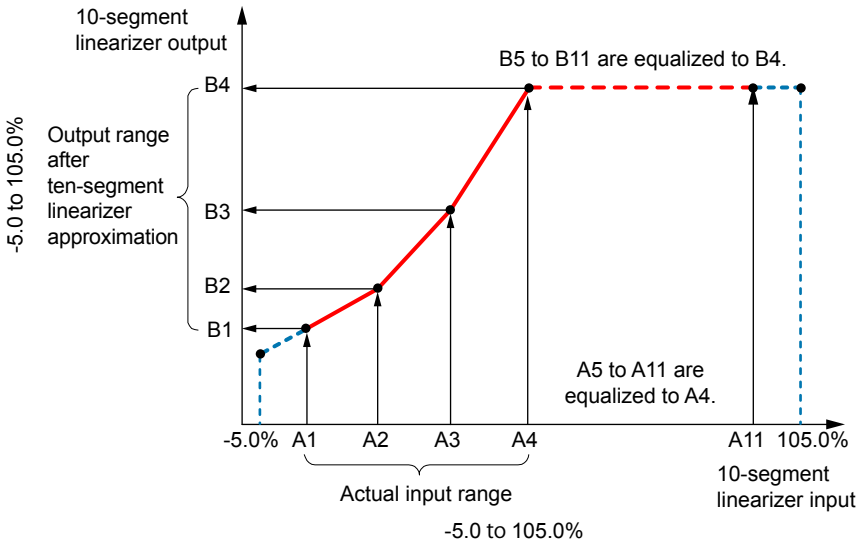
10-segment Linearizer Bias

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 remote auxiliary analog input AIN2: Not used AIN4: Not used PVIN: PV input OUT: OUT analog output OUT2: Not used 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 (EU) 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	

Parameters are set in the following order.

(1) PYS: Specifies where the 10-segment linearizer function is used.

(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 remote auxiliary analog input: RSP remote auxiliary analog input range or RSP remote auxiliary analog input range span

Note

- Set the 10-segment linearizer so that each sequential point is greater than or equal to the previous point.
- If the same setpoint is set for two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.

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

5.1.5 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 (EU)	
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 auxiliary analog input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

5.2 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.

5.3 Using Larger, Smaller, Average, or Difference of Two Inputs as PV

Description

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

The larger, smaller, and average are automatically computed based on the two 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

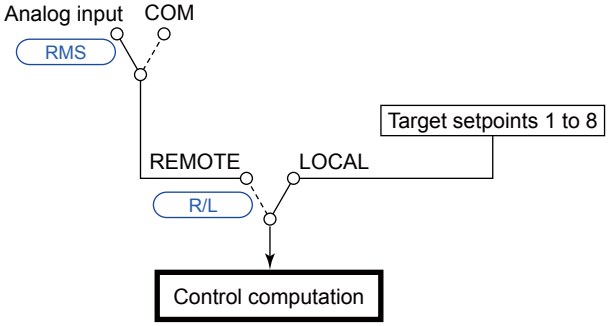
Setting Details

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: Not used 4: Not used	

5.4 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

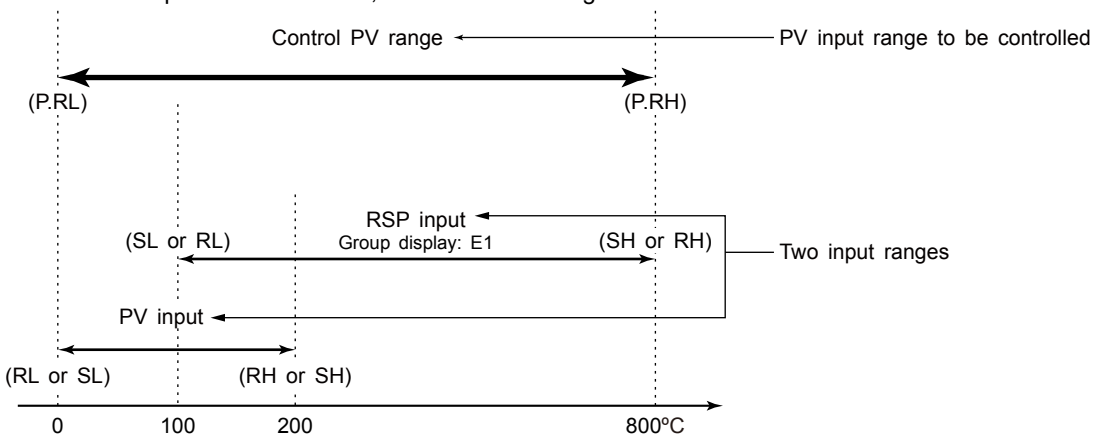
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

5.5 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 200ºC, RSP terminal input of 100 to 800ºC, and control PV range of 0 to 800ºC.



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.

5.6 Setting PV Switching Methods of Loop Control with PV Switching

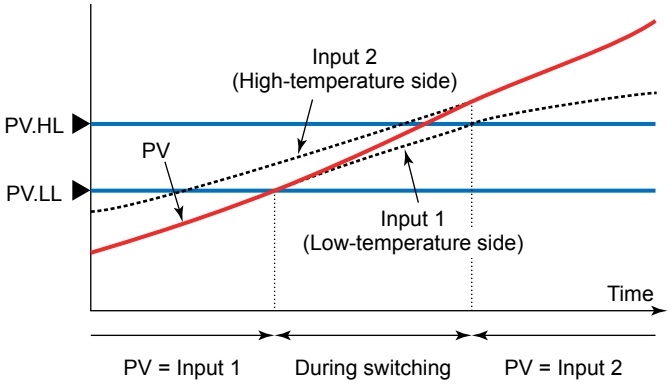
Description

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

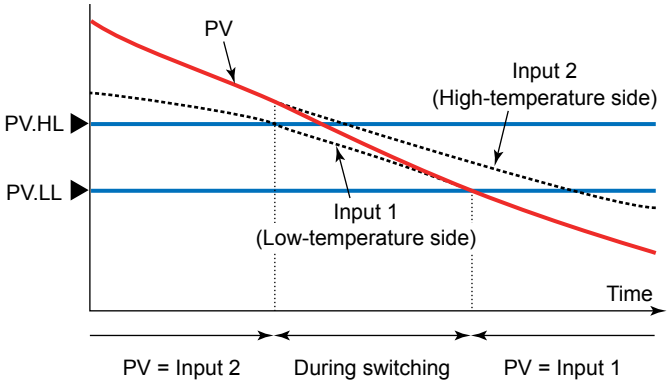
Input 1: PV terminal input
Input 2: RSP terminal input

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

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

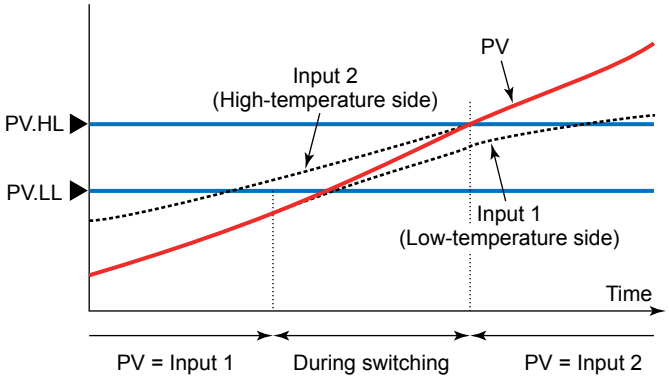
When PV.HL ≤ Input 1, **PV=Input 2**.

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

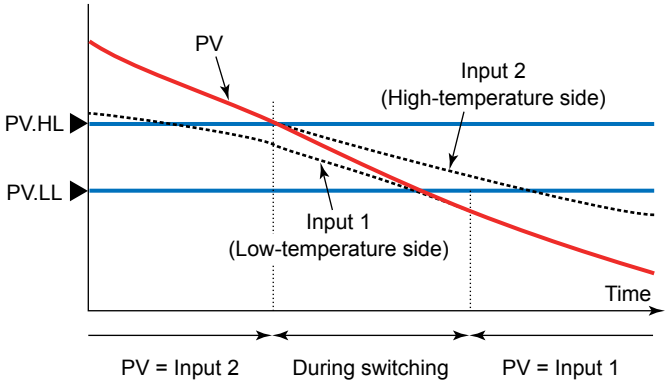
This method automatically switches PV within the range of input switching PV high limit and low limit.

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

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

When PV.HL ≤ Input 2, **PV=Input 2**.

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

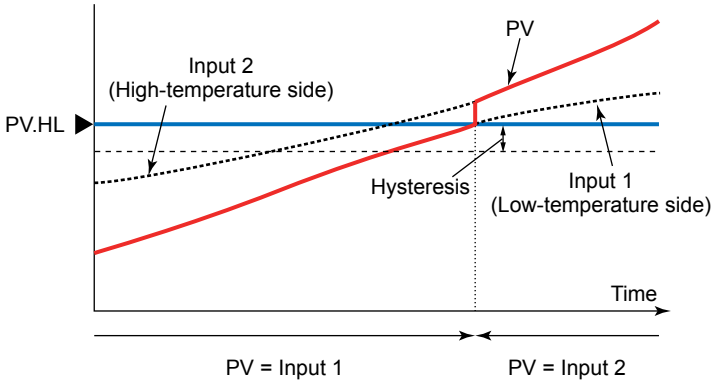
This method automatically switches two inputs at switching point (input switching PV high limit)

It should be selected in case where a sudden change in PV is allowed.

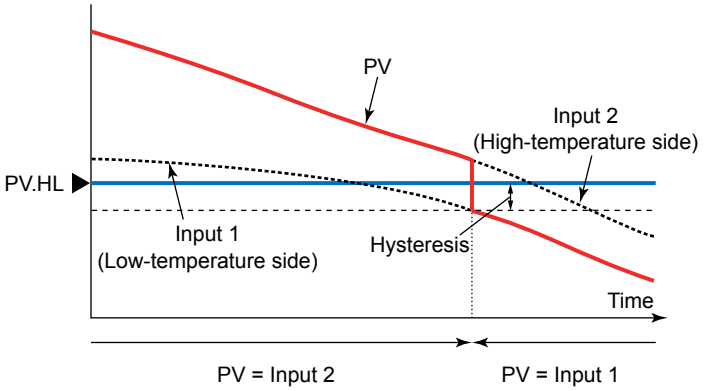
Control output will change smoothly (i.e., without any bumps) when PV switches.

Hysteresis (0.5% of PV range span) is provided around the switching point.

PV rising process



PV falling process

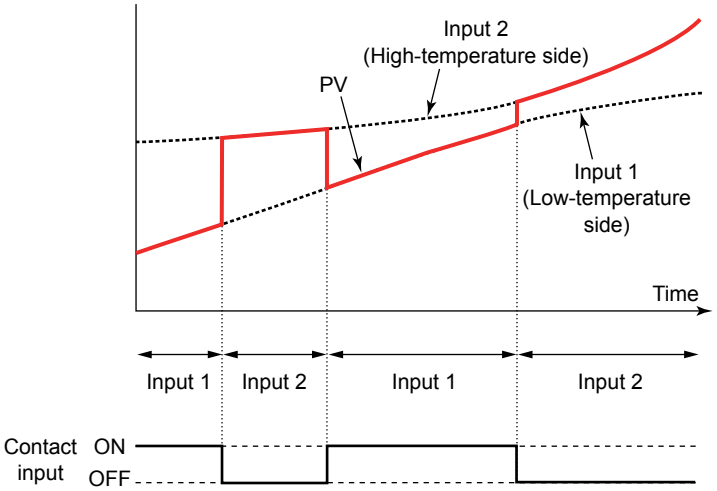


When input 1 < PV.HL – 0.5% of PV input range span, **PV=Input 1**.

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		

CHAPTER 6

CONTROL MODE SETTINGS

Contents

6.1 Setting Control Mode (CTLM)

6.1.1 Single-loop Control

Setting Details

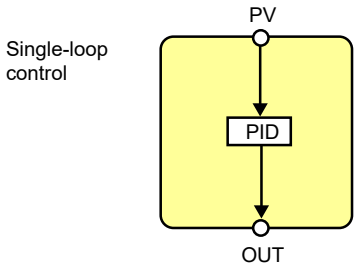
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

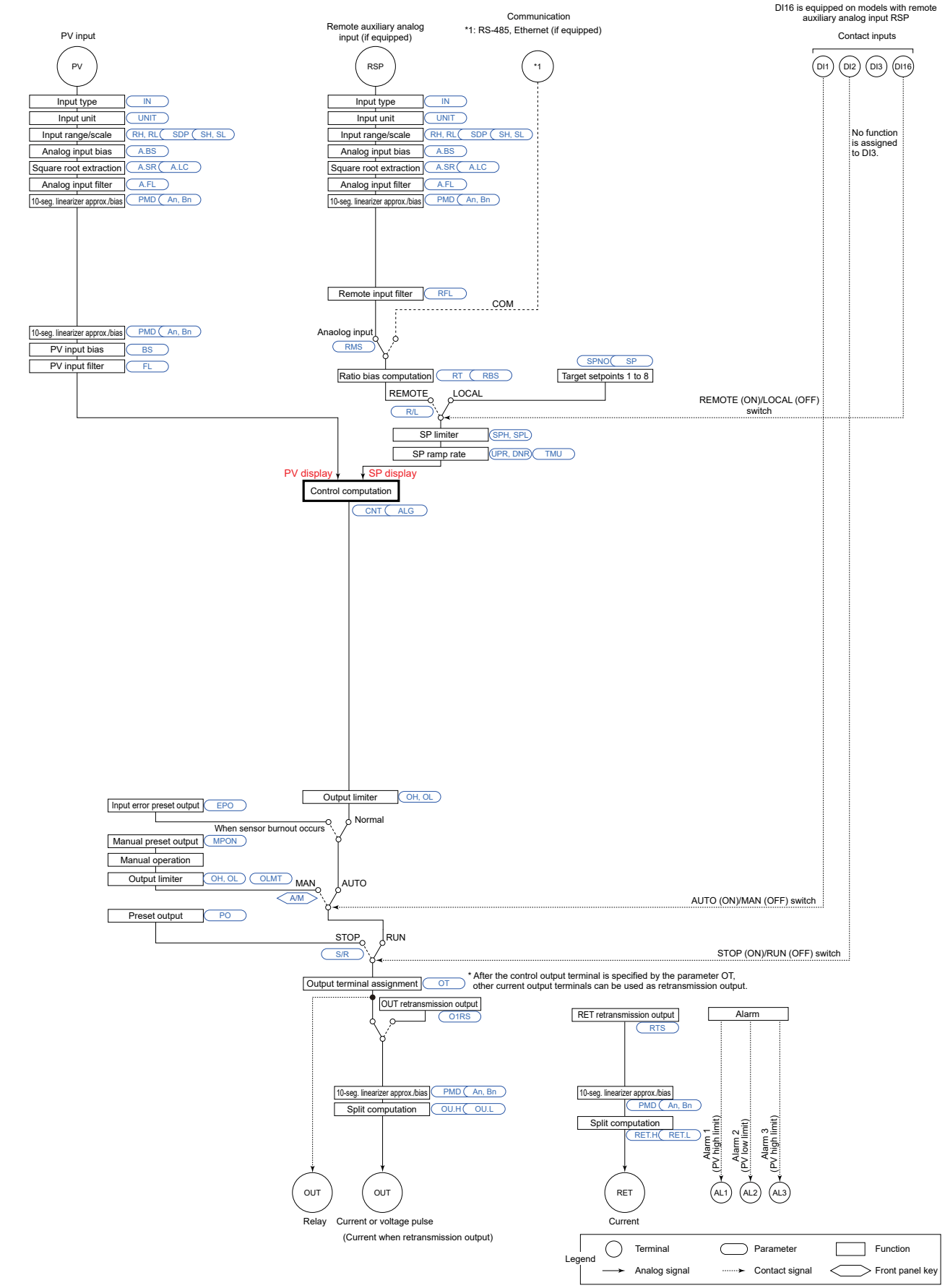
This control mode provides the basic control function having one control computation unit.



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.

■ Single-loop Control Function Block Diagram



6.1.2 Cascade Primary-loop Control

Setting Details

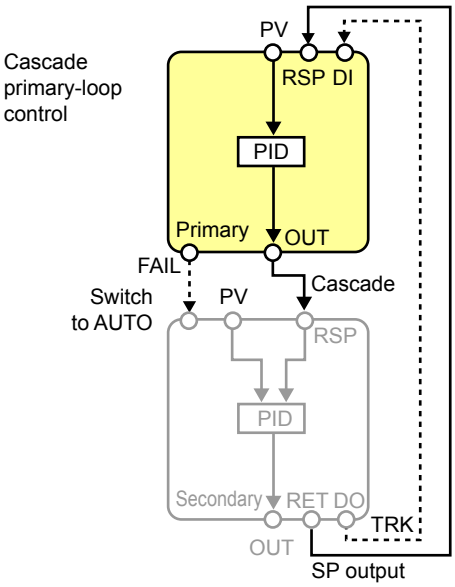
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

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.



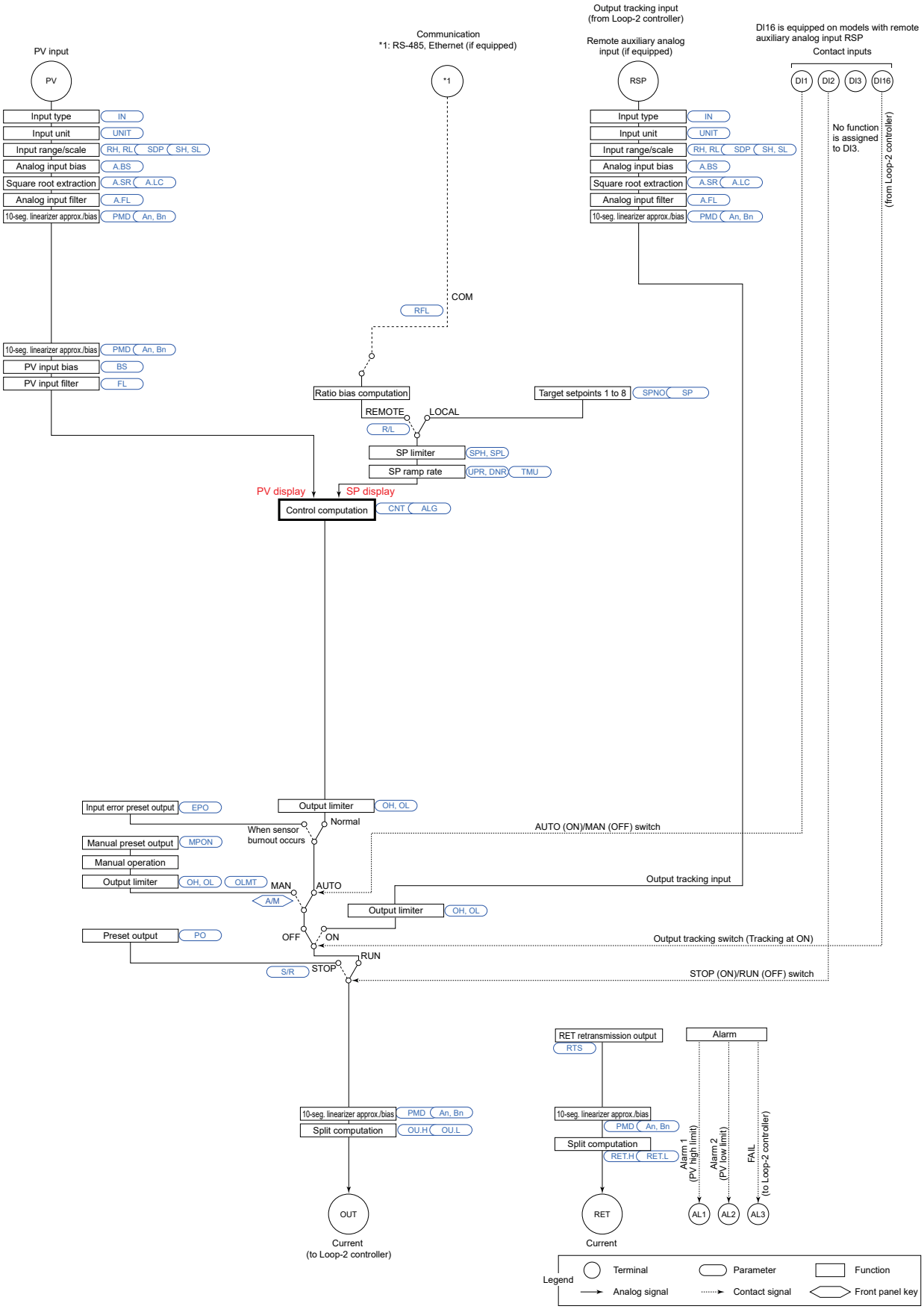
Note

The PPC5 auxiliary analog input (RSP) is a voltage input. A signal conditioner or converting resistor is required to convert the mA control output (OUT) of the primary loop controller and the mA retransmission output (RET) of the secondary loop controller.

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.

■ Cascade Primary-loop Control Function Block Diagram



6.1.3 Cascade Secondary-loop Control

Setting Details

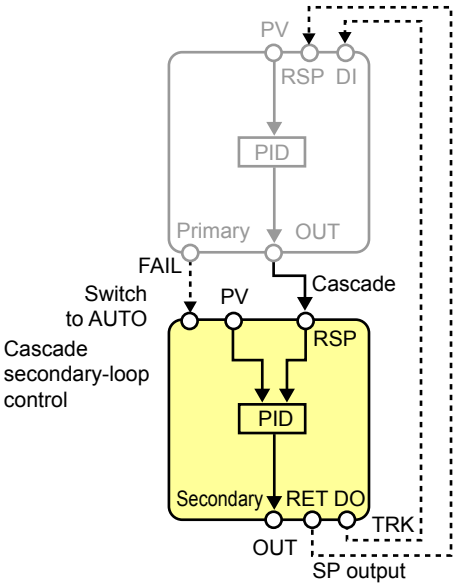
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

This control mode sets 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.



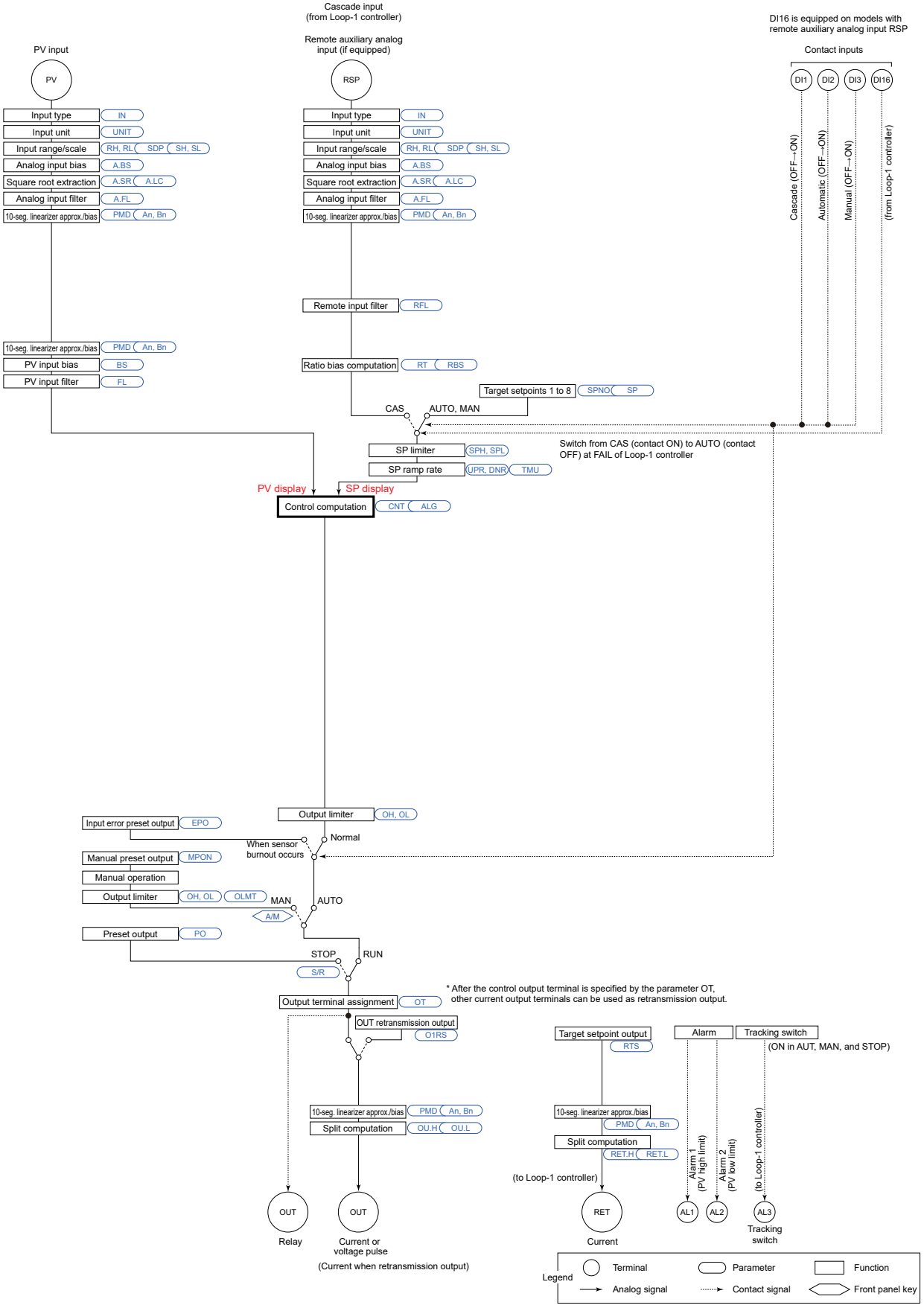
Note

The PPC5 auxiliary analog input (RSP) is a voltage input. A signal conditioner or converting resistor is required to convert the mA control output (OUT) of the primary loop controller and the mA retransmission output (RET) of the secondary loop controller.

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.

■ Cascade Secondary-loop Control Function Block Diagram



6.1.4 Cascade Control

Setting Details

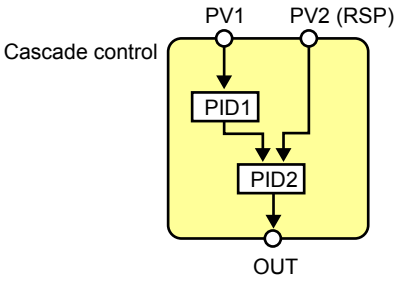
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

This control mode uses two control computation units and permits Cascade control using just a single controller.



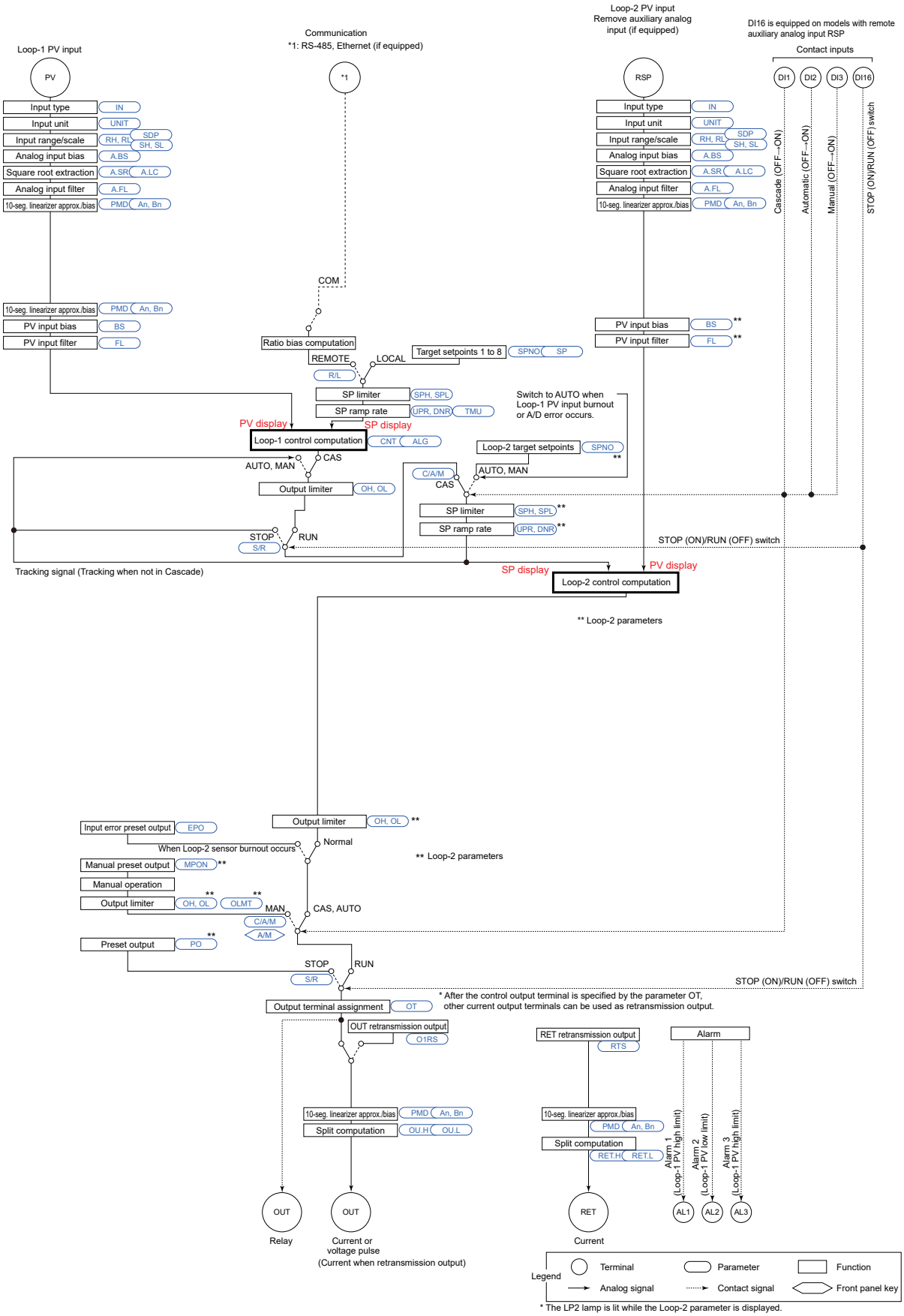
Note

The PPC5 auxiliary analog input (RSP) is a voltage input. Use a signal conditioner for PV2 input from thermocouples, RTDs, or mA transmitters. A converting resistor can also be used to convert a mA signal to voltage.

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.

■ Cascade Control Function Block Diagram



6.1.5 Loop Control for Backup

Setting Details

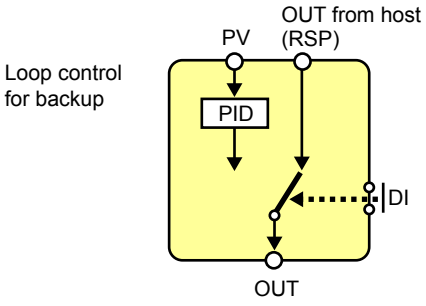
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

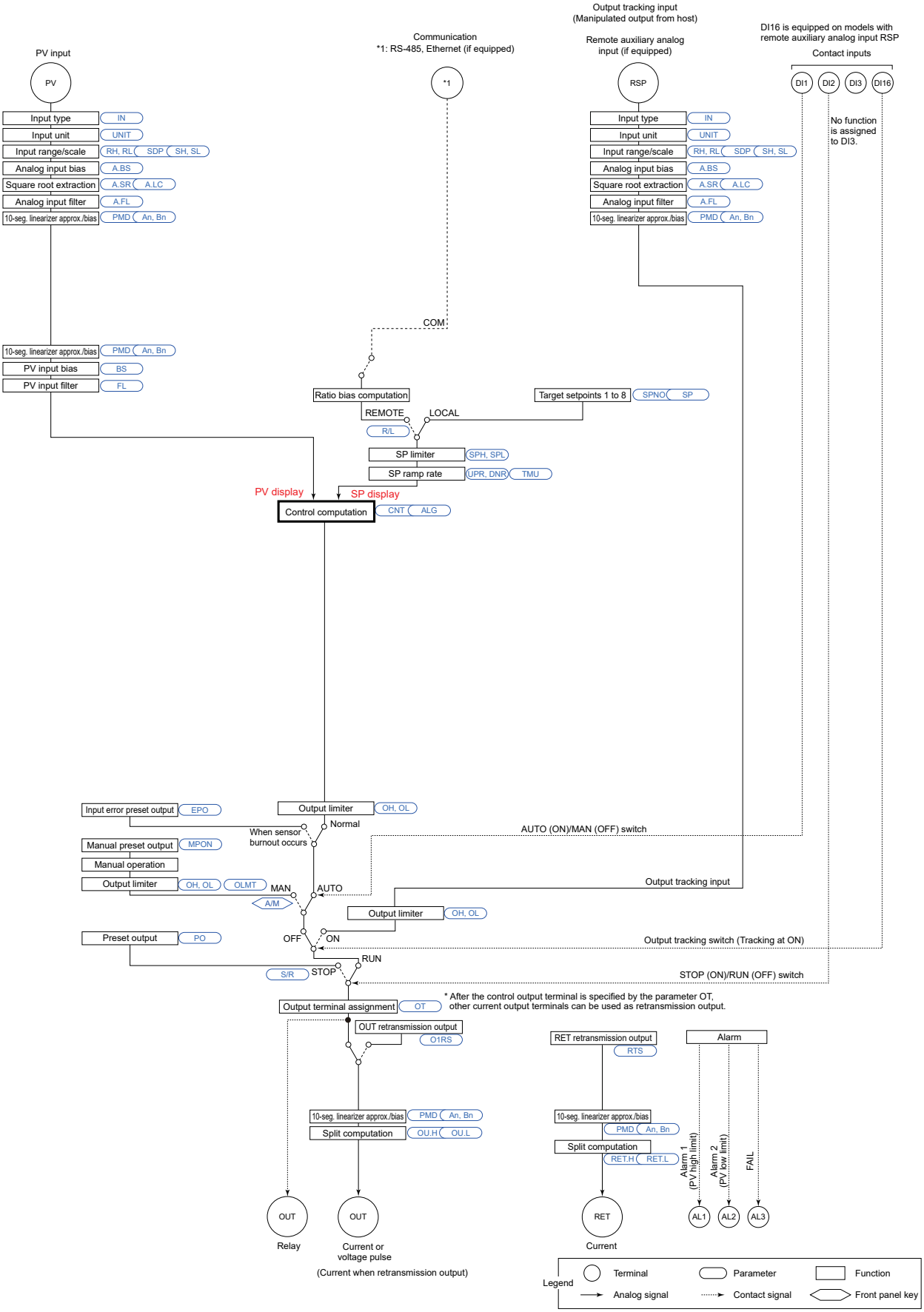
This control mode allows control in connection with host control equipment (such as another controller or programmable controller (PLC)).
Normally, the value received from the host control equipment is output as-is.
If a FAIL signal is received from the host control equipment, the computation result of the ProSense PPC5 Series controller is output.



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.

■ Loop Control for Backup Function Block Diagram



6.1.6 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

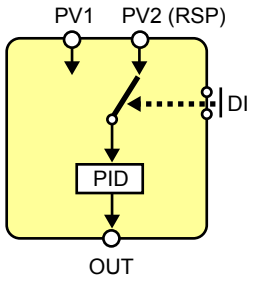
CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

This control mode uses two PV inputs, which are switched according to input contact signals or measurement ranges.

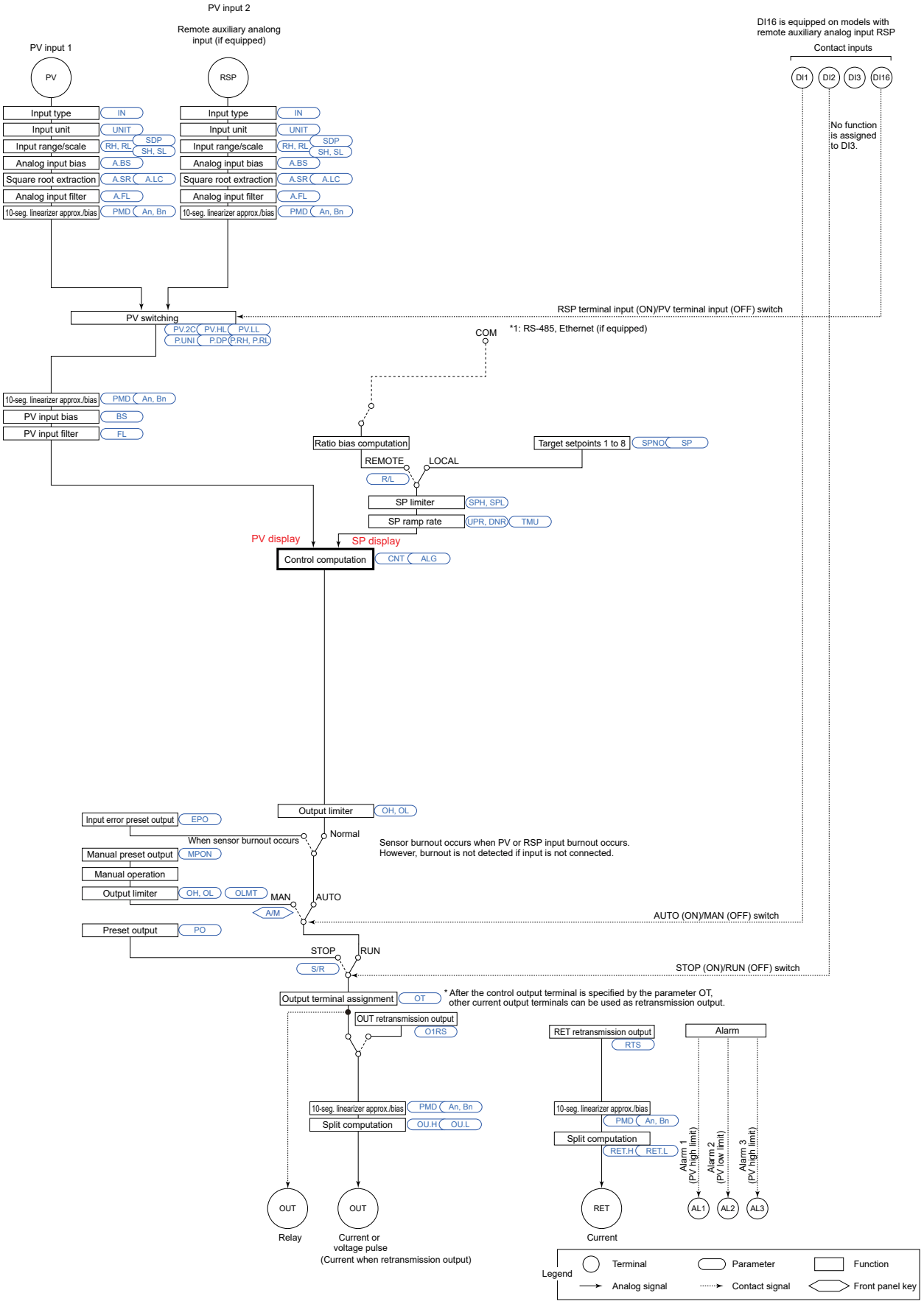
Loop control with PV switching



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.

■ Loop Control with PV Switching Function Block Diagram



6.1.7 Loop Control with PV Auto-selector

Setting Details

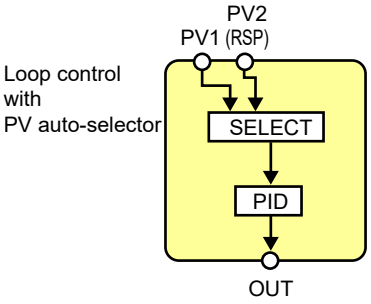
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

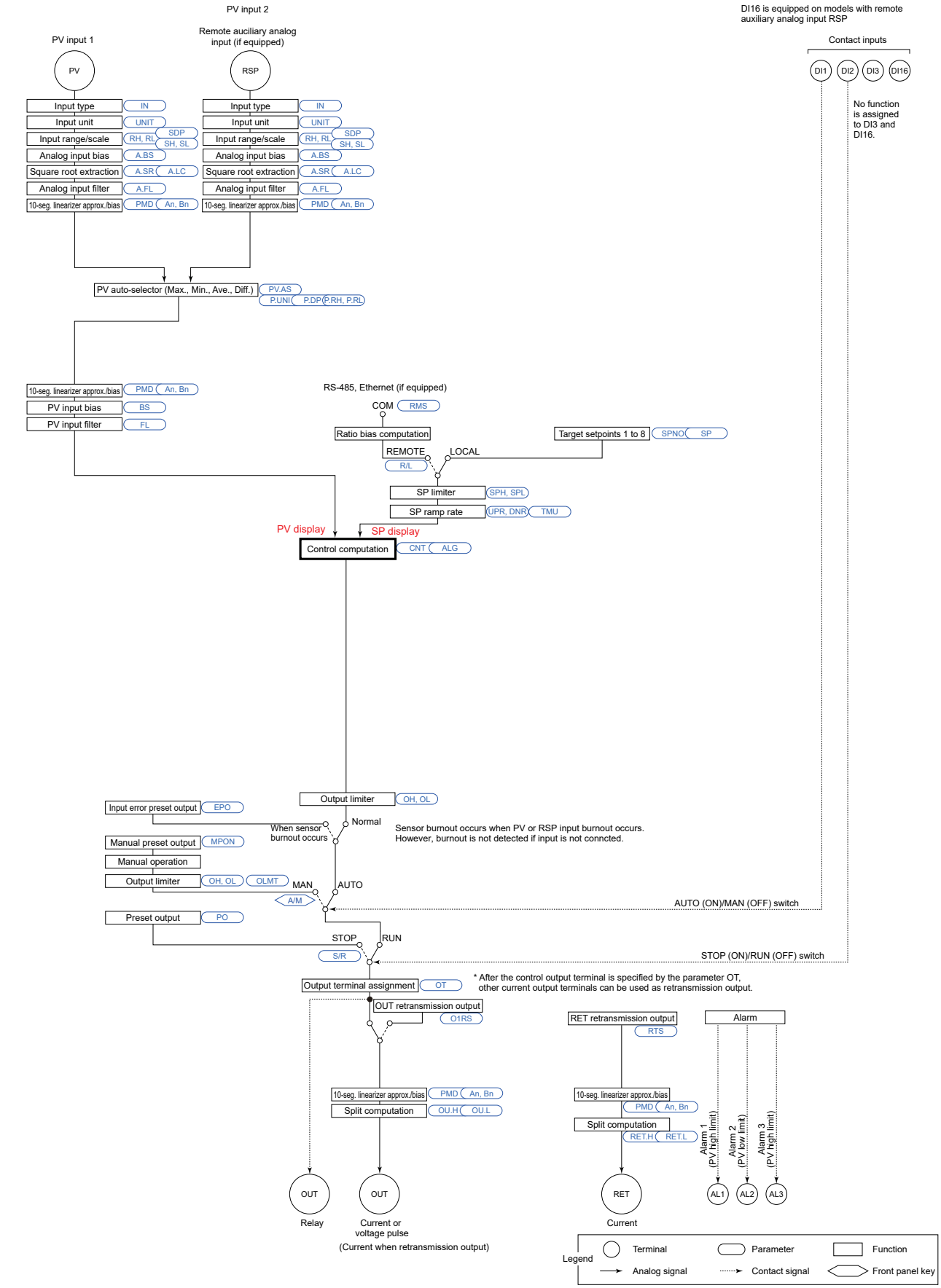
This control mode automatically selects or calculates the larger, the smaller, the average, or difference of two PV inputs for control.



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.

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



6.1.8 Loop Control with PV-hold Function

Setting Details

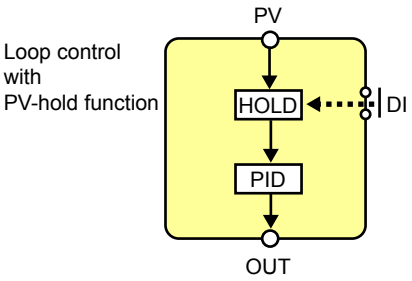
Parameter symbol	Name	Display level	Setting range	Menu symbol
CTLM	Control mode	STD	SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector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

CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.

Description

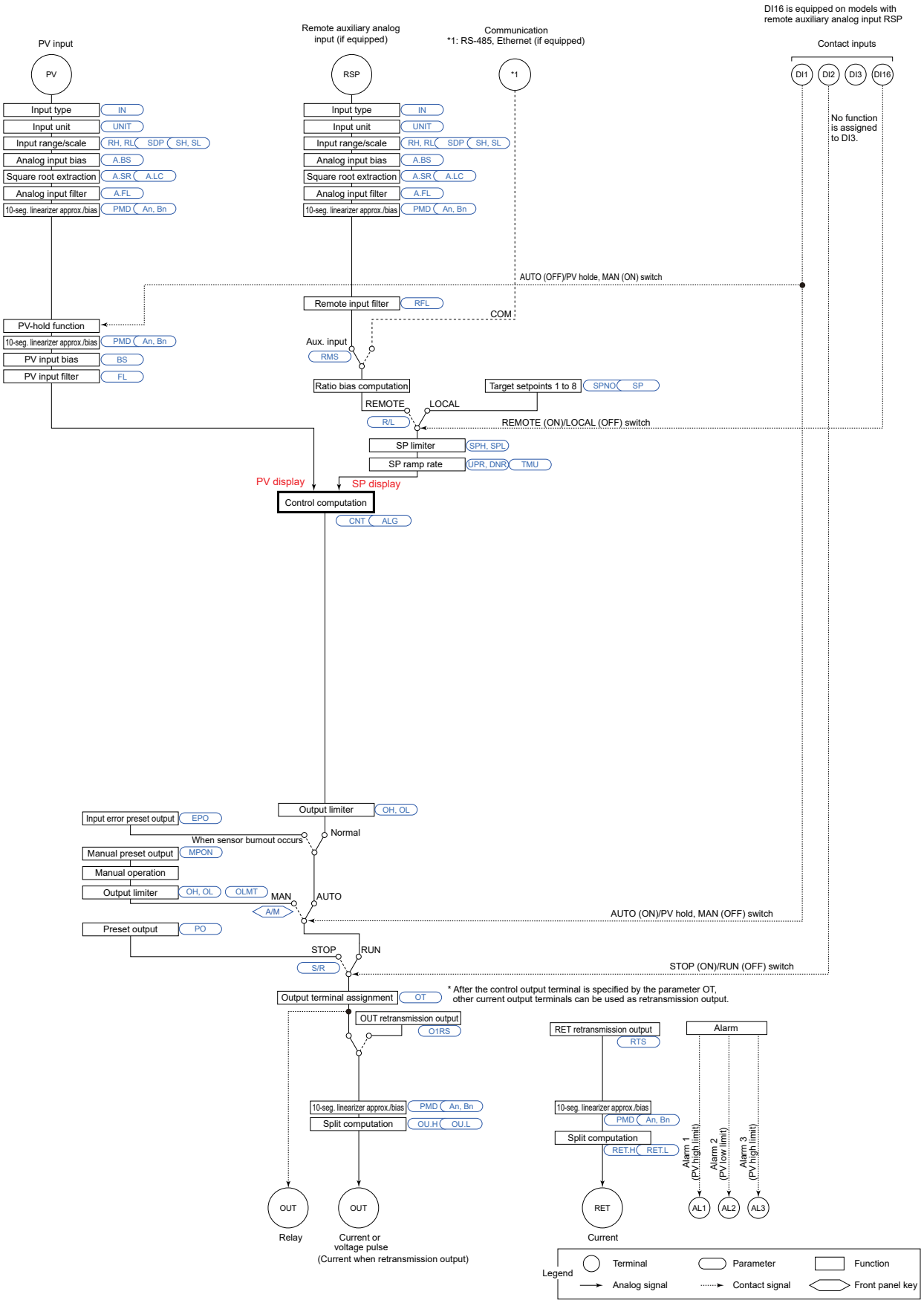
This control mode holds the PV input value and control output value by switching the external sensor using contact input.



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.

■ Loop Control with PV-hold Function Function Block Diagram



6.2 Setting Control Type (CNT)

The following table shows the available control types (CNT).

Control type	PPC5
PID control	√
ON/OFF control (1 point of hysteresis)	√
ON/OFF control (2 points of hysteresis)	√
Sample PI control	√
Batch PID control	√
Feedforward control	N/A

√: 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	BUM	PVSW	PVSEL	PVHD
PID control	√	√	√	√	√	√	√	√
ON/OFF control (1 point of hysteresis)	√	N/A	N/A	N/A	N/A	√	√	N/A
ON/OFF control (2 points of hysteresis)	√	N/A	N/A	N/A	N/A	√	√	N/A
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	N/A	N/A

√: Available, N/A: Not available

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

Control type	Output type		
	Current output	Time proportional output	ON/OFF output
PID control	√	√	N/A
ON/OFF control (1 point of hysteresis)	√	N/A	√
ON/OFF control (2 points of hysteresis)	√	N/A	√
Sample PI control	√	√	N/A
Batch PID control	√	√	N/A
Feedforward control	N/A	N/A	N/A

√: Available, N/A: Not available

6.2.1 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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	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	
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, 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.

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.

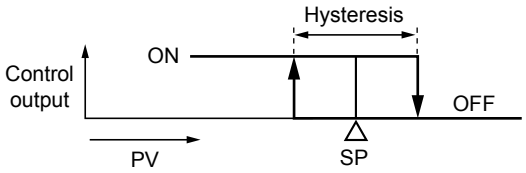
6.2.2 ON/OFF Control (1 point of hysteresis / 2 points of hysteresis)

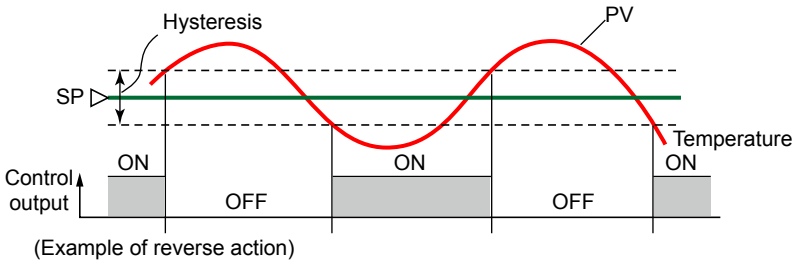
Description

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.

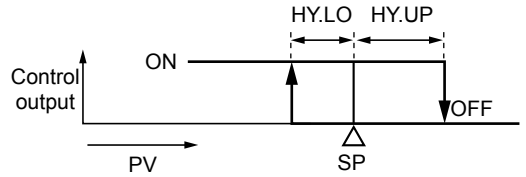
When the control type (CNT) is set to "ONOF," one point of hysteresis can be set to the operating point.
When the control type (CNT) is set to "ONOF2," two points of hysteresis (deviation positive hysteresis and deviation negative hysteresis) can be set to the operating point.

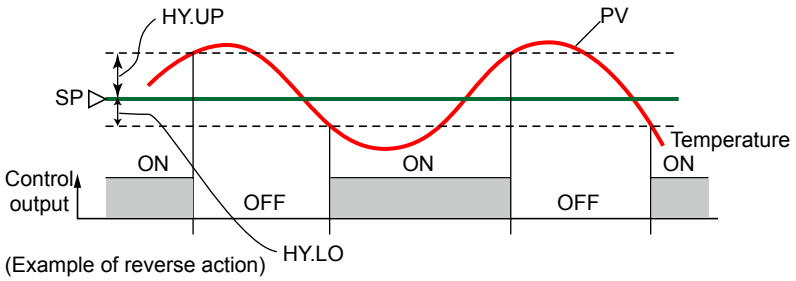
1 point of hysteresis





2 points of hysteresis





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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	CTL Set
HYS	Hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EU)	PID Ope
HY.UP	Upper-side hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EU)	
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.

6.2.3 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) 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
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.

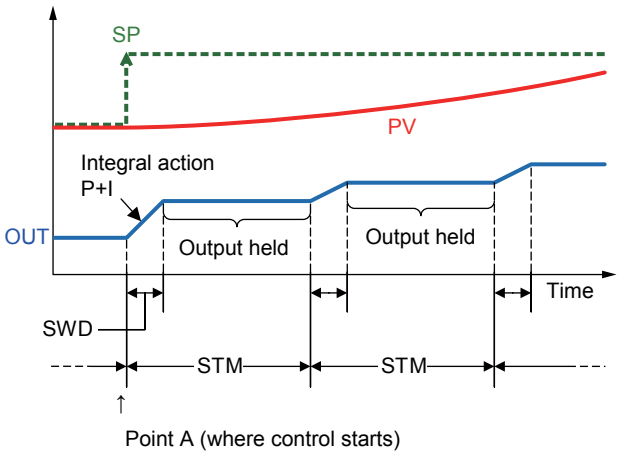
Note

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.

6.2.4 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.
- 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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	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.

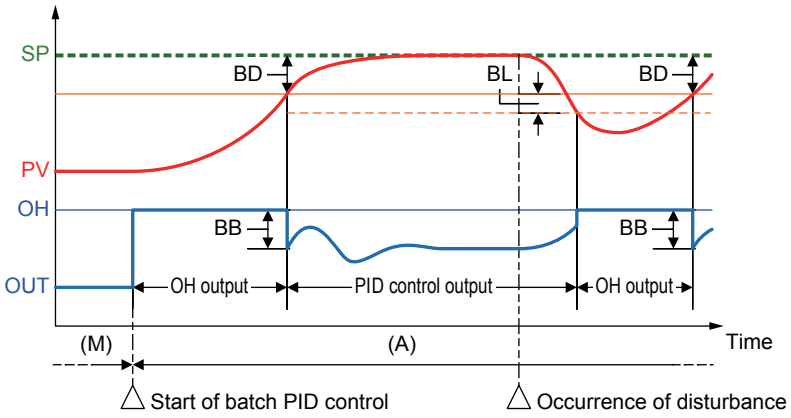
A guideline for STM is LM + TM x (2 to 3). (LM: Equivalent dead time, TM: Equivalent time constant)
A guideline for SWD is STM/10.
Control is not executed when SWD = 0.
PI control is always executed when SWD (≠0) ≥ STM.

6.2.5 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.
Batch PID control is started as MAN is changed into AUTO.



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

Batch PID control also starts when the SP is changed or when the operation mode is switched from STOP to RUN.

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) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	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 (EU)	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 (EU)	

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.

6.3 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)

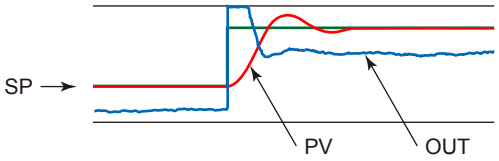
PV Derivative Type PID

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.

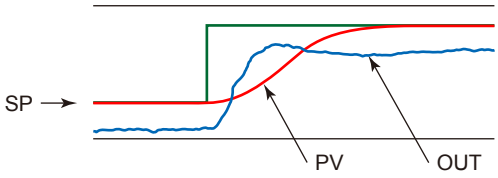
$$OUT = \frac{100}{P}\left(e + \frac{1}{Ti}\int e \cdot dt + Td\frac{d}{dt}\cdot \Delta PV\right)$$

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

PV Derivative Type PID (output bump at SP change)



PV Derivative Type PID (output bumpless at SP change)

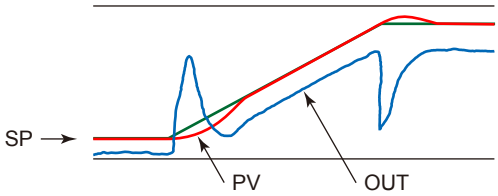


Deviation Derivative Type PID

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.

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

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

6.4 Switching PID

6.4.1 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

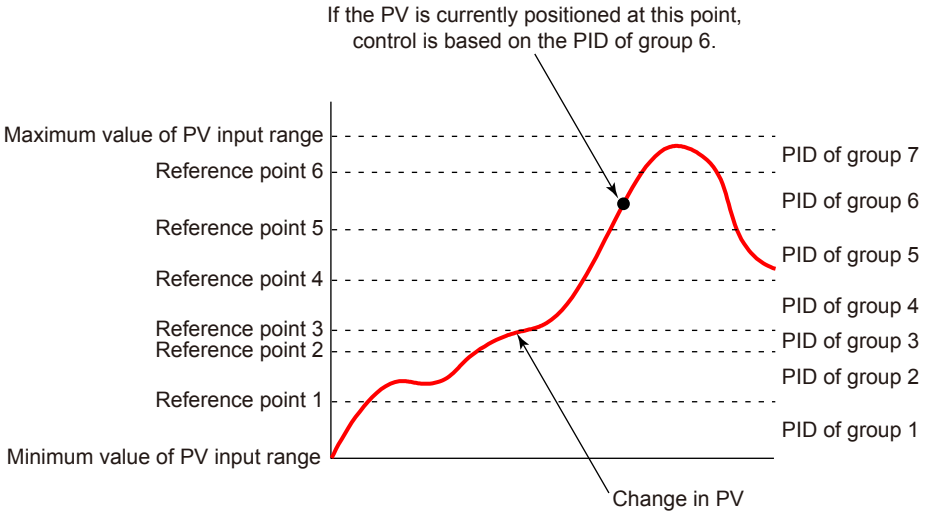
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

6.4.2 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. Reference deviation (RDV) in Section 6.4.5 Switching PID According to Deviation (Reference Deviation) and zone PID switching hysteresis (RHY) in Section 6.4.6 Setting Hysteresis at Time of PID Switch impact the PID group switch point.

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

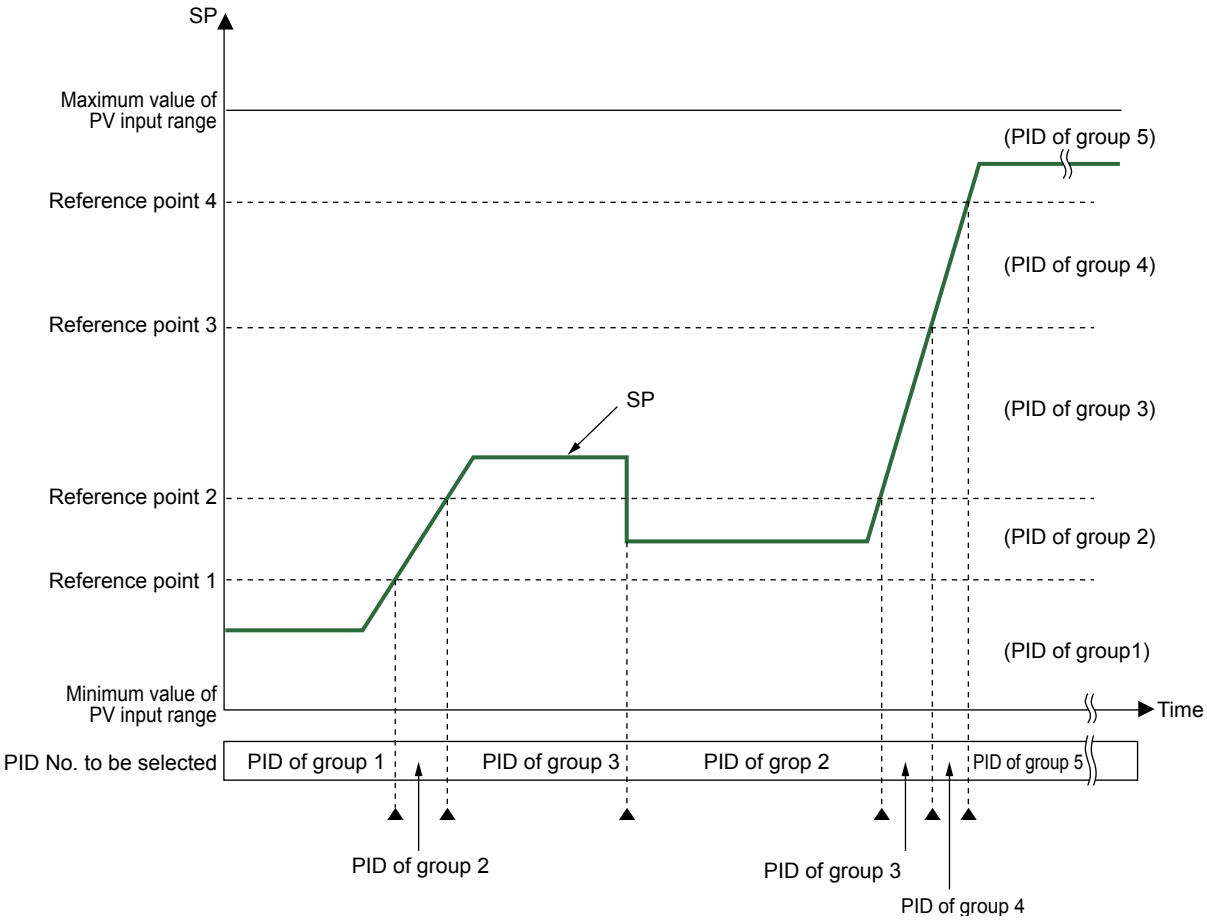
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

6.4.3 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.

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

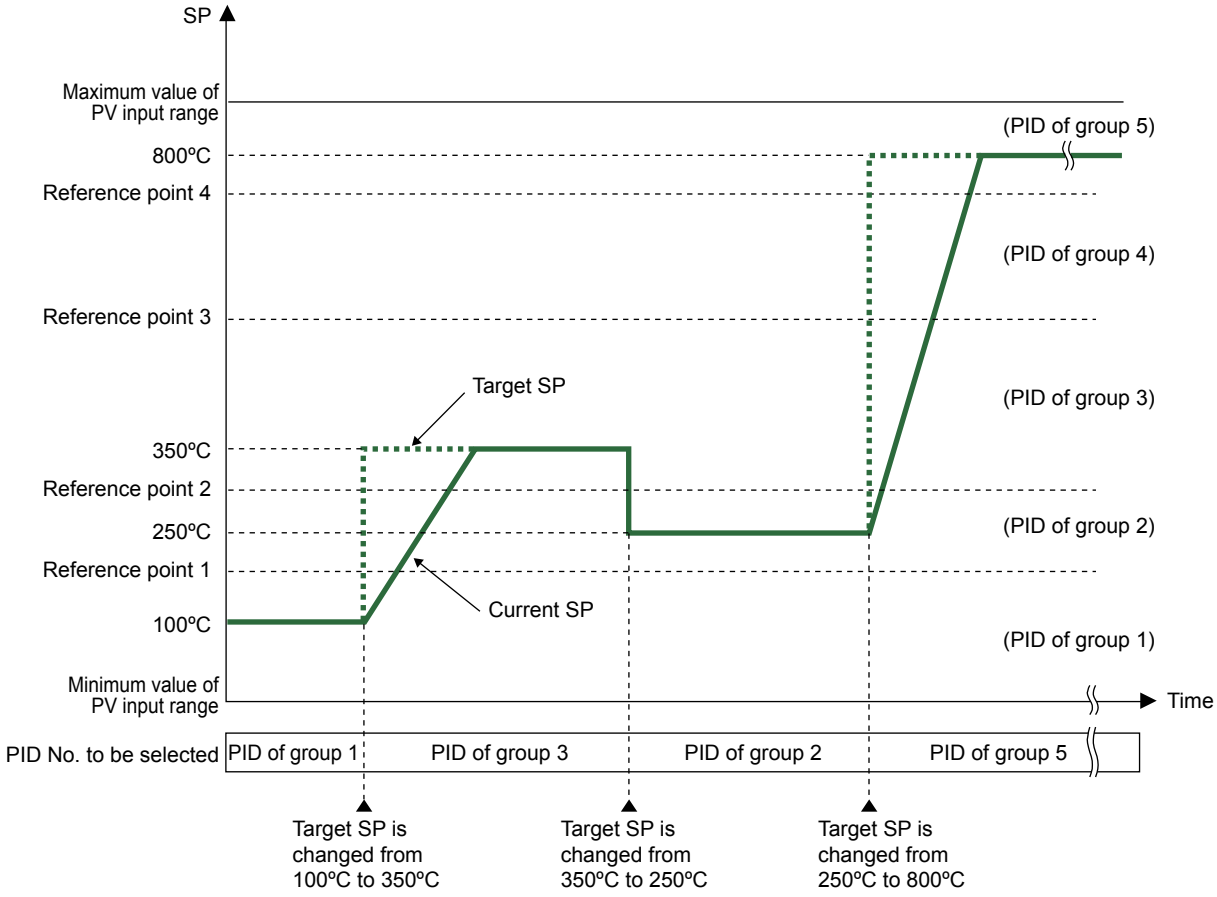
When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

6.4.4 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.

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.

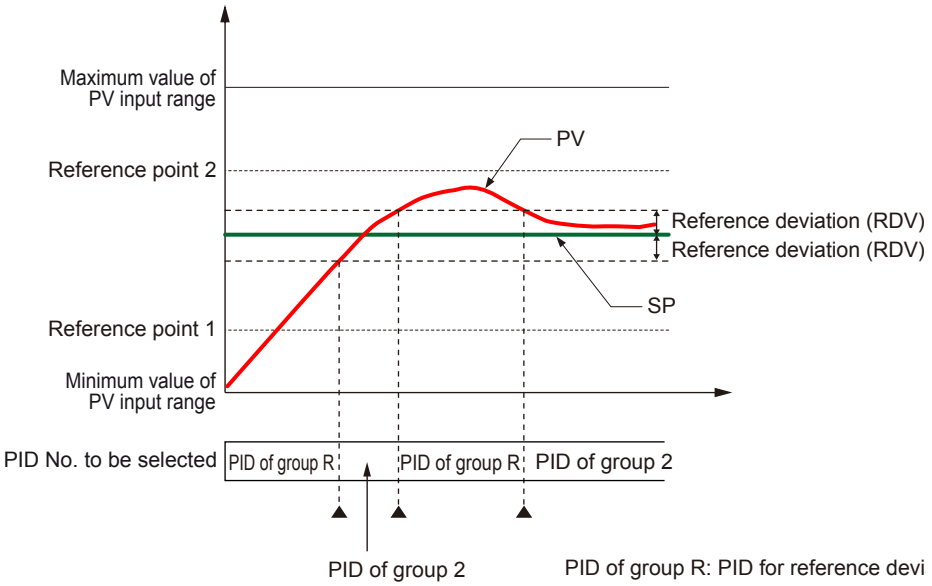
Note

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.

6.4.5 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

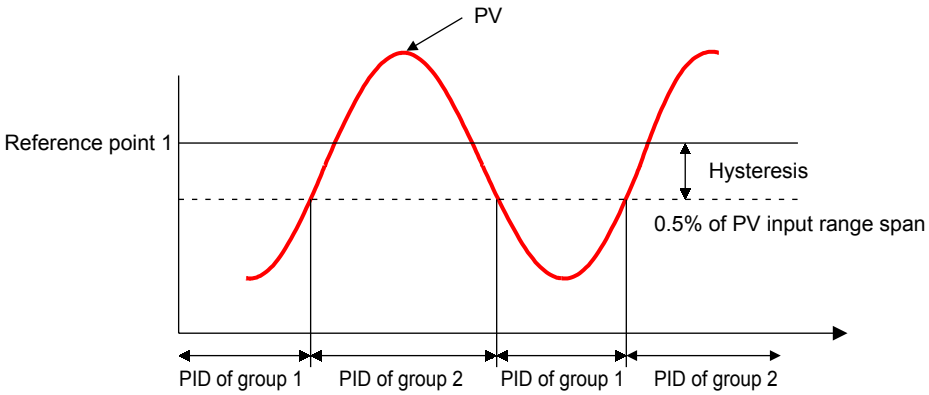
Parameter symbol	Name	Display level	Setting range	Menu symbol
ZON	Zone PID selection	STD	0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	CTL Set
RDV	Reference deviation	STD	OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EU)	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.

6.4.6 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 (EU)	ZONE Ope

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

6.4.7 Switching PID by Contact Input

Description

PID can be switched by contact input.

Setting Details

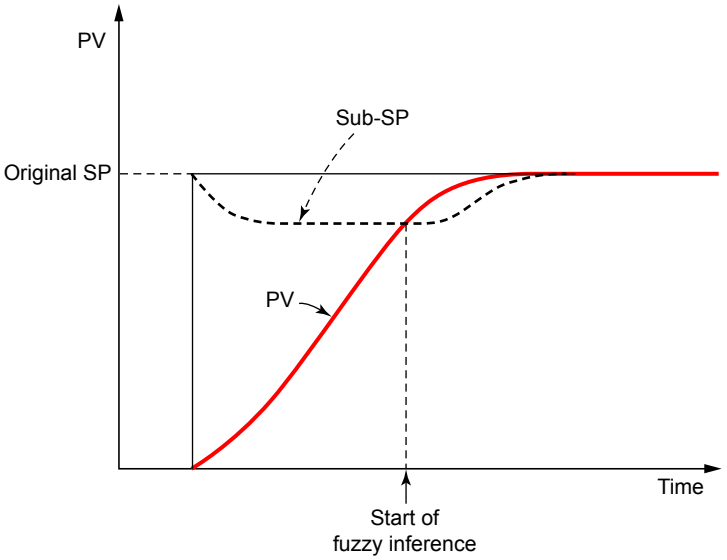
See Section 10.1 "Bit-0 to Bit-3 of PID Number (PN.B0 to PN.B3)"

6.5 Suppressing Overshoot (Super Function)

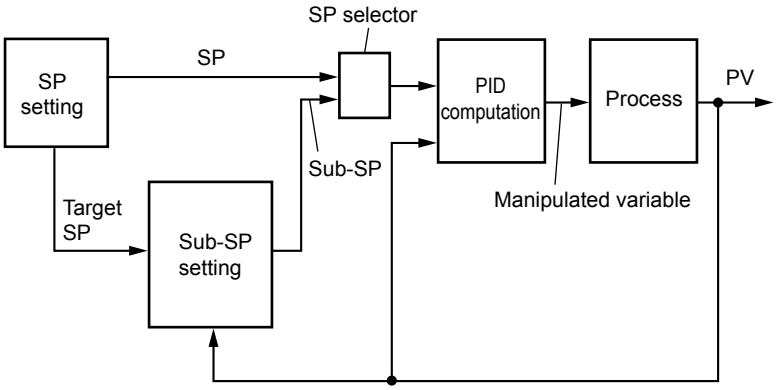
Description

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 Logic” 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.

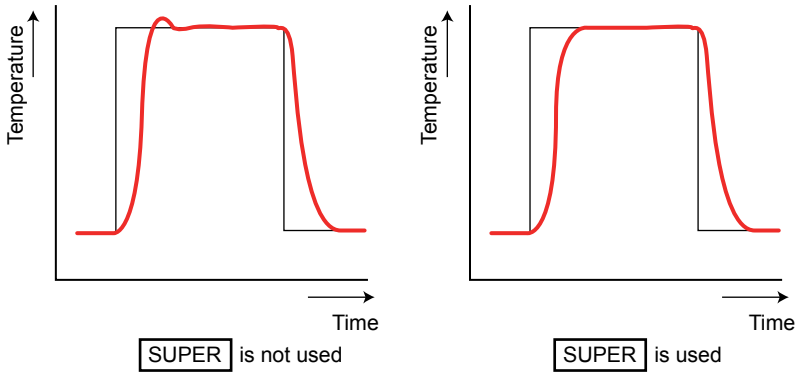
Operation Diagram



Control System Block Diagram

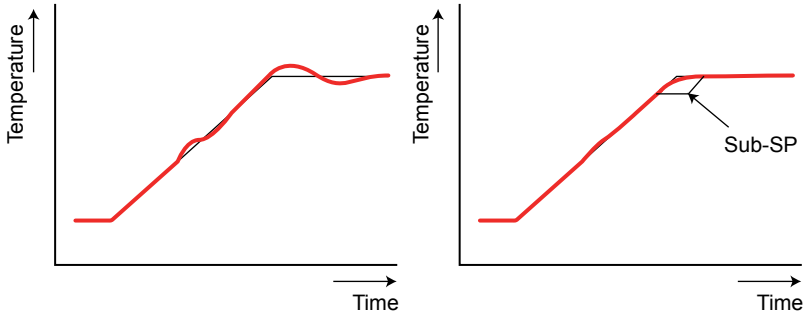


Example of Overshoot Suppression Control for Setpoint Changes



SUPER is not used　　SUPER is used

Example of Overshoot Suppression Control for Ramp to Setpoint



SUPER is not used　　SUPER is used

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

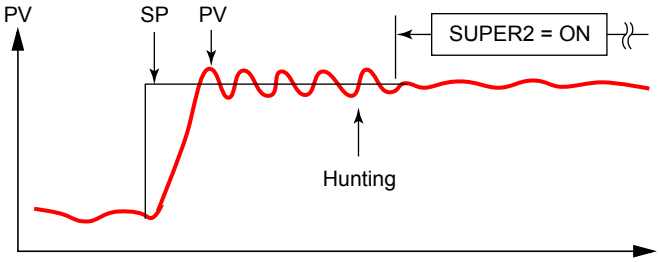
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

The setting SC=4 is effective compared with SC=1. However, the hunting may occur until the PV reaches SP.
Do not use the Super function for the Sample PI control or processes with fast response such as flow rate control and pressure control.

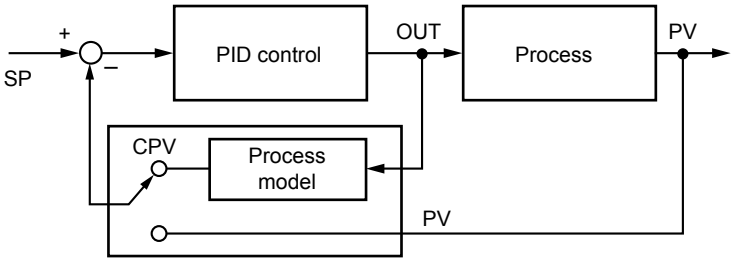
6.6 Suppressing Hunting (Super2 Function)

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.

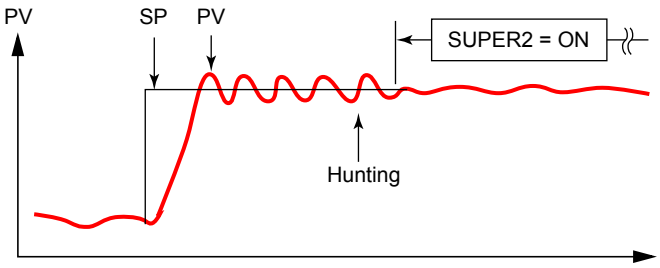


- In hunting condition, the Super2 function selects the output from process model as PV signal.
- The process model removes a factor of dead time from the actual process.
- The real process is under the open-loop condition.
- After hunting is suppressed, the Super2 function selects real PV signal, and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

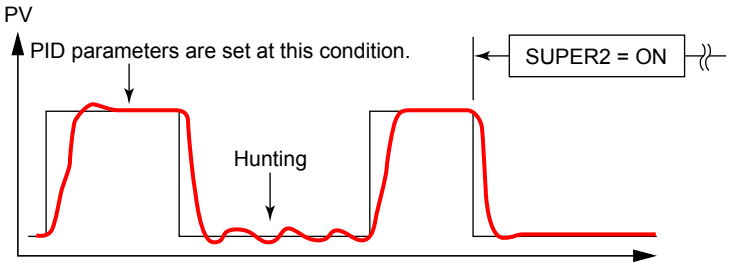


Effects of Super2

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.

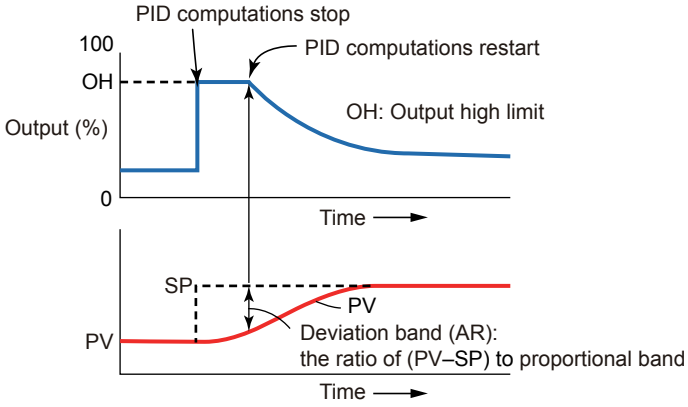
Set SC=2 when there are a lot of disturbances, and much hunting occurs.
Set SC=3 when SP is changed frequently. Hunting suppressing effect is smaller than that of SC=2, however, responsiveness is good.

Do not use the Super function for the Sample PI control.
This Super function does not work when the controller is configured for direct action or processes with fast response such as flow rate control and pressure control.

6.7 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.

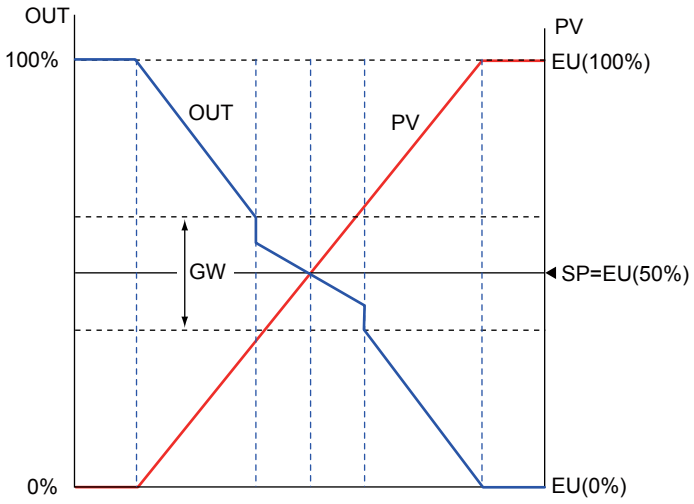
6.8 Performing Non-linear PID Control

Description

If a deviation (E) is smaller than the non-linear control gap width (GW), it is computed as a proportional added the non-linear 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 (EU)	TUNE Ope
GG	Non-linear control gain	PRO	0.001 to 1.000	

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

6.9 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.

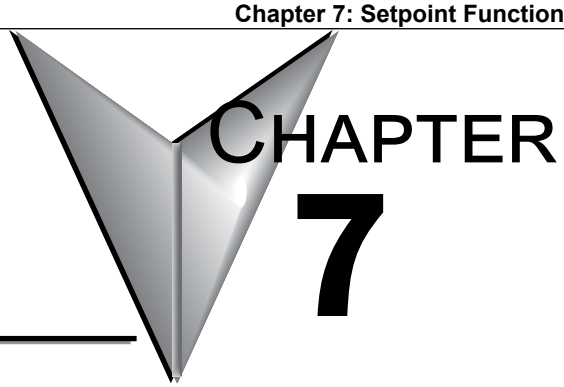
Note

In time proportional output, the output is turned on and off irrespective of the upper/lower limit.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
AT.TY	Auto-tuning type	STD	0: Normal 1: Stability	TUNE Ope
AT.OH	Output high limit in auto-tuning	PRO	-5.0 to 105.0% (Disabled in Heating/cooling control)	
AT.OL	Output low limit in auto-tuning	PRO		

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



CHAPTER 7

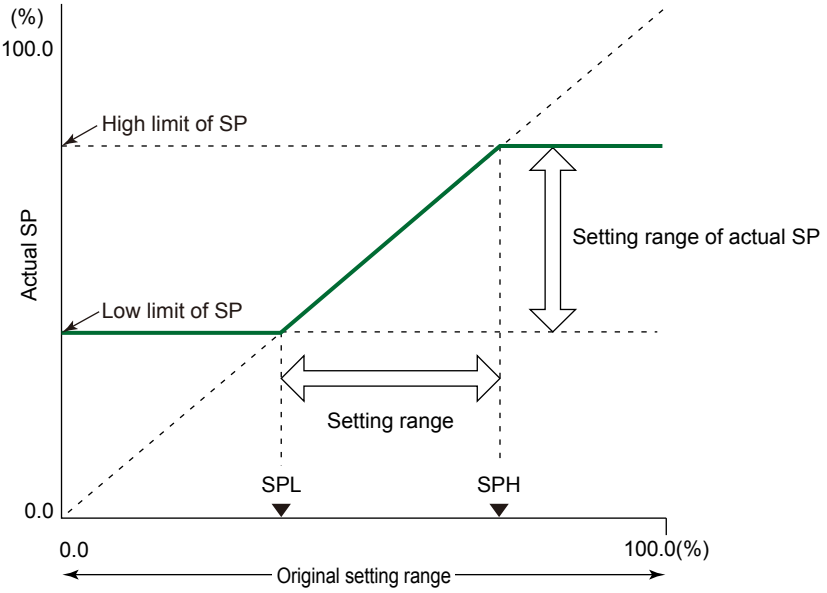
SETPOINT FUNCTIONS

Contents

7.1 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.



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.

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

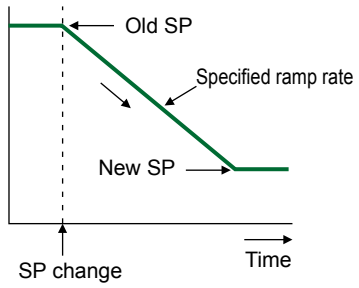
Description

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.

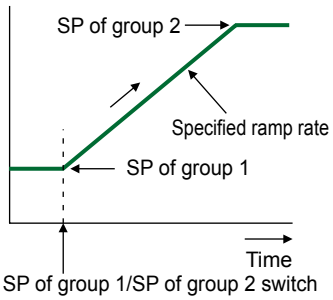
The SP ramp-rate setting function works when:
(1) SP is changed.
(2) SP is changed by switching SP number (SPNO).
(3) Power is turned on or has recovered from a failure (PV tracking=ON); or
(4) Operation mode is switched from MAN to AUTO (PV tracking=ON).

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

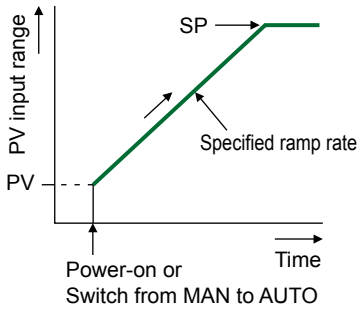
(1) When SP is changed

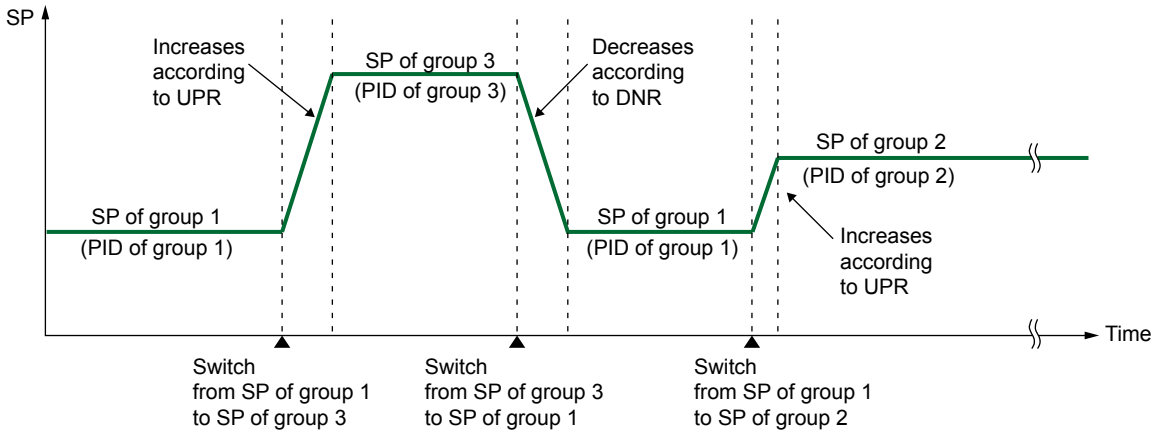


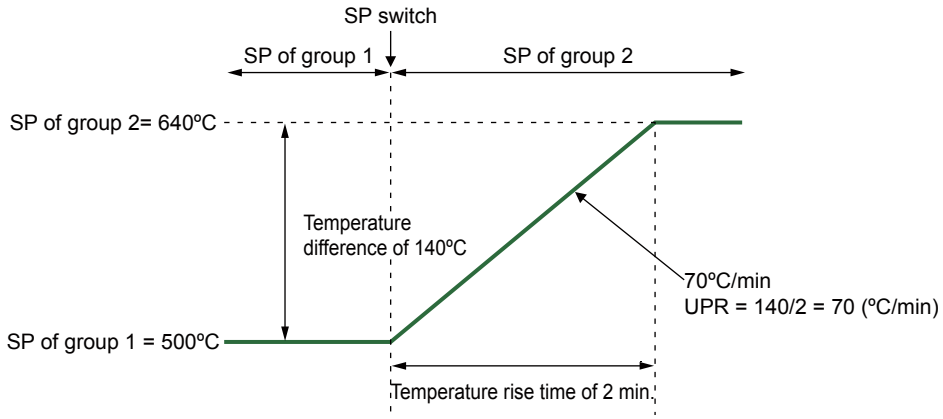
(2) When SP No. (SPNO) is switched



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







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

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 (EU)	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	

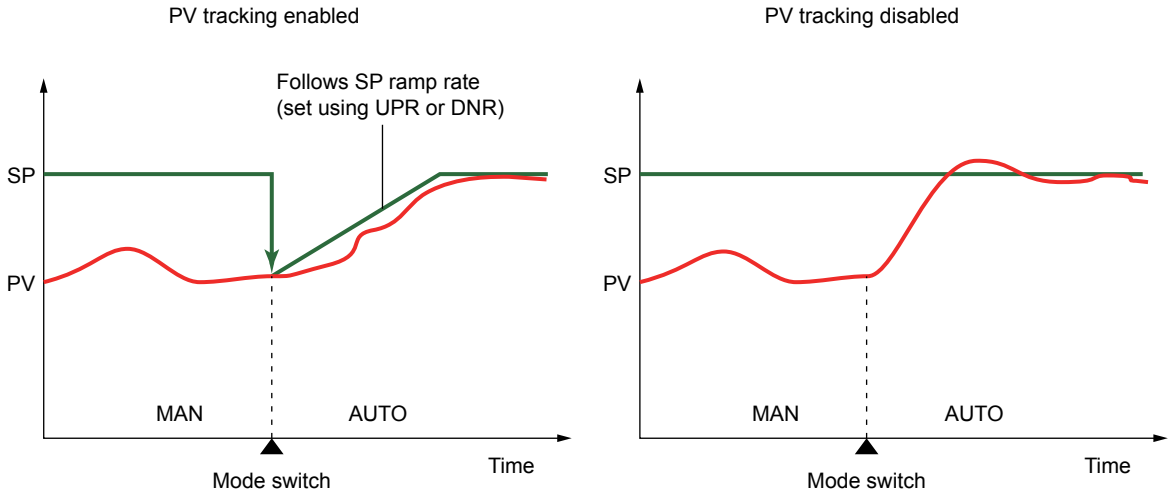
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

7.3 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.

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

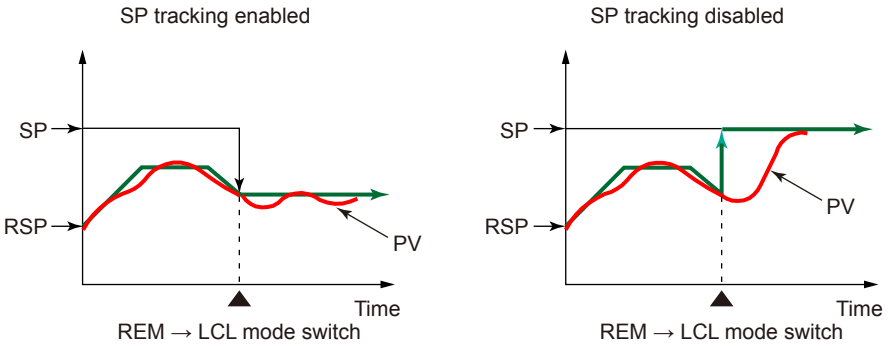
Parameter symbol	Name	Display level	Setting range	Menu symbol
PVT	PV tracking selection	STD	OFF, ON	SPS Ope

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

7.4 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.

CHAPTER 8

OUTPUT SETTING FUNCTIONS

Contents

8.1 Setting Control Output Type

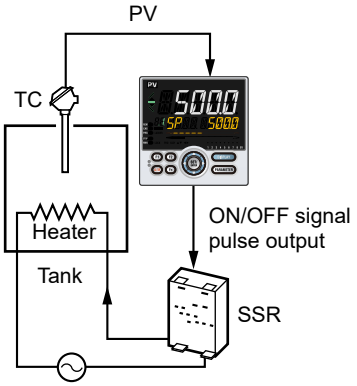
Description

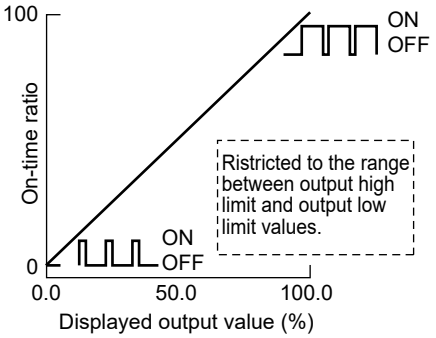
Time Proportional Relay Output / Time Proportional Voltage Pulse Output

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

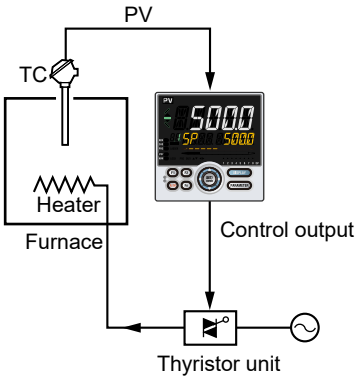
The output type is selected as either the relay output or the voltage pulse output.

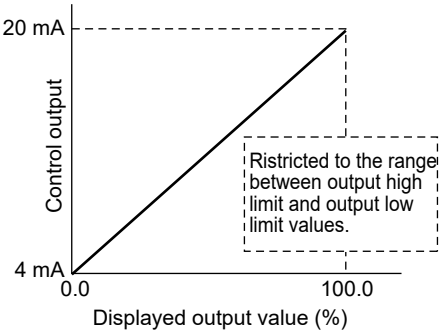




Current Output

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).

Setting Details

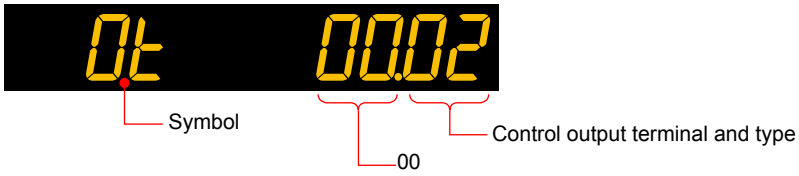
Parameter symbol	Name	Display level	Setting range	Menu symbol
OT	Output type selection	EASY	Control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay)	OUT Set

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

For each output terminal number see Section 1.4 Wiring.

Control Output (PID Control, ON/OFF Control, Sample PI Control, Batch PID Control)

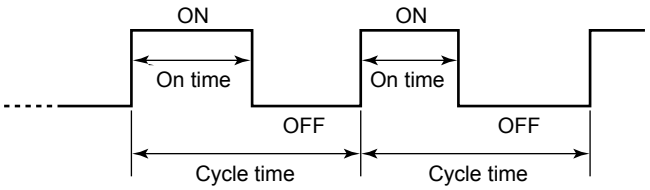
The figure below shows an example of setting the current output of the OUT terminal to the control output terminal and type. Set “02” to lower two digits and “00” to upper two digits.



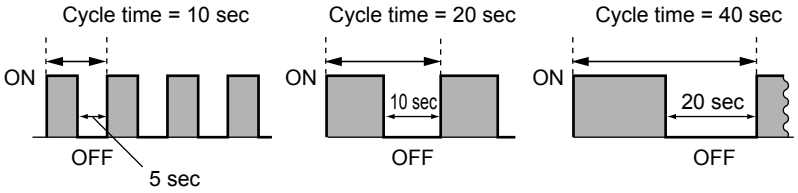
8.2 Setting Control Output Cycle Time

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%)



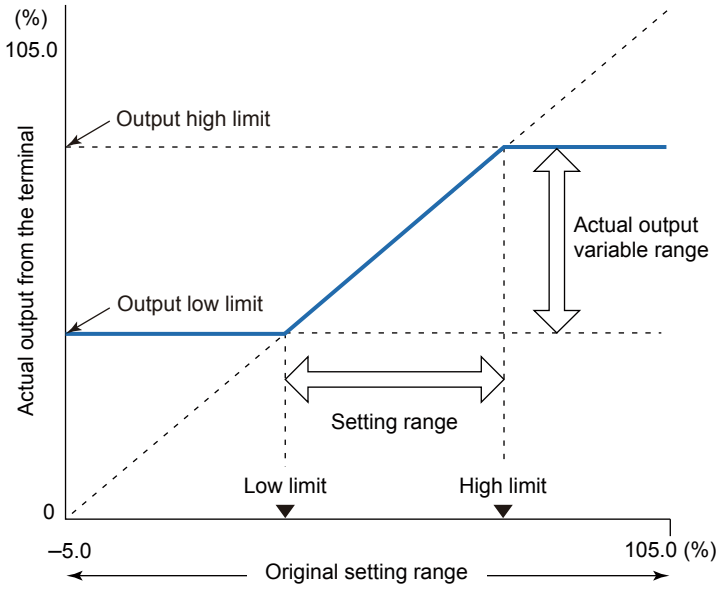
Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
CT	Control output cycle time	EASY	0.5 to 1000.0 s	OUT Set

8.3 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.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
OH	Control output high limit	EASY	-4.9 to 105.0%, (OL<OH)	PID Ope
OL	Control output low limit	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut	
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.

8.4 Disabling Output Limiter in MAN mode

Description

Output limiter can be released when in MAN mode.
Note that the output bump is caused if the operation mode is changed from MAN to AUTO 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

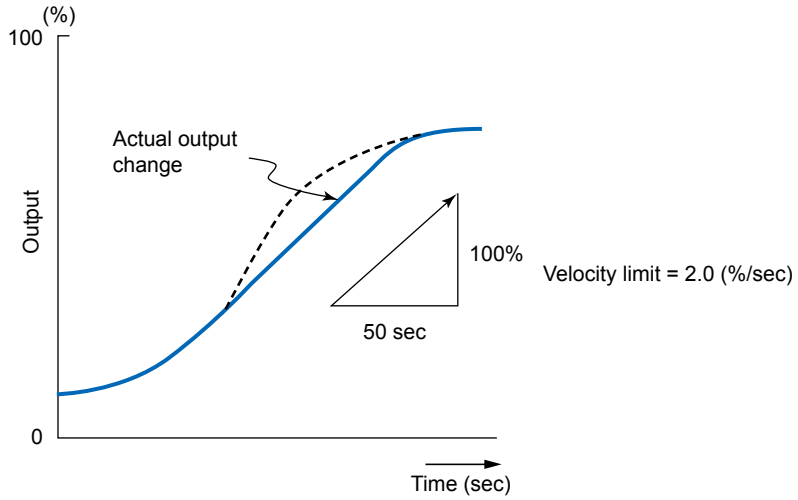
Parameter symbol	Name	Display level	Setting range	Menu symbol
OLMT	Output limiter switch	PRO	OFF: Disable output limiter in MAN mode ON: Enable output limiter in MAN mode	TUNE Ope

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

8.5 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 ON/OFF 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

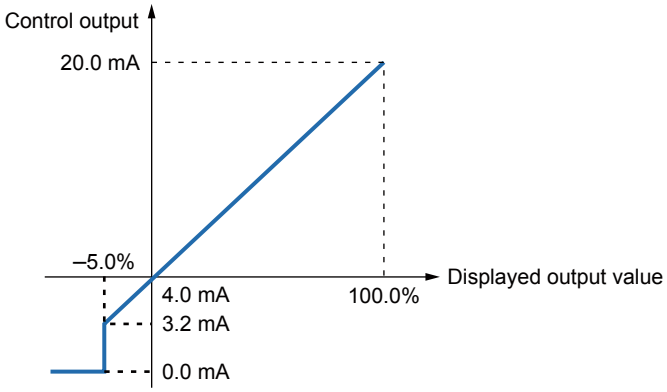
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

8.6 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	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut (0 mA output in MAN mode)	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.

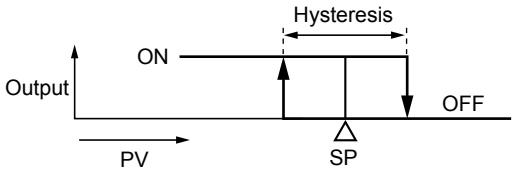
8.7 Setting ON/OFF Control Hysteresis

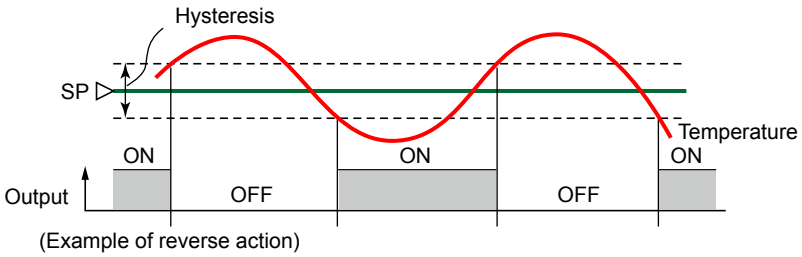
Description

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

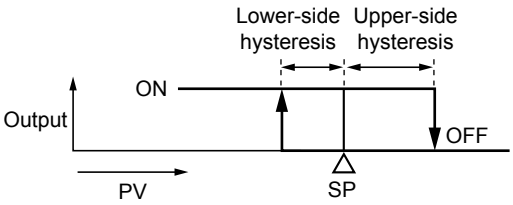
Set one point of hysteresis.

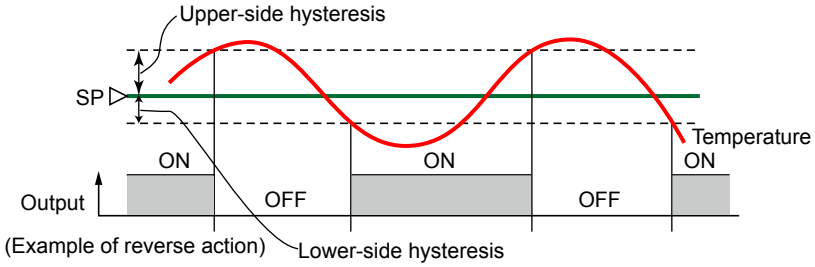




Two Points of Hysteresis

Set two points of hysteresis (upper-side hysteresis and lower-side hysteresis).





Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
HYS	Hysteresis (in ON/OFF control)	EASY	0.0 to 100.0% of PV input range span (EU)	PID Ope
HY.UP	Upper-side hysteresis (in ON/OFF 2 control)	EASY	0.0 to 100.0% of PV input range span (EU)	
HY.LO	Lower-side hysteresis (in ON/OFF 2 control)	EASY		
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.

8.8 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.

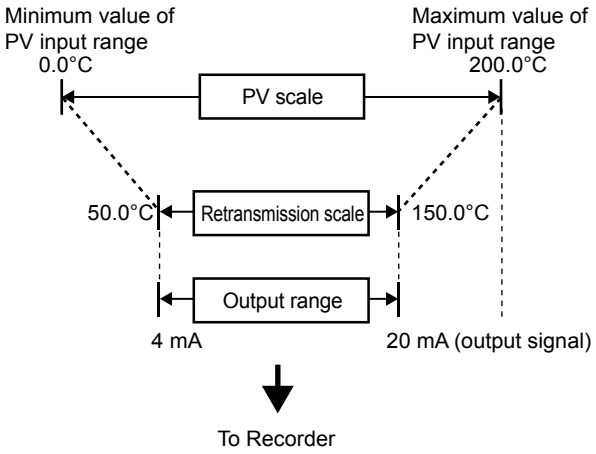
Note

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.

8.9 Setting Retransmission Output Terminal, Type, and Scales

Description

The OUT (O1RS) terminals can be used as retransmission output when control output is not assigned to them.
Confirm the output type selection (OT) before setting the retransmission output. The range can be changed.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RTS	Retransmission out RET	EASY	OFF: Disable PV1: PV SP1: SP OUT1: OUT LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Not used COUT1: Not used MV1: Not used TSP2: Loop-2 target SP HOUT2: Not used COUT2: Not used MV2: Not used PV: PV terminals analog input RSP: RSP terminals remote auxiliary analog input AIN2: Not used AIN4: Not used	OUT Set

(Continued)

Parameter symbol	Name	Display level	Setting range	Menu symbol
RTH	Maximum value of retransmission output scale of RET	STD	When RTS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, or RSP: 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.	OUT Set
RTL	Minimum value of retransmission output scale of RET	STD		
O1RS	Retransmission output type of OUT current output	STD	Same as RTS	
O1RH	Maximum value of retransmission output scale of OUT current output	STD	When O1RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV or RSP: 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.	
O1RL	Minimum value of retransmission output scale of OUT current output	STD		

Setpoints PV2, SP2 and OUT2: Can be used in Cascade control.
Setpoint TSP2: Can be used in Cascade control.
Setpoint RSP: Can be used when equipped with remote auxiliary input.

Parameters and Corresponding Terminals

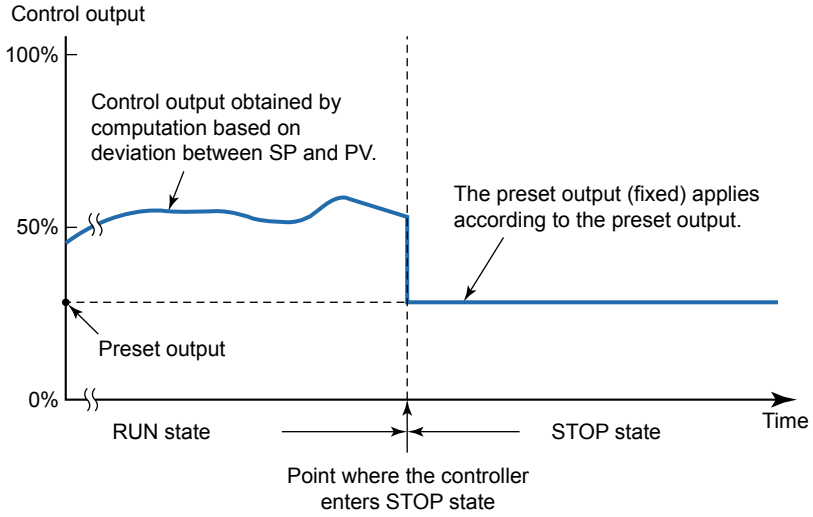
RTS, RTH, RTL	RET terminal
O1RS, O1RH, O1RL	OUT terminal

8.10 Setting Preset Output Value

8.10.1 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.



Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PO	Preset output	EASY	In STOP mode, fixed control output can be generated. -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, 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, 0.0% is output when the setting value is 0.0% or less and 100.0% is output when 0.1% or more.

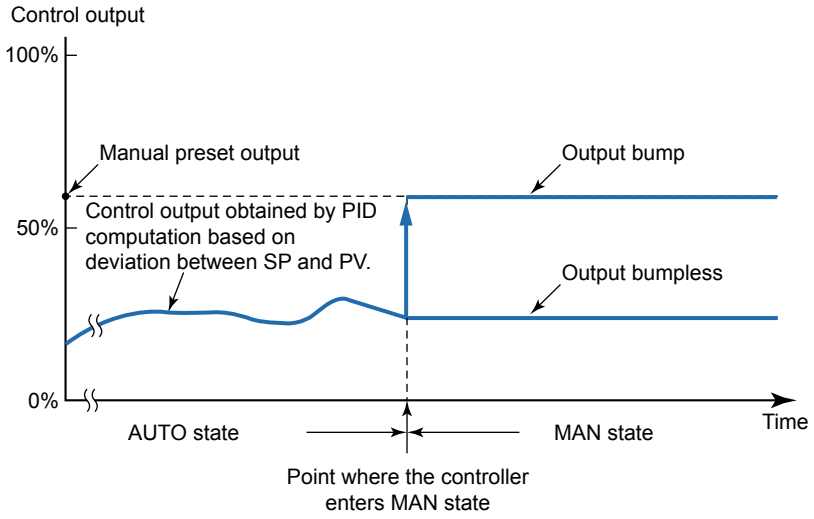
8.10.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

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.

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.

8.10.3 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

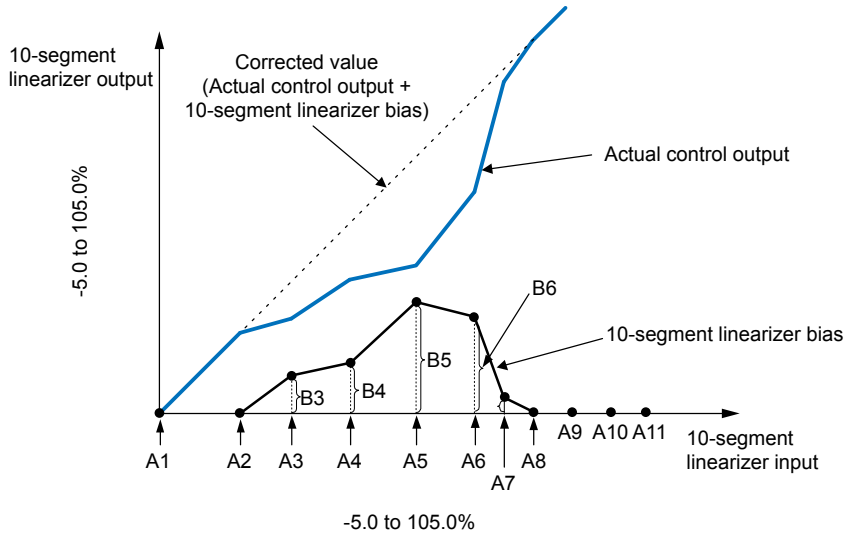
8.11 Setting 10-segment Linearizer for Output

Description

A total of up to four 10-segment linearizers can be used for the input unit and output unit.

10-segment Linearizer Biasing

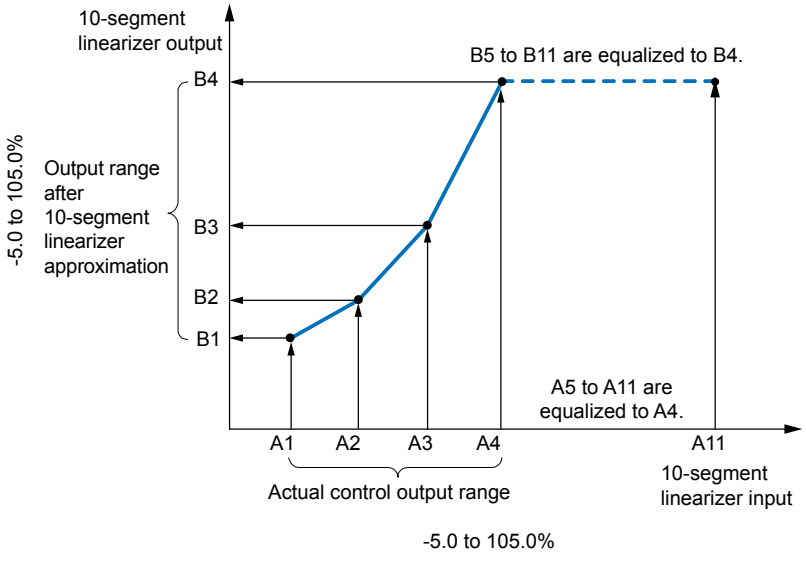
This function is used to correct the control output by adding the corresponding bias values to each of the 11 points of optionally set input values. When the 10-segment linearizer input is A1 or less, B1 is added. Moreover, the input is A11 or more, B11 is added.



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: Not used AIN4: Not used PVIN: PV input OUT: OUT analog output OUT2: Not used 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 (EU) 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 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 each sequential point is greater than or equal to the previous point.
- If the same setpoint is set for the two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.

8.12 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
RET.A	RET current output range	STD		

Parameters and Corresponding Terminals

OU.A	OUT terminal
RET.A	RET terminal

8.13 Setting Split Computation Output Function

Description

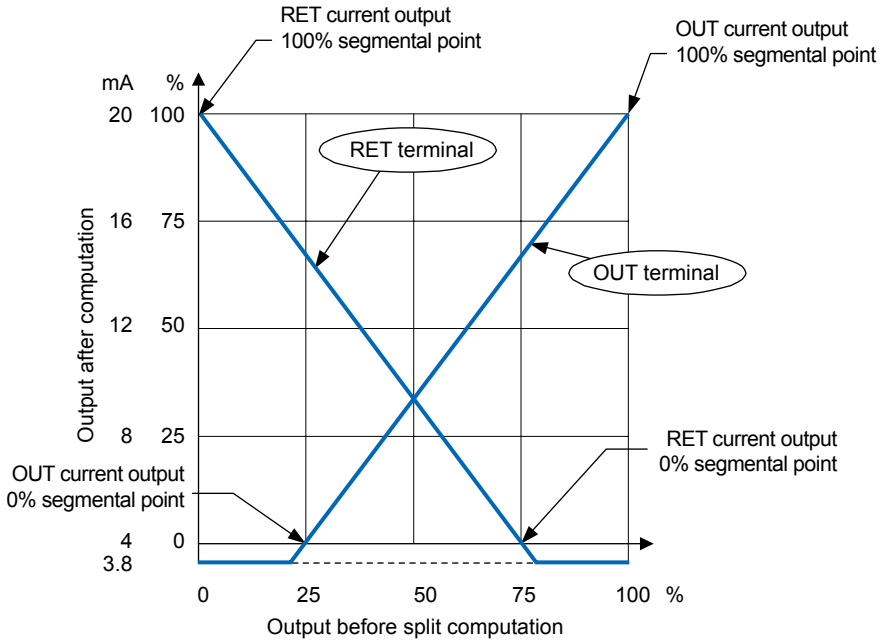
There are two characteristics of split computations: V-mode characteristics and Parallel-mode characteristics. The current output range can be changed.

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=OUT1
Current output 100% segmental point	OU.H=100.0%	RET.H=0.0%
Current output 0% segmental point	OU.L=25.0%	RET.L=75.0%
Current output range	OU.A=4-20	RET.A=4-20

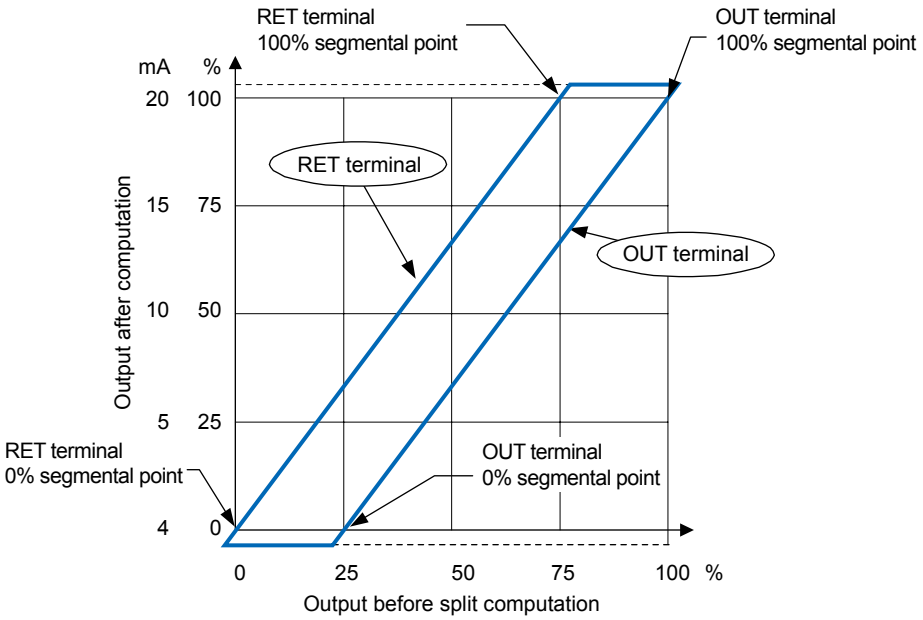


Parallel-mode Characteristics

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=OUT1
Current output 100% segmental point	OU.H=100.0%	RET.H=75.0%
Current output 0% segmental point	OU.L=25.0%	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		
RET.H	100% segmental point of RET current output	PRO		
RET.L	0% segmental point of RET current output	PRO		

Parameters and Corresponding Terminals

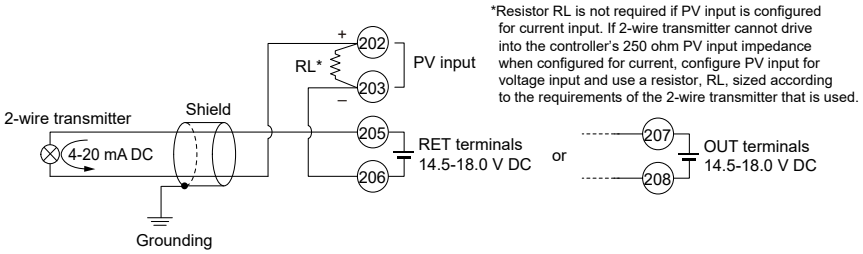
OU.H, OU.L	OUT terminal
RET.H, RET.L	RET terminal

8.14 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.

Loop power supply connection to a 2-wire transmitter.

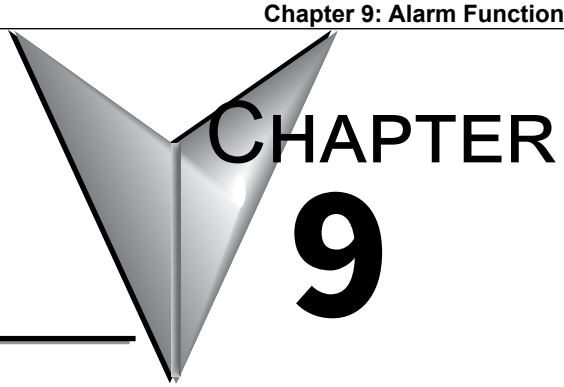


Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
RTS	Retransmission output type of RET	EASY	OFF: Disable PV1: PV SP1: SP OUT1: OUT LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Not used COUT1: Not used MV1: Not used TSP2: Loop-2 target SP HOUT2: Not used COUT2: Not used MV2: Not used PV: PV terminals analog input RSP: RSP terminals analog input AIN2: Not used AIN4: Not used	OUT Set
O1RS	Retransmission output type of OUT current output	EASY		

Parameters and Corresponding Terminals

RTS	RET terminal
O1RS	OUT terminal



CHAPTER 9

ALARM FUNCTIONS

Contents

9.1 Setting Alarm Type

Description

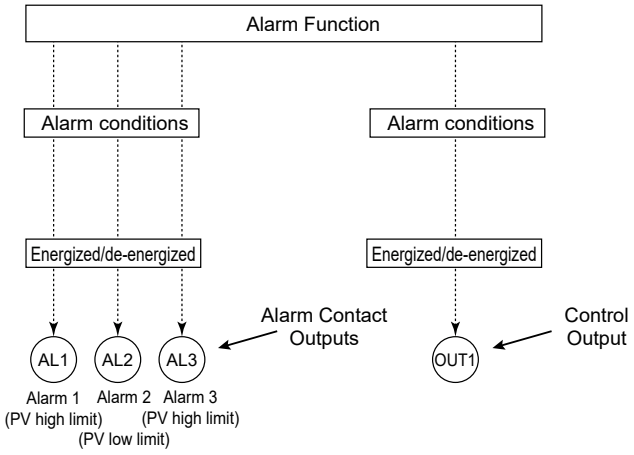
The alarm-related parameters consist of the alarm type (type, stand-by action, energized/de-energized, and latch function), PV velocity alarm time setpoint, alarm hysteresis, alarm (On-/Off-) delay timer, and alarm setpoint.
In Cascade control, both of Loop 1 and Loop 2 have these parameters.

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)

Both 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.

Alarm output can be assigned to the unused control relay output.

Energized/de-energized of alarm output can be changed.

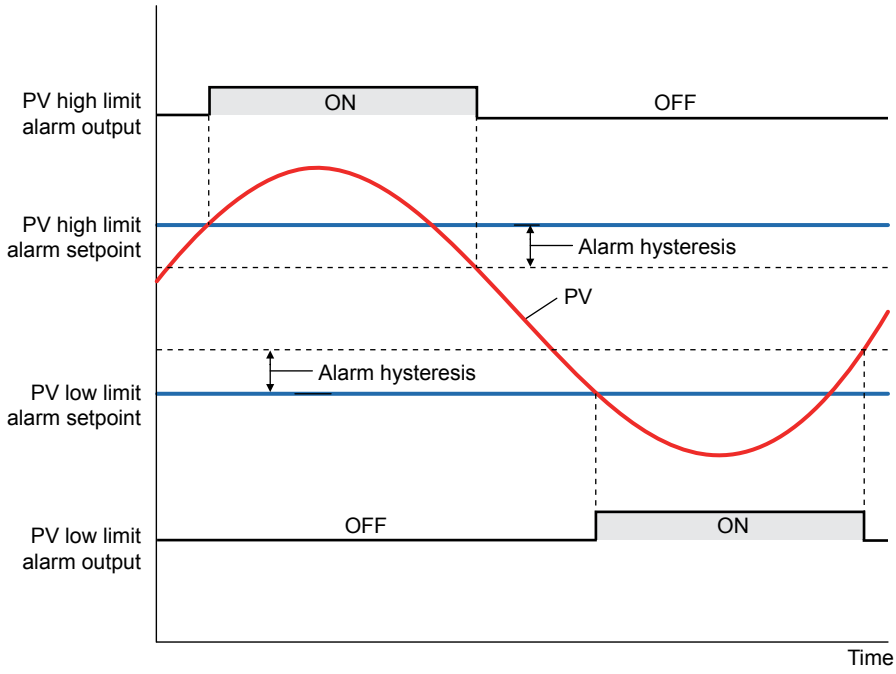


* The above figure shows the default case of single-loop control mode. To change an alarm contact output or control ouput assignment, see section 10.2.1 Setting Function of Contact Output
* OUT1 can be used for alarm output when the relay outputs are not used for control output.

The following table shows the initial setting for each control mode.

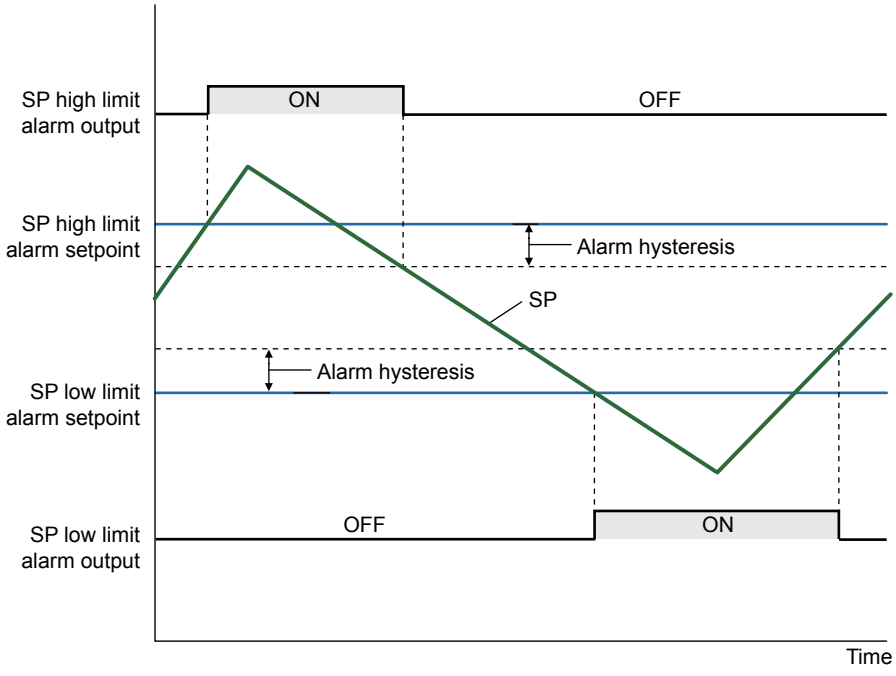
Control mode	AL1 terminal	AL2 terminal	AL3 terminal
Single-loop Control Loop Control with PV Switching Loop Control with PV Auto-selector Loop Control with PV-hold Function	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	Alarm 3 (PV high limit)
Cascade Primary-loop Control Loop Control for Backup	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	FAIL
Cascade Secondary-loop Control	Alarm 1 (PV high limit)	Alarm 2 (PV low limit)	Tracking switch (to Loop-1 controller)
Cascade Control	Alarm 1 (Loop-1 PV high limit)	Alarm 2 (Loop-1 PV low limit)	Alarm 3 (Loop-1 PV high limit)

PV High Limit Alarm and PV Low Limit Alarm



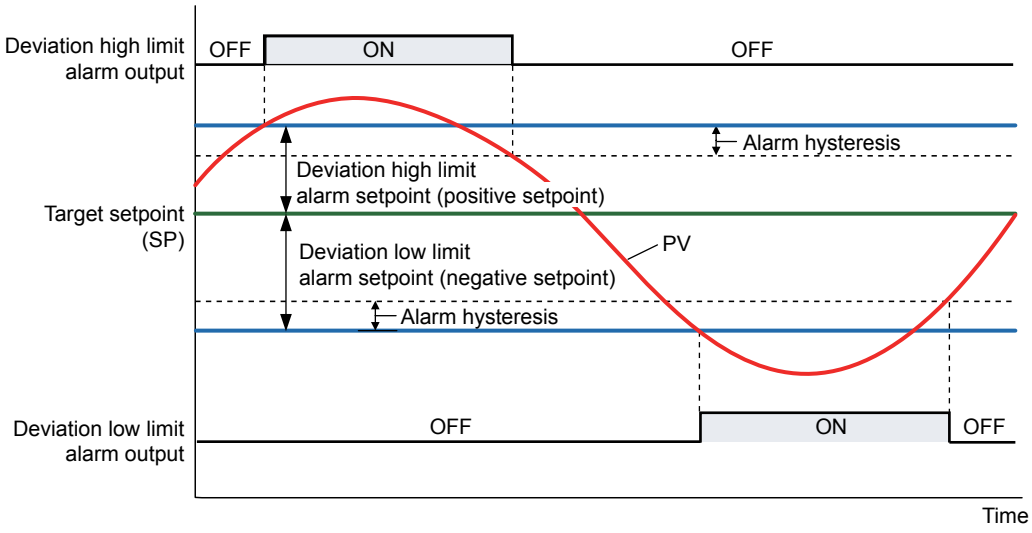
Contact type in the figure above: Energized when an event occurs (factory default).

SP High Limit Alarm and SP Low Limit Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

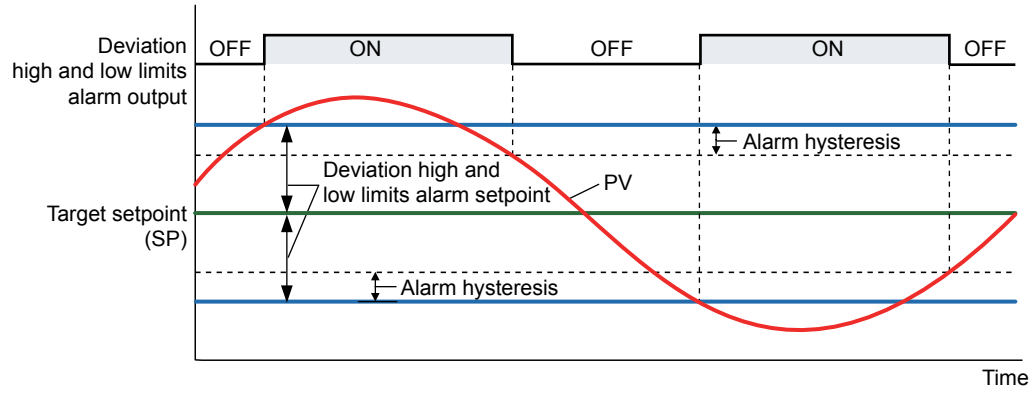
Deviation High Limit Alarm and Deviation Low Limit Alarm, Deviation(%) High Limit Alarm, Deviation(%) Low Limit Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

When a negative setpoint is set for the deviation high limit alarm setpoint, the deviation setpoint will be lower than the SP.
Moreover, when a positive setpoint is set for the deviation low limit alarm setpoint, the deviation setpoint will be higher than the SP.
Set the alarm setpoints and hysteresis for deviation(%) high limit and deviation(%) low limit alarms as percentages of the setpoint. Set the alarm setpoint of the deviation low limit alarm with a negative value.

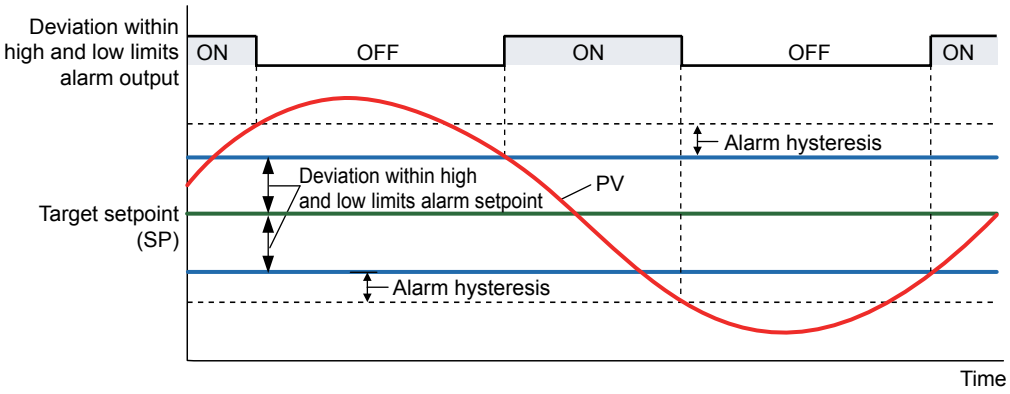
Deviation High and Low Limits Alarm, Deviation(%) High and Low Limits Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

Set the alarm setpoint and hysteresis for a deviation(%) high and low limits as percentages of the setpoint.

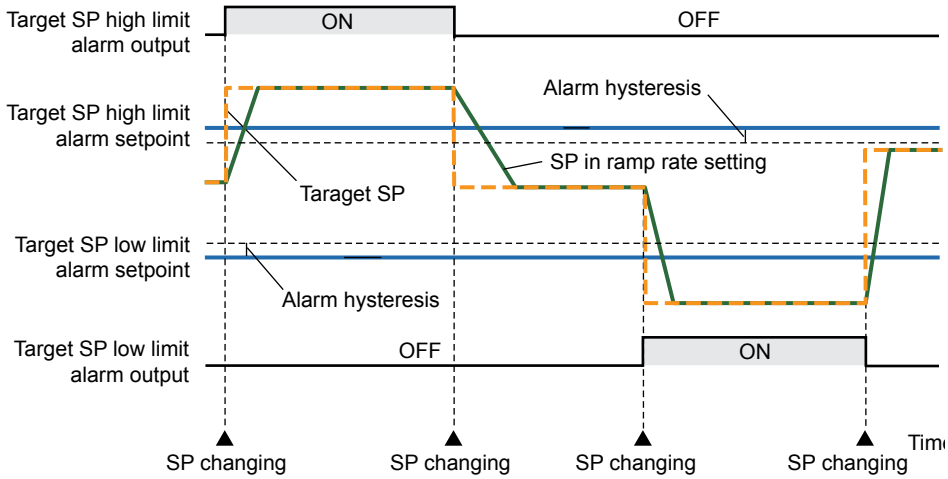
Deviation within High and Low Limits Alarm, Deviation(%) within High and Low Limits Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

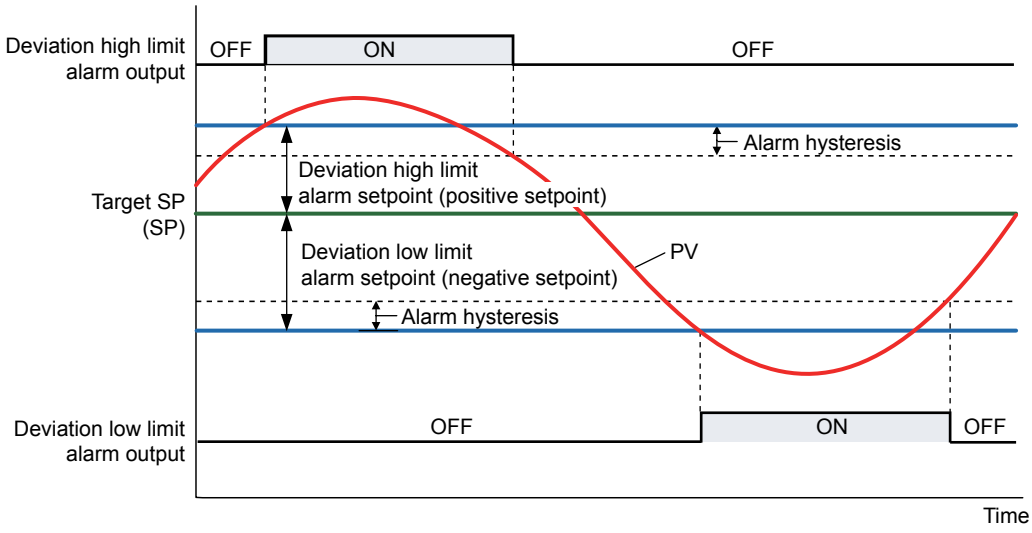
Set the alarm setpoint and hysteresis for a deviation(%) within high and low limits as percentages of the setpoint.

Target SP High Limit Alarm and Target SP Low Limit Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

Target SP Deviation High Limit Alarm and Target SP Deviation Low Limit Alarm, Target SP Deviation(%) High Limit Alarm, Target SP Deviation(%) Low Limit

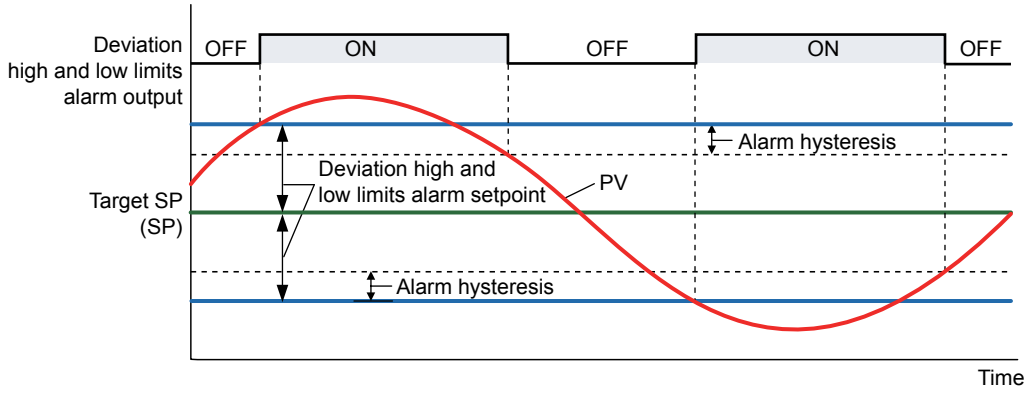


Contact type in the figure above: Energized when an event occurs (factory default).
* Target SP: a set target setpoint. When the ramp-rate is set, it becomes a final target setpoint.

When a negative setpoint is set for the deviation high limit alarm setpoint, the deviation setpoint will be lower than the target SP.
Moreover, when a positive setpoint is set for the deviation low limit alarm setpoint, the deviation setpoint will be higher than the target SP.

Set the alarm setpoints and hysteresis for a target SP deviation(%) high limit alarm and target SP deviation(%) low limit alarm as percentages of the setpoint.

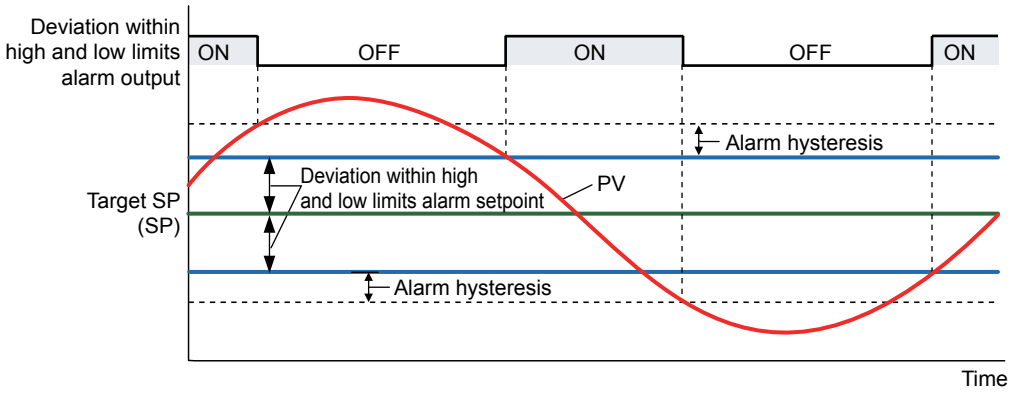
Target SP Deviation High and Low Limits Alarm, Target SP Deviation(%) High and Low Limits Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

Set the alarm setpoint and hysteresis for a target SP deviation(%) high and low limits alarm as percentages of the setpoint.

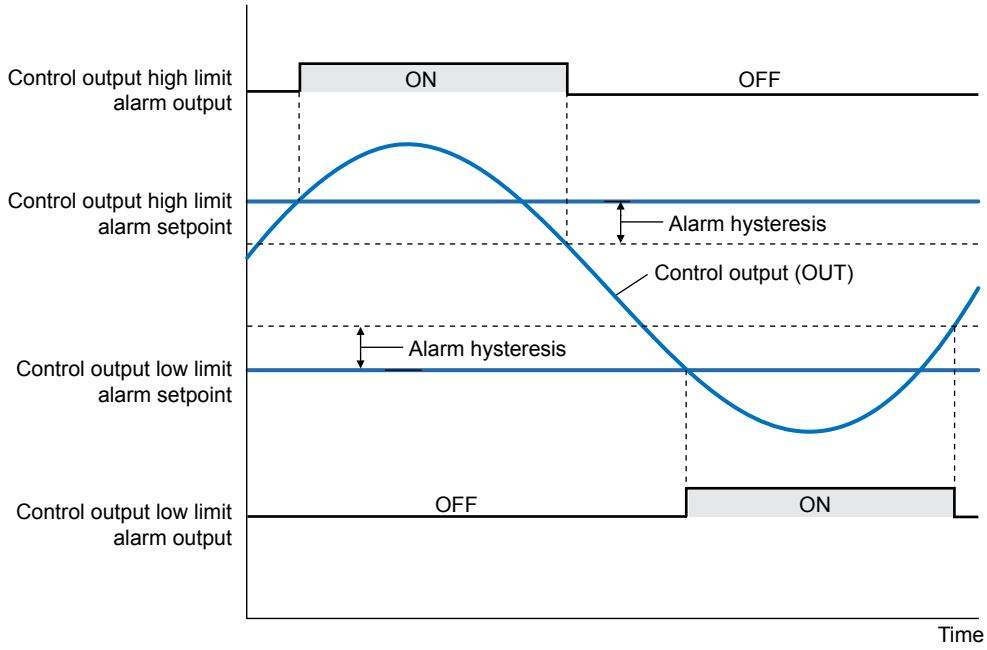
Target SP Deviation within High and Low Limits Alarm, Target SP Deviation(%) within High and Low Limits Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

Set the alarm setpoint and hysteresis for a target SP deviation(%) within high and low limits alarm as percentages of the setpoint.

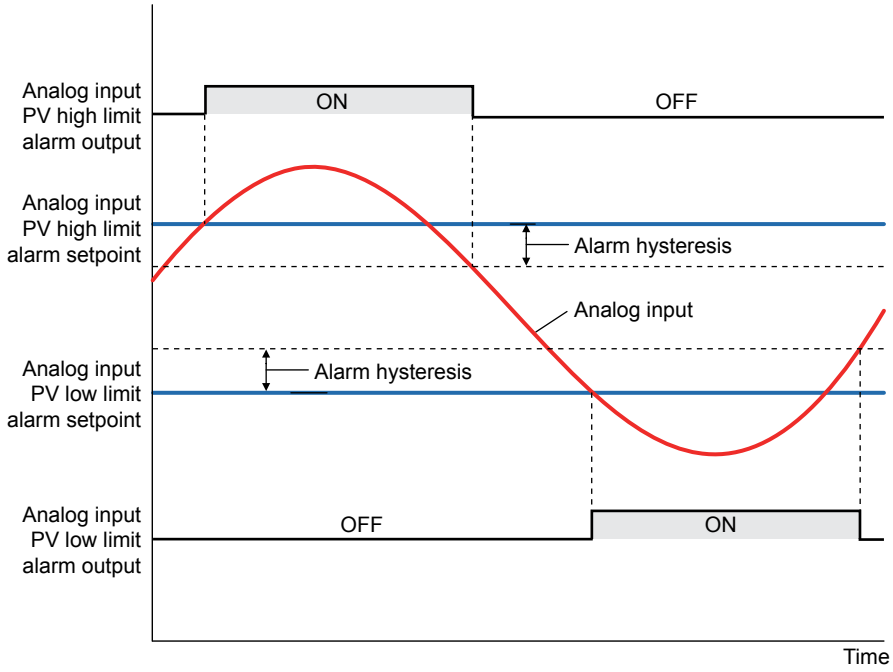
Control Output High Limit Alarm and Control Output Low Limit Alarm



Contact type in the figure above: Energized when an event occurs (factory default).

Analog Input PV High Limit Alarm and Analog Input PV Low Limit Alarm

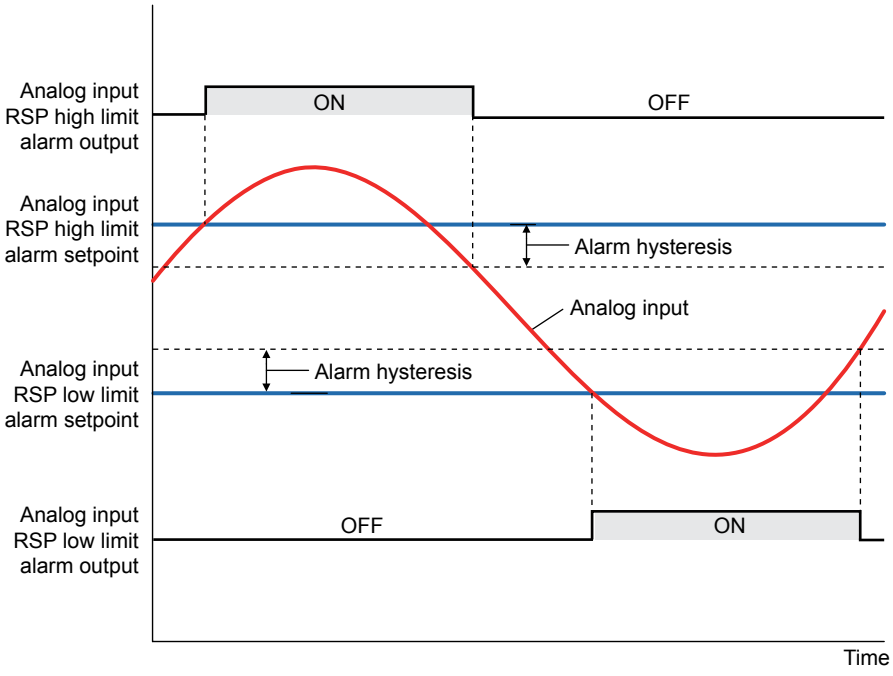
These alarms monitor the input value after the analog input computation process is completed.



Contact type in the figure above: Energized when an event occurs (factory default).

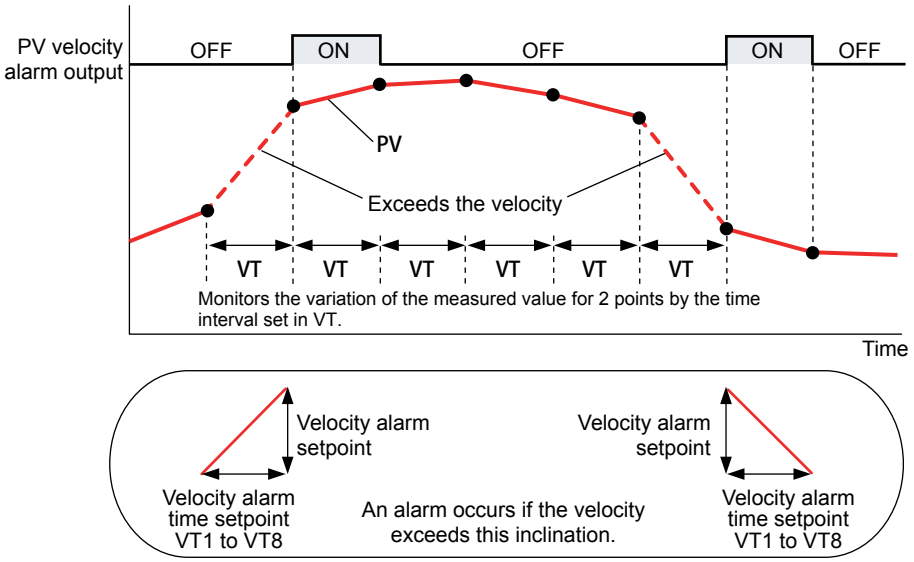
Analog Input RSP High limit Alarm and Analog Input RSP Low Limit Alarm (PPC5-110x Models)

These alarms monitor the input value after the analog input computation process is completed.



Contact type in the figure above: Energized when an event occurs (factory default).

PV Velocity Alarm



Contact type in the figure above: Energized 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 energized).

- Burnout of PV input or RSP remote auxiliary analog input
- ADC failure of PV input or RSP remote auxiliary analog input
- Reference junction compensation (RJC) error of PV input

The fault diagnosis alarm does not work the stand-by action functions.

FAIL output

When the FAIL condition is caused (faulty MCU or system data error), DO (alarm output) turned off regardless of contact type.
The FAIL output does not work the alarm latch, the energized/de-energized and the stand-by action functions.

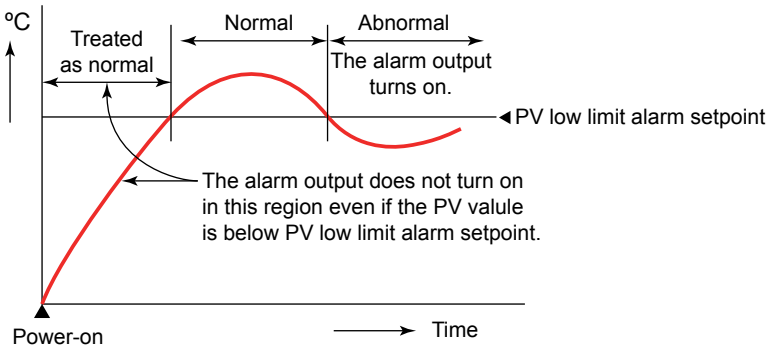
Stand-by Action

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

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

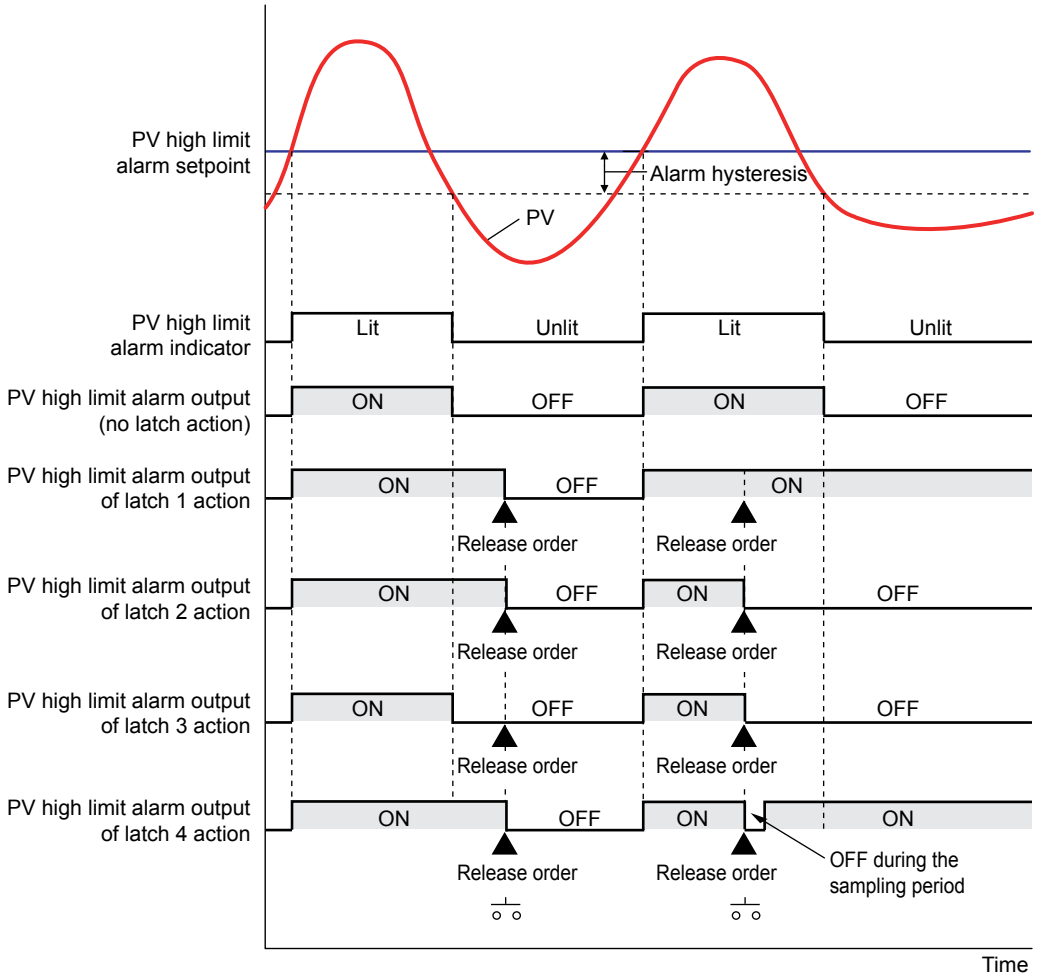
Always forces cancelling of the alarm output when an order to release the alarm latch is received. (Alarm output OFF)

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

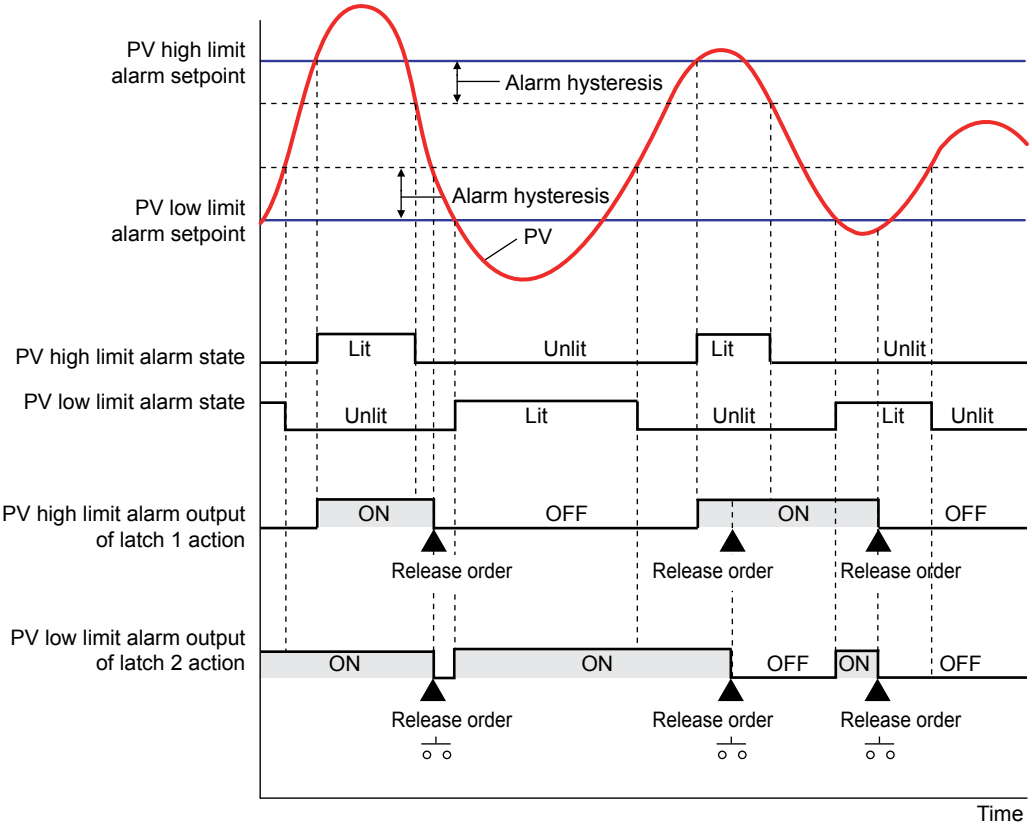
Cancels the alarm output when an order to release the alarm latch is received. (Alarm output OFF.)
However, cancels the alarm output for the duration of the sampling period (control period) if an order to release the alarm latch is received during alarm condition. (Alarm output OFF)



Contact type in the figure above: Energized when an event occurs (factory default).

Release of Alarm Latch

The alarm latch function can be cancelled by the user function key, via communication or by contact input.
Cancelling the alarm latch function cancels all latched alarm outputs.



Contact type in the figure above: Energized when an event occurs (factory default).

Operation of Alarm Output and Display Lamp (EV)

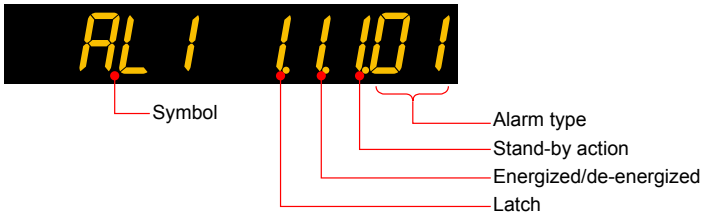
The contact output and display lamp (EV) are usually output and displayed according to the setpoint of the alarm type. However, the alarm conditions (operations) of the normal action, and latch action can be assigned to the contact output and display lamp (EV), regardless of the setpoint of the alarm type. (Two operations can be assigned simultaneously.)

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.

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 1)	Energized (0) / de-energized (1)	Stand-by action Without (0) / with (1)	Alarm type
Disable	- (Note 2)	- (Note 2)	- (Note 2)	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
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
PV velocity	0 / 1 / 2 / 3 / 4	0 / 1	- (Note 2)	29
Fault diagnosis	0 / 1 / 2 / 3 / 4	0 / 1	- (Note 2)	30
FAIL	- (Note 2)	- (Note 2)	- (Note 2)	31
Deviation(%) high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	32
Deviation(%) low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	33
Deviation(%) high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	34
Deviation(%) within high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	35
Target SP deviation(%) high limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	36
Target SP deviation(%) low limit	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	37
Target SP deviation(%) high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	38
Target SP deviation(%) within high and low limits	0 / 1 / 2 / 3 / 4	0 / 1	0 / 1	39

Note 1: 0: No latch function, 1: Latch 1, 2: Latch 2, 3: Latch 3, 4: Latch 4
Note 2: -: Alarm function doesn't work even if any value is set.

9.2 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.

If the number of alarms is set to zero, alarm setpoint parameters, alarm type parameters, and menu are not displayed.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
ALNO.	Number of alarm groups	PRO	0 to 8	CTL Set

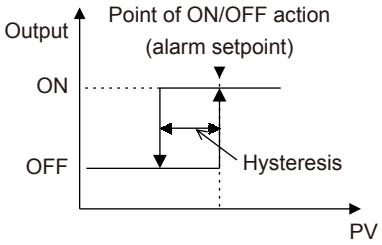
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

9.3 Setting Hysteresis to Alarm Operation

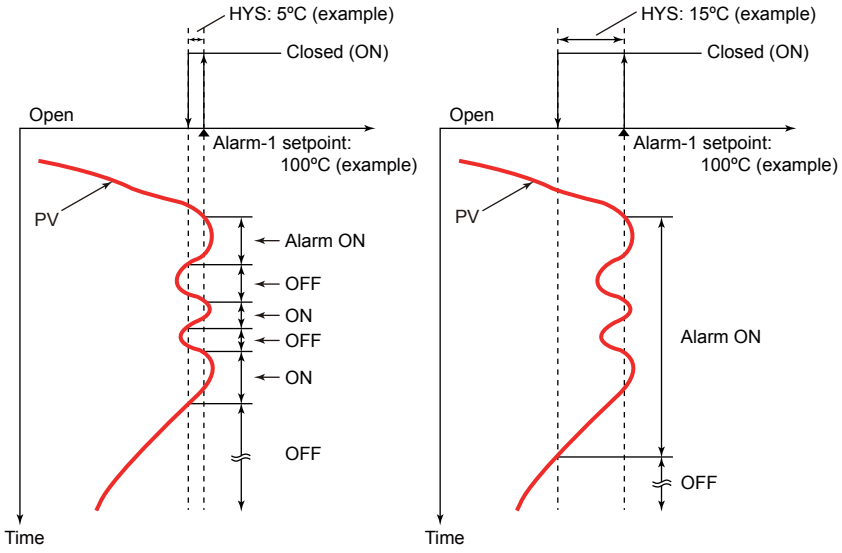
Description

Prevent frequent alarm switching 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

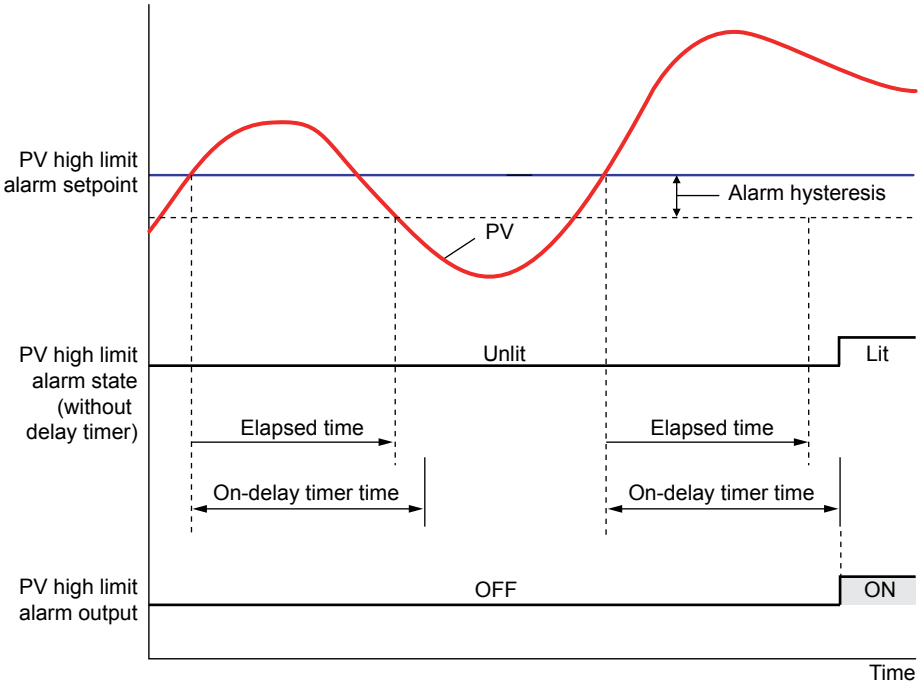
Parameter symbol	Name	Display level	Setting range	Menu symbol
HY1 to HY8	Alarm-1 to -8 hysteresis	EASY	Sets the hysteresis setpoint as a display value. -19999 to 30000 (set it within the input range) The decimal point position depends on the input type.	ALRM Ope

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

9.4 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 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.

9.5 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.	ALM Set
OR.D	OUT relay contact type	PRO	0: Closes the contact when an event occurs 1: Opens the contact when an event occurs.	

Parameters and Corresponding Terminals

OR.S, OR.D	OUT terminal

9.6 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.

CHAPTER 10

CONTACT INPUT AND OUTPUT FUNCTIONS

Contents

10.1 Setting Contact Input Function

10.1.1 Setting Contact Input Function

Description

The contact input function works by setting the contact input internal relay number (I relay) for DI1, DI2, and DI3 (DI16 for PPC5-110x models) to functions such as the AUTO/MAN and REMOTE/LOCAL..
This explanation assumes that the contact type is energized. (The function is executed when the contact is turned on)
If the power is switched from off to on in the DI on state, the contact state is changed from off to on.

Contact Input Internal Relay Number (I relay)

DI symbol	NO.
DI1	5025
DI2	5026
DI3	5027
DI16	5046

DI16 is available on PPC5-110x models with remote auxiliary analog input

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)
If output tracking is switched from off to on, the output is bumped to the external input value.
If output tracking is switched from on to off, the output is not bumped.

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	–
ON→OFF	Maintains the current operation status	–

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	–

Note: Display will not turn off when an alarm or event is active in the controller

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 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)

Contact status	Operation	Remark
OFF→ON	Interrupt-displays the message	Pressing the DISPLAY key erases the message.
ON→OFF	Displays the current PV	–

PV Red/white Switch (PVRW)

PV color can be switched using contact input. (Status switch)

Contact status	Operation	Remark
ON	Red color	–
OFF	White color	–

Set "10" to the parameter PCMD.

Bit-0 to Bit-3 of SP Number (SP.B0 to SP.B3)

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: Contact input is turned off when the bit of SP number is not assigned to the contact input.

SP group and PID group when the SP number is changed
In the SP group number selection method, the PID changes to the PID group set with parameter PIDN at the same time the SP group is switched.
In the zone PID selection method, only the SP group will be switched.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
SP.BC	Bit changing method of SP number	STD	0: Status switch 1 1: Status switch 2	DI.NU Set

Bit-0 to Bit-3 of PID Number (PN.B0 to PN.B3)

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 and 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: 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.B2)

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: The contact input is turned off when the bit of manual preset output number is not assigned to the contact input.

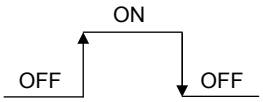
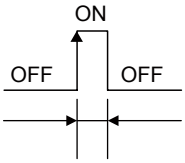
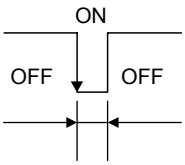
In Cascade control, the manual preset output number selection is only for Loop 2.

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	Menu symbol
A/M	AUTO/MAN switch	STD	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	
PVRW	PV red/white 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	

The following table shows the initial setting for each control mode. No function is assigned to contact inputs other than those listed below.

Control mode	DI1	DI2	DI3	DI16 (PPC5-110x models)
Single-loop Control 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	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	Output tracking switch (tracking in ON state)
Cascade Secondary-loop 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 (OFF→ON) switch	AUTO (OFF→ON) switch	MAN (OFF→ON) switch	STOP (ON)/ RUN (OFF) switch
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	AUTO (ON)/ MAN (OFF) switch	STOP (ON)/ RUN (OFF) switch	None	None

10.1.2 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

Parameter symbol	Name	Display level	Setting range	Menu symbol
DI1.D	DI1 contact type	PRO	0: The assigned function is enabled when the contact input is closed. 1: 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
DI16	DI16 contact type	PRO	0: The assigned function is enabled when the contact input is closed. 1: The assigned function is enabled when the contact input is opened.	RSP Set

10.2 Setting Contact Output Function

10.2.1 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. (The contact is turned on when an event occurs.)

Setting Details

Contact Output

Parameter symbol	Name	Display level	Menu symbol
AL1.S	AL1 function selection	STD	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.

Contact Output for Control

Parameter symbol	Name	Display level	Menu symbol
OR.S	OUT relay function selection	STD	ALM Set

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.S can be used as status output when they are not used as control output.

Alarm Status

The alarm status can be output to the contact output. (The setpoints below are I relay numbers.)

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. (Then contact is turned on when an event occurs.)
To output the normal alarm to the contact output, assign the alarm output status.

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.)

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.

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	–
4256	FAIL output	Normal status	FAIL status

System Error Status

Setpoint	Function	Contact status	
		ON	OFF
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

Error Status

Setpoint	Function	Contact status	
		ON	OFF
4065	PV input ADC error	Error occurs	Normal
4066	RSP input (E1-terminal area) ADC error		
4073	PV input burnout error		
4074	RSP input (E1-terminal area) burnout error		
4070	PV input RJC 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		
4009	Faulty FRAM		

10.2.2 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

Parameter symbol	Name	Display level	Setting range	Menu symbol
AL1.D	AL1 contact type	PRO	0: When the event of assigned function occurs, the contact output is closed. 1: 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.

Contact Output for Control

Parameter symbol	Name	Display level	Setting range	Menu symbol
OR.D	OUT relay contact type	PRO	0: When the event of assigned function occurs, the contact output is closed. 1: When the event of assigned function occurs, the contact output is opened.	ALM Set

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.D can be used as status output when they are not used as control output.

CHAPTER 11

SETTING DISPLAY AND KEY FUNCTIONS

Contents

11.1 Setting Display Functions

11.1.1 Setting Active Color PV Display Function

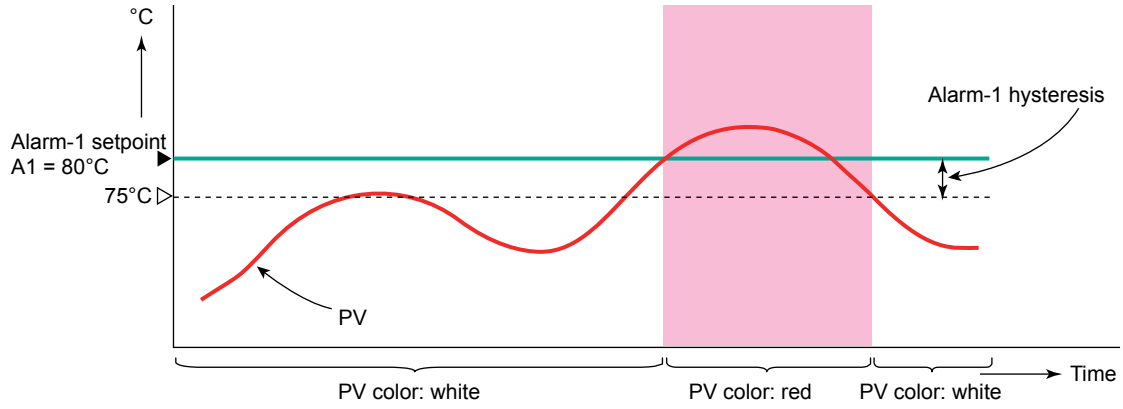
The active color PV display function changes the PV display color when an event occurs.

Description

Link to Alarm

The PV display color changes by linking to the alarm 1 or alarm 2.

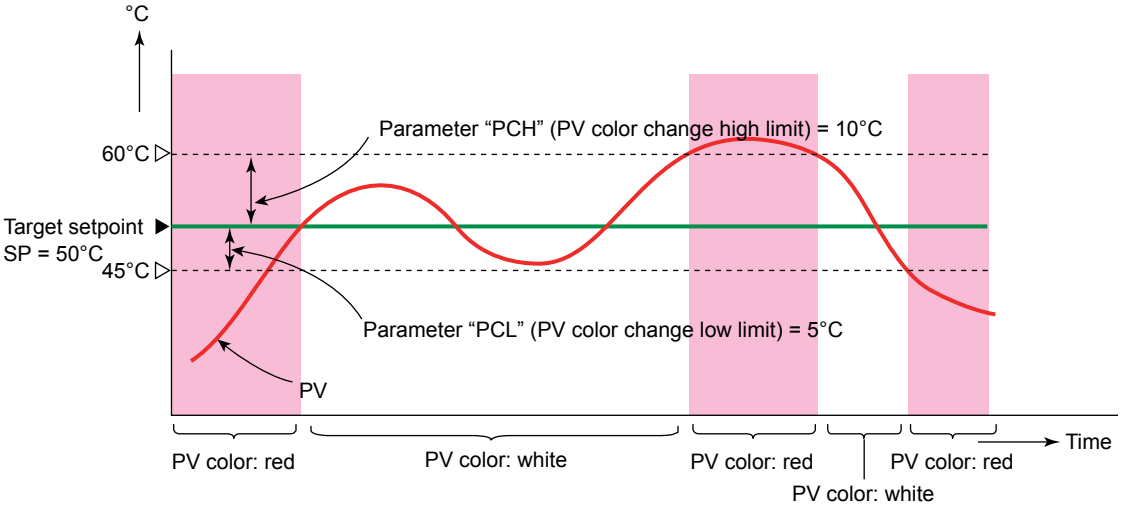
The following is an example of operation linking to alarm 1.
Set the alarm-1 type to “PV high limit alarm” and alarm-1 setpoint to “80°C.”
When the active color PV display switch is set to”2,” PV display color changes from white to red if PV exceeds the alarm-1 setpoint.
The red-to-white switching action can be set.



Change by Deviation

The PV display color changes by deviation (PV – SP).

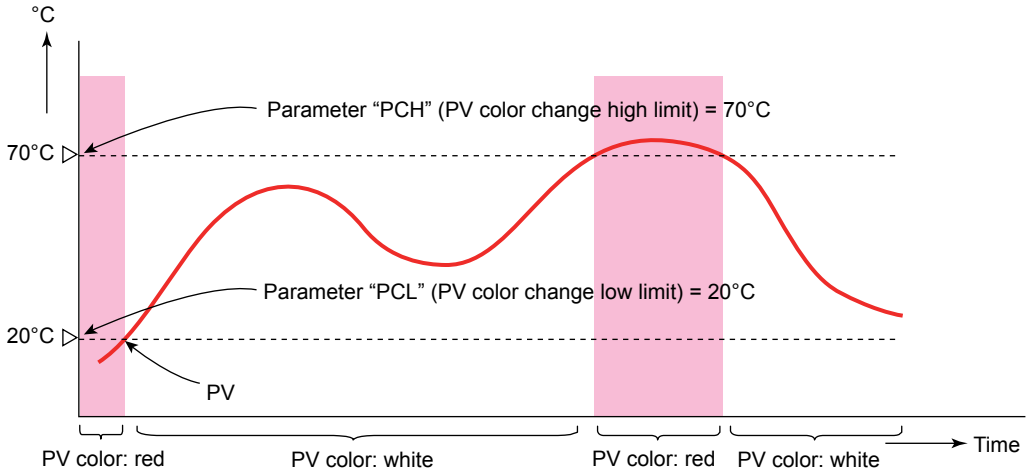
Set the PV color change high limit to “10°C” and the PV color change low limit to “5°C” as deviation band for the current target setpoint “50°C.” PV display color changes from white to red if PV is out of the deviation.
The red-to-white switching action can be set. There is no hysteresis.



Link to PV

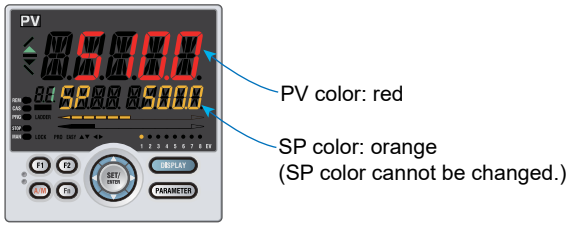
The PV display color changes by linking to PV.

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.



Link to DI

The PV display color changes by linking to DI (ON/OFF).

The following is an example for changing the display color by a state of DI1.
Set the parameter PCMD=10, and PVRW=5025.
PV display color is red when DI1=ON, and is white when DI1=OFF.

PVRW: PV red/white switch (Menu: DI.SL)

Setting Details

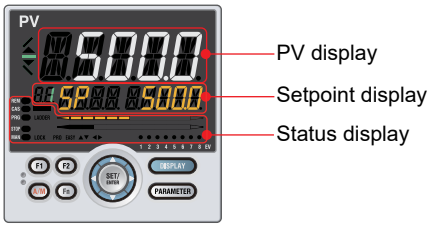
Parameter symbol	Name	Display level	Setting range	Menu symbol
PCMD	Active color PV display switch	EASY	0: Fixed in white 1: Fixed in red 2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red) 3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white) 4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red) 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) 10: Link to DI (ON: red, OFF: 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.

11.1.2 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.
When an error at power-on or hardware malfunction error occurs, Operation display cannot be set to non-display.



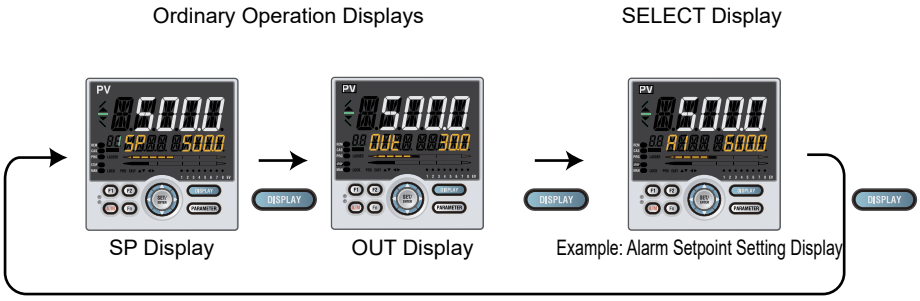
Setting Details

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		

11.1.3 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:
CTL, PV, RSP, MPV, OUT, R485, ETHR, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, I/O, SYS, INIT, VER, and LVL.



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 (2301 to 5000, 6701 to 6710)	CSEL Set

D Resistor Number	Category	Description
2501 to 2700	Loop-1 Operation Parameters	SP and alarm setpoint setting
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	SP and alarm setpoint setting
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
4801 to 5000	10-segment Linearizer Setting Parameters	10-segment linearizer settings

11.1.4 Changing Event Display

Description

The PPC5 has eight 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) 5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed) 5046: Link to DI16 (Lit when the contact is closed) 5153 to 5155: Link to AL1-AL3 (Lit when the contact is closed)	DISP Set

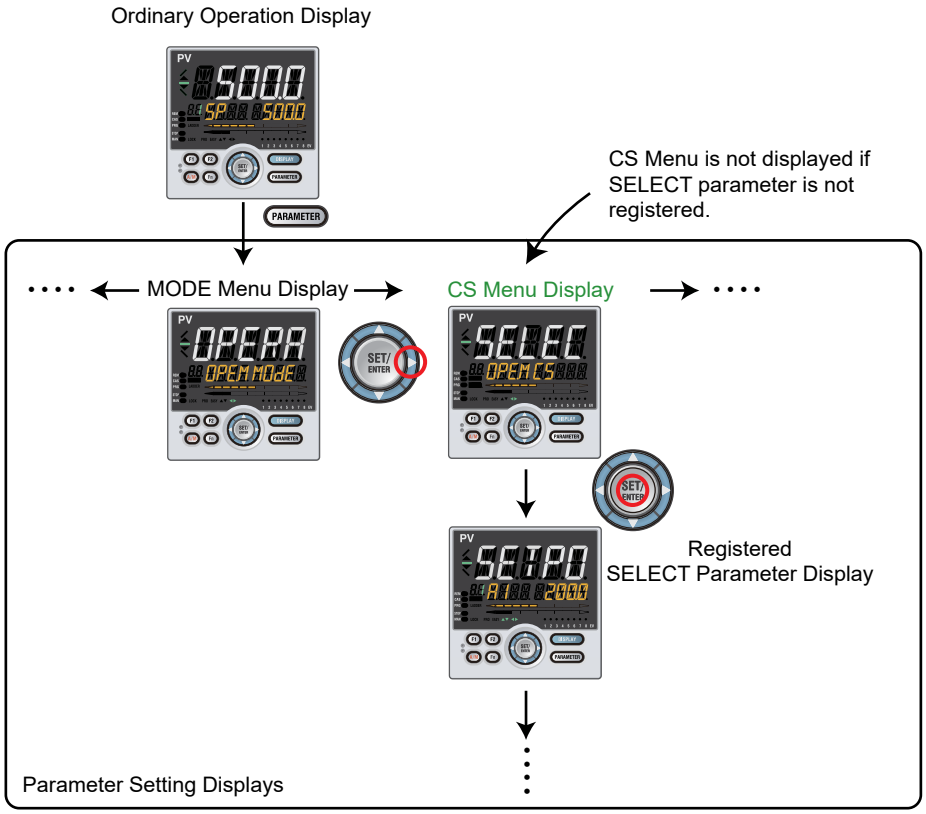
Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Relay Number	Description
4001 to 4064	System error
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
4577 to 4640	SP number and PID number
4641 to 4704	Free area
4705 to 4768	Key
4769 to 4832	Display
4833 to 5024	Free area
5025 to 5152	Input relay
5153 to 5280	Output relay
5281 to 5408	Control computation output
5473 to 5536	Free area
5537 to 5792	Internal relay
5793 to 6048	Free area
6305 to 6432	DI terminals

11.1.5 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:
CTL, PV, RSP, MPV, OUT, R485, ETHR, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, I/O, SYS, INIT, VER, and LVL.



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 (2301 to 5000)	CSEL Set

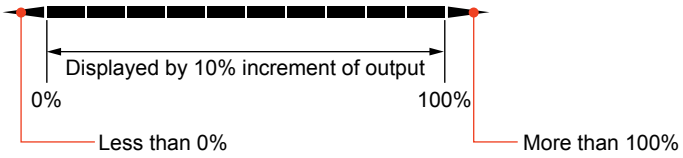
D Resistor Number	Category	Description
2501 to 2700	Loop-1 Operation Parameters	SPs and alarm setpoints setting
2701 to 2800		SP-related settings
2801 to 2900		Alarm function settings
2901 to 3000		PV-related settings
3001 to 3500		PID settings
3501 to 3600		Control action-related settings
3601 to 3800	Loop-2 Operation Parameters	SPs and alarm setpoints setting
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
4801 to 5000	10-segment Linearizer Setting Parameters	10-segment linearizer settings

11.1.6 Setting Bar-graph Display Function

Description

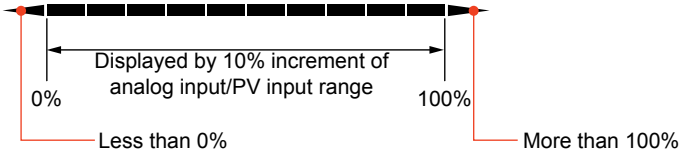
The upper and lower bar-graph displays are provided on the front of the controller.
PV or OUT can be displayed. Data which can be displayed on Bar-graph display are as follows.

OUT, Output



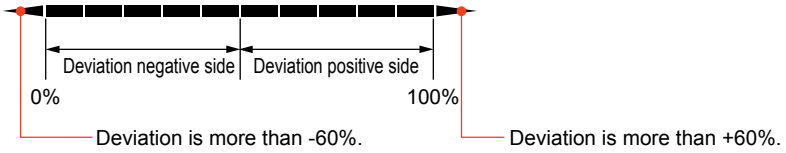
For relay, OFF is equivalent to 0% and ON is equivalent to 100%.

PV, SP, and Analog Input, TSP



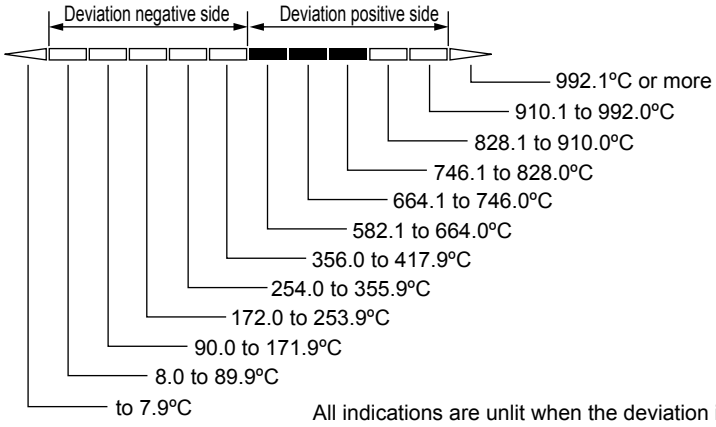
Deviation

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)).
Indication is unlit when TSP – (deviation display band (BDV)) ≤ PV ≤ TSP + (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.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
BAR1	Upper bar-graph display registration	STD	0: Disable 1:OUT 2: Not used 3: PV 4: SP 5: Deviation 6: Loop-2 OUT 7: Not used 8: Loop-2 PV 9: Loop-2 SP 10: Loop-2 deviation 11 to 16: Disable bar graph 17: Not used 18: PV terminals analog input 19: RSP terminals auxiliary analog input 20: Not used 21: Not used 27: TSP 28: TSP deviation 29: Loop-2 TSP 30: Loop-2 TSP deviation	DISP Set
BAR2	Lower bar-graph display registration	STD		
BDV	Bar-graph deviation display band	STD	0.0 to 100.0% of PV input range span (EU)	

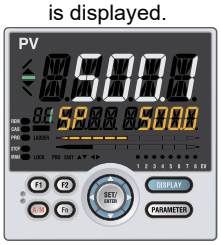
Note1: The bar-graph deviation display band (BDV) is enabled when the deviation is set to the BAR1 or BAR2.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

11.1.7 Masking Least Significant Digit of PV Display

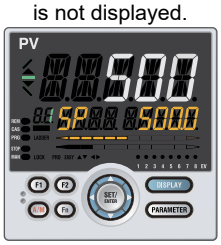
Description

With and without least significant digit of the PV in the Operation Display can be set.
If the least significant digit is set to none, the value in the least significant can be truncated or rounded.
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	
	Rounding	Rounding-off
1499.9	1499	1500
1500.4	1500	1500
1999.9	1999	2000
2000.4	2000	2000
3000.0	3000	3000
3000.9	3000	3001
3001.0	3001	3001

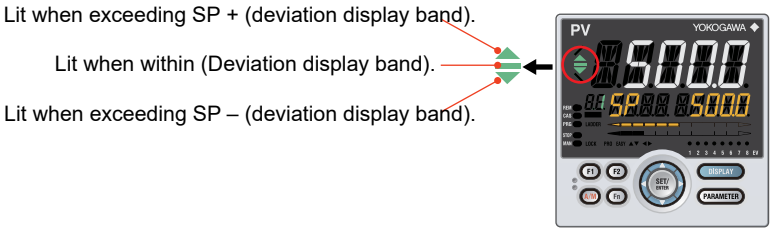
Setting Details

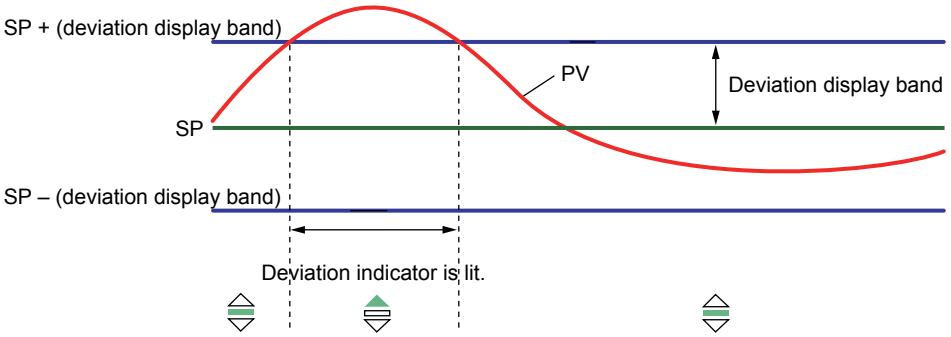
Parameter symbol	Name	Display level	Setting range	Menu symbol
MLSD	Least significant digital mask of PV display	STD	OFF: With least significant digit ON: Without least significant digit	DISP Set
MKTP	Method for least significant digital mask of PV display	STD	0: Rounding 1: Rounding-off	DISP Set

11.1.8 Changing Deviation Display Lamp Action

Description

The deviation display shows the condition of (PV – SP).





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 (EU).	DISP Set

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

11.1.9 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.

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

In the following cases, the LCD backlight does not go off.

- when an alarm occurs
- When an error at power-on or a hardware malfunction error 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

Note: Display will not turn off when an alarm or event is active in the controller

11.1.10 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

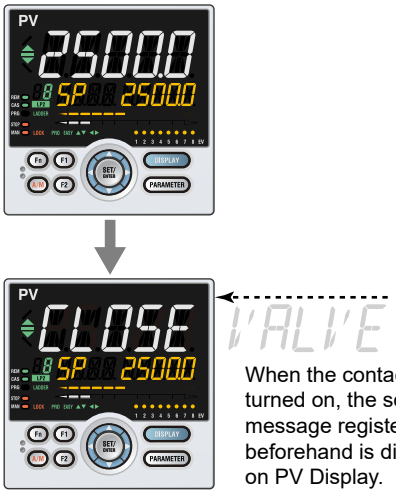
Parameter symbol	Name	Display level	Setting range	Menu symbol
HOME	Home Operation Display setting	PRO	SP1: SP Display SP2: Loop-2 SP Display OUT1: OUT Display OUT2: Loop-2 OUT Display HCO: Not used VP: Not used MV: Not used PID1: PID Number Display PID2: Loop-2 PID Number Display HC1: Not used HC2: Not used PV1: PV2/PV1 Display PV2: PV1/PV2 Display PV: PV Analog Input Display RSP: RSP Auxiliary analog Input Display AIN2: Not used AIN4: Not used CS1 to CS5: SELECT Display 1 to 5	DISP Set

11.1.11 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 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)

Operation Display



When the contact input is turned on, the scrolling message registered beforehand is displayed on PV Display.

11.1.12 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

11.1.13 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

11.1.14 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

11.1.15 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.	DISP Set

11.1.16 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).

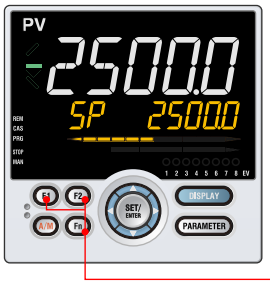
Setting Details

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)	
B.SP	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)	
D.CYC	Display update cycle	PRO	1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s	

11.2 Assigning Function to User Function Key and A/M Key

Description

The PPC5 has three user function keys on the front panel.
Various functions (operation mode switch etc.) can be assigned to the user function key.
Press the user function key to perform the assigned function.
The User function key is available only on the Operation Display.
The assigned function does not work on the Parameter Setting Display. However, the Fn key can be used to turn on/off the guide display.



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 (Note 1)			
			F1	F2	Fn	A/M
OFF	Unassigned	–	√	√	√	√
A/M	AUTO/MAN switch	AUTO and MAN switches every time the user function key is pressed.	√	√	√	√√ (Note 2)
C/A/M	CAS/AUTO/MAN switch	MAN→AUTO→Cascade is repeated every time the user function key is pressed.	√	√	√	√√ (Note 2)
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. (Note 3)	√	√	√	√
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 (Note 1)			
			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 returns to the initial Operation Display. The PARAMETER 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.
Note 3: When the STOP/RUN switch is set to the contact input, the setpoint S/R does not work for the user function key. Disable the setting if the STOP/RUN switch parameter (S/R) is assigned to the contact input.

Status of user function key

The status of the user function key can be identified by communication.
“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)

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.

11.3 Setting Security Functions

11.3.1 Setting or Clearing the 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, MPV, OUT, R485, ETHR, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, I/O, SYS, INIT, VER, and LVL.

Always remember your password when using the password function.

To clear the password, set parameter PASS to “0.”

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
PASS	Password setting	EASY	0 (No password) to 65535	SYS Set

11.3.2 Setting Parameter Display Level

Description

Parameter display level can be set according to the setting level.

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

11.3.3 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		
MPV	[MPV] menu lock	PRO		
OUT	[OUT] menu lock	PRO		
R485	[R485] menu lock	PRO		
ETHR	[ETHR] 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		
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		

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

11.3.4 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		

11.3.5 Setting Display/Non-display of Operation Display

Description

Display/non-display of the Operation Display can be set.

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	Not used	PRO		
U.VP	Not used	PRO		
U.MV	Not used	PRO		
U.PID	PID Number Display lock	PRO		
U.HC	Not used	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 Remote auxiliary analog Input Display lock	PRO		
U.AI2	Not used	PRO		
U.AI4	Not used	PRO		
U.PVO	PV only Display lock	PRO		

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

11.3.6 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 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

11.4 Confirmation of Key and I/O Condition and Version

11.4.1 Confirmation of Key and I/O Condition

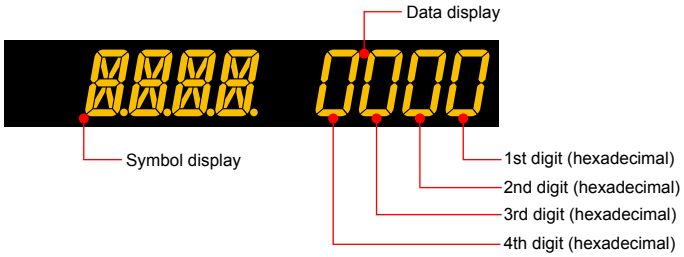
Description

Confirmation of 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	PRO		
X100	DI16 status	PRO		
Y000	AL1-AL3 status	PRO		

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 key (0: OFF, 1: ON)
	1	DISPLAY 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	–
	1	–
	2	–
	3	–
2nd digit	4	–
	5	DI16 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	–

11.4.2 Confirmation of Version

Description

Confirmation of 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	Not used in PPC5 controller	EASY		
ECU3	ECU-3 version	EASY		
ECU4	Not used in PPC5 controller	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		

CHAPTER 12

RESETTING DEFAULT VALUES

Contents

12.1 Initializing Parameter Settings to Factory Default Values

Description

Parameter settings can be initialized to the factory default values.
Use the keypad or 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

12.2 Registering and Initializing User Default Values

12.2.1 Registering User Settings as Default Values

Description

The user default values can be registered as parameter default values.
Use the Parameter Setting Software to register user setting (default) values.

CAUTION

Before registering user default values, make sure that the controller is configured to the desired user setting values.

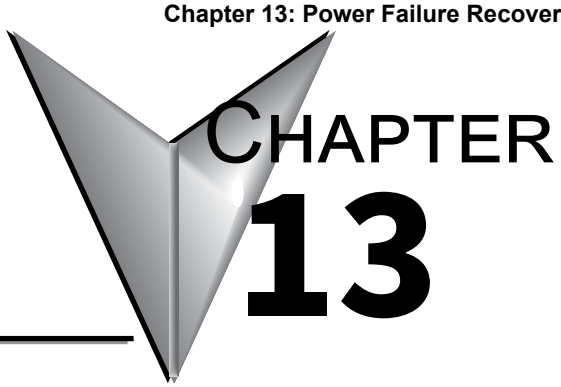
12.2.2 Initializing to User Setting (Default) Values

Description

Parameter settings can be initialized to the user setting (default) values.
Use the 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



CHAPTER 13

POWER FAILURE RECOVERY

Contents

13.1 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:
Regardless of the length of power failure time, all functions of the controller cannot be operated for about 10 seconds after recovery. However, the case of instantaneous power failure is excepted.

- 100–240 V AC: Instantaneous power failure of 20 ms or less

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. Alarm latch will be initialized.
Setting parameter	Set contents of each parameter are retained.
Auto-tuning	Cancelled.
Control action	Action before power failure continues.

- Power failure of about 5 seconds or more

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. Alarm latch will be initialized.
Setting parameter	Set contents of each parameter are retained.
Auto-tuning	Cancelled.
Control action	Differs with setting of the parameter “R.MD” (restart mode).

R.MD setting	Control action after recovery from power failure
CONT	Continues action before power failure. (Factory default)
MAN	Outputs the preset output value (PO) of the PID group used as control output and continues action in MAN mode.
AUTO	The control computation is executed in AUTO mode based on the preset output value (PO) of the PID group used as control output.

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

13.2 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

13.3 Power Frequency Setting

Description

The power frequency can be set by automatic detection or manually.
Set the range to the commercial frequency of the installation location.

Setting Details

Parameter symbol	Name	Display level	Setting range	Menu symbol
FREQ	Power frequency	EASY	AUTO 60: 60 Hz 50: 50 Hz	SYS Set

CHAPTER 14

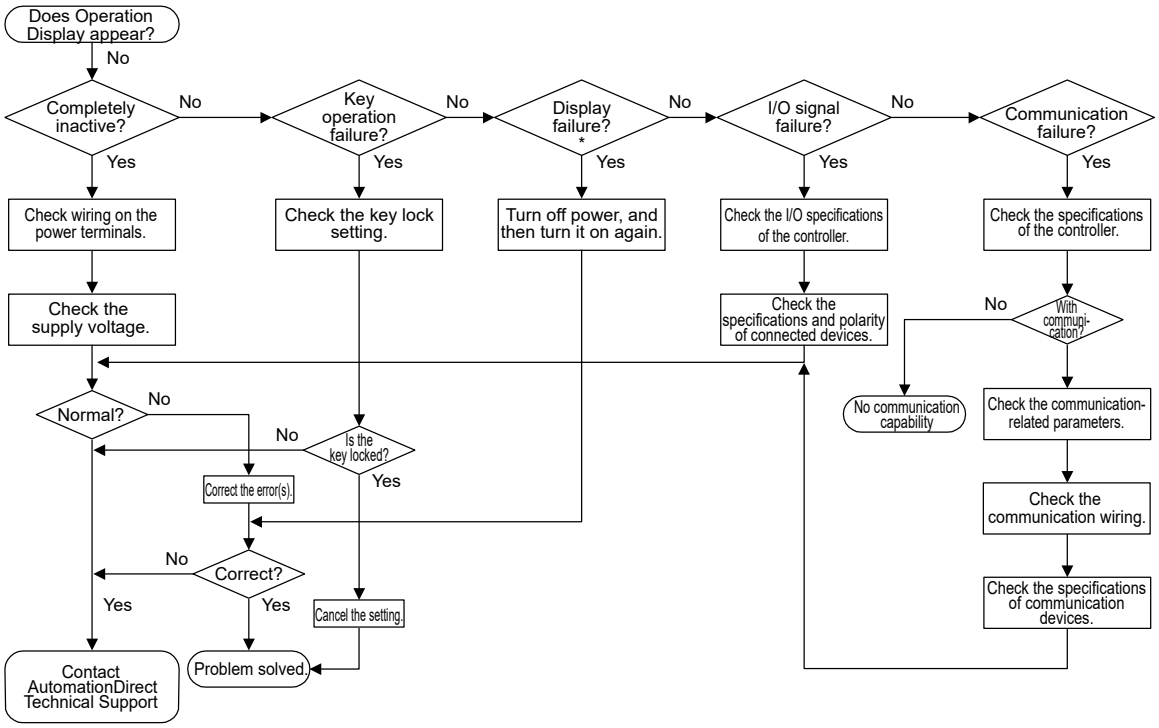
TROUBLESHOOTING

Contents

14.1 Troubleshooting

14.1.1 Troubleshooting Flowchart

If the Operation Display does not appear after turning on the controller's power, follow the measures in the procedure below.



*: A LCD (liquid crystal display) is used as the display for this product. At low temperatures the display transitions may become slow. However, this does not impact controller function.

14.1.2 Errors at Power On

The errors shown below may occur in the fault diagnosis when the power is turned on.
You can view the details of each error through communication or the Parameter Setting Software. (View on the register monitor.)

PV display (Operation Display)	Setpoint 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 AutomationDirect
ERR	SYS -----	–	–	System data error	System data is corrupted.	Faulty Contact AutomationDirect
	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.
	PAR 0010 (for setup parameter error only)			Setup parameter error	Setup parameter data is corrupted. Initialized to factory default value.	
	PAR 0020 (for operation parameter error only)			Operation parameter error	Operation parameter data is corrupted. Initialized to user default value.	
	PAR 0400			Control parameter (operation mode, output) error	Control parameter data is corrupted. Initialized to user default value.	
	SLOT 0017 (0017: Error occurs to all hardware of E1 or E3-terminal areas.)		Setup parameter (OP.ER)	Non responding hardware of extended function (E1or E3-terminal areas)	Inconsistence of system data and hardware of extended function. Non responding communication between hardware of extended function (E1 or E3-terminal areas).	Faulty Contact AutomationDirect
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 AutomationDirect
		Right most decimal point on Symbol display blinks.		Faulty FRAM	Writing (storing) data to FRAM is impossible.	
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	User profile error	User profile is corrupted.	Download the user profile again.

Errors at Power On (Input/output Action)

Error description	PV input, RSP input	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output)	Contact input	Contact (alarm) output	Communication
Faulty MCU RAM Faulty MCU ROM	Undefined	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	OFF	OFF	Stopped
System data error	Undefined	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	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
Setup parameter error											
Operation parameter error											
Control parameter error											
Non responding hardware of extended function (E1 or E3-terminal areas)	Undefined	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 (out of accuracy)	Normal action	Normal action	Normal action	Normal action	Normal action
Faulty FRAM	Normal action					Normal action					
User profile error	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	communication is disabled

14.1.3 Errors during Operation

Errors during Operation (1)

The errors shown below may occur during operation.
You can view the details of each error through communication or the Parameter Setting Software. (View on the register monitor.)

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	Analog input terminal AD value error	Faulty Contact AutomationDirect.
RJC.E (Displays RJC.E and PV alternately.)	Normal indication (Note)	–	Setup parameter (AD1.E)	Universal input terminal RJC error • PV input	Universal input terminal RJC error	Faulty Contact AutomationDirect. 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	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%.	Check analog input value
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)

Error description	PV input, RSP input	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output)	Contact input	Contact (alarm) output	Communication
Analog input terminal ADC error • PV input • RSP input	105%	Normal action	When in AUTO and RUN modes: Error preset output When in MAN mode: MAN output	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Universal input terminal RJC error • PV input • RSP input	Normal action (without reference junction compensation)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
Analog input terminal burnout error • PV input • RSP input	Depends on the parameter BSL. Upscale: 105% Downscale: -5%	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
PV input burnout error (Loop1, Loop2)	Depends on the setting of the parameter BSL of the analog terminal connected to the PV where the error occurs. Upscale: 105% Downscale: -5%		When in AUTO and RUN modes: Error preset output When in MAN mode: MAN output								
PV input over-scale PV input under-scale (PV values out of -5 to 105%) (Loop1, Loop 2)	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action
RSP input burnout error (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	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action	Normal action

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.

Errors during operation (Input/output Action)

Error description	PV input, RSP input, and aux. analog input	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output)	Contact input	Contact (alarm) output	Communication
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	When in AUTO and RUN modes: Error preset output When in MAN mode: MAN output	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
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
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	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.
					Communication from coordinated master is interrupted for 2 seconds.	
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	–	Setup parameter (OP.ER)	User profile error	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 AutomationDirect

Errors during Operation (Input/output Action)

Error description	PV input, RSP input	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output)	Contact input	Contact (alarm) output	Communication
Auto-tuning time-out (Loop 1, Loop 2)	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
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
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
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
Faulty FRAM	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 AutomationDirect
Undefined	Undefined	–	–	Faulty DCU (ROM/RAM error, corrupted)	DCU is corrupted.	Faulty, Contact AutomationDirect

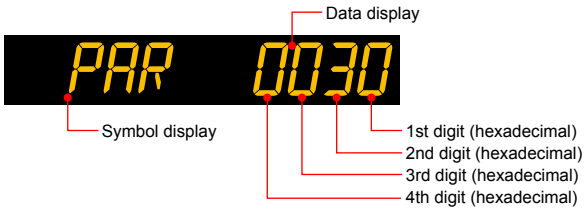
Errors during Operation On (Input/output Action)

Error description	PV input, RSP input	Control computation	Control output	Retransmission output	Alarm action	Analog output (control output, retransmission output)	Voltage pulse output (control output)	Relay output (control output)	Contact input	Contact (alarm) output	Communication
Faulty MCU	Undefined	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	OFF	OFF	Stopped
Faulty DCU (ROM/RAM error, corrupted)	Undefined	Stopped	Undefined	Undefined	Stopped	0% or less	OFF	OFF	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.

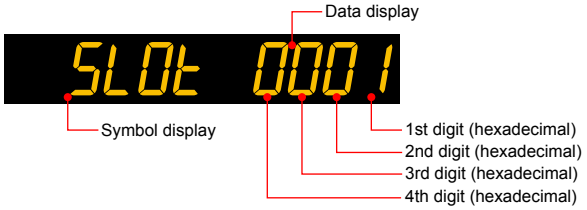
For example:
If the setup parameter error and the operation parameter errors occur, it is displayed as follows:



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	–

For example:
If the hardware in E1-terminal area does not respond, it is displayed as follows:



Parameter OP.ER

Displayed digit	bit	Description
1st digit	0	Non responding hardware in E1-terminal area
	1	–
	2	Non responding hardware in E3-terminal area
	3	–
2nd digit	4	–
	5	–
	6	–
	7	–
3rd digit	8	–
	9	–
	10	Communication error in E3-terminal area
	11	–
4th digit	12	–
	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	–
	3	–
2nd digit	4	–
	5	RJC error of PV input
	6	–
	7	–
3rd digit	8	PV input burnout error
	9	RSP input (E1-terminal area) burnout error
	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 PV2.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	–

14.2 Maintenance

14.2.1 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.

14.2.2 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.

CHAPTER 15

PARAMETER SETTINGS

Contents

15.1 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
E3: indicates the parameter in E3-terminal area
1 to 8, R: indicate the group numbers

Loop-2 Display

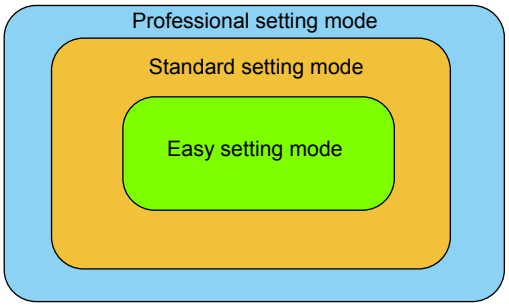
"LP2" appearing in the parameter map indicates that the LP2 lamp (green) is lit.

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.
Ⓢ	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.
Ⓟ	PRO	Professional setting mode: Displays all parameters.	Corresponding parameters are displayed only in Professional setting mode.



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, 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	Not used
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.

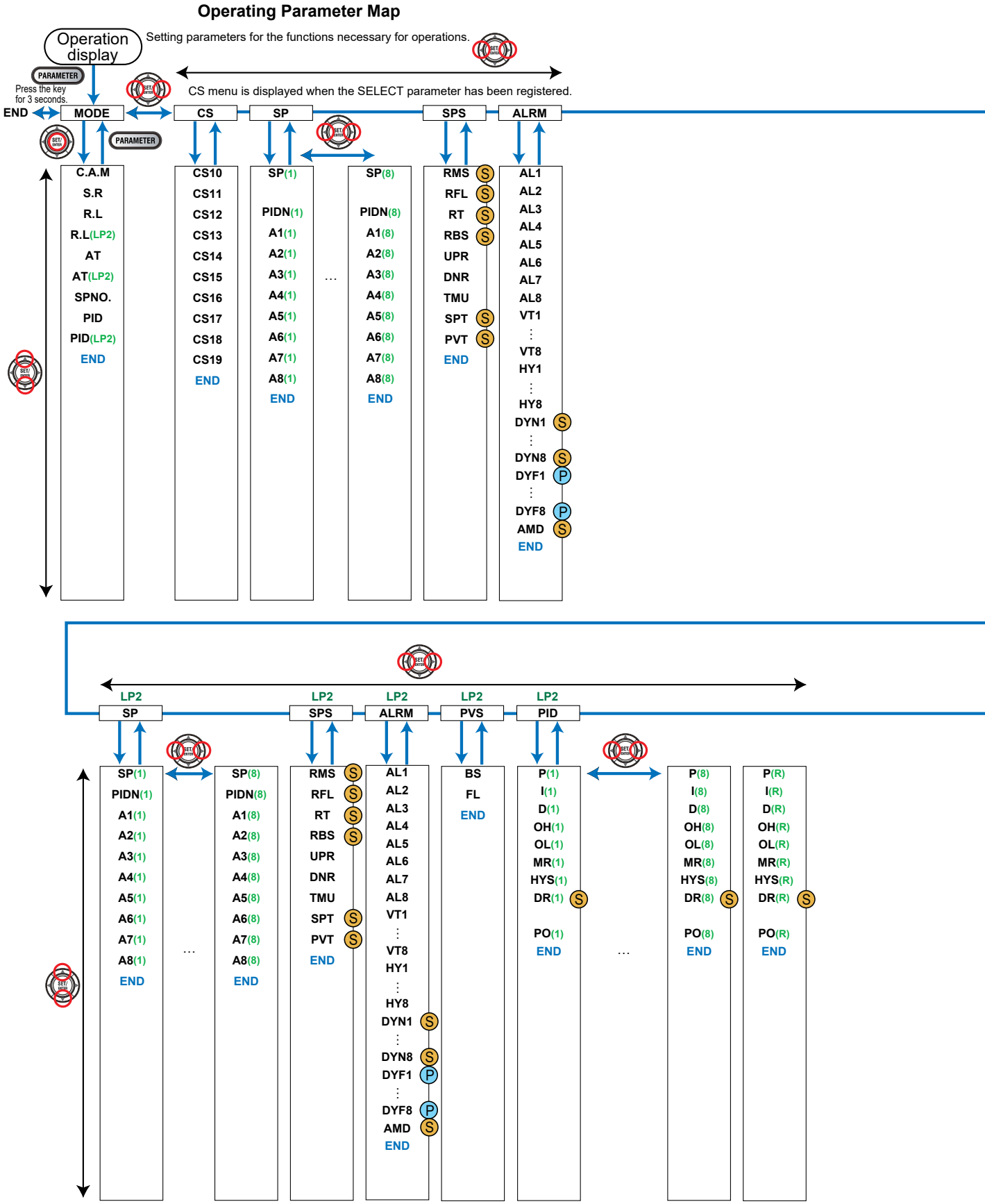
Menu symbol	Functions
PASS	Password setting (Displayed only when the password has been sent.)

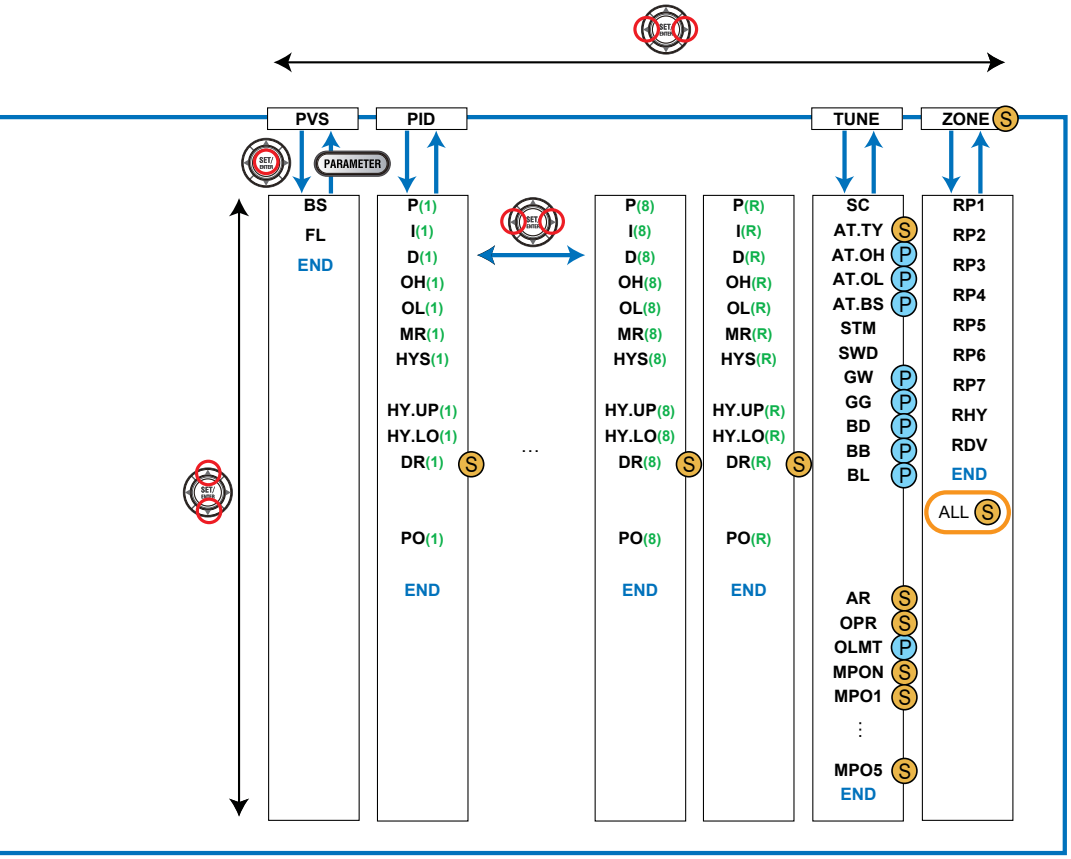
Menu symbol	Functions
CTL	Control mode, control type, sampling period, number of SP groups, number of PID groups, etc
PV	PV input type, range, scale, etc
RSP	RSP remote input type, scale, etc
MPV	Input function in Loop control with PV switching and Loop control with PV auto-selector, SP limiters, etc.
MPV (LP2)	Loop-2 input function, SP limiters (Loop 2), etc in Cascade control.
OUT	Control output type, retransmission output, etc.
R485 (E3)	RS-485 communication (E3-terminal area)
ETHR (E3)	Ethernet communication, gateway setting, IP access restriction, etc. (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
DI.D (E1)	Contact input type (E1-terminal area)
ALM	Alarm output function, contact output type
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

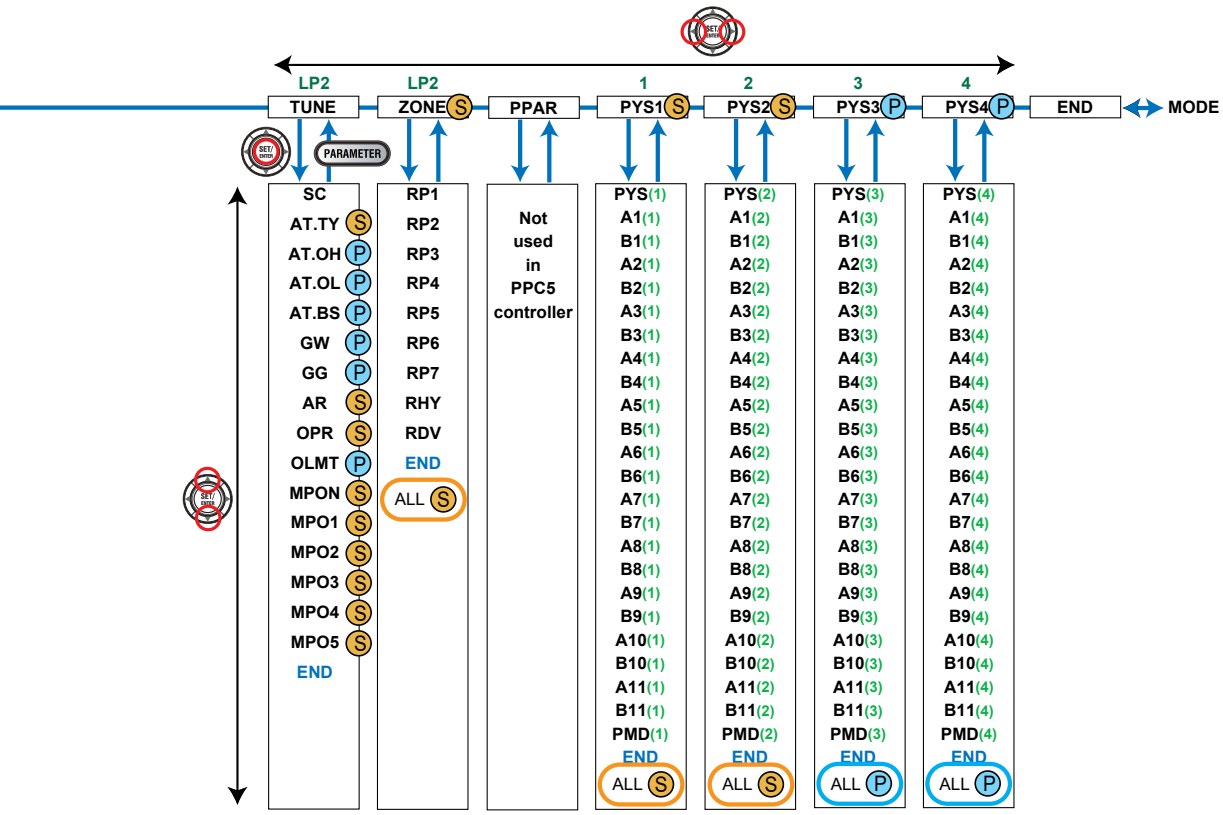
Note

Some parameters are not displayed according to the setting such as control mode, control type, or input and output.

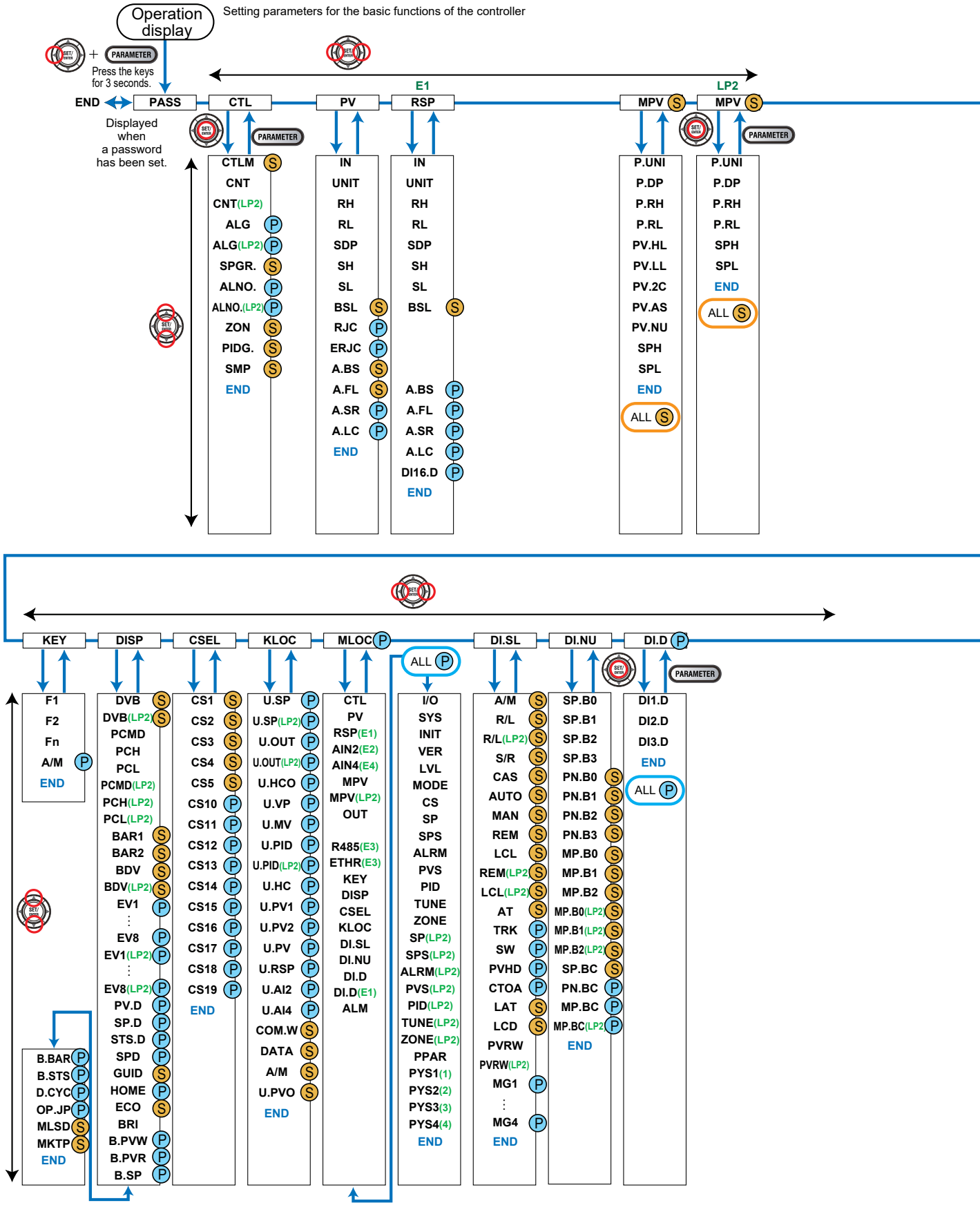
Operating Parameter Map

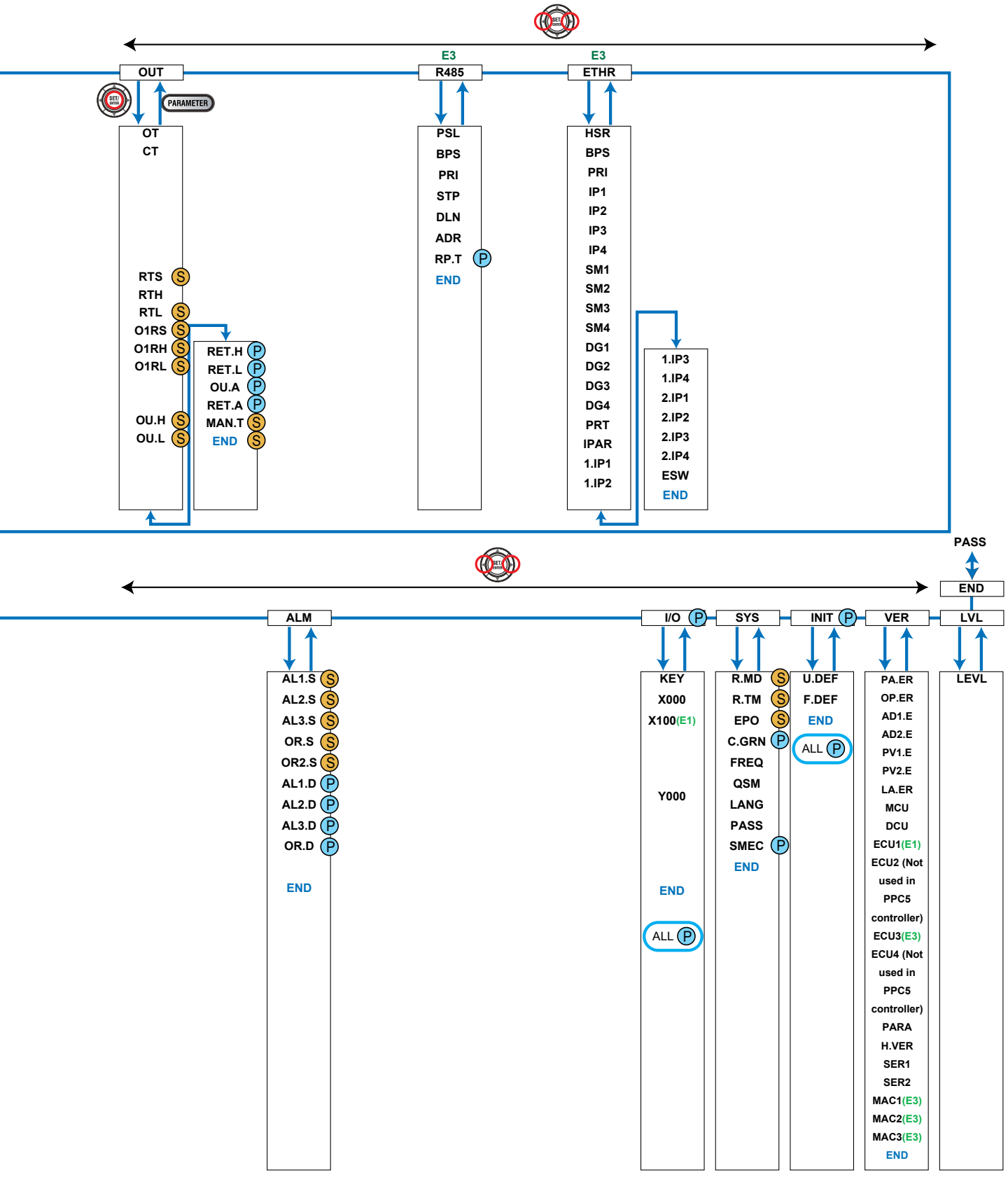



PVS
PID
TUNE
ZONE S
PARAMETER
BS
FL
END
P(1)
I(1)
D(1)
OH(1)
OL(1)
MR(1)
HYS(1)
HY.UP(1)
HY.LO(1)
DR(1) S
PO(1)
END
P(8)
I(8)
D(8)
OH(8)
OL(8)
MR(8)
HYS(8)
HY.UP(8)
HY.LO(8)
DR(8) S
PO(8)
END
P(R)
I(R)
D(R)
OH(R)
OL(R)
MR(R)
HYS(R)
HY.UP(R)
HY.LO(R)
DR(R) S
PO(R)
END
SC
AT.TY S
AT.OH P
AT.OL P
AT.BS P
STM
SWD
GW P
GG P
BD P
BB P
BL P
AR S
OPR S
OLMT P
MPON S
MPO1 S
MPO5 S
END
RP1
RP2
RP3
RP4
RP5
RP6
RP7
RHY
RDV
END
ALL S


LP2
TUNE
LP2
ZONE S
PPAR
1
PYS1 S
2
PYS2 S
3
PYS3 P
4
PYS4 P
END
MODE
PARAMETER
SC
AT.TY S
AT.OH P
AT.OL P
AT.BS P
GW P
GG P
AR S
OPR S
OLMT P
MPON S
MPO1 S
MPO2 S
MPO3 S
MPO4 S
MPO5 S
END
RP1
RP2
RP3
RP4
RP5
RP6
RP7
RHY
RDV
END
ALL S
Not used in PPC5 controller
PYS(1)
A1(1)
B1(1)
A2(1)
B2(1)
A3(1)
B3(1)
A4(1)
B4(1)
A5(1)
B5(1)
A6(1)
B6(1)
A7(1)
B7(1)
A8(1)
B8(1)
A9(1)
B9(1)
A10(1)
B10(1)
A11(1)
B11(1)
PMD(1)
END
ALL S
PYS(2)
A1(2)
B1(2)
A2(2)
B2(2)
A3(2)
B3(2)
A4(2)
B4(2)
A5(2)
B5(2)
A6(2)
B6(2)
A7(2)
B7(2)
A8(2)
B8(2)
A9(2)
B9(2)
A10(2)
B10(2)
A11(2)
B11(2)
PMD(2)
END
ALL S
PYS(3)
A1(3)
B1(3)
A2(3)
B2(3)
A3(3)
B3(3)
A4(3)
B4(3)
A5(3)
B5(3)
A6(3)
B6(3)
A7(3)
B7(3)
A8(3)
B8(3)
A9(3)
B9(3)
A10(3)
B10(3)
A11(3)
B11(3)
PMD(3)
END
ALL P
PYS(4)
A1(4)
B1(4)
A2(4)
B2(4)
A3(4)
B3(4)
A4(4)
B4(4)
A5(4)
B5(4)
A6(4)
B6(4)
A7(4)
B7(4)
A8(4)
B8(4)
A9(4)
B9(4)
A10(4)
B10(4)
A11(4)
B11(4)
PMD(4)
END
ALL P

Setup Parameter Map




OUT
PARAMETER
OT
CT
RTS S
RTH
RTL S
O1RS S
O1RH S
O1RL S
OU.H S
OU.L S
RET.H P
RET.L P
OU.A P
RET.A P
MAN.T S
END S
E3
R485
PSL
BPS
PRI
STP
DLN
ADR
RP.T P
END
E3
ETHR
HSR
BPS
PRI
IP1
IP2
IP3
IP4
SM1
SM2
SM3
SM4
DG1
DG2
DG3
DG4
PRT
IPAR
1.IP1
1.IP2
1.IP3
1.IP4
2.IP1
2.IP2
2.IP3
2.IP4
ESW
END
PASS
END
ALM
AL1.S S
AL2.S S
AL3.S S
OR.S S
OR2.S S
AL1.D P
AL2.D P
AL3.D P
OR.D P
END
I/O P
KEY
X000
X100(E1)
Y000
END
ALL P
SYS
R.MD S
R.TM S
EPO S
C.GRN P
FREQ
QSM
LANG
PASS
SMEC P
END
INIT P
U.DEF
F.DEF
END
ALL P
VER
PA.ER
OP.ER
AD1.E
AD2.E
PV1.E
PV2.E
LA.ER
MCU
DCU
ECU1(E1)
ECU2 (Not used in PPC5 controller)
ECU3(E3)
ECU4 (Not used in PPC5 controller)
PARA
H.VER
SER1
SER2
MAC1(E3)
MAC2(E3)
MAC3(E3)
END
LVL
LEVL

15.2 List of Parameters

15.2.1 Operation Parameters

Operation 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 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)
• Operation mode: R.L, AT, PID

Note) To switch the following operations, establish an online connection with the controller and use the tuning window in the Parameter Setting Software.
- STOP/RUN switch (S.R)
- REMOTE/LOCAL switch (R.L)
- AUTO-tuning switch (AT)
- SP number selection (SPNO.)
- PID number (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.	-

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
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 (EU)	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 (EU)	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. [Latch action (0/1/2/3/4)] + [Energized (0) or De-energized (1)] + [Without (0) or With (1) Stand-by action] + [Alarm type: 2 digits (see below)] 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: Not used 18: Not used 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: Not used 24: Not used 25: Not used 26: Not used 27: Not used 28: Not used 29: PV velocity 30: Fault diagnosis 31: FAIL 32: Deviation(%) high limit 33: Deviation(%) low limit 34: Deviation(%) high and low limits 35: Deviation(%) within high and low limits 36: Target SP deviation(%) high limit 37: Target SP deviation(%) low limit 38: Target SP deviation(%) high and low limits 39: Target SP deviation(%) within high and low limits	AL1, AL3, AL5, AL7: Latch action (0) Energized (0) Without Stand-by action (0) PV high limit (01) AL2, AL4, AL6, AL8: Latch action (0) Energized (0) Without Stand-by action (0) PV low limit (02)

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: AL1 to AL8

Alarm Function Setting Menu (Menu: ALRM) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
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. When the decimal point position for the input type is set to "1", the initial value of the hysteresis is "1.0".	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: 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 (EU)	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	EASY	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.	5.0%
I	Integral time	EASY	OFF: Disable 1 to 6000 s	240 s
D	Derivative time	EASY	OFF: Disable 1 to 6000 s	60 s
OH	Control output high limit	EASY	-4.9 to 105.0%, (OL<OH)	100.0%
OL	Control output low limit	EASY	-5.0 to 104.9%, (OL<OH), SD: Tight shut	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)	EASY	0.0 to 100.0% of PV input range span (EU)	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 (EU)	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
PO	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: P, I, D, OH, OL, MR, HYS, DR, PO

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%	100.0%
AT.OL	Output low limit in auto-tuning	PRO		0.0%
AT.BS	SP bias in auto-tuning	PRO	-100.0 to 100.0% of PV input range span (EU)	0.0 % of PV input range span
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 (EU)	OFF
GG	Non-linear control gain	PRO	0.001 to 1.000	1.000
BD	Batch PID deviation setpoint	PRO	0.0 to 100.0% of PV input range span (EU)	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 (EU)	0.0% of PV input range span
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, AT.BS, GW, GG, AR, OPR, OLMT

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 (EU)	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 (EU)	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
P01 to P10	P01 to P10 parameter	STD	Not used in PPC5 controller

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 auxiliary analog input AIN2: Not used AIN4: Not used PVIN: PV input OUT: OUT analog output OUT2: Not used 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 (EU) 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

15.2.2 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	SGL
CNT	Control type	EASY	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) S-PI: Sample PI control BATCH: Batch PID control FFPID: Not used	PID
ALG	PID control mode	PRO	0: Standard PID control mode 1: Fixed-point control mode	0
SPGR.	Number of SP groups	STD	1 to 8	8
ALNO.	Number of alarms	PRO	0 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 2) 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 1: 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

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	STD	-100.0 to 100.0% of PV input range span (EU)	0.0 % of PV input range span
A.FL	PV analog input filter	STD	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 auxiliary 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	RSP remote auxiliary analog input unit	EASY	-: No unit C: Degree Celsius -: No unit --: No unit ---: No unit F: Degree Fahrenheit	C
RH	Maximum value of RSP remote auxiliary analog input range	EASY	Depends on the input type.	Depends on the input type
RL	Minimum value of RSP remote auxiliary input range	EASY		Depends on the input type
SDP	RSP remote auxiliary 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 RSP remote auxiliary analog input scale	EASY	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	1370.0
SL	Minimum value of RSP remote auxiliary analog input scale	EASY		-270.0
BSL	RSP remote auxiliary analog input burnout action	STD	OFF: Disable UP: Upscale DOWN: Downscale	OFF

RSP Input Setting Menu (Menu: RSP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
A.BS	RSP remote aux. analog input bias	PRO	-100.0 to 100.0% of RSP input range span (EU)	0.0 % of RSP input range span
A.FL	RSP remote aux. analog input filter	PRO	OFF, 1 to 120 s	OFF
A.SR	RSP remote 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 remote aux. analog input low signal cutoff	PRO	0.0 to 5.0%	1.0%
DI16.D	DI16 contact type	PRO	0: The assigned function is enabled when the contact is closed. 1: The assigned function is enabled when the contact is opened.	0

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	Depends on the input type
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 (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay)	00.03
CT	Control output cycle time	EASY	0.5 to 1000.0 s	30.0 s

Output Setting Menu (Menu: OUT) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
RTS	Retransmission output RET	EASY	OFF: Disable PV1: PV SP1: SP OUT1: OUT LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Not used COUT1: Not used MV1: Not used TSP2: Loop-2 target SP HOUT2: Not used COUT2: Not used MV2: Not used PV: PV terminals analog input RSP: RSP terminals remote auxiliary analog input AIN2: Not used AIN4: Not used 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 or RSP: RTL + 1 digit to 30000	100 % of PV input range
RTL	Minimum value of retransmission output scale of RET	STD	-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.	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 or RSP: 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.	-
O1RL	Minimum value of retransmission output scale of OUT 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%
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
RET.A	RET current output range	PRO		4-20
MAN.T	Manual output operation type	PRO	Selects how to manipulate the control output during manual operation. (Note) DT.ET: Direct key method (The value specified by the Up and Down arrow keys is output as is.) ST.ET: SET/ENT key method (The value specified on the setting display and confirmed with the SET/ENT key is output.)	DT.ET

Note: When the control type (CNT) is set to ON/OFF control, the operation of setting DT.ET can be run.

RS-485 Communication Setting Menu (Menu: R485) (E3 terminal area)

Parameter symbol	Name	Display level	Setting range	Initial value
PSL	Protocol selection	EASY	PCL: Not used PCLSM: Not used LADR: Not used CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Not used CO-S2: Not used P-P: Not used	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	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

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 Setting this parameter to “ON” enables the Ethernet communication parameter settings. * The parameter ESW automatically returns to “OFF”after “ON” is set.	OFF

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	OFF
Fn	User function key-n action setting	EASY	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.	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)

Parameter symbol	Name	Display level	Setting range	Initial value
DVB	Deviation display band	STD	0.0 to 100.0% of PV input range span (EU)	1.0 % of PV input range span
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) 10: Link to DI (ON: red, OFF: white)	0
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.	0
PCL	PV color change low limit	EASY		0
BAR1	Upper bar-graph display registration	STD	0: Disable 1:OUT 2: Not used 3: PV 4: SP 5: Deviation 6: Loop-2 OUT 7: Not used 8: Loop-2 PV 9: Loop-2 SP 10: Loop-2 deviation 11 to 16: Disable bar graph 17: Not used 18: PV terminals remote auxiliary analog input 19: RSP terminals remote auxiliary analog input 20: Not used 21: Not usedt 27: TSP 28: TSP deviation 29: Loop-2 TSP 30: Loop-2 TSP deviation	5
BAR2	Lower bar-graph display registration	STD		1

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 (EU)	1.0 % 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) 5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed) 5046: Link DI16 (E1-terminal area) (Lit when the contact is closed) 5153 to 5155: Link to AL1-AL3 (Lit when the contact is closed)	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: Not used VP: Not used MV: Not used PID1: PID Number Display PID2: Loop-2 PID Number Display HC1: Not used HC2: Not used PV1: PV2/PV1 Display PV2: PV1/PV2 Display PV: PV Analog Input Display RSP: RSP Remote auxiliary analog Input Display AIN2: Not used AIN4: Not used 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 Setpoint 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
D.CYC	Display update cycle	PRO	1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s	2
OP.JP	Autoreturn to operation display	PRO	Automatically returned to the Operation Display when there has been no keystroke operation for 5 minutes. OFF, ON	ON

Display Function Setting Menu (Menu: DISP) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
MLSD	Least significant digital mask of PV display	STD	OFF: With least significant digit ON: Without least significant digit	OFF
MKTP	Method for least significant digital mask of PV display	STD	0: Rounding, 1: Rounding-off	0

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, 2301 to 5000, 6701 to 6710	OFF
CS10 to CS19	SELECT parameter-10 to -19 registration	PRO	OFF, 2301 to 5000	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 (Cascade control: ON)
U.HCO	Not used	PRO		OFF
U.VP	Not used	PRO		OFF
U.MV	Not used	PRO		ON
U.PID	PID Number Display lock	PRO		ON
U.HC	Not used	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		ON (Loop control with PV switching and Loop control with PV auto-selector: OFF)
U.RSP	RSP Remote auxiliary analog Input Display lock	PRO		
U.AI2	Not used	PRO		ON (Loop control with PV auto-selector: OFF)
U.AI4	Not used	PRO		
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
U.PVO	PV only Display lock	PRO	OFF: Display ON: Nondisplay	ON

The following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
• Parameter: U.SP, U.OUT, U.PID

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		
MPV	[MPV] menu lock	PRO		
OUT	[OUT] menu lock	PRO		
R485	[R485] menu lock	PRO		
ETHR	[ETHR] 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		
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		

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: MPV

Menu Lock Setting Menu (Menu: MLOC) (Continued from previous page)

Parameter symbol	Name	Display level	Setting range	Initial value
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: SP, SPS, ALRM, PVS, PID, TUNE, ZONE

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 “OFF” to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI16: 5046	5025
R/L	REMOTE/LOCAL switch	STD		5046
S/R	STOP/RUN switch	STD		5026
CAS	Switch to CAS	STD		OFF
AUTO	Switch to AUTO	STD		OFF
MAN	Switch to MAN	STD		OFF
REM	Switch to REMOTE	STD		OFF
LCL	Switch to LOCAL	STD		OFF
AT	Auto-tuning START/STOP switch	STD		OFF
TRK	Output tracking switch	PRO		OFF
SW	PV switch	PRO		OFF
PVHD	PV hold	PRO		OFF
CTOA	CAS to AUTO switch	PRO		OFF
LAT	Latch release	STD		OFF
LCD	LCD backlight ON/OFF switch	STD		OFF
PVRW	PV red/white switch	STD		OFF
MG1	Message display interruption 1	PRO		OFF
MG2	Message display interruption 2	PRO		OFF
MG3	Message display interruption 3	PRO		OFF
MG4	Message display interruption 4	PRO		OFF

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

• Parameter: R/L, REM, LCL, PVRW

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 “OFF” to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI16: 5046	OFF
SP.B1	Bit-1 of SP number	EASY		OFF
SP.B2	Bit-2 of SP number	EASY		OFF
SP.B3	Bit-3 of SP number	EASY		OFF
PN.B0	Bit-0 of PID number	STD		OFF
PN.B1	Bit-1 of PID number	STD		OFF
PN.B2	Bit-2 of PID number	STD		OFF
PN.B3	Bit-3 of PID number	STD		OFF
MP.B0	Bit-0 of manual preset output number	STD		OFF
MP.B1	Bit-1 of manual preset output number	STD		OFF
MP.B2	Bit-2 of manual preset output number	STD		OFF
SP.BC	Bit changing method of SP number	STD	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	0: The assigned function is enabled when the contact input is closed. 1: The assigned function is enabled when the contact input is opened.	0
DI2.D	DI2 contact type	PRO		0
DI3.D	DI3 contact type	PRO		0

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: OFF 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 (OFF) / MAN (ON) 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		OFF
AL1.D	AL1 contact type	PRO	0: When the event of assigned function occurs, the contact output is closed. 1: When the event of assigned function occurs, the contact output is opened.	0
AL2.D	AL2 contact type	PRO		0
AL3.D	AL3 contact type	PRO		0
OR.D	OUT relay contact type	PRO		0

I/O Display Menu (Menu: I/O)

Parameter symbol	Name	Display level
KEY	Key status	PRO
X000	DI1-DI3 status	PRO
X100	DI16 status (E1-terminal area)	PRO
Y000	AL1-AL3 status	PRO

Note: You can view the key and I/O status by establishing an online connection with the controller and using the tuning window in the Parameter Setting Software.

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	Not used	PRO	Must be set to OFF	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	ENG
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
SMEC	Sampling period error counter	PRO	0 to 65535 (display only)	0 when power is turned on.
COM.W	Communication write enable/disable	STD	OFF: Enable, ON: Disable	OFF

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

Note: You can perform the following operations from the Parameter Setting Software.
- User setting initialization
- Factory default initialization

Error and Version Confirmation Menu (Menu: VER)

Parameter symbol	Name	Display level
PA.ER	Parameter error status	EASY
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	Not used	EASY
MCU	MCU version	EASY
DCU	DCU version	EASY
ECU1	ECU-1 version	EASY
ECU2	Not used in PPC5 controller	EASY
ECU3	ECU-3 version	EASY
ECU4	Not used in PPC5 controller	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

Note: You can view the following status by establishing an online connection with the controller and using the tuning window in the Parameter Setting Software.
- Parameter error (Register no. 2068)
- Option error (Register no. 2070)
- A/D converter error 1 (Register no. 2001)
- A/D converter error 2 (Register no. 2065)
- Loop-1 PV input error (Register no. 2002)
- Loop-2 PV input error (Register no. 2018)

You can view and edit the following information in the system data window in the Parameter Setting Software.

- MCU version
- DCU version
- ECU-1 version
- ECU-3 version
- Parameter version
- Product version

You can view and edit the following information in the communication execution window in the Parameter Setting Software.

- Serial number 1
- Serial number 2

You can view the following information on the product's nameplate.

- MAC address 1
- MAC address 2
- MAC address 3

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

CHAPTER 16

SOFTWARE FUNCTIONAL OVERVIEW

Contents

16.1 Functional Overview

This section describes the main functional overview of the Parameter Setting Software.

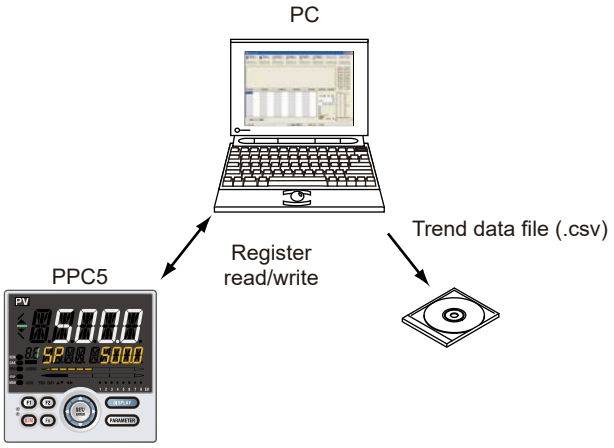
Parameter setting function

This function is used to set the parameters of the controller.
There are setup parameters for setting the basic functions of a controller and operation parameters used for setting functions necessary to operate the controller.
It is also possible to set them using the Setting wizard.

Monitoring function

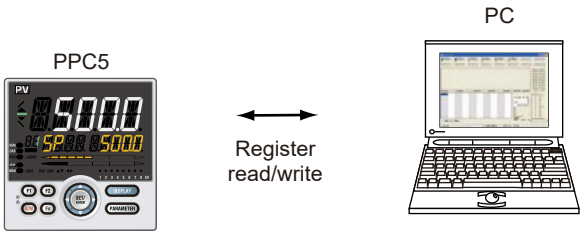
Tuning/change

With the PC connected to one controller, the tuning function tunes PID parameters by displaying PV input values (PV), target setpoints (SP), control output values (OUT), etc. on the PC screen. Furthermore, it also enables the PV, SP, and OUT values to be displayed as trend data and acquired together with the loop information and fixed registers in the Tuning window. Acquired trend data can be saved in a file of .csv format.



Monitoring/changing registers

The register monitoring function enables the controller's registers to be monitored and/or changed.



Upload/download/comparison function

This function downloads parameter data to the controller, uploads it from the controller, and compares it with the controller data.
You can specify all data, or individual data items, to be uploaded or downloaded.

File management/print function

This function enables you to save created parameter data in a file. It also allows data to be printed out for submission to the customer.

PPC5-CBL1 Configuration Cable and IR Adapter

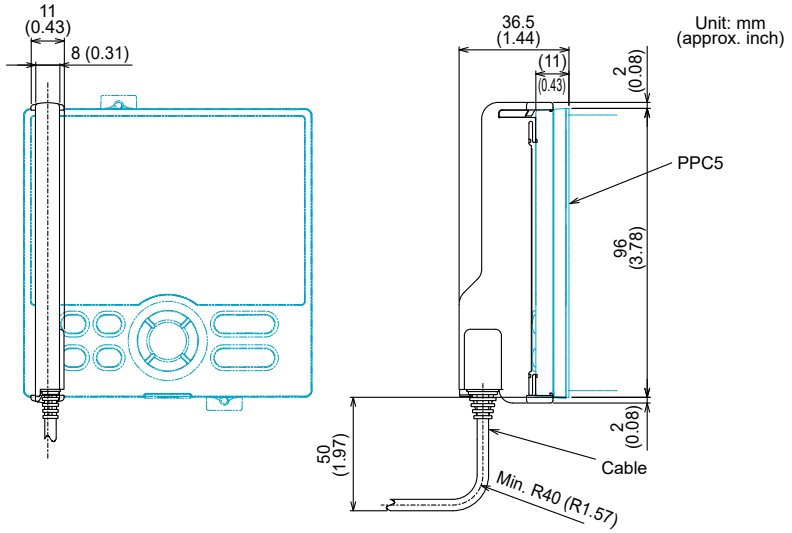
Communication method:

Non-contact, two-way, serial optical communication on the controller side
Compliant with the USB Specification Rev. 1.1 on the PC side

Power supplied from the USB bus power

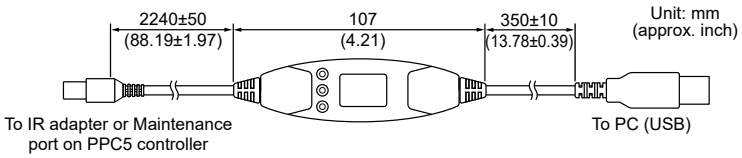
Rated input voltage; 4.75 to 5.25 VDC,
100mA DC (including the cable)

Ambient temperature: 0 to 50° C
Ambient humidity: 20 to 90%RH (No condensation)
Transport and storage conditions: -20 to 70° C, 5 to 90%RH (No condensation)
Dust-proof and drip-proof: IP3x



PPC5-CBL1 Cable

USB serial converter is incorporated, Compliant with the USB Specification Rev. 1.1
USB Series “A” plug on the PC side
Dedicated plug (5-pin) on the adapter side
Cable length: About 2.7 m



CAUTION

- The cable is not waterproof. Do not use it in locations that are likely to be exposed to splashes of water or other liquids.
- Directly insert the USB plug into a USB port on the PC.

16.2 Connecting the Controller to a PC and Setting Parameters

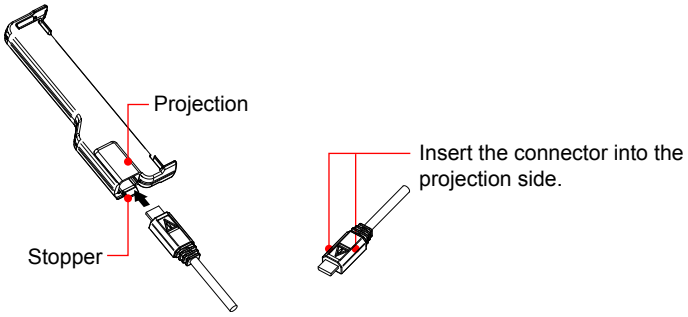
IR Adapter Communication (front panel communication)

Attach the IR adapter to the controller's front panel and connect the cable between the PC's USB terminal and the IR adapter.

Attach the IR adapter and the cable

1. Attach the IR adapter and the cable.

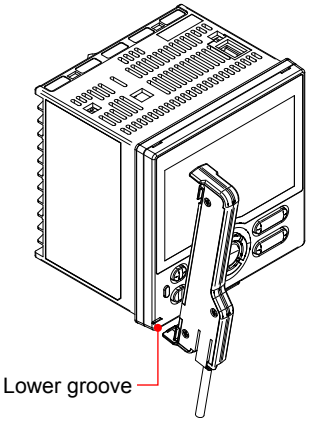
Insert the connector into the adapter until you hear a click.



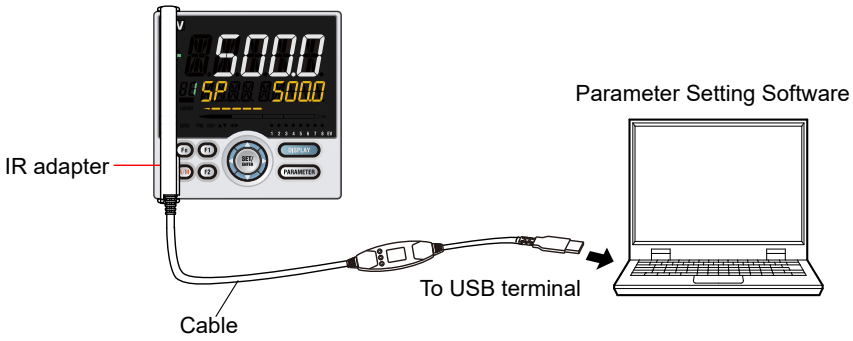
2. Attach the IR adapter to the controller's front panel.

Hang the adapter's bracket from the lower side groove.

Bring the adapter into contact with the controller's front panel.

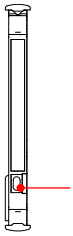


3. Connect the cable to the USB communication port of a personal computer.



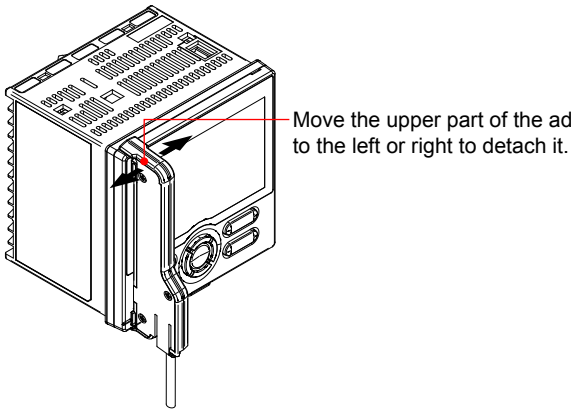
CAUTION

- Make sure the IR adapter is attached to the controller in a vertical orientation. Communication is not possible if the IR adapter is attached in a slanting position.
- Do not remove the cable while communicating, or it may affect the stability of the operation system.
- Do not put PC in suspend or sleep mode while communicating, or the system may fail to recover.
- The IR adapter and the cable are not waterproof. Do not use them in locations that are likely to be exposed to splashes of water or other liquids.
- Keep the IR adapter optical communication interface clean.

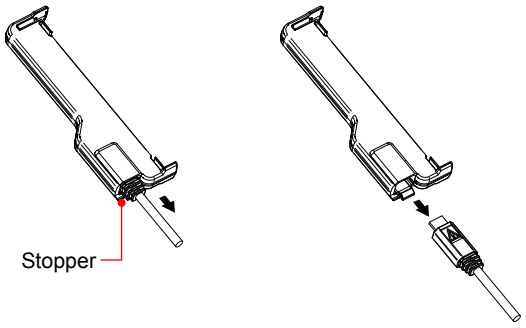


Detach the IR adapter and the cable

1. Detach the IR adapter from the controller.



2. Disconnect the dedicated cable from the IR adapter.

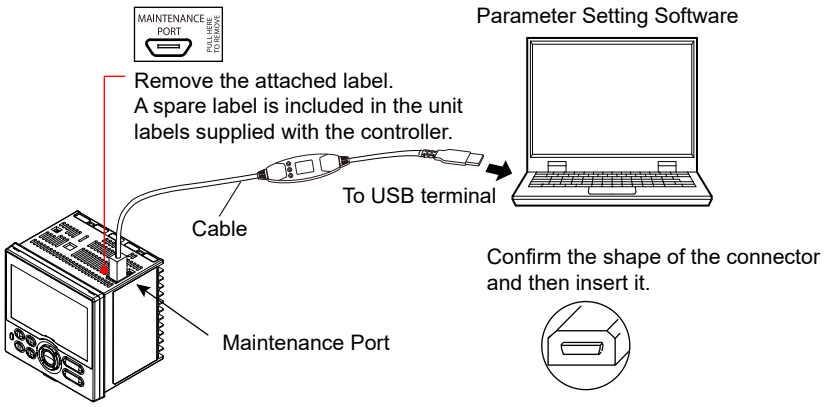


Maintenance Port Communication (Do not supply power to the controller)

Connect the cable between the PC's USB terminal and the connection port on top of the controller.

Note

When connecting the PC to a controller using the maintenance port, do not supply power to the controller, otherwise the controller will not function properly. If the cable is connected to the controller and the power is turned on or if the controller's power supply is turned on and the cable is connected, disconnect the cable and turn the controller's power supply back on again. This returns the controller to the normal condition.



The following table shows the functions available between the controller and Parameter Setting Software when the PC is connected using the controller's maintenance port.

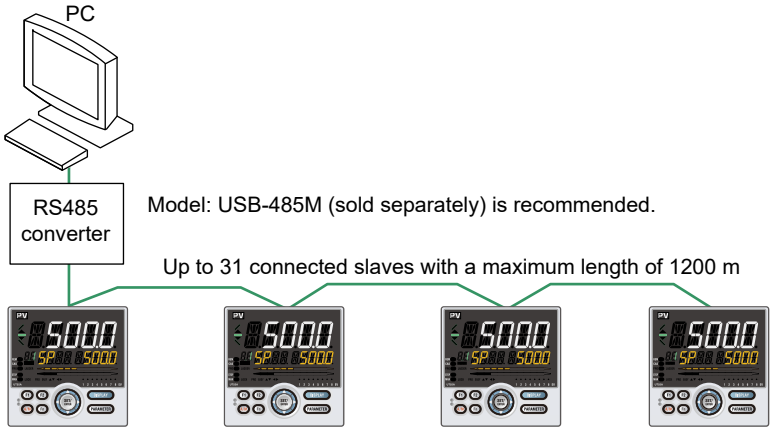
Software Menu	Software Function
Communication	Upload all
	Download all
	Upload parameter data
	Download parameter data
	Compare communication
Controller operation	Factory defaults
	User defaults
	Set User defaults

RS-485 communication terminal (PPC5-1x01 models)

Connect the PC to the controller via the communication terminals on the back of the unit.

This connection requires an RS485 converter (recommended model: USB-485M).

Reference Section 1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models)



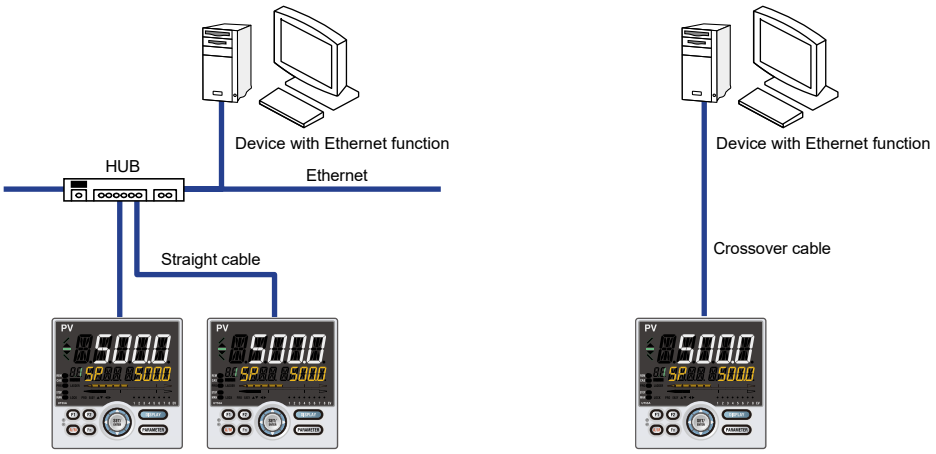
Setting parameters

Parameter symbol	Name	Display level	Setting range	Menu symbol
PSL	Protocol selection	EASY	PCL: Not used PCLSM: Not used LADR: Not used CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Not used CO-S2: Not used P-P: Not used	R485 Set
BPS	Baud rate		600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	
PRI	Parity		NONE: None EVEN: Even ODD: Odd	
STP	Stop bit		1: 1 bit, 2: 2 bits	
DLN	Data length		7: 7 bits, 8: 8 bits	
ADR	Address		1 to 99	

Set: Setup parameter

Ethernet communication (PPC5-1x02 models)

Use a 10BASE-T/100BASE-TX compatible cable to connect the PC to a network through which the PC can communicate, and then connect to controllers on the network.



Note

When connecting a PPC5 controller to a network, the baud rate, connectors, etc. must match. For more information, consult a network administrator.

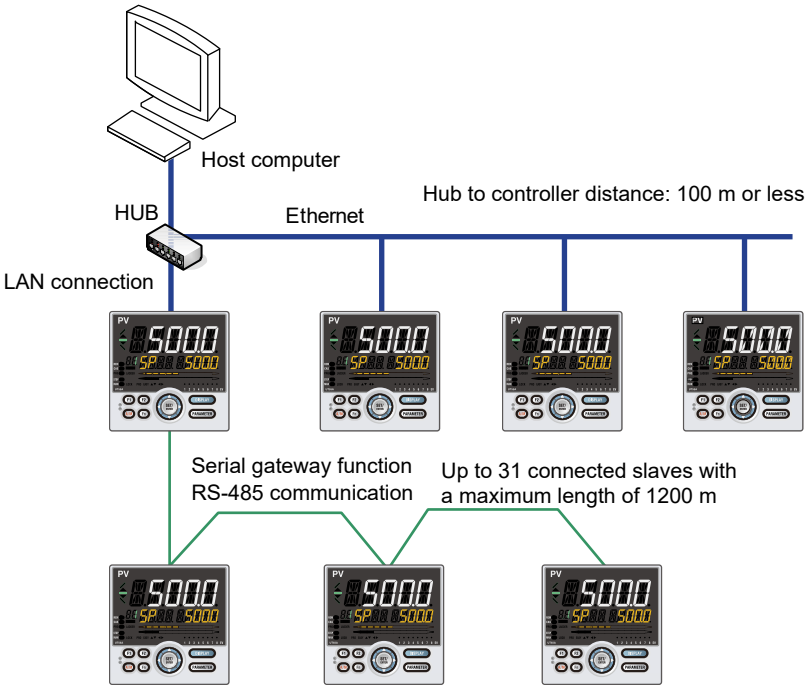
Setting parameters

Parameter symbol	Name	Display level	Setting range	Menu symbol
HSR	High-speed response mode	EASY	OFF, 1 to 8	ETHR Set
IP1 to IP4	IP address 1 to 4		0 to 255 Default: (IP1).(IP2).(IP3).(IP4) =(192).(168).(1).(1)	
SM1 to SM4	Subnet mask 1 to 4		0 to 255 Default: (SM1).(SM2).(SM3).(SM4) =(255).(255).(255).(0)	
DG1 to DG4	Default gateway 1 to 4		0 to 255 Default: (DG1).(DG2).(DG3).(DG4) =(255).(255).(255).(0)	
PRT	Port number		502, 1024 to 65535	
IPAR	IP access restriction		OFF: Disable, ON: Enable	
1.IP1 to 1.IP4	Permitted IP address 1-1 to 1-4		0 to 255 Default: (1.IP1).(1.IP2).(1.IP3).(1.IP4) =(255).(255).(255).(255)	
2.IP1 to 2.IP4	Permitted IP address 2-1 to 2-4		0 to 255 Default: (2.IP1).(2.IP2).(2.IP3).(2.IP4) =(255).(255).(255).(255)	
ESW	Ethernet setting switch		Setting this parameter to “ON” enables the Ethernet parameter settings. OFF, ON	

Set: Setup parameter

Ethernet-serial gateway function

Connect the controller with RS-485 communication to the controller with Ethernet-serial gateway function. The PC can access data of controller with RS-485 communication.



The communication conditions between the controller with gateway function and the slave controllers should be the same settings (parameters PSL, STP, and DLN). ADR should be set so that there are no overlaps between slave units.
It is necessary to set the following parameters in addition to the Ethernet parameters.

Setting parameters

Parameter symbol	Name	Display level	Setting range	Menu symbol
BPS	Baud rate	EASY	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	ETHR Set
PRI	Parity		NONE: None EVEN: Even ODD: Odd	

Set: Setup parameter

CHAPTER 17

SOFTWARE SETTING FLOW AND NAVIGATION

Contents

17.1 Setting Flow

The ProSense PPC5 series controller is made exclusively for AutomationDirect by Yokogawa. The PPC5 controllers are a special version of the Yokogawa UT55A series.

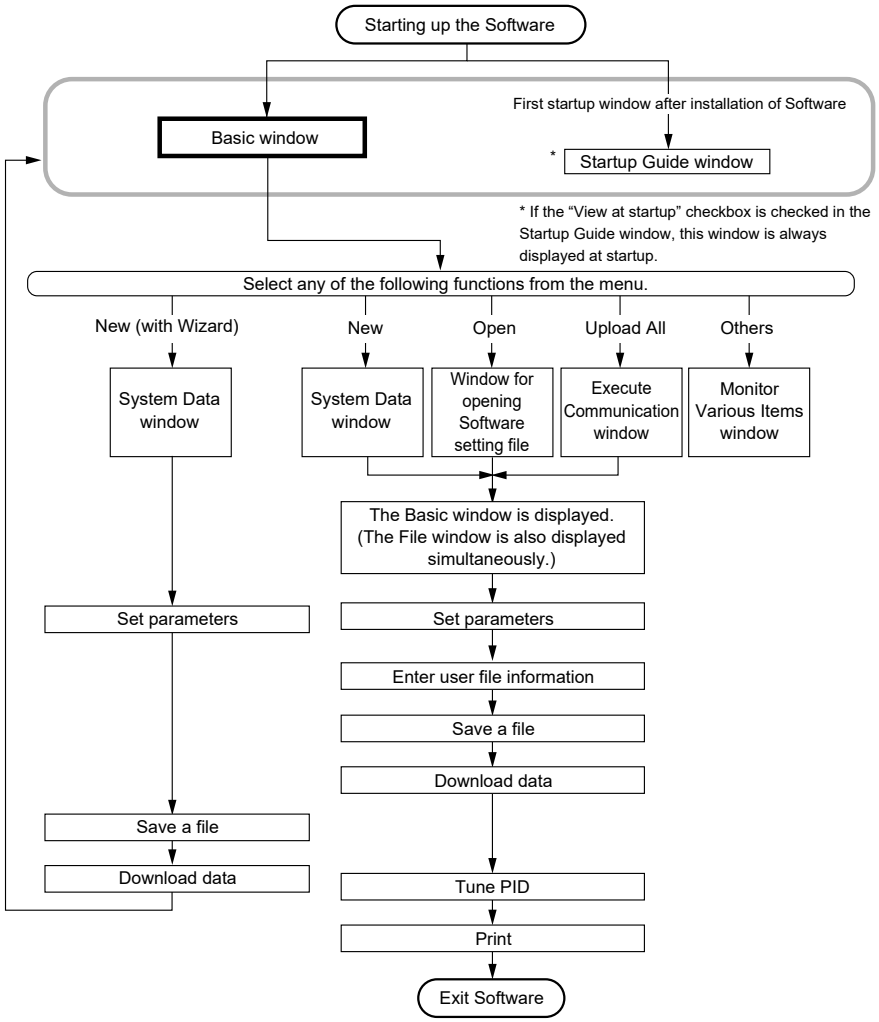
ProSense Model	Yokogawa Model (exclusive to AutomationDirect)
PPC5-1000	UT55A-000-11-00/S55
PPC5-1001	UT55A-001-11-00/S55
PPC5-1002	UT55A-002-11-00/S55
PPC5-1100	UT55A-040-11-00/S55
PPC5-1101	UT55A-041-11-00/S55
PPC5-1102	UT55A-042-11-00/S55

Reference the Manual Setting Values table in Section 17.4 Creating New Parameters Using the Wizard Function

The operation guide describes how to set parameters to the controller, creating user file information, monitoring, downloading, uploading, file management, printing, etc.

Note

Ladder Programming is not available or supported with PPC5 Controller.

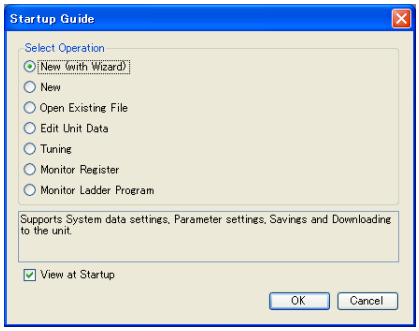


17.2 Starting up/Exiting the Parameter Setting Software

Starting up the Parameter Setting Software

Procedure

1. Click on Windows' [Start], select [Programs] – [UTAdvanced], and then click on [Setting Tool].



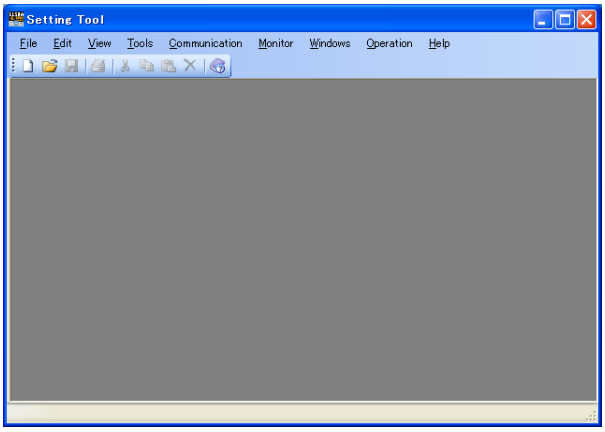
The Startup Guide window is displayed at the first startup after installing the Parameter Setting Software and if the Use Startup Guide checkbox is checked in the Environmental Setting window.

- New (with Wizard)
  Enables you to set system data, set parameters, save a file, and download data to the controller in sequence.
- New
  Creates new parameters.
- Open Existing File
  Enables you to open and edit an existing user file.
- Edit Unit Data
  Enables you to read out and edit data from the controller.
- Tuning
  Enables you to tune controller data.
- Monitor Registers
  Monitors controller registers.
- Monitor Ladder Programs (not used in PPC5 controller).
- View at Startup
  If this checkbox is checked, the Startup Guide window is displayed at the next startup.
- Guide message
  This section displays the description of a selected function.

2. Select a function and click the [OK] button. Click the [Cancel] button to close the window.

The Startup Guide window can also be started up by double-clicking on the Setting Tool shortcut or a setting file on the Desktop.

If the Startup Guide window is disabled from being displayed at startup, the following Basic window appears.



Exiting the Parameter Setting Software

Procedure

1. Click on [File] – [Exit] in the menu or click .

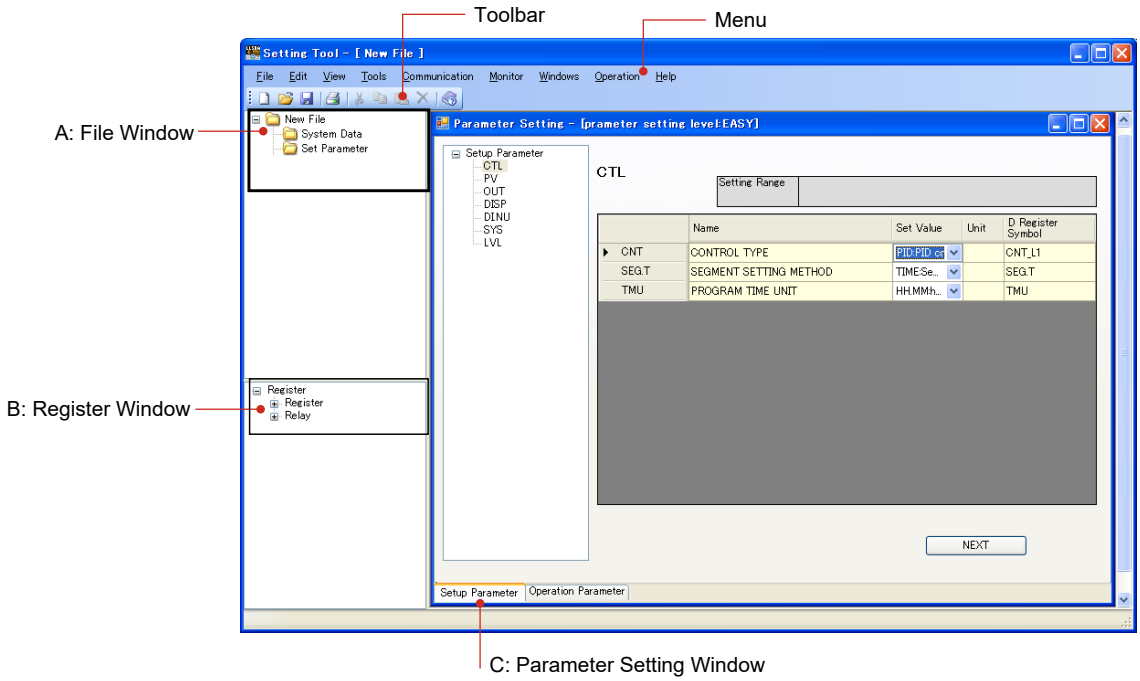
Note

Save the current editing file as necessary.

17.3 Window Names and Functions

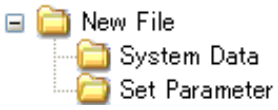
Basic window

The Basic window is a background window for setting system data, setting parameters, performing tuning etc.
The window below shows an example display of the Parameter Setting window.



A: File window

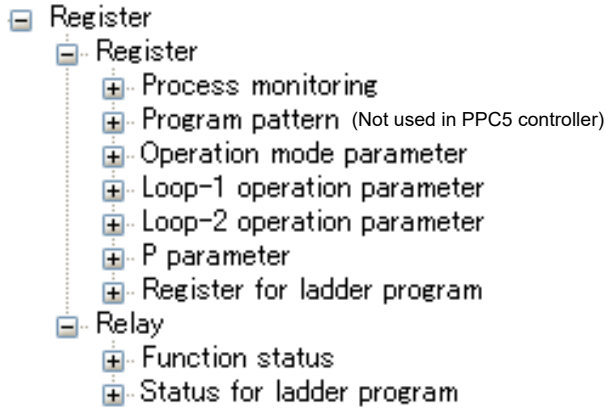
The File window is displayed on the left of the Basic window. It can be made visible or invisible. If data is saved in a file, the file name is displayed.
Clicking on a folder on the tree causes the Set System Data or Set Parameter window to appear.



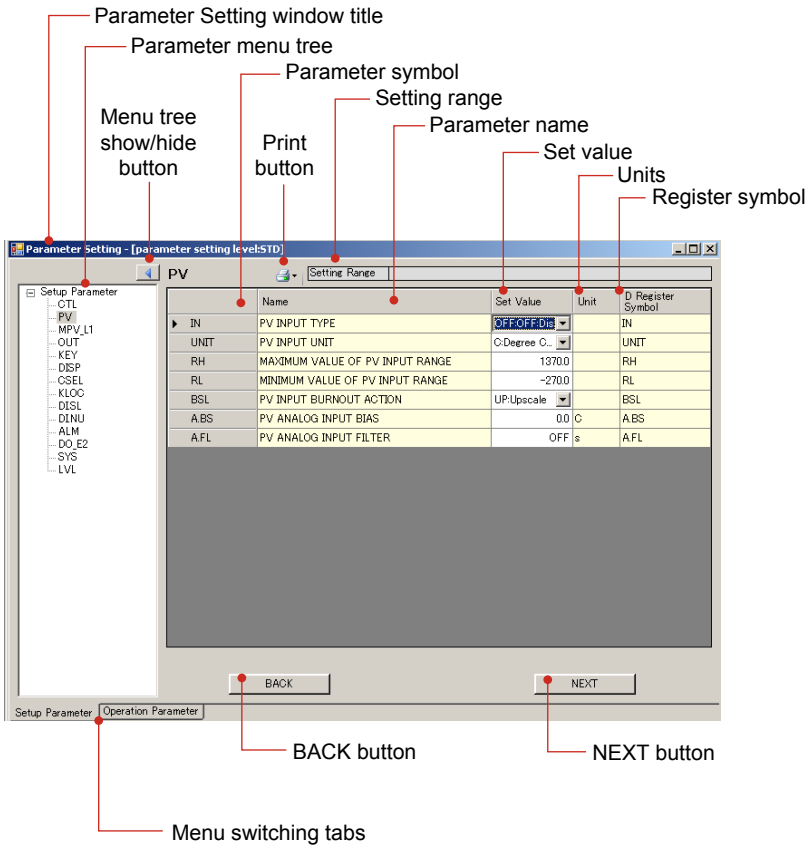
B: Register window

The Register window is also displayed on the left of the Basic window. It can be made visible or invisible. This window can be used to set parameters, perform tuning or monitor registers.

Right-clicking in the Register window enables the [Expand] or [Collapse] shortcut menu to be selected. When Expand is selected, a register can be searched by using the keyboard to enter search conditions.



C: Parameter Setting window



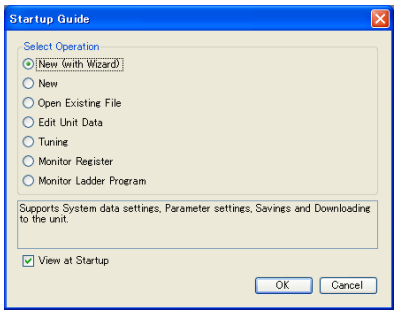
Name	Specifications
Menu switching tabs	Used to switch to the operation parameter or setup parameter windows.
Parameter Setting window title	Parameter Setting – [Parameter display level:***] To set to easy setting mode display or parameter display level (LEVL = EASY): EASY To set to standard setting mode display or parameter display level (LEVL = STD): STD To set to professional setting mode display or parameter display level (LEVL = PRO): PRO
Parameter menu tree	A menu tree of operation parameters and setup parameters
Menu tree show/hide button	Shows/hides a parameter menu tree by clicking.
Print button	Prints parameters.
Setting Range	Shows the setting range of the selected parameter.
Parameter symbol	Shows parameter symbols.
Parameter name	Shows parameter names.
Set value	Shows parameter set values. Enter a set value into a cell directly or select it from a dropdown list. To register a register, enter a register symbol by drag-and-drop from the Register window or input a register symbol into a cell directly.
Units	Shows the unit of a parameter set value.
Register symbol	Shows register symbols. Use these symbols when performing tuning.

17.4 Creating New Parameter File Using the Wizard Function

The Wizard function supports operations from system data setting, parameter setting, and a file save to downloading data to the controller. When using the Wizard function, parameters to be displayed are those available in the “easy setting mode” of the controller’ s parameter display level (LEVL).

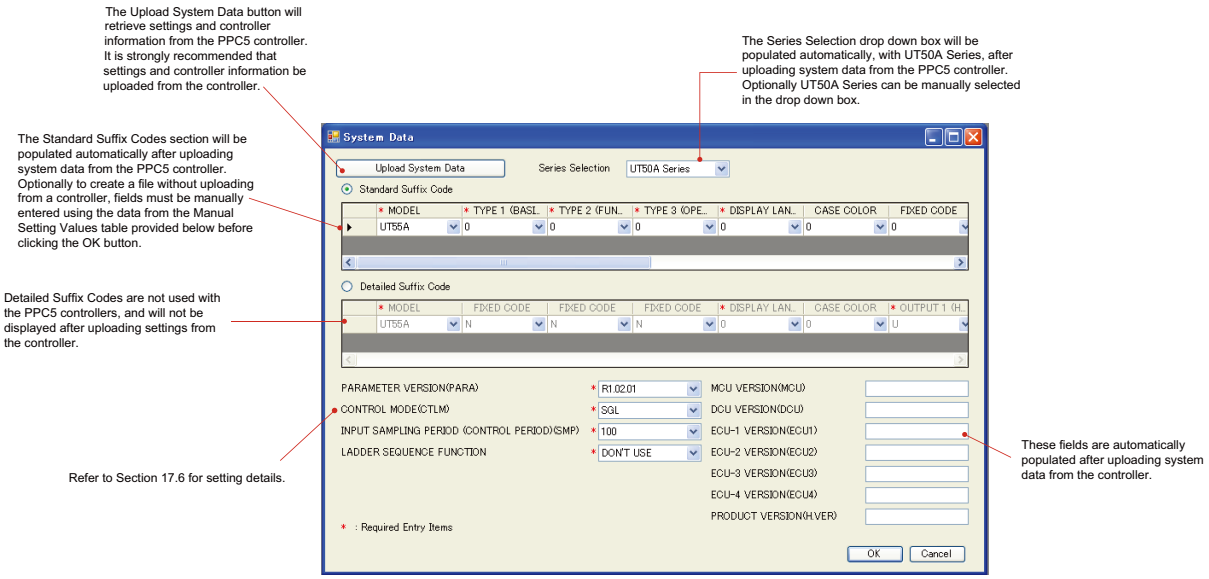
Procedure

1. Click on Windows’ [Start], select [All Programs] – [UTAdvanced], and then click on [Setting Tool].



The Startup Guide window appears at the first startup after installing the Parameter Setting Software and if the Use Startup Guide checkbox is checked in the Environmental Setting window.

2. Click on New (with Wizard) and click the [OK] button to display the System Data window.

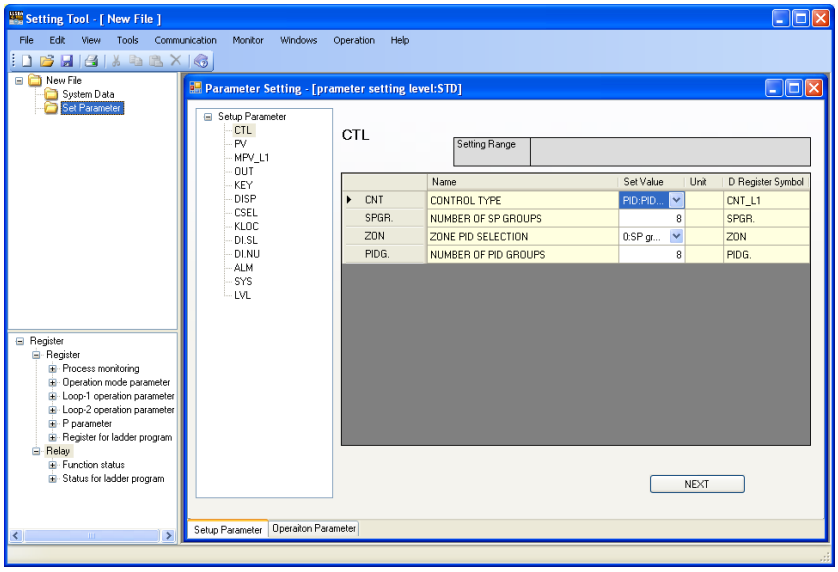


Items marked by an asterisk * are mandatory input fields.
LADDER SEQUENCE FUNCTION is not used with the PPC5 controller.

Clicking the [Upload System Data] button enables the parameter setting software to communicate with the controller to load system data into it.

It is strongly recommended that settings and controller information be uploaded from the controller. To create a file without uploading from a controller, use the settings in the table below. All other settings should be left as the default "0" or "none" respectively.					
Manual Setting Values					
Controller	Model	Type 2	Type 3	Display Language	Case Color
PPC5-1000	UT55A	0	0	1	1
PPC5-1001	UT55A	0	1	1	1
PPC5-1002	UT55A	0	2	1	1
PPC5-1100	UT55A	4	0	1	1
PPC5-1101	UT55A	4	1	1	1
PPC5-1102	UT55A	4	2	1	1

3. Enter system data and click the [OK] button to display the Parameter Setting window. Clicking the [Cancel] button closes the System Data window and cancels the settings that have been made.



Setting parameters

- For entering a set value: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.
- Entering a register symbol: Drag and drop register symbols from the Register window. When register symbols have been entered, candidates are displayed in a list; select a desired one from the list. It is also possible to register a register symbol by entering a register number. Entering and accepting a register number causes the indication to change to the register symbol.
  The cell's background color is different, identifying it as a cell in which a register symbol can be entered. To disable setting, enter "OFF" or "0" (zero).

A cell's column width can be increased or decreased by dragging the boundary line between columns.

Icon	Status
	Status enabling a drop
	Status disabling a drop

Set parameters in turn, starting at the top of the parameter menu tree. Clicking [NEXT] causes

a list of parameters to be switched to the next list. Clicking [BACK] causes a list of parameters to be switched to the previous list.

Parameter setting sequence

First set parameters relating to the input/output of setup parameters (menus CTL, PV, RSP, MPV_L1, MPV_L2, and OUT), then set the other setup parameters. After setting most of the setup parameters, set the operation parameters.

Note

- Parameters to be displayed are the same as those in the "easy setting mode" of the controller irrespective of the software parameter view level.
- If setup parameter(s) are set after setting the operation parameters, there may be cases in which the operation parameters are initialized.

What are register symbols?

Register symbols are the symbols of registers containing data such as controller parameter, operation status, alarm status, contact input, and error information in 16 bits or 1 bit.

When performing communication, registers are used as D-registers or I-relays.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y

Ln: loop number (L1 or L2)

Y: group number (1 to 8 (20) or 1 to 16, R)

xxxx_En

En: terminal area number (E1 or E3)

Example:

SP_L1_3: This means Loop-1 group-3 target setpoint.

PYS_2: This means group-2 PYS.

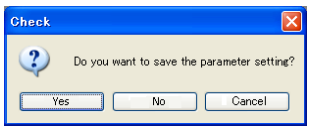
DI1.D_E1: This means E1-terminal area DI1.D.

Menu symbols and parameter symbols different from those in the controller

For menu symbols and parameter symbols, the loop number and terminal area number are indicated like register symbols. For example, the alarm function menu is indicated as ALRM in the controller, while it is indicated as ALRM_L1 in the software. For the notation, refer to "D-register symbols" above.

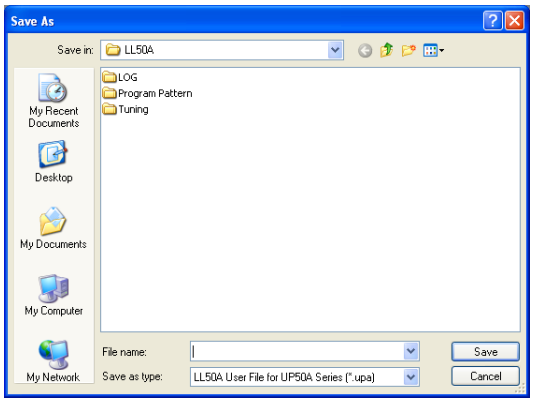
- Alarm function setting parameters
  In the controller, the alarm type, stand-by action, energized/de-energized, and latch settings are made using one parameter. However, they are set using one parameter each in the software.

4. Close the window or click . This causes the confirmation message to appear.

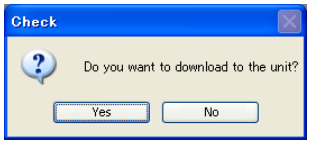


This message dialog is also displayed if the NEXT button is clicked until the end.

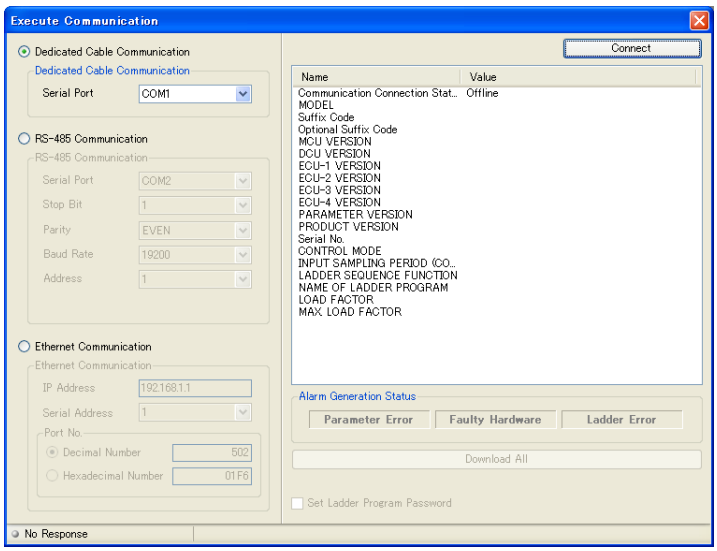
5. Click [Yes] to display the Save As window. Enter a name for the file and click the [Save] button.
LL50A User File for UT50A Series (*.uta)
File format for PPC5 Series Controllers



6. Next, the download message is displayed. Click the [Yes] button to proceed with the download, or the [No] button not to download. If you click the [No] button, move to step 9.



7. When download is selected, the Execute Communication window appears. Set up the communication conditions and click the [Download All] button.

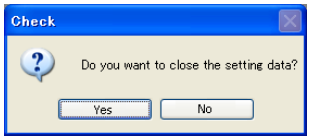


Alarm occurrence status (Lit when the corresponding errors occur.)
The symbols in parentheses indicate the register symbol.

Error display	Description
Parameter Error	System data error (SYSTEM_ERR) Calibration value error (CALB_ERR) User (parameter) default value error (UPARA_ERR) Setup parameter error (SETPA_ERR) Operation parameter error (OPEPA_ERR) Control parameter error (CTLPA_ERR) Faulty FRAM (FRAM_ERR)
Faulty Hardware	PV input A/D converter error (ADERR) RSP input A/D converter error (ADERR_E1) PV input RJC error (RJCERR) Nonresponding hardware of E1 terminal area (E1_ERR) Nonresponding hardware of E3 terminal area (E3_ERR)

8. When download has completed, a download completed message appears. Click [OK] to close the Execute Communication window.

9. Next, the message asking if you want to close setting data appears.



If you click [Yes], the user file is closed, causing the Startup Guide window to appear. If you click [No], the Basic window and File window are displayed.

Note

To change languages, close the wizard once and set the language.

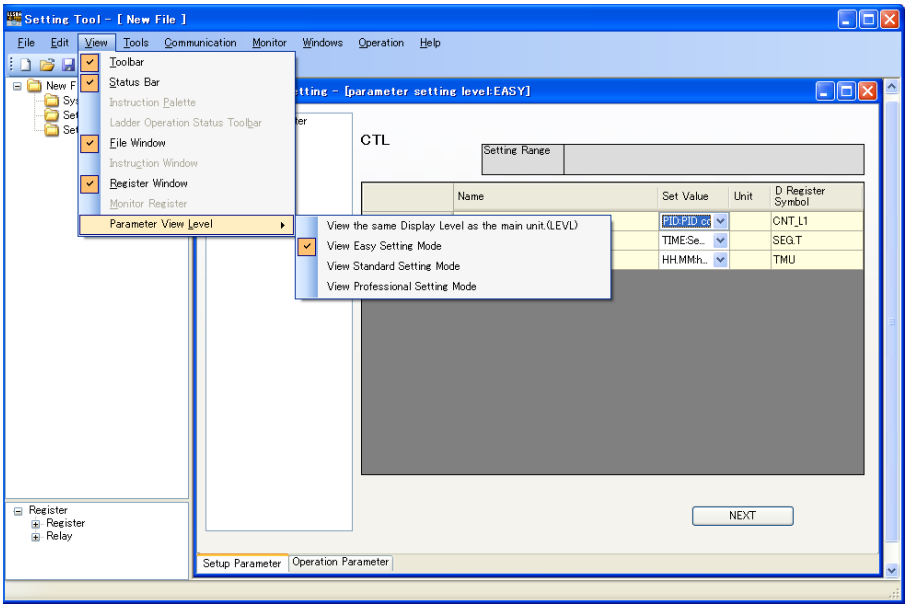
17.5 Setting the Parameter View Level

Aside from the controller's parameter display level, this section sets the view level of parameters to be displayed in the parameter setting software. It is different from the controller's parameter display level (LEVL).

Procedure

1. When the Parameter Setting window is being displayed, click on [View], select [Parameter View Level], and click on the following command in the menu. This enables parameters to be set in each view level.

- View the same Display Level as the controller: The parameter view level changes to Easy Setting Mode, Standard Setting Mode, and Professional Setting Mode according to the LEVL parameter set value of the parameter setting function.
- View Easy Setting Mode: Same as the controller's easy setting mode
- View Standard Setting Mode: Same as the controller's standard setting mode
- View Professional Setting Mode: Same as the controller's professional setting mode



The parameter view level is displayed on the Parameter Setting window's title bar.

Parameter Setting window title: Parameter Setting – [Parameter display level: ***]

- To set to easy setting mode display or parameter display level (LEVL = EASY): EASY
- To set to standard setting mode display or parameter display level (LEVL = STD): STD
- To set to professional setting mode display or parameter display level (LEVL = PRO): PRO

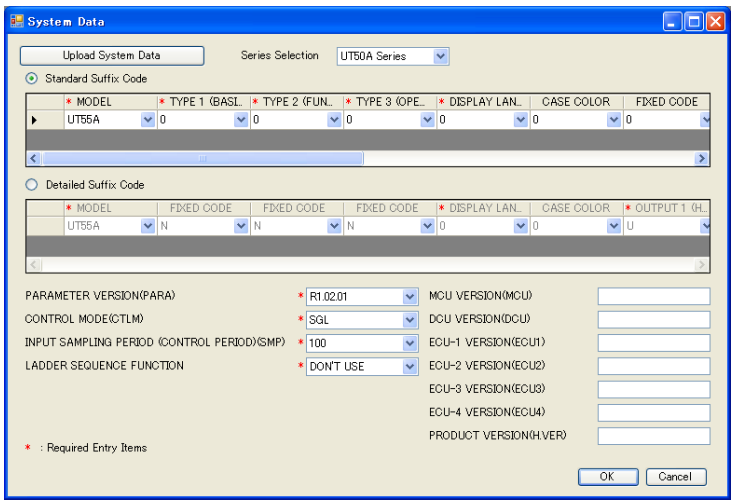
Parameters menu-locked in the controller unit can be displayed and set in the software.

17.6 Setting System Data

Procedure

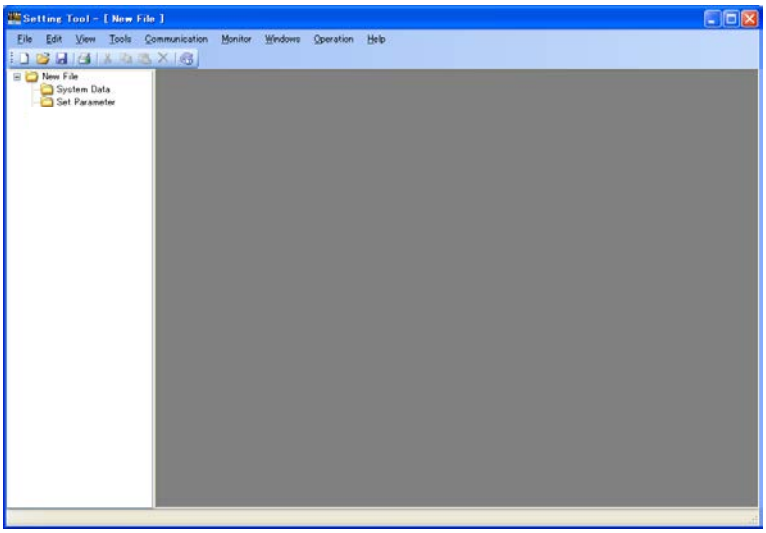
1. Open the System Data window in any of the following ways:

- Click on (or select) "New (with Wizard)" in the Startup Guide window and click the [OK] button.
- Click on (or select) "New" in the Startup Guide window and click the [OK] button.
- Click on "System Data" in the File window.
- Click on [File] – [New] in the menu.
- Click on [File] – [New (with Wizard)] in the menu.
- Click  on the toolbar.



Items marked by an asterisk * are mandatory input fields.
LADDER SEQUENCE FUNCTION not used in the PPC5 controller.

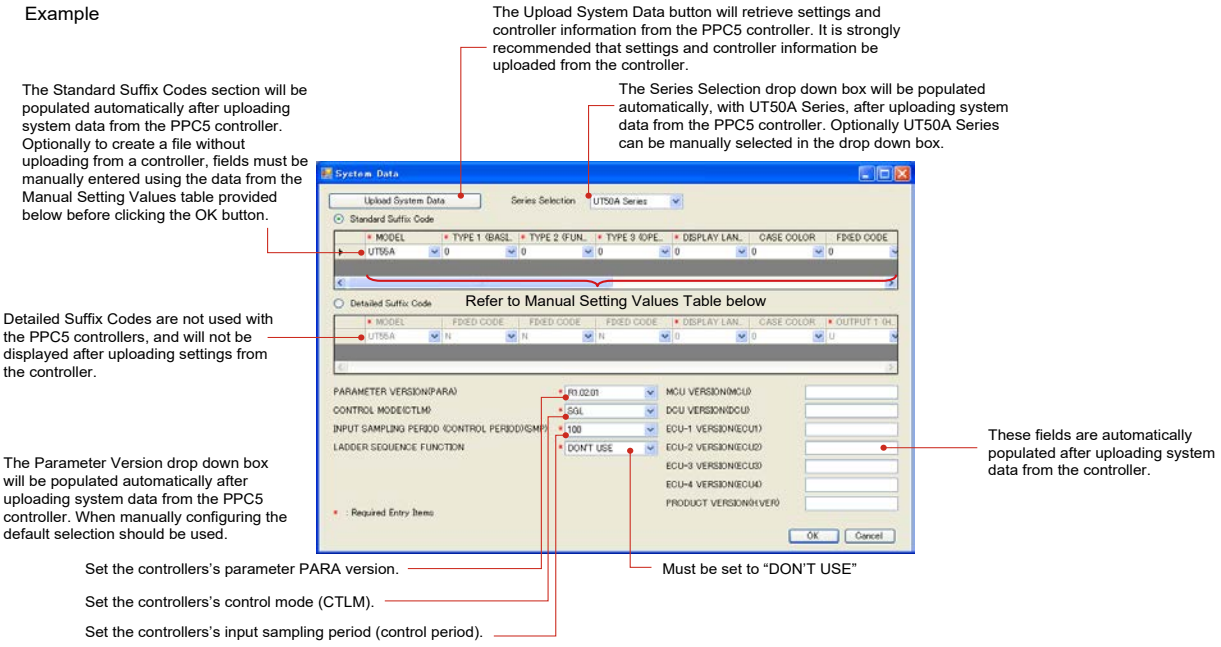
2. Enter system data or upload it from the controller and click the [OK] button. This causes the Basic window to appear. The File window is also displayed.



3. See each section for the successive operations.

Connect a PC to the controller and upload system data from the controller to the PC. This makes it easy to set system data.
If a PC cannot be connected to the controller, set up system data manually.

Example



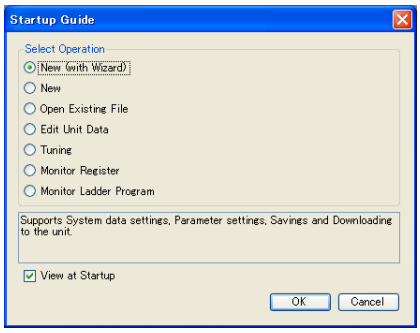
Clicking the [Upload System Data] button enables the parameter setting software to communicate with the controller to load system data into it.

It is strongly recommended that settings and controller information be uploaded from the controller. To create a file without uploading from a controller, use the settings in the table below. All other settings should be left as the default “0” or “none” respectively.					
Manual Setting Values					
Controller	Model	Type 2	Type 3	Display Language	Case Color
PPC5-1000	UT55A	0	0	1	1
PPC5-1001	UT55A	0	1	1	1
PPC5-1002	UT55A	0	2	1	1
PPC5-1100	UT55A	4	0	1	1
PPC5-1101	UT55A	4	1	1	1
PPC5-1102	UT55A	4	2	1	1

17.7 Setting Parameters

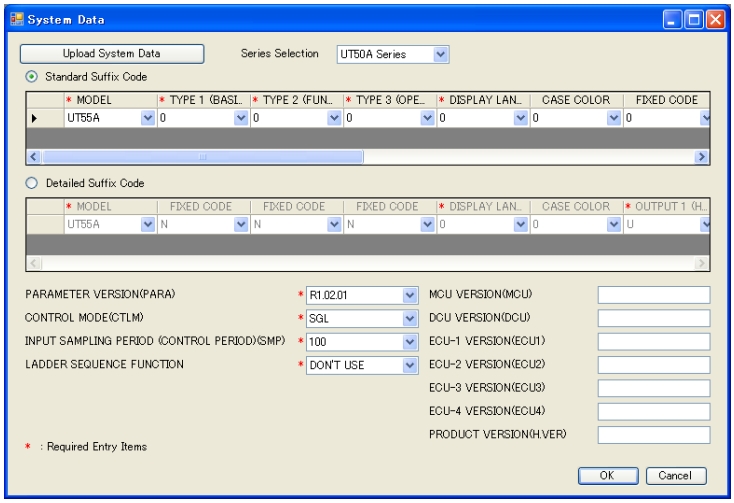
Procedure

1. Click on Windows' [Start], select [All Programs] – [UTAdvanced], and then click on [Setting Tool].



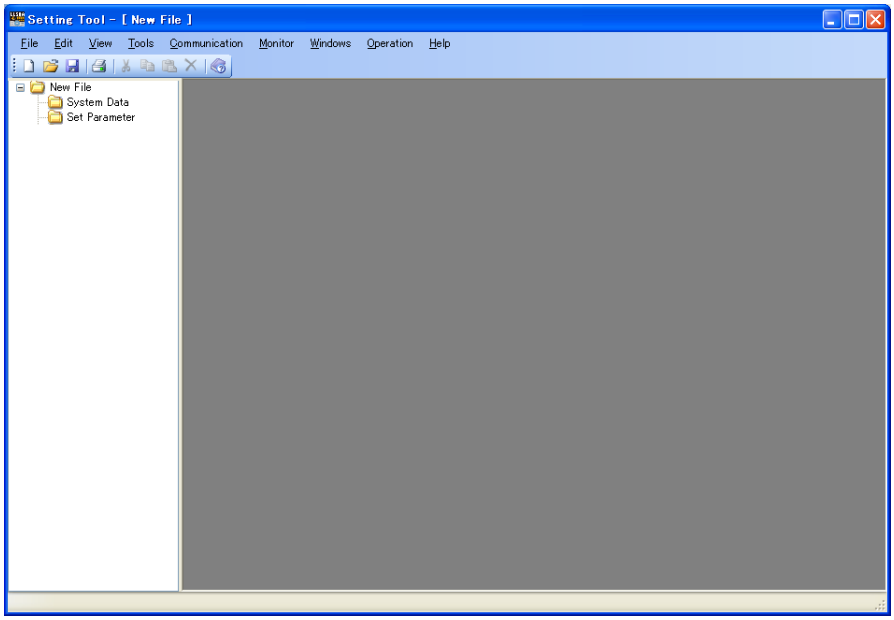
The Startup Guide window appears at the first startup after installing the parameter setting software and if the "Use the startup guide" checkbox is checked in the Environmental Setting window.

2. Click on "New" and click [OK] in the Startup Guide window, click on [File] – [New] in the menu, or click  on the toolbar to display the System Data window.

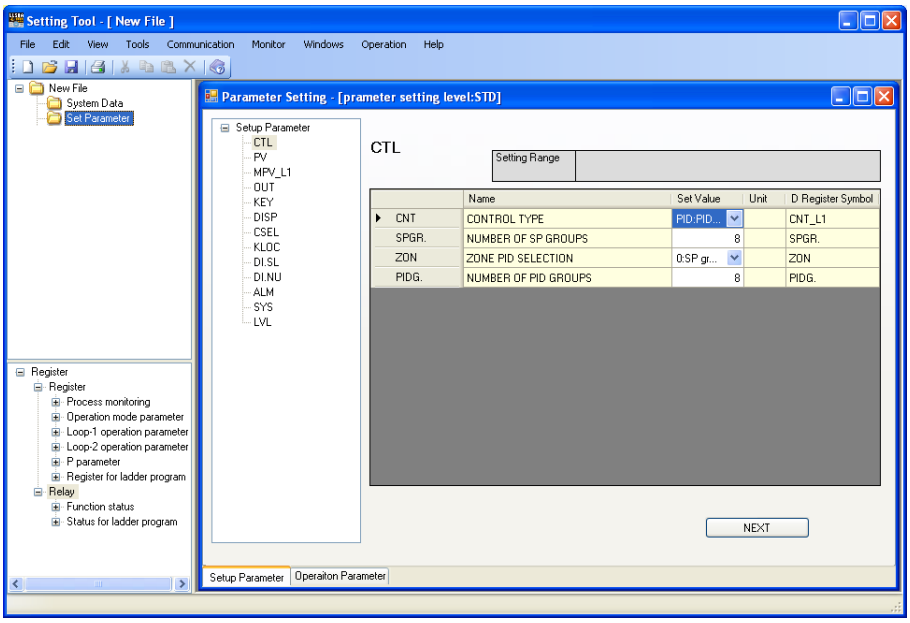


Items marked by an asterisk * are mandatory input fields.
LADDER SEQUENCE FUNCTION not used in PPC5 controller.

3. Enter system data and click the [OK] button to display the Basic window. The File window is also displayed.



4. Click "Set Parameter" in the File window to display the Parameter Setting window at the right of the Basic window.



Parameter setting sequence

First set parameters relating to the input/output of setup parameters (menus CTL, PV, RSP, MPV_L1, MPV_L2, and OUT), then set the other setup parameters. After setting most of the setup parameters, set the operation parameters.

Note

- Parameters to be displayed are as given by the setting of the parameter view level.
- If setup parameter(s) are set after setting the operation parameters, there may be cases in which the operation parameters are initialized.

5. Click on the menu of a parameter that you want to set, to display a list of parameters in the Parameter Setting window. (Click the [+] button to expand the menu or click the [-] button to collapse it.)

6. Click on the parameter that you want to set.

7. Enter a value to be set.

- For entering a value to be set: Click in a cell to enable entry, enter the desired set value, then press the [Enter] key.
- For selecting a set value: Select it from a dropdown list.
- Entering a register symbol: Drag and drop register symbols from the Register window. When register symbols have been entered, candidates are displayed in a list; select a desired one from the list. It is also possible to register a register symbol by entering a register number. Entering and accepting a register number causes the indication to change to the corresponding register symbol.
  The cell' s background color is different, identifying it as a cell in which a register symbol can be entered. To disable setting, enter "OFF" or "0" (zero).

Icon	Status
	Status enabling a drop
	Status disabling a drop

8. Repeat steps 5 to 7 to set other parameters.

9. To finish parameter setting, click  .

What are register symbols?

Register symbols are the symbols of registers containing data such as controller parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.
When performing communication, registers are used as D-registers or I-relays.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
Ln: loop number (L1 or L2)
Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
En: terminal area number (E1 or E3)

Example:
SP_L1_3: This means Loop-1 group-3 target setpoint.
PYS_2: This means group-2 PYS.
DI1.D_E1: This means E1-terminal area DI1.D.

Menu symbols and parameter symbols different from those in the controller

For menu symbols and parameter symbols, the loop number and terminal area number are indicated like register symbols. For example, the alarm function menu is indicated as ALRM in the controller, while it is indicated as ALRM_L1 in the software. For the notation, refer to "D-register symbols" above.

- Alarm function setting parameters
  In the controller, the alarm type, standby operation, energized/non-energized, and latch settings are made using one parameter. However, they are set using one parameter each in the software.

Message registration

Register message to be displayed on the controller.
Setup parameter menu: DI.SL
Symbol: MSG1 to MSG2

Group unit copy of parameter setting value

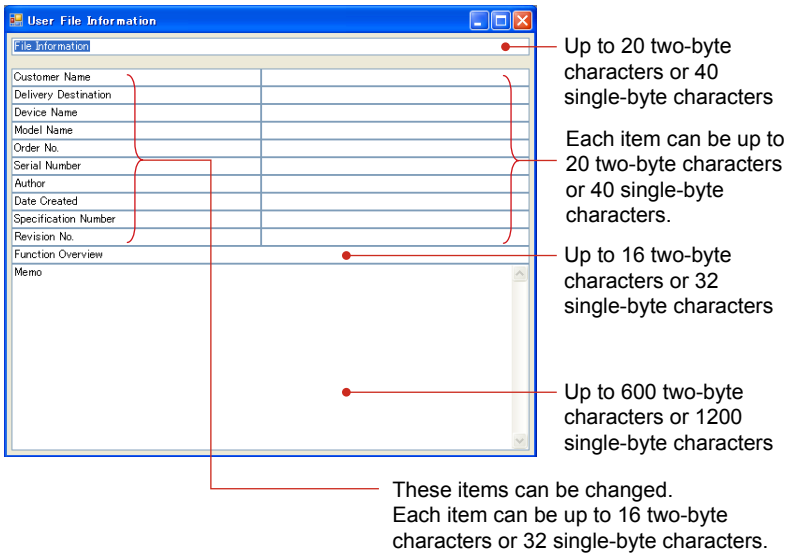
You can copy the setting values of SP groups (SP_L1, SP_L2) and PID groups (PID_L1, PID_L2) within each group.
Display the parameter setting window you want to copy the setting value and click the "Copy parameter" button.
Select (group) the copy source (one) and copy destination (s), and click OK.

17.8 Creating User File Information

User file information is used for creating data sheets that are submitted to the customer. Data sheets can also be printed out. User file information is saved in a user file and will not be downloaded to the controller.

Procedure

1. Click on [File] – [Set User File Information] in the menu. Enter user file information in the window displayed.



2. To close the window, click .

17.9 Downloading Data

CAUTION

Do not download data while the controller is being used for control loop. Otherwise, it may cause a sudden change of the control output.
Be sure to disconnect the main unit from the target unit before downloading data.

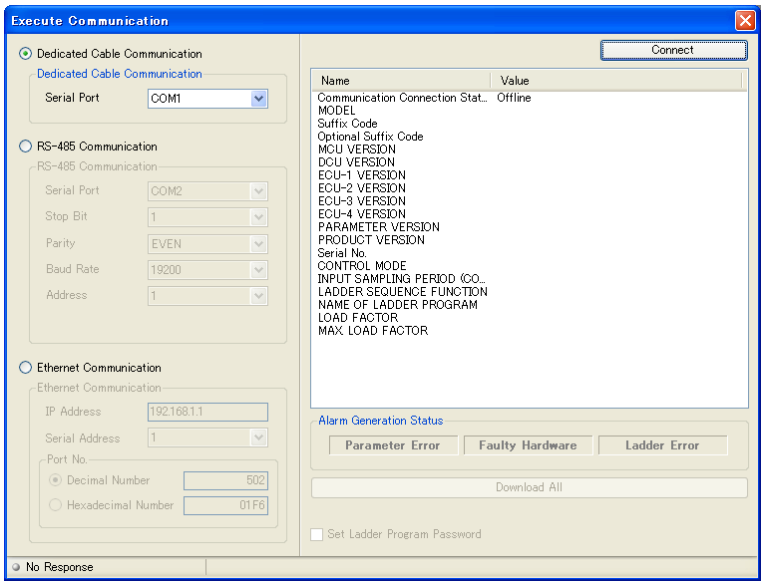
Note

Before downloading, it is recommended to compare the file data with the controller data to identify any potential changes. See Section 17.11 Comparing Data with Controller's Data.

Download All

Procedure

1. Click on [Communication] – [Download All] in the menu to display the Execute Communication window.



2. Set up the communication conditions and click the [Download All] button. When download is complete, the following message appears.
3. Click [OK] to close the Execute Communication window.

After clicking the [Download All] button, follow the prompts that are displayed.

If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

Description

Data which can be downloaded by one operation are a user file name, system data (only control mode and control period) and parameter data.
Once a password has been set, it must be entered whenever you upload, download, or compare. The password default value is non-setting. The password can be up to eight single-byte alphanumeric characters and is case sensitive.

Individual data can be downloaded as follows.

- Click on [Communication] – [Download Parameter Data] in the menu.

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the controller's communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the controller's IP address (for Ethernet communication).
- Serial Address: Set the controller's RS-485 communication address if communication is made via an Ethernet/RS-485 converter. (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window.

Note

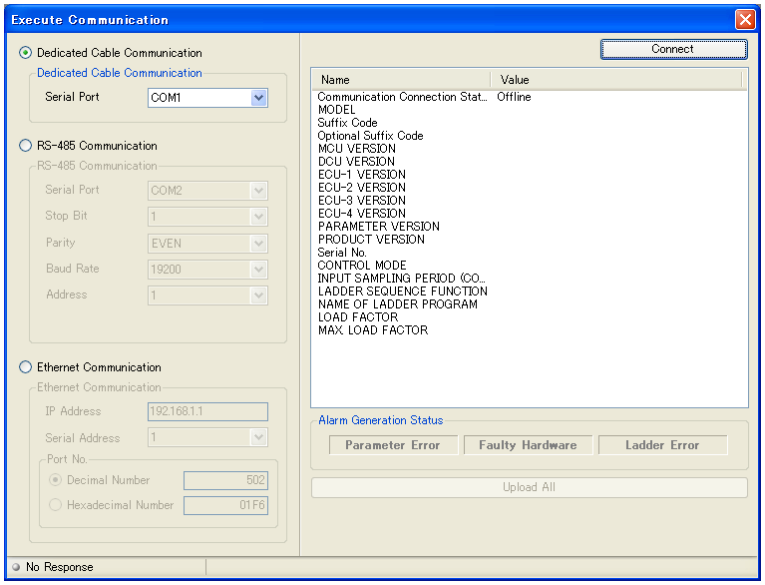
- Do not disconnect a connection cable or turn off the controller power supply during a download.

17.10 Uploading Data

Upload All

Procedure

1. Click on [Communication] – [Upload All] in the menu to display the Execute Communication window.



2. Set up the communication conditions and click the [Upload All] button. When an upload is complete, the Execute Communication window.

If the data in use has not yet been saved, a dialog box asking if you want to save data appears.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

Description

Data which are uploaded at once are a user file name, system data and parameter data. Once a password has been set, it must be entered whenever you upload, download, or compare. The password default value is non-setting. The password can be up to eight single-byte alphanumeric characters and is case-sensitive.

Individual data can be uploaded as follows.

- Click on [Communication] – [Upload Parameter Data] in the menu.

<Execute Communication window>

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the controllers' s communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the controller' s IP address (for Ethernet communication).
- Serial Address: Set the controller' s RS-485 communication address if communication is made via an Ethernet/RS-485 converter. (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window.

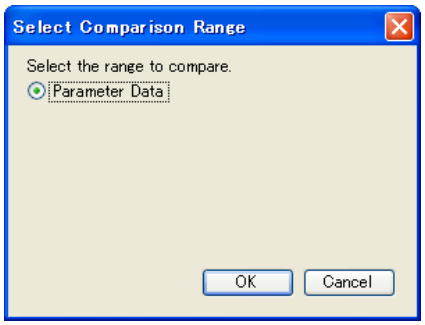
Note

Do not disconnect a connection cable or turn off the controller power supply during an upload.

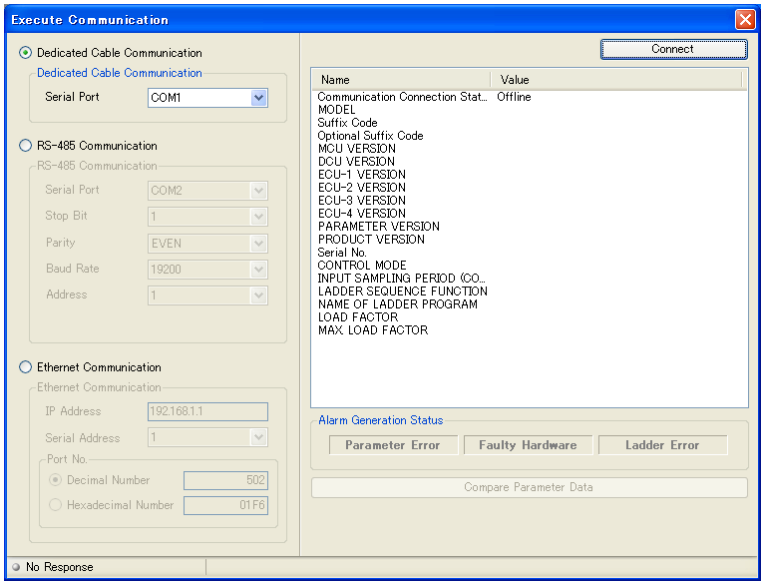
17.11 Comparing Data with Controller's Data

Procedure

1. Click on [Communication] – [Compare Communication] in the menu to display the Select Comparison Range window.

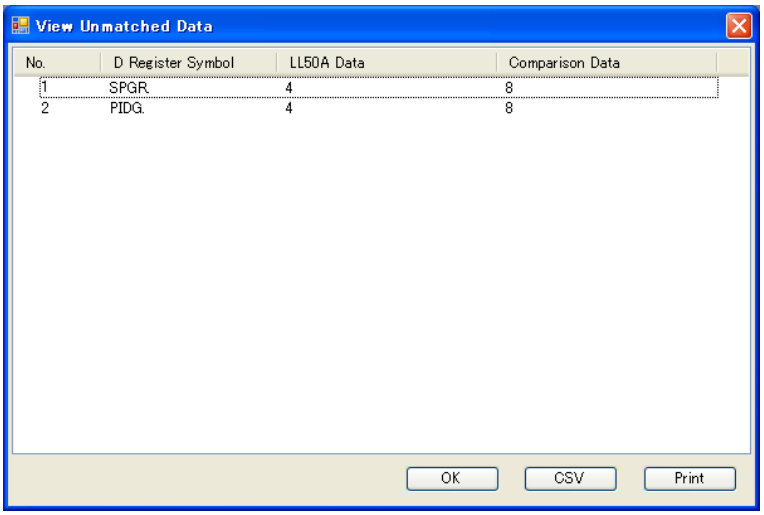


2. Select the comparison range and click the [OK] button to display the Execute Communication window.



3. Set up the communication conditions and click the [Execute Parameter Comparison] button to start parameter comparison. When parameter data matches the controller's data, the following message appears. If there is any mismatch, the mismatched data is displayed.

Window displayed if there is mismatched data



The contents of mismatch can be output to a .csv format file. If the following message appears during data comparison, follow the instructions of the message. If the parameter version is different, data may not be properly compared.

- To save the data and continue the process, click [Yes].
- To continue the process without saving the data, click [No].
- To stop the process, click [Cancel].

Description

33333333333333333333

- Serial Port: A port available for a PC is automatically displayed.
- Stop Bit, Parity, Baud Rate, and address: Set these items according to the controller's communication conditions. Data length: fixed 8 bit
- IP Address: Set this address according to the controller's IP address (for Ethernet communication).
- Serial Address: Set the controller's RS-485 communication address if communication is made via an Ethernet/RS-485 converter. (Not allowed to be duplicated)
- Port Number: Set the port number. (Decimal Number or Hexadecimal Number)

If data is downloaded via a maintenance port, nothing is displayed in the Alarm Generation Status in the Execute Communication window.

Note

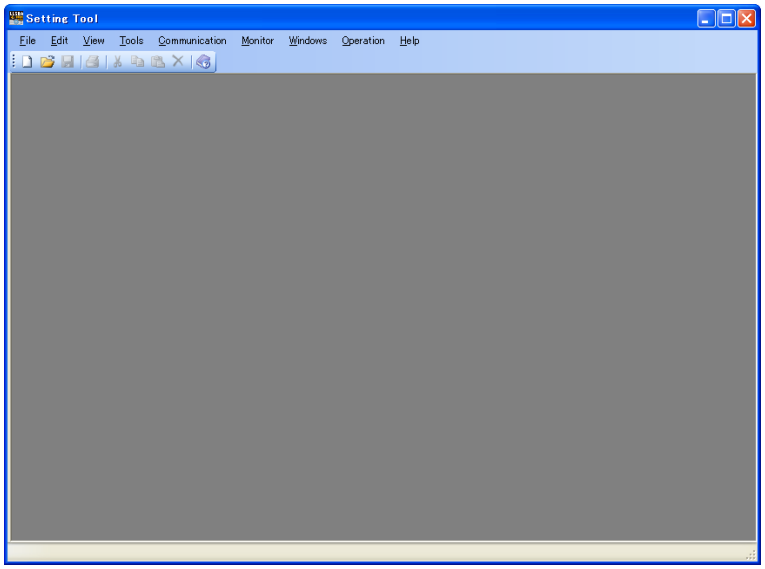
- Do not disconnect a connection cable or turn off the controller power supply during data comparison.

17.12 Monitoring/Changing Data

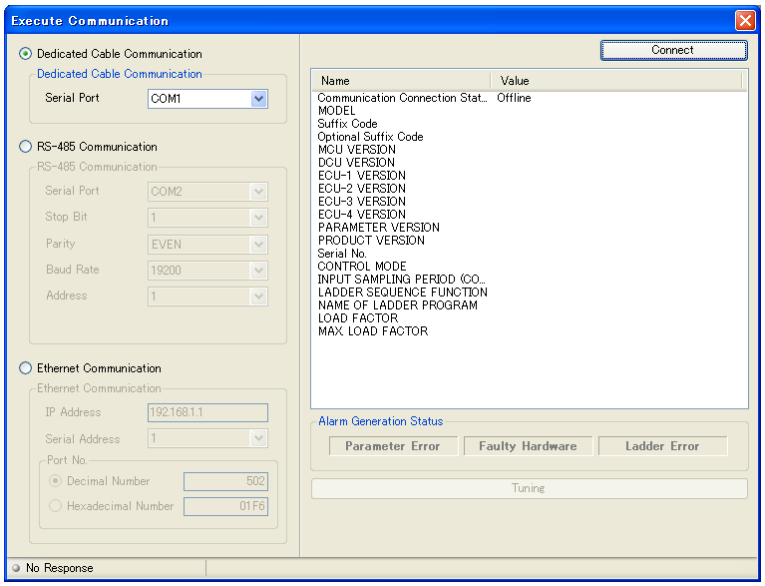
17.12.1 Monitoring/Changing Tuning Data

Procedure

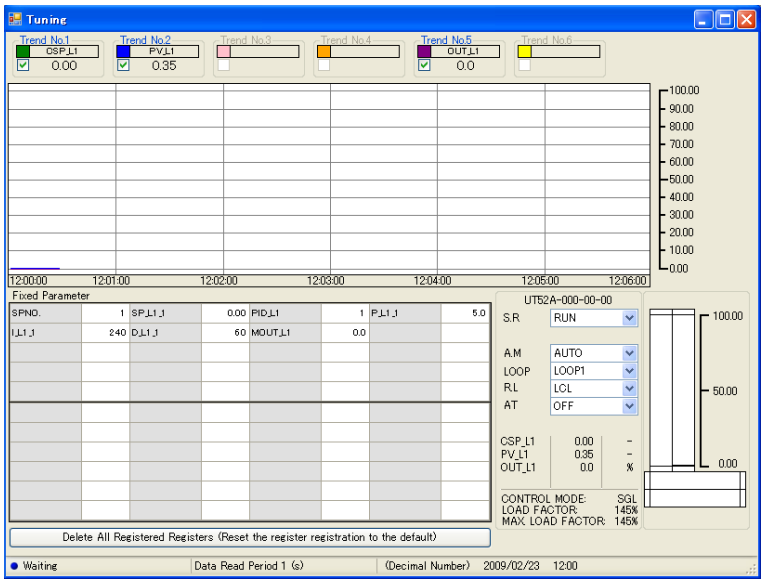
1. Display the Basic window.



2. Click on [Monitor] – [Tuning] in the menu to display the Execute Communication window.

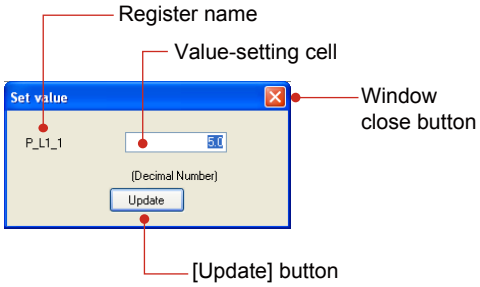


3. Set up the communication conditions and click the [TUNING] button to display the Tuning window.



4. By observing PV, SP, and OUT trends, change the proportional band, integral time, and derivative time according to the register values in the register monitor display area.

5. Double-click in the cell of a register value that you want to change to display the Set Value window.



A value is displayed in the data format selected by clicking on [Monitor] – [Display Format] in the menu.

6. Enter a value and click the [Update] button.

7. To close the window, click .

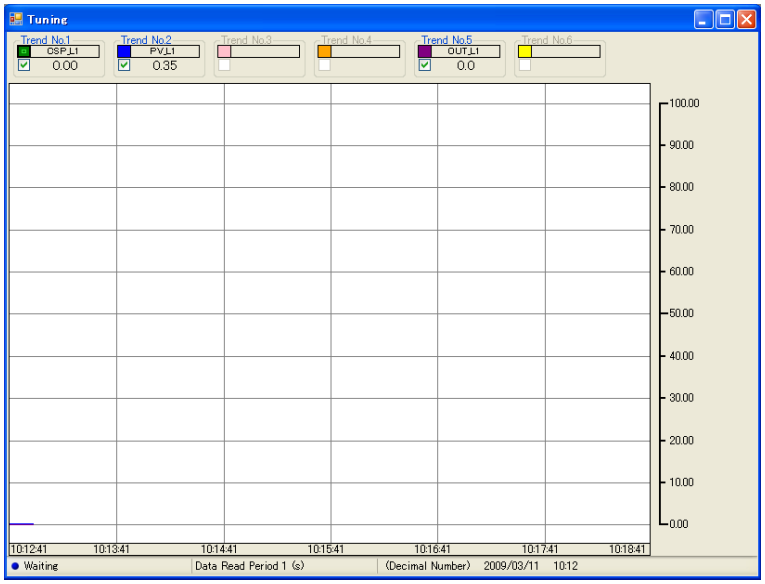
If trend data has not yet been saved during tuning, a dialog box asking if you want to save data appears.

- To save the data, click the [Yes] button.
- To discard the data, click the [No] button.
- To return to tuning, click the [Cancel] button.

Making register-monitoring display invisible

Procedure

1. Click on [View] – [Monitor Register] in the menu.



Clearing tuning trend

Procedure

1. Click on [Monitor] – [Clear Trend] in the menu.

This function clears only the display; no data will be deleted.

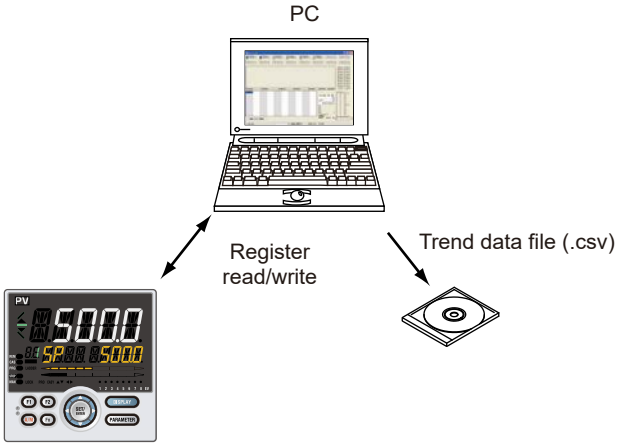
Description

The tuning function performs tuning by communicating with one controller.
This function is primarily used at system startup. The recommended trend acquisition period is one day. Furthermore, it also enables the PV, SP, and OUT values to be displayed as trend data and acquired together with the loop information and fixed registers in the Tuning window. A maximum of 65,000 acquisition times of trend data can be saved irrespective of the data read cycle. If the number of acquisition times exceeds 65,000, acquired data will automatically be saved in another file. However, the trend data can not be saved for the first one minute when another file has been made.
Example: If data acquisition is performed the 65,000st time at 21:30:50 on May 20, 2009, the name of the file containing this data is 2009_05_20_21_30_50.csv.

Note

If the control mode, control type, scale parameter, or another item is changed while the Tuning window is displayed, close the Tuning window and then re-open it to refresh the displayed values.

If a register value is changed, the change is reflected in the controller.
Multiple Tuning windows cannot be displayed simultaneously.



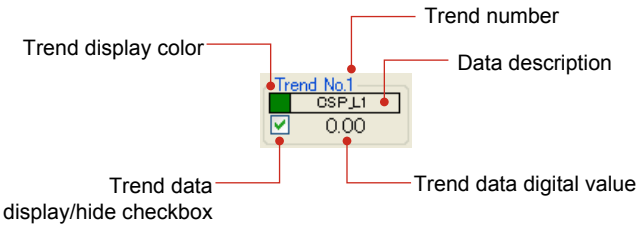
<Execute Communication window>

- Serial port: A port available for a PC is automatically displayed.
- Stop bit, parity, baud rate, data length, and address: Set these items according to the controller's communication conditions.
- IP address: Set this address according to the controller's IP address (for Ethernet communication).
- Serial address: Set the controller's RS-485 communication address if communication is made via an Ethernet/RS-485 converter. (Not allowed to be duplicated)
- Port number: Set the port number. (Decimal or Hexadecimal)

Note

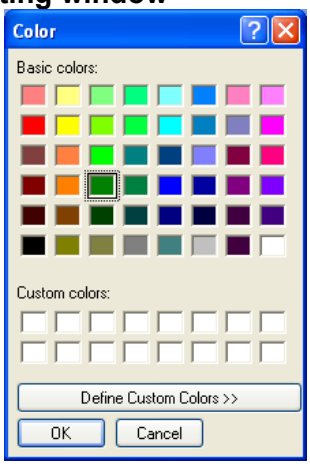
Do not disconnect a connection cable or turn off the controller power supply during trend data tuning.

(1) Trend data digital-value display section

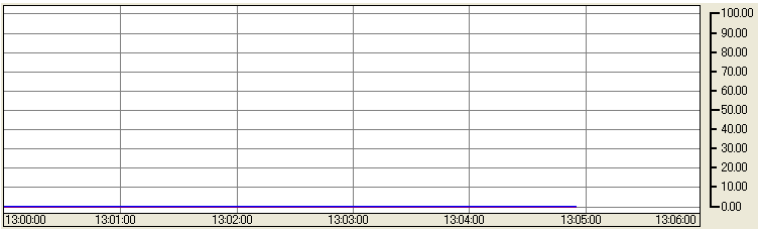


Display	Description
Number of trend data displayed	Up to six data
Trend data display/ hide checkbox	Select whether or not to display trend data on a graph using a check mark. Even if trend data is made invisible, a trend data digital value is displayed and can be output in .csv file format as trend data.
Trend display color	Clicking on the trend display color causes the Color dialog box to appear, enabling you to change the display color.
Data description	<When suffix code type 1 (basic control) is standard type or Position proportional type> When the control mode is anything other than Cascade control: Trend 1: CSP_L1 (target setpoint) Trend 2: PV_L1 (measured input value) Trend 3: None Trend 4: None Trend 5: OUT_L1 (control output value) Trend 6: None When the Control mode is Cascade control: Trend 1: CSP_L1 (Loop-1 target setpoint) Trend 2: PV_L1 (Loop-1 measured input value) Trend 3: CSP_L2 (Loop-2 target setpoint) Trend 4: PV_L2 (Loop-2 measured input value) Trend 5: OUT_L2 (control output value) Trend 6: None
Trend data digital value	Data read from the controller (Max. 7 digits including the sign and decimal point) is displayed.

Color Setting window



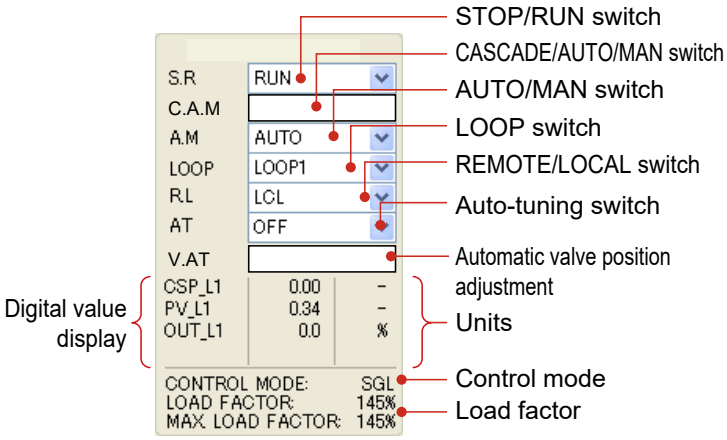
(2) Trend display area



Display	Description
Scale display	Maximum value to minimum value of the input range (Loop 1 and Loop 2) Scale divisions: 11
Trend	Trend data of -5.0 to 105.0% (0 to 100% scale) is displayed. Display update period: Data read cycle Plotting: Plotting from the left When the trend is plotted up to the right end, the display area is scrolled to the left by 2/3 hours on the time-axis scale. If a value exceeds the range, trend display is limited. However, read data is saved as is in a .csv file. Trend data is displayed starting on the left end.
X-axis (time-axis) scale	The time axis is automatically calculated according to the data read cycle.
Background color	Right-clicking on the trend graph and selecting Background Color from the shortcut menu which appears causes the Color dialog box to appear, enabling you to change the trend display color.

(3) Loop information display area

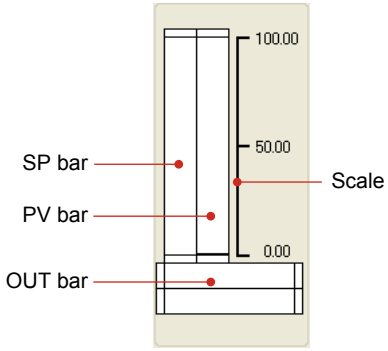
This area displays loop information selected by LOOP switching.



Display	Description
Model and suffix codes	This field displays the model and suffix codes read out when the window is opened.
STOP/RUN switching	Displays the operation status, which can be switched. RUN: Starts operation. STOP: Stops operation.
CASCADE/AUTO/MAN switching	Displays the operation status. It is displayed when the control mode is Cascade control or Secondary-loop cascade control. It can be switched. CAS: Cascade AUTO: Automatic MAN: Manual
AUTO/MAN switching	Displays the operation status. It is displayed when the control mode is anything other than Cascade control or Secondary-loop cascade control. It can be switched. AUTO: Automatic MAN: Manual
LOOP switching	The loop can be switched between LOOP1 and LOOP2 when the control mode is Cascade contro or Dual-loop controll.
Auto-tuning switching	Enables auto-tuning to be activated or deactivated. When auto-tuning is activated, optimized PID values are set to the controller and are displayed and updated in the register monitor display area at the next data read cycle. When auto-tuning finishes, OFF is displayed at the next read cycle. Switchable among OFF, 1 to 8, and R
SV and PV digital value display	PV and SV digital values are read from the controller and displayed. The values are max. 7 digits including the sign and decimal point.
OUT digital value display	OUT digital values are read from the controller and displayed. The values are max. 7 digits including the sign and decimal point.
Unit display	Displays units.
Control mode	Displays control mode.
Load factor and maximum load factor	Not used in PPC5 controller.

The display update period is the data read cycle. Data to be updated are those other than the model and suffix codes, unit display, and control mode.

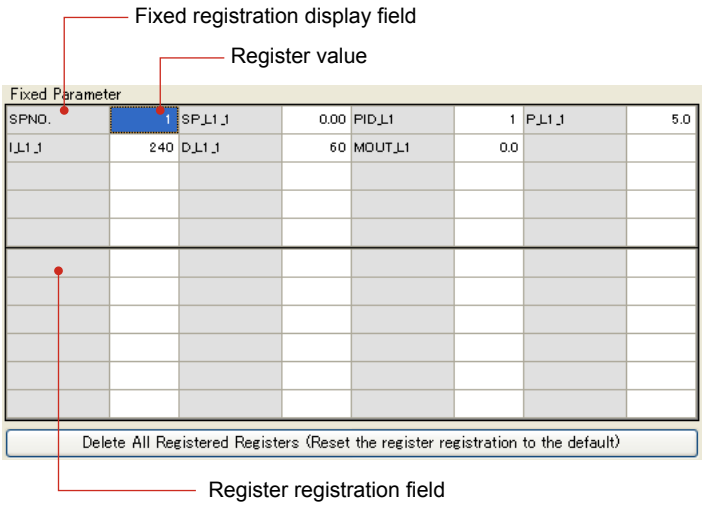
(4) Bar graph display area



Display	Description
SP and PV bars	Display the SP and PV values of the loop selected by LOOP switching in a bar graph. LOOP1 SP bar: green, PV bar: blue LOOP2 SP bar: pink, PV bar: orange
OUT bar	Displays OUT values in a bar graph. Control output: purple
Scale	The maximum value to minimum value of the input scale (Loop 1 and Loop 2) Memory: 3 points

The display update period is the data read cycle. Data to be updated are SP bar, PV bar, and OUT bar.

(5) Register monitor display area



Display	Description
Fixed register display field	24 registers The registers that are displayed change depending on the model, control mode or control type. Registration details cannot be modified.
Register registration field	24 registers The registers are registered by drag-and-drop from the Register window. To delete a registered register: (1) Use the shortcut menu that is displayed by right-clicking in the register registration field concerned. (2) Click on the register name that you want to delete and press the Delete key. The cell in which a register has been registered can be overwritten.
Register value	Double-clicking on the cell concerned causes the Set Value window to appear, enabling you to change a register value. To switch between decimal and hexadecimal displays: Click on [Monitor], select [Display Format], and click on [Decimal] or [Hexadecimal] in the menu. The display update period is the data read cycle.
Delete All Registered Registers button	Deletes all registers registered in the register registration field to initialize register registration.

What are register symbols?

Register symbols are the symbols of registers containing data such as controller parameter, operation status, alarm status, contact input, or error information in 16 bits or 1 bit.

When performing communication, registers are used as D-registers or I-relays.

D-register symbols

For some register symbols, the loop number, terminal area number, and group number are indicated by adding the underscore (_) to the end of a parameter symbol. If both the loop number and group number are added to a parameter symbol, they are added to it in the order of _loop number and _group number.

xxxx_Ln_Y
Ln: loop number (L1 or L2)
Y: group number (1 to 8 (20) or 1 to 16, R)
xxxx_En
En: terminal area number (E1 or E3)

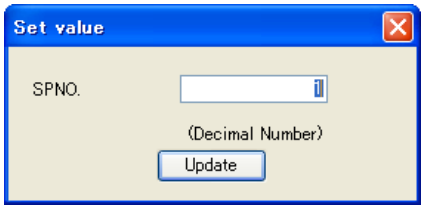
Example:
SP_L1_3: This means Loop-1 group-3 target setpoint.
PYS_2: This means group-2 PYS.
DI1.D_E1: This means E1-terminal area DI1.D.

Note

When hexadecimal display is selected, the integers of registers are displayed in hexadecimal numbers, except DAT01 to DAT20. (No decimal point position is displayed.)
DAT01 to DATA20 use 32-bit floating-point numbers of the IEEE 754 format in hexadecimal notation.

Set Value window

When a register set value is registered in the register monitor display area, the following Set Value window appears.



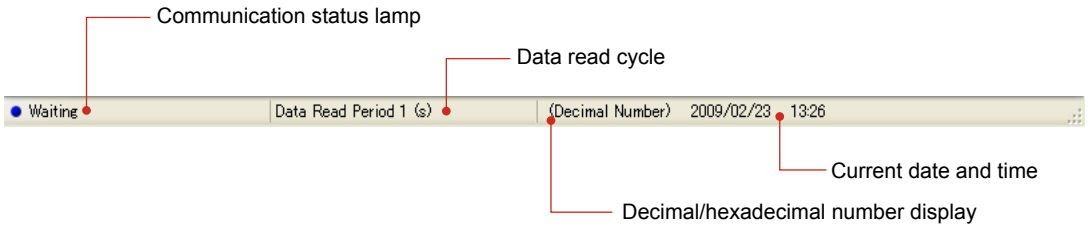
Actions to be taken when the Set Value window is closed

The display of the following data will be updated:

- Trend data digital value
- LOOP information display area
- Bar graph display
- Register monitor display area

Even if the Set Value window is opened and then closed without changing a set value, the displays will be updated irrespective of the data read cycle.

(6) Status bar display area



Display	Description
Communication status lamp	Green: Communicating Blinks at the data read cycle. Blue: Waiting (lit) Red: Delay occurring (Lit) Gray: No response
Progress bar display	The progress rate is indicated in a bar display (when Save Tuning Data)
Data read cycle	Double-clicking on this item causes the Set Data Read Cycle window to open.
Decimal/hexadecimal display	Enables you to check if a register value is displayed in whichever data format of decimal or hexadecimal numbers. It can be switched by the command from the menu. Click on [Monitor], select [Display Format], and click on [Decimal] or [Hexadecimal] in the menu.
Current date	PC system date (year/month/day)
Current time	PC system time (hour : minute)

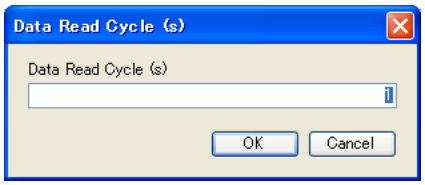
Note

When the communication status indicates “Red: Delay occurring (Lit)”, set the data read cycle longer.

17.12.2 Setting Data Read Cycle

Procedure

1. Double-click on the data read cycle display field in the status bar display area.



2. Set a data read cycle and click the [OK] button.

Description

Data is read during tuning, while monitoring registers, and at the set data read cycle.
Setting range: 1 to 3600 sec

If the data read cycle is changed during tuning, the X-axis (time-axis) span of the trend graph changes as shown in the table below. The trend graph displayed is deleted, and trend data starts to be plotted from the left end of the X axis (time axis).

Data Read Cycle	X-axis (Time-axis) Span
1 sec	6 min
2 sec	12 min
60 sec	6 hr

Note

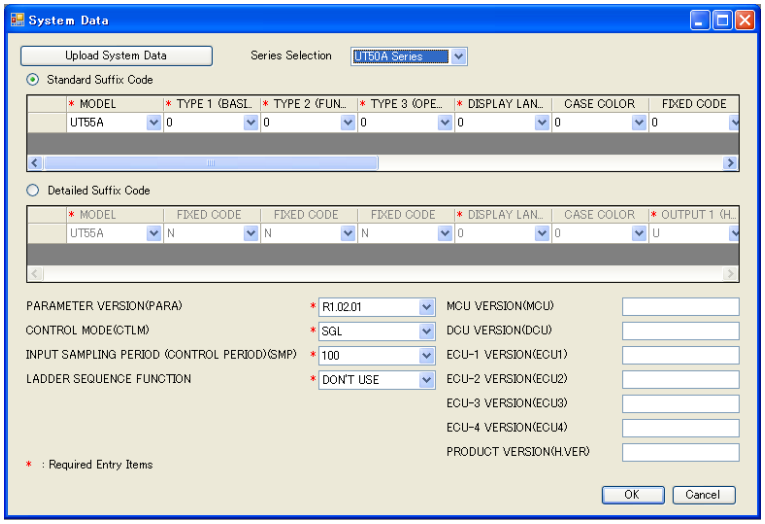
If communication processing is unable to meet the set data read cycle, a communication delay occurs.

17.13 Managing Files

17.13.1 Creating a New File

Procedure

1. Click on [File] – [New] in the menu or click  on the toolbar to display the Set System Data window.



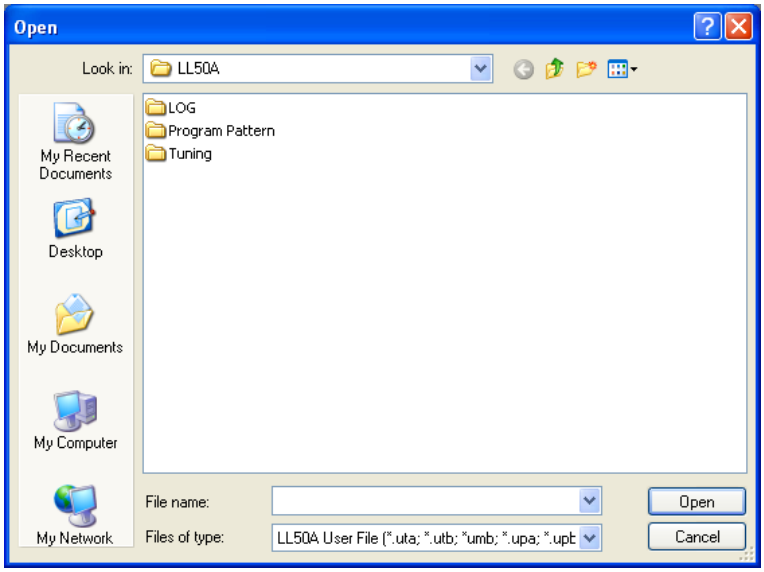
Items marked by an asterisk * are mandatory input fields.
LADDER SEQUENCE FUNCTION not used in PPC5 controller.

2. Enter system data or click the [Upload System Data] button and then click the [OK] button.

17.13.2 Opening a User File

Procedure

1. Click on [File] – [Open] in the menu or click on the toolbar to display the Open File window.



2. See the following table for the user file extension.

If a password has been set to a user file, enter the user file password.

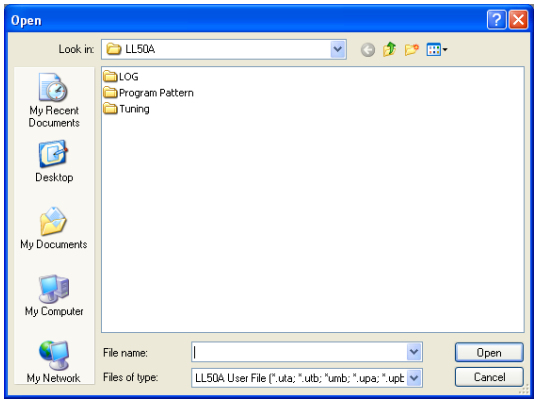
Extension

Model	Extension
PPC5	uta

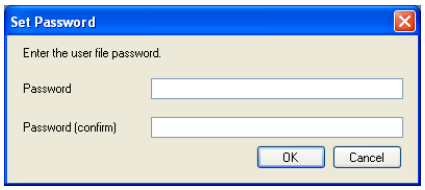
17.13.3 Setting/Clearing a User File Password

Procedure

1. With the file concerned closed, click on [File] – [Set User File Password] in the menu to display the Open File window.



2. Select the user file to which you want to set a password and then click [Open].
3. Enter the password and click the [OK] button. The password can be up to eight single-byte alphanumeric characters.



How to Clear a User File Password

1. With the file concerned closed, click on [File] – [Set User File Password] in the menu to display the Open File window.
2. Select the user file to which you want to clear a password and then click [Open].
3. Enter the password and click the [OK] button. The password can be up to eight single-byte alphanumeric characters.
4. Click the [OK] button without entering a password in Set Password dialog box.

Description

If a user file password is set to the user file, it is necessary to enter the password in the opening a user file or comparing with file data.
When setting or clearing a user file password, it is necessary to close the file in use.

17.13.4 Closing a File

Procedure

1. Click on [File] – [Close] in the menu to close the file in use.
   To save a file in use, save it by entering a file name.

17.13.5 Saving by Overwrite

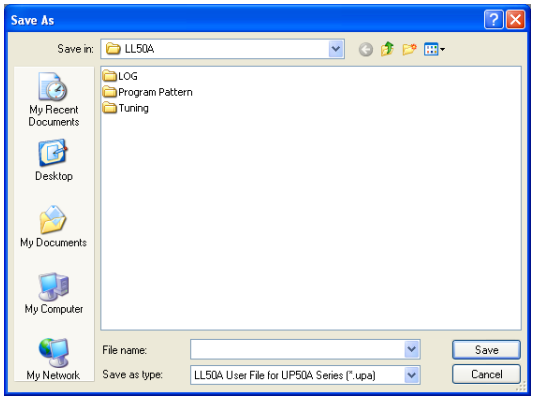
Procedure

1. Click on [File] – [Save] in the menu or click  on the toolbar to save data in use.

17.13.6 Saving a File

Procedure

1. Click on [File] – [Save As] in the menu to display the Save As window. A file name can be up to 40 single-byte characters (20 two-byte characters).
   LL50A User File for UT50A Series (*.uta) File format for PPC5 Series Controllers

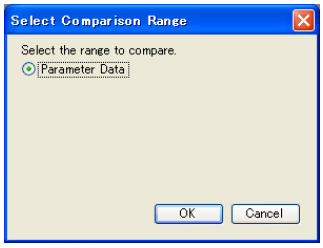


2. Enter a name for the file and click the [Save] button.

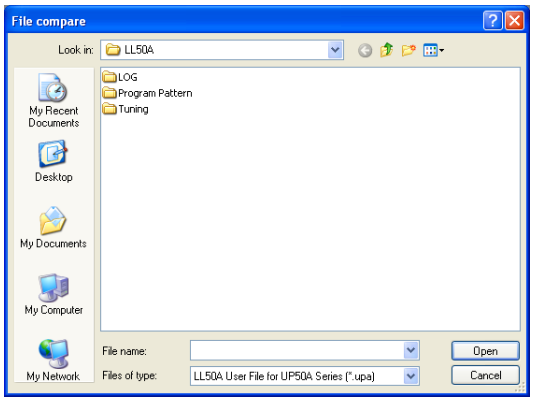
17.13.7 Comparing with File Data

Procedure

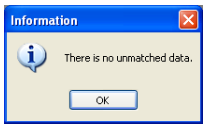
1. Click on [File] – [Compare Files] in the menu to display the Select Compare Range window.



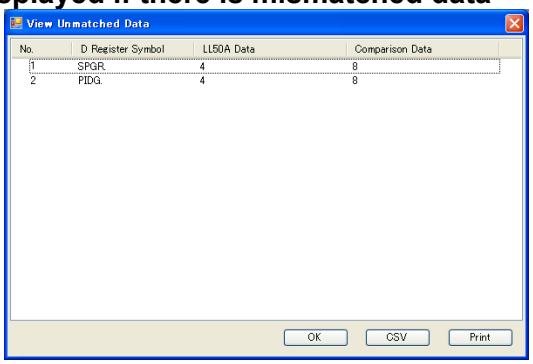
2. Select the comparison range and click the [OK] button.
3. Open a file to be compared and click the [Open] button.



4. Execute data comparison. When working data matches the file data, the following message appears. If there is any mismatch, the mismatched data is displayed.



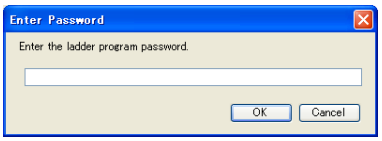
Window displayed if there is mismatched data



The details of the mismatch can be output to a file in .csv format.
If there is a difference in the parameter version, data may not be properly compared.

- To cancel comparison, click the [No] button.
- To continue comparison, click the [Yes] button.

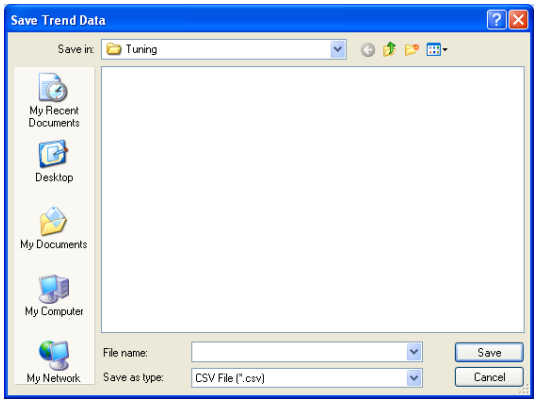
If a password has been set to data to be compared, the Enter Password dialog box appears. Enter the password and click the [OK] button.



17.13.8 Saving Tuning Data

Procedure

1. Click on [File] – [Save Trend Data] in the menu during tuning to display the Save Trend Data window.



2. Enter a name for the file and click the [Save] button.

Description

Trend data can be saved in .csv file format. A maximum of 65,000 acquisition times of trend data can be saved irrespective of the data read cycle. If the number of acquisition times exceeds 65,000, acquired data will automatically be saved in another file.
The save folder cannot be changed.
Example: If data acquisition is performed the 65,000st time at 21:30:50 on May 20, 2009, the name of the file containing this data is 2009_05_20_21_30_50.csv.

Example of Single-loop control

Title
Unit data

Model	IP Address	Serial Address	Loop	Control mode	Control type
UT55A-000-00-00			1	SGL	Standard type

Trend information

Trend number	Loop number	Data	Decimal point position	Unit	Line color	Min.	Max.
Trend number1	LOOP1	CSP_L1	1	C	Green	-2700	13700
Trend number2	LOOP1	PV_L1	1	C	Blue	-2700	13700
Trend number3							
Trend number4							
Trend number5	LOOP1	OUT_L1	1	%	Purple	0	100
Trend number6							

Trend data

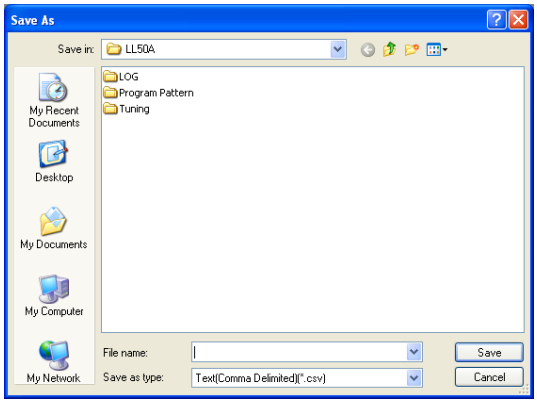
Date	Time	Trend1	Trend2	Trend3	Trend4	Trend5	Trend6	S_R	A_M	L1C	A_MR	L_L1	R_L_L2	AT_L1	AT_L2	V_AT	LOAD	LOAD	M	SPNO
2010/7/29	10:38:46	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	
2010/7/29	10:38:47	-270	0.1			0		RUN	MAN		LCL		OFF				12	14		
2010/7/29	10:38:48	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:49	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:50	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:51	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:52	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:53	-270	0.1			0		RUN	MAN		LCL		OFF				12	14		
2010/7/29	10:38:54	-270	0.1			0		RUN	MAN		LCL		OFF				12	14		
2010/7/29	10:38:55	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:56	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:57	-270	0.1			0		RUN	MAN		LCL		OFF				14	14		
2010/7/29	10:38:58	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	
2010/7/29	10:38:59	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	
2010/7/29	10:39:00	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	
2010/7/29	10:39:01	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	
2010/7/29	10:39:02	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	
2010/7/29	10:39:03	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:04	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:05	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:06	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:07	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:08	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:09	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:10	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:11	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:12	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:13	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:14	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:15	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:16	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:17	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:18	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:19	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:20	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:21	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:22	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:23	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:24	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:25	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:26	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:27	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270
2010/7/29	10:39:28	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:29	-270	0.1			0		RUN	MAN		LCL		OFF				12	14	1	-270
2010/7/29	10:39:30	-270	0.1			0		RUN	MAN		LCL		OFF				14	14	1	-270

17.13.9 Saving a CSV File

Save Parameter Data and File Information

Procedure

1. Click on [File] – [Save to CSV File] – [Save Parameter Data and File Information] to display the Save As window.



2. Enter a name for the file and click the [Save] button. The user file extension is “uta.”

Description

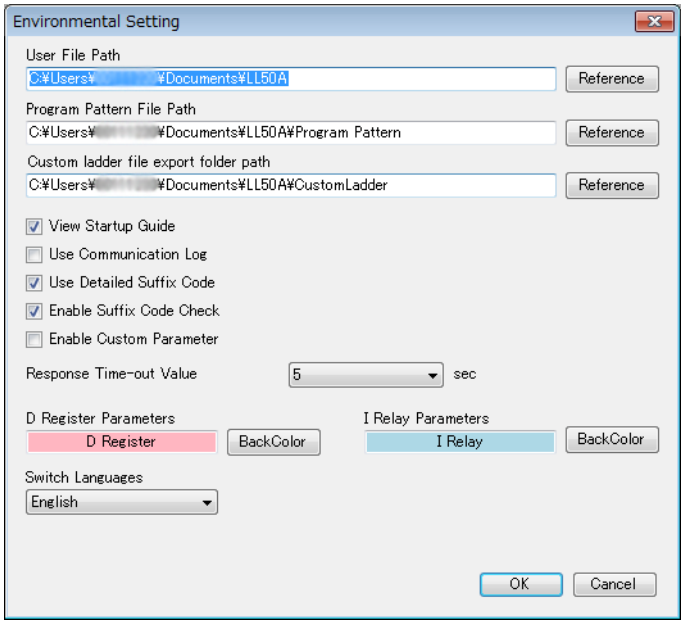
Example of CSV format

File	UT55A.uta		
Model	UT55A-000-00-00		
Control	SGL		
Product			
Parameter	R1.02.01		
File Information			
File Information			
Customer Name			
Delivery Destination			
Device Name			
Model Name			
Order No.			
Serial Number			
Author			
Date Created			
Specification Number			
Revision No.			
Function Overview			
Memo			
System Data			
Name	Set Value		
Model and suffix codes :	UT55A-000-00-00		
PARAMETER VERSION	R1.02.01		
CONTROL MODE	SGL		
INPUT SAMPLING PERIOD (CONTROL PERIOD)		100	
LADDER SEQUENCE FUNCTION	DON'T USE		
MCU VERSION			
DCU VERSION			
ECU-1 VERSION			
ECU-2 VERSION			
ECU-3 VERSION			
ECU-4 VERSION			
PRODUCT VERSION			
Setup Parameter - CTL			
D Register Symbol	Name	Set Value	Unit
CNT_L1	CONTROL TYPE	PID:PID control	
ALG_L1	PID CONTROL MODE	0:Standard PID control mode	
SPGR.	NUMBER OF SP GROUPS	8	
ALNO._L1	NUMBER OF ALARMS	4	
ZON	ZONE PID SELECTION	0:SP group number selection 1	
PIDG.	NUMBER OF PID GROUPS	8	
Setup Parameter - PV			
D Register Symbol	Name	Set Value	Unit
IN	PV INPUT TYPE	OFF:OFF:Disable	
UNIT	PV INPUT UNIT	C:Degree Celsius	
RH	MAXIMUM VALUE OF PV INPUT RANGE	1370	
RL	MINIMUM VALUE OF PV INPUT RANGE	-270	
BSL	PV INPUT BURNOUT ACTION	UP:Upscale	
RJC	PV INPUT REFERENCE JUNCTION COMPENSATION	ON:RJC ON	
ERJC	PV INPUT EXTERNAL RJC SETPOINT	0 C	
A.BS	PV ANALOG INPUT BIAS	0 C	
A.FL	PV ANALOG INPUT FILTER	OFF	s
A.SR	PV ANALOG INPUT SQUARE ROOT EXTRACTION	OFF:No square root extraction.	
A.LC	PV ANALOG INPUT LOW SIGNAL CUTOFF	1 %	

17.13.10 Making Environmental Settings

Procedure

1. Click on [File] – [Environmental Setting] in the menu to display the Environmental Setting window.



2. Set the path and click the [OK] button.

Description

- User File Path
  Shows the predetermined software user file storage location.

Note

For Windows 7/8.1/10, do not set a path that includes the Program Files folder. Otherwise, the Parameter Setting Software will not run properly.

- Program Pattern File Path

Not used with the PPC5 controller.

Note

For Windows 7/8.1/10, do not set a path that includes the Program Files folder. Otherwise, the Parameter Setting Software will not run properly.

- View Startup Guide
  If this item is checked, the Startup Guide is displayed at startup.
- Use Communication Log
  If this item is checked, communication logs are output to the specified location.
- Use Detailed Suffix Code
  If this item is checked, the detailed model and suffix codes are available when creating a new file.
- Response time-out value
  Set the response time-out value longer if the response of controller is late in each monitoring.
  The value can be set for 1 to 10 seconds.

- Enable Suffix Code Check
  If this item is checked, confirm that the model and suffix code is appropriately set in the suffix code of the System Data windows.
- Switch languages
  Can be changed “Japanese” or “English.”

The directories (default values) to which each file is stored are as shown below:

For Windows 7/8.1/10

File Type	Storage Directory (Default)
User files for UT55A (.uta) File format for PPC5 controller	C:\Users\<UserName>\Documents\LL50A
Trend files (.csv)	C:\Users\<UserName>\Documents\LL50A\Tuning
Communication log files (.log)	C:\Users\<UserName>\Documents\LL50A\LOG The directory cannot be changed.

17.14 Window Operations

Window operations

Procedure

1. Click on [Window] – [following command] in the menu.

The following window operations are available:
- Cascade
- Tile Horizontal
- Tile Vertical
- Arrange Icons
- Close All

Making the toolbar, palette, or window visible/invisible

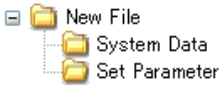
Procedure

1. Click on [View] – [following command] in the menu.

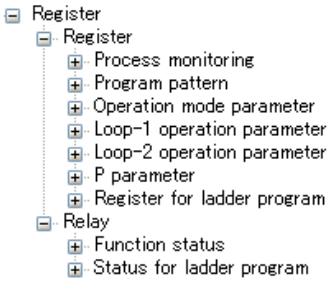
The following operations are available:
- Making the toolbar visible/invisible

- Making the status bar visible/invisible

- Making the File window visible/invisible



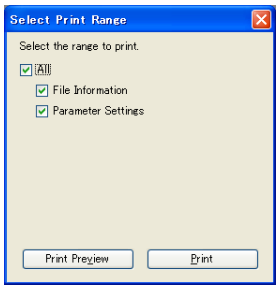
- Making the Register window visible/invisible



17.15 Printing

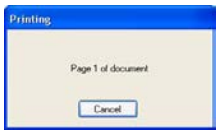
Procedure

1. Click on [File] – [Print] in the menu or click on the toolbar to display the Select Printing Range window.



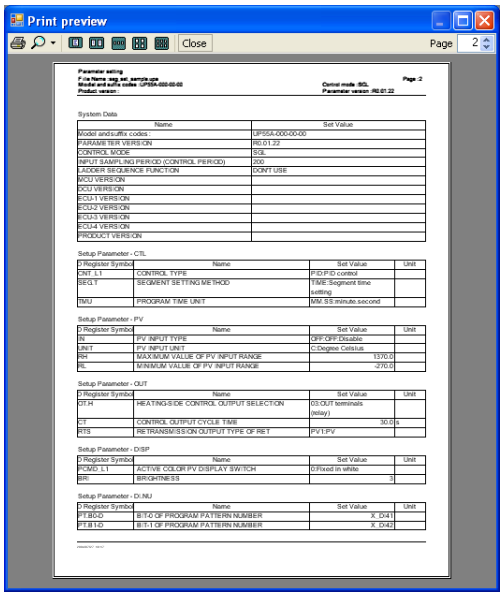
2. Select the data to be printed and click the [Print] button to display the Printing window.
Clicking [Printing Preview] enables a printing image to be displayed as shown below.

3. Printing window is displayed during printing.
To stop printing, click the [Cancel] button.



Description

The following shows a printing image.



17.16 Initializing the Controller

Initializing the Controller to Factory Defaults

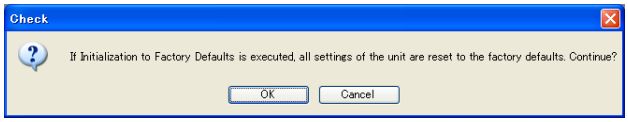
Take care to prevent casual use of the password assigned in this section.

Note

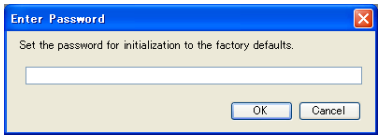
- The user setting values are not initialized even if the parameter setting values are initialized to the factory default values.

Procedure

1. Change to the status that enables communication with the controller.
2. Click on [Operation] – [Initialize] – [Initialize to Factory Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password "**UTAdvanced_INIT**" and click the [OK] button. (Single-byte alphanumeric characters)



4. The Execute Communication window appears. Click the [Initialize to Factory Defaults] button to start initialization.
   To cancel initialization, click .

Setting the User Default Values

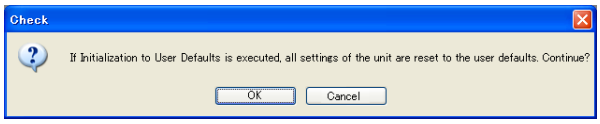
Parameter data set to the controller can be set as the user default values.

CAUTION

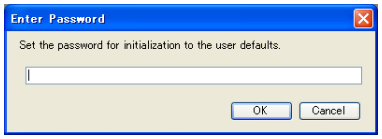
Before registering the user setting value as the user default value, make sure that the user setting value is set to the parameter.

Procedure

1. Change to the status that enables communication with the controller.
2. Click on [Operation] – [Set User Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password “UTAdvanced_INIT_SET” and click the [OK] button. (Single-byte alphanumeric characters)

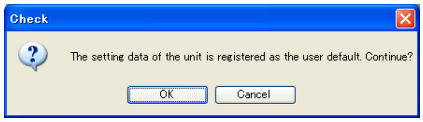


4. The Execute Communication window appears. Click the [Set User Defaults] button to start user default value setting.
   To cancel user default value setting, Click .

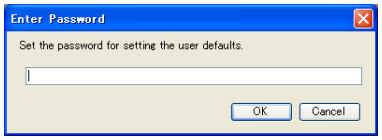
Initializing to the User Default Values

Procedure

1. Change to the status that enables communication with the controller.
2. Click on [Operation] – [Initialize] – [Initialize to User Defaults] in the menu. The following confirmation message is displayed; click the [OK] button.



3. Enter the initialization password “UTAdvanced_USER_INIT” and click the [OK] button. (Single-byte alphanumeric characters)

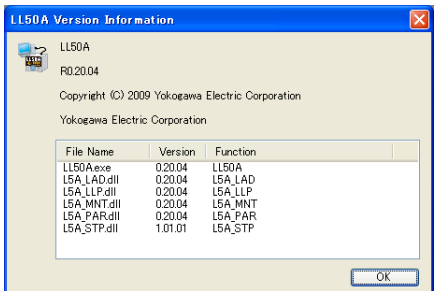


4. The Execute Communication window appears. Click the [Initialize to User Defaults] button to start initialization.
   To cancel initialization, click .

17.17 Checking Software Version

Procedure

1. Click on [Help] – [About...] in the menu to display the Setting Tool Version Information window.



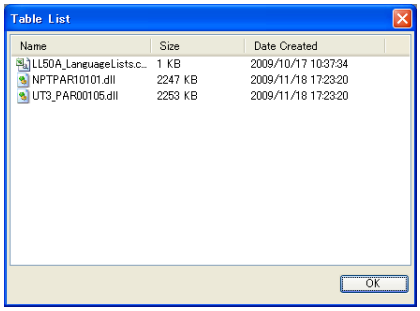
2. To close the window, click the [OK] button or .

17.18 Viewing the List of Tables

The list of tables shows the names of .dll and .xml files contained in the Table folder of the Parameter Setting Software.

Procedure

1. Click on [Help] – [Table List] in the menu to display the Table List window.



2. To close the window, click the [OK] button or .

CHAPTER 18

COMMUNICATION OVERVIEW

Contents

18.1 PPC5 Controller Communication

The PPC5 controller communication supports RS-485 communication and Ethernet communication.

Host communication: Modbus communication that enables centralized monitoring of the PPC5 by a host computer.
Coordinated operation: A system of coordinated operation is configured with a master controller and a number of slave controllers, all of which are PPC5. The slave controllers are set to operate in the same way as the master controller.
The PPC5 with Ethernet communication can be connected to IEEE802.3-compliant network (10BASE-T/100BASETX - Auto negotiated). A serial gateway function can increase the number of connected controllers.

Communication function		Protocol	Connectable device	Terminal position
RS-485 communication	RS-485 host communication	Modbus/RTU Modbus/ASCII	PC Touch panel PLC The slave devices for Ethernet communication: PPC5	E3-terminal area Reference Section 1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models)
	Coordinated operation	Coordinated operation	PPC5	
Ethernet communication		Modbus/TCP	PC Touch panel PLC	E3-terminal area Reference Section 1.4.11 Ethernet Communication Interface Wiring (PPC5-1x02 Models)

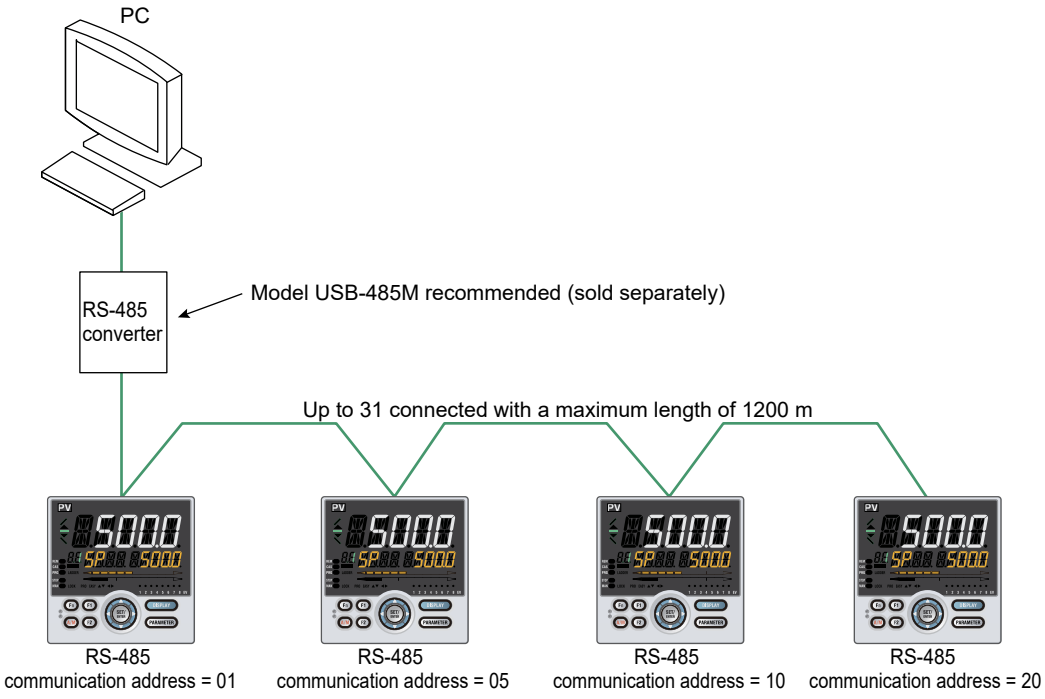
18.2 RS-485 Communication (PPC5-1x01 Models)

Two protocols are supported on the RS-485 interface: Modbus/RTU communication protocol and Modbus/ASCII communication protocol.
RS-485 communication allows data to be collected from the PPC5 and data to be set on the PPC5 easily from a host computer.

18.2.1 Communication Specifications

	Communication specifications Host communication
Communication interface	RS-485
Communication method	4-wire type half-duplex or 2-wire type half-duplex, asynchronous operation, non-procedural
Connection method	1:n multi-drop method (n = max. 31)
Communication distance	Max. 1200 m
Baud rate	600, 1200, 2400, 4800, 9600, 19200, 38400 bps
Start bit	1 bits
Data length	Modbus communication (ASCII): Fixed at 7 bits
	Modbus communication (RTU): Fixed at 8 bits
Parity bit	NONE (none), EVEN (even), ODD (odd)
Stop bit	1, 2 bits

Example, Reference Section 1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models):



18.3 Ethernet Communication (PPC5-1x02 Models)

The PPC5 with Ethernet communication can be connected to an IEEE802.3-compliant network (10BASE-T/100BASE-TX - Auto negotiated) and are capable of exchanging data with host computers, such as personal computers or PLCs, using the MODBUS/TCP protocol.
The PPC5 also has an RS-485 communication interface and the Ethernet-serial gateway function that relays the communication data received via network to the serial communication terminals. With this function, other serial communication devices not equipped with a network function can be connected to a network.

18.3.1 Communication Specifications

Ethernet Communication Interface Specification (the slave devices)

	Communication specifications
Standard	Ethernet IEEE802.3-compliant
Interface	RJ45 (10BASE-T/100BASE-TX)
Access control	CSMA/CD
Transmission speed	10 Mbps/100 Mbps
Maximum segment length	100 m (Note 1)
Communication method	Modbus/TCP
Data type	Binary
Maximum number of connections	2
Port No.	502 (factory default), can be selected within the range of 1024 to 65535

Note 1: Distance from hub to PPC5

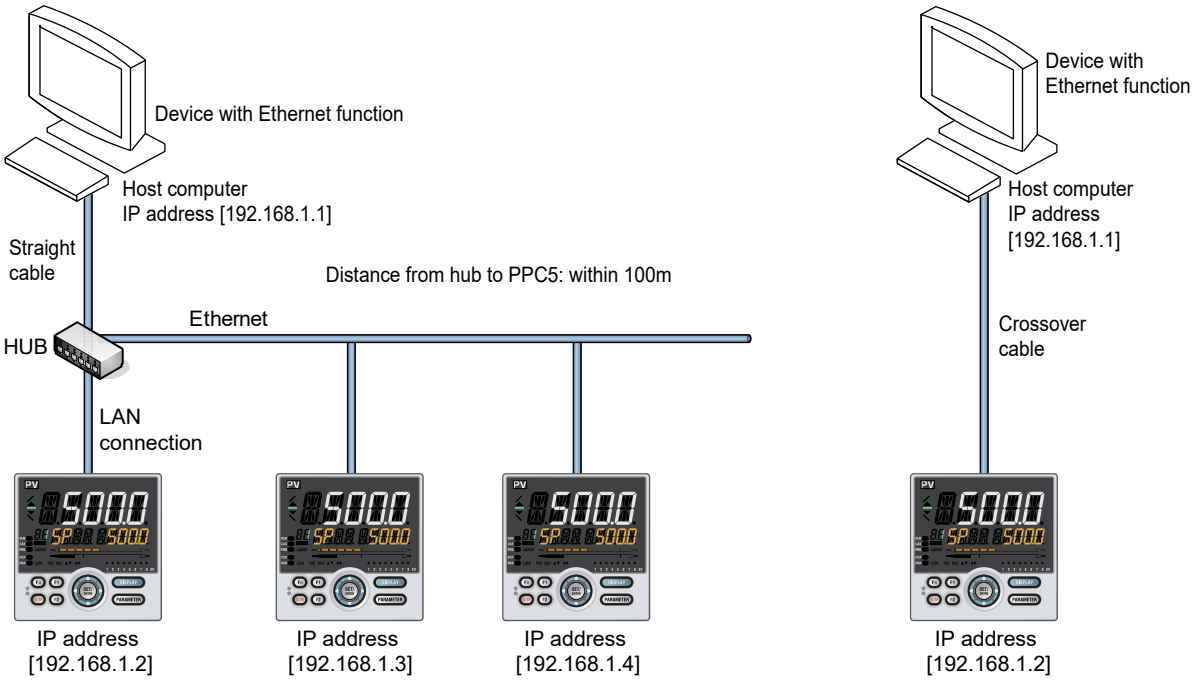
RS-485 Communication Interface Specification (the master devices for serial gateway function)

	Communication specifications
Communication interface	RS-485
Communication method	2-wire type half-duplex, asynchronous operation, non-procedural
Connection method	1:n multi-drop method (n = max. 31)
Communication distance	Max. 1200 m
Baud rate	9600, 19200, 38400 bps
Protocol	Modbus/RTU
Start bit	1 bit
Data length	8 bits
Parity bit	NONE (none), EVEN (even), ODD (odd)
Stop bit	1 bit

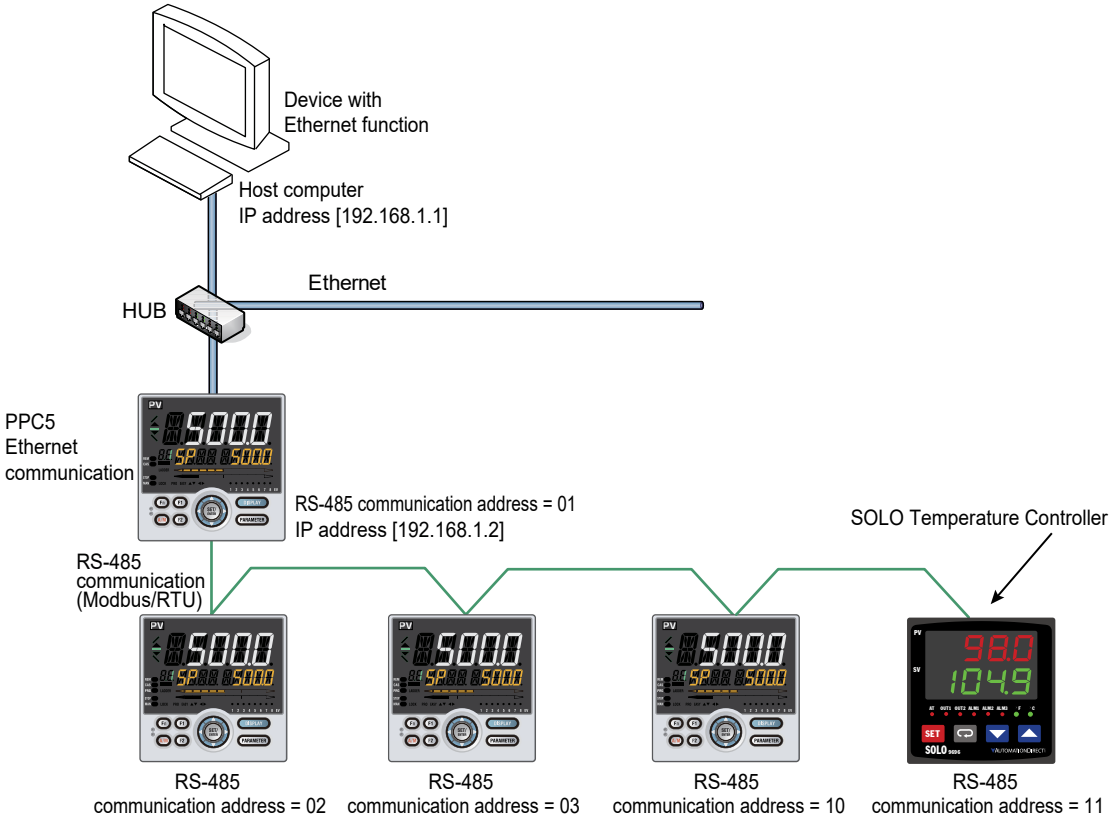
Note

If you want to connect the PPC5 to a network, you need to ensure consistency with the baud rate, connector, and the like. For details, consult with the administrator of the network.

Example: Ethernet Communication Connection



Example: Ethernet-serial Gateway Function Connection



18.4 Coordinated Communication (PPC5-1x01 Models)

Coordinated operation is a function in which a PPC5 controller is used as the master controller, and a number of the PPC5 controllers are connected to each other as slave controllers and operated according to the operation of the master controller.

18.4.1 Communication Specifications

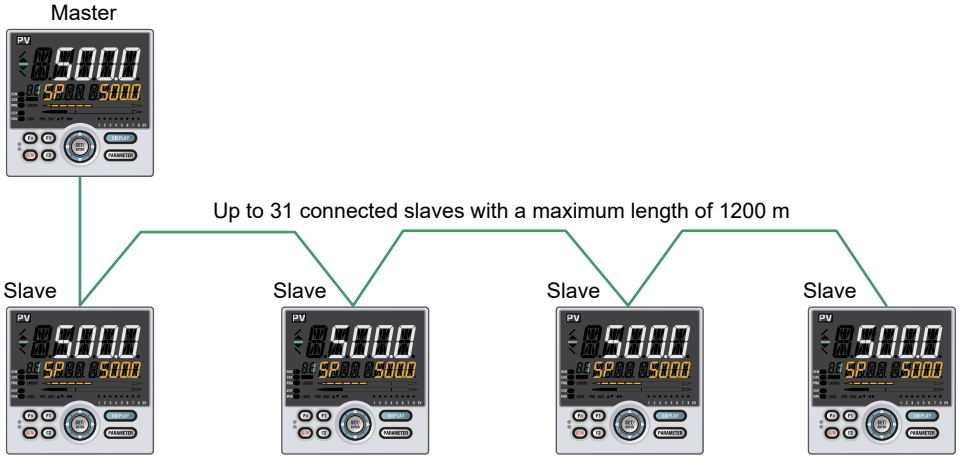
RS-485 Communication Interface Specification

	Communication specifications
Communication interface	RS-485
Communication method	4-wire type half-duplex or 2-wire type half-duplex, asynchronous operation, non-procedural
Connection method	1:n multi-drop method (n = max. 31)
Connection distance	Max. 1200 m
Baud rate	600, 1200, 2400, 4800, 9600, 19200, 38400 bps
Sart bit	1 bit
Data length	7, 8 bits
Parity bit	NONE (none), EVEN (even), ODD (odd)
Stop bit	1, 2 bits

Connection Specifications

	Communication sSpecifications
Maximum number of devices available for connection	32
Data transmitting device	1
Data receiving device	31
Transmitted data update period	200 ms

Example:



CHAPTER 19

COMMUNICATION SETTINGS

Contents

19.1 Setting Parameters

19.1.1 Setting RS-485 Communication (PPC5-1x01 Models)

This section describes the setting parameters and setting ranges of the PPC5 for using the communication functions.

Setting Display

Parameter Setting Display

Operation Display > **PARAMETER** and **Left arrow** keys simultaneously for 3 seconds (to the [**CTL**] Menu Display) > **Right arrow** key (to the [**R485**] Menu Display in E3) > **SET/ENTER** key (The setting parameter is displayed.)

Setting Details

Parameter symbol	Group display	Name	Setting range		Menu symbol	Initial value
PSL	E3	Protocol selection	Not used	PCL	R485	MBRTU (8)
			Not used	PCLSM		
			Not used	LADR		
			Coordinated master station	CO-M (3)		
			Coordinated slave station	CO-S (4)		
			Modbus (ASCII)	MBASC (7)		
			Modbus (RTU)	MBRTU (8)		
			Not used	CO-S1 (10)		
			Not used	CO-S2 (11)		
			Not used	P-P		
BPS		Baud rate	600 bps	600 (0)		19200 (5)
			1200 bps	1200 (1)		
			2400 bps	2400 (2)		
			4800 bps	4800 (3)		
			9600 bps	9600 (4)		
			19200 bps	19200 (5)		
			38400 bps	38400 (6)		
PRI		Parity	None	NONE (0)		EVEN (1)
			Even	EVEN (1)		
			Odd	ODD (2)		
STP		Stop bit	1 bit	1 (1)		1 (1)
			2 bits	2 (2)		
DLN		Data length	Modbus (ASCII)	Fixed at 7 bits (0)		8 bits (1)
			Modbus (RTU)	Fixed at 8 bits (1)		
ADR		Address	1 to 99			1
RP.T		Minimum response time	0 to 10 (x10ms)			0

Note: Figures in parentheses "( )" are values to be set when performing communication.

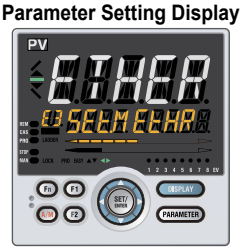
Description

- Protocol selection
  Select the protocol to be used.
- Baud rate
  Set the same baud rate as the host computer that the controller is to be connected to. The baud rate unit is bps (bits per second).
- Parity
  Set the same parity bit as the host computer that the controller is to be connected to. Set the handling of parity to be carried out when data is sent or received.
- Stop bit
  Set the same stop bit as the host computer that the controller is to be connected to.
- Data length
  Set the same data length as the host computer that the controller is to be connected to.
  Modbus communication (ASCII): Fixed at 7 bits.
  Modbus communication (RTU): Fixed at 8 bits.
- Address
  Any number within the range 1 to 99 can be set. (Numbers need not be consecutive and can be skipped. However, set only unique numbers within the same system. Do not set the same address twice.) The maximum connecting configuration is 31 controllers.
- Minimum response time
  Set the time from when receiving a communication command to responding to it. The minimum response time unit is 10 ms. The actual response time is calculated using the equation: Communication processing time + setting value of PR.T x 10 (ms).

19.1.2 Setting Ethernet Communication (PPC5-1x02 Models)

Setting Display

Parameter Setting Display



Operation Display > **PARAMETER** and **Left arrow** keys simultaneously for 3 seconds (to the [**CTL**] Menu Display) > **Right arrow** key (to the [**ETHR**] Menu Display in E3) > **SET/ENTER** key (The setting parameter is displayed.) (E3 indicating the terminal area is displayed on Group display.)

Setting Details

Parameter	Group display	Name	Setting range	Menu symbol	Factory default
HSR	E3	High-speed response mode	OFF (0) 1 to 8	ETHR	1
BPS		Baud rate	9600: 9600 bps (4) 19200: 19200 bps (5) 38400: 38400 bps (6)		38400 (6)
PRI		Parity	NONE: no parity (0)		EVEN (1)
			EVEN: even (1)		
			ODD: odd (2)		
IP1		IP address 1	0 to 255		192
IP2		IP address 2			168
IP3		IP address 3			1
IP4		IP address 4			1
SM1		Subnet mask 1	0 to 255		255
SM2		Subnet mask 2			255
SM3		Subnet mask 3			255
SM4		Subnet mask 4			0
DG1		Default gateway 1	0 to 255		0
DG2		Default gateway 2			0
DG3		Default gateway 3			0
DG4		Default gateway 4			0
PRT		Port number	502, 1024 to 65535		502
IPAR		IP access restriction	OFF: Disable (0)		OFF (0)
			ON: Enable (1)		
1.IP1		Permitted IP address 1-1	0 to 255		255
1.IP2		Permitted IP address 1-2			
1.IP3		Permitted IP address 1-3			
1.IP4		Permitted IP address 1-4			
2.IP1		Permitted IP address 2-1			
2.IP2		Permitted IP address 2-2			
2.IP3		Permitted IP address 2-3			
2.IP4		Permitted IP address 2-4			
ESW		Ethernet setting switch	OFF: - (0)		OFF (0)
			ON: (1)		

Note: Figures in parentheses "( )" are values to be set when performing communication.

Description

- High-speed response mode
  Set the address of the device for which the process data high-speed response function is used.
- Baud rate
  Set the same baud rate as the host computer that the controller is to be connected to. The baud rate unit is bps (bits per second).
- Parity
  Set the same parity bit as the host computer that the controller is to be connected to. Set the handling of parity to be carried out when data is sent or received.
- IP address
  Set the IP address according to the following format:

	0 to 255		0 to 255		0 to 255		0 to 255
IP address	IP1	.	IP2	.	IP3	.	IP4

- Subnet mask
  Set the subnet mask according to the following format:

	0 to 255		0 to 255		0 to 255		0 to 255
Subnet Mask	SM1	.	SM2	.	SM3	.	SM4

- Default gateway
  Set the default gateway according to the following format:

	0 to 255		0 to 255		0 to 255		0 to255
Default Gateway	DG1	.	DG2	.	DG3	.	DG4

Note

For the settings of the IP address, subnet mask, and default gateway, consult with the administrator of the network before setting them.

- Port number
  Generally, use "502" as the port in the Modbus/TCP protocol. To use a different port number, set within the range of 1024 to 65535.
- IP access restriction
  Set this parameter to ON (1) to enable access restriction by permitted IP address.
- Permitted IP address
  Register an IP address of the access permitted device.
- Ethernet setting switch
  This switch is for enabling the Ethernet communications parameter settings. Setting this parameter to “ON (1)” enables the high-speed response mode, IP address, subnet mask, default gateway, port number, IP access restriction, and permitted IP address settings. After this parameter is set to "ON (1)" to enable the settings, it is automatically returned to "OFF (0)."

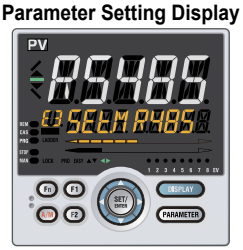
Note

After changing the high-speed response mode, IP address, subnet mask, default gateway, port number, IP access restriction, or permitted IP address, set the Ethernet setting switch (ESW) to ON (1) to update the settings. Turning the PPC5 controller off/on can also update the settings.

***: It takes about 20 seconds for the new settings of the Ethernet communication parameters to be enabled.**

19.1.3 Setting Coordinated Operation (PPC5-1x01 Models)

Parameter Setting Display



Operation Display > **PARAMETER** and **Left arrow** keys simultaneously for 3 seconds (to the [**CTL**] Menu Display) > **Right arrow** key (to the [**R485**] Menu Display in E3) > **SET/ENTER** key (The setting parameter is displayed.)

Setting Details

Parameter	Group display	Name	Setting Range		Menu symbol	Factory Default
PSL	E3	Protocol selection	Coordinated master station	CO-M (3)	R485	MBRTU (8)
			Coordinated slave station	CO-S (4)		
			Coordinated slave station (Loop-1 mode)	CO-S1 (10)		
			Coordinated slave station (Loop-2 mode)	CO-S2 (11)		
BPS		Baud rate	600 bps	600 (0)		19200 (5)
			1200 bps	1200 (1)		
			2400 bps	2400 (2)		
			4800 bps	4800 (3)		
			9600 bps	9600 (4)		
			19200 bps	19200 (5)		
			38400 bps	38400 (6)		
PRI		Parity	None	NONE (0)		EVEN (1)
			Even	EVEN (1)		
			Odd	ODD (2)		
STP		Stop bit	1 bit	1 (1)		1 (1)
			2 bits	2 (2)		
DLN		Data length	7 bits	7 (7)		8 bits (8)
			8 bits	8 (8)		
ADR		Address	1 to 99			1
RP.T		Minimum response time	0 to 10 (x10ms)			0

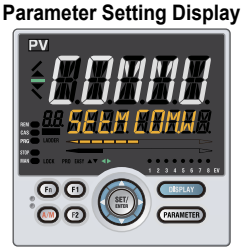
Note: Figures in parentheses "( )" are values to be set when performing communication.

19.2 Setting Communication Write Permit

Writing to registers via all communication protocols can be permitted and prohibited. (When the writing is being prohibited, the response returns as "normal" if the communication is performed, but the writing is not performed.)
However, communication using the IR adapter (on the front panel) is possible.
Writing to registers via communication is possible only when the parameter COM.W (communication write enable/disable) in the KLOC menu is set to OFF (enable).

Setting Display

Parameter Setting Display



Operation Display > **PARAMETER** and **Left arrow** keys simultaneously for 3 seconds (to the [**CTL**] Menu Display) > **Right arrow** key (to the [**KLOC**] Menu Display) > **SET/ENTER** key (The COM.W parameter is displayed.)

Setting Details

Parameter symbol	Name	Setting range	Menu symbol	Initial value
COM.W	Communication write enable/ disable	OFF: Enable (0)	KLOC	OFF (0)
		ON: Disable (1)		

Note: Figures in parentheses "( )" are values to be set when performing communication.

CHAPTER 20

MODBUS COMMUNICATION

Contents

20.1 Modbus Communication (PPC5-1x01 Models)

20.1.1 Overview

The PPC5-1x01 can communicate with devices such as PCs, PLCs, and touch panels by using Modbus communication. With Modbus communication, these devices can exchange data with PPC5 by reading/writing the internal registers (D registers and I relays) of the PPC5.

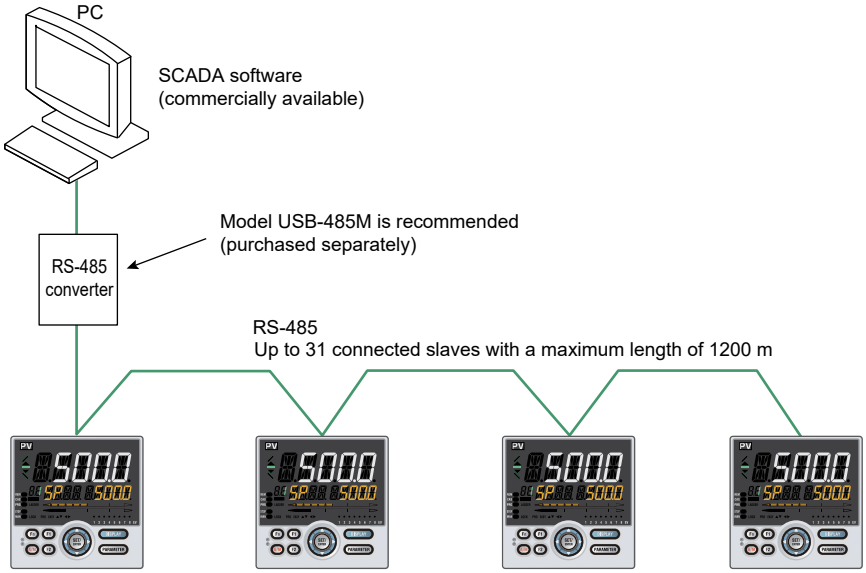
CAUTION

The parameters of the PPC5 are placed in the D registers.
If the settings of some parameters are changed, the related parameters may be initialized.
When changing the parameter setting, configure (write) the settings in the following orders.

1. Setup parameters
   - 1-1 Control mode parameter (CTLM) *1
   - 1-2 Input -related parameters *2
   - 1-3 Output-related parameters
   - 1-4 Other necessary parameters
2. Operation parameters
   - 2-1 Alarm type parameters
   - 2-2 Alarm setpoint parameters
   - 2-3 Other necessary parameters

*1: If the setting of CTLM (control mode) is changed, the related parameters will be initialized.
*2: If the setting of IN (input type) is changed, the parameters related to ranges or scales such as target setpoint etc. will be initialized.

Overview of Modbus Communication Connection



Reference Section 1.4.9 RS-485 Communication Interface Wiring (PPC5-1x01 Models)

There are two transfer modes in Modbus communication, the ASCII mode and RTU mode (binary method).

When multiple controllers are connected on a single network, all of the controllers must be set to the same transfer mode.

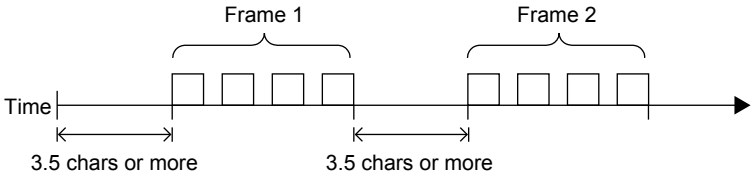
The following table compares the RTU and ASCII modes.

Comparison of RTU and ASCII Modes

Item	ASCII Mode	RTU Mode
Number of data bits	7 bits (ASCII)	8 bits (binary)
Detection of message start	Text : (colon)	Time Data receive after the silent interval of 3.5 characters or more
Detection of message end	Text CR+LF	Time Silent interval of 3.5 characters or more after data receive
Message length (*1)	2N+1	N
Inter-character timer timeout	1 second	None
Error detection	Longitudinal redundancy check: LRC	Cyclic redundancy check:CRC-16

*1: The message length in the ASCII mode is “2N+1”. The message length in the RTU mode is assumed to be “N.”

Detection of Message Frame Termination in RTU Mode



Note

When the data written to D registers / I relays is outside the valid range, the response is returned as “normal.”
However, the data cannot be written to D registers / I relays.

20.1.2 Configuration of Messages

The structure of messages sent to the PPC5 from the host computer is as follows:

	(1)	(2)	(3)	(4)	(5)	(6)
Element	**Message start mark**	**Address No (ADR)**	**Function code**	**Data**	**Error check**	**Message end mark**
Number of bytes in RTU mode	None	1	1	2n (variable length)	2	None
Number of bytes in ASCII mode	1	2	2	4n (variable length)	2	2

(1) Message start mark
This indicates the start of the message. A colon (:) is required only in the ASCII mode.

(2) Address No. (01 to 99)
This No. is for enabling the host computer to identify the PPC5 at the communication destination.
(Individual PPC5 ID numbers are expressed in Hex in messages.)

(3) Function code
The instruction (function code) from the host computer is specified.

(4) Data
The D register / I relay numbers, number of D registers / I relays, parameter values, etc. are specified according to the function code. (These are expressed in Hex in messages.)

Writing to string parameters is set in the word unit to enable writing to be performed. However, the string length of each string parameter is fixed, once 0x00 is written, 0x00 is consistently written in the subsequent strings, but not displayed in the indicator.

Example:

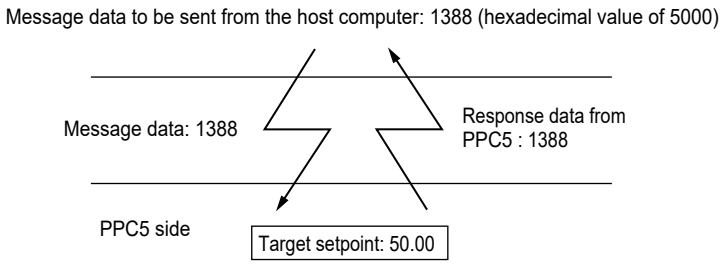
Condition	Content of D register n	Content of D register n+1	Content of D register n+2	Content of D register n+3	Display data
Status before writing to string parameter	12 (0x3132)	34 (0x3334)	56 (0x3536)	(0x0000)	12345678
Status after writing to string parameter	12 (0x3132)	3 (0x3300)	(0x0000)	(0x0000)	123

(5) Error check
In the RTU mode, errors are checked by the cyclic redundancy check (CRC-16).
In the ASCII mode, errors are checked by the longitudinal redundancy check (LRC).

(6) Message end mark
This indicates the end of the message. “CR” and “LF” are required only in the ASCII mode.

● Message format for communication

Example: When setting the target setpoint “50.00,” the host computer sends the value “1388” as message data which is a hexadecimal value of “5000” (50.00 excluding the decimal point) (this is also true for setting 5.000 or 500.0).



* The PPC5 determines the decimal point position for “5000” by the decimal point position parameter setting (in this case, P.DP = 2).

■ Specifying D registers / I relays

When you use a commercially available SCADA or the like or a user-created communication program, you must be careful when specifying D register / I relay numbers contained in messages because in both cases, you cannot use the original D register / I relay numbers as they are.

When using a commercially available SCADA or the like:

Specify D register numbers by changing them into reference numbers. To change them into a reference number, replace the D register number's leading character “D” with “4.”

Specify I relay numbers by changing them into reference numbers. To change them into a reference number, remove the I relay number's leading character “I.”

In a user-created communication program:

Specify D register numbers using the hexadecimal number of the value obtained by subtracting “40001” from the D register's reference number.

Specify I relay numbers using the hexadecimal number of the value obtained by subtracting “1” from the I relay’s reference number.

Example:

When specifying “D2018”:

- In SCADA, specify the reference number “42018.”
- Specify the message in the user-created communication program as “07E1”. This number is the number “2017” (number obtained by subtracting 40001 from the reference number) expressed in hexadecimal number.

■ Error check

The error checking of the ASCII mode is different from the RTU mode.

● ASCII mode

In the ASCII mode, error checking is performed by the longitudinal redundancy check (LRC).

Each individual byte from the communication address up to the final data (excluding “:”, “CR” and “LF”) is added, and the 2's complement of the result becomes LRC.

Ignore the uppermost carry during addition.

Example:

How to calculate the LRC in the case of command [:]110307E10004[LRC][CR][LF] for reading four values continuously from D register D0218 of the controller at communication address 17.

(1) Communication address 17 is expressed as “0x11” in Hex.
D2018 is “0x07E1”. This is the number “2017” (number obtained by subtracting 40001 from reference No. 42018) expressed in Hex.
When this is converted to 1-byte Hex data, this becomes “11,03,00,C8,00,04”.
(In Modbus/ASCII messages, “11” is ASCII code “H’ 31, H’ 31”, which comprises two bytes.)

(2) This 1-byte Hex data is added one byte at a time as follows:
→ 11+03+07+E1+00+04 = 00

(3) 2's complement of the lowermost 1 byte of the result of addition is “00”.
00000000 (0x00) → 11111111 (complement) +1=00000000 (00)

- RTU Mode

  In the RTU mode, error checking is performed by the cyclic redundancy check (CRC-16). Of all message blocks (from communication address through to final data), eight bits (excluding start bit, stop bit and parity bit) are aligned serially, and the remainder (16 bits) when the result is divided by predetermined binary 17 bits becomes the CRC-16.

Example (CRC-16 calculation example)

When reading four data from D register D2018 by function code 03 (read status of multiple D registers) from the slave at communication address 11 (0Bh).
"0B0307E10004" is sent as the send command.

(1) Default is FFFF. This is XORed (exclusive ORed) with the 1st byte (= slave address 11).
(2) The lower byte of the result is referenced, and the value corresponding to that value in the following table is obtained. In this case, the 244th value in the table is referenced to obtain 8701h as the result is F4h.
(3) The upper byte of the result of the XOR in (1) is XORed with the result of (2).
(4) The result (remainder) of (3) is taken as the next default, and the same operation is performed on the 2nd byte (=function code 03).

```
Default value                FF FF
Communication address           0B
                             ------
XOR                          FF F4
Reference to table        87 01
                          --------
XOR                       87 FE
Function code                03
                          --------
XOR                       87 FD
Reference to table     81 C1
                       --------
XOR                    81 46
  •                       •
  •                       •
  •                       •

XOR                 14 78
Last character         04
                    --------
XOR                 14 7C
Reference to table  E1 01
                    --------
Resulting error     E1 15
```

Convert the hex value to a decimal value, find the corresponding number in table of next page (Table Showing Results of Error Checking (CRC) of Values 0 to 255 by A001h), and substitute the number into the formula.
In the example shown on the left, hex value "F4" is converted to decimal value 244. From table of next page, the number corresponding to 244 proves to be "8701". This number is substituted into the formula.

(5) From here on, steps (1) to (4) are repeated to calculate up to the final "04".
(6) The upper and lower bytes of the result of calculation "E115" are inverted, and "15E1" is appended to the final.
0B0307E1000415E1

Showing Results of Error Checking (CRC) of Values 0 to 255 by A001h

Number	0	1	2	3	4	5	6	7
Result	0000	C0C1	C181	0140	C301	03C0	0280	C241
Number	8	9	10	11	12	13	14	15
Result	C601	06C0	0780	C741	0500	C5C1	C481	0440
Number	16	17	18	19	20	21	22	23
Result	CC01	0CC0	0D80	CD41	0F00	CFC1	CE81	0E40
Number	24	25	26	27	28	29	30	31
Result	0A00	CAC1	CB81	0B40	C901	09C0	0880	C841
Number	32	33	34	35	36	37	38	39
Result	D801	18C0	1980	D941	1B00	DBC1	DA81	1A40
Number	40	41	42	43	44	45	46	47
Result	1E00	DEC1	DF81	1F40	DD01	1DC0	1C80	DC41
Number	48	49	50	51	52	53	54	55
Result	1400	D4C1	D581	1540	D701	17C0	1680	D641
Number	56	57	58	59	60	61	62	63
Result	D201	12C0	1380	D341	1100	D1C1	D081	1040
Number	64	65	66	67	68	69	70	71
Result	F001	30C0	3180	F141	3300	F3C1	F281	3240
Number	72	73	74	75	76	77	78	79
Result	3600	F6C1	F781	3740	F501	35C0	3480	F441
Number	80	81	82	83	84	85	86	87
Result	3C00	FCC1	FD81	3D40	FF01	3FC0	3E80	FE41
Number	88	89	90	91	92	93	94	95
Result	FA01	3AC0	3B80	FB41	3900	F9C1	F881	3840
Number	96	97	98	99	100	101	102	103
Result	2800	E8C1	E981	2940	EB01	2BC0	2A80	EA41
Number	104	105	106	107	108	109	110	111
Result	EE01	2EC0	2F80	EF41	2D00	EDC1	EC81	2C40
Number	112	113	114	115	116	117	118	119
Result	E401	24C0	2580	E541	2700	E7C1	E681	2640
Number	120	121	122	123	124	125	126	127
Result	2200	E2C1	E381	2340	E101	21C0	2080	E041
Number	128	129	130	131	132	133	134	135
Result	A001	60C0	6180	A141	6300	A3C1	A281	6240
Number	136	137	138	139	140	141	142	143
Result	6600	A6C1	A781	6740	A501	65C0	6480	A441
Number	144	145	146	147	148	149	150	151
Result	6C00	ACC1	AD81	6D40	AF01	6FC0	6E80	AE41
Number	152	153	154	155	156	157	158	159
Result	AA01	6AC0	6B80	AB41	6900	A9C1	A881	6840
Number	160	161	162	163	164	165	166	167
Result	7800	B8C1	B981	7940	BB01	7BC0	7A80	BA41
Number	168	169	170	171	172	173	174	175
Result	BE01	7EC0	7F80	BF41	7D00	BDC1	BC81	7C40
Number	176	177	178	179	180	181	182	183
Result	B401	74C0	7580	B541	7700	B7C1	B681	7640
Number	184	185	186	187	188	189	190	191
Result	7200	B2C1	B381	7340	B101	71C0	7080	B041
Number	192	193	194	195	196	197	198	199
Result	5000	90C1	9181	5140	9301	53C0	5280	9241
Number	200	201	202	203	204	205	206	207
Result	9601	56C0	5780	9741	5500	95C1	9481	5440
Number	208	209	210	211	212	213	214	215
Result	9C01	5CC0	5D80	9D41	5F00	9FC1	9E81	5E40
Number	216	217	218	219	220	221	222	223
Result	5A00	9AC1	9B81	5B40	9901	59C0	5880	9841
Number	224	225	226	227	228	229	230	231
Result	8801	48C0	4980	8941	4B00	8BC1	8A81	4A40
Number	232	233	234	235	236	237	238	239
Result	4E00	8EC1	8F81	4F40	8D01	4DC0	4C80	8C41
Number	240	241	242	243	244	245	246	247
Result	4400	84C1	8581	4540	8701	47C0	4680	8641
Number	248	249	250	251	252	253	254	255
Result	8201	42C0	4380	8341	4100	81C1	8081	4040

20.1.3 Configuration of Responses

If the instruction message from the host computer is normal and the address is for itself, the PPC5 moves to the process execution phase after it judges that the received content is normal. The PPC5 then parses the content of the instruction message and executes processing.
However, it does not execute processing if the content of the instruction message is in error. In this case, the PPC5 either ignores received content, or generates a response message to inform the host computer that the received content is in error.
After executing the requested processing when the received content is normal, the PPC5 generates a response message appended with an error check corresponding to the instruction function code, and sends this message to the host computer.

- Response in a normal state
  In the case of the loopback function and write function on a single D register / I relay, the PPC5 returns the same response message as the instruction message.
  In the case of a write function on multiple D registers / I relays, the PPC5 returns part of the instruction message as the response message.
  In the case of the read function, the PPC5 appends the address No. and function code with the data that was read, and returns this as the response message.

- Response in an error state
  When a communication error (framing error, parity error, inter-character timer timeout, or receiving frame over-length) occurs, the PPC5 does not return a message.
  When the message contains an inconsistency other than a communication error, the PPC5 does not perform any processing, and returns the following message.

Element	Message start mark	Address No (ADR)	Function code (*1)	Data	Error check	Message end mark
Number of bytes in RTU mode	None	1	1	1	2	None
Number of bytes in ASCII mode	1	2	2	2	2	2

*1: The value of “function code (Hex) + 0x80” is set in the function code.

The following shows the details of the error code.

Error code	Meaning	Cause
01	Function code error	The function code does not exist.
02	D register / I relay No. error	A No. outside the range has been specified.
03	Number of D registers / I relays error	A number of registers outside the range has been specified.
09	Monitor not specified	An attempt was made to read a monitor without specifying the monitor.

Even if continuous D registers specified by a read function include unused registers, no error is generated and the PPC5 returns “0” as the value.
The PPC5 returns error code “02” or “03” when the start address of continuously specified addresses is in the range, and the continuously specified addresses become out of range as a result of the number of specified addresses (according to function code).

- When there is no response even after a message is sent:
  - When a transmission error (overrun, framing, parity, LRC or CRC-16 error) is detected
  - When the address in the instruction message is wrong
  - When the inter-character timer timeout occurs
  - When the communication address is “00” or “F9” (broadcast specification)
  - When a receive buffer overflow (buffer size: 512 bytes) has occurred

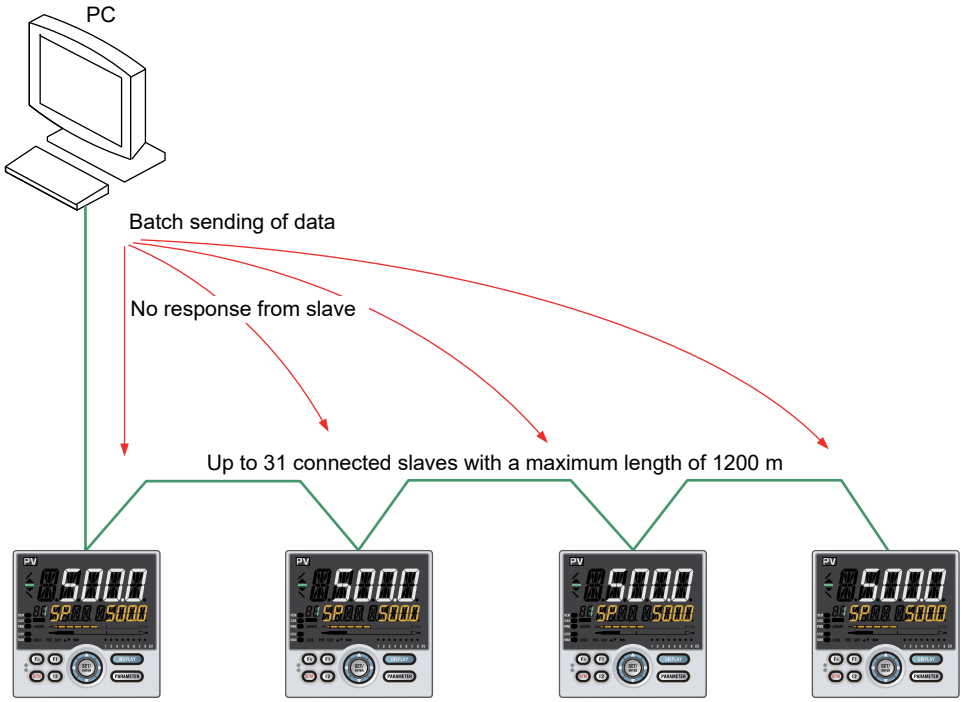
Note: As a measure for the above, execute time-out processing by the communication function or communication program on the host computer.

20.1.4 Specifying Broadcast

This function allows multiple instruments specified by respective addresses to receive commands.

(1) Broadcast specification is executed with the following addresses specified to the address No. in the command:
"00": All controllers supporting Modbus on network
"F9": All PPC5 controllers on network
(2) This command functions regardless of communication address.
(3) This address can be used only for writing.
(4) When communication is performed with this address specified, the PPC5 that receives the command does not return a response.

Broadcast Specification



20.1.5 Messages and Responses

These instruction words are used so that the host computer obtains the D register and I relay information of the PPC5.

List of Function Codes

Code No.	Function	Description
01	Reading of multiple I relays	Up to 256 I relays can be read continuously (I4001 to I7072).
03	Reading of multiple D registers	Up to 100 D registers can be read continuously (D0001 to D7600).
05	Writing of I relays	Only one I relay can be written (I4001 to I7072).
06	Writing of D registers	Only one D register can be written (D0001 to D7600).
08	Loopback test	This is used to check the communication connection.
15	Writing of multiple I relays	Up to 256 I relays can be written continuously (I4001 to I7072).
16	Writing of multiple D registers	Up to 50 D registers can be written continuously (D0001 to D7600).

Function codes cannot be written to read-only or use-disabled D registers / I relays.
Broadcast specification is possible with function codes “05,” “06,” “15,” “16,” “67,” and “68” only.
(Also in this case, read-only or use-disabled D registers / I relays will not be written.)

■ 01 Reading multiple I relays

● Function

The content of I relays is read continuously for the specified number of relays from the specified I relay No.

- The maximum number of relays that can be read at a time is 256.
- The response status of I relays is one bit for each I relay.
  The bit indicates: 1 = ON and 0 = OFF. The LSB (least significant bit) of the first data item indicates the status of the read start I relay.
  If the status of I relay Nos. 20 to 27 is assumed to be ON-ON-OFF-OFF-ON-OFF-ON-OFF, it is expressed as 01010011 (0x53) in the binary number.
  The status of eight I relays is represented by one byte. If the number of I relays is short of eight I relays in the last data item, the remaining empty space is filled with zero.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x01)	I relay start No.	Number of read I relays	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x01)	Byte count (Note 1)	I relay content	• • •
Number of bytes in RTU mode	None	1	1	1	1	• • •
Number of bytes in ASCII mode	1	2	2	2	2	• • •

Continuation of response

I relay content	Error check	Message end mark (CR+LF)
1	2	None
2	2	2

Note 1: When the byte count is assumed to be “N,” N = Number of read I relays / 8 (however, N = N + 1 when the remainder is not zero).

■ 03 Reading multiple D registers

● Function

The content of D registers is read continuously for the specified number of registers from the specified D register No.

- The maximum number of registers that can be read at a time is 100.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADS)	Function code (0x03)	Register start No.	Number of read registers	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADRS)	Function code (0x03)	Byte count (Note 1)	Register content	• • •
Number of bytes in RTU mode	None	1	1	1	2	• • •
Number of bytes in ASCII mode	1	2	2	2	4	• • •

Continuation of response

Register content	Error check	Message end mark (CR+LF)
2	2	None
4	2	2

Note 1: Byte count = 2 x number of read registers

■ 05 Writing to an I relay

● Function

Data is written to the specified I relay No.

- The number of relays that can be written at a time is 1.
- When data outside the setting range of parameters is set, the response is a normal response, but the data is not written.
- Broadcasting can be specified. No response is returned when broadcasting is specified.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x05)	I relay No.	Write data	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x05)	I relay No.	Write data	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

■ 06 Writing to a D register

● Function

Data is written to the specified D register No.

- The number of registers that can be written at a time is 1.
- When data outside the setting range of parameters is set, the response is a normal response, but the data is not written.
- Broadcasting can be specified. No response is returned when broadcasting is specified.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x06)	Register No.	Write data	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x06)	Register No.	Write data	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

■ 08 Loopback test

● Function

This is used to check the communication connection.

- The diagnostics code is fixed at "0000".
- Any data can be selected for the send data.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x08)	Diagnostic code (0000)	Send data (arbitrary)	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x08)	Diagnostic code (0000)	Same as send data	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

■ 15 Writing to multiple I relays

● Function

Data is written to I relays continuously for the specified number of relays from the specified relay number.

- The maximum number of relays that can be written at a time is 256.
- The data to be written is one bit for each I relay.
  The bit indicates: 1 = ON and 0 = OFF. The LSB of the first written data item indicates the status of the write start I relay.
  The status of 8 I relays is represented by one byte. If the maximum number of I relays is exceeded by the last written data, the exceeding part of the data item is not written.
- Broadcasting can be specified. No response is returned when broadcasting is specified.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x0F)	I relay start No.	Number of I relays	Byte count (Note 1)
Number of bytes in RTU mode	None	1	1	2	2	1
Number of bytes in ASCII mode	1	2	2	4	4	2

Continuation of message

Write data	• • •	Write data	Error check	Message end mark (CR+LF)
1	• • •	1	2	None
2	• • •	2	2	2

Note 1: When the byte count is assumed to be “N,” N = Number of write I relays / 8 (however, N = N + 1 when the remainder is not zero).

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x0F)	I relay start No.	Number of I relays	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

■ 16 Writing to multiple D registers

● Function

Data is written to D registers continuously for the specified number of registers from the specified D register No.

- The maximum number of registers that can be written at a time is 50.
- When data outside the setting range of parameters is set, the response is a normal response, but the data is not written.
- Broadcasting can be specified. No response is returned when broadcasting is specified.

● Message (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x10)	Register start No.	Number of registers	Byte count (Note 1)
Number of bytes in RTU mode	None	1	1	2	2	1
Number of bytes in ASCII mode	1	2	2	4	4	2

Continuation of message

Write data	• • •	Write data	Error check	Message end mark (CR+LF)
2	• • •	2	2	None
4	• • •	4	2	2

Note 1: Byte count = 2 x number of write registers

● Response (during normal operation)

Element	Message start mark (:)	Address No. (ADR)	Function code (0x10)	Register start No.	Number of registers	Error check	Message end mark (CR+LF)
Number of bytes in RTU mode	None	1	1	2	2	2	None
Number of bytes in ASCII mode	1	2	2	4	4	2	2

CHAPTER 21

MODBUS/TCP COMMUNICATION

Contents

21.1 Overview

The PPC5-1x02 models can use Modbus/TCP communication protocol for performing communication with a general-purpose PC, PLC, touch panel, or other device using TCP/IP protocol via Ethernet or other network.
Internal registers on PPC5 are read and written, and data transactions performed with connected devices via this communication protocol.
The PPC5 can be connected to IEEE802.3-compliant networks (10BASE-T/100BASE-TX - Auto negotiated), and communication with the Modbus/TCP protocol is generally performed on port No. 502. (The port No. can be changed.)
Moreover, the PPC5 operates as an Ethernet serial gateway. The host computer reads/writes data from/to other devices equipped with serial communication function using the MODBUS/TCP protocol via the PPC5.

CAUTION

The parameters of the PPC5 are placed in the D registers.
If the settings of some parameters are changed, the related parameters may be initialized.
When changing the parameter setting, configure (write) the settings in the following orders.

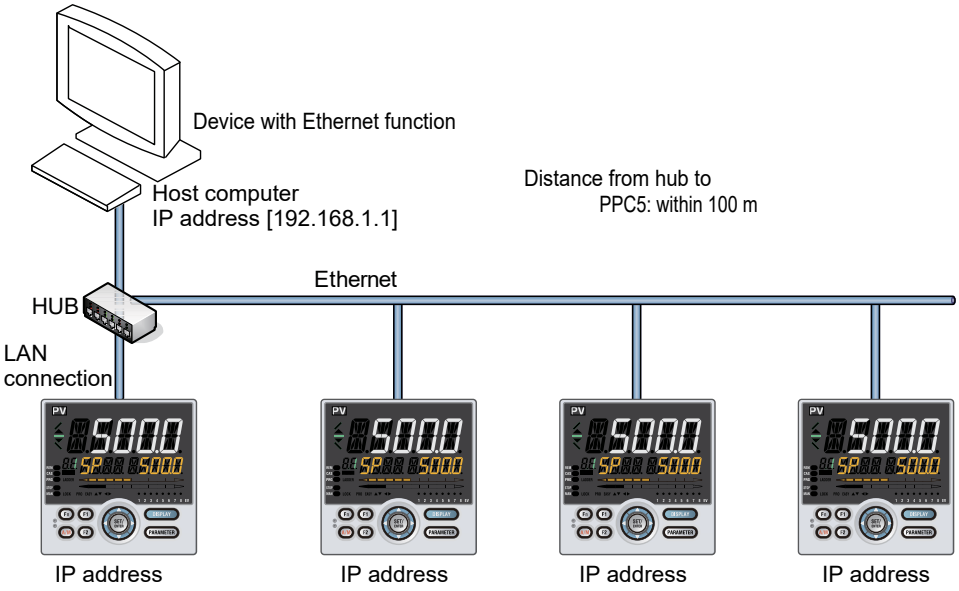
1. Setup parameters
   - 1-1 Control mode parameter (CTLM) *1
   - 1-2 Input -related parameters *2
   - 1-3 Output-related parameters
   - 1-4 Other necessary parameters
2. Operation parameters
   - 2-1 Alarm type parameters
   - 2-2 Alarm setpoint parameters
   - 2-3 Other necessary parameters

*1: If the setting of CTLM (control mode) is changed, the related parameters will be initialized.
*2: If the setting of IN (input type) is changed, the parameters related to ranges or scales such as target setpoint etc. will be initialized.

Network Layers

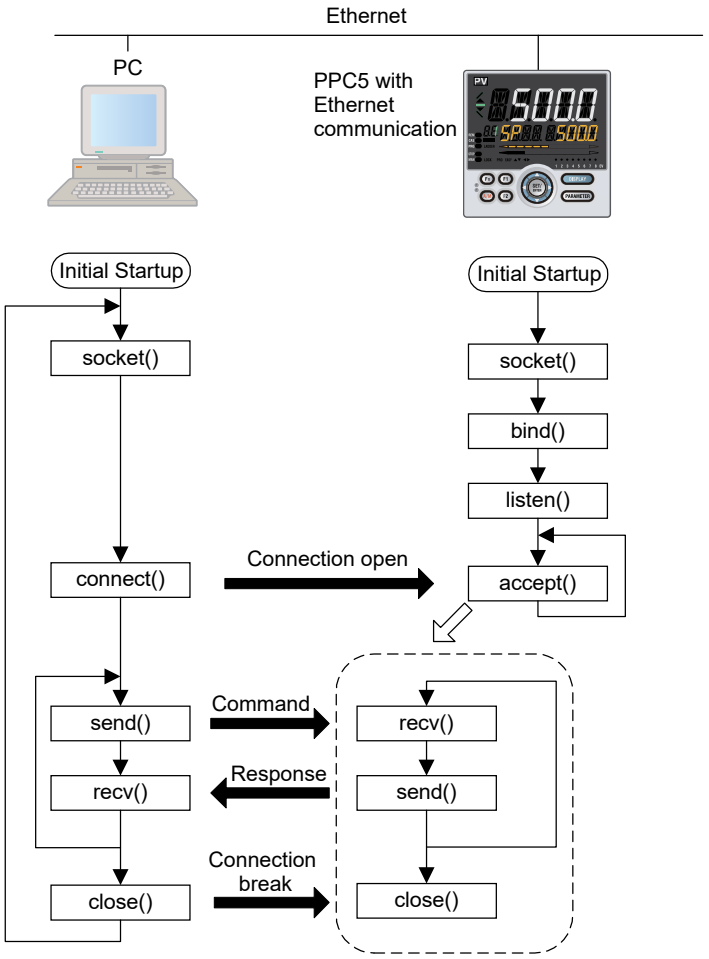
	Host computer (such as PC)
Application layer	Modbus/TCP
Transport layer	TCP
Network layer	IP
Data link layer	Ethernet
Physical layer	10BASE-T/100BASE-TX

Overview of Ethernet Communication Connection



21.2 TCP/IP-based Communication (PPC5-1x02 Models)

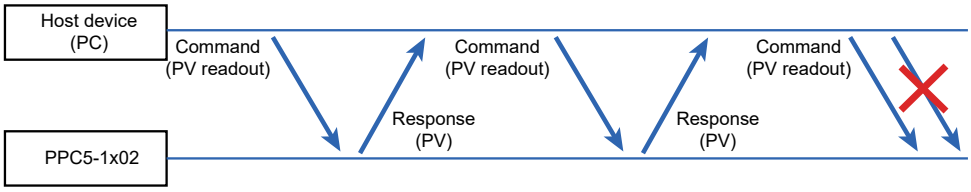
Modbus/TCP performs transactions by the procedure in the figure below on the TCP/IP socket interface.



Note

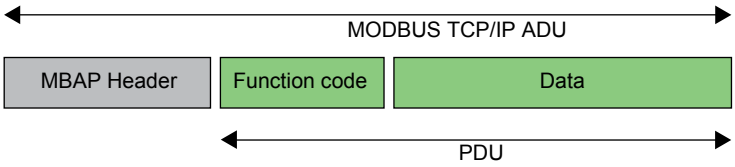
If there is no request for at least 60 seconds from the host computer after the connection is established, the PPC5 breaks the connection.

The maximum number of transactions for PPC5-1x02 models is "1".
When sending commands continuously, send the next command after confirming the response from PPC5-1x02 models. (See the figure below).



21.3 Configuration of Network Frames

Modbus/TCP frames are configured as follows:



MBAP Header (Modbus Application Protocol Header): Header for identifying that the protocol is Modbus/TCP
PDU (Protocol Data Unit): Body of data communication

21.3.1 Configuration of MBAP Header

The MBAP header comprises seven bytes as follows:

Byte No	0	1	2	3	4	5	6
Content	Transfer ID		Protocol ID		Number of bytes		Unit ID

Transfer ID: The host computer specifies an arbitrary value for identifying transactions. The PPC5 returns the value received from the host computer as the response.
Protocol ID: “0” is specified in the case of the Modbus/TCP protocol.
Number of bytes: Number of bytes from the unit ID (byte No.6) onwards
Unit ID: The host computer specifies “1” and the PPC5 returns “1” as the response. For the communication with the device connected to the RS-485 communication terminals using the Ethernet-serial gateway function, specify its communication address (2 to 99).

21.3.2 Configuration of PDU

The PDU (Protocol Data Unit) comprises n bytes as follows:

Byte No	0	1 onwards (n-1)
Content	Function code	Data

Function code: The instruction from the host computer is specified.
Data: The D register No. and number, parameter values, and the like of internal registers are specified according to the function code.

21.4 Communication with Host Computer

21.4.1 List of Function Codes

These instruction words are used so that the host computer obtains the D register and I relay information of the PPC5.

List of Function Codes

Code No.	Function	Description
01	Reading of multiple I relays	Up to 256 registers can be read continuously (I4001 to I7072).
03	Reading of multiple D registers	Up to 100 registers can be read continuously (D0001 to D7600) .
05	Writing of I relays	Only one register can be written (I4001 to I7072).
06	Writing of D registers	Only one register can be written (D0001 to D7600) .
08	Loopback test	This is used to check the communication connection.
15	Writing of multiple I relays	Up to 256 registers can be written continuously (I4001 to I7072).
16	Writing of multiple D registers	Up to 50 registers can be written continuously (D0001 to D7600) .

Function codes cannot be written to read-only or use-disabled registers.

21.4.2 Requests and Responses

■ 01 Reading multiple I relays

● Function

The content of I relays is read continuously for the specified number of relays from the specified I relay No.

- The maximum number of relays that can be read at a time is 256.
- The response status of I relays is one bit for each I relay.
  The bit indicates: 1 = ON and 0 = OFF. The LSB of the first data item indicates the status of the read start I relay.
  If the status of I relay Nos. 20 to 27 is supposed to be ON-ON-OFF-OFF-ON-OFF-ON-OFF, it is expressed as 01010011 (0x53) in the binary number.
  The status of eight I relays is represented by one byte. If the maximum number of I relays is short of eight I relays in the last data item, the remaining empty space is filled with zero.

● Request (during normal operation) Read n number of data

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	I relay start No.	Number of I relays
(Hex)	Optional value	0000	0006	01	01		n

● Response (during normal operation)

Element	MBAP Header				PDU				
Number of bytes	2	2	2	1	1	1	1		1
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Byte count (Note 1)	I relay content 1	• • •	I relay content N
(Hex)	Optional value	0000	N+3	01	01	N			

Note 1: When the byte count is assumed to be “N,” N = Number of read I relays / 8 (however, N = N + 1 when the remainder is not zero).

■ 03 Reading multiple D registers

● Function

The content of D registers is read continuously for the specified number of registers from the specified D register No.

- The maximum number of registers that can be read at a time is 100.

● Request (during normal operation) Read n number of data

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register start No.	Number of registers
(Hex)	Optional value	0000	0006	01	03		n

● Response (during normal operation)

Element	MBAP Header				PDU				
Number of bytes	2	2	2	1	1	1	2		2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Byte count	Register content 1	• • •	Register content n
(Hex)	Optional value	0000	2n+3	01	03	2n			

■ 05 Writing to an I relay

● Function

Data is written to the specified I relay No.

- The number of relays that can be written at a time is 1.
- The write data 0xFF00 and 0x0000 indicate ON (1) and OFF (0) respectively. When data other than these is set, the response is a normal response, but the data is not written.

● Request (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	I relay No.	Write data
(Hex)	Optional value	0000	0006	01	05		

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	I relay No.	Write data
(Hex)	Optional value	0000	0006	01	05		

■ 06 Writing to a D register

● Function

Data is written to the specified D register No.

- The number of registers that can be written at a time is 1.
- When the data out of setting range of the parameter is set, the response is a normal response, but the data is not written.

● Request (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register No.	Write data
(Hex)	Optional value	0000	0006	01	06		

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register No.	Write data
(Hex)	Optional value	0000	0006	01	06		

■ 08 Loopback test

● Function

This is used to check the communication connection.

- The “0000” shown below (marked with an asterisk *) is fixed.
- Any data can be selected for the send data.

● Request (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	**2**	**2**	**2**	**1**	**1**	**2**	**2**
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	0000*	Send data
(Hex)	Optional value	0000	0006	01	08	0000	Optional value

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	**2**	**2**	**2**	**1**	**1**	**2**	**2**
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	0000*	Send data
(Hex)	Optional value	0000	0006	01	08	0000	Optional value

■ 15 Writing to multiple I relays

● Function

Data is written to I relays continuously for the specified number of relays from the specified I relay No.

- The maximum number of relays that can be written at a time is 256.
- The data to be written is one bit for each I relay.
  The bit indicates: 1 = ON and 0 = OFF. The LSB of the first written data item indicates the status of the write start I relay.
  The status of 8 I relays is represented by one byte. If the maximum number of I relays is exceeded by the last written data, the exceeding part of the data item is not written.

● Request (during normal operation) Write n number of data

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	I relay start No.	Number of I relays
(Hex)	Optional value	0000	N+7	01	0F		n

Continuation of request

PDU			
1	1		1
Byte count (Note 1)	Data 1	• • •	Data N
N			

Note 1: When the byte count is assumed to be “N,” N = Number of write I relays / 8 (however, N = N + 1 when the remainder is not zero).

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	I relay start No.	Number of I relays
(Hex)	Optional value	0000	0006	01	0F		n

■ 16 Writing to multiple D registers

● Function

Data is written to D registers continuously for the specified number of registers from the specified D register No.

- The maximum number of registers that can be written at a time is 50.
- When the data out of setting range of the parameter is set, the response is a normal response, but the data is not written.

● Request (during normal operation) Write n number of data

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register start No.	Number of registers
(Hex)	Optional value	0000	2n+7	01	10		n

Continuation of request

PDU			
1	2		2
Byte count	Data 1	• • •	Data n
2n			

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register start No.	Number of registers
(Hex)	Optional value	0000	0006	01	10		n

21.4.3 Response Error Codes

- When a response is returned to a request:

When the PDU in the request contains an inconsistency, the PPC5 does not perform any processing, and returns the following request.

Element	MBAP Header				PDU	
Number of bytes	**2**	**2**	**2**	**1**	**1**	**1**
Command element	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code*	Error Code
(Hex)	Optional value	0000	03	01		

* The value of “function code (Hex) + 80 (Hex)” is set in the function code.

- Response error codes

Error Code	Meaning	Cause
01	Function code error	The function code does not exist.
02	D register/I relay No. error	A No. outside the range has been specified.
03	Number of D registers/ I relays error	A number of registers/relays outside the range has been specified.
09	Monitor not specified	An attempt was made to read a monitor without specifying the monitor.

- When a response is not returned to a request

In the following instances, the PPC5 does not perform any processing and does not return a response:

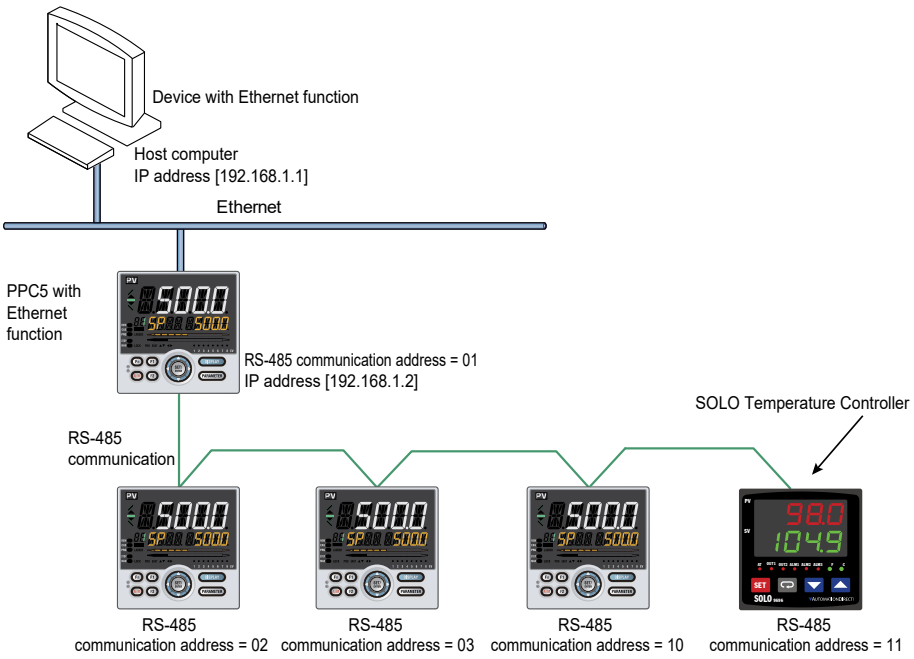
- When a connection has not been established on the TPC/IP socket interface
- When the MBAP Header in a request contains an inconsistency

* As a measure for the above, execute time-out processing by the communication function or communication program on the host computer.

21.5 Ethernet-Serial Gateway Function (PPC5-1x02 Models)

21.5.1 Overview

The PPC5-1x02 models have an available Ethernet-serial gateway function that reads/writes data from/to other devices equipped with RS-485 serial communication function using the MODBUS/TCP protocol via the PPC5.
With this function, the host computer can access the devices connected to the RS-485 serial communication line in the same way as to access the devices connected to Ethernet.



The PPC5 operates as a gateway that changes the MODBUS/TCP protocol received via network to the MODBUS/RTU protocol for the serial devices connected to the RS-485 communication interface. Therefore, the devices supporting the MODBUS/RTU protocol are required for the devices to be connected.

Note

When Ethernet communication is used, the RS-485 communication interface of the PPC5 is exclusively for the Ethernet-serial gateway function.
PCs and other host computers cannot access the PPC5 via this RS-485 communication interface.

21.5.2 Communication with Serial Devices

A maximum of 31 serial devices are connectable. Set a communication address (02 to 99) different from each other for each device.

Note

When Ethernet-serial gateway function is used, do not set the communication address '1' for the RS-485 communication serial devices connected to the Ethernet-connected PPC5.

- Setting for Devices Working as Ethernet-serial Gateway Function
  Set the following communication conditions.

Parameter symbol	Group display	Name	Setting range		Menu symbol	Initial value
BPS	E3	Baud rate	9600 bps	9600 (4)	ETHR	38400 (6)
			19200 bps	19200 (5)		
			38400 bps	38400 (6)		
PRI		Parity	None	NONE (0)		EVEN (1)
			Even	EVEN (1)		
			Odd	ODD (2)		

Figures in parentheses "( )" are values to be set when performing communication.

- Setting for Serial Devices Connected to Ethernet-connected PPC5
  Set the following communication conditions for the serial devices connected to the RS-485 communication line.

Parameter symbol	Group display	Name	Setting range		Menu symbol	Initial value
PSL	E3	Protocol selection	Modbus (RTU)	MBRTU (8)	R485	MBRTU (8)
BPS		Baud rate	9600 bps	9600 (4)		19200 (5)
			19200 bps	19200 (5)		
			38400 bps	38400 (6)		
PRI		Parity	None	NONE (0)		EVEN (1)
			Even	EVEN (1)		
			Odd	ODD (2)		
STP		Stop bit	1 bit	1 (1)		1 (1)
DLN		Data length	8 bits	8 (8)		8 (8)
ADR		Address	2 to 99			1

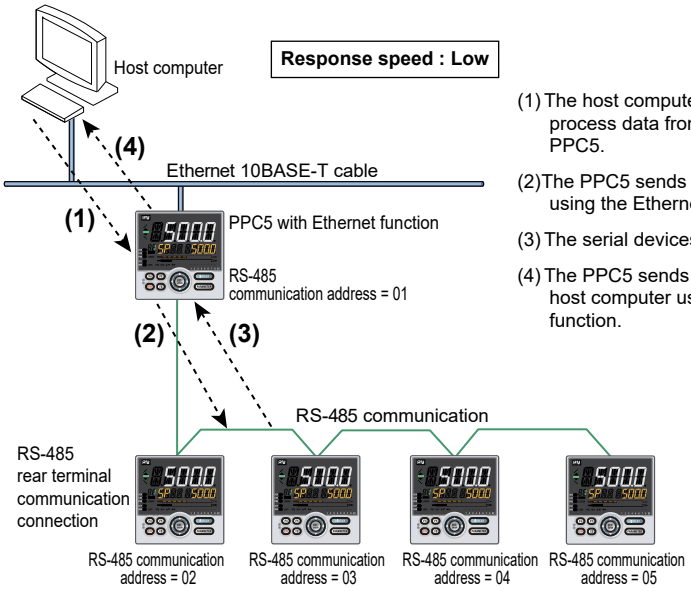
Figures in parentheses "( )" are values to be set when performing communication.

21.6 Process Data High-speed Response Function

21.6.1 Overview

The PPC5 -1x02 models have a function that reads periodically the process data from the PPC5 itself and the process data from other serial devices connected to the RS-485 serial communication line and stores them in the PPC5.
With this function, when process data read-out command is sent form the host computer, the PPC5 can return the process data stored in itself at high speed, without communicating with the serial devices one by one. This function is called the Process data high-speed response function.
The figure below shows the data flow when the host computer reads process data in the case of not using / using the function.

When Process Data High-speed Response Function is not Used



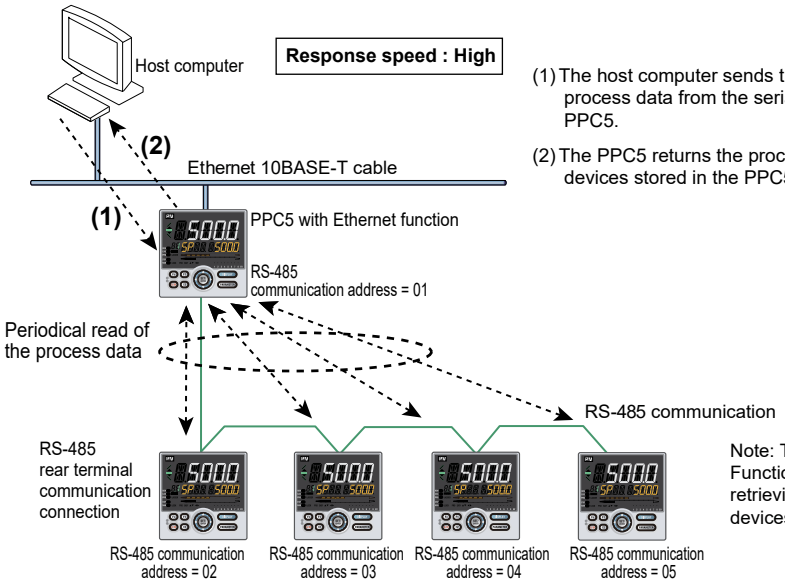
(1) The host computer sends the command to read the process data from the serial devices through the PPC5.

(2) The PPC5 sends the command to the serial devices using the Ethernet-serial gateway function.

(3) The serial devices return the process data.

(4) The PPC5 sends the received process data to the host computer using the Ethernet-serial gateway function.

When Process Data High-speed Response Function is Used



(1) The host computer sends the command to read the process data from the serial devices through the PPC5.

(2) The PPC5 returns the process data of the serial devices stored in the PPC5 to the host computer.

Note: The High-speed Response Function is only available for retrieving data from PPC5 RS-485 devices (PPC5-1x01).

The function can read periodically the process data from a maximum of 8 serial devices, store them in the PPC5, and return the response at high speed.
However, the function can be used for a maximum of 7 serial devices connected to the RS-485 communication line because the serial communication address “1” is for PPC5.

Note

- The period to read the process data from other serial devices cannot be specified. The PPC5 reads the process data by the fastest automatically according to the number of serial devices for which the function is used.
- If the number of serial devices for which the function is used is particularly large, the process data value of each serial device stored in the PPC5 may be delayed relative to the actual process. If the delay becomes a problem, turn this function off.

21.6.2 How to Set the Function

The parameter HSR specifies the operation of the function.

Parameter symbol	Group display	Name	Setting Range	Menu symbol	Initial value
HSR	E3	High-speed response mode	0: OFF (The process data high-speed response function is not used.) 1: The process data of the device itself is returned as a response at high speed. 2 to 8 :The process data of the device itself and the process data from the serial devices connected to the RS-485 communication line are returned as a response at high speed. Specify the maximum address of the serial devices. Note: Set the continuous communication address which begins from “2” for other serial communication devices connected to the RS-485 communication terminals. After setting the parameter HSR, set “1” for the parameter ESW to update the setting. If you change other parameters, update the setting at the end.	ETHR	1

Note

- A maximum of 31 serial devices are connectable to the RS-485 communication line. Set the serial communication address (2 to 99) for each device so that the host computer can access using the Ethernet-serial gateway function.
  However, the function can be used only for the serial devices with the continuous communication addresses from 2 to 8. Set the serial communication addresses from 2 to 8 for the serial devices for which the function is to be used.
- Simply changing the value for the above parameters does not enable the setting content. Be sure to update the setting content by setting the Ethernet setting switch (ESW) to ON (1) after the setting is made.
  The setting content is also enabled by performing the power ON/OFF operation of the PPC5.

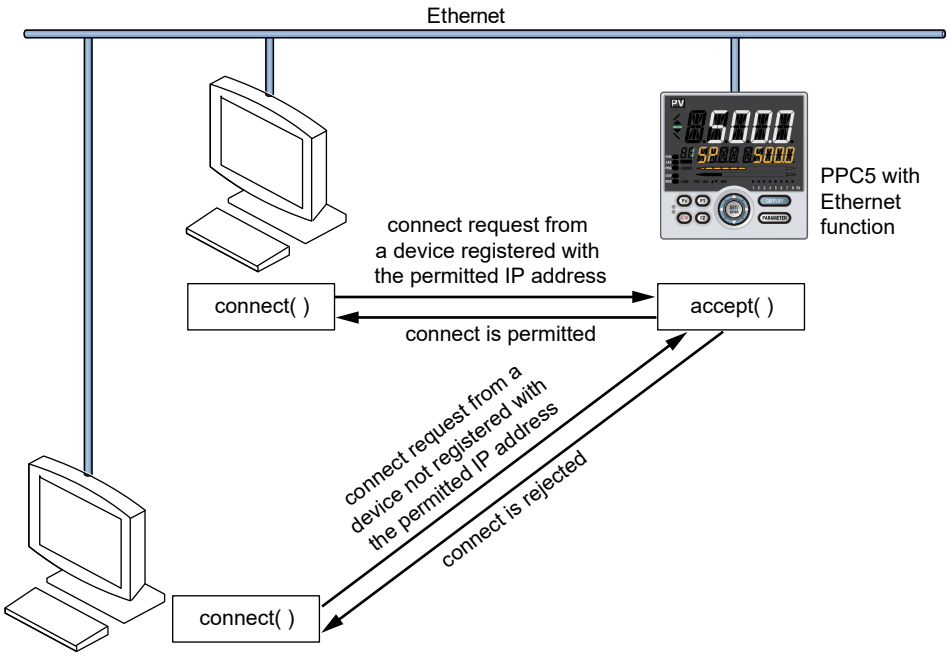
***: It takes about 20 seconds for the new settings of the Ethernet communication parameters to be enabled.**

21.6.3 Process Data for High-speed Response

The function treats from D2001 to D2025 as process data in D register map, regardless of the kind of the serial devices connected to the RS-485 communication line.
The PPC5 reads this data periodically from the serial devices for which the function is used and returns a response at high speed to the command to read data from multiple registers (function code: 03) in this category from the host computer.

21.7 IP Access Restriction Function

The PPC5 has an IP access control function to permit access from registered IP addresses and reject access from unregistered IP addresses. This function is able to prevent unauthorized access and thereby increase security.



Use the following parameters to specify the IP access restriction function.

Parameter symbol	Group display	Name	Setting range	Menu symbol	Initial value
IPAR	E3	IP access restriction	Disable: OFF (0) Enable: ON (1)	ETHR	OFF (0)
1.IP1		Permitted IP address 1-1	0 to 255		255
1.IP2		Permitted IP address 1-2			
1.IP3		Permitted IP address 1-3			
1.IP4		Permitted IP address 1-4			
2.IP1		Permitted IP address 2-1			
2.IP2		Permitted IP address 2-2			
2.IP3		Permitted IP address 2-3			
2.IP4		Permitted IP address 2-4			

Note: Figures in parentheses “( )” are values to be set when performing communication.

Note

- Just changing the value for the above parameters does not enable the setting content. Be sure to update the setting content by setting the Ethernet setting switch (ESW) to ON (1) after the setting is finished. The setting content is also enabled by performing the power ON/OFF operation of the PPC5.
- If the permitted IP address is 255.255.255.255, it is an invalid IP address. Access is not permitted.

***: It takes about 20 seconds for the new settings of the Ethernet communication parameters to be enabled.**

CHAPTER 22

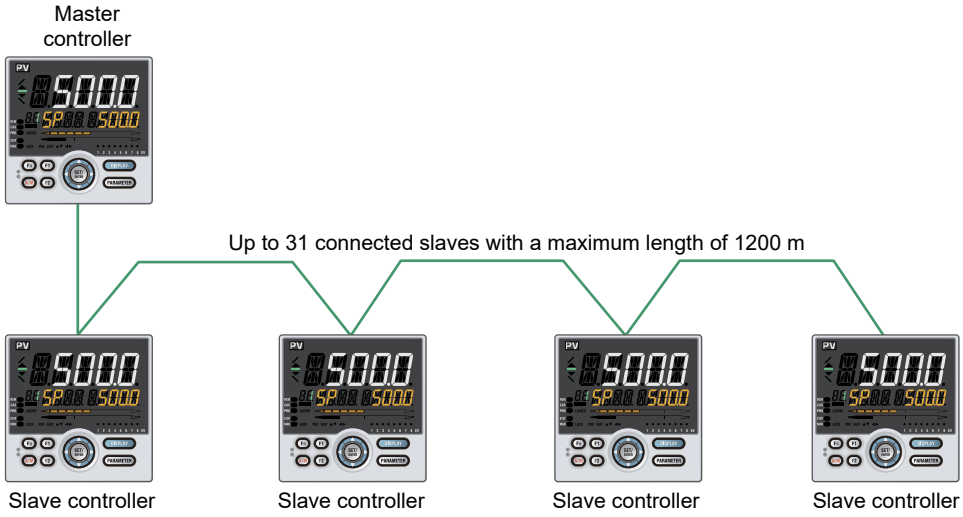
COORDINATED OPERATION

Contents

22.1 Overview

Coordinated operation is configured with a master controller and a number of slave controllers, all of which are PPC5. The slave controllers are set to operate in the same way as the master controller.

Overview of Coordinated Operation Connection



22.2 Coordinated Items

The controllers operate in coordination with respect to the following items.

● **Start-up condition of the Super function (overshoot suppressing function)**

• The slave controller operates according to the data received from the master controller regardless of the setting of the parameter SC (Super function) for the slave controller.

Parameter symbol	Name	Setting range
SC	Super function	0: 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)

Note: The setpoints 2 and 3 are not available for Super function (overshoot suppressing function).

● **Operation mode (RUN/STOP) switching**

Switching over the master controller's operation mode also switches the operation mode of the slave controllers accordingly.

● **PID number switching and switching over to the zone PID mode**

In coordinated operation, the slave controller's PID number depends on the setting of the parameter ZON of the master and slave controllers. The table below shows the slave controller's PID number selecting action.

Master controller's setting \ Slave controller's PID number selecting action	Slave: ZON=0 SP group number selection 1	Slave: ZON=1 Zone PID selection (selection by PV)	Slave: ZON=2 Zone PID selection (selection by target SP)	Slave: ZON=3 SP group number selection 2	Slave: ZON=4 Zone PID selection (selection by SP)
Master: ZON=0 SP group number selection 1	Operates by the same PID number as the master controller.	Operates by the same PID number as the master controller.	Operates by the same PID number as the master controller.	Operates by the PID number selection of slave controller.	Operates by the same PID number as the master controller.
Master: ZON=1 Zone PID selection (selection by PV)	Operats by Zone PID (PV).	Operats by Zone PID (PV).	Operates by Zone PID (target setpoint).	Operates by the PID number selection of slave controller.	Operats by Zone PID (SP).
Master: ZON=2 Zone PID selection (selection by target SP)	Operats by Zone PID (PV).	Operats by Zone PID (PV).	Operates by Zone PID (target setpoint).	Operates by the PID number selection of slave controller.	Operats by Zone PID (SP).
Master: ZON=3 SP group number selection 2	Operates by the same PID number as the master controller.	Operates by the same PID number as the master controller.	Operates by the same PID number as the master controller.	Operates by the PID number selection of slave controller.	Operates by the same PID number as the master controller.
Master: ZON=4 Zone PID selection (selection by SP)	Operats by Zone PID (PV).	Operats by Zone PID (PV).	Operates by Zone PID (target setpoint).	Operates by the PID number selection of slave controller.	Operats by Zone PID (SP).

If the PID number of the master controller exceeds the number of PID group of the slave controller, the PID number of the slave controller is "1."

Note

The PPC5 displays data in 5 digits. Data that is read/written via communication also consists of 5 digits. However, if you do not need to use 5-digit data for communication, set the data display digits of the controller to no more than 4 digits.

22.3 Starting Coordinated Operation

After the wiring and setup of communication parameters have been completed, turn off the power once and turn it on again.

- **Switchover of coordinated operation**

  Set all the slave controllers to REM (remote) mode.
  Slave controllers do not operate in coordination when they are in LCL (local) mode. (Each slave controller operates independently in LCL mode.)

- **Switchover of operation mode (RUN/STOP)**

  Switching over the master controller's operation mode also switches the operation mode of the slave controllers accordingly.

Note

If the operation mode (RUN /STOP) of the slave PPC5 controller is under the control of an external contact input, the operation mode cannot be switched by coordinated operation because the control by the external contact input takes priority.
In coordinated operation, slave controller's "target setpoint ramp-rate setting" is disabled.

CHAPTER 23

D REGISTERS (HOLDING REGISTERS)

Contents

23.1 Overview

This chapter describes the functions and applications of the D registers.
D registers are used in Modbus and Ethernet communications for storing parameter data, flag data, process data, and other data and values.
The host computer can utilize these data by reading from and writing to the D registers.

Use of the D registers enables the following:
- Centralized control by the host computer
- Reading and writing of data between the PPC5 and the host computer

23.2 Conventions Used in D Register Tables

This section describes the conventions used in the D register map tables.
The numerical values arranged vertically in the leftmost column of the table represent (1) D register numbers. 5-digit numbers in the column next to it show (2) reference numbers for Modbus communication. The third column from the left provides (3) register numbers (hexadecimal) for Modbus communication.
Alphabet characters in the register map represent process data, operation parameters, setup parameters, and other flag register names.

Register map (Categories)				
Register contents				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2001	42001	07D0	**AD1.E** *1	R
D2002	42002	07D1	**PV1.E_L1** *1	R
D2003	42003	07D2	**PV_L1** *1	R
D2004	42004	07D3	CSP_L1	R
D2005	42005	07D4	OUT_L1	R
• • •	• • •	• • •	• • •	• • •

(1) D register numbers

(2) Reference numbers (for Modbus communication)

(3) Hexadecimal numbers (for Modbus communication)

Read/writee by communication
R: Read enabled
W: Write enabled
: No register

*1: Register symbols listed in blue-color boldface (e.g., **AD1.E**) indicates the parameters of the PPC5.

■ D Register Symbols

- With regards to some D register symbols, the loop number, terminal area, and group number are indicated by adding the underline (_) to the end of the parameter symbols.
  If both the loop number and group number are added to the parameter symbols, they are added in the order of _loop number and _group number.

□□□□_Ln_Y	**Ln**: Loop numbers (L1 or L2)
	Y: Group numbers (1 to 8 or R)
□□□□_En	**En**: Terminal area (E1 or E3)
□□□□_Sn	**Sn**: Segment Number (S1 to S99)

Example : **SP_L1_3** Indicates Loop-1 SP of group 3.
A2_2 Indicates A2 of group 2.

23.3 Classification of D Registers

■ Classification of D Register Map Tables

The table on next page outlines how the D registers are classified by their numbers in the D register map tables.

CAUTION

- No data can be written to or read from blank parts of the data storage area by communication.
  The PPC5 sometimes does not operate properly if an attempt is made to write to or read from blank parts of the data storage area.

■ Setting a Value with a Decimal Point

When setting a value with a decimal point from the host computer, set a value excluding the decimal point (hexadecimal).

Note

The PPC5 determine the decimal point position by the parameter setting.

Example: When setting a target setpoint “50.0” from the host computer
Set “1F4” which is a hexadecimal value of “500” (50.0 excluding the decimal point) (this is also true for setting 5.00 or 500).
Target setpoint “50.0”: P.DP = 1
Target setpoint “5.00”: P.DP = 2
Target setpoint “500”: P.DP = 0

Classification of D Registers

Register No.	Area and data categories	Description
D2001 to D2100	Process monitoring	Process data
D2101 to D2200		Current SP group and PID group
D2501 to D2700	Loop-1 operation parameter	SP and alarm setpoint setting
D2701 to D2800		SP-related setting
D2801 to D2900		Alarm function setting
D2901 to D3000		PV-related setting
D3001 to D3500		PID setting
D3501 to D3600		Control action-related setting
D3601 to D3800	Loop-2 operation parameter	SP and alarm setpoint setting
D3801 to D3900		SP-related setting
D3901 to D4000		Alarm function setting
D4001 to D4100		PV-related setting
D4101 to D4600		PID setting
D4601 to D4700		Control action-related setting
D4701 to D4800	P parameter	P parameter
D4801 to D5000	10-segment linearizer setting parameter	10-segment linearizer setting
D5001 to D5100	Setup parameter	Control function setting
D5101 to D5300		Input setting
D5301 to D5400		Output setting
D5501 to D5700		Communication setting
D5701 to D5800		Key action setting / Display function setting / SELECT display setting
D5801 to D5900		Lock setting (Key lock / menu lock)
D5901 to D6200		DI function setting
D6301 to D6400		I/O display
D6401 to D6500		System setting
D7601 to D7700	Terminal status register	Input / Output terminal status register

Note 1: Data in the process values, operation parameters, and setup parameters is stored in the format (data excluding the decimal point of PV input range, PV input range span, %, or ABS) described in “Lists of Operation Parameters” and “Lists of Setup Parameters”
The OFF status of data is indicated by “0” and the ON status is indicated by “1.”
D registers D2001 to D2100 are read-only.

23.4 D Registers

23.4.1 Process Monitoring

Process monitoring area									
Process data									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2001	42001	07D0	**AD1.E**	R	D2066	42066	0811	DIMG	R
D2002	42002	07D1	**PV1.E_L1**	R	D2067	42067	0812		
D2003	42003	07D2	**PV_L1**	R	D2068	42068	0813	**PA.ER**	R
D2004	42004	07D3	CSP_L1	R	D2069	42069	0814		
D2005	42005	07D4	OUT_L1	R	D2070	42070	0815	**OP.ER**	R
D2008	42008	07D7	MOD_L1	R	D2071	42071	0816	ALOLA1_L1	R
D2009	42009	07D8	**PID_L1**	R	D2072	42072	0817	ALOLA1_L2	R
D2010	42010	07D9	CSPNO.	R	D2073	42073	0818	ALOLA2_L1	R
D2011	42011	07DA	ALM_L1	R	D2074	42074	0819	ALOLA2_L2	R
D2013	42013	07DC	ALM_L2	R	D2075	42075	081A	ALOLA3_L1	R
D2014	42014	07DD			D2076	42076	081B	ALOLA3_L2	R
D2018	42018	07E1	**PV2.E_L2**	R	D2077	42077	081C	ALOLA4_L1	R
D2019	42019	07E2	**PV_L2**	R	D2078	42078	081D	ALOLA4_L2	R
D2020	42020	07E3	CSP_L2	R					
D2021	42021	07E4	OUT_L2	R					
D2024	42024	07E7	MOD_L2	R					
D2025	42025	07E8	**PID_L2**	R					
D2026	42026	07E9							
D2035	42035	07F2	DEV_L1	R					
D2036	42036	07F3	DEV_L2	R					
D2037	42037	07F4	ALO_L1	R					
D2038	42038	07F5	ALO_L2	R					

Process monitoring area									
Current SP group and PID group									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2101	42101	0834	SP_L1_*	R/W	D2151	42151	0866	SP_L2_*	R/W
D2102	42102	0835	SUB_*	R/W	D2152	42152	0867		
D2103	42103	0836	PIDN_L1_*	R/W	D2153	42153	0868	PIDN_L2_*	R/W
D2104	42104	0837	A1_L1_*	R/W	D2154	42154	0869	A1_L2_*	R/W
D2105	42105	0838	A2_L1_*	R/W	D2155	42155	086A	A2_L2_*	R/W
D2106	42106	0839	A3_L1_*	R/W	D2156	42156	086B	A3_L2_*	R/W
D2107	42107	083A	A4_L1_*	R/W	D2157	42157	086C	A4_L2_*	R/W
D2108	42108	083B	A5_L1_*	R/W	D2158	42158	086D	A5_L2_*	R/W
D2109	42109	083C	A6_L1_*	R/W	D2159	42159	086E	A6_L2_*	R/W
D2110	42110	083D	A7_L1_*	R/W	D2160	42160	086F	A7_L2_*	R/W
D2111	42111	083E	A8_L1_*	R/W	D2161	42161	0870	A8_L2_*	R/W
D2113	42113	0840			D2163	42163	0872		
D2114	42114	0841	P_L1_*	R/W	D2164	42164	0873	P_L2_*	R/W
D2115	42115	0842	I_L1_*	R/W	D2165	42165	0874	I_L2_*	R/W
D2116	42116	0843	D_L1_*	R/W	D2166	42166	0875	D_L2_*	R/W
D2117	42117	0844	OH_L1_*	R/W	D2167	42167	0876	OH_L2_*	R/W
D2118	42118	0845	OL_L1_*	R/W	D2168	42168	0877	OL_L2_*	R/W
D2119	42119	0846	MR_L1_*	R/W	D2169	42169	0878	MR_L2_*	R/W
D2120	42120	0847	HYS_L1_*	R/W	D2170	42170	0879	HYS_L2_*	R/W
D2121	42121	0848	SU.HY_L1_*	R/W	D2171	42171	087A		
D2122	42122	0849	HY.UP_L1_*	R/W	D2174	42174	087D	DR_L2_*	R/W
D2123	42123	084A	HY.LO_L1_*	R/W	D2175	42175	087E		
D2124	42124	084B	DR_L1_*	R/W					

*: The group number to be displayed varies depending on the currently used SP number selection (D2312) and PID number (D2009, D2025).
Either 1 to 8 or R (the currently used group number) is written.
However, only 1 to 8 is written in D2101 to D2111 and D2151 to D2161.

Process Data Area

Some of the D registers represent multiple events such as errors and status depending on combinations of bits in the register.
In the following tables, if an event indicated by a specific bit occurs, the state of that bit changes to “1.”
If no event occurs, the state of that bit is “0.” Blank lines in each table indicate unused bits.

Process Data (D2001 to D2100)

● **Bit Configuration of D2001: AD1.E (A/D converter error status 1)**

Bit	Symbol	Event
0	ADERR	PV input A/D converter error
1	ADERR_E1	RSP input (E1-terminal area) A/D converter error
2		
3		
4		
5	RJCERR	PV input RJC error
6		
7		
8	ADBO	PV input burnout error
9	ADBO_E1	RSP input (E1-terminal area) burnout error
10		
11		
12		
13 to 15		

● **Bit Configuration of D2002: PV1.E_L1 (Loop-1 PV input error status)**

Bit	Symbol	Event
0	PVBO_L1	Loop-1 PV input burnout error
1	RSPBO_L1	Loop-1 RSP input burnout error
2		
3		
4	PVPOVER_L1	Loop-1 PV input over-scale
5	PVMOVER_L1	Loop-1 PV input under-scale
6 to 13		
14	ATERR_L1	Loop-1 auto-tuning timeout error
15		

● **D2003 to D2007**

Register No.	Description		Range and meaning of value
D2003	PV_L1	Loop-1 measurment value	-5.0 to 105.0% of PV input range (EU)
D2004	CSP_L1	Loop-1 control setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)
D2005	OUT_L1	Loop-1 control output	-5.0 to 105.0%

● **Bit Configuration of D2008: MOD_L1 (Loop-1 operation mode status)**

Bit	Symbol	Event
0	A.M	0: AUTO, 1: MAN *1
1	R.L_L1	0: Local, 1: Remote
2	S.R	0: Run, 1: Stop
3		
4	CAS_ON	1: CAS *2
5	AUTO_ON	1: AUTO *2
6	MAN_ON	1: MAN *2
7		
8	TRK_ON_L1	1: Output tracking
9		
10 to 13		
14	AT_L1_ON	0: Auto-tuning is OFF, 1: Auto-tuning is ON
15		

*1: Effective for the control modes except for cascade control and cascade secondary-loop control.
*2: Effective for cascade control mode and cascade secondary-loop control mode.

● **Bit Configuration of D2009: PID_L1 (Current PID number for Loop-1)**

Bit	Symbol	Event
0	PIDN.B0_L1	Loop-1 bit-0 of the PID number
1	PIDN.B1_L1	Loop-1 bit-1 of the PID number
2	PIDN.B2_L1	Loop-1 bit-2 of the PID number
3	PIDN.B3_L1	Loop-1 bit-3 of the PID number
4 to 15		

● **Bit Configuration of D2010: CSPNO. (Current control setpoint number)**

Bit	Symbol	Event
0	CSPN.B0	Bit-0 of control setpoint number
1	CSPN.B1	Bit-1 of control setpoint number
2	CSPN.B2	Bit-2 of control setpoint number
3	CSPN.B3	Bit-3 of control setpoint number
4 to 15		

● **Bit Configuration of D2011: ALM_L1 (Loop-1 alarm-1 to alarm-8 status)**

Bit	Symbol	Event
0	ALM1_L1	'1' when Loop-1 alarm 1 is ON; '0' when OFF
1	ALM2_L1	'1' when Loop-1 alarm 2 is ON; '0' when OFF
2	ALM3_L1	'1' when Loop-1 alarm 3 is ON; '0' when OFF
3		
4	ALM4_L1	'1' when Loop-1 alarm 4 is ON; '0' when OFF
5	ALM5_L1	'1' when Loop-1 alarm 5 is ON; '0' when OFF
6	ALM6_L1	'1' when Loop-1 alarm 6 is ON; '0' when OFF
7		
8	ALM7_L1	'1' when Loop-1 alarm 7 is ON; '0' when OFF
9	ALM8_L1	'1' when Loop-1 alarm 8 is ON; '0' when OFF
10 to 15		

● **Bit Configuration of D2013: ALM_L2 (Loop-2 alarm-1 to alarm-8 status)**

Bit	Symbol	Event
0	ALM1_L2	'1' when Loop-2 alarm 1 is ON; '0' when OFF
1	ALM2_L2	'1' when Loop-2 alarm 2 is ON; '0' when OFF
2	ALM3_L2	'1' when Loop-2 alarm 3 is ON; '0' when OFF
3		
4	ALM4_L2	'1' when Loop-2 alarm 4 is ON; '0' when OFF
5	ALM5_L2	'1' when Loop-2 alarm 5 is ON; '0' when OFF
6	ALM6_L2	'1' when Loop-2 alarm 6 is ON; '0' when OFF
7		
8	ALM7_L2	'1' when Loop-2 alarm 7 is ON; '0' when OFF
9	ALM8_L2	'1' when Loop-2 alarm 7 is ON; '0' when OFF
10 to 15		

● **Bit Configuration of D2018: PV2.E_L2 (Loop-2 PV input error status)**

Bit	Symbol	Event
0	PVBO_L2	Loop-2 PV input burnout error
1	RSPBO_L2	Loop-2 RSP input burnout error
2	CRSPBO_L2	Burnout error when the Loop-2 RSP input is used for control
3		
4	PVPOVER_L2	Loop-2 PV input over-scale
5	PVMOVER_L2	Loop-2 PV input under-scale
6 to 13		
14	ATERR_L2	Loop-2 auto-tuning timeout error
15		

● **D2019 to D2023**

Register No.	Description		Range and meaning of value
D2019	PV_L2	Loop-2 measurment value	-5.0 to 105.0% of PV input range (EU)
D2020	CSP_L2	Loop-2 control setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)
D2021	OUT_L2	Loop-2 control output	-5.0 to 105.0%

● **Bit Configuration of D2024: MOD_L2 (Loop-2 operation mode status)**

Bit	Symbol	Event
0		
1	R.L_L2	0: Local, 1: Remote
2 to 13		
14	AT_L2_ON	0: Auto-tuning is OFF, 1: Auto-tuning is ON
15		

● **Bit Configuration of D2025: PID_L2 (Current PID number for Loop 2)**

Bit	Symbol	Event
0	PIDN.B0_L2	Loop-2 bit-0 of the PID number
1	PIDN.B1_L2	Loop-2 bit-1 of the PID number
2	PIDN.B2_L2	Loop-2 bit-2 of the PID number
3	PIDN.B3_L2	Loop-2 bit-3 of the PID number
4 to 15		

● **D2033 to D2036**

Register No.	Description		Range and meaning of value
D2033	CTSP_L1	Loop-1 final target setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: P.RL to P.RH)
D2034	CTSP_L2	Loop-2 final target setpoint	
D2035	DEV_L1	Loop-1 deviation	-105.0 to 105.0% of PV input range span (EU)
D2036	DEV_L2	Loop-2 deviation	-105.0 to 105.0% of PV input range span (EU)

● **Bit Configuration of D2037: ALO_L1 (Loop-1 alarm-1 to alarm-8 output status)**

Bit	Symbol	Event
0	ALO1_L1	Output status where Loop-1 alarm output 1 is assighed. 0: When the alarm is turned off (alarm type: energized), or the alarm is turned on (alarm type: de-energized). (The relay contact is open.) 1: When the alarm is turned on (alarm type: energized), or the alarm is turned off (alarm type: de-energized). (The relay contact is closed.)
1	ALO2_L1	Output status where Loop-1 alarm output 2 is assighed. For bit information, same as bit 0.
2	ALO3_L1	Output status where Loop-1 alarm output 3 is assighed. For bit information, same as bit 0.
3		
4	ALO4_L1	Output status where Loop-1 alarm output 4 is assighed. For bit information, same as bit 0.
5	ALO5_L1	Output status where Loop-1 alarm output 5 is assighed. For bit information, same as bit 0.
6	ALO6_L1	Output status where Loop-1 alarm output 6 is assighed. For bit information, same as bit 0.
7		
8	ALO7_L1	Output status where Loop-1 alarm output 7 is assighed. For bit information, same as bit 0.
9	ALO8_L1	Output status where Loop-1 alarm output 8 is assighed. For bit information, same as bit 0.
10 to 15		

● **Bit Configuration of D2038: ALO_L2 (Loop-2 alarm-1 to alarm-8 output status)**

Bit	Symbol	Event
0	ALO1_L2	Output status where Loop-2 alarm output 1 is assighed. 0: When the alarm is turned off (alarm type: energized), or the alarm is turned on (alarm type: de-energized). (The relay contact is open.) 1: When the alarm is turned on (alarm type: energized), or the alarm is turned off (alarm type: de-energized). (The relay contact is closed.)
1	ALO2_L2	Output status where Loop-2 alarm output 2 is assighed. For bit information, same as bit 0.
2	ALO3_L2	Output status where Loop-2 alarm output 3 is assighed. For bit information, same as bit 0.
3		
4	ALO4_L2	Output status where Loop-2 alarm output 4 is assighed. For bit information, same as bit 0.
5	ALO5_L2	Output status where Loop-2 alarm output 5 is assighed. For bit information, same as bit 0.
6	ALO6_L2	Output status where Loop-2 alarm output 6 is assighed. For bit information, same as bit 0.
7		
8	ALO7_L2	Output status where Loop-2 alarm output 7 is assighed. For bit information, same as bit 0.
9	ALO8_L2	Output status where Loop-2 alarm output 8 is assighed. For bit information, same as bit 0.
10 to 15		

● **Bit Configuration of D2066: DIMG (Message display interruption status)**

Bit	Symbol	Event
0	MG1.B	Message display interruption 1 (1: displayed, 0: not displayed)
1	MG2.B	Message display interruption 2 (1: displayed, 0: not displayed)
2	MG3.B	Message display interruption 3 (1: displayed, 0: not displayed)
3		
4	MG4.B	Message display interruption 4 (1: displayed, 0: not displayed)
5 to 15		

● **Bit Configuration of D2068: PA.ER (Parameter error status)**

Bit	Symbol	Event
0	SYSTEM_ERR	System data error
1	CALB_ERR	Calibration value error
2	UPARA_ERR	User (parameter) default value error
3		
4	SETPA_ERR	Setup parameter error
5	OPEPA_ERR	Operation parameter error
6		
7		
8	FRAM_ERR	Faulty FRAM
9		
10	CTLPA_ERR	Control parameter error
11 to 15		

● **Bit Configuration of D2070: OP.ER (Option error status)**

Bit	Symbol	Event
0	E1_ERR	Nonresponding hardware of E1 terminal area
1		
2	E3_ERR	Nonresponding hardware of E3 terminal area
3		
4		
5 to 7		
8		
9		
10	COM_E3_ERR	Communication error E3 terminal area
11		
12		
13 to 15		

● **Bit Configuration of D2071: ALOLA1_L1 (Loop-1 alarm-1 to alarm-8 latch output status)**

Bit	Symbol	Event
0	ALO1LA1_L1	Alarm-1 latch-1 output status
1	ALO2LA1_L1	Alarm-2 latch-1 output status
2	ALO3LA1_L1	Alarm-3 latch-1 output status
3		
4	ALO4LA1_L1	Alarm-4 latch-1 output status
5	ALO5LA1_L1	Alarm-5 latch-1 output status
6	ALO6LA1_L1	Alarm-6 latch-1 output status
7		
8	ALO7LA1_L1	Alarm-7 latch-1 output status
9	ALO8LA1_L1	Alarm-8 latch-1 output status
10 to 15		

- **Bit Configuration of D2072: ALOLA1_L2 (Loop-2 alarm-1 to alarm-8 latch output status)**

Bit	Symbol	Event
0	ALO1LA1_L2	Alarm-1 latch-1 output status
1	ALO2LA1_L2	Alarm-2 latch-1 output status
2	ALO3LA1_L2	Alarm-3 latch-1 output status
3		
4	ALO4LA1_L2	Alarm-4 latch-1 output status
5	ALO5LA1_L2	Alarm-5 latch-1 output status
6	ALO6LA1_L2	Alarm-6 latch-1 output status
7		
8	ALO7LA1_L2	Alarm-7 latch-1 output status
9	ALO8LA1_L2	Alarm-8 latch-1 output status
10 to 15		

- **Bit Configuration of D2073: ALOLA2_L1 (Loop-1 alarm-1 to alarm-8 latch-2 output status)**

Bit	Symbol	Event
0	ALO1LA2_L1	Alarm-1 latch-2 output status
1	ALO2LA2_L1	Alarm-2 latch-2 output status
2	ALO3LA2_L1	Alarm-3 latch-2 output status
3		
4	ALO4LA2_L1	Alarm-4 latch-2 output status
5	ALO5LA2_L1	Alarm-5 latch-2 output status
6	ALO6LA2_L1	Alarm-6 latch-2 output status
7		
8	ALO7LA2_L1	Alarm-7 latch-2 output status
9	ALO8LA2_L1	Alarm-8 latch-2 output status
10 to 15		

- **Bit Configuration of D2074: ALOLA2_L2 (Loop-2 alarm-1 to alarm-8 latch-2 output status)**

Bit	Symbol	Event
0	ALO1LA2_L2	Alarm-1 latch-2 output status
1	ALO2LA2_L2	Alarm-2 latch-2 output status
2	ALO3LA2_L2	Alarm-3 latch-2 output status
3		
4	ALO4LA2_L2	Alarm-4 latch-2 output status
5	ALO5LA2_L2	Alarm-5 latch-2 output status
6	ALO6LA2_L2	Alarm-6 latch-2 output status
7		
8	ALO7LA2_L2	Alarm-7 latch-2 output status
9	ALO8LA2_L2	Alarm-8 latch-2 output status
10 to 15		

- **Bit Configuration of D2075: ALOLA3_L1 (Loop-1 alarm-1 to alarm-8 latch-3 output status)**

Bit	Symbol	Event
0	ALO1LA3_L1	Alarm-1 latch-3 output status
1	ALO2LA3_L1	Alarm-2 latch-3 output status
2	ALO3LA3_L1	Alarm-3 latch-3 output status
3		
4	ALO4LA3_L1	Alarm-4 latch-3 output status
5	ALO5LA3_L1	Alarm-5 latch-3 output status
6	ALO6LA3_L1	Alarm-6 latch-3 output status
7		
8	ALO7LA3_L1	Alarm-7 latch-3 output status
9	ALO8LA3_L1	Alarm-8 latch-3 output status
10 to 15		

- **Bit Configuration of D2076: ALOLA3_L2 (Loop-2 alarm-1 to alarm-8 latch-3 output status)**

Bit	Symbol	Event
0	ALO1LA3_L2	Alarm-1 latch-3 output status
1	ALO2LA3_L2	Alarm-2 latch-3 output status
2	ALO3LA3_L2	Alarm-3 latch-3 output status
3		
4	ALO4LA3_L2	Alarm-4 latch-3 output status
5	ALO5LA3_L2	Alarm-5 latch-3 output status
6	ALO6LA3_L2	Alarm-6 latch-3 output status
7		
8	ALO7LA3_L2	Alarm-7 latch-3 output status
9	ALO8LA3_L2	Alarm-8 latch-3 output status
10 to 15		

- **Bit Configuration of D2077: ALOLA4_L1 (Loop-1 alarm-1 to alarm-8 latch-4 output status)**

Bit	Symbol	Event
0	ALO1LA4_L1	Alarm-1 latch-4 output status
1	ALO2LA4_L1	Alarm-2 latch-4 output status
2	ALO3LA4_L1	Alarm-3 latch-4 output status
3		
4	ALO4LA4_L1	Alarm-4 latch-4 output status
5	ALO5LA4_L1	Alarm-5 latch-4 output status
6	ALO6LA4_L1	Alarm-6 latch-4 output status
7		
8	ALO7LA4_L1	Alarm-7 latch-4 output status
9	ALO8LA4_L1	Alarm-8 latch-4 output status
10 to 15		

- **Bit Configuration of D2078: ALOLA4_L2 (Loop-2 alarm-1 to alarm -8 latch-4 output status)**

Bit	Symbol	Event
0	ALO1LA4_L2	Alarm-1 latch-4 output status
1	ALO2LA4_L2	Alarm-2 latch-4 output status
2	ALO3LA4_L2	Alarm-3 latch-4 output status
3		
4	ALO4LA4_L2	Alarm-4 latch-4 output status
5	ALO5LA4_L2	Alarm-5 latch-4 output status
6	ALO6LA4_L2	Alarm-6 latch-4 output status
7		
8	ALO7LA4_L2	Alarm-7 latch-4 output status
9	ALO8LA4_L2	Alarm-8 latch-4 output status
10 to 15		

Current SP Group and PID Group (D2101 to D2200)

Register No.	Description		Range and meaning of value
D2101	SP_L1_*	Loop-1 target setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)
D2102			
D2103	PIDN_L1_*	Loop-1 PID number selection	Set a PID group number to use. 1 to 8 (Depends on the PIDG. setting.)
D2104	A1_L1_*	Loop-1 alarm-1 setpoint	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.
D2105	A2_L1_*	Loop-1 alarm-2 setpoint	
D2106	A3_L1_*	Loop-1 alarm-3 setpoint	
D2107	A4_L1_*	Loop-1 alarm-4 setpoint	
D2108	A5_L1_*	Loop-1 alarm-5 setpoint	
D2109	A6_L1_*	Loop-1 alarm-6 setpoint	
D2110	A7_L1_*	Loop-1 alarm-7 setpoint	
D2111	A8_L1_*	Loop-1 alarm-8 setpoint	
D2112 to D2113			
D2114	P_L1_*	Proportional band	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
D2115	I_L1_*	Integral time	0: OFF (Disable) 1 to 6000 s
D2116	D_L1_*	Derivative time	0: OFF (Disable) 1 to 6000 s
D2117	OH_L1_*	Control output high limit	-4.9 to 105.0%, (OL<OH) In Heating/cooling control: 0.1 to 105.0% (OL<OH)
D2118	OL_L1_*	Control output low limit	-5.0 to 104.9%, (OL<OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL<OH)
D2119	MR_L1_*	Manual reset	Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%
D2120	HYS_L1_*	Hysteresis (in ON/OFF control)	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EU) In Heating/cooling control or Position proportional control: 0.0 to 100.0%
D2121			
D2122	HY.UP_L1_*	Upper-side hysteresis (in ON/OFF control)	0.0 to 100.0% of PV input range span (EU)
D2123	HY.LO_L1_*	Lower-side hysteresis (in ON/OFF control)	
D2124	DR_L1_*	Direct/reverse action switch	0: RVS (Reverse action) 1: DIR (Direct action)
D2136 to D2150			
D2151	SP_L2_*	Loop-2 target setpoint	Same as D2101
D2152			
D2153 to D2161	PIDN_L2_* to A8_L2_*	Loop-2 PID number selection to alarm-8 setpoint	Same as D2103 to D2111
D2162 to D2163			
D2164 to D2170	P_L2_* to HYS_L2_*	Loop-2 proportional band to Hysteresis (in ON/OFF control)	Same as D2114 to D2120
D2171 to D2173			
D2174	DR_L2_*	Loop-2 direct/reverse action switch	Same as D2124
D2175			
D2186 to D2200			

*: 1 to 8, or R

23.4.2 Loop-1 Operation Parameter (D2501 to D3600)

Loop-1 operation parameter									
SP and alarm setpoint setting (Menu: SP)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2501	42501	09C4	SP_L1_1	R/W	D2551	42551	09F6	A8_L1_3	R/W
D2502	42502	09C5	SUB_1	R/W	D2552	42552	09F7		
D2503	42503	09C6	PIDN_L1_1	R/W	D2561	42561	0A00	SP_L1_4	R/W
D2504	42504	09C7	A1_L1_1	R/W	D2562	42562	0A01	SUB_4	R/W
D2505	42505	09C8	A2_L1_1	R/W	D2563	42563	0A02	PIDN_L1_4	R/W
D2506	42506	09C9	A3_L1_1	R/W	D2564	42564	0A03	A1_L1_4	R/W
D2507	42507	09CA	A4_L1_1	R/W	D2565	42565	0A04	A2_L1_4	R/W
D2508	42508	09CB	A5_L1_1	R/W	D2566	42566	0A05	A3_L1_4	R/W
D2509	42509	09CC	A6_L1_1	R/W	D2567	42567	0A06	A4_L1_4	R/W
D2510	42510	09CD	A7_L1_1	R/W	D2568	42568	0A07	A5_L1_4	R/W
D2511	42511	09CE	A8_L1_1	R/W	D2569	42569	0A08	A6_L1_4	R/W
D2512	42512	09CF			D2570	42570	0A09	A7_L1_4	R/W
D2521	42521	09D8	SP_L1_2	R/W	D2571	42571	0A0A	A8_L1_4	R/W
D2522	42522	09D9	SUB_2	R/W	D2572	42572	0A0B		
D2523	42523	09DA	PIDN_L1_2	R/W	D2581	42581	0A14	SP_L1_5	R/W
D2524	42524	09DB	A1_L1_2	R/W	D2582	42582	0A15	SUB_5	R/W
D2525	42525	09DC	A2_L1_2	R/W	D2583	42583	0A16	PIDN_L1_5	R/W
D2526	42526	09DD	A3_L1_2	R/W	D2584	42584	0A17	A1_L1_5	R/W
D2527	42527	09DE	A4_L1_2	R/W	D2585	42585	0A18	A2_L1_5	R/W
D2528	42528	09DF	A5_L1_2	R/W	D2586	42586	0A19	A3_L1_5	R/W
D2529	42529	09E0	A6_L1_2	R/W	D2587	42587	0A1A	A4_L1_5	R/W
D2530	42530	09E1	A7_L1_2	R/W	D2588	42588	0A1B	A5_L1_5	R/W
D2531	42531	09E2	A8_L1_2	R/W	D2589	42589	0A1C	A6_L1_5	R/W
D2532	42532	09E3			D2590	42590	0A1D	A7_L1_5	R/W
D2541	42541	09EC	SP_L1_3	R/W	D2591	42591	0A1E	A8_L1_5	R/W
D2542	42542	09ED	SUB_3	R/W	D2592	42592	0A1F		
D2543	42543	09EE	PIDN_L1_3	R/W					
D2544	42544	09EF	A1_L1_3	R/W					
D2545	42545	09F0	A2_L1_3	R/W					
D2546	42546	09F1	A3_L1_3	R/W					
D2547	42547	09F2	A4_L1_3	R/W					
D2548	42548	09F3	A5_L1_3	R/W					
D2549	42549	09F4	A6_L1_3	R/W					
D2550	42550	09F5	A7_L1_3	R/W					

Loop-1 operation parameter				
SP and alarm setpoint setting (Menu: SP)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2601	42601	0A28	SP_L1_6	R/W
D2602	42602	0A29	SUB_6	R/W
D2603	42603	0A2A	PIDN_L1_6	R/W
D2604	42604	0A2B	A1_L1_6	R/W
D2605	42605	0A2C	A2_L1_6	R/W
D2606	42606	0A2D	A3_L1_6	R/W
D2607	42607	0A2E	A4_L1_6	R/W
D2608	42608	0A2F	A5_L1_6	R/W
D2609	42609	0A30	A6_L1_6	R/W
D2610	42610	0A31	A7_L1_6	R/W
D2611	42611	0A32	A8_L1_6	R/W
D2612	42612	0A33		
D2621	42621	0A3C	SP_L1_7	R/W
D2622	42622	0A3D	SUB_7	R/W
D2623	42623	0A3E	PIDN_L1_7	R/W
D2624	42624	0A3F	A1_L1_7	R/W
D2625	42625	0A40	A2_L1_7	R/W
D2626	42626	0A41	A3_L1_7	R/W
D2627	42627	0A42	A4_L1_7	R/W
D2628	42628	0A43	A5_L1_7	R/W
D2629	42629	0A44	A6_L1_7	R/W
D2630	42630	0A45	A7_L1_7	R/W
D2631	42631	0A46	A8_L1_7	R/W
D2632	42632	0A47		
D2641	42641	0A50	SP_L1_8	R/W
D2642	42642	0A51	SUB_8	R/W
D2643	42643	0A52	PIDN_L1_8	R/W
D2644	42644	0A53	A1_L1_8	R/W
D2645	42645	0A54	A2_L1_8	R/W
D2646	42646	0A55	A3_L1_8	R/W
D2647	42647	0A56	A4_L1_8	R/W
D2648	42648	0A57	A5_L1_8	R/W
D2649	42649	0A58	A6_L1_8	R/W
D2650	42650	0A59	A7_L1_8	R/W
D2651	42651	0A5A	A8_L1_8	R/W

Loop-1 operation parameter				
SP-related setting (Menu: SPS)				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D2701	42701	0A8C	RMS_L1	R/W
D2702	42702	0A8D	RFL_L1	R/W
D2703	42703	0A8E	RT_L1	R/W
D2704	42704	0A8F	RBS_L1	R/W
D2705	42705	0A90	UPR_L1	R/W
D2706	42706	0A91	DNR_L1	R/W
D2707	42707	0A92	TMU_L1	R/W
D2708	42708	0A93		
D2709	42709	0A94		
D2710	42710	0A95	SPT_L1	R/W
D2711	42711	0A96	PVT_L1	R/W
D2714	42714	0A99		

Loop-1 operation parameter									
Alarm function setting (Menu: ALRM)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2801	42801	0AF0	AL1.T_L1	R/W	D2851	42851	0B22	**DYN3_L1**	R/W
D2802	42802	0AF1	AL1.W_L1	R/W	D2852	42852	0B23	**DYN4_L1**	R/W
D2803	42803	0AF2	AL1.D_L1	R/W	D2853	42853	0B24	**DYN5_L1**	R/W
D2804	42804	0AF3	AL1.L_L1	R/W	D2854	42854	0B25	**DYN6_L1**	R/W
D2805	42805	0AF4	AL2.T_L1	R/W	D2855	42855	0B26	**DYN7_L1**	R/W
D2806	42806	0AF5	AL2.W_L1	R/W	D2856	42856	0B27	**DYN8_L1**	R/W
D2807	42807	0AF6	AL2.D_L1	R/W	D2857	42857	0B28	**DYF1_L1**	R/W
D2808	42808	0AF7	AL2.L_L1	R/W	D2858	42858	0B29	**DYF2_L1**	R/W
D2809	42809	0AF8	AL3.T_L1	R/W	D2859	42859	0B2A	**DYF3_L1**	R/W
D2810	42810	0AF9	AL3.W_L1	R/W	D2860	42860	0B2B	**DYF4_L1**	R/W
D2811	42811	0AFA	AL3.D_L1	R/W	D2861	42861	0B2C	**DYF5_L1**	R/W
D2812	42812	0AFB	AL3.L_L1	R/W	D2862	42862	0B2D	**DYF6_L1**	R/W
D2813	42813	0AFC	AL4.T_L1	R/W	D2863	42863	0B2E	**DYF7_L1**	R/W
D2814	42814	0AFD	AL4.W_L1	R/W	D2864	42864	0B2F	**DYF8_L1**	R/W
D2815	42815	0AFE	AL4.D_L1	R/W	D2865	42865	0B30		
D2816	42816	0AFF	AL4.L_L1	R/W	D2866	42866	0B31	**AMD_L1**	R/W
D2817	42817	0B00	AL5.T_L1	R/W	D2867	42867	0B32		
D2818	42818	0B01	AL5.W_L1	R/W	D2871	42871	0B36		
D2819	42819	0B02	AL5.D_L1	R/W	D2872	42872	0B37		
D2820	42820	0B03	AL5.L_L1	R/W	D2873	42873	0B38		
D2821	42821	0B04	AL6.T_L1	R/W	D2874	42874	0B39		
D2822	42822	0B05	AL6.W_L1	R/W	D2875	42875	0B3A		
D2823	42823	0B06	AL6.D_L1	R/W	D2876	42876	0B3B		
D2824	42824	0B07	AL6.L_L1	R/W	D2877	42877	0B3C		
D2825	42825	0B08	AL7.T_L1	R/W	D2878	42878	0B3D		
D2826	42826	0B09	AL7.W_L1	R/W	D2879	42879	0B3E		
D2827	42827	0B0A	AL7.D_L1	R/W					
D2828	42828	0B0B	AL7.L_L1	R/W					
D2829	42829	0B0C	AL8.T_L1	R/W					
D2830	42830	0B0D	AL8.W_L1	R/W					
D2831	42831	0B0E	AL8.D_L1	R/W					
D2832	42832	0B0F	AL8.L_L1	R/W					
D2833	42833	0B10	**VT1_L1**	R/W					
D2834	42834	0B11	**VT2_L1**	R/W					
D2835	42835	0B12	**VT3_L1**	R/W					
D2836	42836	0B13	**VT4_L1**	R/W					
D2837	42837	0B14	**VT5_L1**	R/W					
D2838	42838	0B15	**VT6_L1**	R/W					
D2839	42839	0B16	**VT7_L1**	R/W					
D2840	42840	0B17	**VT8_L1**	R/W					
D2841	42841	0B18	**HY1_L1**	R/W					
D2842	42842	0B19	**HY2_L1**	R/W					
D2843	42843	0B1A	**HY3_L1**	R/W					
D2844	42844	0B1B	**HY4_L1**	R/W					
D2845	42845	0B1C	**HY5_L1**	R/W					
D2846	42846	0B1D	**HY6_L1**	R/W					
D2847	42847	0B1E	**HY7_L1**	R/W					
D2848	42848	0B1F	**HY8_L1**	R/W					
D2849	42849	0B20	**DYN1_L1**	R/W					
D2850	42850	0B21	**DYN2_L1**	R/W					

Loop-1 operation parameter				
PV-related setting (Menu: PVS)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D2901	42901	0B54	BS_L1	R/W
D2902	42902	0B55	FL_L1	R/W
D2903	42903	0B56		

Loop-1 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3001	43001	0BB8	P_L1_1	R/W	D3051	43051	0BEA	P_L1_2	R/W
D3002	43002	0BB9	I_L1_1	R/W	D3052	43052	0BEB	I_L1_2	R/W
D3003	43003	0BBA	D_L1_1	R/W	D3053	43053	0BEC	D_L1_2	R/W
D3004	43004	0BBB	OH_L1_1	R/W	D3054	43054	0BED	OH_L1_2	R/W
D3005	43005	0BBC	OL_L1_1	R/W	D3055	43055	0BEE	OL_L1_2	R/W
D3006	43006	0BBD	MR_L1_1	R/W	D3056	43056	0BEF	MR_L1_2	R/W
D3007	43007	0BBE	HYS_L1_1	R/W	D3057	43057	0BF0	HYS_L1_2	R/W
D3009	43009	0BC0	HY.UP_L1_1	R/W	D3059	43059	0BF2	HY.UP_L1_2	R/W
D3010	43010	0BC1	HY.LO_L1_1	R/W	D3060	43060	0BF3	HY.LO_L1_2	R/W
D3011	43011	0BC2	DR_L1_1	R/W	D3061	43061	0BF4	DR_L1_2	R/W
D3022	43022	0BCD			D3072	43072	0BFF		

Loop-1 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3101	43101	0C1C	P_L1_3	R/W	D3151	43151	0C4E	P_L1_4	R/W
D3102	43102	0C1D	I_L1_3	R/W	D3152	43152	0C4F	I_L1_4	R/W
D3103	43103	0C1E	D_L1_3	R/W	D3153	43153	0C50	D_L1_4	R/W
D3104	43104	0C1F	OH_L1_3	R/W	D3154	43154	0C51	OH_L1_4	R/W
D3105	43105	0C20	OL_L1_3	R/W	D3155	43155	0C52	OL_L1_4	R/W
D3106	43106	0C21	MR_L1_3	R/W	D3156	43156	0C53	MR_L1_4	R/W
D3107	43107	0C22	HYS_L1_3	R/W	D3157	43157	0C54	HYS_L1_4	R/W
D3109	43109	0C24	HY.UP_L1_3	R/W	D3159	43159	0C56	HY.UP_L1_4	R/W
D3110	43110	0C25	HY.LO_L1_3	R/W	D3160	43160	0C57	HY.LO_L1_4	R/W
D3111	43111	0C26	DR_L1_3	R/W	D3161	43161	0C58	DR_L1_4	R/W
D3123	43123	0C32			D3173	43173	0C64		

Loop-1 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3201	43201	0C80	P_L1_5	R/W	D3251	43251	0CB2	P_L1_6	R/W
D3202	43202	0C81	I_L1_5	R/W	D3252	43252	0CB3	I_L1_6	R/W
D3203	43203	0C82	D_L1_5	R/W	D3253	43253	0CB4	D_L1_6	R/W
D3204	43204	0C83	OH_L1_5	R/W	D3254	43254	0CB5	OH_L1_6	R/W
D3205	43205	0C84	OL_L1_5	R/W	D3255	43255	0CB6	OL_L1_6	R/W
D3206	43206	0C85	MR_L1_5	R/W	D3256	43256	0CB7	MR_L1_6	R/W
D3207	43207	0C86	HYS_L1_5	R/W	D3257	43257	0CB8	HYS_L1_6	R/W
D3209	43209	0C88	HY.UP_L1_5	R/W	D3259	43259	0CBA	HY.UP_L1_6	R/W
D3210	43210	0C89	HY.LO_L1_5	R/W	D3260	43260	0CBB	HY.LO_L1_6	R/W
D3211	43211	0C8A	DR_L1_5	R/W	D3261	43261	0CBC	DR_L1_6	R/W
D3223	43223	0C96			D3273	43273	0CC8		

Loop-1 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3301	43301	0CE4	P_L1_7	R/W	D3351	43351	0D16	P_L1_8	R/W
D3302	43302	0CE5	I_L1_7	R/W	D3352	43352	0D17	I_L1_8	R/W
D3303	43303	0CE6	D_L1_7	R/W	D3353	43353	0D18	D_L1_8	R/W
D3304	43304	0CE7	OH_L1_7	R/W	D3354	43354	0D19	OH_L1_8	R/W
D3305	43305	0CE8	OL_L1_7	R/W	D3355	43355	0D1A	OL_L1_8	R/W
D3306	43306	0CE9	MR_L1_7	R/W	D3356	43356	0D1B	MR_L1_8	R/W
D3307	43307	0CEA	HYS_L1_7	R/W	D3357	43357	0D1C	HYS_L1_8	R/W
D3309	43309	0CEC	HY.UP_L1_7	R/W	D3359	43359	0D1E	HY.UP_L1_8	R/W
D3310	43310	0CED	HY.LO_L1_7	R/W	D3360	43360	0D1F	HY.LO_L1_8	R/W
D3311	43311	0CEE	DR_L1_7	R/W	D3361	43361	0D20	DR_L1_8	R/W
D3323	43323	0CFA			D3373	43373	0D2C		

Loop-1 operation parameter				
PID setting (Menu: PID)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3401	43401	0D48	P_L1_R	R/W
D3402	43402	0D49	I_L1_R	R/W
D3403	43403	0D4A	D_L1_R	R/W
D3404	43404	0D4B	OH_L1_R	R/W
D3405	43405	0D4C	OL_L1_R	R/W
D3406	43406	0D4D	MR_L1_R	R/W
D3407	43407	0D4E	HYS_L1_R	R/W
D3409	43409	0D50	HY.UP_L1_R	R/W
D3410	43410	0D51	HY.LO_L1_R	R/W
D3411	43411	0D52	DR_L1_R	R/W
D3423	43423	0D5E		

Loop-1 operation parameter									
Control action-related setting (Tuning menu: TUNE) (Zone control menu: ZONE)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3501	43501	0DAC	SC_L1	R/W	D3551	43551	0DDE	RP1_L1	R/W
D3502	43502	0DAD			D3552	43552	0DDF	RP2_L1	R/W
D3503	43503	0DAE	AT.TY_L1	R/W	D3553	43553	0DE0	RP3_L1	R/W
D3504	43504	0DAF	AT.OH_L1	R/W	D3554	43554	0DE1	RP4_L1	R/W
D3505	43505	0DB0	AT.OL_L1	R/W	D3555	43555	0DE2	RP5_L1	R/W
D3506	43506	0DB1	AT.BS_L1	R/W	D3556	43556	0DE3	RP6_L1	R/W
D3507	43507	0DB2			D3557	43557	0DE4	RP7_L1	R/W
D3511	43511	0DB6	STM	R/W	D3558	43558	0DE5	RHY_L1	R/W
D3512	43512	0DB7	SWD	R/W	D3559	43559	0DE6	RDV_L1	R/W
D3513	43513	0DB8	GW_L1	R/W	D3560	43560	0DE7		
D3514	43514	0DB9	GG_L1	R/W					
D3515	43515	0DBA							
D3517	43517	0DBC	BD	R/W					
D3518	43518	0DBD	BB	R/W					
D3519	43519	0DBE	BL	R/W					
D3520	43520	0DBF							
D3525	43525	0DC4							
D3526	43526	0DC5	AR_L1	R/W					
D3527	43527	0DC6	OPR_L1	R/W					
D3528	43528	0DC7	OLMT_L1	R/W					
D3529	43529	0DC8							
D3531	43531	0DCA	MPON_L1	R/W					
D3532	43532	0DCB	MPO1_L1	R/W					
D3533	43533	0DCC	MPO2_L1	R/W					
D3534	43534	0DCD	MPO3_L1	R/W					
D3535	43535	0DCE	MPO4_L1	R/W					
D3536	43536	0DCF	MPO5_L1	R/W					
D3537	43537	0DD0							

Loop-1 SP and Alarm Setpoint Setting of Groups 1 to 8 (D2501 to D2700)

Register No.	Description		Range and meaning of value
D2501	**SP_L1_1**	Target setpoint of group 1	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)
D2502	**SUB_1**	Sub-target setpoint (in Two-position two-level control) of group 1	Set the offset from SP. -100.0 to 100.0% of PV input range span (EU)
D2503	**PIDN_L1_1**	PID number selection of group 1	Set a PID group number to use. 1 to 8 (Depends on the PIDG. setting.)
D2504	**A1_L1_1**	Alarm-1 setpoint of group 1	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.
D2505	**A2_L1_1**	Alarm-2 setpoint of group 1	
D2506	**A3_L1_1**	Alarm-3 setpoint of group 1	
D2507	**A4_L1_1**	Alarm-4 setpoint of group 1	
D2508	**A5_L1_1**	Alarm-5 setpoint of group 1	
D2509	**A6_L1_1**	Alarm-6 setpoint of group 1	
D2510	**A7_L1_1**	Alarm-7 setpoint of group 1	
D2511	**A8_L1_1**	Alarm-8 setpoint of group 1	
D2512 to D2520			
D2521 to D2531	**SP_L1_2 to A8_L1_2**	Target setpoint of group 2 to Alarm-8 setpoint of group 2	Same as 2501 to D2511
D2542 to D2540			
D2541 to D2551	**SP_L1_3 to A8_L1_3**	Target setpoint of group 3 to Alarm-8 setpoint of group 3	Same as D2501 to D2511
D2552 to D2560			
D2561 to D2571	**SP_L1_4 to A8_L1_4**	Target setpoint of group 4 to Alarm-8 setpoint of group 4	Same as D2501 to D2511
D2572 to D2580			
D2581 to D2591	**SP_L1_5 to A8_L1_5**	Target setpoint of group 5 to Alarm-8 setpoint of group 5	Same as D2501 to D2511
D2593 to D2600			
D2601 to D2611	**SP_L1_6 to A8_L1_6**	Target setpoint of group 6 to Alarm-8 setpoint of group 6	Same as D2501 to D2511
D2612 to D2620			
D2621 to D2631	**SP_L1_7 to A8_L1_7**	Target setpoint of group 7 to Alarm-8 setpoint of group 7	Same as D2501 to D2511
D2632 to D2640			
D2641 to D2651	**SP_L1_8 to A8_L1_8**	Target setpoint of group 8 to Alarm-8 setpoint of group 8	Same as D2501 to D2511
D2652 to D2700			

Loop-1 SP-related Setting (D2701 to D2800)

Register No.	Description		Range and meaning of value
D2701	**RMS_L1**	Remote input method	0: RSP (Via remote (aux. analog) input) 1: COM (Via communication) RSP is not displayed if the remote (auxiliary analog) input is not specified. COM is not displayed if the communication function is not specified. When neither the remote (auxiliary analog) input nor communication function is specified, this parameter is not displayed.
D2702	**RFL_L1**	Remote input filter	0: OFF (Disable) 1 to 120 s
D2703	**RT_L1**	Remote input ratio	SP = Remote input x RT + Remote input bias 0.001 to 9.999
D2704	**RBS_L1**	Remote input bias	-100.0 to 100.0% of PV input range span (EU)
D2705	**UPR_L1**	SP ramp-up rate	Used to prevent SP from changing suddenly. Set a ramp-up rate or ramp-down rate per hour or minute. Set a time unit using the parameter TMU. 0: OFF (Disable) 0.0 + 1 digit to 100.0% of PV input range span (EU)
D2706	**DNR_L1**	SP ramp-down rate	
D2707	**TMU_L1**	SP ramp-rate time unit	0: HOUR (Ramp-up rate or ramp-down rate per hour) 1: MIN (Ramp-up rate or ramp-down rate per minute)
D2708 to D2709			
D2710	**SPT_L1**	SP tracking selection	Tracking is performed when the mode changes from Remote to Local. (The local setpoint keeps track of the remote setpoint.) 0: OFF (Disable) 1: ON (Enable)
D2711	**PVT_L1**	PV tracking selection	Causes the setpoint to keep track of the PV so the setpoint automatically reverts to its original value at a preset rate of change. The UPR, DNR, and TMU are used in combination. Operating conditions: 1) MAN → AUTO, 2) STOP → AUTO, 3) Power-on, 4) SP number change, 5) SP change 0: OFF (Disable) 1: ON (Enable)
D2714 to D2800			

Loop-1 Alarm Function Setting (D2801 to D2900)

Register No.	Description		Range and meaning of value
D2801	AL1.T_L1	Alarm-1 type	A**L1.T_L1 to AL8.T_L1** 0: Disable 1: PV high limit 2: PV low limit 3: SP high limit 4: SP low limit 5: Deviation high limit 6: Deviation low limit 7: Deviation high and low limits 8: Deviation within high and low limits 9: 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 19: Analog input PV high limit 20: Analog input PV low limit 21: Analog input RSP high limit 22: Analog input RSP low limit 29: PV velocity 30: Fault diagnosis 31: FAIL A**L1.W_L1 to AL8.W_L1** 0: Without Stand-by action 1: With Stand-by action A**L1.D_L1 to AL8.D_L1** 0: Alarm output: Energized 1: Alarm output: De-energized A**L1.L_L1 to AL8.L_L1** **0**: OFF 1: Latch 1 2: Latch 2 3: Latch 3 4: Latch 4 When the PPC5 parameter is set by key stroke, the alarm type, stand-by action, energized/de-energized, and latch comprise one parameter.
D2802	AL1.W_L1	Alarm-1 stand-by action	
D2803	AL1.D_L1	Alarm-1 energized/de-energized	
D2804	AL1.L_L1	Alarm-1 latch	
D2805	AL2.T_L1	Alarm-2 type	
D2806	AL2.W_L1	Alarm-2 stand-by action	
D2807	AL2.D_L1	Alarm-2 energized/de-energized	
D2808	AL2.L_L1	Alarm-2 latch	
D2809	AL3.T_L1	Alarm-3 type	
D2810	AL3.W_L1	Alarm-3 stand-by action	
D2811	AL3.D_L1	Alarm-3 energized/de-energized	
D2812	AL3.L_L1	Alarm-3 latch	
D2813	AL4.T_L1	Alarm-4 type	
D2814	AL4.W_L1	Alarm-4 stand-by action	
D2815	AL4.D_L1	Alarm-4 energized/de-energized	
D2816	AL4.L_L1	Alarm-4 latch	
D2817	AL5.T_L1	Alarm-5 type	
D2818	AL5.W_L1	Alarm-5 stand-by action	
D2819	AL5.D_L1	Alarm-5 energized/de-energized	
D2820	AL5.L_L1	Alarm-5 latch	
D2821	AL6.T_L1	Alarm-6 type	
D2822	AL6.W_L1	Alarm-6 stand-by action	
D2823	AL6.D_L1	Alarm-6 energized/de-energized	
D2824	AL6.L_L1	Alarm-6 latch	
D2825	AL7.T_L1	Alarm-7 type	
D2826	AL7.W_L1	Alarm-7 stand-by action	
D2827	AL7.D_L1	Alarm-7 energized/de-energized	
D2828	AL7.L_L1	Alarm-7 latch	
D2829	AL8.T_L1	Alarm-8 type	
D2830	AL8.W_L1	Alarm-8 stand-by action	
D2831	AL8.D_L1	Alarm-8 energized/de-energized	
D2832	AL8.L_L1	Alarm-8 latch	
D2833	**VT1_L1**	PV velocity alarm time setpoint 1	1 to 5999 (second)
D2834	**VT2_L1**	PV velocity alarm time setpoint 2	
D2835	**VT3_L1**	PV velocity alarm time setpoint 3	
D2836	**VT4_L1**	PV velocity alarm time setpoint 4	
D2837	**VT5_L1**	PV velocity alarm time setpoint 5	
D2838	**VT6_L1**	PV velocity alarm time setpoint 6	
D2839	**VT7_L1**	PV velocity alarm time setpoint 7	
D2840	**VT8_L1**	PV velocity alarm time setpoint 8	

Register No.	Description		Range and meaning of value
D2841	HY1_L1	Alarm-1 hysteresis	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.
D2842	HY2_L1	Alarm-2 hysteresis	
D2843	HY3_L1	Alarm-3 hysteresis	
D2844	HY4_L1	Alarm-4 hysteresis	
D2845	HY5_L1	Alarm-5 hysteresis	
D2846	HY6_L1	Alarm-6 hysteresis	
D2847	HY7_L1	Alarm-7 hysteresis	
D2848	HY8_L1	Alarm-8 hysteresis	
D2849	DYN1_L1	Alarm-1 On-delay timer	An alarm output is ON when the delay timer expires after the alarm setpoint is reached. 0 to 5999 (second)
D2850	DYN2_L1	Alarm-2 On-delay timer	
D2851	DYN3_L1	Alarm-3 On-delay timer	
D2852	DYN4_L1	Alarm-4 On-delay timer	
D2853	DYN5_L1	Alarm-5 On-delay timer	
D2854	DYN6_L1	Alarm-6 On-delay timer	
D2855	DYN7_L1	Alarm-7 On-delay timer	
D2856	DYN8_L1	Alarm-8 On-delay timer	
D2857	DYF1_L1	Alarm-1 Off-delay timer	An alarm output is OFF when the delay timer expires after the alarm setpoint is reached. 0 to 5999 (second)
D2858	DYF2_L1	Alarm-2 Off-delay timer	
D2859	DYF3_L1	Alarm-3 Off-delay timer	
D2860	DYF4_L1	Alarm-4 Off-delay timer	
D2861	DYF5_L1	Alarm-5 Off-delay timer	
D2862	DYF6_L1	Alarm-6 Off-delay timer	
D2863	DYF7_L1	Alarm-7 Off-delay timer	
D2864	DYF8_L1	Alarm-8 Off-delay timer	
D2865			
D2866	AMD_L1	Alarm mode	0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode
D2879 to D2900			

Loop-1 PV-related Setting (D2901 to D3000)

Register No.	Description		Range and meaning of value
D2901	BS_L1	PV input bias	-100.0 to 100.0% of PV input range span (EU)
D2902	FL_L1	PV input filter	0: OFF (Disable) 1 to 120 s
D2903 to D2900			

Loop-1 PID Setting of Groups 1 to 8 and R (D3001 to D3500)

Register No.	Description		Range and meaning of value
D3001	**P_L1_1**	Proportional band of group 1	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.
D3002	**I_L1_1**	Integral time of group 1	0: OFF (Disable) 1 to 6000 s
D3003	**D_L1_1**	Derivative time of group 1	0: OFF (Disable) 1 to 6000 s
D3004	**OH_L1_1**	Control output high limit of group 1	-4.9 to 105.0%, (OL<OH)
D3005	**OL_L1_1**	Control output low limit of group 1	-5.0 to 104.9%, (OL<OH), SD: Tight shut
D3006	**MR_L1_1**	Manual reset of group 1	Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%
D3007	**HYS_L1_1**	Hysteresis (in ON/OFF control)	0.0 to 100.0% of PV input range span (EU)
D3009	**HY.UP_L1_1**	Upper-side hysteresis (in ON/OFF control) of group 1	0.0 to 100.0% of PV input range span (EU)
D3010	**HY.LO_L1_1**	Lower-side hysteresis (in ON/OFF control) of group 1	
D3011	**DR_L1_1**	Direct/reverse action switch of group 1	0: RVS: Reverse action 1: DIR: Direct action
D3023 to D3050			

Register No.	Description		Range and meaning of value
D3051 to D3072	**P_L1_2 to DR_L1_2**	Proportional band of group 2	Same as D3001 to D3022
D3073 to D3100			
D3101 to D3122	**P_L1_3 to DR_L1_3**	Proportional band of group 3	Same as D3001 to D3022
D3123 to D3150			
D3151 to D3172	**P_L1_4 to DR_L1_4**	Proportional band of group 4	Same as D3001 to D3022
D3173 to D3200			
D3201 to D3222	**P_L1_5 to DR_L1_5**	Proportional band of group 5	Same as D3001 to D3022
D3223 to D3250			
D3251 to D3272	**P_L1_6 to DR_L1_6**	Proportional band of group 6	Same as D3001 to D3022
D3273 to D3300			
D3301 to D3322	**P_L1_7 to DR_L1_7**	Proportional band of group 7	Same as D3001 to D3022
D3323 to D3350			
D3351 to D3372	**P_L1_8 to DR_L1_8**	Proportional band of group 8	Same as D3001 to D3022
D3373 to D3400			
D3401 to D3422	**P_L1_R to DR_L1_R**	Proportional band of group R	Same as D3001 to D3022
D3423 to D3500			

Loop-1 Control Action-related Setting (D3501 to D3600)

Register No.	Description		Range and meaning of value
D3501	SC_L1	Super function	0: 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) Note: Setpoints 2 and 3 must be used in PID control or PI control. Disabled in the following controls: 1) ON/OFF control, 2) PD control, 3) P control **Do not use the function for the control processes with responses similar to flow or pressure control.**
D3502			
D3503	AT.TY_L1	Auto-tuning type	0: Normal 1: Stability
D3504	AT.OH_L1	Output high limit in auto-tuning	-5.0 to 105.0%
D3505	AT.OL_L1	Output low limit in auto-tuning	
D3506	AT.BS_L1	SP bias in auto-tuning	-100.0 to 100.0% of PV input range span (EU)
D3507 to D3510			
D3511	STM	Sample PI sampled time	0 to 9999 s
D3512	SWD	Sample PI control time span	0 to 9999 s
D3513	GW_L1	Non-linear control gap width	0: OFF 0.0+1 digit to 50.0% of PV input range span (EU)
D3514	GG_L1	Non-linear control gain	0.001 to 1.000
D3515 to D3516			
D3517	BD	Batch PID deviation setpoint	0.0 to 100.0% of PV input range span (EU)
D3518	BB	Batch PID bias	0.0 to 100.0%
D3519	BL	Batch PID lock-up width	0.0 to 100.0% of PV input range span (EU)
D3520			
D3525			
D3526	AR_L1	Anti-reset windup (excess integration prevention)	0: AUTO, 50.0 to 200.0%
D3527	OPR_L1	Output velocity limiter	0: OFF (Disable), 0.1 to 100.0%/s
D3528	OLMT_L1	Output limiter switch	0: OFF (Disable output limiter in MAN mode) 1: ON (Enable output limiter in MAN mode)
D3529 to D3530			
D3531	MPON_L1	Manual preset output number selection	Select the output used in MAN mode when switched from AUTO to MAN mode. 0: 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)
D3532	MPO1_L1	Manual preset output 1	-5.0 to 105.0% However, output is limited to the output high limit and low limit.
D3533	MPO2_L1	Manual preset output 2	
D3534	MPO3_L1	Manual preset output 3	
D3535	MPO4_L1	Manual preset output 4	
D3536	MPO5_L1	Manual preset output 5	
D3537 to D3550			

Register No.	Description		Range and meaning of value
D3551	RP1_L1	Reference point 1	Set reference points at which switching is carried out between groups of PID constants according to the given temperature zone. 0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)
D3552	RP2_L1	Reference point 2	
D3553	RP3_L1	Reference point 3	
D3554	RP4_L1	Reference point 4	
D3555	RP5_L1	Reference point 5	
D3556	RP6_L1	Reference point 6	
D3557	RP7_L1	Reference point 7	
D3558	RHY_L1	Zone PID switching hysteresis	Hysteresis can be set for switching at a reference point. 0.0 to 10.0% of PV input range span (EU)
D3559	RDV_L1	Reference deviation	Set a deviation from SP. The PID for reference deviation is used if there is a larger deviation than the preset reference deviation. 0: OFF (Disable) 0.0 + 1 digit to 100.0% of PV input range span (EU)
D3560 to D3600			

23.4.3 Loop-2 Operation Parameter (D3601 to D4700)

Loop-2 operation parameter									
SP and alarm setpoint setting (Menu: SP)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3601	43601	0E10	SP_L2_1	R/W	D3651	43651	0E42	A8_L2_3	R/W
D3602	43602	0E11			D3652	43652	0E43		
D3603	43603	0E12	PIDN_L2_1	R/W	D3661	43661	0E4C	SP_L2_4	R/W
D3604	43604	0E13	A1_L2_1	R/W	D3662	43662	0E4D		
D3605	43605	0E14	A2_L2_1	R/W	D3663	43663	0E4E	PIDN_L2_4	R/W
D3606	43606	0E15	A3_L2_1	R/W	D3664	43664	0E4F	A1_L2_4	R/W
D3607	43607	0E16	A4_L2_1	R/W	D3665	43665	0E50	A2_L2_4	R/W
D3608	43608	0E17	A5_L2_1	R/W	D3666	43666	0E51	A3_L2_4	R/W
D3609	43609	0E18	A6_L2_1	R/W	D3667	43667	0E52	A4_L2_4	R/W
D3610	43610	0E19	A7_L2_1	R/W	D3668	43668	0E53	A5_L2_4	R/W
D3611	43611	0E1A	A8_L2_1	R/W	D3669	43669	0E54	A6_L2_4	R/W
D3612	43612	0E1B			D3670	43670	0E55	A7_L2_4	R/W
D3621	43621	0E24	SP_L2_2	R/W	D3671	43671	0E56	A8_L2_4	R/W
D3622	43622	0E25			D3672	43672	0E57		
D3623	43623	0E26	PIDN_L2_2	R/W	D3681	43681	0E60	SP_L2_5	R/W
D3624	43624	0E27	A1_L2_2	R/W	D3682	43682	0E61		
D3625	43625	0E28	A2_L2_2	R/W	D3683	43683	0E62	PIDN_L2_5	R/W
D3626	43626	0E29	A3_L2_2	R/W	D3684	43684	0E63	A1_L2_5	R/W
D3627	43627	0E2A	A4_L2_2	R/W	D3685	43685	0E64	A2_L2_5	R/W
D3628	43628	0E2B	A5_L2_2	R/W	D3686	43686	0E65	A3_L2_5	R/W
D3629	43629	0E2C	A6_L2_2	R/W	D3687	43687	0E66	A4_L2_5	R/W
D3630	43630	0E2D	A7_L2_2	R/W	D3688	43688	0E67	A5_L2_5	R/W
D3631	43631	0E2E	A8_L2_2	R/W	D3689	43689	0E68	A6_L2_5	R/W
D3632	43632	0E2F			D3690	43690	0E69	A7_L2_5	R/W
D3641	43641	0E38	SP_L2_3	R/W	D3691	43691	0E6A	A8_L2_5	R/W
D3642	43642	0E39			D3692	43692	0E6B		
D3643	43643	0E3A	PIDN_L2_3	R/W					
D3644	43644	0E3B	A1_L2_3	R/W					
D3645	43645	0E3C	A2_L2_3	R/W					
D3646	43646	0E3D	A3_L2_3	R/W					
D3647	43647	0E3E	A4_L2_3	R/W					
D3648	43648	0E3F	A5_L2_3	R/W					
D3649	43649	0E40	A6_L2_3	R/W					
D3650	43650	0E41	A7_L2_3	R/W					

Loop-2 operation parameter									
SP and alarm setpoint setting (Menu: SP)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3701	43701	0E74	SP_L2_6	R/W	D3751	43751	0EA6	A8_L2_8	R/W
D3702	43702	0E75			D3752	43752	0EA7		
D3703	43703	0E76	PIDN_L2_6	R/W					
D3704	43704	0E77	A1_L2_6	R/W					
D3705	43705	0E78	A2_L2_6	R/W					
D3706	43706	0E79	A3_L2_6	R/W					
D3707	43707	0E7A	A4_L2_6	R/W					
D3708	43708	0E7B	A5_L2_6	R/W					
D3709	43709	0E7C	A6_L2_6	R/W					
D3710	43710	0E7D	A7_L2_6	R/W					
D3711	43711	0E7E	A8_L2_6	R/W					
D3712	43712	0E7F							
D3721	43721	0E88	SP_L2_7	R/W					
D3722	43722	0E89							
D3723	43723	0E8A	PIDN_L2_7	R/W					
D3724	43724	0E8B	A1_L2_7	R/W					
D3725	43725	0E8C	A2_L2_7	R/W					
D3726	43726	0E8D	A3_L2_7	R/W					
D3727	43727	0E8E	A4_L2_7	R/W					
D3728	43728	0E8F	A5_L2_7	R/W					
D3729	43729	0E90	A6_L2_7	R/W					
D3730	43730	0E91	A7_L2_7	R/W					
D3731	43731	0E92	A8_L2_7	R/W					
D3732	43732	0E93							
D3741	43741	0E9C	SP_L2_8	R/W					
D3742	43742	0E9D							
D3743	43743	0E9E	PIDN_L2_8	R/W					
D3744	43744	0E9F	A1_L2_8	R/W					
D3745	43745	0EA0	A2_L2_8	R/W					
D3746	43746	0EA1	A3_L2_8	R/W					
D3747	43747	0EA2	A4_L2_8	R/W					
D3748	43748	0EA3	A5_L2_8	R/W					
D3749	43749	0EA4	A6_L2_8	R/W					
D3750	43750	0EA5	A7_L2_8	R/W					

Loop-2 operation parameter				
SP-related setting (Menu: SPS)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3801	43801	0ED8	RMS_L2	R/W
D3802	43802	0ED9	RFL_L2	R/W
D3803	43803	0EDA	RT_L2	R/W
D3804	43804	0EDB	RBS_L2	R/W
D3805	43805	0EDC	UPR_L2	R/W
D3806	43806	0EDD	DNR_L2	R/W
D3807	43807	0EDE	TMU_L2	R/W
D3808	43808	0EDF		
D3810	43810	0EE1	SPT_L2	R/W
D3811	43811	0EE2	PVT_L2	R/W
D3812	43812	0EE3		

Loop-2 operation parameter									
Alarm function setting (Menu: ALRM)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D3901	43901	0F3C	AL1.T_L2	R/W	D3951	43951	0F6E	DYN3_L2	R/W
D3902	43902	0F3D	AL1.W_L2	R/W	D3952	43952	0F6F	DYN4_L2	R/W
D3903	43903	0F3E	AL1.D_L2	R/W	D3953	43953	0F70	DYN5_L2	R/W
D3904	43904	0F3F	AL1.L_L2	R/W	D3954	43954	0F71	DYN6_L2	R/W
D3905	43905	0F40	AL2.T_L2	R/W	D3955	43955	0F72	DYN7_L2	R/W
D3906	43906	0F41	AL2.W_L2	R/W	D3956	43956	0F73	DYN8_L2	R/W
D3907	43907	0F42	AL2.D_L2	R/W	D3957	43957	0F74	DYF1_L2	R/W
D3908	43908	0F43	AL2.L_L2	R/W	D3958	43958	0F75	DYF2_L2	R/W
D3909	43909	0F44	AL3.T_L2	R/W	D3959	43959	0F76	DYF3_L2	R/W
D3910	43910	0F45	AL3.W_L2	R/W	D3960	43960	0F77	DYF4_L2	R/W
D3911	43911	0F46	AL3.D_L2	R/W	D3961	43961	0F78	DYF5_L2	R/W
D3912	43912	0F47	AL3.L_L2	R/W	D3962	43962	0F79	DYF6_L2	R/W
D3913	43913	0F48	AL4.T_L2	R/W	D3963	43963	0F7A	DYF7_L2	R/W
D3914	43914	0F49	AL4.W_L2	R/W	D3964	43964	0F7B	DYF8_L2	R/W
D3915	43915	0F4A	AL4.D_L2	R/W	D3965	43965	0F7C		
D3916	43916	0F4B	AL4.L_L2	R/W	D3966	43966	0F7D	AMD_L2	R/W
D3917	43917	0F4C	AL5.T_L2	R/W	D3967	43967	0F7E		
D3918	43918	0F4D	AL5.W_L2	R/W					
D3919	43919	0F4E	AL5.D_L2	R/W					
D3920	43920	0F4F	AL5.L_L2	R/W					
D3921	43921	0F50	AL6.T_L2	R/W					
D3922	43922	0F51	AL6.W_L2	R/W					
D3923	43923	0F52	AL6.D_L2	R/W					
D3924	43924	0F53	AL6.L_L2	R/W					
D3925	43925	0F54	AL7.T_L2	R/W					
D3926	43926	0F55	AL7.W_L2	R/W					
D3927	43927	0F56	AL7.D_L2	R/W					
D3928	43928	0F57	AL7.L_L2	R/W					
D3929	43929	0F58	AL8.T_L2	R/W					
D3930	43930	0F59	AL8.W_L2	R/W					
D3931	43931	0F5A	AL8.D_L2	R/W					
D3932	43932	0F5B	AL8.L_L2	R/W					
D3933	43933	0F5C	VT1_L2	R/W					
D3934	43934	0F5D	VT2_L2	R/W					
D3935	43935	0F5E	VT3_L2	R/W					
D3936	43936	0F5F	VT4_L2	R/W					
D3937	43937	0F60	VT5_L2	R/W					
D3938	43938	0F61	VT6_L2	R/W					
D3939	43939	0F62	VT7_L2	R/W					
D3940	43940	0F63	VT8_L2	R/W					
D3941	43941	0F64	HY1_L2	R/W					
D3942	43942	0F65	HY2_L2	R/W					
D3943	43943	0F66	HY3_L2	R/W					
D3944	43944	0F67	HY4_L2	R/W					
D3945	43945	0F68	HY5_L2	R/W					
D3946	43946	0F69	HY6_L2	R/W					
D3947	43947	0F6A	HY7_L2	R/W					
D3948	43948	0F6B	HY8_L2	R/W					
D3949	43949	0F6C	DYN1_L2	R/W					
D3950	43950	0F6D	DYN2_L2	R/W					

Loop-2 operation parameter				
PV-related setting (Menu: PVS)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4001	44001	0FA0	BS_L2	R/W
D4002	44002	0FA1	FL_L2	R/W
D4003	44003	0FA2		

Loop-2 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4101	44101	1004	P_L2_1	R/W	D4151	44151	1036	P_L2_2	R/W
D4102	44102	1005	I_L2_1	R/W	D4152	44152	1037	I_L2_2	R/W
D4103	44103	1006	D_L2_1	R/W	D4153	44153	1038	D_L2_2	R/W
D4104	44104	1007	OH_L2_1	R/W	D4154	44154	1039	OH_L2_2	R/W
D4105	44105	1008	OL_L2_1	R/W	D4155	44155	103A	OL_L2_2	R/W
D4106	44106	1009	MR_L2_1	R/W	D4156	44156	103B	MR_L2_2	R/W
D4108	44108	100B			D4158	44158	103D		
D4109	44109	100C			D4159	44159	103E		
D4110	44110	100D			D4160	44160	103F		
D4111	44111	100E	DR_L2_1	R/W	D4161	44161	1040	DR_L2_2	R/W
D4112	44112	100F			D4162	44162	1041		
D4123	44123	101A			D4173	44173	104C		

Loop-2 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4201	44201	1068	P_L2_3	R/W	D4251	44251	109A	P_L2_4	R/W
D4202	44202	1069	I_L2_3	R/W	D4252	44252	109B	I_L2_4	R/W
D4203	44203	106A	D_L2_3	R/W	D4253	44253	109C	D_L2_4	R/W
D4204	44204	106B	OH_L2_3	R/W	D4254	44254	109D	OH_L2_4	R/W
D4205	44205	106C	OL_L2_3	R/W	D4255	44255	109E	OL_L2_4	R/W
D4206	44206	106D	MR_L2_3	R/W	D4256	44256	109F	MR_L2_4	R/W
D4208	44208	106F			D4258	44258	10A1		
D4211	44211	1072	DR_L2_3	R/W	D4261	44261	10A4	DR_L2_4	R/W
D4212	44212	1073			D4262	44262	10A5		
D4223	44223	107E			D4273	44273	10B0		

Loop-2 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4301	44301	10CC	P_L2_5	R/W	D4351	44351	10FE	P_L2_6	R/W
D4302	44302	10CD	I_L2_5	R/W	D4352	44352	10FF	I_L2_6	R/W
D4303	44303	10CE	D_L2_5	R/W	D4353	44353	1100	D_L2_6	R/W
D4304	44304	10CF	OH_L2_5	R/W	D4354	44354	1101	OH_L2_6	R/W
D4305	44305	10D0	OL_L2_5	R/W	D4355	44355	1102	OL_L2_6	R/W
D4306	44306	10D1	MR_L2_5	R/W	D4356	44356	1103	MR_L2_6	R/W
D4308	44308	10D3			D4358	44358	1105		
D4311	44311	10D6	DR_L2_5	R/W	D4361	44361	1108	DR_L2_6	R/W
D4312	44312	10D7			D4362	44362	1109		
D4323	44323	10E2			D4373	44373	1114		

Loop-2 operation parameter									
PID setting (Menu: PID)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4401	44401	1130	P_L2_7	R/W	D4451	44451	1162	P_L2_8	R/W
D4402	44402	1131	I_L2_7	R/W	D4452	44452	1163	I_L2_8	R/W
D4403	44403	1132	D_L2_7	R/W	D4453	44453	1164	D_L2_8	R/W
D4404	44404	1133	OH_L2_7	R/W	D4454	44454	1165	OH_L2_8	R/W
D4405	44405	1134	OL_L2_7	R/W	D4455	44455	1166	OL_L2_8	R/W
D4406	44406	1135	MR_L2_7	R/W	D4456	44456	1167	MR_L2_8	R/W
D4408	44408	1137			D4458	44458	1169		
D4411	44411	113A	DR_L2_7	R/W	D4461	44461	116C	DR_L2_8	R/W
D4412	44412	113B			D4462	44462	116D		
D4423	44423	1146			D4473	44473	1178		

Loop-2 operation parameter				
PID setting (Menu: PID)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4501	44501	1194	P_L2_R	R/W
D4502	44502	1195	I_L2_R	R/W
D4503	44503	1196	D_L2_R	R/W
D4504	44504	1197	OH_L2_R	R/W
D4505	44505	1198	OL_L2_R	R/W
D4506	44506	1199	MR_L2_R	R/W
D4507	44507	119A	HYS_L2_R	R/W
D4508	44508	119B		
D4511	44511	119E	DR_L2_R	R/W
D4512	44512	119F		
D4523	44523	11AA		

Loop-2 operation parameter									
Control action-related setting (Tuning menu: TUNE) (Zone control menu: ZONE)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4601	44601	11F8	SC_L2	R/W	D4651	44651	122A		
D4602	44602	11F9			D4652	44652	122B		
D4603	44603	11FA	AT.TY_L2	R/W	D4653	44653	122C	RP1_L2	R/W
D4604	44604	11FB	AT.OH_L2	R/W	D4654	44654	122D	RP2_L2	R/W
D4605	44605	11FC	AT.OL_L2	R/W	D4655	44655	122E	RP3_L2	R/W
D4606	44606	11FD	AT.BS_L2	R/W	D4656	44656	122F	RP4_L2	R/W
D4607	44607	11FE			D4657	44657	1230	RP5_L2	R/W
D4613	44613	1204	GW_L2	R/W	D4658	44658	1231	RP6_L2	R/W
D4614	44614	1205	GG_L2	R/W	D4659	44659	1232	RP7_L2	R/W
D4615	44615	1206			D4660	44660	1233	RHY_L2	R/W
D4626	44626	1211	AR_L2	R/W	D4661	44661	1234	RDV_L2	R/W
D4627	44627	1212	OPR_L2	R/W	D4662	44662	1235		
D4628	44628	1213	OLMT_L2	R/W					
D4629	44629	1214							
D4631	44631	1216	MPON_L2	R/W					
D4632	44632	1217	MPO1_L2	R/W					
D4633	44633	1218	MPO2_L2	R/W					
D4634	44634	1219	MPO3_L2	R/W					
D4635	44635	121A	MPO4_L2	R/W					
D4636	44636	121B	MPO5_L2	R/W					
D4637	44637	121C							

Loop-2 SP and Alarm Setpoint Setting of Groups 1 to 8 (D3601 to D3800)

Register No.	Description		Range and meaning of value
D3601	SP_L2_1	Target setpoint of group 1	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)
D3602			
D3603	PIDN_L2_1	PID number selection of group 1	Set a PID group number to use. 1 to 8 (Depends on the PIDG. setting.)
D3604	A1_L2_1	Alarm-1 setpoint of group 1	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.
D3605	A2_L2_1	Alarm-2 setpoint of group 1	
D3606	A3_L2_1	Alarm-3 setpoint of group 1	
D3607	A4_L2_1	Alarm-4 setpoint of group 1	
D3608	A5_L2_1	Alarm-5 setpoint of group 1	
D3609	A6_L2_1	Alarm-6 setpoint of group 1	
D3610	A7_L2_1	Alarm-7 setpoint of group 1	
D3611	A8_L2_1	Alarm-8 setpoint of group 1	
D3612 to D3620			
D3621 to D3631	SP_L2_2 to A8_L2_2	Target setpoint of group 2 to Alarm-8 setpoint of group 2	Same as D3601 to D3611
D3632 to D3640			
D3641 to D3651	SP_L2_3 to A8_L2_3	Target setpoint of group 3 to Alarm-8 setpoint of group 3	Same as D3601 to D3611
D3652 to D3660			
D3661 to D3671	SP_L2_4 to A8C_L2_4	Target setpoint of group 4 to Alarm-8 setpoint of group 4	Same as D3601 to D3611
D3672 to D3680			
D3681 to D3691	SP_L2_5 to A8_L2_5	Target setpoint of group 5 to Alarm-8 setpoint of group 5	Same as D3601 to D3611
D3691 to D3700			
D3701 to D3711	SP_L2_6 to A8_L2_6	Target setpoint of group 6 to Alarm-8 setpoint of group 6	Same as D3601 to D3611
D3712 to D3720			
D3721 to D3731	SP_L2_7 to A8_L2_7	Target setpoint of group 7 to Alarm-8 setpoint of group 7	Same as D3601 to D3611
D3732 to D3740			
D3741 to D3751	SP_L2_8 to A8_L2_8	Target setpoint of group 8 to Alarm-8 setpoint of group 8	Same as D3601 to D3611
D3752 to D3800			

Loop-2 SP-related Setting (D3801 to D3900)

Register No.	Description		Range and meaning of value
D3801	**RMS_L2**	Remote input method	0: RSP (Via remote (aux. analog) input) 1: COM (Via communication) RSP is not displayed if the remote (auxiliary analog) input is not specified. COM is not displayed if the communication function is not specified. When neither the remote (auxiliary analog) input nor communication function is specified, this parameter is not displayed.
D3802	**RFL_L2**	Remote input filter	0: OFF (Disable) 1 to 120 s
D3803	**RT_L2**	Remote input ratio	SP = Remote input x RT + Remote input bias 0.001 to 9.999
D3804	**RBS_L2**	Remote input bias	-100.0 to 100.0% of PV input range span (EU)
D3805	**UPR_L2**	SP ramp-up rate	Used to prevent SP from changing suddenly. Set a ramp-up rate or ramp-down rate per hour or minute. Set a time unit using the parameter TMU. 0: OFF (Disable) 0.0 + 1 digit to 100.0% of PV input range span (EU)
D3806	**DNR_L2**	SP ramp-down rate	
D3807	**TMU_L2**	SP ramp-rate time unit	0: HOUR (Ramp-up rate or ramp-down rate per hour) 1: MIN (Ramp-up rate or ramp-down rate per minute)
D3808 to D3809			
D3810	**SPT_L2**	SP tracking selection	Tracking is performed when the mode changes from Remote to Local. (The local setpoint keeps track of the remote setpoint.) 0: OFF (Disable) 1: ON (Enable)
D3811	**PVT_L2**	PV tracking selection	Causes the setpoint to keep track of the PV so the setpoint automatically reverts to its original value at a preset rate of change. The UPR, DNR, and TMU are used in combination. Operating conditions: 1) MAN → AUTO, 2) STOP → AUTO, 3) Power-on, 4) SP number change, 5) SP change 0: OFF (Disable) 1: ON (Enable)
D3812 to D3900			

Loop-2 Alarm Function Setting (D3901 to D4000)

Register No.	Description		Range and meaning of value
D3901	AL1.T_L2	Alarm-1 type	A**L1.T_L2 to AL8.T_L2** 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 19: Analog input PV high limit 20: Analog input PV low limit 21: Analog input RSP high limit 22: Analog input RSP low limit 29: PV velocity 30: Fault diagnosis 31: FAIL A**L1.W_L2 to AL8.W_L2** 0: Without Stand-by action 1: With Stand-by action A**L1.D_L2 to AL8.D_L2** 0: Alarm output: Energized 1: Alarm output: De-energized A**L1.L_L2 to AL8.L_L2** **0**: OFF 1: Latch 1 2: Latch 2 3: Latch 3 4: Latch 4 When the PPC5 parameter is set by key stroke, the alarm type, stand-by action, energized/de-energized, and latch comprise one parameter.
D3902	AL1.W_L2	Alarm-1 stand-by action	
D3903	AL1.D_L2	Alarm-1 energized/de-energized	
D3904	AL1.L_L2	Alarm-1 latch	
D3905	AL2.T_L2	Alarm-2 type	
D3906	AL2.W_L2	Alarm-2 stand-by action	
D3907	AL2.D_L2	Alarm-2 energized/de-energized	
D3908	AL2.L_L2	Alarm-2 latch	
D3909	AL3.T_L2	Alarm-3 type	
D3910	AL3.W_L2	Alarm-3 stand-by action	
D3911	AL3.D_L2	Alarm-3 energized/de-energized	
D3912	AL3.L_L2	Alarm-3 latch	
D3913	AL4.T_L2	Alarm-4 type	
D3914	AL4.W_L2	Alarm-4 stand-by action	
D3915	AL4.D_L2	Alarm-4 energized/de-energized	
D3916	AL4.L_L2	Alarm-4 latch	
D3917	AL5.T_L2	Alarm-5 type	
D3918	AL5.W_L2	Alarm-5 stand-by action	
D3919	AL5.D_L2	Alarm-5 energized/de-energized	
D3920	AL5.L_L2	Alarm-5 latch	
D3921	AL6.T_L2	Alarm-6 type	
D3922	AL6.W_L2	Alarm-6 stand-by action	
D3923	AL6.D_L2	Alarm-6 energized/de-energized	
D3924	AL6.L_L2	Alarm-6 latch	
D3925	AL7.T_L2	Alarm-7 type	
D3926	AL7.W_L2	Alarm-7 stand-by action	
D3927	AL7.D_L2	Alarm-7 energized/de-energized	
D3928	AL7.L_L2	Alarm-7 latch	
D3929	AL8.T_L2	Alarm-8 type	
D3930	AL8.W_L2	Alarm-8 stand-by action	
D3931	AL8.D_L2	Alarm-8 energized/de-energized	
D3932	AL8.L_L2	Alarm-8 latch	
D3933	**VT1_L2**	PV velocity alarm time setpoint 1	0.01 to 99.59 (m.s)
D3934	**VT2_L2**	PV velocity alarm time setpoint 2	
D3935	**VT3_L2**	PV velocity alarm time setpoint 3	
D3936	**VT4_L2**	PV velocity alarm time setpoint 4	
D3937	**VT5_L2**	PV velocity alarm time setpoint 5	
D3938	**VT6_L2**	PV velocity alarm time setpoint 6	
D3939	**VT7_L2**	PV velocity alarm time setpoint 7	
D3940	**VT8_L2**	PV velocity alarm time setpoint 8	

Register No.	Description		Range and meaning of value
D3941	**HY1_L2**	Alarm-1 hysteresis	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.
D3942	**HY2_L2**	Alarm-2 hysteresis	
D3943	**HY3_L2**	Alarm-3 hysteresis	
D3944	**HY4_L2**	Alarm-4 hysteresis	
D3945	**HY5_L2**	Alarm-5 hysteresis	
D3946	**HY6_L2**	Alarm-6 hysteresis	
D3947	**HY7_L2**	Alarm-7 hysteresis	
D3948	**HY8_L2**	Alarm-8 hysteresis	
D3949	**DYN1_L2**	Alarm-1 On-delay timer	An alarm output is ON when the delay timer expires after the alarm setpoint is reached. 0.00 to 99.59 (m.s)
D3950	**DYN2_L2**	Alarm-2 On-delay timer	
D3951	**DYN3_L2**	Alarm-3 On-delay timer	
D3952	**DYN4_L2**	Alarm-4 On-delay timer	
D3953	**DYN5_L2**	Alarm-5 On-delay timer	
D3954	**DYN6_L2**	Alarm-6 On-delay timer	
D3955	**DYN7_L2**	Alarm-7 On-delay timer	
D3956	**DYN8_L2**	Alarm-8 On-delay timer	
D3957	**DYF1_L2**	Alarm-1 Off-delay timer	An alarm output is OFF when the delay timer expires after the alarm setpoint is reached. 0.00 to 99.59 (m.s)
D3958	**DYF2_L2**	Alarm-2 Off-delay timer	
D3959	**DYF3_L2**	Alarm-3 Off-delay timer	
D3960	**DYF4_L2**	Alarm-4 Off-delay timer	
D3961	**DYF5_L2**	Alarm-5 Off-delay timer	
D3962	**DYF6_L2**	Alarm-6 Off-delay timer	
D3963	**DYF7_L2**	Alarm-7 Off-delay timer	
D3964	**DYF8_L2**	Alarm-8 Off-delay timer	
D3965			
D3966	**AMD_L2**	Alarm mode	0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode
D3967 to D4000			

Loop-2 PV-related Setting (D4001 to D4100)

Register No.	Description		Range and meaning of value
D4001	**BS_L2**	PV input bias	-100.0 to 100.0% of PV input range span (EU)
D4002	**FL_L2**	PV input filter	0: OFF (Disable) 1 to 120 s
D4003 to D4100			

Loop-2 PID Setting of Groups 1 to 8 and R (D4101 to D4600)

Register No.	Description		Range and meaning of value
D4101	P_L2_1	Proportional band of group 1	0.0 to 999.9% When 0.0% is set, it operates as 0.1%.
D4102	I_L2_1	Integral time of group 1	0: OFF (Disable) 1 to 6000 s
D4103	D_L2_1	Derivative time of group 1	0: OFF (Disable) 1 to 6000 s
D4104	OH_L2_1	Control output high limit of group 1	-4.9 to 105.0%, (OL<OH)
D4105	OL_L2_1	Control output low limit of group 1	-5.0 to 104.9%, (OL<OH), SD: Tight shut
D4106	MR_L2_1	Manual reset of group 1	Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%
D4108 to D4110			
D4111	DR_L2_1	Direct/reverse action switch of group 1	0: RVS: Reverse action 1: DIR: Direct action
D4112			
D4123 to D4450			

Register No.	Description		Range and meaning of value
D4151 to D4172	**P_L2_2 to DR_L2_2**	Proportional band of group 2	Same as D4101 to D4122
D4173 to D4200			
D4201 to D4222	**P_L2_3 to DR_L2_3**	Proportional band of group 3	Same as D4101 to D4122
D4223 to D4250			
D4251 to D4272	**P_L2_4 to DR_L2_4**	Proportional band of group 4	Same as D4101 to D4122
D4273 to D4300			
D4301 to D4322	**P_L2_5 to DR_L2_5**	Proportional band of group 5	Same as D4101 to D4122
D4323 to D4350			
D4351 to D4372	**P_L2_6 to DR_L2_6**	Proportional band of group 6	Same as D4101 to D4122
D4373 to D4400			
D4401 to D4422	**P_L2_7 to DR_L2_7**	Proportional band of group 7	Same as D4101 to D4122
D4423 to D4450			
D4451 to D4472	**P_L2_8 to DR_L2_8**	Proportional band of group 8	Same as D4101 to D4122
D4473 to D4500			
D4501 to D4522	**P_L2_R to DR_L2_R**	Proportional band of group R	Same as D4101 to D4122
D4523 to D4600			

Loop-2 Control Action-related Setting (D4601 to D4700)

Register No.	Description		Range and meaning of value
D4601	SC_L2	Super function	0: 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) Note: Setpoints 2 and 3 must be used in PID control or PI control. Disabled in the following controls: 1) ON/OFF control, 2) PD control, 3) P control **Do not use the function for the control processes with response such as flow or pressure control.**
D4602			
D4603	AT.TY_L2	Auto-tuning type	0: Normal, 1: Stability
D4604	AT.OH_L2	Output high limit in auto-tuning	-5.0 to 105.0%
D4605	AT.OL_L2	Output low limit in auto-tuning	
D4606	AT.BS_L2	SP bias in auto-tuning	-100.0 to 100.0% of PV input range span (EU)
D4607 to D4612			
D4613	GW_L2	Non-linear control gap width	0: OFF 0.0+1digit to 50.0% of PV input range span (EU)
D4614	GG_L2	Non-linear control gain	0.001 to 1.000
D4615 to D4625			
D4626	AR_L2	Anti-reset windup (excess integration prevention)	0: AUTO, 50.0 to 200.0%
D4627	OPR_L2	Output velocity limiter	0: OFF (Disable), 0.1 to 100.0%/s
D4628	OLMT_L2	Output limiter switch	0: OFF (Disable output limiter in MAN mode) 1: ON (Enable output limiter in MAN mode)
D4629 to D4630			
D4631	MPON_L2	Manual preset output number selection	Select the output used in MAN mode when switched from AUTO to MAN mode. 0: 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)
D4632	MPO1_L2	Manual preset output 1	-5.0 to 105.0%
D4633	MPO2_L2	Manual preset output 2	
D4634	MPO3_L2	Manual preset output 3	
D4635	MPO4_L2	Manual preset output 4	
D4636	MPO5_L2	Manual preset output 5	
D4637 to D4652			
D4653	RP1_L2	Reference point 1	0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)
D4654	RP2_L2	Reference point 2	
D4655	RP3_L2	Reference point 3	
D4656	RP4_L2	Reference point 4	
D4657	RP5_L2	Reference point 5	
D4658	RP6_L2	Reference point 6	
D4659	RP7_L2	Reference point 7	
D4660	RHY_L2	Zone PID switching hysteresis	0.0 to 10.0% of PV input range span (EU)
D4661	RDV_L2	Reference deviation	0: OFF (Disable) 0.0 + 1 digit to 100.0% of PV input range span (EU)
D4662 to D4700			

23.4.4 P Parameter (D4701 to D4800)

P parameter
Not used in PPC5 controller.

23.4.5 10-segment Linearizer Setting Parameter (D4801 to D5000)

10-segment linearizer setting parameter									
10-segment inearizer setting (Menu: PYS1, PYS2, PYS3)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D4801	44801	12C0	PYS_1	R/W	D4851	44851	12F2	B10_2	R/W
D4802	44802	12C1	A1_1	R/W	D4852	44852	12F3	A11_2	R/W
D4803	44803	12C2	B1_1	R/W	D4853	44853	12F4	B11_2	R/W
D4804	44804	12C3	A2_1	R/W	D4854	44854	12F5	PMD_2	R/W
D4805	44805	12C4	B2_1	R/W	D4855	44855	12F6		
D4806	44806	12C5	A3_1	R/W	D4861	44861	12FC	PYS_3	R/W
D4807	44807	12C6	B3_1	R/W	D4862	44862	12FD	A1_3	R/W
D4808	44808	12C7	A4_1	R/W	D4863	44863	12FE	B1_3	R/W
D4809	44809	12C8	B4_1	R/W	D4864	44864	12FF	A2_3	R/W
D4810	44810	12C9	A5_1	R/W	D4865	44865	1300	B2_3	R/W
D4811	44811	12CA	B5_1	R/W	D4866	44866	1301	A3_3	R/W
D4812	44812	12CB	A6_1	R/W	D4867	44867	1302	B3_3	R/W
D4813	44813	12CC	B6_1	R/W	D4868	44868	1303	A4_3	R/W
D4814	44814	12CD	A7_1	R/W	D4869	44869	1304	B4_3	R/W
D4815	44815	12CE	B7_1	R/W	D4870	44870	1305	A5_3	R/W
D4816	44816	12CF	A8_1	R/W	D4871	44871	1306	B5_3	R/W
D4817	44817	12D0	B8_1	R/W	D4872	44872	1307	A6_3	R/W
D4818	44818	12D1	A9_1	R/W	D4873	44873	1308	B6_3	R/W
D4819	44819	12D2	B9_1	R/W	D4874	44874	1309	A7_3	R/W
D4820	44820	12D3	A10_1	R/W	D4875	44875	130A	B7_3	R/W
D4821	44821	12D4	B10_1	R/W	D4876	44876	130B	A8_3	R/W
D4822	44822	12D5	A11_1	R/W	D4877	44877	130C	B8_3	R/W
D4823	44823	12D6	B11_1	R/W	D4878	44878	130D	A9_3	R/W
D4824	44824	12D7	PMD_1	R/W	D4879	44879	130E	B9_3	R/W
D4825	44825	12D8			D4880	44880	130F	A10_3	R/W
D4831	44831	12DE	PYS_2	R/W	D4881	44881	1310	B10_3	R/W
D4832	44832	12DF	A1_2	R/W	D4882	44882	1311	A11_3	R/W
D4833	44833	12E0	B1_2	R/W	D4883	44883	1312	B11_3	R/W
D4834	44834	12E1	A2_2	R/W	D4884	44884	1313	PMD_3	R/W
D4835	44835	12E2	B2_2	R/W	D4885	44885	1314		
D4836	44836	12E3	A3_2	R/W					
D4837	44837	12E4	B3_2	R/W					
D4838	44838	12E5	A4_2	R/W					
D4839	44839	12E6	B4_2	R/W					
D4840	44840	12E7	A5_2	R/W					
D4841	44841	12E8	B5_2	R/W					
D4842	44842	12E9	A6_2	R/W					
D4843	44843	12EA	B6_2	R/W					
D4844	44844	12EB	A7_2	R/W					
D4845	44845	12EC	B7_2	R/W					
D4846	44846	12ED	A8_2	R/W					
D4847	44847	12EE	B8_2	R/W					
D4848	44848	12EF	A9_2	R/W					
D4849	44849	12F0	B9_2	R/W					
D4850	44850	12F1	A10_2	R/W					

10-segment linearizer setting parameter				
10-segment linearizer setting (Menu: PYS4)				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D4901	44901	1324	**PYS_4**	R/W
D4902	44902	1325	**A1_4**	R/W
D4903	44903	1326	**B1_4**	R/W
D4904	44904	1327	**A2_4**	R/W
D4905	44905	1328	**B2_4**	R/W
D4906	44906	1329	**A3_4**	R/W
D4907	44907	132A	**B3_4**	R/W
D4908	44908	132B	**A4_4**	R/W
D4909	44909	132C	**B4_4**	R/W
D4910	44910	132D	**A5_4**	R/W
D4911	44911	132E	**B5_4**	R/W
D4912	44912	132F	**A6_4**	R/W
D4913	44913	1330	**B6_4**	R/W
D4914	44914	1331	**A7_4**	R/W
D4915	44915	1332	**B7_4**	R/W
D4916	44916	1333	**A8_4**	R/W
D4917	44917	1334	**B8_4**	R/W
D4918	44918	1335	**A9_4**	R/W
D4919	44919	1336	**B9_4**	R/W
D4920	44920	1337	**A10_4**	R/W
D4921	44921	1338	**B10_4**	R/W
D4922	44922	1339	**A11_4**	R/W
D4923	44923	133A	**B11_4**	R/W
D4924	44924	133B	**PMD_4**	R/W
D4925	44925	133C		

10-segment Linearizer Setting (D4801 to D5000)

Register No.	Description		Range and meaning of value
D4801	**PYS_1**	10-segment linearizer selection of group 1	0: OFF (Disable) 1: PV (PV analog input) 2: RSP (RSP auxiliary analog input) 3: AIN2 Not used 4: AIN4 Not used 5: PVIN (PV input) 6: OUT (OUT analog output) 7: OUT2 Not used 8: RET (RET analog output)
D4802	**A1_1**	10-segment linearizer input 1 of group 1	**A1_1 to A11_1** -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0% **B1_1 to B11_1** 10-segment linearizer bias: -66.7 to 105.0% of input range span (EU) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%
D4803	**B1_1**	10-segment linearizer output 1 of group 1	
D4804	**A2_1**	10-segment linearizer input 2 of group 1	
D4805	**B2_1**	10-segment linearizer output 2 of group 1	
D4806	**A3_1**	10-segment linearizer input 3 of group 1	
D4807	**B3_1**	10-segment linearizer output 3 of group 1	
D4808	**A4_1**	10-segment linearizer input 4 of group 1	
D4809	**B4_1**	10-segment linearizer output 4 of group 1	
D4810	**A5_1**	10-segment linearizer input 5 of group 1	
D4811	**B5_1**	10-segment linearizer output 5 of group 1	
D4812	**A6_1**	10-segment linearizer input 6 of group 1	
D4813	**B6_1**	10-segment linearizer output 6 of group 1	
D4814	**A7_1**	10-segment linearizer input 7 of group 1	
D4815	**B7_1**	10-segment linearizer output 7 of group 1	
D4816	**A8_1**	10-segment linearizer input 8 of group 1	
D4817	**B8_1**	10-segment linearizer output 8 of group 1	
D4818	**A9_1**	10-segment linearizer input 9 of group 1	
D4819	**B9_1**	10-segment linearizer output 9 of group 1	
D4820	**A10_1**	10-segment linearizer input 10 of group 1	
D4821	**B10_1**	10-segment linearizer output 10 of group 1	
D4822	**A11_1**	10-segment linearizer input 11 of group 1	
D4823	**B11_1**	10-segment linearizer output 11 of group 1	
D4824	**PMD_1**	10-segment linearizer mode of group 1	0: 10-segment linearizer bias 1: 10-segment linearizer approximation
D4825 to D4830			
D4831	**PYS_2**	10-segment linearizer selection of group 2	Same as D4801
D4832 to D4853	**A1_2 to B11_2**	10-segment linearizer input 1 of group 2 to 10-segment linearizer output 11 of group 2	Same as D4802 to D4823
D4854	**PMD_2**	10-segment linearizer mode of group 2	Same as D4824
D4855 to D4860			
D4861	**PYS_3**	10-segment linearizer selection of group 3	Same as D4801
D4862 to D4883	**A1_3 to B11_3**	10-segment linearizer input 1 of group 3 to 10-segment linearizer output 11 of group 3	Same as D4802 to D4823
D4884	**PMD_3**	10-segment linearizer mode of group 3	Same as D4824
D4885 to D4800			
D4801	**PYS_4**	10-segment linearizer selection of group 4	Same as D4801
D4802 to D4823	**A1_4 to B11_4**	10-segment linearizer input 1 of group 4 to 10-segment linearizer output 11 of group 4	Same as D4802 to D4823
D4824	**PMD_4**	10-segment linearizer mode of group 4	Same as D4824
D4825 to D5000			

23.4.6 Setup Parameters (D5001 to D7000)

Setup parameter				
Control function setting (Menu: CTL)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5001	45001	1388	CTLM	R/W
D5002	45002	1389		
D5003	45003	138A	CNT_L1	R/W
D5004	45004	138B	CNT_L2	R/W
D5005	45005	138C	ALG_L1	R/W
D5006	45006	138D	ALG_L2	R/W
D5007	45007	138E	SPGR.	R/W
D5008	45008	138F		
D5009	45009	1390	ALNO._L1	R/W
D5010	45010	1391	ALNO._L2	R/W
D5011	45011	1392		
D5012	45012	1393	ZON	R/W
D5013	45013	1394		
D5014	45014	1395	PIDG.	R/W
D5015	45015	1396		
D5019	45019	139A	SMP	R/W
D5020	45020	139B		

Setup parameter				
Input setting (PV input setting menu: PV) (RSP input setting menu: RSP)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5101	45101	13EC	IN	R/W
D5102	45102	13ED	UNIT	R/W
D5103	45103	13EE	DP	R
D5104	45104	13EF	RH	R/W
D5105	45105	13F0	RL	R/W
D5106	45106	13F1	SDP	R/W
D5107	45107	13F2	SH	R/W
D5108	45108	13F3	SL	R/W
D5109	45109	13F4	BSL	R/W
D5110	45110	13F5	RJC	R/W
D5111	45111	13F6	ERJC	R/W
D5112	45112	13F7	A.BS	R/W
D5113	45113	13F8	A.FL	R/W
D5114	45114	13F9	A.SR	R/W
D5115	45115	13FA	A.LC	R/W
D5116	45116	13FB		
D5121	45121	1400	IN_E1	R/W
D5122	45122	1401	UNIT_E1	R/W
D5123	45123	1402	DP_E1	R
D5124	45124	1403	RH_E1	R/W
D5125	45125	1404	RL_E1	R/W
D5126	45126	1405	SDP_E1	R/W
D5127	45127	1406	SH_E1	R/W
D5128	45128	1407	SL_E1	R/W
D5129	45129	1408	BSL_E1	R/W
D5132	45132	140B	RTD.S_E1	R/W
D5133	45133	140C	A.BS_E1	R/W
D5134	45134	140D	A.FL_E1	R/W
D5135	45135	140E	A.SR_E1	R/W
D5136	45136	140F	A.LC_E1	R/W
D5137	45137	1410	DI16.D_E1	R/W
D5138	45138	1411		

Setup parameter				
Input setting (Input range·SP limiter/input switch/input auto-selector setting parameters menu: MPV)				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D5201	45201	1450	**P.UNI_L1**	R/W
D5202	45202	1451	**P.DP_L1**	R/W
D5203	45203	1452	**P.RH_L1**	R/W
D5204	45204	1453	**P.RL_L1**	R/W
D5205	45205	1454	**PV.HL**	R/W
D5206	45206	1455	**PV.LL**	R/W
D5207	45207	1456	**PV.2C**	R/W
D5208	45208	1457	**PV.AS**	R/W
D5209	45209	1458	**PV.NU**	R/W
D5210	45210	1459	**SPH_L1**	R/W
D5211	45211	145A	**SPL_L1**	R/W
D5212	45212	145B		
D5221	45221	1464	**P.UNI_L2**	R/W
D5222	45222	1465	**P.DP_L2**	R/W
D5223	45223	1466	**P.RH_L2**	R/W
D5224	45224	1467	**P.RL_L2**	R/W
D5225	45225	1468		
D5230	45230	146D	**SPH_L2**	R/W
D5231	45231	146E	**SPL_L2**	R/W
D5232	45232	146F		

Setup parameter				
Output setting (Menu: OUT)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5301	45301	14B4		
D5302	45302	14B5		
D5303	45303	14B6	CT	R/W
D5304	45304	14B7		
D5305	45305	14B8		
D5311	45311	14BE		
D5312	45312	14BF		
D5313	45313	14C0		
D5314	45314	14C1		
D5315	45315	14C2		
D5316	45316	14C3		
D5317	45317	14C4		
D5322	45322	14C9	RTH	R/W
D5323	45323	14CA	RTL	R/W
D5324	45324	14CB	O1RS	R/W
D5325	45325	14CC	O1RH	R/W
D5326	45326	14CD	O1RL	R/W
D5327	45327	14CE		
D5328	45328	14CF		
D5329	45329	14D0		
D5330	45330	14D1		
D5331	45331	14D2	OU.H	R/W
D5332	45332	14D3	OU.L	R/W
D5333	45333	14D4		
D5334	45334	14D5		
D5335	45335	14D6	RET.H	R/W
D5336	45336	14D7	RET.L	R/W
D5337	45337	14D8		
D5341	45341	14DC	OU.A	R/W
D5342	45342	14DD		
D5343	45343	14DE	RET.A	R/W
D5344	45344	14DF		

Setup parameter									
Communication setting (RS-485 communication setting menu: R485) (Ethernet communication setting menu: ETHR) (Error and version confirmation menu: VER)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5508	45508	1583			D5551	45551	15AE	SM4_E3	R/W
D5521	45521	1590	PSL_E3	R/W	D5552	45552	15AF	DG1_E3	R/W
D5522	45522	1591	BPS_E3	R/W	D5553	45553	15B0	DG2_E3	R/W
D5523	45523	1592	PRI_E3	R/W	D5554	45554	15B1	DG3_E3	R/W
D5524	45524	1593	STP_E3	R/W	D5555	45555	15B2	DG4_E3	R/W
D5525	45525	1594	DLN_E3	R/W	D5556	45556	15B3	PRT_E3	R/W
D5526	45526	1595	ADR_E3	R/W	D5557	45557	15B4	IPAR_E3	R/W
D5527	45527	1596	RP.T_E3	R/W	D5558	45558	15B5	1.IP1_E3	R/W
D5528	45528	1597			D5559	45559	15B6	1.IP2_E3	R/W
D5538	45538	15A1			D5560	45560	15B7	1.IP3_E3	R/W
D5541	45541	15A4	HSR_E3	R/W	D5561	45561	15B8	1.IP4_E3	R/W
D5542	45542	15A5	BPS_E3	R/W	D5562	45562	15B9	2.IP1_E3	R/W
D5543	45543	15A6	PRI_E3	R/W	D5563	45563	15BA	2.IP2_E3	R/W
D5544	45544	15A7	IP1_E3	R/W	D5564	45564	15BB	2.IP3_E3	R/W
D5545	45545	15A8	IP2_E3	R/W	D5565	45565	15BC	2.IP4_E3	R/W
D5546	45546	15A9	IP3_E3	R/W	D5566	45566	15BD	ESW_E3	R/W
D5547	45547	15AA	IP4_E3	R/W	D5567	45567	15BE		
D5548	45548	15AB	SM1_E3	R/W	D5571	45571	15C2	MAC1_E3	R
D5549	45549	15AC	SM2_E3	R/W	D5572	45572	15C3	MAC2_E3	R
D5550	45550	15AD	SM3_E3	R/W	D5573	45573	15C4	MAC3_E3	R
					D5574	45574	15C5		

Setup parameter									
Key operation setting (Menu: KEY), Display function setting (Menu: DISP), SELECT Display setting (Menu: CSEL)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5701	45701	1644	F1-K *1	R/W	D5751	45751	1676	B.STS	R/W
D5702	45702	1645	F2-K *1	R/W	D5752	45752	1677	CTRS	
D5703	45703	1646	Fn-K *1	R/W	D5753	45753	1678	D.CYC	R/W
D5704	45704	1647	A/M-K *1	R/W	D5754	45754	1679	OP.JP	R/W
D5709	45709	164C			D5755	45755	167A	MLSD	R/W
D5710	45710	164D			D5757	45757	167C		
D5711	45711	164E	DVB_L1	R/W	D5758	45758	167D		
D5712	45712	164F	DVB_L2	R/W	D5759	45759	167E		
D5713	45713	1650	PCMD_L1	R/W	D5760	45760	167F		
D5714	45714	1651	PCH_L1	R/W	D5761	45761	1680	CS1	R/W
D5715	45715	1652	PCL_L1	R/W	D5762	45762	1681	CS2	R/W
D5716	45716	1653	PCMD_L2	R/W	D5763	45763	1682	CS3	R/W
D5717	45717	1654	PCH_L2	R/W	D5764	45764	1683	CS4	R/W
D5718	45718	1655	PCL_L2	R/W	D5765	45765	1684	CS5	R/W
D5719	45719	1656	BAR1	R/W	D5766	45766	1685		
D5720	45720	1657	BAR2	R/W	D5767	45767	1686		
D5721	45721	1658	BDV_L1	R/W	D5768	45768	1687		
D5722	45722	1659	BDV_L2	R/W	D5769	45769	1688		
D5723	45723	165A	EV1_L1	R/W	D5770	45770	1689	CS10	R/W
D5724	45724	165B	EV2_L1	R/W	D5771	45771	168A	CS11	R/W
D5725	45725	165C	EV3_L1	R/W	D5772	45772	168B	CS12	R/W
D5726	45726	165D	EV4_L1	R/W	D5773	45773	168C	CS13	R/W
D5727	45727	165E	EV5_L1	R/W	D5774	45774	168D	CS14	R/W
D5728	45728	165F	EV6_L1	R/W	D5775	45775	168E	CS15	R/W
D5729	45729	1660	EV7_L1	R/W	D5776	45776	168F	CS16	R/W
D5730	45730	1661	EV8_L1	R/W	D5777	45777	1690	CS17	R/W
D5731	45731	1662	EV1_L2	R/W	D5778	45778	1691	CS18	R/W
D5732	45732	1663	EV2_L2	R/W	D5779	45779	1692	CS19	R/W
D5733	45733	1664	EV3_L2	R/W	D5780	45780	1693		
D5734	45734	1665	EV4_L2	R/W					
D5735	45735	1666	EV5_L2	R/W					
D5736	45736	1667	EV6_L2	R/W					
D5737	45737	1668	EV7_L2	R/W					
D5738	45738	1669	EV8_L2	R/W					
D5739	45739	166A	PV.D	R/W					
D5740	45740	166B	SP.D	R/W					
D5741	45741	166C	STS.D	R/W					
D5742	45742	166D	SPD	R/W					
D5743	45743	166E	GUID	R/W					
D5744	45744	166F	HOME	R/W					
D5745	45745	1670	ECO	R/W					
D5746	45746	1671	BRI	R/W					
D5747	45747	1672	B.PVW	R/W					
D5748	45748	1673	B.PVR	R/W					
D5749	45749	1674	B.SP	R/W					
D5750	45750	1675	B.BAR	R/W					

*1: Same parameter exists in other menu. “-K” is added to the end of the parameter in KEY menu.

Setup parameter									
Lock setting (Key lock setting menu: KLOC) (Menu lock setting menu: MLOC)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5801	45801	16A8	U.SP_L1	R/W	D5851	45851	16DA	DI.SL-L *1	R/W
D5802	45802	16A9	U.SP_L2	R/W	D5852	45852	16DB	DI.NU-L *1	R/W
D5803	45803	16AA	U.OUT_L1	R/W	D5853	45853	16DC	DI.D-L *1	R/W
D5804	45804	16AB	U.OUT_L2	R/W	D5854	45854	16DD		R/W
D5805	45805	16AC		R/W	D5855	45855	16DE		R/W
D5806	45806	16AD		R/W	D5856	45856	16DF		R/W
D5807	45807	16AE		R/W	D5857	45857	16E0		R/W
D5809	45809	16B0	U.PID_L1	R/W	D5858	45858	16E1	ALM-L *1	R/W
D5810	45810	16B1	U.PID_L2	R/W	D5859	45859	16E2		R/W
D5811	45811	16B2		R/W	D5860	45860	16E3		R/W
D5812	45812	16B3	U.PV1	R/W	D5861	45861	16E4		R/W
D5813	45813	16B4	U.PV2	R/W	D5862	45862	16E5		R/W
D5814	45814	16B5	U.PV	R/W	D5863	45863	16E6	I/O-L *1	R/W
D5815	45815	16B6	U.RSP	R/W	D5864	45864	16E7	SYS-L *1	R/W
D5816	45816	16B7			D5865	45865	16E8	INIT-L *1	R/W
D5817	45817	16B8			D5866	45866	16E9	VER-L *1	R/W
D5818	45818	16B9	COM.W	R/W	D5867	45867	16EA	LVL-L *1	R/W
D5819	45819	16BA	DATA-L *1	R/W	D5868	45868	16EB	MODE-L *1	R/W
D5820	45820	16BB	A/M-L *1	R/W	D5869	45869	16EC	CS-L *1	R/W
D5831	45831	16C6	CTL-L *1	R/W	D5870	45870	16ED	SP_L1-L *1	R/W
D5832	45832	16C7	PV-L *1	R/W	D5871	45871	16EE	SPS_L1-L *1	R/W
D5833	45833	16C8	RSP_E1-L *1	R/W	D5872	45872	16EF	ALRM_L1-L *1	R/W
D5834	45834	16C9		R/W	D5874	45874	16F1	PVS_L1-L *1	R/W
D5835	45835	16CA		R/W	D5875	45875	16F2	PID_L1-L *1	R/W
D5836	45836	16CB	MPV_L1-L *1	R/W	D5876	45876	16F3	TUNE_L1-L *1	R/W
D5837	45837	16CC	MPV_L2-L *1	R/W	D5877	45877	16F4	ZONE_L1-L *1	R/W
D5838	45838	16CD	OUT-L *1	R/W	D5878	45878	16F5	SP_L2-L *1	R/W
D5839	45839	16CE		R/W	D5879	45879	16F6	SPS_L2-L *1	R/W
D5840	45840	16CF		R/W	D5880	45880	16F7	ALRM_L2-L *1	R/W
D5841	45841	16D0	R485_E3-L *1	R/W	D5881	45881	16F8	PVS_L2-L *1	R/W
D5842	45842	16D1		R/W	D5882	45882	16F9	PID_L2-L *1	R/W
D5843	45843	16D2	ETHR_E3-L *1	R/W	D5883	45883	16FA	TUNE_L2-L *1	R/W
D5844	45844	16D3		R/W	D5884	45884	16FB	ZONE_L2-L *1	R/W
D5845	45845	16D4		R/W	D5885	45885	16FC	PPAR-L *1	R/W
D5846	45846	16D5		R/W	D5886	45886	16FD	PYS1-L *1	R/W
D5847	45847	16D6	KEY-L *1	R/W	D5887	45887	16FE	PYS2-L *1	R/W
D5848	45848	16D7	DISP-L *1	R/W	D5888	45888	16FF	PYS3-L *1	R/W
D5849	45849	16D8	CSEL-L *1	R/W	D5889	45889	1700	PYS4-L *1	R/W
D5850	45850	16D9	KLOC-L *1	R/W	D5895	45895	1706		

*1: Same parameter exists in other menu. “-L” is added to the end of the parameter in KLOC menu or MLOC menu.

Setup parameter									
DI function setting (DI function registration menu: DI.SL) (DI function numbering menu: DI.NU)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D5901	45901	170C	A/M-D *1	R/W	D5951	45951	173E	PN.B3	R/W
D5902	45902	170D	R/L_L1-D *1	R/W	D5952	45952	173F		
D5903	45903	170E	R/L_L2-D *1	R/W	D5960	45960	1747	MP.BC_L1	R/W
D5904	45904	170F	S/R-D *1	R/W	D5961	45961	1748	MP.B0_L1	R/W
D5905	45905	1710	CAS-D *1	R/W	D5962	45962	1749	MP.B1_L1	R/W
D5906	45906	1711	AUTO-D *1	R/W	D5963	45963	174A	MP.B2_L1	R/W
D5907	45907	1712	MAN-D *1	R/W	D5964	45964	174B		
D5908	45908	1713	REM_L1-D *1	R/W	D5965	45965	174C	MP.BC_L2	R/W
D5909	45909	1714	LCL_L1-D *1	R/W	D5966	45966	174D	MP.B0_L2	R/W
D5910	45910	1715	REM_L2-D *1	R/W	D5967	45967	174E	MP.B1_L2	R/W
D5911	45911	1716	LCL_L2-D *1	R/W	D5968	45968	174F	MP.B2_L2	R/W
D5914	45914	1719	AT-D *1	R/W	D5969	45969	1750		
D5915	45915	171A	TRK-D *1	R/W					
D5916	45916	171B	SW-D *1	R/W					
D5917	45917	171C	PVHD-D *1	R/W					
D5918	45918	171D	CTOA-D *1	R/W					
D5919	45919	171E							
D5920	45920	171F	LAT-D *1	R/W					
D5921	45921	1720	LCD-D *1	R/W					
D5922	45922	1721	MG1-D *1	R/W					
D5923	45923	1722	MG2-D *1	R/W					
D5924	45924	1723	MG3-D *1	R/W					
D5925	45925	1724	MG4-D *1	R/W					
D5937	45937	1730	PVRW_L1-D *1	R/W					
D5938	45938	1731	PVRW_L2-D *1	R/W					
D5940	45940	1733							
D5941	45941	1734	SP.BC	R/W					
D5942	45942	1735	SP.B0	R/W					
D5943	45943	1736	SP.B1	R/W					
D5944	45944	1737	SP.B2	R/W					
D5945	45945	1738	SP.B3	R/W					
D5946	45946	1739							
D5947	45947	173A	PN.BC	R/W					
D5948	45948	173B	PN.B0	R/W					
D5949	45949	173C	PN.B1	R/W					
D5950	45950	173D	PN.B2	R/W					

*1: Same parameter exists in other menu. “-D” is added to the end of the parameter in DI.SL menu.

Setup parameter									
DI function setting (Message)									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D6001	46001	1770	MSG1	R/W	D6051	46051	17A2	MSG3	R/W
D6002	46002	1771	MSG1	R/W	D6052	46052	17A3		
D6003	46003	1772	MSG1	R/W	D6061	46061	17AC	MSG4	R/W
D6004	46004	1773	MSG1	R/W	D6062	46062	17AD	MSG4	R/W
D6005	46005	1774	MSG1	R/W	D6063	46063	17AE	MSG4	R/W
D6006	46006	1775	MSG1	R/W	D6064	46064	17AF	MSG4	R/W
D6007	46007	1776	MSG1	R/W	D6065	46065	17B0	MSG4	R/W
D6008	46008	1777	MSG1	R/W	D6066	46066	17B1	MSG4	R/W
D6009	46009	1778	MSG1	R/W	D6067	46067	17B2	MSG4	R/W
D6010	46010	1779	MSG1	R/W	D6068	46068	17B3	MSG4	R/W
D6011	46011	177A	MSG1	R/W	D6069	46069	17B4	MSG4	R/W
D6012	46012	177B			D6070	46070	17B5	MSG4	R/W
D6021	46021	1784	MSG2	R/W	D6071	46071	17B6	MSG4	R/W
D6022	46022	1785	MSG2	R/W	D6072	46072	17B7		
D6023	46023	1786	MSG2	R/W					
D6024	46024	1787	MSG2	R/W					
D6025	46025	1788	MSG2	R/W					
D6026	46026	1789	MSG2	R/W					
D6027	46027	178A	MSG2	R/W					
D6028	46028	178B	MSG2	R/W					
D6029	46029	178C	MSG2	R/W					
D6030	46030	178D	MSG2	R/W					
D6031	46031	178E	MSG2	R/W					
D6032	46032	178F							
D6041	46041	1798	MSG3	R/W					
D6042	46042	1799	MSG3	R/W					
D6043	46043	179A	MSG3	R/W					
D6044	46044	179B	MSG3	R/W					
D6045	46045	179C	MSG3	R/W					
D6046	46046	179D	MSG3	R/W					
D6047	46047	179E	MSG3	R/W					
D6048	46048	179F	MSG3	R/W					
D6049	46049	17A0	MSG3	R/W					
D6050	46050	17A1	MSG3	R/W					

Setup parameter				
DI function setting (DI1-DI3 contact type setting menu: DI.D)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D6101	46101	17D4	DI1.D	R/W
D6102	46102	17D5	DI2.D	R/W
D6103	46103	17D6	DI3.D	R/W
D6104	46104	17D7		

Setup parameter				
DO function setting (AL1-AL3 function registration menu: ALM)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D6201	46201	1838	AL1.S	R/W
D6202	46202	1839	AL2.S	R/W
D6203	46203	183A	AL3.S	R/W
D6204	46204	183B	OR.S	R/W
D6206	46206	183D	AL1.D	R/W
D6207	46207	183E	AL2.D	R/W
D6208	46208	183F	AL3.D	R/W
D6209	46209	1840	OR.D	R/W
D6211	46211	1842		

Setup parameter				
I/O display (Menu: I/O)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D6301	46301	189C	KEY-IO *1	R

*1: Same parameter exists in other menu. “-IO” is added to the end of the parameter in I/O menu.

Setup parameter				
System setting (Menu: SYS)				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D6401	46401	1900	R.MD	R/W
D6402	46402	1901	R.TM	R/W
D6403	46403	1902		
D6408	46408	1907	EPO	R/W
D6410	46410	1909	FREQ	R/W
D6411	46411	190A		
D6417	46417	1910	QSM	R/W
D6418	46418	1911	LANG	R/W
D6419	46419	1912		
D6420	46420	1913		
D6421	46421	1914	U.DEF	R/W
D6422	46422	1915		
D6423	46423	1916	F.DEF	R/W
D6424	46424	1917		
D6426	46426	1919		
D6431	46431	191E	LEVL	R/W
D6432	46432	191F		

D6501 to D6700: Free area

Control Function Setting (D5001 to D5100)

Register No.	Description		Range and meaning of value
D5001	**CTLM**	Control mode	1: SGL (Single-loop control) 2: CAS1 (Cascade primary-loop control) 3: CAS2 (Cascade secondary-loop control) 4: CAS (Cascade control) 5: BUM (Loop control for backup) 6: PVSW (Loop control with PV switching) 7: PVSEL (Loop control with PV auto-selector) 8: PVHD (Loop control with PV-hold function)
D5002			
D5003	**CNT_L1**	Loop-1 control type	0: PID (PID control) 1: ONOF (ON/OFF control (1 point of hysteresis)) 2: ONOF2 (ON/OFF control (2 points of hysteresis)) 5: S-PI (Sample PI control) 6: BATCH (Batch PID control) 7: FFPID (Not used)
D5004	**CNT_L2**	Loop-2 control type	0: PID (PID control)
D5005	**ALG_L1**	Loop-1 PID control mode	0: Standard PID control mode 1: Fixed-point control mode **Select "Fixed-point control mode" for pressure or flow rate control.**
D5006	**ALG_L2**	Loop-2 PID control mode	
D5007	**SPGR.**	Number of SP groups	Set a number of SP groups to use. 1 to 8
D5008			
D5009	**ALNO._L1**	Loop-1 number of alarms	1 to 8
D5010	**ALNO._L2**	Loop-2 number of alarms	1 to 8
D5011			
D5012	**ZON**	Zone PID selection	If set to "SP group number selection," allows PID constants to be selected for each SP group. If set to "Zone PID selection," automatically selects PID constants according to the range set in the Reference point. 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)
D5013			
D5014	**PIDG.**	Number of PID groups	Set a number of PID groups to use. 1 to 8
D5019	**SMP**	Input sampling period (control period)	0: 50 (50 ms) 1: 100 (100 ms) 2: 200 (200 ms)
D5020 to D5100			

Input Setting (D5101 to D5300)

Register No.	Description		Range and meaning of value
D5101	**IN**	PV input type	0: OFF (Disable) 1: K1 (-270.0 to 1370.0°C / -450.0 to 2500.0 F) 2: K2 (-270.0 to 1000.0°C / -450.0 to 2300.0 F) 3: K3 (-200.0 to 500.0°C / -200.0 to 1000.0 F) 4: J (-200.0 to 1200.0°C / -300.0 to 2300.0 F) 5: T1 (-270.0 to 400.0°C / -450.0 to 750.0 F) 6: T2 (0.0 to 400.0°C / -200.0 to 750.0 F) 7: B (0.0 to 1800.0°C / 32 to 3300 F) 8: S (0.0 to 1700.0°C / 32 to 3100 F) 9: R (0.0 to 1700.0°C / 32 to 3100 F) 10: N (-200.0 to 1300.0°C / -300.0 to 2400.0 F) 11: E (-270.0 to 1000.0°C / -450.0 to 1800.0 F) 12: L (-200.0 to 900.0°C / -300.0 to 1600.0 F) 13: U1 (-200.0 to 400.0°C / -300.0 to 750.0 F) 14: U2 (0.0 to 400.0°C / -200.0 to 1000.0 F) 15: W (0.0 to 2300.0°C / 32 to 4200 F) 16: PL2 (0.0 to 1390.0°C / 32.0 to 2500.0 F) 17: P2040 (0.0 to 1900.0°C / 32 to 3400 F) 18: WRE (0.0 to 2000.0°C / 32 to 3600 F) 30: JPT1 (-200.0 to 500.0°C / -300.0 to 1000.0 F) 31: JPT2 (-150.00 to 150.00°C / -200.0 to 300.0 F) 35: PT1 (-200.0 to 850.0°C / -300.0 to 1560.0 F) 36: PT2 (-200.0 to 500.0°C / -300.0 to 1000.0 F) 37: PT3 (-150.00 to 150.00°C / -200.0 to 300.0 F) 40: 0.4-2V (0.400 to 2.000 V) 41: 1-5V (1.000 to 5.000 V) 42: 4-20 (4.00 to 20.00 mA) 50: 0-2V (0.000 to 2.000 V) 51: 0-10V (0.00 to 10.00 V) 52: 0-20 (0.00 to 20.00 mA) 55: -1020 (-10.00 to 20.00 mV) 56: 0-100 (0.0 to 100.0 mV) *W: W-5% Re/W-26% Re(Hoskins Mfg. Co.), ASTM E988 WRE: W97Re3-W75Re25
D5102	**UNIT**	PV input unit	0, 2, 3, 4: - (No unit) 1: C (Degree Celsius) 5: F (Degree Fahrenheit)
D5103	DP	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
D5104	**RH**	Maximum value of PV input range	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.)
D5105	**RL**	Minimum value of PV input range	
D5106	**SDP**	PV input scale decimal point position	Same as D5103
D5107	**SH**	Maximum value of PV input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000
D5108	**SL**	Minimum value of PV input scale	
D5109	**BSL**	PV input burnout action	0: OFF (Disable) 1: UP (Upscale) 2: DOWN (Downscale)
D5110	**RJC**	PV input reference junction compensation	0: OFF (RJC OFF) 1: ON (RJC ON)
D5111	**ERJC**	PV input external RJC setpoint	-10.0 to 60.0°X
D5112	**A.BS**	PV analog input bias	-100.0 to 100.0% of PV input range span (EU)
D5113	**A.FL**	PV analog input filter	0: OFF 1 to 120 s
D5114	**A.SR**	PV analog input square root extraction	0: OFF (No square root extraction.) 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)

Register No.	Description		Range and meaning of value
D5115	**A.LC**	PV analog input low signal cutoff	0.0 to 5.0%
D5116 to D5120			
D5121	**IN_E1**	RSP remote input type	40: 0.4-2V (0.400 to 2.000 V) 41: 1-5V (1.000 to 5.000 V) 50: 0-2V (0.000 to 2.000 V) 51: 0-10V (0.00 to 10.00 V) 57: 0-125 (0.000 to 1.250 V)
D5122	**UNIT_E1**	RSP remote input unit	Same as D5102
D5123	DP_E1	RSP remote input decimal point position	Same as D5103
D5124	**RH_E1**	Maximum value of RSP remote input range	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.)
D5125	**RL_E1**	Minimum value of RSP remote input range	
D5126	**SDP_E1**	RSP remote input scale decimal point position	Same as D5103
D5127	**SH_E1**	Maximum value of RSP remote input scale	Same as D5107, D5108
D5128	**SL_E1**	Minimum value of RSP remote input scale	
D5129	**BSL_E1**	RSP remote input burnout action	Same as D5109
D5133	**A.BS_E1**	RSP analog input bias	-100.0 to 100.0% of RSP input range span (EU)
D5134	**A.FL_E1**	RSP analog input filter	Same as D 5113
D5135	**A.SR_E1**	RSP analog input square root extraction	Same as D5114
D5136	**A.LC_E1**	RSP analog input low signal cutoff	Same as D5115
D5137	**DI16.D_E1**	DI16 contact type	0: The assigned function is enabled when the contact is closed. 1: The assigned function is enabled when the contact is opened.

Register No.	Description		Range and meaning of value
D5198 to D5200			
D5201	**P.UNI_L1**	Loop-1 control PV input unit	0, 2, 3, 4: - (No unit) 1: C (Degree Celsius) 5: F (Degree Fahrenheit)
D5202	**P.DP_L1**	Loop-1 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
D5203	**P.RH_L1**	Loop-1 maximum value of control PV input range	-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000
D5204	**P.RL_L1**	Loop-1 minimum value of control PV input range	
D5205	**PV.HL**	Input switching PV high limit (in Loop control with PV switching)	0.0 to 100.0% of control PV input range (EU), (PV.HL>PV.LL)
D5206	**PV.LL**	Input switching PV low limit (in Loop control with PV switching)	
D5207	**PV.2C**	Input switching action (in Loop control with PV switching)	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
D5208	**PV.AS**	Input computation selection (in Loop control with PV auto-selector)	0: Max. value 1: Min. value 2: Ave. value 3: Input 1 - Input 2 4: Input 2 - Input 1
D5209	**PV.NU**	Number of inputs (in Loop control with PV auto-selector)	2: Use Input 1 and Input 2 3: Use Input 1, Input 2, and Input 3 4: Use 4 inputs
D5210	**SPH_L1**	Loop-1 SP high limit	0.0 to 100.0% of PV input range (EU), (SPL<SPH)
D5211	**SPL_L1**	Loop-1 SP low limit	
D5210 to D5220			
D5221	**P.UNI_L2**	Loop-2 control PV input unit (in Cascade control)	Same as D5201
D5222	**P.DP_L2**	Loop-2 control PV input decimal point position (in Cascade control)	Same as D5202
D5223	**P.RH_L2**	Loop-2 maximum value of Control PV input range (in Cascade control)	Same as D5203, D5204
D5224	**P.RL_L2**	Loop-2 minimum value of Control PV input range (in Cascade control)	
D5225 to D5229			
D5230	**SPH_L2**	Loop-2 SP high limit	Same as D5210, D5211
D5231	**SPL_L2**	loop-2 SP low limit	
D5225 to D5300			

Output Setting (D5301 to D5400)

Register No.	Description		Range and meaning of value
D5303	**CT**	Control output cycle time	0.5 to 1000.0 s
D5317 to D5320			
D5321	**RTS**	Retransmission output RET	0: OFF (Disable) 1: PV1 (PV) 2: SP1 (SP) 3: OUT1 4: LPS (15 V DC loop power supply) 5: PV2 (Loop-2 PV) 6: SP2 (Loop-2 SP) 7: OUT2 (Loop-2 OUT) 8: TSP1 (Target SP) 9: HOUT1 (Not used) 10: COUT1 (Not used) 11: MV1 (Not used) 12: TSP2 (Loop-2 target SP) 13: HOUT2 (Not used) 14: COUT2 (Not used) 15: MV2 (Not used) 16: PV (PV terminals analog input) 17: RSP (RSP terminals analog input) 18: AIN2 (Not used) 19: ANI4 (Not used) Loop-2 setting values are unavailable in Single-loop control.

Register No.	Description		Range and meaning of value
D5322	**RTH**	Maximum value of retransmission output scale of RET	When RTS=1 (PV1), 2 (SP1), 5 (PV2), 6 (SP2), 8 (TSP1), 12 (TSP2), 16 (PV), 17 (RSP) RTL+1digit to 30000 Decimal point position: RTS=1 (PV1), 2 (SP1), or 8 (TSP1): decimal point position is same as that of PV input. RTS=5 (PV2), 6 (SP2), or 12 (TSP2): decimal point position is same as that of RSP input. RTS=16 (PV): decimal point position is same as that of PV input scale. RTS=17 (RSP): decimal point position is same as that of RSP input scale.
D5323	**RTL**	Minimum value of retransmission output scale of RET	When RTS=1 (PV1), 2 (SP1), 5 (PV2), 6 (SP2), 8 (TSP1), 12 (TSP2), 16 (PV), 17 (RSP) -19999 to RTH-1digit Decimal point position: RTS=1 (PV1), 2 (SP1), 8 (TSP1): decimal point position is same as that of AIN4 scale. RTS=5 (PV2), 6 (SP2), 12 (TSP2):decimal point position is same as that of RSP input. RTS=16 (PV): decimal point position is same as that of PV input scale. RTS=17 (RSP): decimal point position is same as that of RSP input scale.
D5324	**O1RS**	Retransmission output type of OUT current output	Same as D5321
D5325	**O1RH**	Maximum value of retransmission output scale of OUT current output	When O1RS=1 (PV1), 2 (SP1), 5 (PV2), 6 (SP2), 8 (TSP1), 12 (TSP2), 16 (PV), 17 (RSP) O1RL+1digit to 30000 Decimal point position: O1RS=1 (PV1), 2 (SP1), 8 (TSP1): decimal point position is same as that of PV input. O1RS=5 (PV2), 6 (SP2), 12 (TSP2): decimal point position is same as that of RSP input. O1RS=16 (PV): decimal point position is same as that of PV input scale. O1RS=17 (RSP): decimal point position is same as that of RSP input scale.
D5326	**O1RL**	Minimum value of retransmission output scale of OUT current output	When O1RS=1 (PV1), 2 (SP1), 5 (PV2), 6 (SP2), 8 (TSP1), 12 (TSP2), 16 (PV), 17 (RSP) -19999 to O1RH-1digit O1RS=1 (PV1), 2 (SP1), 8 (TSP1): decimal point position is same as that of PV input. O1RS=5 (PV2), 6 (SP2), 12 (TSP2): decimal point position is same as that of RSP input. O1RS=16 (PV): decimal point position is same as that of PV input scale. O1RS=17 (RSP): decimal point position is same as that of RSP input scale.

Register No.	Description		Range and meaning of value
D5331	**OU.H**	100% segmental point of OUT current output	-100.0 to 200.0%
D5332	**OU.L**	0% segmental point of OUT current output	
D5335	**RET.H**	100% segmental point of RET current output	
D5336	**RET.L**	0% segmental point of RET current output	
D5337 to D5340			
D5341	**OU.A**	OUT current output range	0: 4-20 (4 to 20 mA) 1: 0-20 (0 to 20 mA) 2: 20-4 (20 to 4 mA) 3: 20-0 (20 to 0 mA)
D5343	**RET.A**	RET current output range	
D5344 to D5400			

Communication Setting (D5501 to D5700)

Register No.	Description		Range and meaning of value
D5521	**PSL_E3**	Protocol selection	0: PCL (Not used) 1: PCLSM (Not used)) 3: CO-M (Coordinated master station) 4: CO-S (Coordinated slave station) 7: MBASC (Modbus (ASCII)) 8: MBRTU (Modbus (RTU))
D5522	**BPS_E3**	Baud rate	Same as D5502
D5523	**PRI_E3**	Parity	Same as D5503
D5524	**STP_E3**	Stop bit	1: 1 bit, 2: 2 bit
D5525	**DLN_E3**	Data length	7: 7 bit, 8: 8 bit
D5526	**ADR_E3**	Address	1 to 99
D5527	**RP.T_E3**	Minimum response time	0 to 10 (x10ms)
D5541	**HSR_E3**	High-speed response mode	0: OFF, 1 to 8

Register No.	Description		Range and meaning of value
D5542	**BPS_E3**	Baud rate	4: 9600 (9600 bps) 5: 19200 (19.2k bps) 6: 38400 (38.4k bps)
D5543	**PRI_E3**	Parity	0: NONE (None) 1: EVEN (Even) 2: ODD (Odd)
D5544	**IP1_E3**	IP address 1	0 to 255 Address : D5542.D5543.D5544.D5545
D5545	**IP2_E3**	IP address 2	
D5546	**IP3_E3**	IP address 3	
D5547	**IP4_E3**	IP address 4	
D5548	**SM1_E3**	Subnet mask 1	0 to 255 Address : D5546.D5547.D5548.D5549
D5549	**SM2_E3**	Subnet mask 2	
D5550	**SM3_E3**	Subnet mask 3	
D5551	**SM4_E3**	Subnet mask 4	
D5552	**DG1_E3**	Default gateway 1	0 to 255 Address : D5550.D5551.D5552.D5553
D5553	**DG2_E3**	Default gateway 2	
D5554	**DG3_E3**	Default gateway 3	
D5555	**DG4_E3**	Default gateway 4	
D5556	**PRT_E3**	Port number	502, 1024 to 65535
D5557	**IPAR_E3**	IP access restriction	0: OFF (Disable) 1: ON (Enable)
D5558	**1.IP1_E3**	Permitted IP address 1-1	0 to 255 Address : D5556.D5557.D5558.D5559
D5559	**1.IP2_E3**	Permitted IP address 1-2	
D5560	**1.IP3_E3**	Permitted IP address 1-3	
D5561	**1.IP4_E3**	Permitted IP address 1-4	
D5562	**2.IP1_E3**	Permitted IP address 2-1	0 to 255 Address : D5560.D5561.D5562.D5563
D5563	**2.IP2_E3**	Permitted IP address 2-2	
D5564	**2.IP3_E3**	Permitted IP address 2-3	
D5565	**2.IP4_E3**	Permitted IP address 2-4	
D5566	**ESW_E3**	Ethernet setting switch	0: OFF, 1: ON (Enable) Setting this parameter to “1: ON” enables the Ethernet communication parameter settings. * The parameter ESW automatically returns to “0: OFF” after “1: ON” is set.
D5567 to D5570			
D5571	**MAC1_E3**	MAC address 1 *1	0000 to FFFF (Hex) Arrangement: D5771, D5772, D5773
D5572	**MAC2_E3**	MAC address 2 *1	
D5573	**MAC3_E3**	MAC address 3 *1	

*1: With regardds to the information on D5571 to D5573, three D registers comprise one parameter data.

Key Operation Setting, Display Function Setting, and SELECT Display Setting (D5701 to D5800)

Register No.	Description		Range and meaning of value
D5701	**F1** *1	User function key-1 action setting	0: OFF (Disable) 1: A/M (AUTO/MAN switch) 2: C/A/M (CAS/AUTO/MAN switch) 3: R/L1 (REM/LCL switch) 4: R/L2 (Loop-2 REM/LCL switch) 5: S/R (STOP/RUN switch) 6: CAS (Switch to CAS) 7: AUTO (Switch to AUTO) 8: MAN (Switch to MAN) 9: REM1 (Switch to REM) 10: LCL1 (Switch to LCL) 11: REM2 (Switch to Loop-2 REM) 12: LCL2 (Switch to Loop-2 LCL) 13: STOP (Switch to STOP) 14: RUN (Switch to RUN) 17: AT (Auto-tuning) 18: LTUP (LCD brightness UP) 19: LTDN (LCD brightness DOWN) 20: BRI (Adjust LCD brightness) 21: LCD (LCD backlight ON/OFF switch) 22: LAT (Latch release) 23: PID (PID tuning switch) Loop-2 setting values are unavalable in Single-loop control.
D5702	**F2** *1	User function key-2 action setting	
D5703	**Fn** *1	User function key-n action setting	
D5704	**A/M-K** *1	A/M key action setting	0: OFF (Disable) 1: A/M (AUTO/MAN switch) 2: C/A/M (CAS/AUTO/MAN switch) 3: R/L1 (REM/LCL switch) 4: R/L2 (Loop-2 REM/LCL switch) 5: S/R (STOP/RUN switch) 6: CAS (Switch to CAS) 7: AUTO (Switch to AUTO) 8: MAN (Switch to MAN)
D5711	**DVB_L1**	Loop-1 deviation display band	Permits a change in the span of deviation shown on the front-panel deviation monitor. 0.0 to 100.0% of PV input range span (EU)
D5712	**DVB_L2**	Loop-2 deviation display band	

*1: Same parameter exists in other menu. “-K” is added to the end of the parameter in KEY menu.

Register No.	Description		Range and meaning of value
D5713	**PCMD_L1**	Loop-1 active color PV display switch	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) 10: Link to DI (ON: red, OFF: white)
D5714	**PCH_L1**	Loop-1 PV color change high limit	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.
D5715	**PCL_L1**	Loop-1 PV color change low limit	
D5716	**PCMD_L2**	Loop-2 active color PV display switch	Same as D5713
D5717	**PCH_L2**	Loop-2 PV color change high limit	Same as D5714
D5718	**PCL_L2**	Loop-2 PV color change low limit	
D5719	**BAR1**	Upper bar-graph display registration	0: Disable 1: OUT 2: Not used 3: PV 4: SP 5: Deviation 6: Loop-2 OUT 7: Not used 8: Loop-2 PV 9: Loop-2 SP 10: Loop-2 deviation 11 to 16: Disable 17: Not used 18: PV terminals analog input 19: RSP terminals analog input 20: Not used 21: Not used 22: Not used 23: Time event and alarm status * *: For BAR1 only
D5720	**BAR2**	Lower bar-graph display registration	
D5721	**BDV_L1**	Loop-1 bar-graph deviation display band	0.0 to 100.0% of PV input range span (EU)
D5722	**BDV_L2**	Loop-2 bar-graph deviation display band	

Register No.	Description		Range and meaning of value
D5723	**EV1_L1**	Loop-1 EV1 display condition registration	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) 5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed)** 5046: Link to DI16 (E1-terminal area) (Lit when the contact is closed)** **: Initial value. The contact action changes by the setting of each "contact type" parameter.
D5724	**EV2_L1**	Loop-1 EV2 display condition registration	
D5725	**EV3_L1**	Loop-1 EV3 display condition registration	
D5726	**EV4_L1**	Loop-1 EV4 display condition registration	
D5727	**EV5_L1**	Loop-1 EV5 display condition registration	
D5728	**EV6_L1**	Loop-1 EV6 display condition registration	
D5729	**EV7_L1**	Loop-1 EV7 display condition registration	
D5730	**EV8_L1**	Loop-1 EV8 display condition registration	
D5731	**EV1_L2**	Loop-2 EV1 display condition registration	
D5732	**EV2_L2**	Loop-2 EV2 display condition registration	
D5733	**EV3_L2**	Loop-2 EV3 display condition registration	
D5734	**EV4_L2**	Loop-2 EV4 display condition registration	
D5735	**EV5_L2**	Loop-2 EV5 display condition registration	
D5736	**EV6_L2**	Loop-2 EV6 display condition registration	
D5737	**EV7_L2**	Loop-2 EV7 display condition registration	
D5738	**EV8_L2**	Loop-2 EV8 display condition registration	

Register No.	Description		Range and meaning of value
D5739	**PV.D**	PV display area ON/OFF	0: OFF (Nondisplay) 1: ON (Display)
D5740	**SP.D**	Setpoint display area ON/OFF	
D5741	**STS.D**	Status display area ON/OFF	
D5742	**SPD**	Scroll speed	(Slow) 1 to 8 (Quick)
D5743	**GUID**	Guide display ON/OFF	0: OFF (Nondisplay) 1: ON (Display)
D5744	**HOME**	Home Operation Display setting	0: SP1 (SP Display) 1: SP2 (Loop-2 SP Display) 2: OUT1 (OUT Display) 3: OUT2 (Loop-2 OUT Display) 5: VP (Valve Position Display) 6: MV (Position Proportional Computation Output Display) 8: PID1 (PID Number Display) 9: PID2 (Loop-2 PID Number Display) 12: PV1 (PV2/PV1 Display) 13: PV2 (PV1/PV2 Display) 14: PV (PV Analog Input Display) 15: RSP (RSP Analog Input Display) 18: CS1 (SELECT Display 1) 19: CS2 (SELECT Display 2) 20: CS3 (SELECT Display 3) 21: CS4 (SELECT Display 4) 22: CS5 (SELECT Display 5)
D5745	**ECO**	Economy mode	0: OFF (Disable) 1: Economy mode ON (All indications except PV display OFF) 2: Economy mode ON (All indications OFF) 3: Brightness 10 % (whole indication)
D5746	**BRI**	Brightness	(Dark) 1 to 5 (Bright)
D5747	**B.PVW**	White brightness adjustment of PV display	Adjusts the white brightness of PV display. (Dark) -4 to 4 (Bright)
D5748	**B.PVR**	Red brightness adjustment of PV display	Adjusts the red brightness of PV display. (Dark) -4 to 4 (Bright)
D5749	**B.SP**	Brightness adjustment of Setpoint display	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)
D5750	**B.BAR**	Brightness adjustment of Bar-graph display	Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)
D5751	**B.STS**	Brightness adjustment of Status indicator	Adjusts the brightness of Status display. (Dark) -4 to 4 (Bright)
D5752			
D5753	**D.CYC**	Display update cycle	1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s
D5754	**OP.JP**	AUTORETURN TO OPERATION DISPLAY	Automatically returned to the Operation Display when there has been no keystroke operation for 5 minutes. 0: OFF (Not automaticaly returned) 1: ON (Automaticaly returned)
D5755	**MLSD**	Least significant digital mask of PV display	0: OFF (With least significant digit) 1: ON (Without least significant digit)

Register No.	Description		Range and meaning of value
D5757 to D5760			
D5761	**CS1**	SELECT Display-1 registration	Register the operation parameter (except the Operation Mode) that is frequently modified to display it in the Operation Display. (Register the register number of the parameter) 0: OFF 2301 to 5000
D5762	**CS2**	SELECT Display-2 registration	
D5763	**CS3**	SELECT Display-3 registration	
D5764	**CS4**	SELECT Display-4 registration	
D5765	**CS5**	SELECT Display-5 registration	
D5766 to D5770			
D5770	**CS10**	SELECT parameter-10 registration	Register the parameter that is frequently modified in the Operation Parameter Setting Display. (Register the register number of the parameter) 0: OFF 2301 to 5000
D5771	**CS11**	SELECT parameter-11 registration	
D5772	**CS12**	SELECT parameter-12 registration	
D5773	**CS13**	SELECT parameter-13 registration	
D5774	**CS14**	SELECT parameter-14 registration	
D5775	**CS15**	SELECT parameter-15 registration	
D5776	**CS16**	SELECT parameter-16 registration	
D5777	**CS17**	SELECT parameter-17 registration	
D5778	**CS18**	SELECT parameter-18 registration	
D5779	**CS19**	SELECT parameter-19 registration	
D5780 to D5800			

Lock Setting (Key Lock/Menu Lock) (D5801 to D5900)

Register No.	Description		Range and meaning of value
D5801	**U.SP_L1**	Loop-1 SP Display lock	0: OFF (Display) 1: ON (Nondisplay)
D5802	**U.SP_L2**	Loop-2 SP Display lock	
D5803	**U.OUT_L1**	Loop-1 OUT Display lock	
D5804	**U.OUT_L2**	Loop-2 OUT Display lock	
D5808	**U.TSP_L2**	Loop-2 TSP Display lock	
D5809	**U.PID_L1**	Loop-1 PID Number Display lock	
D5810	**U.PID_L2**	Loop-2 PID Number Display lock	
D5812	**U.PV1**	PV2/PV1 Display lock	
D5813	**U.PV2**	PV1/PV2 Display lock	
D5814	**U.PV**	PV Analog Input Display lock	
D5815	**U.RSP**	RSP Analog Input Display lock	
D5818	**COM.W**	Communication write enable/disable	0: OFF (Enable) 1: ON (Disable)
D5819	**DATA-L** *1	Front panel parameter data key lock	0: OFF (Unlock) 1: ON (Lock)
D5820	**A/M-L** *1	Front panel A/M key lock	
D5821	**RUN-L** *1	Front panel RUN key lock	
D5822	**RST-L** *1	Front panel RST key lock	
D5823	**PTN-L** *1	Front panel PTN key lock	
D5824	**MODE-L** *1	Front panel MODE key lock	
D5825	**U.TSP_L1**	Loop-1 TSP Display lock	0: OFF (Display) 1: ON (Nondisplay)
D5826	**U.TM**	Remaining Segment-tim Display lock	
D5827			
D5828	**U.RCY**	Remaining Repetition Display lock	
D5829			
D5830	**U.AL_L1**	Loop-1 Alarm-5 to -8 Dsiplay lock	
D5831	**CTL-L** *1	[CTL] menu lock	
D5832	**PV-L** *1	[PV] menu lock	
D5833	**RSP_E1-L** *1	[RSP] menu lock (E1-terminal area)	
D5836	**MPV_L1-L** *1	Loop-1 [MPV] menu lock	
D5837	**MPV_L2-L** *1	Loop-2 [MPV] menu lock	
D5838	**OUT-L** *1	[OUT] menu lock	
D5841	**R485_E3-L** *1	[R485] menu lock (E3-terminal area)	
D5843	**ETHR_E3-L** *1	[ETHR] menu lock (E3-terminal area)	
D5847	**KEY-L** *1	[KEY] menu lock	
D5848	**DISP-L** *1	[DISP] menu lock	
D5849	**CSEL-L** *1	[CSEL] menu lock	
D5850	**KLOC-L** *1	[KLOC] menu lock	
D5851	**DI.SL-L** *1	[DI.SL] menu lock	
D5852	**DI.NU-L** *1	[DI.NU] menu lock	

*1: Same parameter exists in other menu. "-L" is added to the end of the parameter in KLOC menu or MLOC menu.

Register No.	Description		Range and meaning of value
D5853	DI.D-L *1	[DI.D] menu lock	0: OFF (Display) 1: ON (Nondisplay)
D5858	ALM-L *1	[ALM] menu lock	
D5859	DO_E1-L *1	[DO] menu lock (E1-terminal area)	
D5860	DO_E2-L *1	[DO] menu lock (E2-terminal area)	
D5861	DO_E3-L *1	[DO] menu lock (E3-terminal area)	
D5862	DO_E4-L *1	[DO] menu lock (E4-terminal area)	
D5863	I/O-L *1	[I/O] menu lock	
D5864	SYS-L *1	[SYS] menu lock	
D5865	INIT-L *1	[INIT] menu lock	
D5866	VER-L *1	[VER] menu lock	
D5867	LVL-L *1	[LVL] menu lock	
D5868	MODE-L *1	[MODE] menu lock	
D5869	CS-L *1	[CS] menu lock	
D5870	SP_L1-L *1	Loop-1 [SP] menu lock	
D5871	SPS_L1-L *1	Loop-1 [SPS] menu lock	
D5872	ALRM_L1-L *1	Loop-1 [ALRM] menu lock	
D5873	PROG-L	[PROG] menu lock	
D5874	PVS_L1-L *1	Loop-1 [PVS] menu lock	
D5875	PID_L1-L *1	Loop-1 [PID] menu lock	
D5876	TUNE_L1-L *1	Loop-1 [TUNE] menu lock	
D5877	ZONE_L1-L *1	Loop-1 [ZONE] menu lock	
D5878	SP_L2-L *1	Loop-2 [SP] menu lock	
D5879	SPS_L2-L *1	Loop-2 [SPS] menu lock	
D5880	ALRM_L2-L *1	Loop-2 [ALRM] menu lock	
D5881	PVS_L2-L *1	Loop-2 [PVS] menu lock	
D5882	PID_L2-L *1	Loop-2 [PID] menu lock	
D5883	TUNE_L2-L *1	Loop-2 [TUNE] menu lock	
D5884	ZONE_L2-L *1	Loop-2 [ZONE] menu lock	
D5885	PPAR-L *1	[PPAR] menu lock	
D5886	PYS1-L *1	[PYS1] menu lock	
D5887	PYS2-L *1	[PYS2] menu lock	
D5888	PYS3-L *1	[PYS3] menu lock	
D5889	PYS4-L *1	[PYS4] menu lock	
D5890	LOC-L *1	[LOC] menu lock	
D5891	EDIT-L *1	[EDIT] menu lock	
D5892	AL_L1-L *1	Loop-1 [AL] menu lock	
D5893	AL_L2-L *1	Loop-2 [AL] menu lock	
D5894	U.AL_L2	Loop-2 Alarm-5 to -8 Dsiplay lock	
D5895 to D5900			

*1: Same parameter exists in other menu. “-L” is added to the end of the parameter in KLOC menu or MLOC menu.

DI Function Setting (D5901 to D6200)

Register No.	Description		Range and meaning of value
D5901	**A/M-D** *1	AUTO/MAN switch	Set an I relay number of contact input. 0: OFF (Disable) Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI16: 5046
D5902	**R/L_L1-D** *1	REMOTE/LOCAL switch	
D5903	**R/L_L2-D** *1	REMOTE/LOCAL switch	
D5904	**S/R-D** *1	STOP/RUN switch	
D5905	**CAS-D** *1	Switch to CAS	
D5906	**AUTO-D** *1	Switch to AUTO	
D5907	**MAN-D** *1	Switch to MAN	
D5908	**REM_L1-D** *1	Switch to REMOTE	
D5909	**LCL_L1-D** *1	Switch to LOCAL	
D5910	**REM_L2-D** *1	Switch to REMOTE	
D5911	**LCL_L2-D** *1	Switch to LOCAL	
D5912			
D5913	**HOLD-D** *1	Switch to HOLD (Start of hold-mode operation)	
D5914	**AT-D** *1	Auto-tuning START/STOP switch	
D5915	**TRK-D** *1	Output tracking switch	
D5916	**SW-D** *1	PV switch	
D5917	**PVHD-D** *1	PV hold	
D5918	**CTOA-D** *1	CAS to AUTO switch	
D5919			
D5920	**LAT-D** *1	Latch release	
D5921	**LCD-D** *1	LCD backlight ON/OFF switch	
D5922	**MG1-D** *1	Message display interruption 1	
D5923	**MG2-D** *1	Message display interruption 2	
D5924	**MG3-D** *1	Message display interruption 3	
D5925	**MG4-D** *1	Message display interruption 4	
D5926	**PRG-D** *1	Switch to PROG (Start of program operation)	
D5927	**RST-D** *1	Switch to RESET (Stop of program operation)	
D5928	**LOC-D** *1	Switch to LOCAL (LSP) (Start of local-mode operation)	
D5929	**REM-D** *1	Switch to REMOTE (Start of local-mode operation)	
D5930	**P/R-D** *1	PROG/RESET switch	
D5931	**P/L-D** *1	PROG/LOCAL (LSP) switch	
D5932	**WAIT-D** *1	Wait ON/OFF switch	
D5933	**A/M_L1-D** *1	AUTO/MAN switch	
D5934	**A/M_L2-D** *1	Loop-2 AUTO/MAN switch	
D5935	**L/C-D** *1	LOCAL (LSP)/CAS switch	
D5936	**P/H-D** *1	PROG/HOLD switch	
D5937	**PVRW_L1-D** *1	Loop-1 PV red/white switch	
D5938	**PVRW_L2-D** *1	Loop-2 PV red/white switch	
D5939	**S.HLD-D** *1	Switch to HOLD for synchronized program operation	
D5940 to D5940			
D5941	**SP.BC**	Bit changing method of SP number	0: Status switch 1 (Operation by key keystrokes or via communication is enabled according to the conditions.) 1: Status switch 2 (Operation by key keystrokes or via communication is disabled.)

*1: Same parameter exists in other menu. “-D” is added to the end of the parameter in DI.SL menu.

Register No.	Description		Range and meaning of value
D5942	**SP.B0**	Bit-0 of SP number	Set an I relay number of contact input. 0: OFF (Disable) Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI16: 5046
D5943	**SP.B1**	Bit-1 of SP number	
D5944	**SP.B2**	Bit-2 of SP number	
D5945	**SP.B3**	Bit-3 of SP number	
D5946			
D5947	**PN.BC**	Bit changing method of PID number	Same as D5941
D5948	**PN.B0**	Bit-0 of PID number	Same as D5942
D5949	**PN.B1**	Bit-1 of PID number	
D5950	**PN.B2**	Bit-2 of PID number	
D5951	**PN.B3**	Bit-3 of PID number	
D5953			
D5960	**MP.BC_L1**	Bit changing method of manual preset output number	Same as D5941
D5961	**MP.B0_L1**	Bit-0 of manual preset output number	Same as D5942
D5962	**MP.B1_L1**	Bit-1 of manual preset output number	
D5963	**MP.B2_L1**	Bit-2 of manual preset output number	
D5964			
D5965	**MP.BC_L2**	Bit changing method of manual preset output number	Same as D5941
D5966	**MP.B0_L2**	Bit-0 of manual preset output number	Same as D5942
D5967	**MP.B1_L2**	Bit-1 of manual preset output number	
D5968	**MP.B2_L2**	Bit-2 of manual preset output number	
D5969 to D6000			
D6001	MSG1	Messege-1 *2	20-digit value of alphanumeric characters can be set. Arrangement: D6001, D6002, D6003, D6004, D6005, D6006, D6007, DD6008, D6009, D6010, D6011 Write “0x00” to the register after the character string.
D6002	MSG1		
D6003	MSG1		
D6004	MSG1		
D6005	MSG1		
D6006	MSG1		
D6007	MSG1		
D6008	MSG1		
D6009	MSG1		
D6010	MSG1		
D6011	MSG1		
D6012 to D6020			

*2: With regards to the information on D6001 to D6011, D6021 to D6031, D6041 to D6051, and D6061 to D6071, 11 D registers comprise one message.

DO Function Setting (D6201 to D6300)

Register No.	Description		Range and meaning of value
D6021	MSG2	Messege-2 *2	20-digit value of alphanumeric characters can be set. Arrangement: D6021, D6022, D6023, D6024, D6025, D6026, D6027, D6028, D6029, D6030, D6031 Write “0x00” to the register after the character string.
D6022	MSG2		
D6023	MSG2		
D6024	MSG2		
D6025	MSG2		
D6026	MSG2		
D6027	MSG2		
D6028	MSG2		
D6029	MSG2		
D6030	MSG2		
D6031	MSG2		
D6032 to D6040			
D6041	MSG3	Message-3 *2	20-digit value of alphanumeric characters can be set. Arrangement: D6041, D6042, D6043, D6044, D6045, D6046, D6047, D6048, D6049, D6050, D6051 Write “0x00” to the register after the character string.
D6042	MSG3		
D6043	MSG3		
D6044	MSG3		
D6045	MSG3		
D6046	MSG3		
D6047	MSG3		
D6048	MSG3		
D6049	MSG3		
D6050	MSG3		
D6051	MSG3		
D6052 to D6060			
D6061	MSG4	Message-4 *2	20-digit value of alphanumeric characters can be set. Arrangement: D6061, D6062, D6063, D6064, D6065, D6066, D6067, D6068, D6069, D6070, D6071 Write “0x00” to the register after the character string.
D6062	MSG4		
D6063	MSG4		
D6064	MSG4		
D6065	MSG4		
D6066	MSG4		
D6067	MSG4		
D6068	MSG4		
D6069	MSG4		
D6070	MSG4		
D6071	MSG4		
D6072 to D6100			
D6101	**DI1.D**	DI1 contact type	0: The assigned function is enabled when the contact is closed. 1: The assigned function is enabled when the contact is opened.
D6102	**DI2.D**	DI2 contact type	
D6103	**DI3.D**	DI3 contact type	

*2: With regards to the information on D6001 to D6011, D6021 to D6031, D6041 to D6051, and D6061 to D6071, 11 D registers comprise one message.

Register No.	Description		Range and meaning of value
D6201	**AL1.S**	AL1 function selection	Set an I relay number (Setting range: 4001 to 6000). Ex.) Set the number 4353 for AL1.S to use the alarm 1. 0: OFF (No function) 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
D6202	**AL2.S**	AL2 function selection	
D6203	**AL3.S**	AL3 function selection	
D6204	**OR.S**	OUT relay function selection	
D6206	**AL1.D**	AL1 contact type	0: When the event of assigned function occurs, the contact is closed. 1: When the event of assigned function occurs, the contact is opened.
D6207	**AL2.D**	AL2 contact type	
D6208	**AL3.D**	AL3 contact type	
D6209	**OR.D**	OUT relay contact type	Same as D6206

I/O Display (D6301 to D6400)

● **Bit Configuration of D6301: KEY-IO (Key status)**

Bit	Symbol	Event	
0	PARA_KEY	PARAMETER (PARA) key	(0: OFF 1: ON)
1	DISP_KEY	DISPLAY (DISP) key	(0: OFF 1: ON)
2	RIGHT_KEY	RIGHT key	(0: OFF 1: ON)
3	DOWN_KEY	DOWN key	(0: OFF 1: ON)
4	SET_KEY	SET/ENTER key	(0: OFF 1: ON)
5	UP_KEY	UP key	(0: OFF 1: ON)
6	LEFT_KEY	LEFT key	(0: OFF 1: ON)
7	F2_KEY	F2 key	(0: OFF 1: ON)
8	F1_KEY	F1 key	(0: OFF 1: ON)
9	A/M_KEY	A/M key	(0: OFF 1: ON)
10	FN_KEY	Fn key	(0: OFF 1: ON)

System Setting (D6401 to D6500)

Register No.	Description		Range and meaning of value
D6401	**R.MD**	Restart mode	Set how the controller should recover from a power failure of 5 seconds or more. 0: CONT (Continue action set before power failure.) 1: MAN (Start from MAN.) 2: AUTO (Start from AUTO.)
D6402	**R.TM**	Restart timer	Set time between power on and the instant where controller starts computation. 0 to 10 s
D6403 to D6407			
D6408	**EPO**	Input error preset output	Set preset output value when the input burnout or ADC error occurs. Manual output is prioritized when input burnout occurs in MAN. 0: Preset output 1: 0% output 2: 100% output
D6410	**FREQ**	Power frequency	0: AUTO 1: 60 Hz 2: 50 Hz
D6411 to D6416			
D6417	**QSM**	Quick setting mode	0: OFF (Disable) 1: ON (Enable)
D6418	**LANG**	Guide display language	0: ENG (English) 1: FRA (French) 2: GER (German) 3: SPA (Spanish)
D6419 to D6420			
D6421	**U.DEF**	Initialization to user default value	12345: Initialization, automatically returned to "0" after initialization.
D6422			
D6423	**F.DEF**	Initialization to factory default value	-12345: Initialization, automatically returned to "0" after initialization. *
D6424			
D6426 to D6430			
D6431	**LEVL**	Parameter display level	1: EASY (Easy setting mode) 2: STD (Standard setting mode) 3: PRO (Professional setting mode)
D6432 to D6500			

23.4.7 Registers (D7001 to D7600)

For input calculation									
D-Reg No.	Ref. No.	H No.	Register symbol	R/W	D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D7001	47001	1B58	X_PV	R	D7051	47051	1B8A	PVIN_CTL	R *
D7002	47002	1B59	X_RSP	R	D7052	47052	1B8B	PVIN1_CTL	R *
D7003	47003	1B5A		R	D7053	47053	1B8C	PVIN2_CTL	R *
D7004	47004	1B5B			D7054	47054	1B8D	PVIN3_CTL	R *
D7005	47005	1B5C		R	D7055	47055	1B8E	PVIN4_CTL	R *
D7006	47006	1B5D			D7056	47056	1B8F	RSP_CTL	R *
D7011	47011	1B62	**X000**	R	D7057	47057	1B90	TRK_CTL	R *
D7012	47012	1B63		R	D7058	47058	1B91		R *
D7013	47013	1B64		R	D7059	47059	1B92		
D7014	47014	1B65		R	D7061	47061	1B94		R *
D7015	47015	1B66		R	D7062	47062	1B95		
D7016	47016	1B67			D7066	47066	1B99		R *
					D7067	47067	1B9A		

*: R/W when the Parameter Setting Software is used.

For output calculation				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D7101	47101	1BBC	OUT_CTL	R
D7102	47102	1BBD		
D7103	47103	1BBE	RET_CTL	R
D7104	47104	1BBF	OUT2R_CTL	R
D7105	47105	1BC0	OUTR_CTL	R
D7106	47106	1BC1		
D7107	47107	1BC2		
D7108	47108	1BC3		
D7109	47109	1BC4		
D7110	47110	1BC5		
D7111	47111	1BC6	DOAL	R
D7112	47112	1BC7	DO10_E1	R
D7113	47113	1BC8	DO20_E2	R
D7114	47114	1BC9	DO30_E3	R
D7115	47115	1BCA	DO40_E4	R
D7116	47116	1BCB		
D7200	47200	1C1F		

*: R/W when the Parameter Setting Software is used.

Status register				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D7201	47201	1C20	M1_16	R/W
D7202	47202	1C21	M17_32	R/W
D7203	47203	1C22	M33_48	R/W
D7204	47204	1C23	M49_64	R/W
D7205	47205	1C24	M65_80	R/W
D7206	47206	1C25	M81_96	R/W
D7207	47207	1C26	M97_112	R/W
D7208	47208	1C27	M113_128	R/W
D7209	47209	1C28		
D7210	47210	1C29		
D7211	47211	1C2A	M1_16_B	R/W
D7212	47212	1C2B	M17_32_B	R/W
D7213	47213	1C2C	M33_48_B	R/W
D7214	47214	1C2D	M49_64_B	R/W
D7215	47215	1C2E	M65_80_B	R/W
D7216	47216	1C2F	M81_96_B	R/W
D7217	47217	1C30	M97_112_B	R/W
D7218	47218	1C31	M113_128_B	R/W
D7219	47219	1C32		
D7220	47220	1C33		
D7221	47221	1C34		
D7222	47222	1C35		
D7223	47223	1C36		

Constant register				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D7301	47301	1C84	K01	R/W
D7302	47302	1C85	K02	R/W
D7303	47303	1C86	K03	R/W
D7304	47304	1C87	K04	R/W
D7305	47305	1C88	K05	R/W
D7306	47306	1C89	K06	R/W
D7307	47307	1C8A	K07	R/W
D7308	47308	1C8B	K08	R/W
D7309	47309	1C8C	K09	R/W
D7310	47310	1C8D	K10	R/W
D7311	47311	1C8E	K11	R/W
D7312	47312	1C8F	K12	R/W
D7313	47313	1C90	K13	R/W
D7314	47314	1C91	K14	R/W
D7315	47315	1C92	K15	R/W
D7316	47316	1C93	K16	R/W
D7317	47317	1C94	K17	R/W
D7318	47318	1C95	K18	R/W
D7319	47319	1C96	K19	R/W
D7320	47320	1C97	K20	R/W
D7321	47321	1C98	K21	R/W
D7322	47322	1C99	K22	R/W
D7323	47323	1C9A	K23	R/W
D7324	47324	1C9B	K24	R/W
D7325	47325	1C9C	K25	R/W
D7326	47326	1C9D	K26	R/W
D7327	47327	1C9E	K27	R/W
D7328	47328	1C9F	K28	R/W
D7329	47329	1CA0	K29	R/W
D7330	47330	1CA1	K30	R/W

Constant register				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D7410	47410	1CF1	C_1	R
D7411	47411	1CF2	C0	R
D7412	47412	1CF3	C1	R
D7413	47413	1CF4	C2	R
D7414	47414	1CF5	C3	R
D7415	47415	1CF6	C4	R
D7416	47416	1CF7	C5	R
D7417	47417	1CF8	C10	R
D7418	47418	1CF9	C50	R
D7419	47419	1CFA	C60	R
D7420	47420	1CFB	C100	R
D7421	47421	1CFC	C1000	R
D7422	47422	1CFD	C10000	R

Input range / scale				
D-Reg No.	**Ref. No.**	**H No.**	**Register symbol**	**R/W**
D7501	47501	1D4C	DP_R	R
D7502	47502	1D4D	RH_R	R
D7503	47503	1D4E	RL_R	R
D7504	47504	1D4F		
D7505	47505	1D50	SDP_R	R
D7506	47506	1D51	SH_R	R
D7507	47507	1D52	SL_R	R
D7508	47508	1D53		
D7509	47509	1D54	DP_E1_R	R
D7510	47510	1D55	RH_E1_R	R
D7511	47511	1D56	RL_E1_R	R
D7512	47512	1D57		
D7513	47513	1D58	SDP_E1_R	R
D7514	47514	1D59	SH_E1_R	R
D7515	47515	1D5A	SL_E1_R	R
D7516	47516	1D5B		
D7517	47517	1D5C	DP_E2_R	R
D7518	47518	1D5D	RH_E2_R	R
D7519	47519	1D5E	RL_E2_R	R
D7520	47520	1D5F		
D7521	47521	1D60	SDP_E2_R	R
D7522	47522	1D61	SH_E2_R	R
D7523	47523	1D62	SL_E2_R	R
D7524	47524	1D63		
D7525	47525	1D64	DP_E4_R	R
D7526	47526	1D65	RH_E4_R	R
D7527	47527	1D66	RL_E4_R	R
D7528	47528	1D67		
D7529	47529	1D68	SDP_E4_R	R
D7530	47530	1D69	SH_E4_R	R
D7531	47531	1D6A	SL_E4_R	R
D7532	47532	1D6B		
D7533	47533	1D6C	P.DP_L1_R	R
D7534	47534	1D6D	P.RH_L1_R	R
D7535	47535	1D6E	P.RL_L1_R	R
D7536	47536	1D6F		
D7537	47537	1D70	P.DP_L2_R	R
D7538	47538	1D71	P.RH_L2_R	R
D7539	47539	1D72	P.RL_L2_R	R

For Input Calculation (D7001 to D7100)

● D7001 to D7010

Register No.	Description		Range and meaning of value
D7001	X_PV	PV analog input	-5.0 to 105.0%
D7002	X_RSP	RSP analog input	-5.0 to 105.0%
D7004			

● Bit Configuration of D7011: X000 (DI1-DI3 status)

Bit	Symbol	Event	
0	X_DI1	DI1 status	(0: OFF 1: ON)
1	X_DI2	DI2 status	(0: OFF 1: ON)
2	X_DI3	DI3 status	(0: OFF 1: ON)
3 to 15			

● Bit Configuration of D7012: X100_E1 (DI16 status: E1-terminal area)

Bit	Symbol	Event	
5	X_DI16	DI16 status	(0: OFF 1: ON)
6 to 15			

● D7051 to D7100

Register No.	Description		Range and meaning of value
D7051	PVIN_CTL	Control PV input	-5.0 to 105.0% of PV input range (EU)
D7052			
D7053			
D7056	RSP_CTL	Control RSP input	0.0 to 100.0% of RSP input range (EU)
D7057	TRK_CTL	Control tracking input	-5.0 to 105.0% of TRK input range (EU)
D7058			
D7059 to D7060			
D7061			
D7062 to D7065			
D7066			
D7067 to D7100			

For Output Calculation (D7101 to D7200)

● **D7101 to D7110**

Register No.	Description		Range and meaning of value
D7101	OUT_CTL	Control OUT output	-5.0 to 105.0% of control OUT output range
D7102			
D7103	RET_CTL	Control RET output	-5.0 to 105.0% of control ERT output range
D7105	OUTR_CTL	Control OUTR output (Relay)	-5.0 to 105.0% of control OUTR output range
D7106 to D7110			

● **Bit Configuration of D7111: DOAL (Control AL1-AL3 status)**

Bit	Symbol	Event
0	AL1_CTL	Control AL1 status (0: OFF 1: ON)
1	AL2_CTL	Control AL2 status (0: OFF 1: ON)
2	AL3_CTL	Control AL3 status (0: OFF 1: ON)
3 to 15		

● **D7116 to D7160**

Register No.	Description		Range and meaning of value
D7116 to D7150			
D7151	Y_OUT	OUT control output	-5.0 to 105.0%
D7152			
D7153	Y_RET	RET control output	-5.0 to 105.0%
D7155	Y_OUTR	OUTR control output	-5.0 to 105.0%
D7156 to D7160			

● **Bit Configuration of D7161: Y000 (AL1-AL3 status)**

Bit	Symbol	Event
0	Y_AL1	AL1 status (0: OFF 1: ON)
1	Y_AL2	AL2 status (0: OFF 1: ON)
2	Y_AL3	AL3 status (0: OFF 1: ON)
3 to 15		

Status Registers (D7201 to D7300)

● **Bit Configuration of D7201 to D7208: M1_16 to M113_128 (Status register (M1-M16 to M113-M128, Non-holding type)**

Bit	Symbol								Event
0	M01	M17	M33	M49	M65	M81	M97	M113	Internal relay (Non-holding type) (0: OFF 1: ON)
1	M02	M18	M34	M50	M66	M82	M98	M114	Internal relay (Non-holding type) (0: OFF 1: ON)
2	M03	M19	M35	M51	M67	M83	M99	M115	Internal relay (Non-holding type) (0: OFF 1: ON)
3	M04	M20	M36	M52	M68	M84	M100	M116	Internal relay (Non-holding type) (0: OFF 1: ON)
4	M05	M21	M37	M53	M69	M85	M101	M117	Internal relay (Non-holding type) (0: OFF 1: ON)
5	M06	M22	M38	M54	M70	M86	M102	M118	Internal relay (Non-holding type) (0: OFF 1: ON)
6	M07	M23	M39	M55	M71	M87	M103	M119	Internal relay (Non-holding type) (0: OFF 1: ON)
7	M08	M24	M40	M56	M72	M88	M104	M120	Internal relay (Non-holding type) (0: OFF 1: ON)
8	M09	M25	M41	M57	M73	M89	M105	M121	Internal relay (Non-holding type) (0: OFF 1: ON)
9	M10	M26	M42	M58	M74	M90	M106	M122	Internal relay (Non-holding type) (0: OFF 1: ON)
10	M11	M27	M43	M59	M75	M91	M107	M123	Internal relay (Non-holding type) (0: OFF 1: ON)
11	M12	M28	M44	M60	M76	M92	M108	M124	Internal relay (Non-holding type) (0: OFF 1: ON)
12	M13	M29	M45	M61	M77	M93	M109	M125	Internal relay (Non-holding type) (0: OFF 1: ON)
13	M14	M30	M46	M62	M78	M94	M110	M126	Internal relay (Non-holding type) (0: OFF 1: ON)
14	M15	M31	M47	M63	M79	M95	M111	M127	Internal relay (Non-holding type) (0: OFF 1: ON)
15	M16	M32	M48	M64	M80	M96	M112	M128	Internal relay (Non-holding type) (0: OFF 1: ON)

● **Bit Configuration of D7211 to D7212: M1_16_B to M17_32_B (Status register (M1_**

B-M16_B to M17_B-M32_B, Holding type)

Bit	Symbol		Event
0	M01_B	M17_B	Internal relay (Holding type) (0: OFF 1: ON)
1	M02_B	M18_B	Internal relay (Holding type) (0: OFF 1: ON)
2	M03_B	M19_B	Internal relay (Holding type) (0: OFF 1: ON)
3	M04_B	M20_B	Internal relay (Holding type) (0: OFF 1: ON)
4	M05_B	M21_B	Internal relay (Holding type) (0: OFF 1: ON)
5	M06_B	M22_B	Internal relay (Holding type) (0: OFF 1: ON)
6	M07_B	M23_B	Internal relay (Holding type) (0: OFF 1: ON)
7	M08_B	M24_B	Internal relay (Holding type) (0: OFF 1: ON)
8	M09_B	M25_B	Internal relay (Holding type) (0: OFF 1: ON)
9	M10_B	M26_B	Internal relay (Holding type) (0: OFF 1: ON)
10	M11_B	M27_B	Internal relay (Holding type) (0: OFF 1: ON)
11	M12_B	M28_B	Internal relay (Holding type) (0: OFF 1: ON)
12	M13_B	M29_B	Internal relay (Holding type) (0: OFF 1: ON)
13	M14_B	M30_B	Internal relay (Holding type) (0: OFF 1: ON)
14	M15_B	M31_B	Internal relay (Holding type) (0: OFF 1: ON)
15	M16_B	M32_B	Internal relay (Holding type) (0: OFF 1: ON)

- **Bit Configuration of D7213 to D7218: M33_48_B to M113_128_B (Status register (M33_B-M48_B to M113_B-M128_B, Holding type)**

Bit	Symbol						Event
0	M33_B	M49_B	M65_B	M81_B	M97_B	M113_B	Internal relay (Holding type) * (0: OFF 1: ON)
1	M34_B	M50_B	M66_B	M82_B	M98_B	M114_B	Internal relay (Holding type) * (0: OFF 1: ON)
2	M35_B	M51_B	M67_B	M83_B	M99_B	M115_B	Internal relay (Holding type) * (0: OFF 1: ON)
3	M36_B	M52_B	M68_B	M84_B	M100_B	M116_B	Internal relay (Holding type) * (0: OFF 1: ON)
4	M37_B	M53_B	M69_B	M85_B	M101_B	M117_B	Internal relay (Holding type) * (0: OFF 1: ON)
5	M38_B	M54_B	M70_B	M86_B	M102_B	M118_B	Internal relay (Holding type) * (0: OFF 1: ON)
6	M39_B	M55_B	M71_B	M87_B	M103_B	M119_B	Internal relay (Holding type) * (0: OFF 1: ON)
7	M40_B	M56_B	M72_B	M88_B	M104_B	M120_B	Internal relay (Holding type) * (0: OFF 1: ON)
8	M41_B	M57_B	M73_B	M89_B	M105_B	M121_B	Internal relay (Holding type) * (0: OFF 1: ON)
9	M42_B	M58_B	M74_B	M90_B	M106_B	M122_B	Internal relay (Holding type) * (0: OFF 1: ON)
10	M43_B	M59_B	M75_B	M91_B	M107_B	M123_B	Internal relay (Holding type) * (0: OFF 1: ON)
11	M44_B	M60_B	M76_B	M92_B	M108_B	M124_B	Internal relay (Holding type) * (0: OFF 1: ON)
12	M45_B	M61_B	M77_B	M93_B	M109_B	M125_B	Internal relay (Holding type) * (0: OFF 1: ON)
13	M46_B	M62_B	M78_B	M94_B	M110_B	M126_B	Internal relay (Holding type) * (0: OFF 1: ON)
14	M47_B	M63_B	M79_B	M95_B	M111_B	M127_B	Internal relay (Holding type) * (0: OFF 1: ON)
15	M48_B	M64_B	M80_B	M96_B	M112_B	M128_B	Internal relay (Holding type) * (0: OFF 1: ON)

*: It is Non-holding type when the input sampling period (control period) (SMP) is 50 ms.

Constant Register (D7301 to D7330)

Register No.	Description		Range and meaning of value
D7301 to D7330	K01 to K30	K01 data register to K30 data register	K01 to K20: -32768 to 32767 K21 to K30: 0 to 65535

Input Range / Scale (D7501 to D7600) (Read only)

Register No.	Description		Range and meaning of value
D7501	DP_R	PV input decimal point position	Same as D5103 (DP)
D7502	RH_R	Maximum value of PV input range	Same as D5104 (RH)
D7503	RL_R	Minimum value of PV input range	Same as D5105 (RL)
D7504			
D7505	SDP_R	PV input scale decimal point position	Same as D5106 (SDP)
D7506	SH_R	Maximum value of PV input scale	Same as D5107 (SH)
D7507	SL_R	Minimum value of PV input scale	Same as D5108 (SL)
D7508			
D7509	DP_E1_R	RSP remote input decimal point position	Same as D5123 (DP_E1)
D7510	RH_E1_R	Maximum value of RSP remote input range	Same as D5124 (RH_E1)
D7511	RL_E1_R	Minimum value of RSP remote input range	Same as D5125 (RL_E1)
D7512			
D7513	SDP_E1_R	RSP remote input scale decimal point position	Same as D5126 (SDP_E1)
D7514	SH_E1_R	Maximum value of RSP remote input scale	Same as D5127 (SH_E1)
D7515	SL_E1_R	Minimum value of RSP remote input scale	Same as D5128 (SL_E1)
D7516			

Register No.	Description		Range and meaning of value
D7532			
D7533	P.DP_L1_R	Loop-1 control PV input decimal point position	Same as D5202 (P.DP_L1)
D7534	P.RH_L1_R	Loop-1 maximum value of control PV input range	Same as D5203 (P.RH_L1)
D7535	P.RL_L1_R	Loop-1 minimum value of control PV input range	Same as D5204 (P.RL_L1)
D7536			
D7537	P.DP_L2_R	Loop-2 control PV input decimal point position (in Cascade control)	Same as D5222 (P.DP_L2)
D7538	P.RH_L2_R	Loop-2 maximum value of Control PV input range (in Cascade control)	Same as D5223 (P.RH_L2)
D7539	P.RL_L2_R	Loop-2 minimum value of Control PV input range (in Cascade control)	Same as D5224 (P.RL_L2)
D7540 to D7600			

23.4.8 Input / Output Terminal Status Register (D7601 to D7700)

Terminal status registers				
Input / output terminal status register				
D-Reg No.	Ref. No.	H No.	Register symbol	R/W
D7601	47601	1DB0	DI	R
D7602	47602	1DB1	DI_E1	R
D7606	47606	1DB5		
D7616	47616	1DBF		
D7621	47621	1DC4	OUT_OUT	R
D7622	47622	1DC5	OUT_OUT2H	R
D7623	47623	1DC6	OUT_OUT2L	R
D7624	47624	1DC7	OUT_RET	R
D7625	47625	1DC8	OUT_OUTR	R
D7627	47627	1DCA		

● **Bit Configuration of D7601: DI (DI1-DI3 terminal status)**

Bit	Symbol	Event
0	DI1	DI1 terminal status (0: OFF 1: ON)
1	DI2	DI2 terminal status (0: OFF 1: ON)
2	DI3	DI3 terminal status (0: OFF 1: ON)
3 to 15		

● **Bit Configuration of D7602: DI_E1 (DI11-DI16 terminal status: E1-terminal area)**

Bit	Symbol	Event
5	DI16	DI16 terminal status (0: OFF 1: ON)
6 to 15		

● **Bit Configuration of D7611: OUT_AL (AL1-AL3 terminal status)**

Bit	Symbol	Event
0	OUT_AL1	AL1 terminal status (0: OFF 1: ON)
1	OUT_AL2	AL2 terminal status (0: OFF 1: ON)
2	OUT_AL3	AL3 terminal status (0: OFF 1: ON)
3 to 15		

● **D7616 to D7700**

Register No.	Description		Range and meaning of value
D7616 to D7620			
D7621	OUT_OUT	OUT terminal	-1500 to 31500
D7624	OUT_RET	RET terminal	-1500 to 31500
D7625	OUT_OUTR	OUT terminal (Relay)	-1500 to 31500
D7627 to D7700			

23.5 Writing via Communication

■ Setting Target Setpoint

In LCL (local) mode

(1) Set the Loop-1 and Loop-2 target setpoints of groups 1 to 8 parameters (SP_L1_1 to SP_L1_8 or SP_L2_1 to SP_L2_8).
(2) Write the setpoint (1 to 8) in the SPNO. (SP number selection) (depends on the setup parameter SPGR. setting)
(3) Set the operation mode (R.L_L1, R.L_L2) to LCL (local) (0).

Register No.	Register symbol	Description
D2312	SPNO.	SP number selection

In REM (remote) mode

(1) The target setpoint can be written via communication only when the operation mode (R.L_L1, R.L_L2) is set to REM (remote) mode.
(2) Write the setpoint in the C.RSP_L1 or C.RSP_L2.
Example: When setting 150.0°C for the C.RSP_L1, write "1500" to this register.
(3) Set the operation mode (R.L_L1, R.L_L2) to the REM (remote) mode.

Register No.	Register symbol	Description
D2331	C.RSP_L1	Loop-1 communication remote setpoint
D2332	C.RSP_L2	Loop-2 communication remote setpoint

■ Setting Control Output Value in MAN Mode

The control output value can be written via communication only when the operation mode is set to MAN mode.
(1) Set the operation mode (A.M) to MAN (1).
(2) Write the control output value in the MOUT_L1, MOUT_L2.

Register No.	Register symbol	Description
D2333	MOUT_L1	Loop-1 heating-side control output in MAN mode
D2335	MOUT_L2	Loop-2 heating-side control output in MAN mode

■ Setting Manual Preset Output Number

The manual preset output number can be written via communication only when the operation mode is set to MAN mode.
(1) Set the Loop-1 and Loop-2 manual preset output 1 to 5 parameters (MPO1_L1 to MPO5_L1 or MPO1_L2 to MPO5_L2).
(2) Write the setpoint (1 to 5) in the MPON_L1 or MPON_L2.
(3) Set the operation mode (A.M) to MAN (1).

Register No.	Register symbol	Description
D3531	MPON_L1	Loop-1 manual preset output number selection
D4631	MPON_L2	Loop-2 manual preset output number selection

■ Setting PID Number (D2503: PIDN_L1_1 to D2643: PIDN_L1_8, D3603: PIDN_L2_1 to D3743: PIDN_L2_8)

PID number can be selected via communication only when the zone PID selection parameter (ZON) is set to 1, 2, or 4.
D2503 to D2643 = 1 to 8, D3603 to D3743 = 1 to 8 (depends on the setup parameter SPGR. setting).
When the PID number is selected using the external contact input, the setting via communication is impossible.

CHAPTER 24

I RELAYS (COIL)

Contents

24.1 Overview

This chapter describes the functions and applications of the I relays.
I relays are used in Modbus communication and contact input / output functions.
I relays contain status information of errors, operation, and alarms. Contents of I relays can be read only by means of communication using a host computer. (Note that the I relays have the same information as the D registers but with I relays, some of the information is read-only.).

Use of the I relays enables the following:
- Centralized control by the host computer

D registers and I relays of the PPC5 are used for parameter settings.

24.2 Classification of I Relays

I relays are classified as shown below.

Classification of I Relay Map

I relay No.	Area and data categories	Description	
4001 to 4064	Function status	System error	Each bit information is the same as that of D register.
4065 to 4128		Input error	Each bit information is the same as that of D register.
4193 to 4256		Operation Mode	Each bit information of 4193 to 4240 is the same as that of D register.
4321 to 4384		Alarm	Each bit information is the same as that of D register.
4385 to 4528		Alarm latch	Each bit information of 4385 to 4512 is the same as that of D register.
4577 to 4704		SP number, PID number	Each bit information is the same as that of D register.
4705 to 4768		Key	Each bit information is the same as that of D register.
4769 to 4784		Display	Each bit information is the same as that of D register.
5025 to 5152	Internal status	Input (status) relay	Each bit information is the same as that of D register.
5153 to 5280		Output (status) relay	Each bit information is the same as that of D register.
5281 to 5536		Control (status) relay	Each bit information is the same as that of D register.
5537 to 5600		Special relay	Each bit information of 5409 to 5540 is the same as that of D register.
5537 to 5792		Internal relay	Each bit information is the same as that of D register.
6305 to 6432	Input terminal status	DI terminal	Each bit information is the same as that of D register.

CAUTION

- In the area for I relay numbers 4001 to 6560, it is prohibited to write data to I relays with blank cells in I relay map tables. If you attempt to do so, the PPC5 may not operate properly.

Note

- I relay numbers 4001 to 6560 store ON/OFF status information and are normally read for ON/OFF status information.

■ How to Specify I Relay Numbers

When specifying an I relay number for communication, begin the number with the character “I.”

Example: Set “I4066” to specify the ADERR_E1 (I relay No.: 4066).

■ I relay symbol

- With regards to some register symbols, the loop number and terminal area are indicated by adding the underline (_) to the end of the parameter symbols.

□□□□_Ln **Ln**: Loop numbers (L1 or L2)
□□□□_En **En**: Terminal area (E1or E3)

Example : **PVBO_L1** Indicates Loop-1 PVBO.
ADERR_E1 Indicates ADERR in E1-terminal area.

System error			Input error		
NO.	**I relay symbol**	**R/W**	**NO.**	**I relay symbol**	**R/W**
4001	SYSTEM_ERR	R	4065	ADERR	R
4002	CALB_ERR	R	4066	ADERR_E1	R
4003	UPARA_ERR	R	4067	ADERR_E2	R
4004			4068		
4005	SETPA_ERR	R	4069		
4006	OPEPA_ERR	R	4070	RJCERR	R
4008			4071		
4009	FRAM_ERR	R	4072		
4010			4073	ADBO	R
4011	CTLPA_ERR	R	4074	ADBO_E1	R
4012			4075		
4033	E1_ERR	R	4076		
4035	E3_ERR	R	4077		
4036			4078		
4038			4079		
4039			4080		
4040			4083		
4042			4097	PVBO_L1	R
4043	COM_E3_ERR	R	4098	RSPBO_L1	R
4044			4099	CRSPBO_L1	R
4046			4100		
			4101	PVPOVER_L1	R
			4102	PVMOVER_L1	R
			4103		
			4111	ATERR_L1	R
			4112		
			4113	PVBO_L2	R
			4114	RSPBO_L2	R
			4115	CRSPBO_L2	R
			4116		
			4117	PVPOVER_L2	R
			4118	PVMOVER_L2	R
			4119		
			4127	ATERR_L2	R
			4128		

Operation mode		
NO.	I relay symbol	R/W
4193	A.M *1	R/W
4194	R.L_L1	R/W
4195	S.R	R/W
4196		
4197	CAS_ON *2	R/W
4198	AUTO_ON *2	R/W
4199	MAN_ON *2	R/W
4200		
4201	TRK_ON_L1	R/W
4202		
4203		
4204		
4205		
4206		
4207	AT_L1_ON	R/W
4208		
4215		
4226	R.L_L2	R/W
4227		
4234		
4239	AT_L2_ON	R/W
4240		
4241	C2_AMS_ON	R
4242		
4256	FAIL_ALARM	R

*1: Effective for the control modes except for cascade control and cascade secondary-loop control.
*2: Effective for cascade control mode and cascade secondary-loop control mode.

Alarm			Alarm latch			Alarm latch		
NO.	I relay symbol	R/W	NO.	I relay symbol	R/W	NO.	I relay symbol	R/W
4321	ALM1_L1	R	4385	ALO1LA1_L1	R	4449	ALO1LA3_L1	R
4322	ALM2_L1	R	4386	ALO2LA1_L1	R	4450	ALO2LA3_L1	R
4323	ALM3_L1	R	4387	ALO3LA1_L1	R	4451	ALO3LA3_L1	R
4324			4388			4452		
4325	ALM4_L1	R	4389	ALO4LA1_L1	R	4453	ALO4LA3_L1	R
4326	ALM5_L1	R	4390	ALO5LA1_L1	R	4454	ALO5LA3_L1	R
4327	ALM6_L1	R	4391	ALO6LA1_L1	R	4455	ALO6LA3_L1	R
4328			4392			4456		
4329	ALM7_L1	R	4393	ALO7LA1_L1	R	4457	ALO7LA3_L1	R
4330	ALM8_L1	R	4394	ALO8LA1_L1	R	4458	ALO8LA3_L1	R
4331			4395			4459		
4337	ALM1_L2	R	4401	ALO1LA1_L2	R	4465	ALO1LA3_L2	R
4338	ALM2_L2	R	4402	ALO2LA1_L2	R	4466	ALO2LA3_L2	R
4339	ALM3_L2	R	4403	ALO3LA1_L2	R	4467	ALO3LA3_L2	R
4340			4404			4468		
4341	ALM4_L2	R	4405	ALO4LA1_L2	R	4469	ALO4LA3_L2	R
4342	ALM5_L2	R	4406	ALO5LA1_L2	R	4470	ALO5LA3_L2	R
4343	ALM6_L2	R	4407	ALO6LA1_L2	R	4471	ALO6LA3_L2	R
4344			4408			4472		
4345	ALM7_L2	R	4409	ALO7LA1_L2	R	4473	ALO7LA3_L2	R
4346	ALM8_L2	R	4410	ALO8LA1_L2	R	4474	ALO8LA3_L2	R
4347			4411			4475		
4353	ALO1_L1	R	4417	ALO1LA2_L1	R	4481	ALO1LA4_L1	R
4354	ALO2_L1	R	4418	ALO2LA2_L1	R	4482	ALO2LA4_L1	R
4355	ALO3_L1	R	4419	ALO3LA2_L1	R	4483	ALO3LA4_L1	R
4356			4420			4484		
4357	ALO4_L1	R	4421	ALO4LA2_L1	R	4485	ALO4LA4_L1	R
4358	ALO5_L1	R	4422	ALO5LA2_L1	R	4486	ALO5LA4_L1	R
4359	ALO6_L1	R	4423	ALO6LA2_L1	R	4487	ALO6LA4_L1	R
4360			4424			4488		
4361	ALO7_L1	R	4425	ALO7LA2_L1	R	4489	ALO7LA4_L1	R
4362	ALO8_L1	R	4426	ALO8LA2_L1	R	4490	ALO8LA4_L1	R
4363			4427			4491		
4369	ALO1_L2	R	4433	ALO1LA2_L2	R	4497	ALO1LA4_L2	R
4370	ALO2_L2	R	4434	ALO2LA2_L2	R	4498	ALO2LA4_L2	R
4371	ALO3_L2	R	4435	ALO3LA2_L2	R	4499	ALO3LA4_L2	R
4372			4436			4500		
4373	ALO4_L2	R	4437	ALO4LA2_L2	R	4501	ALO4LA4_L2	R
4374	ALO5_L2	R	4438	ALO5LA2_L2	R	4502	ALO5LA4_L2	R
4375	ALO6_L2	R	4439	ALO6LA2_L2	R	4503	ALO6LA4_L2	R
4376			4440			4504		
4377	ALO7_L2	R	4441	ALO7LA2_L2	R	4505	ALO7LA4_L2	R
4378	ALO8_L2	R	4442	ALO8LA2_L2	R	4506	ALO8LA4_L2	R
4379			4443			4507		

Alarm latch			SP number and PID number		
NO.	I relay symbol	R/W	NO.	I relay symbol	R/W
4513	ALOLA_RLS	R/W	4577	CSPN.B0	R
4514	ALM_WAIT	R/W	4578	CSPN.B1	R
4515			4579	CSPN.B2	R
4516			4580	CSPN.B3	R
4517			4581		
			4593		
			4594		
			4609	PIDN.B0_L1	R
			4610	PIDN.B1_L1	R
			4611	PIDN.B2_L1	R
			4612	PIDN.B3_L1	R
			4613		
			4625	PIDN.B0_L2	R
			4626	PIDN.B1_L2	R
			4627	PIDN.B2_L2	R
			4628	PIDN.B3_L2	R
			4629		

Key			Display, PV event status and Time event status		
NO.	I relay symbol	R/W	NO.	I relay symbol	R/W
4705	PARA_KEY	R	4769	MG1.B	R
4706	DISP_KEY	R	4770	MG2.B	R
4707	RIGHT_KEY	R	4771	MG3.B	R
4708	DOWN_KEY	R	4772		
4709	SET_KEY	R	4773	MG4.B	R
4710	UP_KEY	R	4774		
4711	LEFT_KEY	R	4775		
4712	F2_KEY	R	4776		
4713	F1_KEY	R	4777		
4714	A/M_KEY	R	4778		
4715	FN_KEY	R	4779	PVRW_L1	R
			4780	PVRW_L2	R
			4781		
			4782		
			4783		
			4784		

System Error, Input Error, and Operation Mode (4001 to 4320)

I relay No.	Symbol	Event	
4001 to 4016	SYSTEM_ERR to CTLPA_ERR	Parameter error status (Same as D2068)	
4033 to 4048	E1_ERR to COM_E3_ERR	Option error status (Same as D2070)	
4049 to 4064			
4065 to 4128	ADERR to ADBO	A/D converter error status 1 (Same as D2001)	
	PVBO_L1 to ATERR_L1	Loop-1 PV input error status (Same as D2002)	
	PVBO_L2 to ATERR_L2	Loop-2 PV input error status (Same as D2018)	
4193 to 4208	A.M_L1 to AT_L1_ON	Loop-1 operation mode status (Same as D2008)	
4225 to 4240	R.L_L2 to AT_L2_ON	Loop-2 operation mode status (Same as D2024)	
4241	C2_AMS_ON	AUTO/MAN/STOP status (Cascade secondary-loop)	0: OFF 1: ON
4256	FAIL_ALARM	FAIL alarm status (For contact output. Not available for communication.)	0: FAIL alarm 1: OFF (Normal)
4257 to 4320	Free area		

Alarm, Alarm Latch (4321 to 4576)

I relay No.	Symbol	Event	
4321 to 4336	ALM1_L1~ALM8_L1	Loop-1 alarm-1 to alarm-8 status (Same as D2011)	
4337 to 4352	ALM1_L2~ALM8_L2	Loop-2 alarm-1 to alarm-8 status (Same as D2013)	
4353 to 4368	ALO1_L1 to ALO8_L1	Loop-1 alarm-1 to alarm-8 output status (Same as D2037)	
4369 to 4384	ALO1_L2 to ALO8_L2	Loop-2 alarm-1 to alarm-8 output status (Same as D2038)	
4385 to 4400	ALO1LA1_L1 to ALO8LA1_L1	Loop-1 alarm-1 to alarm-8 latch output status (Same as D2071)	
4401 to 4416	ALO1LA1_L2 to ALO8LA1_L2	Loop-2 alarm-1 to alarm-8 latch output status (Same as D2072)	
4417 to 4432	ALO1LA2_L1 to ALO8LA2_L1	Loop-1 alarm-1 to alarm-8 latch-2 output status (Same as D2073)	
4433 to 4448	ALO1LA2_L2 to ALO8LA2_L2	Loop-2 alarm-1 to alarm-8 latch-2 output status (Same as D2074)	
4449 to 4464	ALO1LA3_L1 to ALO8LA3_L1	Loop-1 alarm-1 to alarm-8 latch-3 output status (Same as D2075)	
4465 to 4480	ALO1LA3_L2 to ALO8LA3_L2	Loop-2 alarm-1 to alarm-8 latch-3 output status (Same as D2076)	
4481 to 4496	ALO1LA4_L1 to ALO8LA4_L1	Loop-1 alarm-1 to alarm-8 latch-4 output status (Same as D2077)	
4497 to 4512	ALO1LA4_L2 to ALO8LA4_L2	Loop-2 alarm-1 to alarm-8 latch-4 output status (Same as D2078)	
4513	ALOLA_RLS	Alarm latch release flag	0: OFF 1: Latch release Automatically returned to "0".
4514	ALM_WAIT	Forced stand-by alarm flag	0: OFF 1: Forced stand-by Automatically returned to "0".

SP Number and PID Number (4577 to 4704)

I relay No.	Symbol	Event
4577 to 4592 *1	CSPN.B0 to CSPN.B3	SP number (Same as D2312)
4593 to 4608		
4609 to 4624 *1	PIDN.B0_L1 to PIDN.B3_L1	Loop-1 PID number (Same as D2009)
4625 to 4640 *1	PIDN.B0_L2 to PIDN.B3_L2	Loop-2 PID number (Same as D2025)
4641 to 4704	Free area	

*1: The information of I relays 4577 to 4592 and 4609 to 4640 is represented by 4-digit binary codes, from 0000 (0 in decimal) to 1000 (8 in decimal), which are formed by the bit combination of four I relays. The lowest-numbered I relay in each set signifies the LSB.

Key (4705 to 4768)

I relay No.	Symbol	Event
4705 to 4720	PARA_KEY to FN_KEY	Key status (Same as D6301)

Display, PV Event Status and Time Event Status (4769 to 5024)

I relay No.	Symbol	Event	
4769 to 4773	MG1.B to MG4.B	Message display interruption status (Same as D2066)	
4779	PVRW_L1	Loop-1 PV red/white switch	0: White color
4780	PVRW_L2	Loop-2 PV red/white switch	1: Red color

Input (status) relay		
NO.	I relay symbol	R/W
5025	X_DI1	R
5026	X_DI2	R
5027	X_DI3	R
5028		
5046	X_DI16	R
5047		

Output (status) relay		
NO.	I relay symbol	R/W
5153	Y_AL1	R/W
5154	Y_AL2	R/W
5155	Y_AL3	R/W

Control (status) relay		
NO.	I relay symbol	R/W
5281	AL1_CTL	R
5282	AL2_CTL	R
5283	AL3_CTL	R
5284		

Internal relay			Internal relay		
NO.	I relay symbol	R/W	NO.	I relay symbol	R/W
5537	M01	R/W	5601	M65	R/W
5538	M02	R/W	5602	M66	R/W
5539	M03	R/W	5603	M67	R/W
5540	M04	R/W	5604	M68	R/W
5541	M05	R/W	5605	M69	R/W
5542	M06	R/W	5606	M70	R/W
5543	M07	R/W	5607	M71	R/W
5544	M08	R/W	5608	M72	R/W
5545	M09	R/W	5609	M73	R/W
5546	M10	R/W	5610	M74	R/W
5547	M11	R/W	5611	M75	R/W
5548	M12	R/W	5612	M76	R/W
5549	M13	R/W	5613	M77	R/W
5550	M14	R/W	5614	M78	R/W
5551	M15	R/W	5615	M79	R/W
5552	M16	R/W	5616	M80	R/W
5553	M17	R/W	5617	M81	R/W
5554	M18	R/W	5618	M82	R/W
5555	M19	R/W	5619	M83	R/W
5556	M20	R/W	5620	M84	R/W
5557	M21	R/W	5621	M85	R/W
5558	M22	R/W	5622	M86	R/W
5559	M23	R/W	5623	M87	R/W
5560	M24	R/W	5624	M88	R/W
5561	M25	R/W	5625	M89	R/W
5562	M26	R/W	5626	M90	R/W
5563	M27	R/W	5627	M91	R/W
5564	M28	R/W	5628	M92	R/W
5565	M29	R/W	5629	M93	R/W
5566	M30	R/W	5630	M94	R/W
5567	M31	R/W	5631	M95	R/W
5568	M32	R/W	5632	M96	R/W
5569	M33	R/W	5633	M97	R/W
5570	M34	R/W	5634	M98	R/W
5571	M35	R/W	5635	M99	R/W
5572	M36	R/W	5636	M100	R/W
5573	M37	R/W	5637	M101	R/W
5574	M38	R/W	5638	M102	R/W
5575	M39	R/W	5639	M103	R/W
5576	M40	R/W	5640	M104	R/W
5577	M41	R/W	5641	M105	R/W
5578	M42	R/W	5642	M106	R/W
5579	M43	R/W	5643	M107	R/W
5580	M44	R/W	5644	M108	R/W
5581	M45	R/W	5645	M109	R/W
5582	M46	R/W	5646	M110	R/W
5583	M47	R/W	5647	M111	R/W
5584	M48	R/W	5648	M112	R/W
5585	M49	R/W	5649	M113	R/W
5586	M50	R/W	5650	M114	R/W
5587	M51	R/W	5651	M115	R/W
5588	M52	R/W	5652	M116	R/W
5589	M53	R/W	5653	M117	R/W
5590	M54	R/W	5654	M118	R/W
5591	M55	R/W	5655	M119	R/W
5592	M56	R/W	5656	M120	R/W
5593	M57	R/W	5657	M121	R/W
5594	M58	R/W	5658	M122	R/W
5595	M59	R/W	5659	M123	R/W
5596	M60	R/W	5660	M124	R/W
5597	M61	R/W	5661	M125	R/W
5598	M62	R/W	5662	M126	R/W
5599	M63	R/W	5663	M127	R/W
5600	M64	R/W	5664	M128	R/W

Internal relay			Internal relay		
NO.	I relay symbol	R/W	NO.	I relay symbol	R/W
5665	M01_B	R/W	5729	M65_B	R/W
5666	M02_B	R/W	5730	M66_B	R/W
5667	M03_B	R/W	5731	M67_B	R/W
5668	M04_B	R/W	5732	M68_B	R/W
5669	M05_B	R/W	5733	M69_B	R/W
5670	M06_B	R/W	5734	M70_B	R/W
5671	M07_B	R/W	5735	M71_B	R/W
5672	M08_B	R/W	5736	M72_B	R/W
5673	M09_B	R/W	5737	M73_B	R/W
5674	M10_B	R/W	5738	M74_B	R/W
5675	M11_B	R/W	5739	M75_B	R/W
5676	M12_B	R/W	5740	M76_B	R/W
5677	M13_B	R/W	5741	M77_B	R/W
5678	M14_B	R/W	5742	M78_B	R/W
5679	M15_B	R/W	5743	M79_B	R/W
5680	M16_B	R/W	5744	M80_B	R/W
5681	M17_B	R/W	5745	M81_B	R/W
5682	M18_B	R/W	5746	M82_B	R/W
5683	M19_B	R/W	5747	M83_B	R/W
5684	M20_B	R/W	5748	M84_B	R/W
5685	M21_B	R/W	5749	M85_B	R/W
5686	M22_B	R/W	5750	M86_B	R/W
5687	M23_B	R/W	5751	M87_B	R/W
5688	M24_B	R/W	5752	M88_B	R/W
5689	M25_B	R/W	5753	M89_B	R/W
5690	M26_B	R/W	5754	M90_B	R/W
5691	M27_B	R/W	5755	M91_B	R/W
5692	M28_B	R/W	5756	M92_B	R/W
5693	M29_B	R/W	5757	M93_B	R/W
5694	M30_B	R/W	5758	M94_B	R/W
5695	M31_B	R/W	5759	M95_B	R/W
5696	M32_B	R/W	5760	M96_B	R/W
5697	M33_B	R/W	5761	M97_B	R/W
5698	M34_B	R/W	5762	M98_B	R/W
5699	M35_B	R/W	5763	M99_B	R/W
5700	M36_B	R/W	5764	M100_B	R/W
5701	M37_B	R/W	5765	M101_B	R/W
5702	M38_B	R/W	5766	M102_B	R/W
5703	M39_B	R/W	5767	M103_B	R/W
5704	M40_B	R/W	5768	M104_B	R/W
5705	M41_B	R/W	5769	M105_B	R/W
5706	M42_B	R/W	5770	M106_B	R/W
5707	M43_B	R/W	5771	M107_B	R/W
5708	M44_B	R/W	5772	M108_B	R/W
5709	M45_B	R/W	5773	M109_B	R/W
5710	M46_B	R/W	5774	M110_B	R/W
5711	M47_B	R/W	5775	M111_B	R/W
5712	M48_B	R/W	5776	M112_B	R/W
5713	M49_B	R/W	5777	M113_B	R/W
5714	M50_B	R/W	5778	M114_B	R/W
5715	M51_B	R/W	5779	M115_B	R/W
5716	M52_B	R/W	5780	M116_B	R/W
5717	M53_B	R/W	5781	M117_B	R/W
5718	M54_B	R/W	5782	M118_B	R/W
5719	M55_B	R/W	5783	M119_B	R/W
5720	M56_B	R/W	5784	M120_B	R/W
5721	M57_B	R/W	5785	M121_B	R/W
5722	M58_B	R/W	5786	M122_B	R/W
5723	M59_B	R/W	5787	M123_B	R/W
5724	M60_B	R/W	5788	M124_B	R/W
5725	M61_B	R/W	5789	M125_B	R/W
5726	M62_B	R/W	5790	M126_B	R/W
5727	M63_B	R/W	5791	M127_B	R/W
5728	M64_B	R/W	5792	M128_B	R/W

Input (Status) Relay and Output (Status) Relay (5025 to 5280)

I relay No.	Symbol	Description
5025 to 5040	X_DI1 to X_DI3	DI1-DI3 status (Same as D7011)
5046	X_DI16	DI16 status (Same as D7012)

Control (Status) Relay (5281 to 5408)

I relay No.	Symbol	Description
5281 to 5296	AL1_CTL to AL3_CTL	Control AL1-AL3 status (Same as D7111)

Internal Relay (5537 to 5792)

I relay No.	Symbol	Description
5537 to 5664	M01 to M128	You can read/write data from/to the area via communication. (Same as D7201 to D7208) That is, you can use the area freely without affecting control function
5665 to 5696	M01_B to M32_B	You can read/write data from/to the area via communication. (Same as D7211 to D7212) That is, you can use the area freely without affecting control function
5697 to 5792	M33_B to M128_B	You can read/write data from/to the area via communication. (Same as D7213 to D7218) That is, you can use the area freely without affecting control function

DI terminals		
NO.	I relay symbol	R/W
6305	DI1	R
6306	DI2	R
6307	DI3	R
6326	DI16	R

DO terminals		
NO.	I relay symbol	R/W
6433	OUT_AL1	R
6434	OUT_AL2	R
6435	OUT_AL3	R

DI Terminals and DO Terminals (6305 to 6560)

I relay No.	Symbol	Description
6305 to 6320	DI1 to DI3	DI1-DI3 status (Same as D7601)
6326	DI16	DI16 status (Same as D7602)
6433 to 6448	OUT_AL1 to OUT_AL3	AL1-AL3 status (Same as D7611)