User's Manual

Models UT550 / UT520
Digital Indicating Controllers
User's Manual for Single-loop Control

NEW GREEN SERIES

IM 05D01C02-01E

Installation

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YOKOGAWA
Yokogawa M&C Corporation

This manual describes installation, wiring, and other tasks required to make the controller ready for operation.

Contents

1. Safety Precautions
2. Model and Suffix Codes
3. How to Install
4. How to Connect Wires
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Introduction

Thank you for purchasing the UT550/UT520 digital indicating controller.
The controller is shipped from the factory with 5 hardcopy user's manuals (A2 size) and 1 user's manual on CD-ROM.
The 5 user's manuals in hardcopy format describe the operating procedures required for basic use (factory-set to single-loop control mode). It is recommended that you refer to these user's manuals to understand [1] installation, [2] initial settings, and [3] operating procedures of the controller.
The CD-ROM contains an User's Manual (Reference) with descriptions of various functions and setting ranges that can be set as necessary. The manual also contains information on operations used to carry out control other than single-loop control.
Moreover, the use of an optional parameter setting tool (Model: LL100-E10) allows you to easily perform settings and adjustments with a PC.

■ How to Use the Manuals

Purpose	Manual Title	Description	Media
Setup	**Installation**	Describes the tasks (installation, wiring, and others) required to make the controller ready for operations.	A2-size paper, back and front
Basic operation	**Initial Settings**	Describes examples of setting PV input types, control output types, and alarm types. Making settings described herein allows you to carry out basic control.	A2-size paper, back and front
Operating procedures and troubleshooting	**Operations**	Describes key operation sequences. For operation control through external contact inputs, see the back of **Installation** User's Manual.	A2-size paper, back and front
Brief operation	**Parameter Map**	Contains the parameter map used as a guideline for setting parameters.	A2-size paper, back and front
Function description and setpoint recording	**Parameters**	Briefly describes the functions of parameters. In addition, each parameter table has a User Setting column, where you can record your setpoints when setting them in the controller.	A2-size paper, back and front
Detailed description of functions	User's Manual (Reference)	Explains more advanced applications than those found in the 5 hardcopy user's manuals (A2 size).	CD-ROM

1. Safety Precautions

The following symbol is indicated on the controller to ensure safe use.

CAUTION

This symbol on the controller indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the instrument. The manual describes how the operator should exercise special care to avoid electric shock or other dangers that may result in injury or loss of life.

The following symbols are used in the hardcopy user's manuals and in the user's manual supplied on the CD-ROM.

NOTE

Indicates that operating the hardware or software in a particular manner may damage it or result in a system failure.

IMPORTANT

Draws attention to information that is essential for understanding the operation and/or features of the controller.

2. Model and Suffix Codes

Before using the controller, check that the model and suffix codes match your order.

Model	Suffix Code	Description
UT550		Digital indicating controller (provided with retransmission output and 15 VDC loop power supply as standard)
Type	-0	Standard type
	-1	Position proportional type
	-2	Heating/cooling type
	-3	Standard type (with 24 V DC loop power supply)
	-4	Position proportional type (with 24 V DC loop power supply)
Optional functions	0	None
	1	With communication, remote input, 6 additional DIs and 4 additional DOs
	2	With communication, remote input, and 1 additional DI
	3	With 5 additional DIs and 4 additional DOs
	4	With remote input and 1 additional DI

Model	Suffix Code	Description
UT520		Digital indicating controller (provided with retransmission output and 15 VDC loop power supply as standard)
Type	-0	Standard type
Optional functions	0	None
	7	With communication, remote input, and 2 additional DIs
	8	With remote input and 2 additional DIs

Check that the following items are provided:
- Digital indicating controller (of ordered model): 1
- Brackets (mounting hardware): ..... 1 pair
- Unit label: 1
- User's Manuals for Single-loop Control: ..... 5 (A2 size)
- User's Manual (Reference) (CD-ROM Version): 1

■ Correspondence between the Model and Suffix Codes, and the Contact Input/Output Terminals Provided

Check the model ordered and the presence/absence of contact inputs and outputs in the following table.

✓ indicate that the contacts are available.

Model and Suffix Codes	Contact input terminals								Contact output terminals						
	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DO1	DO2	DO3	DO4	DO5	DO6	DO7
UT550-☐0	✓	✓							✓	✓	✓				
UT550-☐1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UT550-☐2	✓	✓						✓	✓	✓	✓				
UT550-☐3	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
UT550-☐4	✓	✓						✓	✓	✓	✓				

Note: For details on the functions of contact inputs/outputs, see "Terminal Wiring Diagrams" on the back of the manual.

✓ indicate that the contacts are available.

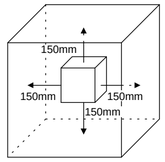
Model and Suffix Codes	Contact input terminals								Contact output terminals						
	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DO1	DO2	DO3	DO4	DO5	DO6	DO7
UT520-00	✓	✓							✓	✓	✓				
UT520-07	✓	✓	✓					✓	✓	✓	✓				
UT520-08	✓	✓	✓					✓	✓	✓	✓				

Note: For details on the functions of contact inputs/outputs, see "Terminal Wiring Diagrams" on the back of the manual.

3. How to Install

NOTE

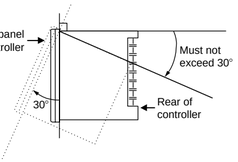
To install the controller, select a location where:
(1) no one may accidentally touch the terminals,
(2) mechanical vibrations are minimal,
(3) corrosive gas is minimal,
(4) temperature can be maintained at about 23°C and the fluctuation is minimal,
(5) no direct radiant heat is present,
(6) no magnetic disturbances are caused,
(7) no wind blows against the terminal board (reference junction compensation element),
(8) no water is splashed,
(9) no flammable materials are around,



Never place the controller directly on flammable items or equipment.
If the controller has to be installed close to flammable items or equipment, be sure to provide shielding panels all around the controller, at least 150mm away from every side; the panels should be made of either 1.43mm-thick metal-plated steel plates or 1.6mm-thick uncoated steel plates.

● Installation Position

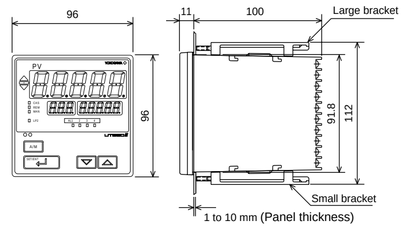
Install the controller at an angle within 30° from horizontal with the front panel facing upward. Do not install it facing downward. The position of right and left sides should be horizontal.

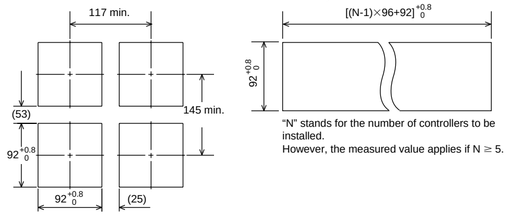


■ External Dimensions and Panel Cutout Dimensions

UT550

Unit: mm

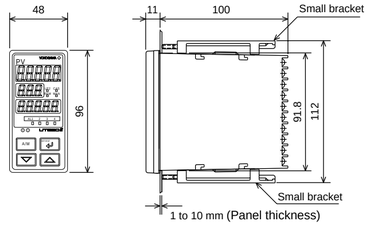


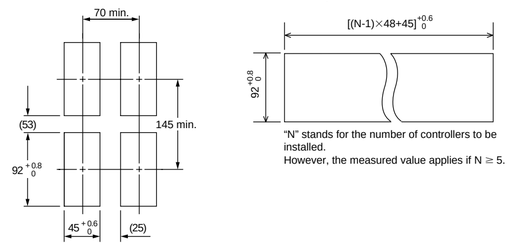


"N" stands for the number of controllers to be installed.
However, the measured value applies if N ≥ 5.

UT520

Unit: mm



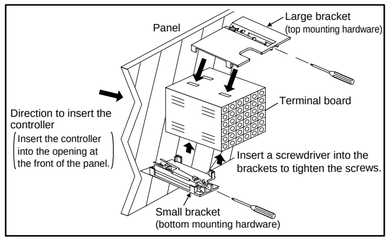


"N" stands for the number of controllers to be installed.
However, the measured value applies if N ≥ 5.

■ How to Install

CAUTION

Turn off the power to the controller before installing it on the panel because there is a possibility of electric shock.



After opening the mounting hole on the panel, follow the procedures below to install the controller:
1. Insert the controller into the opening from the front of the panel so that the terminal board on the rear is at the far side.
2. Set the brackets in place on the top and bottom of the controller as shown in the figure on the left, then tighten the screws of the brackets. Take care not to overtighten them.

4. How to Connect Wires

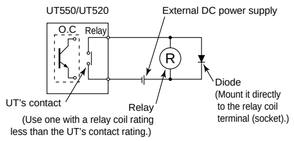
CAUTION

1) Before carrying out wiring, turn off the power to the controller and check that the cables to be connected are not alive with a tester or the like because there is a possibility of electric shock.
2) Wiring must be carried out by personnel who have basic electrical knowledge and practical experience.

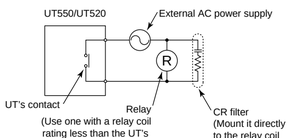
NOTE

1) Provide power from a single-phase instrument power supply. If there is a lot of noise in the power line, insert an insulating transformer into the primary side of the line and use a line filter (recommended part: ZAC2205-00U from TDK) on the secondary side.
As a countermeasures against noise, do not place the primary and secondary power cables close to each other.
2) For thermocouple 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. The cables to be used for wiring, terminal specifications, and recommended parts are as shown below.
3) Control output relays may be replaced. However, because they have a life of 100,000 times that of the resistance load, use auxiliary relays to turn on/off a load.
4) The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.
5) When there is possibility of being struck by external lightening surge, use the arrester to protect the instrument.

■ For DC Relay Wiring



■ For AC Relay Wiring

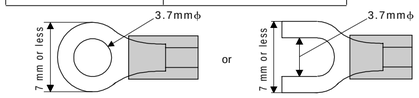


● Cable Specifications and Recommended Cables

Purpose	Name and Manufacturer
Power supply, grounding, relay contact outputs	600 V PVC insulated wires, JIS C 3307, 0.9 to 2.0 mm^2
Thermocouple	Shielded compensating leadwires, JIS C 1610, ☐X-☐-▭-☐ (See Yokogawa Electric's GS 6B1U1-E.)
RTD	Shielded wires (three conductors), UL2482 (Hitachi Cable)
Other signals	Shielded wires

● Recommended Terminal Lugs

Applicable wire size	Tightening torque
0.3 to 1.65 mm^2	0.8 N·m or less



● Terminal Covers (Optional parts)

Target Model	Part Number	Sales Unit
For UT550	T9115YD	1
For UT520	T9115YE	1

5. Hardware Specifications

PV Input Signals

- Number of inputs: 1 (terminals ⑪-⑫-⑬)
- Input type: Universal input system. The input type can be selected with the software.
- Sampling period: Can be selected from 50, 100, 200 and 500 ms.
- Burnout detection: TC, RTD, standard signal
  Functions at 0.4 to 2 V or 1 to 5 V
  Upscale, downscale, and off can be specified.
  For standard signal, burnout is determined to have occurred if it is 0.1 V or less.
- Input bias current: 0.05 μA (for TC or RTD b-terminal)
- Measurement current (RTD): About 0.13 mA
- Input resistance: 1 MΩ or more for thermocouple or mV input
  About 1 MΩ for DC voltage input
- Allowable signal source resistance: 250 Ω or less for thermocouple or mV input
  Effects of signal source resistance: 0.1 μV/Ω or less
  2 kΩ or less for DC voltage input
  Effects of signal source resistance: About 0.01%/100 Ω
- Allowable wiring resistance: for RTD input
  Maximum 150 Ω/wire: Conductor resistance between three wires should be equal
  However, 10 Ω/wire for a maximum range of -150.0 to 150.0°C.
  Wire resistance effect: ±0.1°C /10 Ω
- Allowable input voltage: ±10 V DC for thermocouple, mV, or RTD input
  ±20 V DC for DC voltage input
- Noise rejection ratio: 40 dB (50/60 Hz) or more in normal mode
  120 dB (50/60 Hz) or more in common mode
- Reference junction compensation error: ±1.0°C (15 to 35°C)
  ±1.5°C (0 to 15°C, 35 to 50°C)
- Applicable standards: JIS, IEC, DIN (ITS-90) for thermocouples and RTD

Remote Input Signals

Available only for controllers with remote input terminals

- Number of inputs: 1 (terminals ⑪-⑫)
- Input type: Settable in a range of 0-2, 0-10, 0.4-2.0, or 1-5 V DC
- Sampling period: 100, 200 and 500 ms
  The sampling period of a remote input signal is associated with the PV input's sampling period. If the PV input's sampling period is 50 ms, however, the sampling period of a remote input signal lengthens to 100 ms.
- Input resistance: About 1 MΩ
- Input accuracy: ±0.3% ±1 digit of input span for 0 to 2 V DC
  ±0.2%±1 digit of input span for 0 to 10 V DC
  ±0.375%±1 digit of input span for 0.4 to 2.0 V DC
  ±0.3%±1 digit of input span for 1 to 5 V DC
  Under standard operating conditions (23±2°C, 55±10% RH, power frequency of 50/60 Hz)

Feedback Resistance Input

Provided for position proportional type only (terminals ⑭-⑮-⑰)

- Slide resistance value: 100 Ω to 2.5 kΩ of overall resistance (burnout detection for sliding wire provided)
- Measuring resolution: ±0.1% of overall resistance

Loop Power Supply

Power is supplied to a two-wire transmitter.
(15 V DC: terminals ⑭-⑮; 24 V DC: terminals ⑭-⑱)
A resistor (10 to 250 Ω) connected between the controller and transmitter converts a current signal into a voltage signal, which is then read via the PV input terminal.
Supply voltage: 14.5 to 18.0 V DC, max. 21 mA (provided with a protection circuit against a field short-circuit); 21.6 to 28.0 V DC, max. 30 mA (only for models with 24 V DC loop power supply)

Retransmission Output

Either PV, target setpoint, or control output is output.
Either the retransmission output or the loop power supply can be used with terminals ⑭-⑮.

- Number of outputs: 1 or 2 (terminals ⑭-⑮, terminals ⑯-⑰)
- Output signal: 4-20, 0-20, 20-4, or 20-0 mA DC (where, outputting signal levels of less than 0 mA is not feasible)
- Load resistance: 600 Ω or less
- Output accuracy: ±0.1% of span (±5% of span for 1 mA or less.) under standard operating conditions (23 ±2°C, 55 ±10% RH, power frequency of 50/60 Hz)

Control Output

Universal output system, The output type can be selected with the software.
Relay contact output(s) for the position proportional type

- Current output
  (Standard type: terminals ⑯-⑰; heating-side output: terminals ⑯-⑰, cooling-side output: terminals ⑱-⑰)

Number of outputs	1 or 2 (two for heating/cooling type), switched between a voltage pulse output and current output.
Output signal	4-20, 0-20, 20-4, or 20-0 mA DC
Load resistance	600 Ω or less
Output accuracy	±0.1% of span (±5% of span for 1 mA or less) Under standard operating conditions (23±2°C, 55 ±10% RH, power frequency of 50/60 Hz)

- Voltage pulse output
  (Standard type: terminals ⑯-⑰; heating-side output: terminals ⑯-⑰, cooling-side output: terminals ㉒-㉑)

Number of outputs	1 or 2 (two for heating/cooling type), switched between a voltage pulse output and current output.
Output signal	On-voltage = 12 V or more (load resistance: 600 Ω or more) Off-voltage = 0.1 V DC or less
Resolution	10 ms or 0.1% of output, whichever is larger

- Relay contact output
  (Standard type: terminals ①-②-③, heating-side output: terminals ①-②-③, cooling-side output: terminals ㉒-㉓-㉔, position proportional type: terminals ㉒-㉓-㉔)

Number of outputs	1 or 2 points (two for heating/cooling type)
Output signal	Three terminals (NC, NO, and common)
Contact rating	250 V AC or 30 V DC, 3 A (resistance load)
Resolution	10 ms or 0.1% of output, whichever is larger

Contact Inputs

- Purpose: Target setpoint selection, remote/local mode switching, and run/stop switching
- Number of inputs: Differs with model and suffix codes as shown in the table below.

Model and Suffix Codes	Number of Inputs
UT550-☐0	2
UT550-☐1	8
UT550-☐2	3
UT550-☐3	7
UT550-☐4	3
UT520-00	2
UT520-07	4
UT520-08	4

- Input type: Non-voltage contact or transistor open collector input
- Input contact rating: 12 V DC, 10 mA or more
- On/off determination: For non-voltage contact input, contact resistance of 1 kΩ or less is determined as "on" and contact resistance of 20 kΩ or more as "off."
  For transistor open collector input, input voltage of 2 V or less is determined as "on" and leakage current must not exceed 100 μA when "off."
- Minimum status detection hold time: PV input's sampling period ×3

Contact Outputs

- Purpose: Alarm output, FAIL output, and others
- Number of outputs: Differs with the model and suffix code as shown in the table below.

Model and Suffix Codes	Number of Outputs
UT550-☐0	3
UT550-☐1	7
UT550-☐2	3
UT550-☐3	7
UT550-☐4	3
UT520-00	3
UT520-07	3
UT520-08	3

- Relay contact rating: 240 V AC, 1 A, or 30 V DC, 1 A
- Transistor contact rating: 24 V DC, 50 mA

Display Specifications

- PV display:
  5-digit, 7-segment, red LEDs, character height of 20 mm for UT550 and 12 mm for UT520
- Setpoint display: 3-digit and 5-digit, 7-segment, red LEDs, character height of 9.3 mm (for both UT520 and UT550)
- Status indicating lamps: LEDs

Safety and EMC Standards

- Safety: Compliant with IEC1010-1: 1990 and EN61010-1: 1992
  Approved by CSA1010
  CSA1010 installation category: CATII (IEC1010-1)
  Approved by UL508
- EMC standards: Complies with EN61326.
  The instrument continues to operate at a measuring accuracy of within ±20% of the range during tests.

Construction, Installation, and Wiring

- Construction: Only the front panel is dust-proof and drip-proof (protection class IP55)
  For side-by-side close installation the controller loses its dust-proof and drip-proof protection.
- Material: ABS resin and polycarbonate
- Case color: Black
- Weight: About 1 kg or less
- Dimensions:
  UT550 — 96 (W) × 96 (H) × 100 (depth from panel face) mm
  UT520 — 48(W) × 96 (H) × 100 (depth from panel face) mm
- Installation: Panel-mounting type. With top and bottom mounting hardware (1 each)
- Panel cutout dimensions:
  UT550 — 92 +0.8 0 (W) × 92 +0.8 0 (H) mm
  UT520 — 45 +0.6 0 (W) × 92 +0.8 0 (H) mm
- Installation position: Up to 30° upward facing (not designed for facing downward)
- Wiring: M3.5 screw terminals (for signal wiring and power/ground wiring as well)

Power Supply Specifications

- Power supply: Rated voltage of 100 to 240 V AC (±10%), 50/60 Hz
- Power consumption: Max. 20 VA (8.0 W max.)
- Internal fuse rating: 250 V AC, 1.6A time-lag fuse
- Data backup: Non-volatile memory (can be written to up to 100,000 times)
- Withstanding voltage
  - Between primary terminals* and secondary terminals**: At least 1500 V AC for 1 minute (Note)
  - Between primary terminals* and grounding terminal: At least 1500 V AC for 1 minute (Note)
  - Between grounding terminal and secondary terminals**: At least 1500 V AC for 1 minute
  - Between secondary terminals**: At least 500 V AC for 1 minute

  * Primary terminals indicate power terminals and relay output terminals
  ** Secondary terminals indicate analog I/O signal, voltage pulse output, and contact input terminals
  Note: The withstanding voltage is specified as 2300 V AC per minute to provide a margin of safety.
- Insulation resistance: 20 MΩ or more at 500 V DC between power terminals and grounding terminal
- Grounding: Class 3 grounding (grounding resistance: 100 Ω or below)

Signal Isolations

- PV input terminals: Isolated from other input/output terminals. Not isolated from the internal circuit.
- Remote input terminals: Isolated from other input/output terminals and the internal circuit
- 15 V DC loop power supply terminals: Not isolated from analog current output nor voltage pulse control output. Isolated from other input/output terminals and internal circuit.
- 24 V DC loop power supply terminals: Isolated from 4-20 mA analog output, other input/output terminals and the internal circuit.
- Analog current output terminals (for control output and retransmission): Not isolated between current outputs nor from 15 V DC loop power supply and voltage pulse control output. Isolated from other input/output terminals and internal circuit.
- Voltage pulse control output terminals: Not isolated from current outputs and 15 V DC loop power supply. Isolated from other input/output terminals and internal circuit.
- Relay contact control output terminals: Isolated between contact output terminals and from other input/output terminals and internal circuit.
- Contact input terminals: Not isolated between contact input terminals and from communication terminals. Isolated from other input/output terminals and internal circuit.
- Relay contact output terminals: Not isolated between relay contact outputs. Isolated from other input/output terminals and internal circuit.
- Transistor contact output terminals: Not isolated between transistor contact outputs. Isolated from other input/output terminals and internal circuit.
- RS-485 communication terminals: Not isolated from contact input terminals. Isolated from other input/output terminals and internal circuit.
- Feedback slide resistance input terminals: Not isolated from analog current output terminals (control, retransmission), 15 V loop power supply, and voltage pulse control outputs. Isolated from other input/output terminals and internal circuit.
- Power terminals: Isolated from other input/output terminals and internal circuit.
- Grounding terminals: Isolated from other input/output terminals and internal circuit.

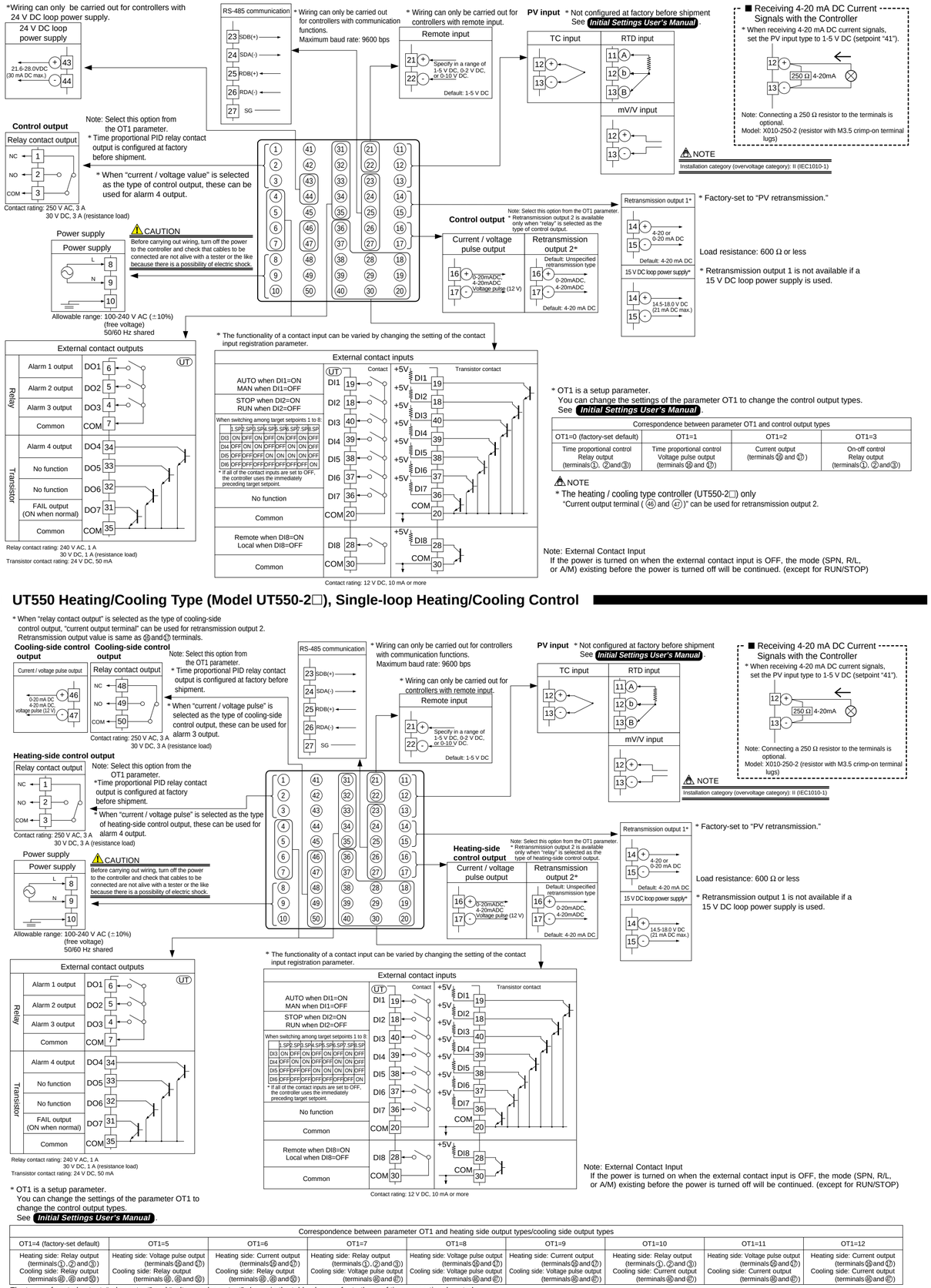
Environmental Conditions

- Normal operating conditions:
  Ambient temperature: 0 to 50°C (40°C or less for side-by-side close installation)
  Temperature change rate: 10°C/h or less
  Ambient humidity: 20 to 90% RH (no condensation allowed)
  Magnetic field: 400 A/m or less
  Continuous vibration at 5 to 14 Hz: Full amplitude of 1.2 mm or less
  Continuous vibration at 14 to 150 Hz: 4.9 m/s^2 or less
  Short-period vibration: 14.7 m/s^2, 15 seconds or less
  Shock: 147 m/s^2 or less, 11 ms
  Installation height: Height above sea level of 2000 m or less
  Warm-up time: 30 minutes or more after power on
- Transportation and storage conditions:
  Temperature: -25 to 70°C
  Temperature change rate: 20°C/h or less
  Humidity: 5 to 95% RH (no condensation allowed)
- Effects of changes in operating conditions
  - Effects from changes in ambient temperature:
    - On voltage or thermocouple input, ±1 μV/°C or ±0.01% of F.S./°C, whichever is larger
    - On remote input, ±0.02% of F.S./°C
    - On RTD input, ±0.05°C /°C (ambient temperature) or less
    - On analog output, ±0.05% of F.S./°C or less
  - Effects from power supply fluctuation (within rated voltage range)
    - On analog input, ±1 μV/10 V or ±0.01% of F.S./10 V, whichever is larger
    - On analog output, ±0.05% of F.S./ 10 V or less

6. Terminal Wiring Diagrams

NOTE
Do not use unassigned terminals as relay terminals.

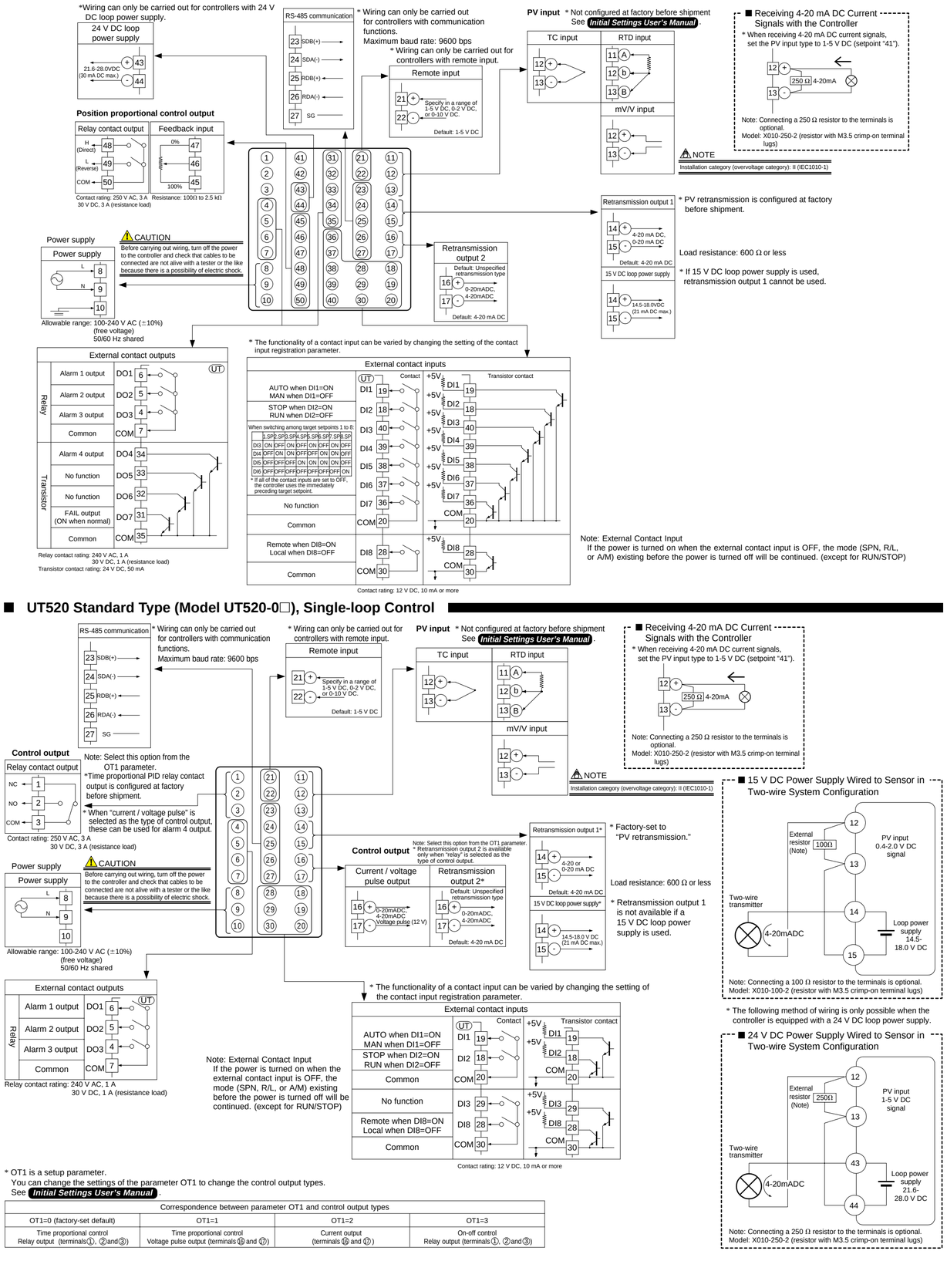
■ UT550 Standard Type (Model UT550-0□ or UT550-3□), or Heating/Cooling Type (Model UT550-2□), Single-loop Control



■ UT550 Heating/Cooling Type (Model UT550-2□), Single-loop Heating/Cooling Control

The types of control output, "relay output" and "voltage pulse output" shown in the table above refer to those of time proportional control.
To change to a relay output for on-off control, select "Relay Terminals" and change the setpoint of the proportional band to "0."

■ UT550 Position Proportional Type (Model UT550-1□ or UT550-4□), Single-loop Position Proportional Control



■ UT520 Standard Type (Model UT520-0□), Single-loop Control

User's Manual

Models UT550 / UT520
Digital Indicating Controllers
User's Manual for Single-loop Control

NEW GREEN SERIES

IM 05D01C02-02E **Initial Settings**

2nd Edition: Jul 1, 2001

YOKOGAWA
Yokogawa M&C Corporation

This manual describes examples of setting PV input types, control output types, and alarm types. Carrying out settings described herein allows you to perform basic control. Refer to examples of various settings to understand how to set parameters required. Refer to "*1. Parameter Map*" in ***Parameters User's Manual*** for an easy to understand explanation of setting various parameters. If you cannot remember how to carry out an operation during setting, press the ENTER key for more than 3 seconds. This brings you to the display (operating display) that appears at power-on.

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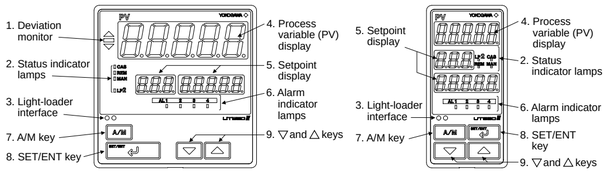
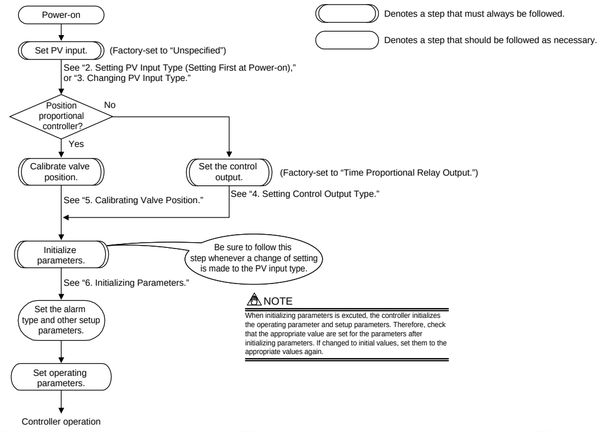
6. Initializing Parameters
7. Changing Alarm Type
8. Description of Multiple Setpoints and PID

1. Names and Functions of Front Panel Parts



	Name of Part	Function
1.	Deviation monitor (for UT550 only)	When lit, indicates the status of a deviation (PV - SP). △: Is lit (in orange) if a deviation exceeds the deviation display range. ▭: Is lit (in green) when a deviation is within the deviation display range. ▽: Is lit (in orange) if a deviation falls below the deviation display range. The deviation monitor goes off if any display other than the operating display or SELECT display is shown. (The deviation display range can be changed using the setup parameter "DVB".)
2.	Status indicator lamps	Is lit (in green) to indicate the status of operation or control. CAS: Not used in single-loop control. REM: Is lit when in remote mode. MAN: Is lit when in manual mode. LP2: Not used in single-loop control.
3.	Light-loader interface	Interface for an adapter cable used when setting and storing parameters from a PC. This requires an optional parameter setting tool.
4.	Process variable (PV) display	Displays PV. Displays an error code (in red) if an error occurs.
5.	Setpoint display	Displays a parameter symbol in 3-digit LED. Displays the setpoint of a parameter in 5-digit LED.
6.	Alarm indicator lamps	If any of alarms 1 to 4 occurs, the respective alarm indicator lamp (AL1 to AL4) is lit (in orange).
7.	A/M key A/M	Used to switch between the AUTO and MAN modes. Each time you press the key, it switches to the AUTO or MAN mode alternately.
8.	SET/ENT key SET/ENT	Used to switch or register a parameter. Pressing the key for more than 3 seconds allows you to switch between the operating display and the main menu for operating parameter setting display alternately.
9.	▽and △ keys	Used to change numerical values. On setting displays for various parameters, you can change target setpoints, parameters, and output values (in manual operation). Pressing the ▽ key decreases a numerical value, while pressing the △ key causes it to increase. You can hold down a key to gradually increase the speed of change. To change from the parameter setting (operating or setup) display to the menu or from the setup parameter setting display menu to operating parameter setting display menu, press the ▽ and △ keys simultaneously.

Setup Procedure



NOTE

When initializing parameters is excuted, the controller initializes the operating parameter and setup parameters. Therefore, check that the appropriate value are set for the parameters after initializing parameters. If changed to initial values, set them to the appropriate values again.

The following explanation of operation for the UT550's panel, shown in the figure, is the same as that of the UT520's panel.

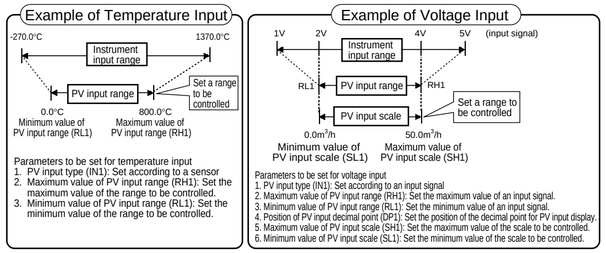
■ Setting of Main Parameters at the Factory before Shipment

Item	Factory-shipped values for standard type controllers	Factory-shipped values for heating/cooling type controllers	Factory-shipped values for position proportional type controllers
Remote input signal (only for controllers with remote inputs)	1 to 5 V DC (variable)		
Control output	Time proportional PID relay output (variable)	Heating side: Time proportional PID relay output (variable) Cooling side: Time proportional PID relay output (variable)	Relay output (fixed)
Control action	Reverse action (variable)	Not specified	
PID parameter	P = 5.0%, I = 240 seconds, D = 60 seconds.		
Alarm output	Alarm-1: PV high limit, Alarm-2: PV low limit, Alarm-3: PV high limit, Alarm-4: PV low limit		

2. Setting PV Input Type (Setting First at Power-on)

NOTE

- The controller displays an operating display when the power is turned on. The submenu "IN" appears at this point if the type of PV input has not been defined yet. In this case, first press the ENTER key once to display the parameter "IN1" for the PV input type, and use the △ key to display the input range code to use, then press the ENTER key to register it. Then, set the maximum value (RH1) and minimum value (RL1) of the PV input range (for voltage input, set the maximum value (SH1) and minimum value (SL1) of the PV input scale). See the operating procedure below for more details.
- The controller is configured to the default of each parameter at the factory before shipment. First check these defaults listed in ***Parameters User's Manual***, and change their values if necessary.



The following operating procedure describes an example of setting a K-type thermocouple (-200.0 to 500.0°C) and a measurement range of 0.0 to 200.0°C.

1. Display view at power-on

2. Press the ENTER key once to display the parameter IN1 (PV input type).

3. Press the △ or ▽ key to display the required setpoint.
The figure below shows an example of a K-type thermocouple (-200.0°C to 500.0°C). See "Instrument Input Range Codes."

4. Press the ENTER key once to register the setpoint.

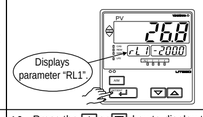
5. Press the ENTER key once to display the parameter "UN1" (PV input unit).

6. Press the ENTER key once to display the parameter "RH1" (maximum value of PV input range).

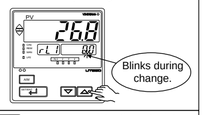
7. Press the △ or ▽ key to display the required setpoint.
The figure below shows an example of setting the minimum value of the PV input range to 200.0°C.

8. Press the ENTER key once to register the setpoint.

9. Press the ENTER key once to display the parameter "RL1" (minimum value of PV input range).



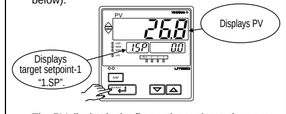
10. Press the △ or ▽ key to display the required setpoint.
The figure below shows an example of setting the minimum value of the PV input range to 0.0°C.



11. Press the ENTER key once to register the setpoint.

If the type of input is voltage, also configure the PV Input Decimal Point Position (DP1), Maximum Value of PV Input Scale (SH1) and Minimum Value of PV Input Scale (SL1) parameters that follow this step.

12. Press the ENTER key for more than 3 seconds. This returns you to the display shown at power-on (figure below).



The PV display in the figure above shows the error code for input burnout (*bolt*) if PV input wiring is not yet complete. The error code disappears when you wire the PV input terminals correctly.

■ Instrument Input Range Codes

Select the unit from the UNIT parameter.

Input	Type	Instrument Input Range Code	Instrument Input Range	Measurement Accuracy
Unspecified		OFF	Set the data item PV Input Type "IN1" to the OFF option to leave the PV input type undefined.	
Thermocouple	K	1	-270.0 to 1370.0°C -450.0 to 2500.0°F	±0.1% of instrument range ±1 digit at 0°C or more ±0.2% ±1 digit for temperatures below 0°C, where the accuracy is: ±2% of instrument range ±1 digit for temperatures below -200.0°C for a type-K thermocouple, or ±1% of instrument range ±1 digit for temperatures below -200.0°C for a type-T thermocouple.
	K	2	-270.0 to 1000.0°C -450.0 to 2300.0°F	
	K	3	-200.0 to 500.0°C -200.0 to 1000.0°F	
	J	4	-200.0 to 1200.0°C -300.0 to 2300.0°F	
	T	5	-270.0 to 400.0°C -450.0 to 750.0°F	
	T	6	0.0 to 400.0°C -200.0 to 750.0°F	
	B	7	0.0 to 1800.0°C 32 to 3300°F	±0.15% of instrument range ±1 digit at 400°C or more ±5% of instrument range ±1 digit at less than 400°C
	S	8	0.0 to 1700.0°C 32 to 3100°F	±0.15% of instrument range ±1 digit
	R	9	0.0 to 1700.0°C 32 to 3100°F	
	N	10	-200.0 to 1300.0°C -300.0 to 2400.0°F	±0.1% of instrument range ±1 digit ±0.25% of instrument range ±1 digit for temperatures below 0°C
	E	11	-270.0 to 1000.0°C -450.0 to 1800.0°F	±0.1% of instrument range ±1 digit at 0°C or more ±0.2% ±1 digit for temperatures below 0°C, where the accuracy is: ±1.5% of instrument range ±1 digit for temperatures below -200.0°C for a type-E thermocouple.
	L(DIN)	12	-200.0 to 900.0°C -300.0 to 1600.0°F	
	U(DIN)	13	-200.0 to 400.0°C -300.0 to 750.0°F	
	U(DIN)	14	0.0 to 400.0°C -200.0 to 1000.0°F	
	W	15	0.0 to 2300.0°C 32 to 4200°F	±0.2% of instrument range ±1 digit
	Platinel 2	16	0.0 to 1390.0°C 32.0 to 2500.0°F	±0.1% of instrument range ±1 digit
	PR20-40	17	0.0 to 1900.0°C 32 to 3400°F	±0.5% of instrument range ±1 digit at 800°C or more No accuracy is guaranteed at less than 800°C
	W97Re3-W75Re25	18	0.0 to 2000.0°C 32 to 3600°F	±0.2% of instrument range ±1 digit
RTD	JPt100	30	-200.0 to 500.0°C -300.0 to 1000.0°F	±0.1% of instrument range ±1 digit (Note1) (Note2)
	JPt100	31	-150.00 to 150.00°C -200.0 to 300.0°F	±0.2% of instrument range ±1 digit (Note1)
	Pt100	35	-200.0 to 850.0°C -300.0 to 1560.0°F	±0.1% of instrument range ±1 digit (Note1) (Note2)
	Pt100	36	-200.0 to 500.0°C -300.0 to 1000.0°F	
	Pt100	37	-150.00 to 150.00°C -200.0 to 300.0°F	±0.2% of instrument range ±1 digit (Note1)
Standard signal	0.4 to 2 V	40	0.400 to 2.000 V	±0.1% of instrument range ±1 digit Display range is scalable in a range of -19999 to 30000. Display span is 30000 or less.
	1 to 5 V	41	1.000 to 5.000 V	
DC voltage	0 to 2 V	50	0.000 to 2.000 V	
	0 to 10 V	51	0.00 to 10.00 V	
	-10 to 20 mV	55	-10.00 to 20.00 mV	
	0 to 100 mV	56	0.0 to 100.0 mV	

* Performance in the standard operating conditions (at 23±2°C, 55±10%RH, and 50/60 Hz power frequency)
Note1: The accuracy is ±0.3°C of instrument range ±1 digit for a temperature range from 0°C to 100°C.
Note2: The accuracy is ±0.5°C of instrument range ±1 digit for a temperature range from -100°C to 200°C.
* To receive a 4-20 mA DC signal, select a standard signal of 1 to 5 V DC and connect it to a 250Ω resistor. This resistor is optional.
Model: X010-250-2 (resistor with M3.5 crimp-on terminal lugs)

NOTE

The controller may automatically initialize the registered operating parameter setpoints if any change is made to the data item PV Input Type (IN1), Maximum Value of PV Input Range (RH1), Minimum Value of PV Input Range (RL1), PV Input Decimal Point Position (DP1), Maximum Value of PV Input Scale (SH1) or Minimum Value of PV Input Scale (SL1). After a change has been made to any of these data items, be sure to verify the registered operating parameter setpoints to ensure that they are correct. If any data item has been changed to its default, set it to a required value.

How to return to a menu

Simultaneously press both the ▽ and △ keys once during parameter setting. This lets you return to the parameter menu.

Ranges Selectable for PV Input

Thermocouple	1 to18
RTD	30, 31, 35 to 37
DC voltage(mV,V)	40, 41, 50, 51, 55, 56

Ranges Selectable for Remote Input

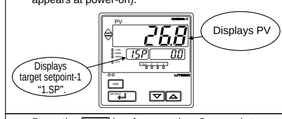
DC voltage(V)	40, 41, 50, 51

3. Changing PV Input Type

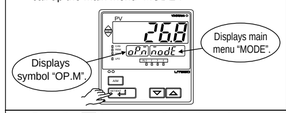
The following operating procedure describes an example of changing the setting of K-type thermocouple (-200.0 to 500.0°C) to RTD Pt100 (-200.0 to 500.0°C) and a measurement range of 0.0 to 200.0°C.

PV input terminal
Thermocouple/mV/V input..... ②-③
RTD input ..... ①-②-③

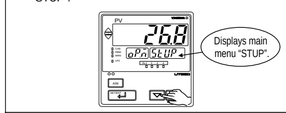
1. Bring the operating display into view (display appears at power-on).



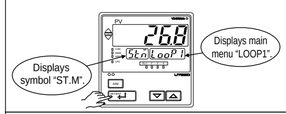
2. Press the ENTER key for more than 3 seconds to call up the main menu "MODE".



3. Press the ▽ key once to display the main menu "STUP".



4. Press the ENTER key once to display the main menu "LOOP1".



5. Press the ENTER key once to display the main menu "UTMD".

6. Press the ENTER key once to display the submenu "MD".

7. Press the △ key once to display the submenu "IN".

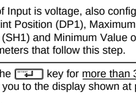
8. Press the ENTER key once to display the parameter "IN1" (PV input type).

9. Press the △ or ▽ key to display the required setpoint. The figure below shows an example of setting the PV input type to a Pt100 resistance temperature detector (-200.0°C to 500.0°C).

10. Press the ENTER key once to register the setpoint.

11. Press the ENTER key once to display the parameter "UN1".

12. Press the ENTER key once to display the parameter "RH1" (maximum value of PV input range).



13. Press the △ or ▽ key to display the required setpoint. The figure below shows an example of setting the maximum value of the PV input range to 200.0°C.

14. Press the ENTER key once to register the setpoint.

15. Press the ENTER key once to display the parameter "RL1" (minimum value of PV input range).

16. Press the △ or ▽ key to display the required setpoint. The figure below shows an example of setting the minimum value of the PV input range to 0.0°C.

17. Press the ENTER key once to register the setpoint.

If the type of Input is voltage, also configure the PV Input Decimal Point Position (DP1), Maximum Value of PV Input Scale (SH1) and Minimum Value of PV Input Scale (SL1) parameters that follow this step.

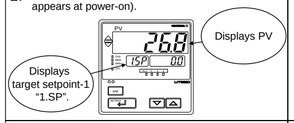
18. Press the ENTER key for more than 3 seconds. This returns you to the display shown at power-on (figure below).

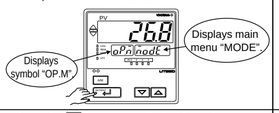
4. Setting Control Output Type (Except for a Position Proportional Controller)

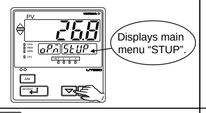
The following operating procedure describes an example of changing time proportional PID relay output (0: factory-shipped value) to current output (2).

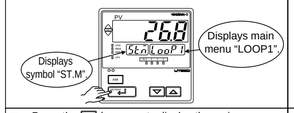
Control output terminal Values in parentheses are setpoints
Time proportional PID relay (0)/on-off(3) output..... ①-②-③
Current PID (2)/time proportional PID voltage pulse (1) output..... ⑯-⑰

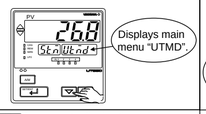
For details on the output terminals for heating/cooling control, see "*6. Terminal Wiring Diagrams*" in the **Installation User's Manual**.

1. Bring the operating display into view (display appears at power-on).


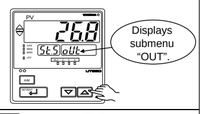
2. Press the ↵ key for more than 3 seconds to call up the main menu "MODE".


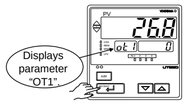
3. Press the ▽ key once to display the main menu "STUP".


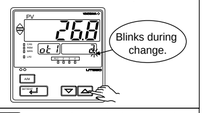
4. Press the ↵ key once to display the main menu "LOOP1".


5. Press the ▽ key once to display the main menu "UTMD".


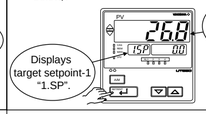
6. Press the ↵ key once to display the submenu "MD".


7. Press the △ key twice to display the submenu "OUT".


8. Press the ↵ key once to display the parameter "OT1" (control output type).


9. Press the △ or ▽ key to display the required setpoint. The figure below shows an example of setting to current output (4 to 20 mA DC).


10. Press the ↵ key once to register the setpoint.

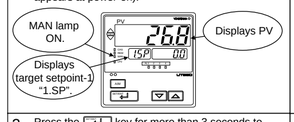

11. Press the ↵ key for more than 3 seconds. This returns you to the display shown at power-on (figure below).


● List of Control Output Types

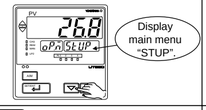
Parameter Symbol	Name of Parameter	Setpoint	Control Output Types
ot 1 (OT1)	Control output type	0	Time proportional PID relay contact output (terminals ① - ② - ③)
		1	Time proportional PID voltage pulse output (terminals ⑯ - ⑰)
		2	Current output (terminals ⑯ - ⑰)
		3	On/off control relay contact output (terminals ① - ② - ③)
		The following 4 to 12 are displayed only for heating/ cooling type controllers.	
		4	Heating-side relay output (terminals ① - ② - ③), cooling-side relay output (terminals ⑱ - ⑲ - ⑳)
		5	Heating-side pulse output (terminals ㉕ - ㉗), cooling-side relay output (terminals ⑱ - ⑲ - ⑳)
		6	Heating-side current output (terminals ㉔ - ㉗), cooling-side relay output (terminals ⑱ - ⑲ - ⑳)
		7	Heating-side relay output (terminals ① - ② - ③), cooling-side pulse output (terminals ㉕ - ㉗)
		8	Heating-side pulse output (terminals ㉕ - ㉗), cooling-side pulse output (terminals ㉕ - ㉗)
		9	Heating-side current output (terminals ㉔ - ㉗), cooling-side pulse output (terminals ㉕ - ㉗)
		10	Heating-side relay output (terminals ① - ② - ③), cooling-side current output (terminals ㉔ - ㉗)
		11	Heating-side pulse output (terminals ㉕ - ㉗), cooling-side current output (terminals ㉔ - ㉗)
		12	Heating-side current output (terminals ㉔ - ㉗), cooling-side current output (terminals ㉔ - ㉗)

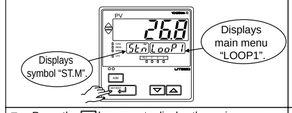
5. Calibrating Valve Position (for a Position Proportional Controller Only)

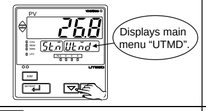
The following operation describes a procedure of inputting a feedback signal from a control valve to calibrate the full closed and full open positions of the valve automatically. To calibrate the valve position, you need to carry out wire connections and bring the controller into manual mode. For connections, see "*6. Terminal Wiring Diagrams*" in **Installation User's Manual** and for entering the manual mode, see "*8. Switching between AUTO and MAN*" in **Operations User's Manual**.

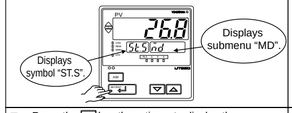
1. Bring the operating display into view (display appears at power-on).


2. Press the ↵ key for more than 3 seconds to call up the main menu "MODE".

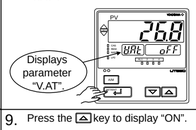

3. Press the ▽ key once to display the main menu "STUP".


4. Press the ↵ key once to display the main menu "LOOP1".


5. Press the ▽ key once to display the main menu "UTMD".


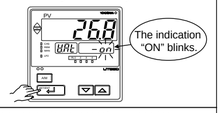
6. Press the ↵ key once to display the submenu "MD".


7. Press the ▽ key three times to display the submenu "VALV".

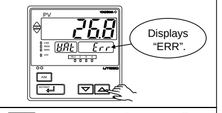

8. Press the ↵ key once to display the parameter "V.AT".


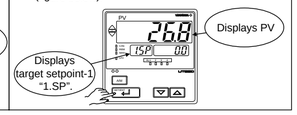
9. Press the △ key to display "ON".


10. Press the ↵ key once. The controller automatically calibrates the valve position (fully open or closed).


11. The controller is viewed as shown below when the valve position is being automatically calibrated.


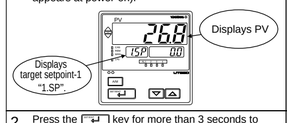
12. Calibration has ended successfully when the indication changes from "ON" to "OFF". Go to step [14].


13. Calibration has ended unsuccessfully if the indication changes from "ON" to "ERR". Check the feedback input wiring and carry out automatic calibration again.


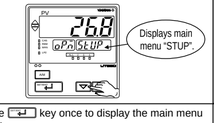
14. Press the ↵ key for more than 3 seconds. This returns you to the display shown at power-on (figure below).


6. Initializing Parameters

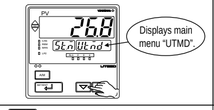
Be sure to follow the steps below after a change of setting has been made to the data item PV Input Type, PV Input Range or PV Input Scale.

1. Bring the operating display into view (display appears at power-on).


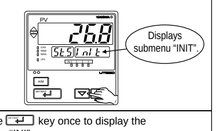
2. Press the ↵ key for more than 3 seconds to call up the main menu "MODE".


3. Press the ▽ key once to display the main menu "STUP".


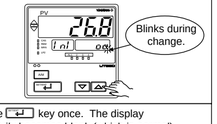
4. Press the ↵ key once to display the main menu "LOOP1".


5. Press the ▽ key once to display the main menu "UTMD".


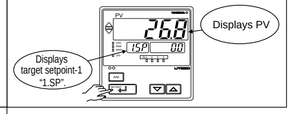
6. Press the ↵ key once to display the submenu "MD".


7. Press the ▽ key twice to display the submenu "INIT".


8. Press the ↵ key once to display the parameter "INI".


9. Press the △ key to display "ON".


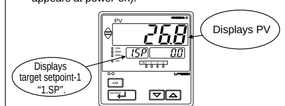
10. Press the ↵ key once. The display momentarily becomes blank (which is normal), indicating the parameters have been initialized.


11. Press the ↵ key for more than 3 seconds. This returns you to the display shown at power-on (figure below).


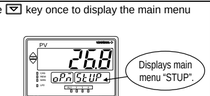
7. Changing Alarm Type

The following operating procedure describes an example of changing alarm 1 (factory-set to the PV high limit alarm) to the PV low limit alarm.
When you have changed alarm type, the alarm setpoint will be initialized; set the alarm setpoint again.

Alarm output terminals — Factory-shipped settings
Alarm-1 (terminal numbers ⑥-⑦).....PV high limit alarm
Alarm-2 (terminal numbers ⑤-⑦).....PV low limit alarm
Alarm-3 (terminal numbers ④-⑦).....PV high limit alarm
Alarm-4 (terminal numbers ㉘-㉙).....PV low limit alarm

1. Bring the operating display into view (display appears at power-on).


2. Press the ↵ key for more than 3 seconds to call up the main menu "MODE".


3. Press the ▽ key once to display the main menu "STUP".


4. Press the ↵ key once to display the main menu "LOOP1".


5. Press the ↵ key once to display the submenu "SP".

6. Press the △ key once to display the submenu "ALM".

7. Press the ↵ key once to display the parameter "AL1" (alarm-1 type).

8. Press the △ or ▽ key to display the required setpoint. The figure below shows an example of setting the PV low limit alarm.

9. Press the ↵ key once to register the setpoint.

You can take the same steps for alarm-2 type (AL2), alarm-3 type (AL3), and alarm-4 type (AL4) that are displayed after this.

10. Press the ↵ key for more than 3 seconds. This returns you to the display shown at power-on (figure below).

11. When setting alarm setpoints, see "*5. Setting Alarm Setpoints*" in **Operations User's Manual**.

■ List of Alarm Types

The table below shows the alarm types and alarm actions.
In the table, codes 1 to 10 are not provided with stand-by actions, while codes 11 to 20 are provided with stand-by actions.

Alarm type	Alarm action "Open/close" shows status of relay contact, and "lit" and "unlit" shows status of lamp	Alarm type code: Contact closes if alarm occurs	Alarm type code: Contact opens if alarm occurs
No alarm	OFF		
PV high limit	Hysteresis; Open (unlit) Closed (lit); PV Alarm setpoint	1	11
PV low limit	Hysteresis; Closed (lit) Open (unlit); Alarm setpoint PV	2	12
Deviation high limit	Hysteresis; Open (unlit) Closed (lit); PV Target SP Deviation setpoint	3	13
Deviation low limit	Hysteresis; Closed (lit) Open (unlit); Deviation setpoint PV Target SP	4	14
De-energized on deviation high limit alarm	Hysteresis; Closed (unlit) Open (lit); PV Deviation setpoint Target SP	5	15
Timer function (conrol stability report event) (Alarm-1 only)	Upward (hour/minute)	21	
	Downward (hour/minute)	22	
	Upward (minute/second)	23	
	Downward (minute/second)	24	
SP high limit	Hysteresis; Open (unlit) Closed (lit); SP Alarm setpoint	28	
SP low limit	Hysteresis; Closed (lit) Open (unlit); Alarm setpoint SP	29	
De-energized on deviation low limit alarm	Hysteresis; Open (lit) Closed (unlit); Deviation setpoint PV Target SP		6 16
Deviation high and low limits	Hysteresis Hysteresis; Closed (lit) Open (unlit) Closed (lit); Deviation setpoint PV Target SP		7 17
Deviation within high and low limits	Hysteresis Closed (lit) Hysteresis; Open (unlit) Open (unlit); Deviation setpoint PV Target SP		8 18
De-energized on PV high limit	Hysteresis; Closed (unlit) Open (lit); PV Alarm setpoint		9 19
De-energized on PV low limit	Hysteresis; Open (lit) Closed (unlit); Alarm setpoint PV		10 20
Sensor grounding alarm	Sensor grounding alarm		25
Fault diagnosis output (Note1)	Fault diagnosis output		26
FAIL output (Note2)	The controller stops when in a FAIL state. The control output is set to "OFF" or "ON" and the alarm output is set to "OFF".		27
Output high limit	Hysteresis; Open (unlit) Closed (lit); Output value Alarm setpoint		30
Output low limit	Hysteresis; Closed (lit) Open (unlit); Alarm setpoint Output value		31

Note 1: The fault diagnosis output turns on in case of input burnout, A/D converter failure, or reference junction compensation (RJC) failure. For input burnout or A/D converter failure, the control output is set to the setpoint of the Preset Output Value operating parameter (PO).

Note 2: The FAIL output is on during normal operation and turns off in case of failure.

Stand-by Action

It is effective in the following cases where;
- the power is turned on
- the target setpoint is changed
- the target setpoint number is switched (however, except for remote setpoint)
- the alarm type is changed

8. Description of Multiple Setpoints and PID

The UT550/UT520 has a maximum of eight target setpoints, and has PID for each of these setpoints. The following shows the correspondence between the target setpoint numbers (SPN), target setpoints (SP), and PID parameters.
For example, if you have set "2" to the target setpoint number (SPN), the control parameters available are target setpoint (2.SP), proportional band (heating-side proportional band) (2.P), integral time (heating-side integral time) (2.I), derivative time (heating-side derivative time) (2.D), cooling-side proportional band (2.Pc), cooling-side integral time (2.Ic), and cooling-side derivative time (2.Dc).
To use multiple target setpoints, see the table below to check the corresponding parameters.

Target setpoint number (SPN)	Target setpoint (SP)	PID parameter: Proportional band (heating-side proportional band)	Integral time (heating-side integral time)	Derivative time (heating-side derivative time)	Cooling-side proportional band	Cooling-side integral time	Cooling-side derivative time
SPN=1	1.SP	1.P	1.I	1.D	1.Pc	1.Ic	1.Dc
SPN=2	2.SP	2.P	2.I	2.D	2.Pc	2.Ic	2.Dc
SPN=3	3.SP	3.P	3.I	3.D	3.Pc	3.Ic	3.Dc
SPN=4	4.SP	4.P	4.I	4.D	4.Pc	4.Ic	4.Dc
SPN=5	5.SP	5.P	5.I	5.D	5.Pc	5.Ic	5.Dc
SPN=6	6.SP	6.P	6.I	6.D	6.Pc	6.Ic	6.Dc
SPN=7	7.SP	7.P	7.I	7.D	7.Pc	7.Ic	7.Dc
SPN=8	8.SP	8.P	8.I	8.D	8.Pc	8.Ic	8.Dc

User's Manual

Models UT550 / UT520
Digital Indicating Controllers
User's Manual for Single-loop Control

NEW GREEN SERIES

Operations

IM 05D01C02-03E

2nd Edition: Jul 1, 2001

YOKOGAWA
Yokogawa M&C Corporation

This manual describes key entries for operating the controller. For operations using external contact inputs, see "*6. Terminal Wiring Diagrams*" in ***Installation User's Manual***. If you cannot remember how to carry out an operation during setting, press the [↵] key for more than 3 seconds. This brings you to the display (operating display) that appears at power-on.

Contents

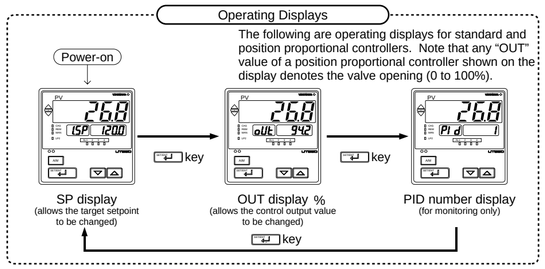
1. Monitoring-purpose Operating Displays Available during Operation
2. Setting Target Setpoint (SP)
3. Performing/Canceling Auto-tuning
4. Setting PID Manually
5. Setting Alarm Setpoints
6. Selecting Target Setpoint Numbers (SPN)
7. Switching between Run and Stop
8. Switching between AUTO and MAN
9. Manipulating Control Output during Manual Operation
10. Switching between Remote (REM) and Local (LCL)
11. Troubleshooting

1. Monitoring-purpose Operating Displays Available during Operation

The monitoring-purpose operating displays available during operation are roughly classified into two groups depending on the types of controller and control output. One group is operating displays for standard and position proportional controllers and the other group is operating displays for a heating/cooling controller.

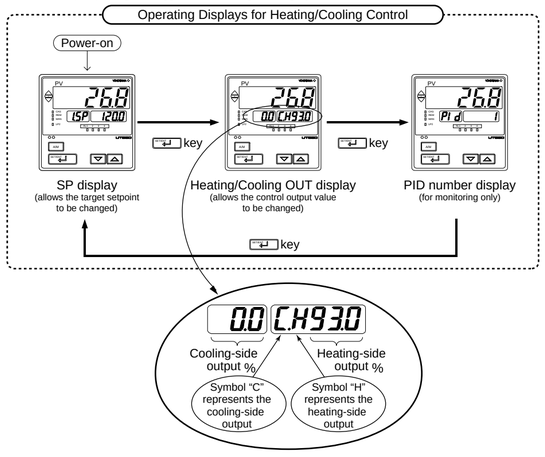
■ Operating Displays for Standard and Position Proportional Controllers

● SP Display
The PV input value appears on the PV display.
The target setpoint (1.SP) appears on the Setpoint display. (can be changed)
● OUT Display
The PV input value appears on the PV display.
The control output value (OUT) appears on the Setpoint display. (can be changed in MAN mode)
When in position proportional control, the Setpoint display shows the valve opening (0% to 100%).
● PID Number Display
The PV input value appears on the PV display.
The PID number (PID) being used appears on the Setpoint display.



■ Operating Displays for a Heating/Cooling Controller

● SP Display
The PV input value appears on the PV display.
The target setpoint (1.SP) appears on the Setpoint display. (can be changed)
● Heating/Cooling OUT Display
The PV input value appears on the PV display.
The heating and cooling sides control output value (C.H) appears on the Setpoint display. (can be changed in MAN mode)
● PID Number Display
The PV input value appears on the PV display.
The PID number (PID) being used appears on the Setpoint display.



2. Setting Target Setpoint (SP)

The following operating procedure describes an example of setting 150.0 to a target setpoint. In automatic operation, the controller starts control using set target setpoints.

1. Bring the operating display into view (display appears at power on).
Displays target setpoint-1 "1.SP". Displays PV.
2. Press the [▲] or [▼] key to display the required setpoint.
Blinks during change.
3. Press the [↵] key once to register the setpoint.

3. Performing/Canceling Auto-tuning

Auto-tuning should be carried out after setting a target setpoint (SP). Make sure the controller is in automatic operation mode (AUTO) and in running state (RUN) before carrying out auto-tuning. See "*8. Switching between AUTO and MAN*," to change to AUTO and "*7. Switching between Run and Stop*," to change to Run.

NOTE

When on-off control is being used, auto-tuning cannot be carried out. Moreover, do not perform auto-tuning when controlling any of the following processes.
- Control processes with quick response such as flow control or pressure control
- Processes where even temporary output on/off results in inconvenience
- Processes where a large output change at control element results in inconvenience
- Processes where variations in PV may exceed an allowable range, adversely affecting product quality

1. Bring the operating display into view (display appears at power on).
MAN lamp OFF. Displays target setpoint-1 "1.SP". Displays PV.
2. Press the [↵] key for more than 3 seconds to call up the main menu "MODE".
Displays symbol "OP.M". Displays main menu "MODE".
3. Press the [▲] key once to display the main menu "LP1".
Displays main menu "LP1".
4. Press the [▼] key once to display the submenu "PAR".
Displays symbol "OP.S". Displays submenu "PAR".
5. Press the [↵] key once again to display the parameter "AT".
Displays parameter "AT".
6. Press the [▲] or [▼] key to display the required setpoint. Tuning for 1.SP is AT = 1.
Blinks during change.
To cancel auto-tuning, set AT = OFF.
7. Press the [↵] key once to register the setpoint. (This starts auto-tuning.)
If the [↵] key is pressed when AT = OFF, auto-tuning will be cancelled. In this case, PID contains the value existing before auto-tuning.
8. During auto-tuning, the panel indications become as shown below.
MAN lamp blinks. Displays symbol "OUT". Displays output values 100.0% and 0.0% alternately.
Auto-tuning is complete when the MAN lamp goes off.

4. Setting PID Manually

If you know the values to be set or if suitable PID constants cannot be obtained by auto-tuning, follow the procedure below to set values.

1. Bring the operating display into view (display appears at power on).
Displays target setpoint-1 "1.SP". Displays PV.
2. Press the [↵] key for more than 3 seconds to call up the main menu "MODE".
Displays symbol "OP.M". Displays main menu "MODE".
3. Press the [▲] key once to display the main menu "LP1".
Displays main menu "LP1".
4. Press the [↵] key once to display the submenu "PAR".
Displays symbol "OP.S". Displays submenu "PAR".
5. Press the [▲] key once to display the submenu "1.PID".
Displays submenu "1.PID".
6. Press the [↵] key six times to display the parameter "1.P". <proportional band for 1.SP>
Displays parameter "1.P".
7. Press the [▲] or [▼] key to display the required setpoint.
Blinks during change.
8. Press the [↵] key once to register the setpoint.

The same steps can be used for integral time (1.I) and derivative time (1.D) that are displayed after this.

[TIP]
For the PID parameter number you set in step 5, select:
the submenu "1.PID" if the PID constants are for 1.SP;
the submenu "2.PID" if the PID constants are for 2.SP;
the submenu "3.PID" if the PID constants are for 3.SP; and
the submenu "4.PID" if the PID constants are for 4.SP.

9. Press the [↵] key for more than 3 seconds. This returns you to the display shown at power-on (figure below).
Displays target setpoint-1 "1.SP". Displays PV.

5. Setting Alarm Setpoints

The following operating procedure describes an example of setting 160.0 to alarm-1 setpoint. Check alarm type before setting the alarm setpoint.
When changing the alarm type, see "*7. Changing Alarm Type*," in ***Initial Settings User's Manual***.

Alarm output terminals	Factory-shipped settings
Alarm-1 (terminal numbers ⑧-⑦)	PV high limit alarm
Alarm-2 (terminal numbers ⑤-⑦)	PV low limit alarm
Alarm-3 (terminal numbers ④-⑦)	PV high limit alarm
Alarm-4 (terminal numbers ③-⑦)	PV low limit alarm

1. Bring the operating display into view (display appears at power on).
Displays target setpoint-1 "1.SP". Displays PV.
2. Press the [↵] key for more than 3 seconds to call up the main menu "MODE".
Displays symbol "OP.M". Displays main menu "MODE".
3. Press the [▲] key once to display the main menu "LP1".
Displays main menu "LP1".
4. Press the [▼] key once to display the submenu "PAR".
Displays symbol "OP.S". Displays submenu "PAR".
5. Press the [▲] key once to display the submenu "1.PID".
Displays submenu "1.PID".
6. Press the [↵] key twice to display the parameter "1.A1".
Displays parameter "1.A1".
7. Press the [▲] or [▼] key to display the required setpoint.
Blinks during change.
8. Press the [↵] key once to register the setpoint.

You can take the same steps for alarm-2 setpoint (1.A2), alarm-3 setpoint (1.A3), alarm-4 setpoint (1.A4) that are displayed after this.

9. Press the [↵] key for more than 3 seconds. This returns you to the display shown at power-on (figure below).
Displays target setpoint-1 "1.SP". Displays PV.

6. Selecting Target Setpoint Numbers (SPN)

The following operating procedure describes an example of changing a target setpoint number (SPN) from 1 to 2.

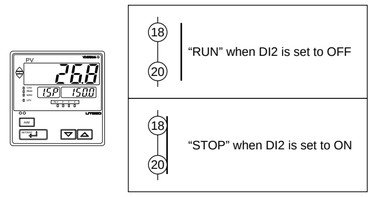
NOTE

If a target setpoint number has been switched using contact input, when the contact input is on, that number cannot be selected by keystroke.

1. Bring the operating display into view (display appears at power on).
Displays target setpoint-1 "1.SP". Displays PV.
2. Press the [↵] key for more than 3 seconds to call up the main menu "MODE".
Displays symbol "OP.M". Displays main menu "MODE".
3. Press the [↵] key several times to display the parameter "SPN".
Displays parameter "SPN".
4. Press the [▲] or [▼] key to display the required setpoint.
Blinks during change.
5. Press the [↵] key once to register the setpoint.
6. Press the [↵] key for more than 3 seconds. This returns you to the display shown at power-on (figure below).
Displays target setpoint-2 "2.SP". Displays PV.

7. Switching between Run and Stop

Switching between the Run state (RUN) and Stop state (STOP) can be made with contact input 2 (DI2). (Factory-set default)



When the controller is stopped, input and outputs are as follows:

PV input	Displays the PV value.
Control output	Provides the preset output value (factory-set to 0%).
Alarm output	Turns the output on in case of an alarm.

Standard type

Output Display in STOP
Displays symbol "STP". Displays a fixed (preset) output value. %

Heating / cooling control

Output Display in STOP
Displays a fixed (preset) cooling-side output value. %
Displays a fixed (preset) heating-side output value. %
Displays symbol "S.T".

Position proportional control

Output Display in STOP
Displays symbol "STP". Displays the valve opening (0 to 100%)

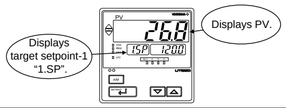
* Switching the target setpoint number (SPN) in STOP allows any preset output value (n.PO) to be switched.
The "n" is same as the target setpoint number.

8. Switching between AUTO and MAN

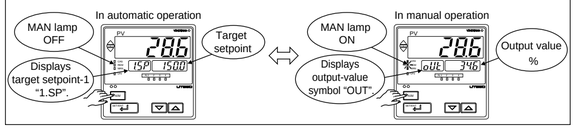
NOTE

If AUTO and MAN have been switched using contact input, when the contact input is ON, switching between AUTO and MAN cannot be achieved by keystroke.

1. Bring the operating display into view (display appears at power on).



2. Each time you press the A/M key on the front panel of the instrument, AUTO and MAN is switched alternately.



9. Manipulating Control Output during Manual Operation

NOTE

Control output cannot be changed if the controller is stopped. In this case, the preset output value (operating parameter PO) will be output. In heating / cooling control, the heating-side preset output value (operating parameter PO) and cooling-side preset output value (operating parameter Oc) will be output.

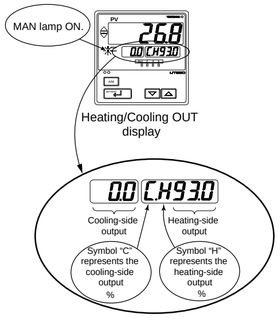
A control output value is linked with a display value changed using the ▽ or △ key. Note that the control output changes as displayed without requiring the ↵ key.

1. Bring manual operating display into view. For switching to manual operation, see "*8. Switching between AUTO and MAN*".

2. Press the △ or ▽ key to change a control output value. You don't need to press the ↵ key.

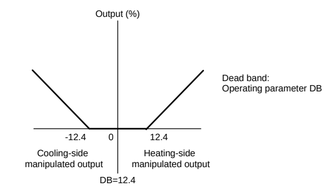
■ Manipulating the Control Output during Heating/Cooling Control

Showing the Heating/Cooling OUT display.



● Controller behavior and control output manipulation when the dead band is positive

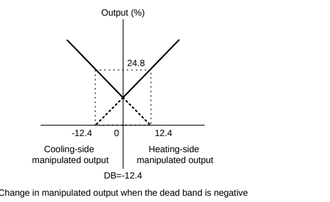
The following is an example when the DB parameter is set at 12.4%.
If you hold down the ▽ key with the heating-side output under manipulation (i.e., cooling-side output C = 0.0%), the heating-side output (H =) decreases.
Consequently, both the heating-side and cooling-side outputs change to 0.0%. If you keep the ▽ key held down longer, you enter the state of manipulating the cooling-side output, and its value begins to increase.
Inversely, if you hold down the △ key with the cooling-side output under manipulation (i.e., heating-side output H = 0.0%), the cooling-side output (C =) decreases. Consequently, both the heating-side and cooling-side outputs go to 0.0%. If you keep the △ key held down longer, you enter the state of manipulating the heating-side output, and its value begins to increase.



Change in manipulated output when the dead band is positive

● Controller behavior and control output manipulation when the dead band is negative

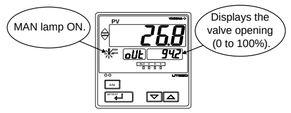
The following is an example when the DB parameter is set at -12.4%.
If you hold down the ▽ key with the heating-side output under manipulation (i.e., cooling-side output C = 0.0%), the heating-side output (H =) decreases. If the output H falls below 24.8%, the cooling-side output C begins to increase from 0.0%. If you keep the ▽ key held down longer and the output C rises above 24.8%, the output H goes to 0.0% and you enter the state of manipulating the cooling-side output.



Change in manipulated output when the dead band is negative

■ Manipulating the Control Output during Position Proportional Control

The controller continues to provide control output as long as the ▽ or △ key is being pressed.
▽ key : Closes the valve.
△ key : Opens the valve.

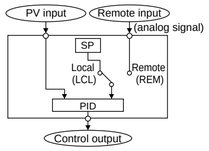


OUT display

Note : Manual output is not limited to output high limit(OH) and output low limit(OL).

10. Switching between Remote (REM) and Local (LCL)

The following operating procedure describes an example of switching from Local (LCL) to Remote (REM).
Switching between REM and LCL is possible for only controllers with remote input.
● Local:
Performs control using target setpoints set in the controller.
● Remote:
Performs control using external analog signals as target setpoints.

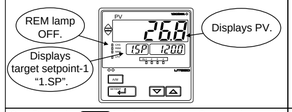


Note: The PID group number when the controller is in Remote operation is the same as the number set in the Target Setpoint Number (SPN) parameter.

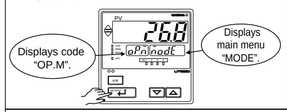
NOTE

If Remote state is achieved by external contact input (contact input is ON), switching between REM and LCL cannot be achieved by keystroke.

1. Bring the operating display into view (display appears at power on).

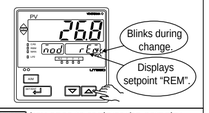


2. Press the ↵ key for more than 3 seconds to call up the main menu "MODE".



3. Press the ↵ key several times to display the parameter "MOD".

4. Press the △ or ▽ key to display "REM".



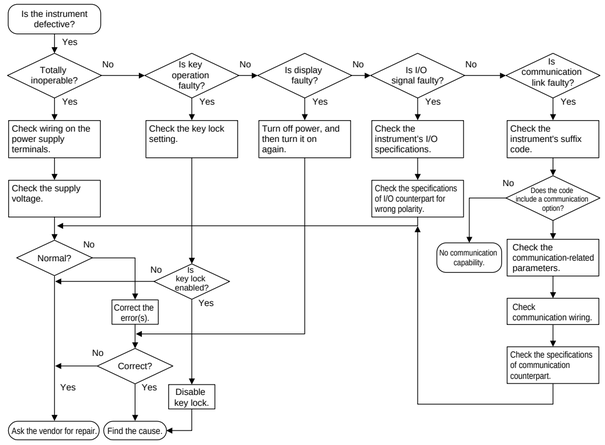
5. Press the ↵ key once to register the setpoint.

Automatically return to the display shown at power-on (figure below).

11. Troubleshooting

■ Troubleshooting Flow

If the operating display does not appear after turning on the controller's power, follow the measures in the procedure below.
If a problem appears complicated, contact our sales representative.



IMPORTANT

Take note of the parameter settings when asking the vendor for repair.

■ Errors at Power On

The following table shows errors that may be detected by the fault diagnosis function when the power is turned on.

Error indication (on PV display unit)	Description of error	PV	Control output	Alarm output	Retransmission output	Communication	Remedy
E000 (E000)	Faulty RAM	None	0% or less or OFF	OFF	0% or less	Stopped	Faulty Contact us for repair.
E001 (E001)	Faulty ROM						
E002 (E002)	System data error	Undefined		Undefined	Undefined		
PV decimal point blinks.	Faulty calibration value	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action	
Error code (Note) (See description below.)	Parameter error	Normal action	0% or less or OFF	Normal action	Normal action		Check and set the initialized parameters.

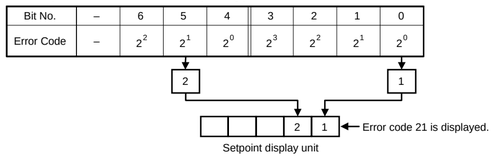
Note : An error code is displayed on the setpoint display unit.

An error code is displayed in the event of an error, according to its type.
An error code is a two-digit figure in which a combination of 6 bits of on and off is converted into a decimal number.
The following shows the relationship between each bit and parameter to be checked for abnormality.

Bit No.	6	5	4	3	2	1	0
Parameter to be checked	Operation mode/output	Operating parameters	Setup parameters	Range data	UT mode	–	Calibration data

For example, if an error occurs with the operating parameter and calibration data, the error code will be as follows:

Bit No.	–	6	5	4	3	2	1	0
Error Code	–	2^2	2^1	2^0	2^3	2^2	2^1	2^0



■ Possible Errors during Operation

The following shows possible errors occurring during operations.

Error indication (on PV display unit)	Description of error	PV	Control output	Alarm output	Retransmission output	Communication	Remedy
Displays "RJC" and PV alternately	RJC error	Measured with RJC=OFF	Normal action	Normal action	Normal action	Normal action	Faulty Contact us for repair.
Decimal point of item part in SP display unit blinks.	EEPROM error	Normal action					
E300 (E300)	ADC error	105%	In AUTO: Preset value output In MAN: Normal action				Check wires and sensor.
bOUt (B.OUT)	PV burnout error	Dependent on the BSL parameter Up-scale: 105% Down-scale: -5%					
oVEr (OVER) or -oVEr (-OVER)	Excessive PV Out of -5 to 105%	-5% or 105%	Normal action				Check process.
E200 (E200)	Auto-tuning failure (Time-out)	Normal action	Action with PID existing before auto-tuning				Check process. Press any key to erase error indication.
Setpoint display -----	Feedback resistor breakdown		Stopped		Stopped		Check the feedback resistor.
Left end of SP display unit blinks.	Faulty communication line		Normal action		Normal action		Check wires and communication parameters, and make resetting. Recovery at normal receipt
Decimal point at right end lights.	Runaway (due to defective power or noise)	Undefined	0% or less or OFF	OFF	0% or less	Stopped	Faulty if power off/on does not reset start the unit. Contact us for repair.
All indications off	Power off	None					Check for abnormal power.

■ Remedies if Power Failure Occurs during Operations

The operation status and remedies after a power failure differ with the length of power failure time:
● Instantaneous power failure of 20 ms or less
A power failure is not detected. Normal operation continues.
● Power failure of about 2 seconds or less
The following show effects caused in "settings" and "operation status."

Alarm action	Continues. Alarm with standby function will enter standby status.
Setting parameter	Set contents of each parameter are retained.
Auto-tuning	Cancelled.
Control action	Action before power failure continues.

● Power failure of more than about 2 seconds
The following show effects caused in "settings" and "operation status."

Alarm action	Continues. Alarm with standby function will enter standby status.
Setting parameter	Set contents of each parameter are retained.
Auto-tuning	Canceled.
Control action	Differs with setting of setup parameter "R.MD"(restart mode).

R.MD setting	Control action after recovery from power failure
CONT	Continues action before power failure. (Factory-set default) For position-proportional type, when V.MD = Valve position estimating type, starts action from 0%.
MAN	Outputs preset output value (PO) as control output and continues action set before power failure in MAN mode. For position-proportional type, when V.MD = Valve position feedback type, starts action from feedback input condition at recovery from power failure. When V.MD = Valve position estimating type, starts action from 0%. For heating/cooling control, starts action from heating-side output value and cooling-side output value of 50% of control computation output.
AUTO	Outputs preset output value (PO) as control output and continues action set before power failure in AUTO mode. For position-proportional type, when V.MD = Valve position feedback type, starts action from feedback input condition at recovery from power failure. When V.MD = Valve position estimating type, starts action from 0%. For heating/cooling control, starts action from heating-side output value and cooling-side output value of 50% of control computation output.

■ Troubleshooting When the Controller Fails to Operate Correctly

If your control tasks are not successful, check the preset parameters and controller wiring before concluding the controller to be defective. The following show some examples of troubleshooting you should refer to in order to avoid the possibility of other problems.

● The controller does not show the correct measured input (PV).

- The UT550/UT520 controllers have a universal input.
The type of PV input can be set/changed using the parameter "IN1". At this point, the controller must be wired correctly according to the selected type of PV input. Check the wiring first if the controller fails to show the correct PV value. To do this, refer to ***Initial Settings User's Manual*** .
With the parameters "RH1", "RL1", "DP1", "SH1" and "SL1", it is possible to scale the input signal and change its number of decimal places. Also check that these parameters are configured correctly.

● The controller does not provide any control output or the control output does not change at all.

- The UT550/UT520 controllers have a universal output.
The type of control output can be set/changed using the parameter "OT1".
At this point, the controller must be wired correctly according to the selected type of control output. Check the wiring first if the controller provides no control output. To do this, refer to "*6. Terminal Wiring Diagrams*," in ***Installation User's Manual***.
With the parameters "OH" and "OL", it is possible to set/change the high and low limits of control output. The control output may not change at all, however, because of restrictions on these parameters. Also check the restrictions on these parameters.
- The control output can only be changed when the controller is in the MAN mode.
If the MAN lamp is off (i.e., the controller is in the AUTO mode), you cannot change the control output using key operation.

● The control output does not change soon after the target setpoint (SP) has been changed.

- If this happens, check the setpoint of the parameter "MOD". In cases where fixed-point control is selected as the PID control mode (MOD = 1), tracking based on the I-term works to prevent the control output from changing suddenly even if the target setpoint SP is varied.
The control output therefore may appear to be working incorrectly at first; however it gradually adapts itself to the new target setpoint.

User's Manual

Models UT550 / UT520
Digital Indicating Controllers
User's Manual for Single-loop Control
Parameter Map

NEW GREEN SERIES

IM 05D01C02-04E

2nd Edition: Jul 1, 2001

YOKOGAWA
Yokogawa M&C Corporation

This manual contains a parameter map as a guideline for setting parameters.

If you are unsure of the key operation sequence, press the key (for more than 3 seconds). This displays a screen at power on (i.e., operating display).

Power on

PV input type IN1=OFF? No / Yes

Determine PV input type first.

Settings herein are described in "*2. Setting PV Input Type (Setting First at Power-on)*", in ***Initial Settings User's Manual***.

Display example: PV 26.8, SELin

key → Displays parameter "IN1"

Display example: PV 26.8, In1 oFF

key

Display example: PV 26.8, In1 (Blinks during change)

key

Display example: PV 26.8, In1 J

After PV input type (IN1), input/output parameters such as PV input unit (UN1), PV input range maximum value (RH1), and PV input range minimum value (RL1) will be displayed.

1. Use the or key to set a numerical value. See *Instrument Input Range Codes* in ***Initial Setting User's Manual***.
2. Press the key to register the value.

PV input type is set to "OFF" when shipped.

A — To the back

From the back — D

Basic Key Operation Sequence

1. Setting display can be switched (moved) using the key.
2. A numerical value is changed by
   (1) Using the or key to change a displayed value (decimal point blinking) and
   (2) Pressing the key to register it.
3. Pressing the key on an operating display (for more than 3 seconds) brings you to the operating parameter setting display.
4. Pressing the key on the operating parameter setting display (for more than 3 seconds) returns you to the operating display.
   To change from the operating parameter setting display to the operating parameter menu display, press the and keys simultaneously.
5. Pressing the key on the setup parameter setting display (for more than 3 seconds) returns you to the operating display.
   To change from the setup parameter setting display to the setup parameter menu display, press the and keys simultaneously.

Operating Display

The following are operating displays for standard and position proportional controllers. Note that any "OUT" value of a position proportional controller shown on the display denotes the valve opening (0 to 100%).

key

SP display: PV 26.8, SP 1200 → key → OUT display: PV 26.8, out 94 % → key → PID number display: PV 26.8, Pid 1

Operating Displays for Heating/Cooling Control

key

SP display: PV 26.8, SP 1200 → key → OUT display for heating/cooling control: PV 26.8, OUT CH93.0 → key → PID number display: PV 26.8, Pid 1

OUT CH93.0: 0.0 = Cooling-side output; 93.0 = Heating-side output
Symbol "C" represents the cooling-side output %
Symbol "H" represents the heating-side output %

Description of Operating Parameter Menu Display: Displays PV. / OP.M: Main menu, OP.S: Submenu / Displays menu.

Description of Operating Parameter Setting Display: Displays PV. / Displays a parameter symbol. / Displays a setpoint.

Operating Parameter Setting Display

Press this key for more than 3 seconds to move to the operating parameter setting display.

From the back — C

Press these keys simultaneously to move to the operating display.

Press this key for more than 3 seconds to move to the operating display.

oPn nodE ⇄ oPn LP1 ⇄ oPn PYS1 ⇄ oPn SEtUP ⇄ Main menu display

key Press simultaneously

oPS PAr ⇄ oPS 1PId ⇄ oPS 2PId ⇄ oPS 3PId ⇄ oPS 4PId ⇄ oPS 5PId ⇄ oPS 6PId ⇄ oPS 7PId ⇄ oPS 8PId ⇄ Submenu display

B — To the back

oPn nodE

nod	Remote/local switching	Displayed only for controllers with remote input
nod	Run/stop switching	Displayed only when contact input registration parameter S/R is "0".
SPn	Target setpoint number selection	

oPS PAr

At	Auto-tuning	Displayed in automatic operation
SC	SUPER function	
b5	PV input bias	
FL	PV input filter	
UPr	Setpoint ramp-up rate	
dnr	Setpoint ramp-down rate	
rt	Ratio setting	Displayed only for controllers with remote input
rb5	Remote input bias	
rFL	Remote input filter	
orb	ON/OFF rate detection band	
orH	ON/OFF rate high limit	
orL	ON/OFF rate low limit	

oPS 1PId / 2PId / 3PId / 4PId / 5PId / 6PId / 7PId / 8PId

1SP	Target setpoint-1	
1A1	Alarm-1 setpoint	
1A2	Alarm-2 setpoint	
1A3	Alarm-3 setpoint	
1A4	Alarm-4 setpoint	
1P	Proportional band / heating-side proportional band	
1I	Integral time / heating-side integral time	
1d	Derivative time / heating-side derivative time	
1oH	Output high limit / heating-side output high limit	
1oL	Output low limit / cooling-side output high limit	
1rr	Manual reset	
1H	ON/OFF control hysteresis / heating-side ON/OFF control hysteresis	
1dr	Direct/reverse action switching	
1Pc	Cooling-side proportional band	Displayed for heating/cooling control
1Ic	Cooling-side integral time	
1dc	Cooling-side derivative time	
1Hc	Cooling-side ON/OFF control hysteresis	
1db	Dead band	Displayed for heating/cooling control or position proportional PID control
1Po	Preset output / heating-side preset output	
1oc	Cooling-side preset output	Displayed for heating/cooling control

1Gr SP /Alarm / PID parameters

2Gr SP /Alarm / PID parameters

3Gr SP /Alarm / PID parameters

4Gr SP /Alarm / PID parameters

5Gr SP /Alarm / PID parameters

6Gr SP /Alarm / PID parameters

7Gr SP /Alarm / PID parameters

8Gr SP /Alarm / PID parameters

Not displayed for ON/OFF control

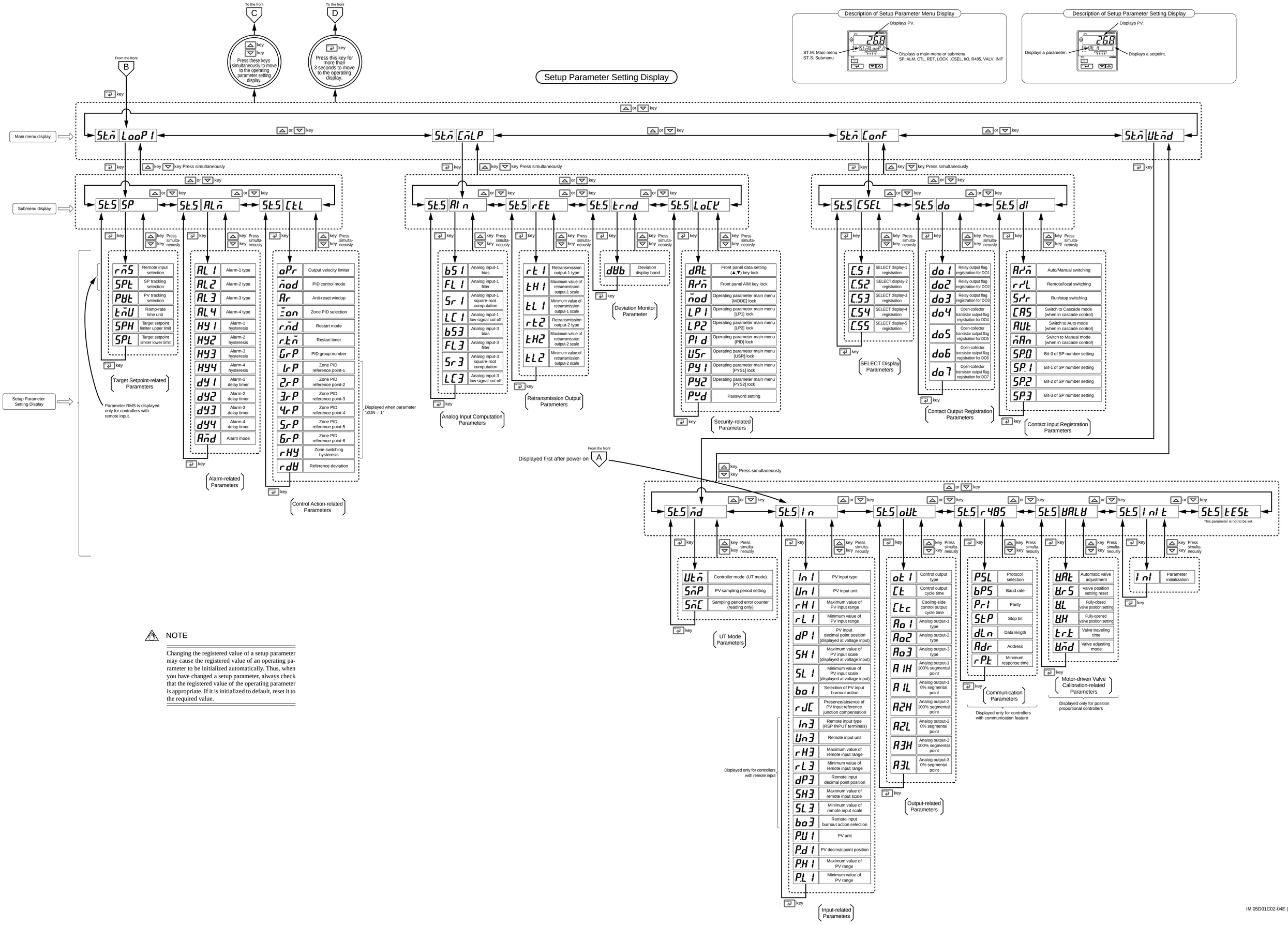
Not displayed for heating/cooling control

oPn PYS1

tA1	Ten-segment linearizer 1 input-1
tb1	Ten-segment linearizer 1 output-1
tA2	Ten-segment linearizer 1 input-2
tb2	Ten-segment linearizer 1 output-2
tA3	Ten-segment linearizer 1 input-3
tb3	Ten-segment linearizer 1 output-3
tA4	Ten-segment linearizer 1 input-4
tb4	Ten-segment linearizer 1 output-4
tA5	Ten-segment linearizer 1 input-5
tb5	Ten-segment linearizer 1 output-5
tA6	Ten-segment linearizer 1 input-6
tb6	Ten-segment linearizer 1 output-6
tA7	Ten-segment linearizer 1 input-7
tb7	Ten-segment linearizer 1 output-7
tA8	Ten-segment linearizer 1 input-8
tb8	Ten-segment linearizer 1 output-8
tA9	Ten-segment linearizer 1 input-9
tb9	Ten-segment linearizer 1 output-9
tAA	Ten-segment linearizer 1 input-10
tbA	Ten-segment linearizer 1 output-10
tAb	Ten-segment linearizer 1 input-11
tbb	Ten-segment linearizer 1 output-11
tnd	Ten-segment linearizer 1 mode

Operating parameter setting display

To switch the parameter display, press the key.



NOTE

Changing the registered value of a setup parameter may cause the registered value of an operating parameter to be initialized automatically. Thus, when you have changed a setup parameter, always check that the registered value of the operating parameter is appropriate. If it is initialized to default, reset it to the required value.

User's Manual

Models UT550 / UT520
Digital Indicating Controllers
User's Manual for Single-loop Control
Parameters

NEW GREEN SERIES

IM 05D01C02-05E

2nd Edition: Jul 1, 2001

YOKOGAWA
Yokogawa M&C Corporation

This manual describes the functions of parameters briefly. In addition, each parameter table has a "User Setting" column, where you can record your setpoints when setting them in the controller.

* Parameters relating to PV or setpoints should all be set in real numbers. For example, use temperature values to define target setpoints and alarm setpoints for temperature input.

* The "User Setting" column in the table below is provided for the customer to record setpoints.
* The column "Target Item in CD-ROM" in the table below provides references from User's Manual (Reference) (CD-ROM Version) which describes items in more detail and items that are not contained in this manual.

■ Operating Parameters

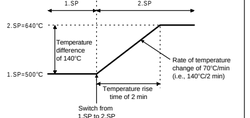
● Operation Mode Parameters

Located in: Main menu = modE (MODE)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
mod (MOD)	Remote/Local switching	Set to "Local" when carrying out control using the target setpoints of the controller or to "Remote" when using target setpoints acquired via a remote input signal or communication. Use the setup parameter RMS, "Remote Input Selection," to determine whether the target setpoints should be acquired via the remote input signal or communication. REM: Remote mode LCL: Local mode	LCL		—
mod (MOD)	Run/Stop switching	Outputs the predetermined (preset) fixed value when the controller stops. A preset output value can be defined for each target setpoint using the operating parameter "PO". Stop: Stops operation. Run: Starts operation.	RUN		—
SPn (SPN)	Target setpoint number selection	1: Selects target setpoint-1 (1.SP). 2: Selects target setpoint-2 (2.SP). 3: Selects target setpoint-3 (3.SP). 4: Selects target setpoint-4 (4.SP). Likewise, options 5 to 8 select target setpoints 5 (5.SP) to 8 (8.SP).	1		—

● Operation-related Parameters

Located in: Main menu = LP1 (LP1) ; Submenu = PAr (PAR)

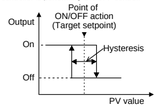
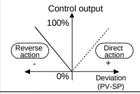
Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
AT (AT)	Auto-tuning	OFF: No auto-tuning 1: Auto-tuning for 1.SP 2: Auto-tuning for 2.SP 3: Auto-tuning for 3.SP 4: Auto-tuning for 4.SP 5 to 8: Perform auto-tuning on a group basis in the same way as 1 to 4 9: Performs auto-tuning to all groups 1 to 8.	OFF		—
SC (SC)	"SUPER" function	OFF: Disable 1: Overshoot suppressing function Suppresses overshoots generated by abrupt changes in the target setpoint or by disturbances. 2: Hunting suppressing function (Stable mode) Suitable to stabilize the state of control when the load varies greatly, or the target setpoint is changed. 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 target setpoint. Note: Use "SUPER" function (SC) 2 or 3 in PID control or PI control. "SUPER" function 2 or 3 is not available in the following controls: 1) ON/OFF control 2) P control (control for proportional band only) 3) PD control (control for proportional band and derivative item only) 4) Heating/cooling control Do not use hunting suppressing function when control processes with response such as flow or pressure control.	OFF		Ref.2.1(5) Ref.2.1(6)
bS (BS)	PV input bias	-100.0% to 100.0% of PV input range span Used to correct the PV input value.	0.0% of PV input range span		Ref.1.1(1)
FL (FL)	PV input filter	OFF, 1 to 120 second Used when the PV input value fluctuates.	OFF		Same as above
UPr (UPR)	Setpoint ramp-up-rate	OFF 0.0% + 1 digit of PV input range span to 100.0% of PV input range span Set ramp-up-rate or ramp-down-rate per hour or minute. Sets unit in ramp-rate-time unit (TMU).	OFF		Ref.4.1(4)
dnr (DNR)	Setpoint ramp-down-rate	Used to prevent the target setpoint from changing suddenly. The ramp setting function works when: 1. the target setpoint is changed (e.g., "1.SP" is changed from 100°C to 150°C); 2. the target setpoint number (SPN) is changed (e.g., the parameter is changed from 1.SP to 2.SP); 3. the power is turned on or has recovered from a failure; or 4. the operating mode is changed from Manual to Auto. 	OFF		Same as above
rt (RT)	Ratio setting	0.001 to 9.999 Target setpoint = Remote input × Ratio setpoint + Remote bias	1.000		Ref.1.2(3)
rbS (RBS)	Remote input bias	-100.0 to 100.0% of PV input range span Used to correct the remote input value.	0.0% of PV input range span		Same as above
rFL (RFL)	Remote input filter	OFF, 1 to 120 second Used when the remote input value fluctuates.	OFF		Same as above
orb (ORB)	ON/OFF rate detection band	0.0 to 100.0% of PV input range span	1.0% of PV input range span		Ref.3.3(4)
orH (ORH)	ON/OFF rate high limit	ORL + 1 digit to 105.0%	100.0 %		Same as above
orL (ORL)	ON/OFF rate low limit	-5.0% to ORH - 1 digit	0.0%		Same as above

● Setpoint-, Alarm- and PID-related Parameters

Located in: Main menu = LP1 (LP1) ; Submenu = 1PId (1.PID)

The table below lists the Target Setpoint-1 (1.SP) operating parameter and parameters that apply to the 1.SP parameter.

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
1SP (1.SP)	Target setpoint-1	0.0 to 100.0% of PV input range However, between target setpoint limiter lower limit (SPL) and upper limit (SPH).	0.0% of PV input range		Ref.4.1(1)

1A1 (1.A1)	Alarm-1 setpoint	PV alarm / SP alarm: -100.0 to 100.0% of PV input range Deviation alarm: -100.0 to 100.0% of PV input range span Output alarm: -5.0 to 105.0% Timer alarm (for alarm-1 only): 0.00 to 99.59 (hour, min) or (min, sec) Allows alarms 1 to 4 (1.A1 to 1.A4) to be set for target setpoint 1 (1.SP). Four alarms can also be set for target setpoints 2 to 8.	PV high limit/SP high limit alarm: 100.0% of PV input range Deviation alarm: 0.0% of PV input range span Other PV/SP low limit alarm: 0.0% of PV input range Output high limit alarm: 100.0% Output Low limit alarm: 0.0%		Ref.4.1(1)
1A2 (1.A2)	Alarm-2 setpoint				Same as above
1A3 (1.A3)	Alarm-3 setpoint				Same as above
1A4 (1.A4)	Alarm-4 setpoint				Same as above
1P (1.P)	Proportional band/Heating-side proportional band (in heating/cooling control)	0.1 to 999.9% of PV input range In heating/cooling control: 0.0 to 999.9% (heating-side on/off control applies when 0.0)	5.0%		Same as above
1I (1.I)	Integral time Heating-side integral time (in heating/cooling control)	OFF, 1 to 6000 second	240 second		Same as above
1d (1.D)	Derivative time Heating-side derivative time (in heating/cooling control)	OFF, 1 to 6000 second	60 second		Same as above
1oH (1.OH)	Output high limit Heating-side output high limit (in heating/cooling control)	-5.0 to 105.0% Heating-side limiter in heating/cooling control: 0.0 to 105.0% (1.OL < 1.OH)	100% Heating/cooling control: 100.0%		Ref.2.1(3) Ref.4.1(1)
1oL (1.OL)	Output low limit Cooling-side output high limit (in heating/cooling control)	-5.0 to 105.0% Cooling-side limiter in heating/cooling control: 0.0 to 105.0% (1.OL < 1.OH) SD (shutdown): Set in manual operation in 4-20 mA control output.	0.0% Heating/cooling control: 100.0%		
1MR (1.MR)	Manual reset	-5.0 to 105.0% (enabled when integral time "1.I" is OFF) The manual reset value equals the output value when PV = SP is true. For example, if the manual reset value is 50%, the output value is 50% when PV = SP becomes true.	50.0%		Ref.4.1(1)
1H (1.H)	ON/OFF control hysteresis Heating-side ON/OFF control hysteresis (in heating/cooling control)	In ON/OFF control: 0.0 to 100.0% of PV input range span Position proportional PID control or heating/cooling control: 0.0 to 100.0% Hysteresis can be set in the target setpoint when the controller is performing ON/OFF control. 	ON/OFF control: 0.5% of PV input range span Position proportional PID control and heating/cooling control: 0.5%		Same as above
1dr (1.DR)	Direct/reverse action switching	RVS: reverse action, DIR: direct action 	RVS		Ref.2.1(1) Ref.4.1(1)
1Pc (1.Pc)	Cooling-side proportional band	0.0 to 999.9% of PV input range (Cooling-side ON/OFF control applies when 0.0)	5.0%		Ref.4.1(1)
1Ic (1.Ic)	Cooling-side integral time	OFF, 1 to 6000 second	240 second		Same as above
1dc (1.Dc)	Cooling-side derivative time	OFF, 1 to 6000 second	60 second		Same as above
1Hc (1.Hc)	Cooling-side ON/OFF control hysteresis	0.0 to 100.0%	0.5%		Same as above
1db (1.DB)	Dead band	In heating/cooling control: -100.0 to 50.0% In position proportional PID control: 1.0 to 10.0% • In heating/cooling control: When setting any positive, there is region whereof the heating- and cooling-side output is presented; when setting any negative value, there is a region where both of the heating- and cooling-side outputs are presented. When setting a value of zero, either the heating- and cooling-side output is provided. • In position proportional control: Set the range so none of the outputs turn on.	3.0%		Same as above
1PO (1.PO)	Preset output/Heating-side preset output (in heating/cooling control)	-5.0 to 105.0% In heating/cooling control: Heating side 0.0 to 105.0% In Stop state, fixed control output can be generated.	0.0%		Ref.2.1(8) Ref.4.1(1)
1oc (1.Oc)	Cooling-side preset output	0.0 to 105.0% In Stop state, cooling-side fixed control output can be generated.	0.0%		

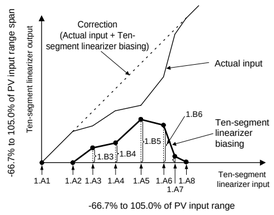
If you are using two or more groups of setpoint, alarm and PID parameters, use the following table to record their values.

Parameter	n=2	n=3	n=4	n=5	n=6	n=7	n=8
n.SP							
n.A1							
n.A2							
n.A3							
n.A4							
n.P							
n.I							
n.D							
n.OH							
n.OL							
n.MR							
n.H							
n.DR							
n.Pc							
n.Ic							
n.Dc							
n.Hc							
n.DB							
n.PO							
n.Oc							

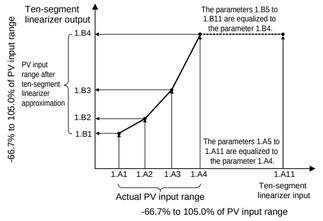
● Ten-segment Linearizer1 Parameters

Located in: Main menu = PYS1 (PYS1)

● Ten-segment linearizer biasing (factory-set default)



● Ten-segment linearizer approximation



Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
1A1 (1.A1)	Ten-segment linearizer 1 input-1	-66.7% to 105.0% of PV input range	0.0% of PV input range		Ref.1.1(2)
1b1 (1.B1)	Ten-segment linearizer 1 output-1	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A2 (1.A2)	Ten-segment linearizer 1 input-2	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b2 (1.B2)	Ten-segment linearizer 1 output-2	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A3 (1.A3)	Ten-segment linearizer 1 input-3	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b3 (1.B3)	Ten-segment linearizer 1 output-3	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A4 (1.A4)	Ten-segment linearizer 1 input-4	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b4 (1.B4)	Ten-segment linearizer 1 output-4	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A5 (1.A5)	Ten-segment linearizer 1 input-5	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b5 (1.B5)	Ten-segment linearizer 1 output-5	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A6 (1.A6)	Ten-segment linearizer 1 input-6	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b6 (1.B6)	Ten-segment linearizer 1 output-6	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A7 (1.A7)	Ten-segment linearizer 1 input-7	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b7 (1.B7)	Ten-segment linearizer 1 output-7	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A8 (1.A8)	Ten-segment linearizer 1 input-8	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b8 (1.B8)	Ten-segment linearizer 1 output-8	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1A9 (1.A9)	Ten-segment linearizer 1 input-9	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1b9 (1.B9)	Ten-segment linearizer 1 output-9	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1AA (1.AA)	Ten-segment linearizer 1 input-10	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1bA (1.BA)	Ten-segment linearizer 1 output-10	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1Ab (1.AB)	Ten-segment linearizer 1 input-11	-66.7% to 105.0% of PV input range	0.0% of PV input range		Same as above
1bb (1.BB)	Ten-segment linearizer 1 output-11	-66.7% to 105.0% of PV input range span -66.7% to 105.0% of PV input range when in ten-segment linearizer approximation	0.0% of PV input range span 0.0% of PV input range when in ten-segment linearizer approximation		Same as above
1Md (1.MD)	Ten-segment linearizer 1 mode	0: Ten-segment linearizer biasing 1: Ten-segment linearizer approximation	0		Same as above

■ Setup Parameters

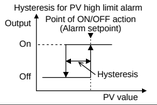
● Target Setpoint-related Parameters

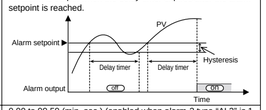
Located in: Main menu = LooP1 (LOOP1) ; Submenu = SP (SP)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
rnS (RMS)	Remote input selection	RSP: Uses the value set remotely via remote input (terminals). COM: Uses the value set remotely via communication.	RSP		Ref.1.2(1)
SPt (SPT)	SP tracking selection	OFF, ON Tracking is performed when the mode changes from Remote to Local (The local setpoint keeps track of the remote setpoint.)	ON		Ref.1.2(4)
PVt (PVT)	PV tracking selection	Causes the setpoint to keep track of the PV value so the setpoint automatically reverts to its original value at a preset rate of change. The Setpoint Ramp-up rate (UPR) and Setpoint Ramp-down rate (DNR) parameters are used in combination. - Operating conditions - 1: Manual operation → Automatic operation; 2: Stop → Start of automatic operation; 3: Power-on; 4: Change SP number; 5: Change SP value OFF: Disable ON: Enable	OFF		Ref.1.1(7)
tmU (TMU)	Ramp-rate time unit setting	Time unit of setpoint ramp-up rate (UPR) and setpoint ramp-down rate(DNR) HOUR: Denotes "per hour." MIN: Denotes "per minute."	HOUR		Ref.4.1(4)
SPH (SPH)	Target setpoint limiter upper limit	0.0% to 100.0% of PV input range. Note that SPL < SPH Places limits on the ranges within which the target setpoints (1.SP to 8.SP) are changed.	100.0% of PV input range		—
SPL (SPL)	Target setpoint limiter lower limit		0.0% of PV input range		—

● Alarm-related Parameters

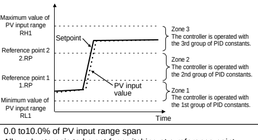
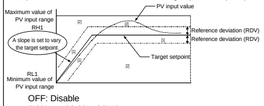
Located in: Main menu = LooP1 (LOOP1) ; Submenu = ALn (ALM)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
AL1 (AL1)	Alarm-1 type	OFF, 1 to 31 (same as below) Common to all target setpoints.	1		Ref.3.3(3) Ref.3.3(4)
AL2 (AL2)	Alarm-2 type	OFF, 1 to 20, 25 to 31 1: PV high limit (energized, no stand-by action) 2: PV low limit (energized, no stand-by action) 3: Deviation high limit (energized, no stand-by action) 4: Deviation low limit (energized, no stand-by action) 5: Deviation high limit (de-energized, no stand-by action) 6: Deviation low limit (de-energized, no stand-by action) For other alarm types, see ■ List of Alarm Types" in ***Initial Settings User's Manual*** Common to all target setpoints.	2		Ref.3.3(4)
AL3 (AL3)	Alarm-3 type		1		Same as above
AL4 (AL4)	Alarm-4 type		2		Same as above
HY1 (HY1)	Alarm-1 hysteresis	0.0 to 100.0% of PV input range span Output alarm: 0.0 to 100.0% Allows margins to be set for an alarm setpoint. With the hysteresis settings, it is possible to prevent relays from chattering. 	0.5% of PV input range span Output alarm: 0.5%		Ref.3.3(2)
HY2 (HY2)	Alarm-2 hysteresis				Same as above
HY3 (HY3)	Alarm-3 hysteresis				Same as above
HY4 (HY4)	Alarm-4 hysteresis				Same as above

dY1 (DY1)	Alarm-1 delay timer	0.00 to 99.59 (min, sec.) (enabled when alarm-1 type "AL1" is 1 to 20 or 28 to 31) An alarm is output when the delay timer expires after the alarm setpoint is reached. 	0.00		—
dY2 (DY2)	Alarm-2 delay timer	0.00 to 99.59 (min, sec.) (enabled when alarm-2 type "AL2" is 1 to 20 or 28 to 31)			—
dY3 (DY3)	Alarm-3 delay timer	0.00 to 99.59 (min, sec.) (enabled when alarm-3 type "AL3" is 1 to 20 or 28 to 31)			—
dY4 (DY4)	Alarm-4 delay timer	0.00 to 99.59 (min, sec.) (enabled when alarm-4 type "AL4" is 1 to 20 or 28 to 31)			—
And (AMD)	Alarm mode	Allows the alarm function to be enabled or disabled according to the operating condition. 0: Always active 1: Not active when in Stop mode 2: Not active when in Stop mode or manual operation 3: Eight alarms are used and always enabled. 4: Eight alarms are used and disabled when the controller is at a stop. 5: Eight alarms are used and disabled when the controller is at a stop or in manual operation.	0		Ref.3.3(1)

● Control Action-related Parameters

Located in: Main menu = LooP1 (LOOP1) ; Submenu = CtL (CTL)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
oPr (OPR)	Output velocity limiter	OFF (0) 0.1 to 100.0%/second can limit control output velocity	OFF		—
mod (MOD)	PID control mode	0: Standard PID control (with output bump at SP change) 1: Fixed -point control (without output bump at SP change) Choose "Fixed-point Control" when controlling pressure or flow rate.	0		Ref.2.1(2)
Ar (AR)	Anti-reset windup (Excess integration prevention)	AUTO (0), 50.0 to 200.0% The larger Setting, the sooner PID computation (integral computation) stops. Used when the control output travels up to 100% or down to 0% and stays at this point.	AUTO		Ref.2.1(4)
Zon (ZON)	Zone PID selection	0: SP selection 1: Zone PID If set to "SP selection," allows PID constants to be selected for each target setpoint. If set to "Zone PID," automatically selects PID constants according to the temperature range set in the given Reference Point parameter.	0		Ref.4.1(2)
rmd (R.MD)	Restart mode	CONT: Continues action set before power failure. MAN: Starts from manual operation status AUTO: Continues action set before power failure in automatic operation. Allows you to determine how the controller should recover from a power failure of longer than 2 second	CONT		—
rtM (R.TM)	Restart timer	0 to 10 second Sets time between power on and the instant where controller starts computation.	0 second		—
GrP (GRP)	PID group number	Allows you to determine how many groups of setpoint, alarm and PID parameters the controller should show. 1: Show one set. 2: Show two sets. 3: Show three sets. 4: Show four sets. 5 to 8: Show as many groups of parameters as have been set.	8		Ref.4.1(1)
1rP (1.RP)	Zone PID reference point-1	0.0 to 100.0% of PV input range. Note that 1.RP ≥ 2.RP ≥ 3.RP ≥ 4.RP ≥ 5.RP ≥ 6.RP. Sets reference points at which switching is carried out between groups of PID constants according to the given temperature zone. You can set a maximum of six reference points and therefore a maximum of seven temperature zones. To enable this parameter, set the Zone PID Selection (ZON) parameter to "1".	100.0% of PV input range		Ref.4.1(2)
2rP (2.RP)	Zone PID reference point-2				Same as above
3rP (3.RP)	Zone PID reference point-3	The example below sets reference points 1 and 2 to provide 3 zones to switch PID constants automatically. 			Same as above
4rP (4.RP)	Zone PID reference point-4				Same as above
5rP (5.RP)	Zone PID reference point-5				Same as above
6rP (6.RP)	Zone PID reference point-6				Same as above
rHY (RHY)	Zone switching hysteresis	0.0 to10.0% of PV input range span Allows hysteresis to be set for switching at a reference point.	0.5% of PV input range span		Same as above
rdV (RDV)	Reference deviation	Used to select a group of PID parameters according to a deviation from the given target setpoint. The controller uses the PID parameters of the number selected in PID group number (GRP) if the PV input falls outside the given deviation range. The following example shows a case when only the reference deviation is set without setting any reference point. The selected set of PID parameters is as follows. Since region 1 is within the deviation range, the controller uses the 1st group of PID parameters. Since region 2 is outside the deviation range, the controller uses the PID parameters of the number selected in PID group number (GRP).  OFF: Disable 0.0% to 100.0% of PV input range span	OFF		Same as above

● Analog Input Computation Parameters

Located in: Main menu = CmLP (CMLP) ; Submenu = AIn (AIN)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
bS1 (BS1)	Analog input-1 bias	Used to correct the PV input value beforehand. When in normal operation, use the PV Input Bias (BS) operating parameter. -100. 0% to 100.0% of PV input range span	0.0% of PV input range span		Ref.1.1(6)
FL1 (FL1)	Analog input-1 filter	OFF: Disable 1 to 120 second	OFF		Same as above
Sr1 (SR1)	Analog input-1 square-root computation	Performs square-root computation for the PV input value. OFF: Do not compute the square root ON: Compute the square root	OFF		Ref.1.1(3)
LC1 (LC1)	Analog input-1 low signal cutoff	0.0% to 5.0% The slope equals "1" at levels below the low-signal cutoff point.	1.0%		Same as above
bS3 (BS3)	Analog input-3 bias	Used to correct the remote input value. -100. 0% to 100.0% of PV input range span	0.0% of PV input range span		Ref.1.1(6)
FL3 (FL3)	Analog input-3 filter	OFF: Disable 1 to 120 second	OFF		Same as above
Sr3 (SR3)	Analog input-3 square-root computation	Performs square-root computation for the remote input value. OFF: Do not compute the square root ON: Compute the square root	OFF		Ref.1.1(3) Ref.1.2(2)
LC3 (LC3)	Analog input-3 low signal cutoff	0.0% to 5.0% The slope equals "1" at levels below the low-signal cutoff point.	1.0%		Same as above

● Retransmission Output Parameters

Located in: Main menu = CnLP (CMLP) ; Submenu = rEt (RET)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
rt1 (RT1)	Retransmission output-1 type	OFF: Disable 1: PV1, 2: SP1, 3: OUT1, 4: LPS loop power supply (15 V), 5: PV2, 6: SP2, 7: OUT2 Setpoints 5 to 7 are not available for single-loop control. Retransmission output 1 is always provided via terminals 14 and 15. In position proportional control, a valve opening signal (0% to 100%) is transmitted if setpoint "3" is selected. In heating/cooling control, an output value before allocation to heating/cooling control (0% to 100%) is transmitted if setpoint "3" is selected. (0% to 50%: Cooling-side output; 50% to 100%: Heating-side output)	1		Ref.2.2(1) Ref.2.2(3)
tH1 (TH1)	Maximum value of retransmission output-1 scale	RT1=1, 2: TL1 + 1 digit to 100.0% of PV input range RT1=3: TL1 + 1 digit to 100.0%	100.0% of PV input range		Ref.2.2(1)
tL1 (TL1)	Minimum value of retransmission output-1 scale	RT1=1, 2: 0.0% of PV input range to TH1 - 1 digit RT1=3: 0.0% to TH1 - 1 digit	0.0% of PV input range		Same as above
rt2 (RT2)	Retransmission output-2 type	Retransmission output-2 is available when the type of control output is not "current" or "voltage pulse." The output is provided via terminals 16 and 17. OFF: Disable 1: PV1, 2: SP1, 3: OUT1, 4: LPS loop power supply (15 V), 5: PV2, 6: SP2, 7: OUT2 Setpoints 5 to 7 are not available for single-loop control. In position proportional control, a valve opening signal (0% to 100%) is transmitted if setpoint "3" is selected. In heating/cooling control, an output value before allocation to heating/cooling control (0% to 100%) is transmitted if setpoint "3" is selected. (0% to 50%: Cooling-side output; 50% to 100%: Heating-side output)	OFF		Ref.2.2(1) Ref.2.2(3)
tH2 (TH2)	Maximum value of retransmission output-2 scale	RT2=1, 2: TL2 + 1 digit to 100.0% of PV input range RT2=3: TL2 + 1 digit to 100.0%	—		Ref.2.2(1)
tL2 (TL2)	Minimum value of retransmission output-2 scale	RT2=1, 2: 0.0% of PV input range to TH2 - 1 digit RT2=3: 0.0% to TH2 - 1 digit	—		Same as above

● Deviation Monitor Parameters

Located in: Main menu = CnLP (CMLP) ; Submenu = trnd (TRND)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
dbb (DVB)	Deviation display band	0.0 to 100.0% of PV input range span Permits a change in the span of deviation shown on the front-panel deviation monitor.	1.0% of PV input range span		Ref.6.1(3)

● Security-related Parameters

Located in: Main menu = CnLP (CMLP) ; Submenu = LocK (LOCK)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
dAt (DAT)	Front panel data setting (△,▽) key lock	OFF: Unlock ON: Lock	OFF		Ref.7.1(2)
AmA (A/M)	Front panel A/M key lock	OFF: Unlock ON: Lock	OFF		Same as above
mod (MOD)	Operating parameter main menu [MOD] lock	OFF: Unlock ON: Lock	OFF		Same as above
LP1 (LP1)	Operating parameter main menu [LP1] lock	OFF: Unlock ON: Lock	OFF		Same as above
LP2 (LP2)	Although not used in single-loop control, it is shown on the display.				
PId (PID)	Operating parameter main menu [PID] lock	OFF: Unlock ON: Lock	OFF		Same as above
USr (USR)	Although not used in single-loop control, it is shown on the display.				
PY1 (PY1)	Operating parameter main menu [PYS1] lock	OFF: Unlock ON: Lock	OFF		Same as above
PY2 (PY2)	Although not used in single-loop control, it is shown on the display.				
PwD (PWD)	Password setting	0: Password not set 1 to 30000	0		Ref.7.1(1)

● SELECT Display Parameters

Located in: Main menu = ConF (CONF) ; Submenu = CSEL (CSEL)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
CS1 (C.S1)	SELECT display-1 registration	OFF, 201 to 1023 Select the desired parameter from among the operating and setup parameters, then register the number (D register No.) accompanying that parameter. For example, registering "302" for C.S1 allows you to change alarm-1 setpoint in operating display. Numbers for registering alarm SP parameter for operating display: Alarm-1 setpoint: 302 Alarm-2 setpoint: 303 Alarm-3 setpoint: 304 Alarm-4 setpoint: 305 Above numbers are alarm setpoint parameters for target setpoint-1 (1.SP). Set the registration number of the alarm setpoint parameter for target setpoint 2 (2.SP), to a value obtained by adding 25 to the registration number of the alarm setpoint parameter for the parameter 1.SP. Likewise, set the registration number of the alarm setpoint parameter for target setpoint 3 (3.SP), to a value obtained by adding 25 to the registration number of the alarm setpoint parameter for the parameter 2.SP.	OFF		Ref.6.1(1)
CS2 (C.S2)	SELECT display-2 registration				Same as above
CS3 (C.S3)	SELECT display-3 registration				Same as above
CS4 (C.S4)	SELECT display-4 registration				Same as above
CS5 (C.S5)	SELECT display-5 registration				Same as above

● Contact Output Registration Parameters

Located in: Main menu = ConF (CONF) ; Submenu = do (DO)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
do1 (DO1)	Relay output flag registration for DO1	The following setpoints are registration numbers for Single-loop Control only. 5689: Alarm-1 output 0: No function 5690: Alarm-2 output 5691: Alarm-3 output 5693: Alarm-4 output 1609: FAIL output	5689		Ref.3.2(1)
do2 (DO2)	Relay output flag registration for DO2		5690		Same as above
do3 (DO3)	Relay output flag registration for DO3		5691		Same as above
do4 (DO4)	Open-collector transistor output flag registration for DO4		5693		Ref.3.2(1)
do5 (DO5)	Open-collector transistor output flag registration for DO5	The following setpoints are registration numbers for single-loop control only. 5689: Alarm-1 output 5690: Alarm-2 output 5691: Alarm-3 output 5693: Alarm-4 output 1609: FAIL output	0		Same as above
do6 (DO6)	Open-collector transistor output flag registration for DO6		0		Same as above
do7 (DO7)	Open-collector transistor output flag registration for DO7		1609		Same as above

● Contact Input Registration Parameters

Located in: Main menu = ConF (CONF) ; Submenu = di (DI)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
AmN (A/M)	Auto/Manual switching	These parameters determine which contact input to use to make selections/switches listed on the left. DI1: 5161 No function: 0 DI2: 5162 DI3: 5163 DI4: 5164 DI5: 5165 DI6: 5166 DI7: 5167 DI8: 5168 The contact inputs are factory-set as shown below. Contact input 1 (DI1): Auto (ON)/Manual (OFF) switching Contact input 2 (DI2): Run (OFF)/Stop (ON) switching Contact inputs 3 to 6 (DI3 to DI6): SP selection (see table below) Contact input 8 (DI8): Remote (ON)/Local (OFF) switching SP Selection: 1.SP 2.SP 3.SP 4.SP 5.SP 6.SP 7.SP 8.SP DI3 ON OFF ON OFF ON OFF ON OFF DI4 OFF ON ON OFF OFF ON ON OFF DI5 OFF OFF OFF ON ON ON ON OFF DI6 OFF OFF OFF OFF OFF OFF OFF ON If all of the SP parameters of a contact input are set to "OFF", the controller uses the immediately preceding SP.	5161		Ref.3.1(3)
rmL (R/L)	Remote/Local switching		5168		Same as above
Srr (S/R)	Run/Stop switching		5162		Same as above
CAS (CAS)	Switch to Cascade mode (when in cascade control)		0		Same as above
AUt (AUT)	Switch to Auto mode (when in cascade control)		0		Same as above
mAn (MAN)	Switch to Manual mode (when in cascade control)		0		Same as above
SP0 (SP.0)	Bit-0 of SP number setting		5163		Same as above
SP.1 (SP.1)	Bit-1 of SP number setting		5164		Same as above
SP.2 (SP.2)	Bit-2 of SP number setting		5165		Same as above
SP.3 (SP.3)	Bit-3 of SP number setting		5166		Same as above

● UT Mode Parameters

Located in: Main menu = Utnd (UTMD) ; Submenu = md (MD)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
Utm (UTM)	Controller mode (UT mode)	1: Single-loop control For another controller mode, see the User's Manual (Reference) (CD-ROM version).	1		—
SmP (SMP)	PV sampling period setting	50, 100, 200 and 500 ms The controller restarts if any change is made to the PV sampling period; this does not affect other parameter settings at all, however.	200 ms		Ref.1.1(4)
SmC (SMC)	Sampling period error counter (reading only)	0 to 30000	Shows 0 at power-on.		Ref.1.1(5)

● Input-related Parameters

Located in: Main menu = Utnd (UTMD) ; Submenu = In (IN)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
In1 (IN1)	PV input type (INPUT 1 terminals) Terminals ⑪, ⑫ and ⑬	Specify the type of PV input as a range code. OFF, 1 to 18, 30, 31, 35 to 37, 40, 41, 50, 51, 55, 56 See "Instrument Input Range Codes" in the ***Initial Settings User's Manual***.	OFF		—
Un1 (UN1)	PV input unit	Select the unit of PV input. %: Percent °F: Fahrenheit °C: Degree Celsius -: No unit	Depends on the PV input type.		—
rH1 (RH1)	Max. value of PV input range	Set the PV input range (RL1 < RH1). - For temperature input - Set the range of temperature that is actually controlled. - For voltage input - Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the parameters Maximum Value of PV Input Scale (SH1) and Minimum Value of PV Input Scale (SL1).	Depends on the PV input type.		—
rL1 (RL1)	Min. value of PV input range				—
dP1 (DP1)	PV input decimal point position (shown when in voltage-input mode)	Set the position of the decimal point of voltage-mode PV input. 0 to 4 0: No decimal place, 1: One decimal place 2 to 4: Two, three, or four decimal places	Depends on the PV input type.		—
SH1 (SH1)	Max. value of PV input scale (shown when in voltage-input mode)	Set the read-out scale of voltage-mode PV input. -19999 to 30000, where SL1 < SH1, SH1 - SL1 ≦ 30000	Depends on the PV input type.		—
SL1 (SL1)	Min. value of PV input scale (shown when in voltage-input mode)				—
bo1 (BO1)	Selection of PV input burnout action	Allows the PV input value to be determined as shown below in case of PV input burnout. • 105% of PV input range if set to "Upscale" • -5.0% of PV input range if set to "Downscale" OFF: Disable UP: Upscale DOWN: Downscale	Depends on the PV input type.		—
rJC (RJC)	Presence/absence of PV input reference junction compensation	Allows input compensation to be applied to thermocouple input. OFF: Absent ON: Present	ON		—
In3 (IN3)	Remote input type (INPUT 3 terminals) Terminals ㉑ and ㉒	Specify the type of remote input as a range code. 40, 41, 50, 51 See "Instrument Input Range Codes" in the ***Initial Settings User's Manual***.	41		Ref1.2.(1)
Un3 (UN3)	Remote input unit	Select the unit of remote input. %: Percent °F: Fahrenheit °C: Degree Celsius -: No unit	%		Same as above
rH3 (RH3)	Maximum value of remote input range	Set the range of a voltage signal. (RL3 < RH3)	5.000		Same as above
rL3 (RL3)	Minimum value of remote input range		1.000		Same as above
dP3 (DP3)	Remote input decimal point position	Set the position of the decimal point for remote input. 0 to 4 0: No decimal place, 1: One decimal place 2 to 4: Two, three, or four decimal places	Same as the position of the PV input's decimal point		Same as above
SH3 (SH3)	Max. value of remote input scale	Set the remote input read-out scale. -19999 to 30000, where SL3 < SH3, SH3 - SL3 ≦ 30000 Under normal operation, set the values of these parameters as shown below. - When PV input is temperature - Maximum and minimum values of PV input range - When PV input is voltage - Maximum and minimum values of PV input scale	Maximum value of PV input scale		Same as above
SL3 (SL3)	Min. value of remote input scale		Minimum value of PV input scale		Same as above
bo3 (BO3)	Remote input burnout action selection	Allows the remote input value to be determined as shown below in case of remote input burnout. • 105% of remote input scale if set to "Upscale" • -5.0% of remote input scale if set to "Downscale" OFF: Disable UP: Upscale DOWN: Downscale	OFF		—
PU1 (P.U1)	PV unit	Set the unit of PV. %: Percent °F: Fahrenheit °C: Degree Celsius -: No unit	Same as the unit of PV input		Ref.1.1(8)
Pd1 (P.D1)	PV decimal point position	Under normal operation, set the same value as in the PV Input Decimal Point Position (DP1) parameter. To shift the decimal point for temperature input, use this parameter. For example, set as "P.D1 = 0" to change a temperature reading of one decimal place to that of no decimal places. This involves reconfiguring the P.H1 and P.L1 parameters. 0 to 4	-		same as above
PH1 (P.H1)	Maximum value of PV range	Under normal operation, keep the values of these parameters between the maximum and minimum values of the PV input range. -19999 to 30000 P.L1 < P.H1, where P.H1-P.L1 ≦ 30000	Maximum value of PV input range or scale		same as above
PL1 (P.L1)	Minimum value of PV range		Minimum value of PV input range or scale		same as above

● Output-related Parameters

Located in: Main menu = Utnd (UTMD) ; Submenu = out (OUT)

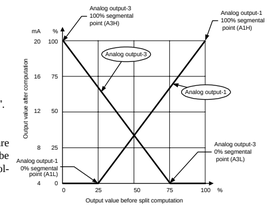
Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
ot1 (OT1)	Control output type	0: Time proportional PID relay contact output (terminals ①-②-③) 1: Time proportional PID voltage pulse output (terminals ⑯-⑰) 2: Current output (terminals ⑯-⑰) 3: ON/OFF control relay contact output (terminals ①-②-③) The following 4 to 12 are displayed only for heating/ cooling type controllers. 4: Heating-side relay output (terminals ①-②-③), cooling-side relay output (terminals ⑭-⑮-⑯) 5: Heating-side pulse output (terminals ⑯-⑰), cooling-side relay output (terminals ⑭-⑮-⑯) 6: Heating-side current output (terminals ⑯-⑰), cooling-side relay output (terminals ⑭-⑮-⑯) 7: Heating-side relay output (terminals ①-②-③), cooling-side pulse output (terminals ⑯-⑰) 8: Heating-side pulse output (terminals ⑯-⑰), cooling-side pulse output (terminals ⑯-⑰) 9: Heating-side current output (terminals ⑯-⑰), cooling-side pulse output (terminals ⑯-⑰) 10: Heating-side relay output (terminals ①-②-③), cooling-side current output (terminals ⑯-⑰) 11: Heating-side pulse output (terminals ⑯-⑰), cooling-side current output (terminals ⑯-⑰) 12: Heating-side current output (terminals ⑯-⑰), cooling-side current output (terminals ⑯-⑰)	0 Heating/ cooling type : 4		—
Ct (CT)	Control output cycle time Heating-side control output cycle time in heating/cooling control	1 to 1000 second Relay's Behavior when Cycle Time = 10 sec. For 20% of Control Output: 10 sec. On-state duration: 2 sec. Off-state duration: 8 sec. For 50% of Control Output: 10 sec. On-state duration: 5 sec. Off-state duration: 5 sec. For 80% of Control Output: 10 sec. On-state duration: 8 sec. Off-state duration: 2 sec.	30 second		Ref.3.3(4)
Ctc (CTc)	Cooling-side control output cycle time	1 to 1000 second	30 second		Ref.3.3(4)
Ao1 (AO1)	Analog output-1 type (OUTPUT 1: Terminals ⑯ and ⑰)	Allows control output or retransmission output to be presented as one of the following current signals. 0: 4 to 20 mA 1: 0 to 20 mA 2: 20 to 4 mA 3: 20 to 0 mA	0		Ref.2.1(7)
Ao2 (AO2)	Analog output-2 type (OUTPUT 2: Terminals ⑯ and ⑰)		0		same as above
Ao3 (AO3)	Analog output-3 type (OUTPUT 3: Terminals ⑭ and ⑮)		0		same as above
A1H (A1H)	Analog output-1 100% segmental point	Set the values of segmental points for the 0% and 100% output levels at which the values are presented via OUTPUT-1 (terminals ⑯ and ⑰). See "■ Performing Split Computations" below. -5.0% to 105.0%, where A1L < A1H	100.0 %		same as above
A1L (A1L)	Analog output-1 0% segmental point		0.0 %		same as above
A2H (A2H)	Analog output-2 100% segmental point	Set the values of segmental points for the 0% and 100% output levels at which the values are presented via OUTPUT-2 (terminals ⑯ and ⑰). See "■ Performing Split Computations" below. -5.0% to 105.0%, where A2L < A2H	100.0 %		same as above
A2L (A2L)	Analog output-2 0% segmental point		0.0 %		same as above
A3H (A3H)	Analog output-3 100% segmental point	Set the values of segmental points for the 0% and 100% output levels at which the values are presented via OUTPUT-3 (terminals ⑭ and ⑮). See "■ Performing Split Computations" below. -5.0% to 105.0%, where A3L < A3H	100.0 %		same as above
A3L (A3L)	Analog output-3 0% segmental point		0.0 %		same as above

■ Performing Split Computations

• V-mode Output

The following explains an example of letting "Analog OUTPUT-1 (terminals ⑯ and ⑰)" and "Analog OUTPUT-3 (terminals ⑭ and ⑮)" present the V-mode characteristics of split computations.

[1] Set the Control Output Type (OT1) parameter to "2".
This sets the control output to "current output."
[2] Set the Retransmission Output 1 (RT1) parameter to "3".
This sets the retransmission output to "control output retransmission."
[3] Set the Analog Output-1 100% Segmental Point (A1H) parameter to "100%".
[4] Set the Analog Output-1 0% Segmental Point (A1L) parameter to "25%".
[5] Set the Analog Output-3 100% Segmental Point (A3H) parameter to "0%".
[6] Set the Analog Output-3 0% Segmental Point (A3L) parameter to "75%".

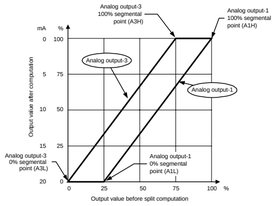


The figure on the right shows an example where both analog outputs-1 and 3 are set to the current signal of 4 to 20 mA DC. The type of output signal can be determined separately for each of the analog outputs listed above, using the following three parameters.
Analog output-1: Analog output-1 type (AO1)
Analog output-2: Analog output-2 type (AO2)
Analog output-3: Analog output-3 type (AO3)

• Parallel-mode Output

The following explains an example of letting "Analog OUTPUT-1 (terminals ⑯ and ⑰)" and "Analog OUTPUT-3 (terminals ⑭ and ⑮)" present the parallel-mode characteristics of split computations.

[1] Set the Control Output Type (OT1) parameter to "2".
This sets the control output to "current output."
[2] Set the Retransmission Output 1 (RT1) parameter to "3".
This sets the retransmission output to "control output retransmission."
[3] Set the Analog Output-1 100% Segmental Point (A1H) parameter to "100%".
[4] Set the Analog Output-1 0% Segmental Point (A1L) parameter to "25%".
[5] Set the Analog Output-3 100% Segmental Point (A3H) parameter to "75%".
[6] Set the Analog Output-3 0% Segmental Point (A3L) parameter to "0%".



The figure on the right shows an example where both analog outputs-1 and 3 are set to the current signal of 20 to 0 mA DC. The type of output signal can be determined separately for each of the analog outputs listed above, using the following three parameters.
Analog output-1: Analog output-1 type (AO1)
Analog output-2: Analog output-2 type (AO2)
Analog output-3: Analog output-3 type (AO3)

● Communication Parameters

Located in: Main menu = Utnd (UTMD) ; Submenu = r485 (R485)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
PSL (PSL)	Protocol selection	0: PC link communication 1: PC link communication (with sum check) 2: Ladder communication 3: Coordinated master station 4: Coordinated slave station 7: MODBUS (ASCII) 8: MODBUS (RTU) 10: Coordinated slave station (loop-1 mode) 11: Coordinated slave station (loop-2 mode)	0		Communication functions
bPS (BPS)	Baud rate	600, 1200, 2400, 4800, 9600 (bps)	9600		
Pri (PRI)	Parity	NONE: None EVEN: Even ODD: Odd	EVEN		
StP (STP)	Stop bit	1, 2	1		
dLn (DLN)	Data length	7, 8 7 is fixed for MODBUS (ASCII) 8 is fixed for MODBUS (RTU), Ladder	8		
Adr (ADR)	Address	1 to 99 However, the maximum number of stations connectable is 31.	1		
rPt (RP.T)	Minimum response time	0 to 10 (× 10 ms)	0		

● Motor-driven Value Calibration-related Parameters (Displayed for Position Proportional Controllers)

Located in: Main menu = Utnd (UTMD) ; Submenu = VALV (VALV)

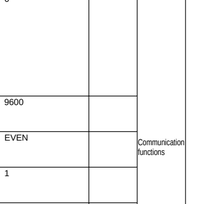
Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
vAt (V.AT)	Valve auto tuning	Automatically adjusts the fully-closed and fully-opened positions of a valve. When this function is used, there is no need for adjustment using the parameters V.RS, V.L and V.H. OFF: - ON: Start automatic adjustment	OFF		—
vrS (V.RS)	Valve position setting reset	The parameters V.RS, V.L and V.H are designed for manual adjustment of valve positions. Setting V.RS to 1 resets the valve adjustment settings and causes the indication "V.RS" to blink.	0		—
vL (V.L)	Fully-closed valve position setting	Pressing the SET/ENT key with valve position set to the fully-closed position causes the adjusted value to be stored. When V.L. adjustment is complete, V.L. stops blinking.	Undefined		—
vH (V.H)	Fully-opened valve position setting	Pressing the SET/ENT key with valve position set to the fully-opened position causes the adjusted value to be stored. When V.H. adjustment is complete, V.H. stops blinking.	Undefined		—
trt (TR.T)	Valve traveling time	5 to 300 sec Used to operate a valve according to the estimated valve position. Set the time required for the valve to open fully from a state of being fully closed. Confirm the valve traveling time by consulting the datasheet of the valve's specifications. The valve traveling time is only effective when Valve Adjustment Mode (V.MD) is set to 1 or 2.	60 sec.		—
vMd (V.MD)	Valve adjusting mode	0: Valve position feedback type 1: Valve position feedback type (moves to the estimating type if a valve input error or burnout occurs.) 2: Valve position estimating type	0		—

● Parameter-initializing Parameters

Located in: Main menu = Utnd (UTMD) ; Submenu = Init (INIT)

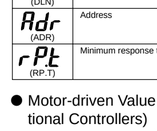
Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
Ini (INI)	Parameter initialization	OFF: - ON: Initialize parameters	OFF		—

■ Tips about Heating/Cooling Control (for heating/cooling controllers only)

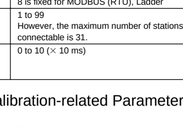


In heating/cooling control, the controller outputs the result of computation after splitting it into heating-purpose and cooling-purpose signals. In addition, the controller can perform PID control or ON/OFF control on the heating and cooling sides separately. When performing ON/OFF control, set the proportional band to "0".
The controller splits the result of computation (0 to 100%) into heating-side and cooling-side signals, as described below.
• 0% to 50% of the computation result is presented as a 0% to 100% cooling-side output.
• 50% to 100% of the computation result is presented as a 0% to 100% heating-side output.

Heating/cooling control provides two methods in which either none of the heating- and cooling-side outputs are presented or both of the heating- and cooling-side outputs are presented, as shown in the following figures.



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



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

Precautions in Heating/Cooling Control

• Keep the ratio of the heating-side proportional band (P) to the cooling-side proportional band (Pc) equal to or below 5.
• If neither the heating-side nor the cooling-side is performing ON/OFF control, setting the integral time (I or Ic) of one side to "0" results in the Integral Time parameters of both sides being set to "OFF", irrespective of the integral time setting of the other side.

■ Tips about Position Proportional Control (for position proportional controllers only)

Position proportional control can be of either feedback type or estimating type.
In feedback-type position proportional control, the controller obtains a valve position signal from a feedback slide-wire resistor attached to a valve.
In estimating-type position proportional control, you set the operating time required for a valve to change from the fully-closed position to the fully-open position beforehand. With the preset operating time, the controller controls the valve by estimating its position. In the case of estimating-type position proportional control, there is no need for feedback input wiring.
Feedback-type position proportional control is superior to the estimating type in terms of control performance. When in manual operation, you can directly manipulate the controller's output terminals. Pressing the △ key sends the valve into opening motion while pressing the ▽ key sends it into closing motion.
The figure on the right shows a schematic representation of a loop configured for position proportional control.