

# User's Manual

## Model UT551 Digital Indicating Controller with Active Color PV Display and Embedded Ethernet



IM 05D01C03-01E

YOKOGAWA ♦  
Yokogawa Electric 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
5. Hardware Specifications
6. Terminal Wiring Diagrams

### Introduction

Thank you for purchasing the UT551 digital indicating controller. The controller is shipped from the factory with 6 hardcopy user's manuals (A2 and A3 size) and 1 user's manual on CD-ROM. The 6 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.

\* "Ethernet" is registered trademark of XEROX Corporation.

### 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
Basic operation of Active Color PV Display	Setting / Explanation of Active Color PV Display	Describes the setting/explanation of Active Color PV Display.	A3-size paper, back and front
Detailed description of functions	User's Manual (Reference)	Explains more advanced applications than those found in the 6 hardcopy user's manuals (A2 and A3 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.



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



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

### ■ Exemption from Responsibility

Make sure that all of the precautions are strictly adhered to. Yokogawa Electric Corporation assumes no liability for any damage resulting from use of the instrument in contradiction to the precautions.

Also, Yokogawa Electric Corporation assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the instrument.

### ■ Regarding Protection, Safety, and Prohibition Against Unauthorized Modification

(1) In order to protect the product and the system controlled by it against damage and ensure its safe use, make certain that all of the instructions and precautions relating to safety contained in this document are strictly adhered to. Yokogawa does not guarantee safety if products are not handled according to these instructions.

(2) Modification of the product is strictly prohibited.

### 2. Model and Suffix Codes

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

Model	Suffix Code	Description
UT551	-0	Digital indicating controller (provided with retransmission output and 15 VDC loop power supply as standard)
Type	-1	Standard type Position proportional type
Optional functions	A	With Ethernet communication
	B	With Ethernet communication, auxiliary analog (remote) input, and 1 additional DI
	C	With Ethernet communication, 5 additional DIs and 4 additional DOs
	D	With Ethernet communication, auxiliary analog (remote) input, 6 additional DIs and 4 additional DOs

Check that the following items are provided:

- Digital indicating controller (ordered model): ..... 1
- Brackets (mounting hardware): ..... 1 pair
- Unit label: ..... 1
- User's Manuals for Single-loop Control: ..... 5 (A2 size)
- User's Manuals "Setting/Explanation of Active Color PV Display": ..... 1 (A3 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.

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
UT551-xA	✓	✓							✓	✓	✓				
UT551-xB	✓	✓							✓	✓	✓				
UT551-xC	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
UT551-xD	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

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.

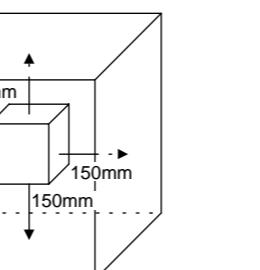
### 3. How to Install



#### NOTE

To install the controller, select a location where:

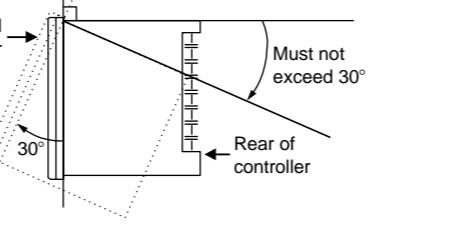
- (1) no one may accidentally touch the terminals,
- (2) mechanical vibrations are minimal,
- (3) corrosive gas is minimal,
- (4) temperature can be maintained at about 23°C and the fluctuation is minimal,
- (5) no direct radiant heat is present,
- (6) no magnetic disturbances are caused,
- (7) no wind 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.

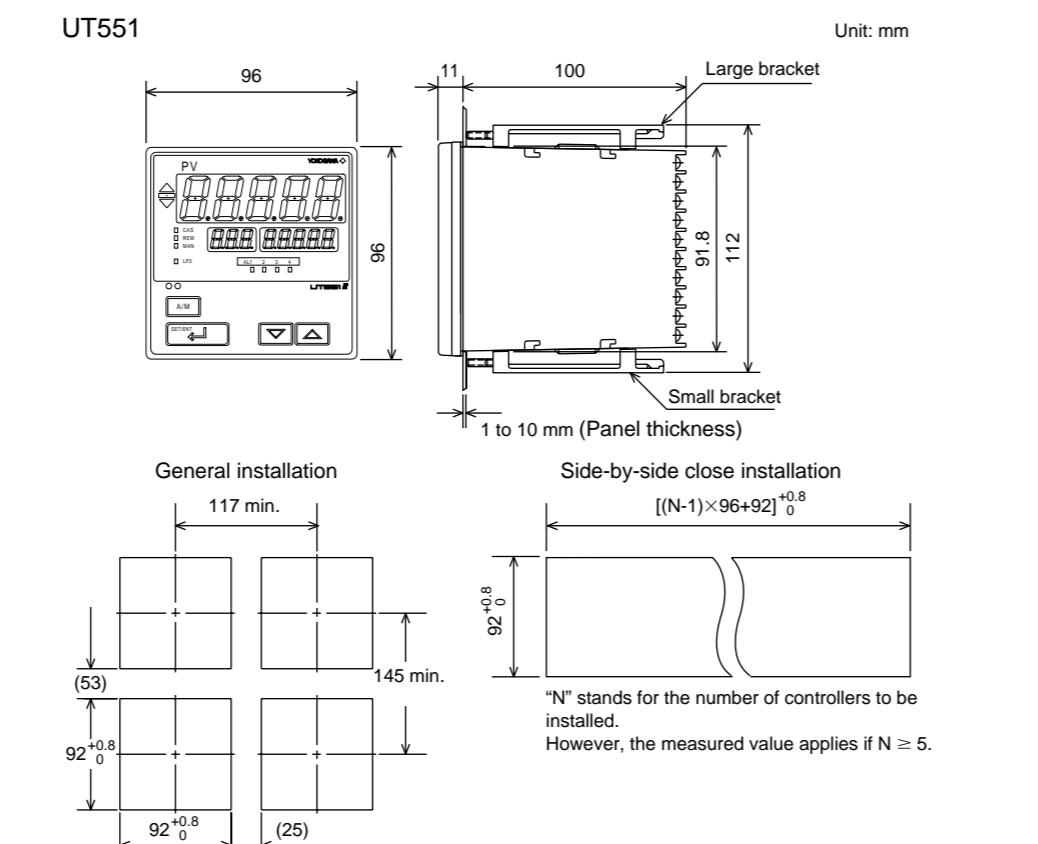
#### ● Installation Position

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

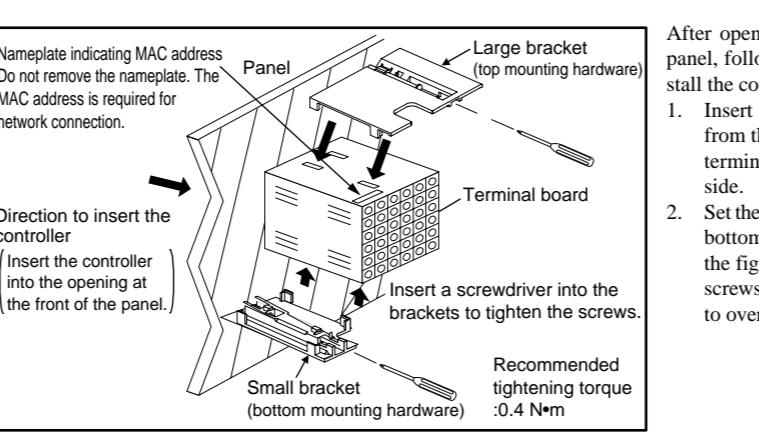


#### ■ How to Install



#### 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



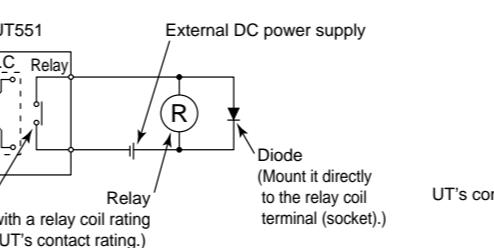
#### CAUTION

- 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) For the protection and safe use of the controller, be sure to place a circuit breaker (conforms with IEC60947-5A, 100V or 220V AC) near the controller where the breaker can easily be operated. In addition, be sure to indicate that it is the instrument to cut the power supply of the controller.
- 3) Wiring must be carried out by personnel who have basic electrical knowledge and practical experience.

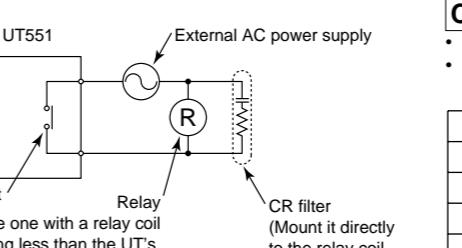
#### NOTE

- 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-suppression surge suppression circuit, into the line in parallel with the load.
- 5) When there is a possibility of being struck by external lightning surge, use the arrester to protect the instrument.

#### ■ For DC Relay Wiring



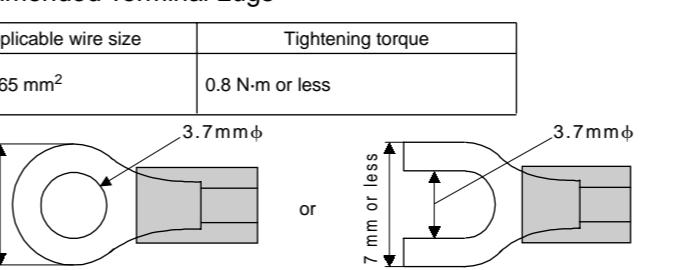
#### ■ For AC Relay Wiring



#### ● 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 <sup>2</sup>
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



### 5. Hardware Specifications

#### PV Input Signals

- Provided for position proportion type only (terminals ①-②-③)
- Slide resistance value: 100 Ω to 2.5 kΩ of overall resistance (burnout detection for sliding wire provided)
  - Sampling period: Can be selected from 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 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

Effects of signal source resistance: 250 Ω or less for thermocouple or mV input

Effects of signal source resistance: 0.1 V/V or less for DC voltage input

Effects of signal source resistance: About 0.01%/100 Ω

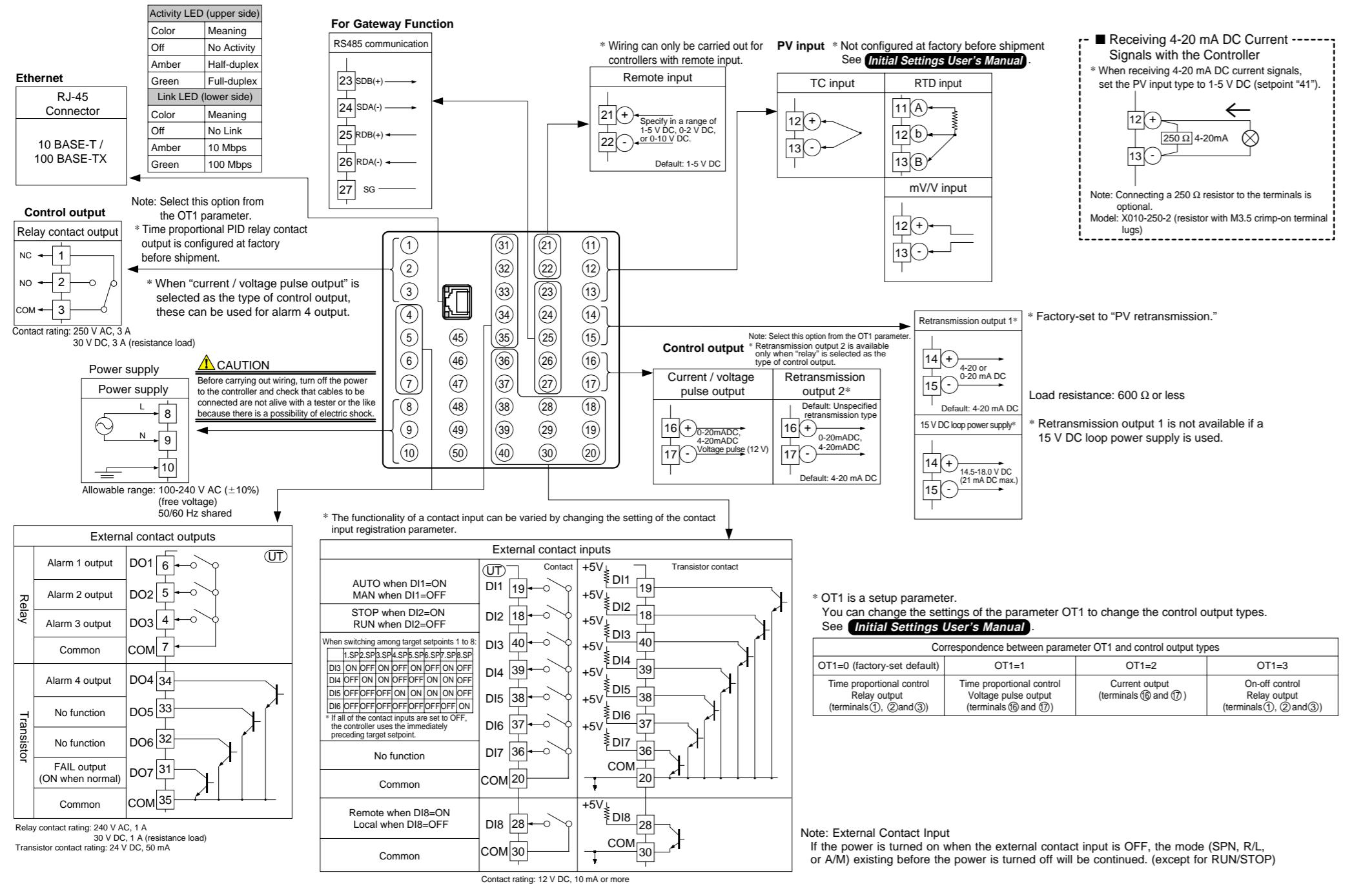
Allow

## 6. Terminal Wiring Diagrams

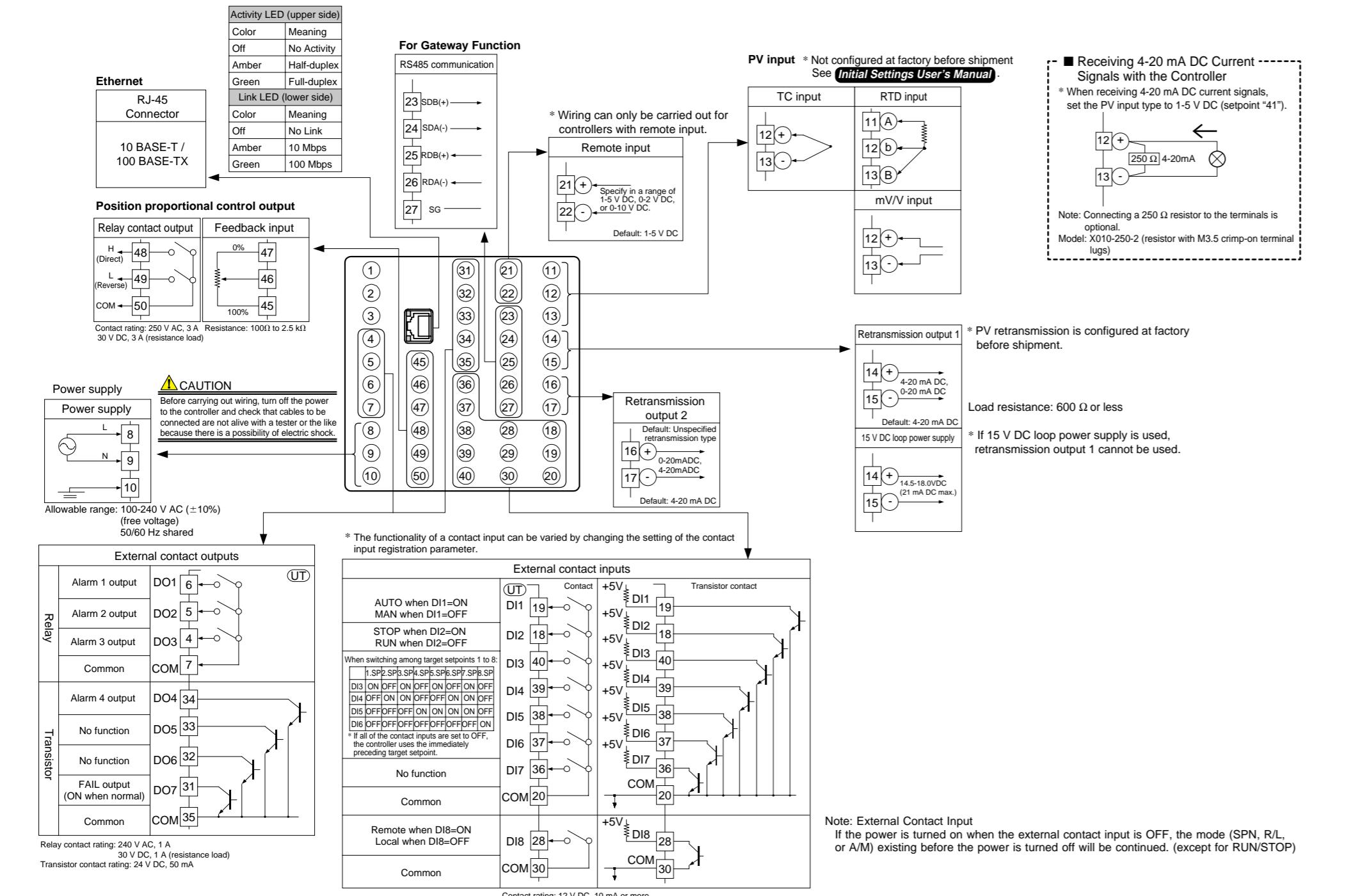
**NOTE**

Do not use unassigned terminals as relay terminals.

### ■ UT551 Standard Type (Model UT551-0x), Single-loop Control



### ■ UT551 Position Proportional Type (Model UT551-1x), Single-loop Position Proportional Control



# User's Manual

## Model UT551 Digital Indicating Controller



with Active Color PV Display and Embedded Ethernet

User's Manual for Single-loop Control Initial Settings

IM 05D01C03-02E

**YOKOGAWA**

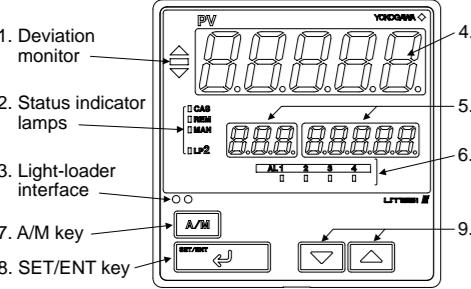
Yokogawa Electric Corporation

3rd Edition: Mar.25, 2005

### Contents

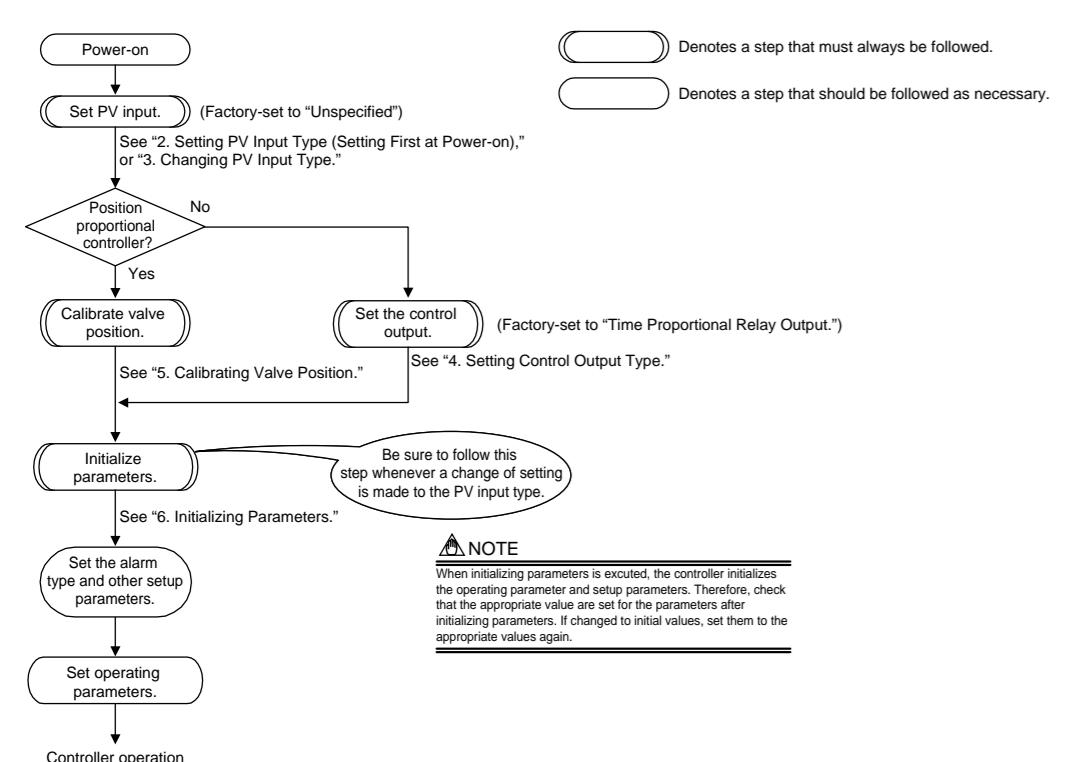
1. Names and Functions of Front Panel Parts
2. Setting PV Input Type (Setting First at Power-on)
3. Changing PV Input Type
4. Setting Control Output Type (Except for a Position Proportional Controller)
5. Calibrating Valve Position (for a Position Proportional Controller Only)
6. Initializing Parameters
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	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.
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 or green) if an error occurs. Display color can be switched between red and green according to the setting of "PCM" setup parameter.
5. Setpoint display	Displays a parameter symbol in 3-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	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	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 increases a numerical value, while pressing the □ key causes it to decrease. 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



### ■ Setting of Main Parameters at the Factory before Shipment

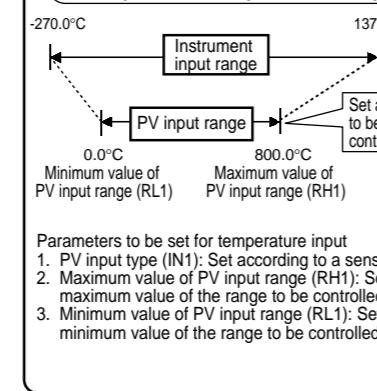
Item	Factory-shipped values for standard type controllers	Factory-shipped values for position proportional type controllers
1 to 5 V DC (variable)		
Control output	Time proportional PID relay output (variable)	Relay output (fixed)
Control action	Reverse action (variable)	Not specified
PID parameter	$P = 5.0\%, I = 240 \text{ seconds}, D = 60 \text{ seconds}$	
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)

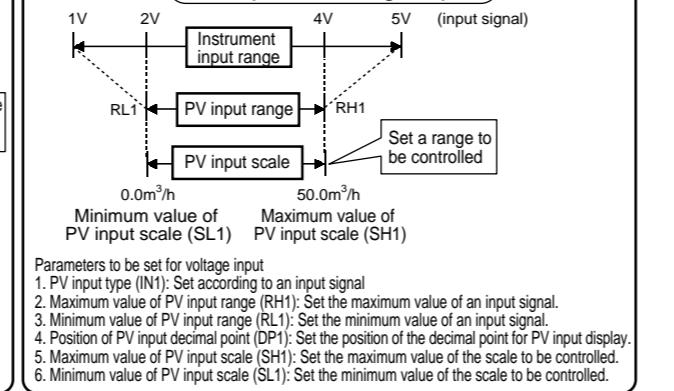
#### NOTE

- 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 **SET/ENT** key once to display the parameter "IN1" for the PV input type, and then the **▲** key to display the input range code to use, then press the **SET/ENT** 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.

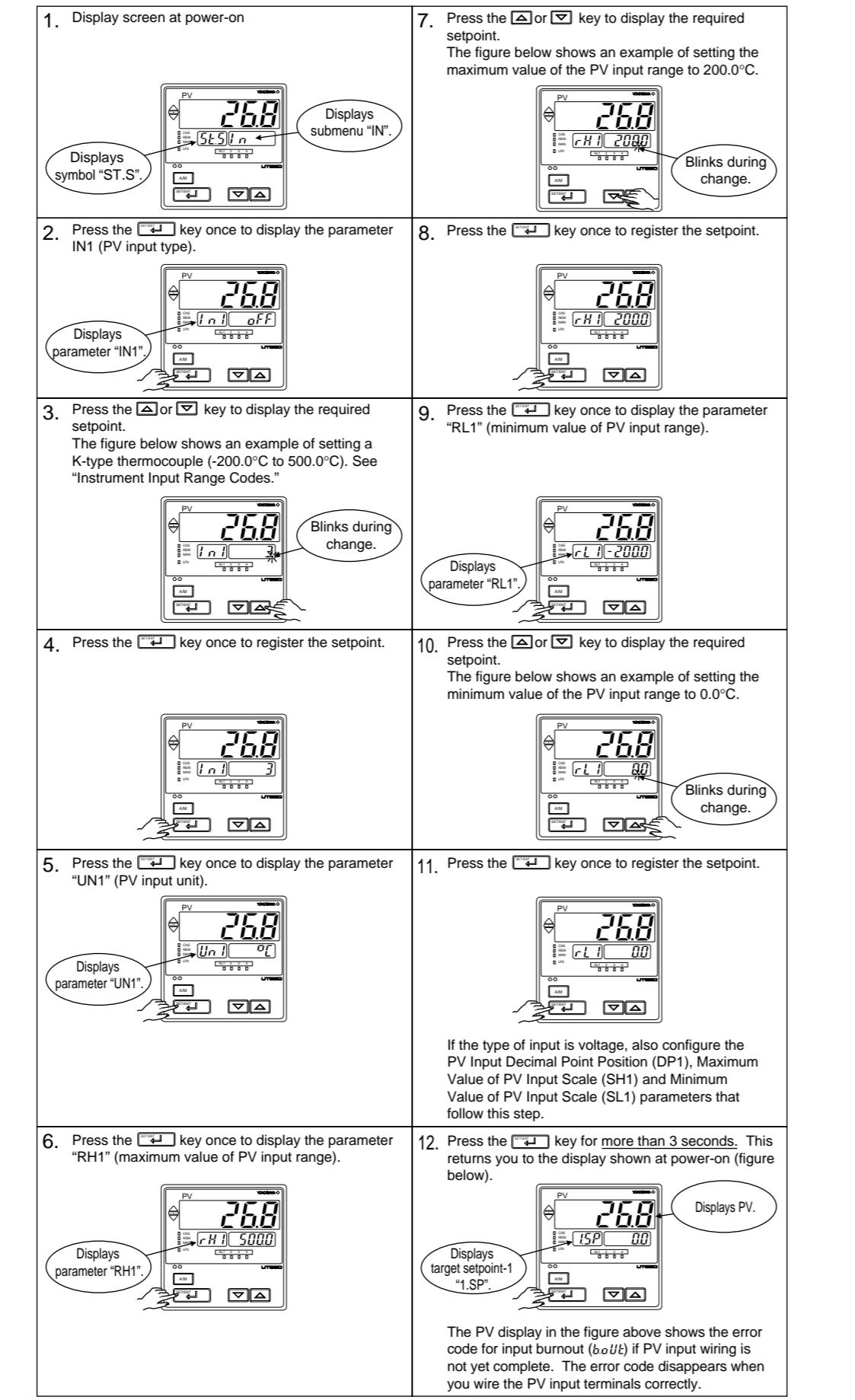
#### Example of Temperature Input



#### Example of Voltage Input



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.



### ■ Instrument Input Range Codes

Select the unit from the UN1 parameter.				
Input	Type	Instrument Input Range Code	Instrument Input Range	Measurement Accuracy
Unspecified	OFF	OFF	Set the data item PV Input Type "IN1" to the OFF option to leave the PV input type undefined.	
		1	-270.0 to 1370.0°C	
		2	-450.0 to 2500.0°F	
		3	-450.0 to 2300.0°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.
		4	-200.0 to 1000.0°C	
		5	-300.0 to 2300.0°F	
		6	0.0 to 400.0°C	
		7	-200.0 to 750.0°F	
		8	0.0 to 1700.0°C	±0.15% of instrument range ±1 digit at 400°C or more ±5% of instrument range ±1 digit at less than 400°C
		9	32 to 3100°F	±0.15% of instrument range ±1 digit
Thermocouple	K	10	-200.0 to 1300.0°C	±0.1% of instrument range ±1 digit ±0.25% of instrument range ±1 digit for temperatures below 0°C
		11	-270.0 to 1000.0°C	
		12	-300.0 to 1600.0°F	±0.1% of instrument range ±1 digit 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.
		13	-200.0 to 400.0°C	
		14	-32 to 750.0°F	
		15	0.0 to 2300.0°C	±0.2% of instrument range ±1 digit
		16	32 to 4200°F	
		17	0.0 to 1390.0°C	±0.1% of instrument range ±1 digit
		18	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
		30	-200.0 to 500.0°C	±0.1% of instrument range ±1 digit (Note1) (Note2)
RTD	JPt100	31	-150.0 to 150.0°C	±0.2% of instrument range ±1 digit (Note1)
		35	-200.0 to 300.0°F	±0.2% of instrument range ±1 digit (Note1)
		36	-200.0 to 500.0°C	±0.1% of instrument range ±1 digit (Note1) (Note2)
		37	-150.0 to 150.0°C	±0.2% of instrument range ±1 digit (Note1)
		40	0.4 to 2 V	±0.1% of instrument range ±1 digit
		41	1 to 5 V	Display range is scalable in a range of -19999 to 30000. Display span is 30000 or less.
		50	0 to 2 V	
Standard signal	DC voltage	51	0 to 10 V	
		55	-10.0 to 20.0 mV	
		56	0 to 100 mV	

\* Performance in the standard operating conditions (at  $23 \pm 2^\circ\text{C}$ ,  $55 \pm 10\%$  RH, and 50/60 Hz power frequency)

Note 1: The accuracy is  $\pm 0.3\%$  of instrument range ±1 digit for a temperature range from 0°C to 100°C.

Note 2: The accuracy is  $\pm 0.5\%$  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  $250\Omega$  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 to 18
RTD	30, 31, 35 to 37
DC voltage(mV,V)	40, 41, 50, 51, 55, 56

### Ranges Selectable for Remote Input

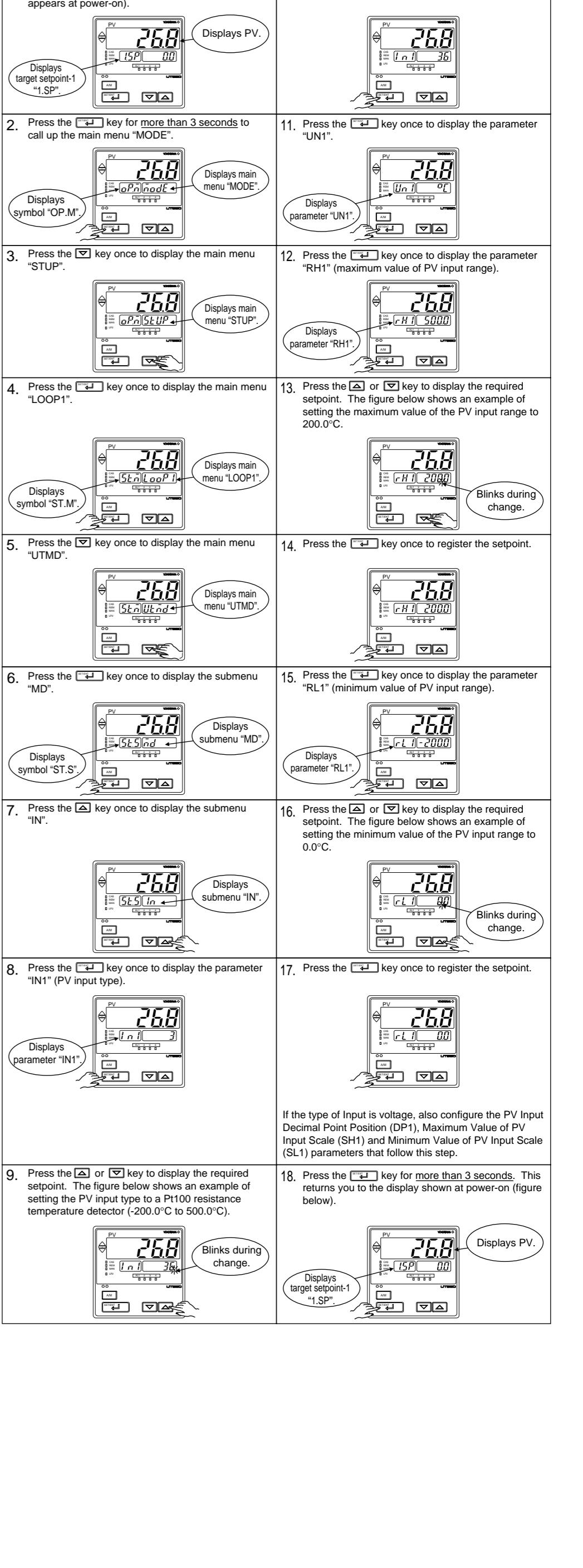
DC voltage(V)	40, 41, 50, 51
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The PV display in the figure above shows the error code for input burnout (*bout*) if PV input wiring is not yet complete. The error code disappears when you wire the PV input terminals correctly.

### 3. Changing PV Input Type

The following operating procedure describes an example of changing the PV input terminal. 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.

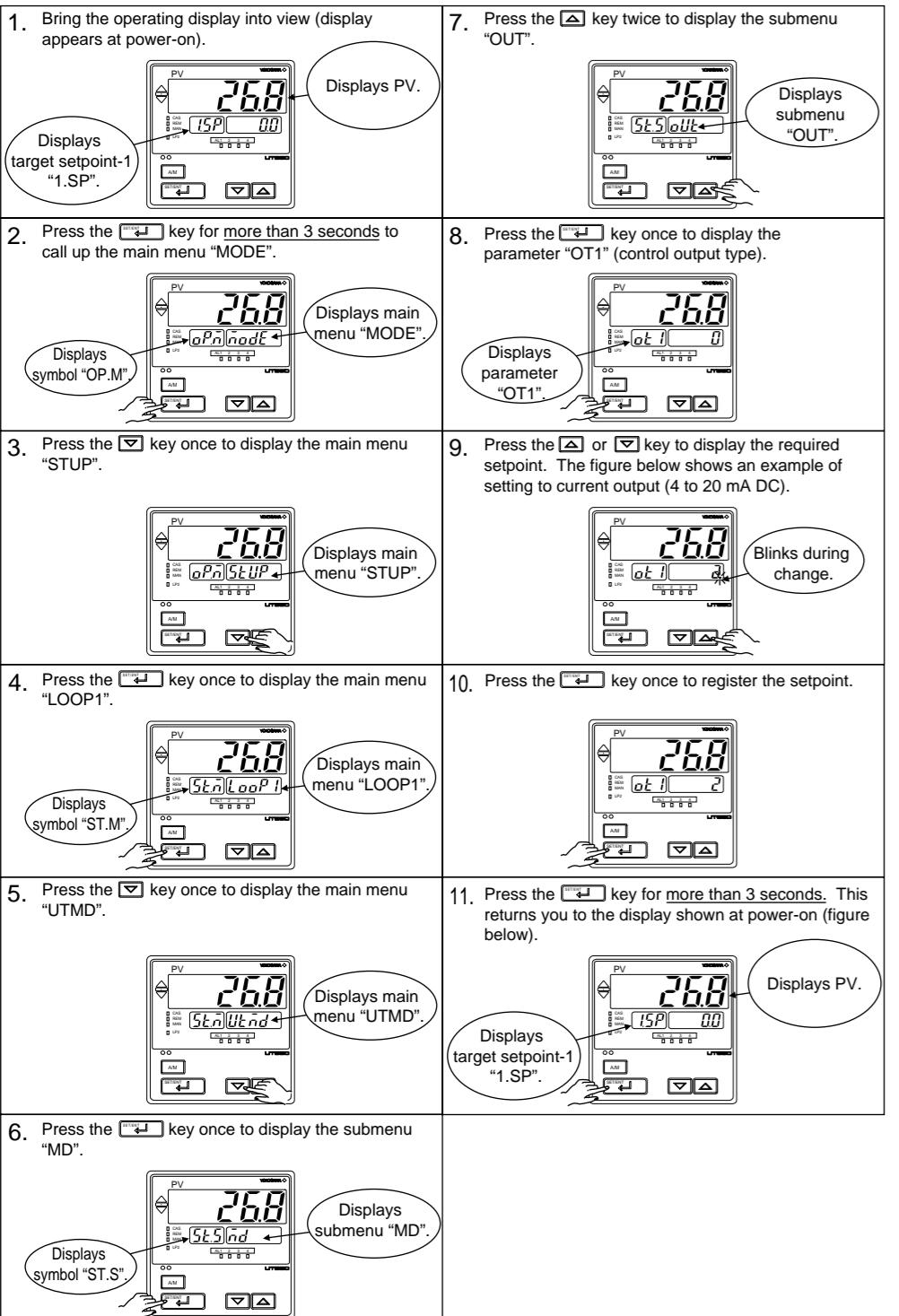
PV input terminal Thermocouple/mV/V input ..... ②-③ RTD input ..... ④-⑤



#### 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.....	⑤-⑦

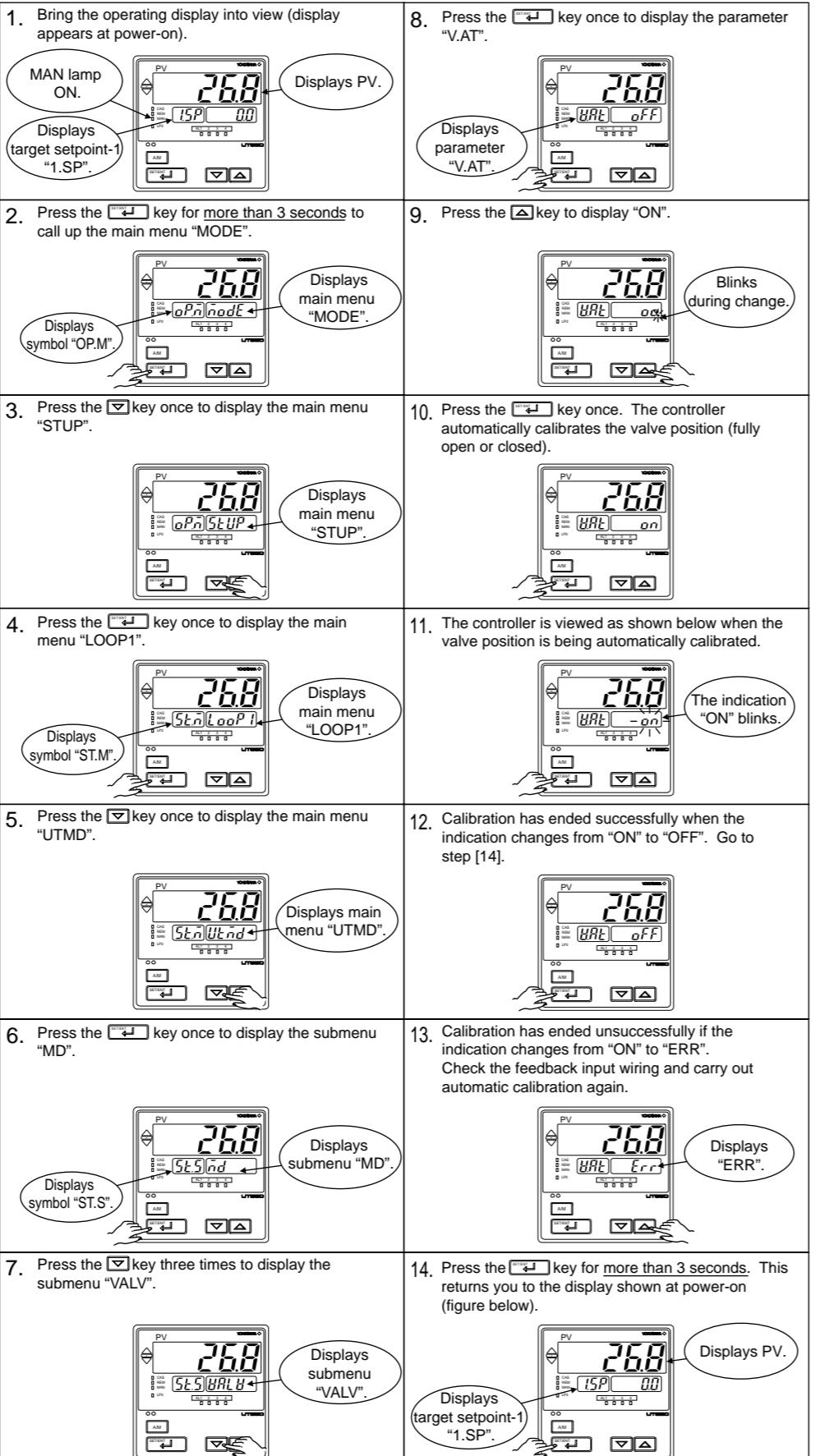


#### ● List of Control Output Types

Parameter Symbol	Name of Parameter	Setpoint	Control Output Types
<i>at</i> 1 (OT1)	Control output type	0	Time proportional PID relay contact output (terminals ①-②-③)
		1	Time proportional PID voltage pulse output (terminals ⑤-⑦)
		2	Current output (terminals ⑤-⑦)
		3	On/off control relay contact output (terminals ①-②-③)

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

The following operating procedure 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*.

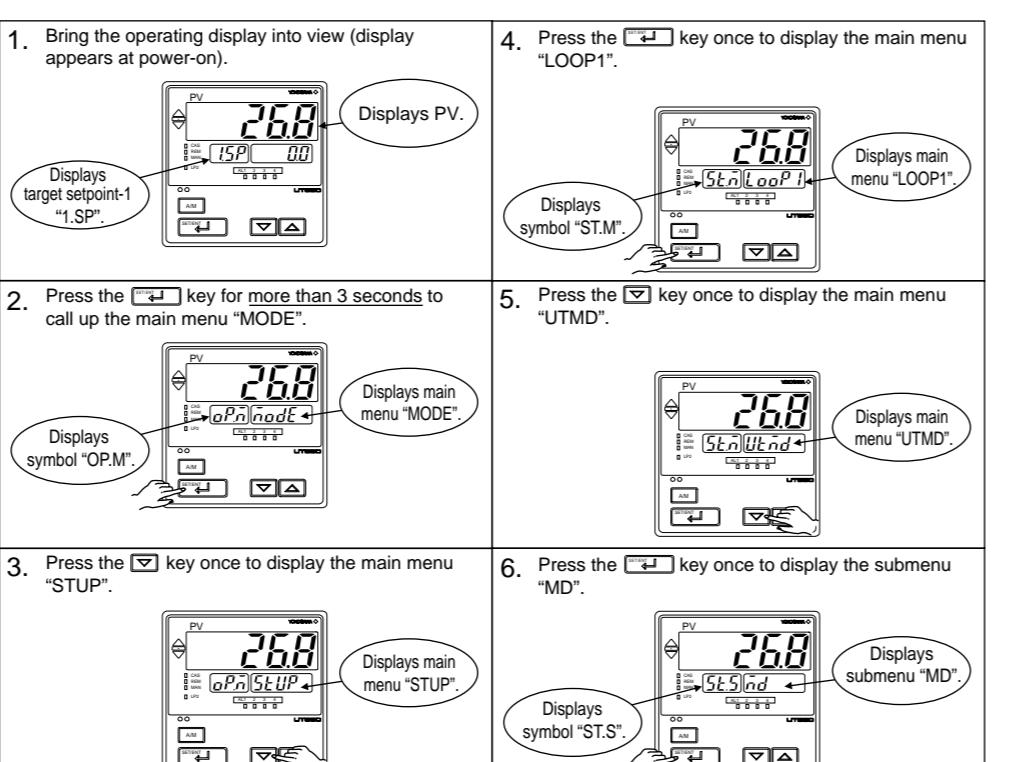


#### 6. Initializing Parameters

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.

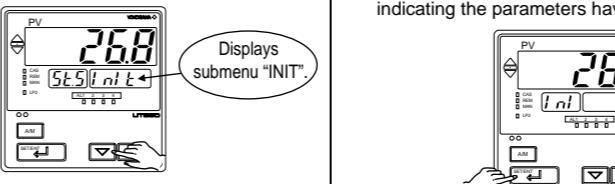
##### CAUTION

Initializing the above parameter setpoints may initialize the registered operating/setup parameter setpoints. Check that they are correct. If any of them has been changed to its initial value, set it to a required value.



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

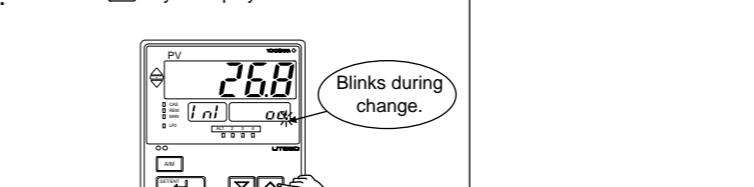
10. Press the key once. The display momentarily becomes blank (which is normal), indicating the parameters have been initialized.



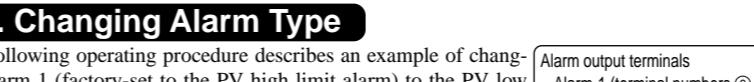
#### 8. Press the key once to display the parameter "INI".



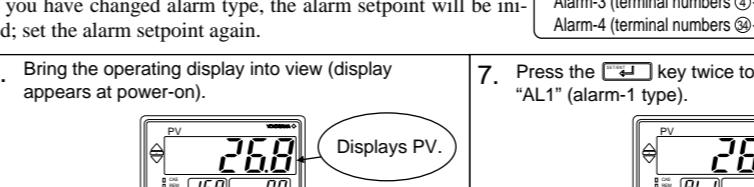
#### 9. Press the key to display "ON".



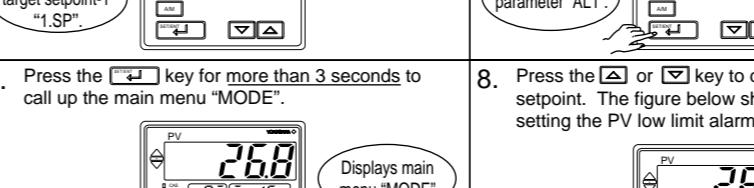
#### 10. Press the key once. The controller automatically calibrates the valve position (fully open or closed).



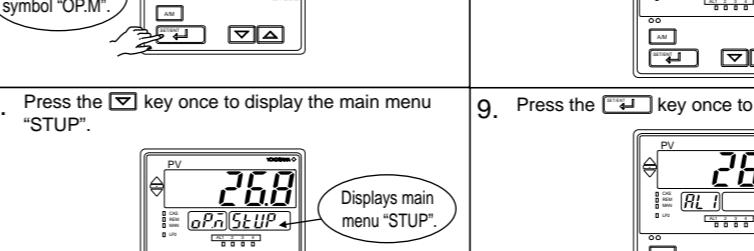
#### 11. The controller is viewed as shown below when the valve position is being automatically calibrated.



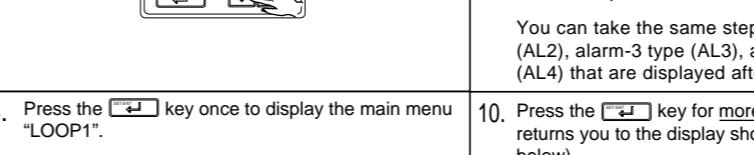
#### 12. Calibration has ended successfully when the indication changes from "ON" to "OFF". Go to step [14].



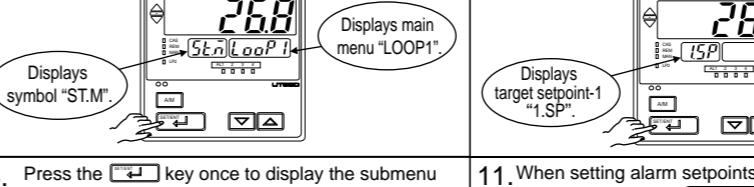
#### 13. Calibration has ended unsuccessfully if the indication changes from "ON" to "ERR". Check the feedback input wiring and carry out automatic calibration again.



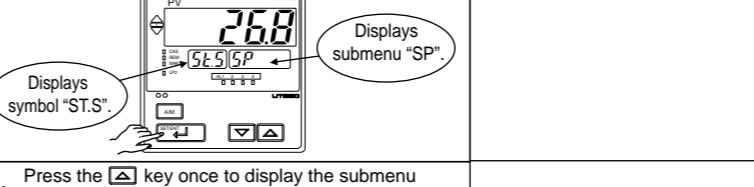
#### 14. Press the key for more than 3 seconds. This returns you to the display shown at power-on (figure below).



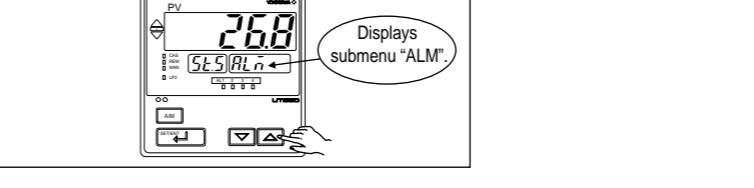
#### 15. Press the key twice to display the parameter "AL1" (alarm-1 type).



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



#### 17. Press the key once to display the main menu "STUP".



#### 18. Press the key once to register the setpoint.



#### 19. Press the key once to display the main menu "LOOP1".



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



#### ■ List of Alarm Types

The table below shows the alarm types and alarm actions. In the table, codes 1 to 10, 33 to 38 are not provided with stand-by actions, while codes 11 to 20, 43 to 48 are provided with stand-by actions.

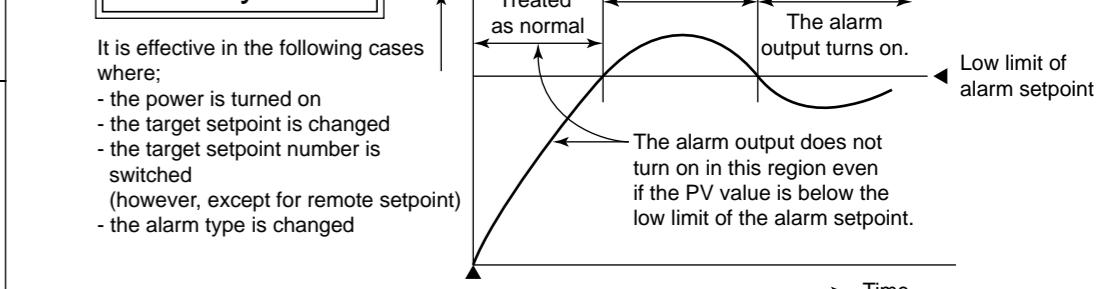
Alarm type	Alarm action	Alarm type code	Alarm type	Alarm action	Alarm type code
No alarm	"Open/close" shows status of relay contact, and "lit" and "unit" shows status of lamp	OFF	Hysteresis	Open (lit) → Closed (unit) → PV	6
PV high limit	De-energized on deviation low limit alarm (Note 3)	1	Hysteresis	Open (unit) → Closed (lit) → PV	16
PV low limit	Deviation high and low limits (Note 3)	2	Hysteresis	Closed (lit) → Open (unit) → PV	7
Deviation high limit (Note 3)	De-energized on deviation high limit alarm (Note 3)	3	Hysteresis	Open (unit) → Closed (lit) → PV	8
Deviation low limit (Note 3)	De-energized on PV high limit	4	Hysteresis	Closed (unit) → Open (unit) → PV	9
De-energized on deviation high limit alarm (Note 3)	De-energized on PV low limit	5	Hysteresis	Open (lit) → Closed (unit) → PV	10
Upward (hour/minute)	Sensor grounding alarm	21	Fault diagnosis output (Note1)	Fault diagnosis output	25
Downward (hour/minute)		22	Upward (minute/second)		26
Upward (minute/second)		23	Downward (minute/second)		27
Downward (minute/second)		24	SP high limit	Hysteresis	30
		28	Output high limit	Closed (lit) → Open (unit) → PV	31
		29	Output low limit	Closed (lit) → Open (unit) → PV	36
		33	De-energized low on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	46
		34	Deviation low limit for target setpoint (Note 3)	Hysteresis	37
		35	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	48
		36	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	38
		37	Deviation low limit for target setpoint (Note 3)	Hysteresis	47
		38	Deviation within high and low limits for target setpoint (Note 3)	Hysteresis	48
		39	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	49
		40	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	50
		41	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	51
		42	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	52
		43	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	53
		44	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	54
		45	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	55
		46	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	56
		47	De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis	57
		48	Deviation high and low limits for target setpoint (Note 3)	Closed (lit) → Open (unit) → PV	58

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. The codes 3 to 8, 13 to 18 and 33 to 38 in the table above is as follows.

Note 3: The difference of alarm action between the alarm type codes 3 to 8, 13 to 18 and 33 to 38 in the table above is as follows. The codes 3 to 8, 13 to 18 are effective for current setpoints. (For example, they are effective for the ramp rate setpoint at SP switching.) The codes 33 to 38, 43 to 48 are effective for target setpoints. (For example, they are not effective for the ramp rate setpoint at SP switching.)

#### Stand-by Action



#### 8. Description of Multiple Setpoints and PID

The UT551 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.

However, when the setup parameter ZON (zon PID selection parameter) = 0.

For example, if you have set "2" to the target setpoint number (SPN), the control parameters available are target setpoint (2.SP), proportional band (2.P), integral time (2.I) and derivative time (2.D).

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	Integral time	Derivative time
SPN=1	1.SP	1.P	1.I	1.D
SPN=2	2.SP	2.P	2.I	2.D
SPN=3	3.SP	3.P	3.I	3.D
SPN=4	4.SP	4.P	4.I	4.D
SPN=5	5.SP	5.P	5.I	5.D
SPN=6	6.SP	6.P	6.I	6.D
SPN=7	7.SP	7.P	7.I	7.D
SPN=8	8.SP	8.P	8.I	8.D

# User's Manual

## Model UT551 Digital Indicating Controller with Active Color PV Display and Embedded Ethernet



IM 05D01C03-03E

**YOKOGAWA**  
Yokogawa Electric Corporation

3rd Edition: Mar.25, 2005

### Contents

- Monitoring-purpose Operating Displays Available during Operation
- Setting Target Setpoint (SP)
- Performing/Cancelling Auto-tuning
- Setting PID Manually
- Setting Alarm Setpoints
- Selecting Target Setpoint Numbers (SPN)
- Switching between Run and Stop
- Switching between AUTO and MAN
- Manipulating Control Output during Manual Operation
- Switching between Remote (REM) and Local (LCL)
- Troubleshooting

### 1. Monitoring-purpose Operating Displays Available during Operation

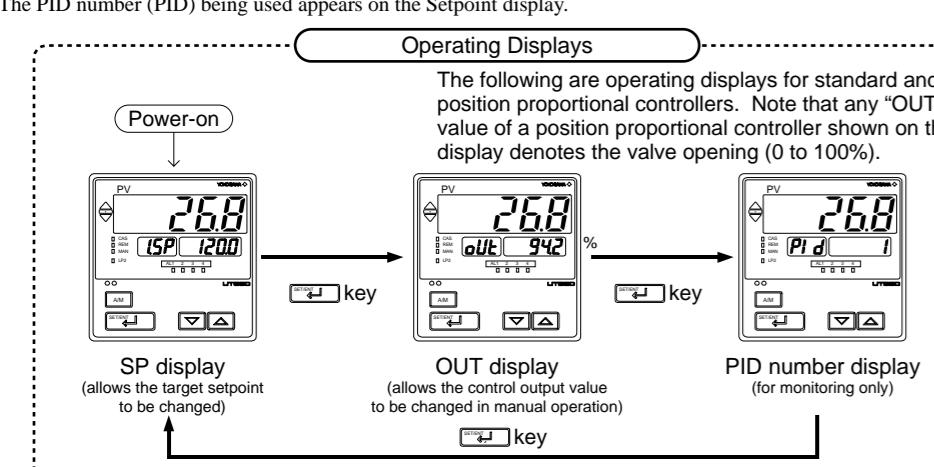
The operating displays for standard and position proportional controllers are prepared as monitoring-purpose operating displays available during operation.

#### 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)

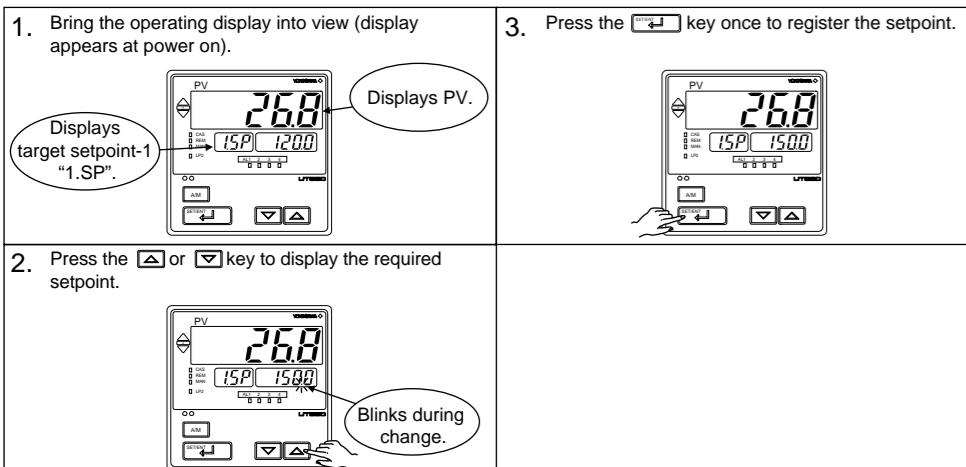
- OUT Display  
The PV input value appears on the PV display.  
The control output value (OUT) appears on the Setpoint display. (can be changed in manual operation)  
When in position proportional control, the Setpoint display shows the valve opening (0% to 100%).

- PID Number Display  
The PV input value appears on the PV display.  
The PID number (PID) being used appears on the Setpoint display.



### 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.



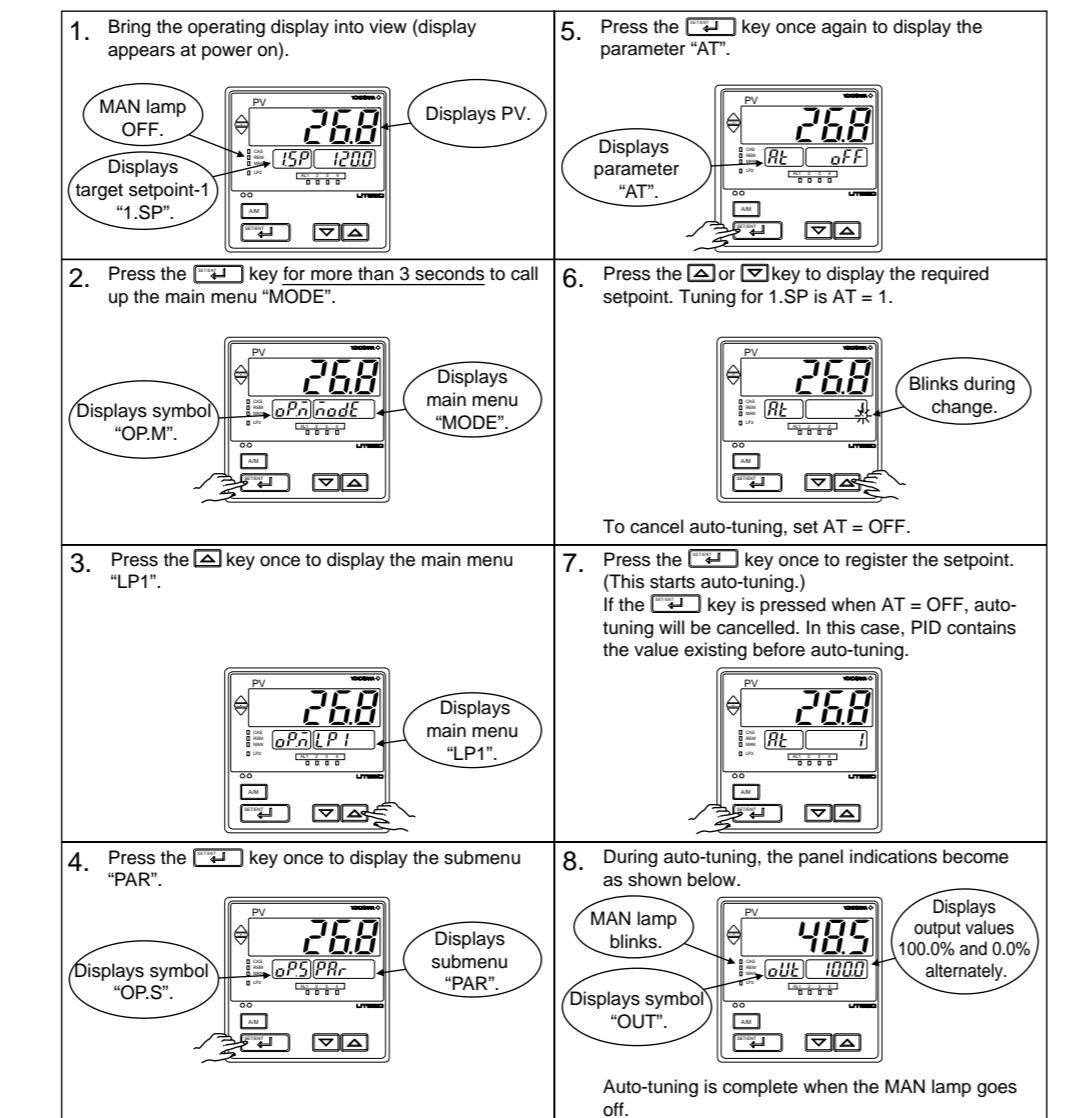
### 3. Performing/Cancelling Auto-tuning

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

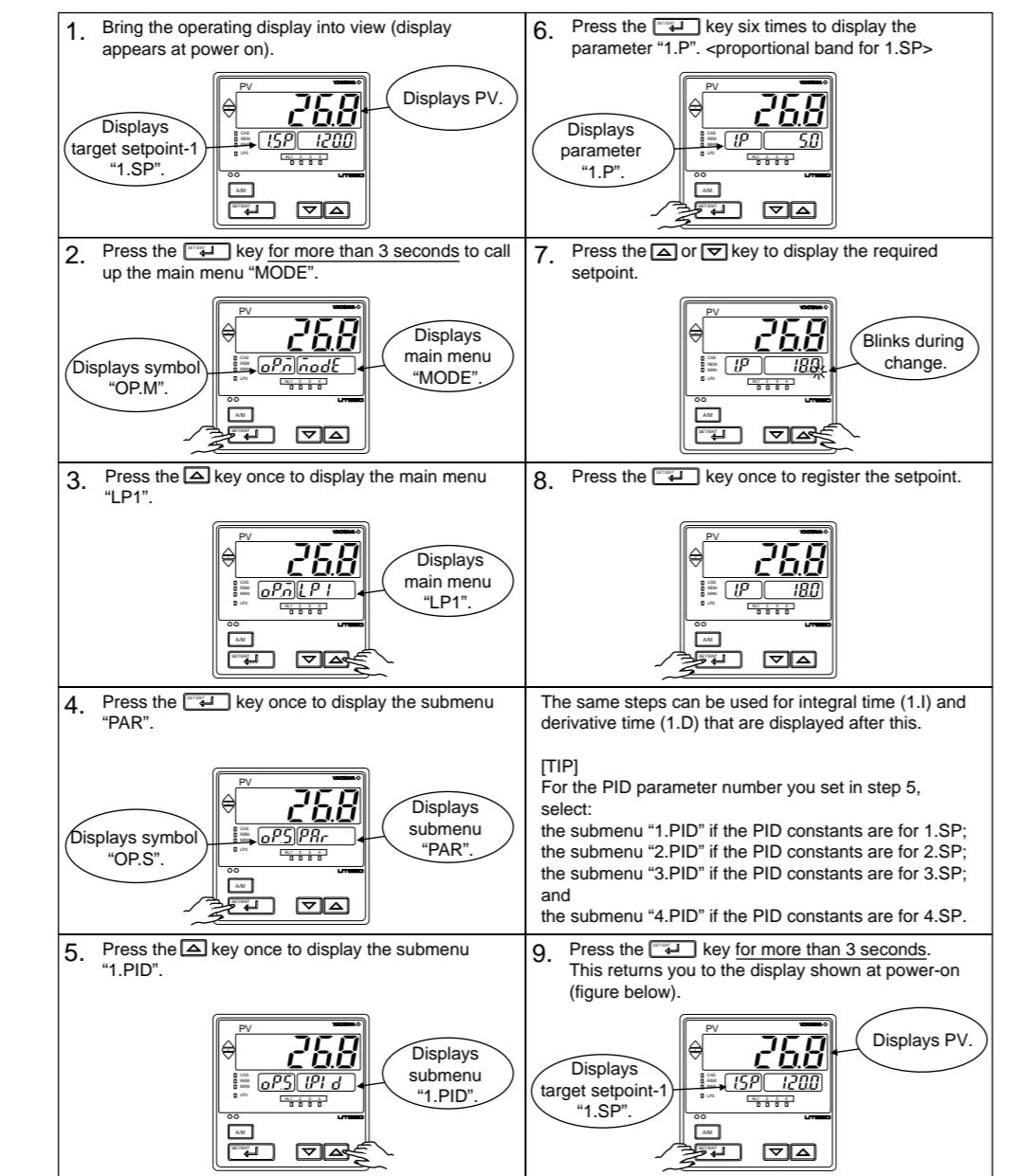
When on-off control is being used, auto-tuning cannot be carried out. Moreover, do not perform auto-tuning when controlling any of the following processes.

- 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



### 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.



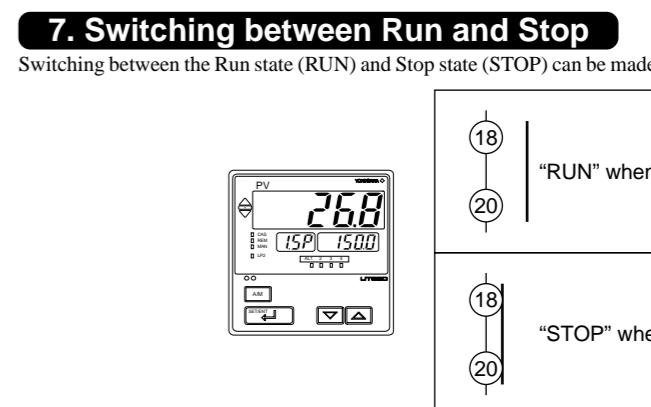
### 5. Setting Alarm Setpoints

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*.

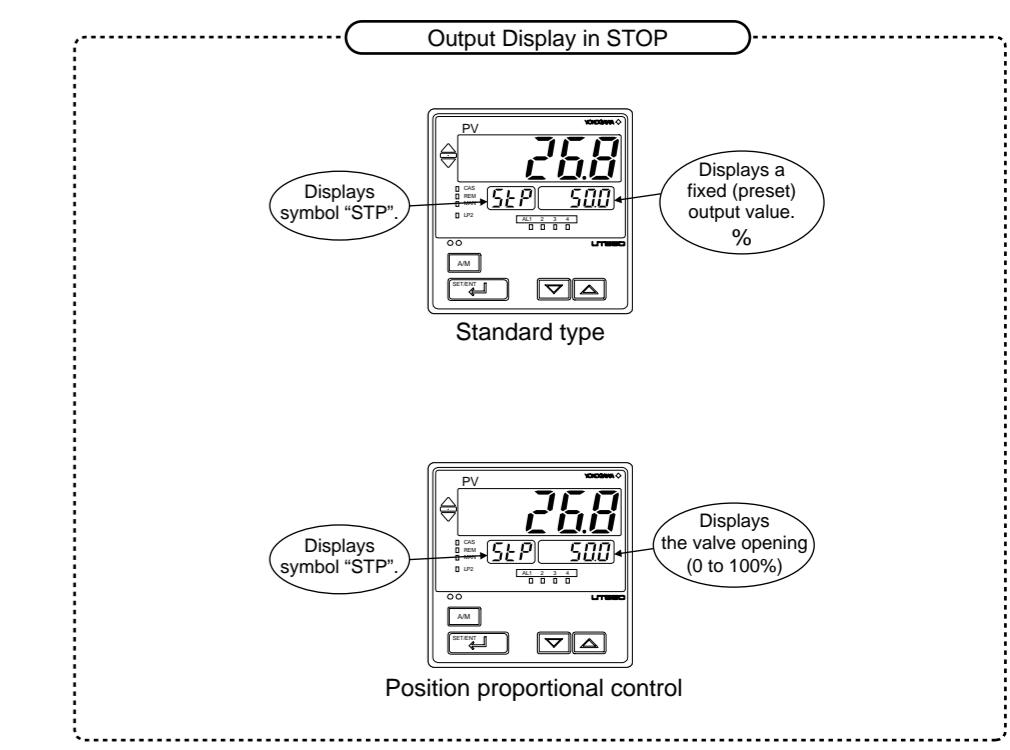
Alarm output terminals	Factory-shipped settings
Alarm-1 (terminal numbers 6~7).....	PV high limit alarm
Alarm-2 (terminal numbers 5~6).....	PV low limit alarm
Alarm-3 (terminal numbers 3~4).....	PV high limit alarm
Alarm-4 (terminal numbers 8~9).....	PV low limit alarm

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



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

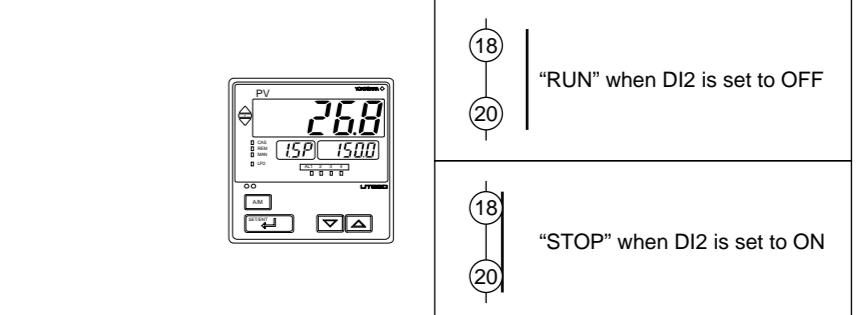
PV input	Displays the PV value.
Control output	Provides the preset output value (factory-set to 0%).
Alarm output	Turns the output on in case of an alarm.



\* 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.

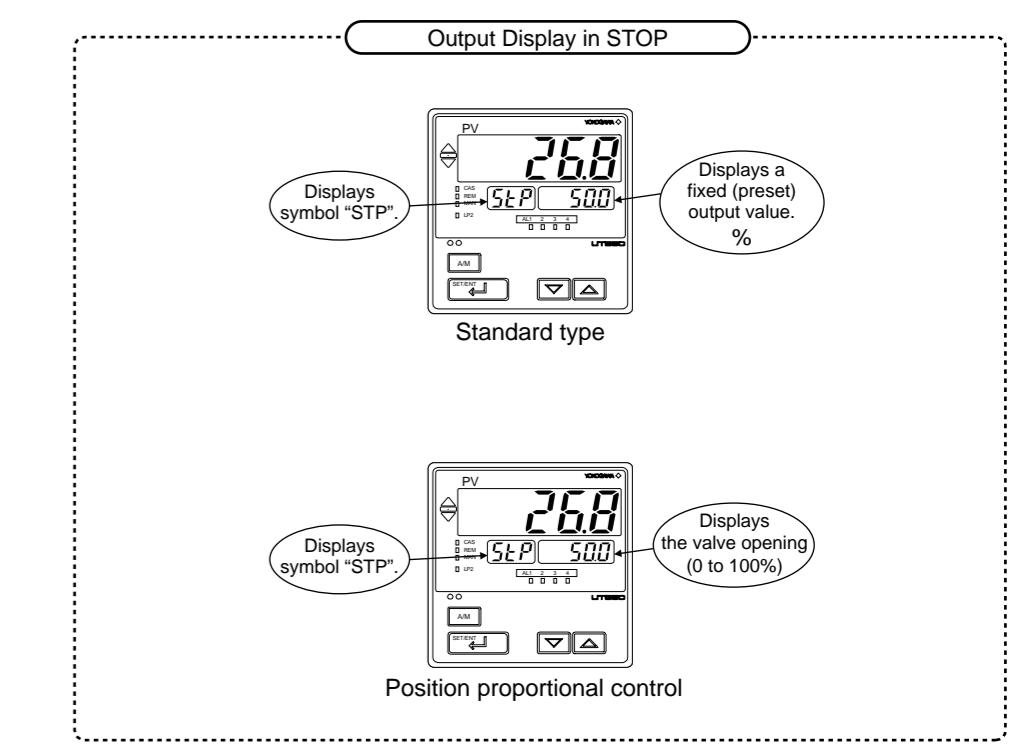
### 7. Switching between Run and Stop

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.



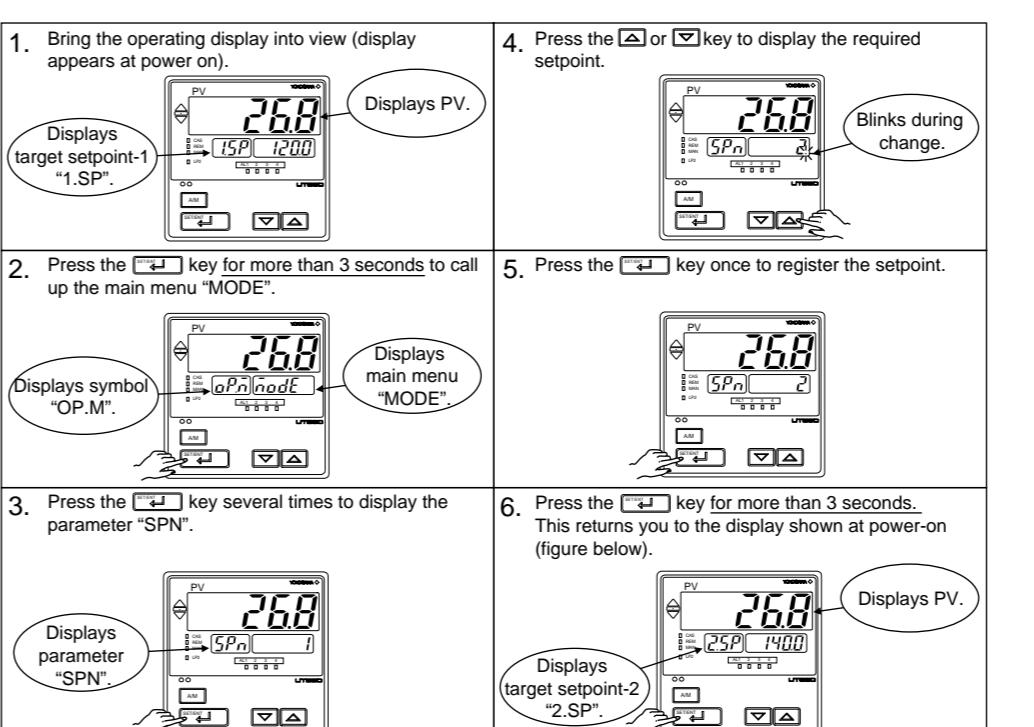
\* Switching the target setpoint number (SPN) in STOP allows any preset output value (n.PO) to be switched. The "n" is same as the target setpoint number.

### 6. Selecting Target Setpoint Numbers (SPN)

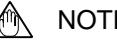
The following operating procedure describes an example of changing a target setpoint number (SPN) from 1 to 2.

#### 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.

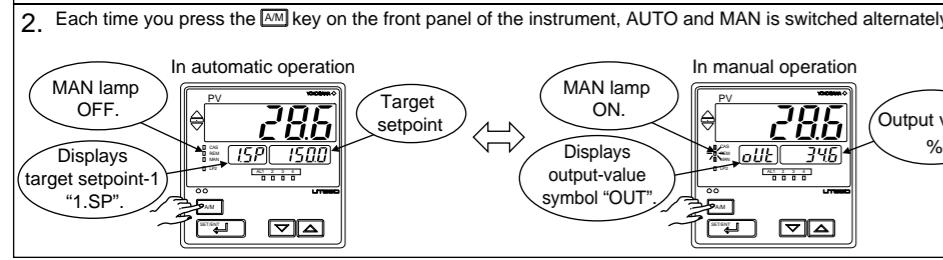
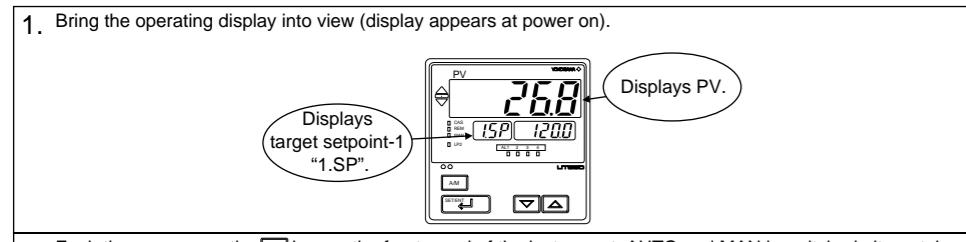


## 8. Switching between AUTO and MAN



### 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.



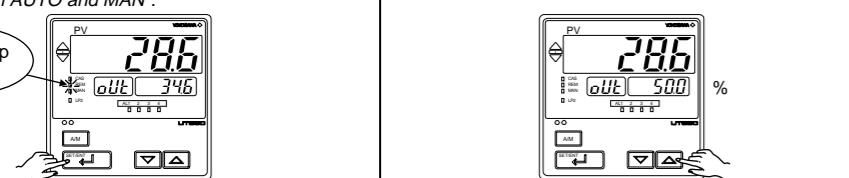
## 9. Manipulating Control Output during Manual Operation



Control output cannot be changed if the controller is stopped. In this case, the preset output value (operating parameter PO) 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 **[MAN]** key.

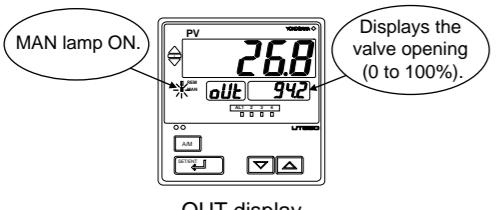
1. Bring manual operating display into view. For switching to manual operation, see "8. Switching between AUTO and MAN".
2. Press the **[▲]** or **[▼]** key to change a control output value. You don't need to press the **[MAN]** key.



## ■ 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 : The output high limit(OH) and output low limit(OL) do not restrict the manual output of position proportional control.

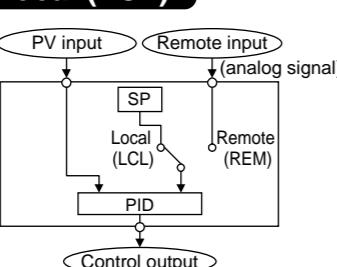
## 10. Switching between Remote (REM) and Local (LCL)

The following operating procedure describes an example of switching from Local (LCL) to Remote (REM).

Switching between REM and LCL is possible for controllers with remote input only.

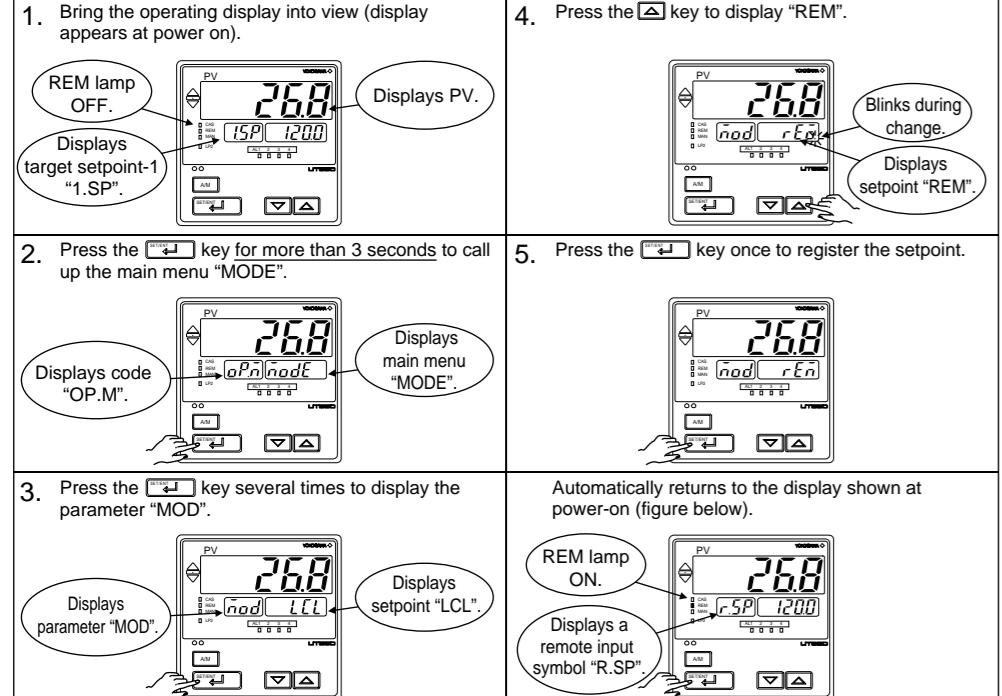
- Local:  
Performs control using target setpoints set in the controller.
- Remote:  
Performs control using external analog signals as target setpoints.

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

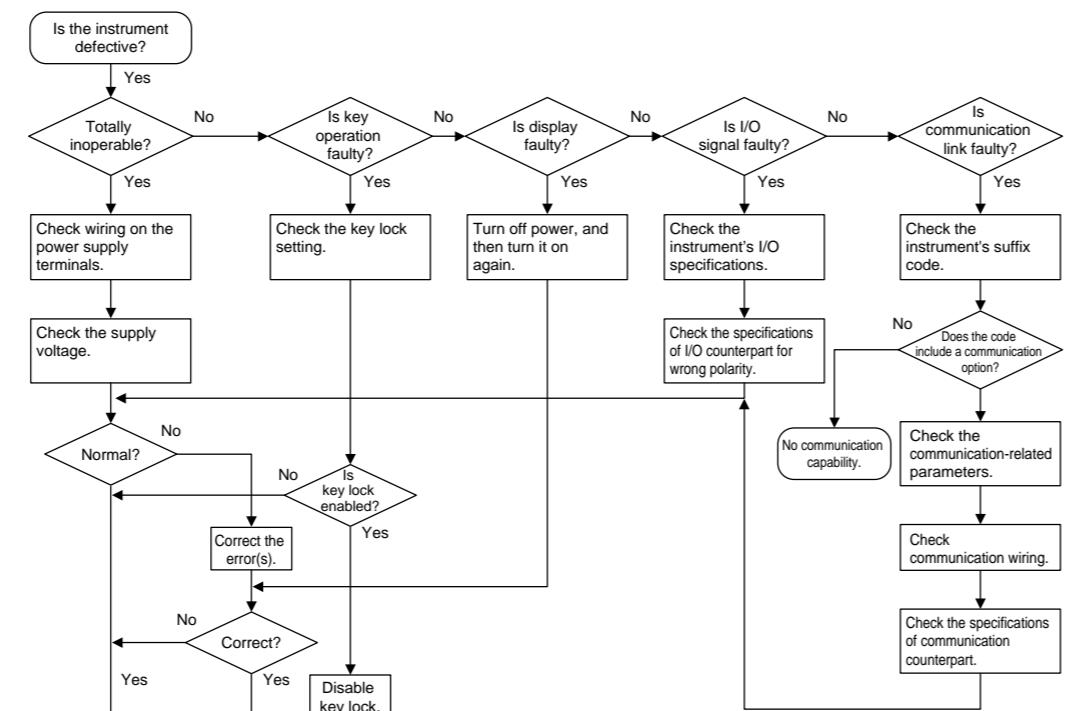
If Remote state is achieved by external contact input (contact input is ON), switching between REM and LCL cannot be achieved by keystroke.



## 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	OFF	0% or less	Stopped	
E001 (E001)	Faulty ROM	None	0% or less or OFF	Undefined	Undefined		Faulty Contact us for repair.
E002 (E002)	System data error	Undefined					
PV decimal point blinks.	Faulty calibration value	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action (out of accuracy)			
Error code (Note) (See description below.)	Parameter error	Normal action	0% or less or OFF	Normal action	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	—	$2^2$	$2^1$	$2^0$	$2^3$	$2^2$	$2^1$	$2^0$

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# User's Manual

# **Model UT551**

## **Digital Indicating Controller**

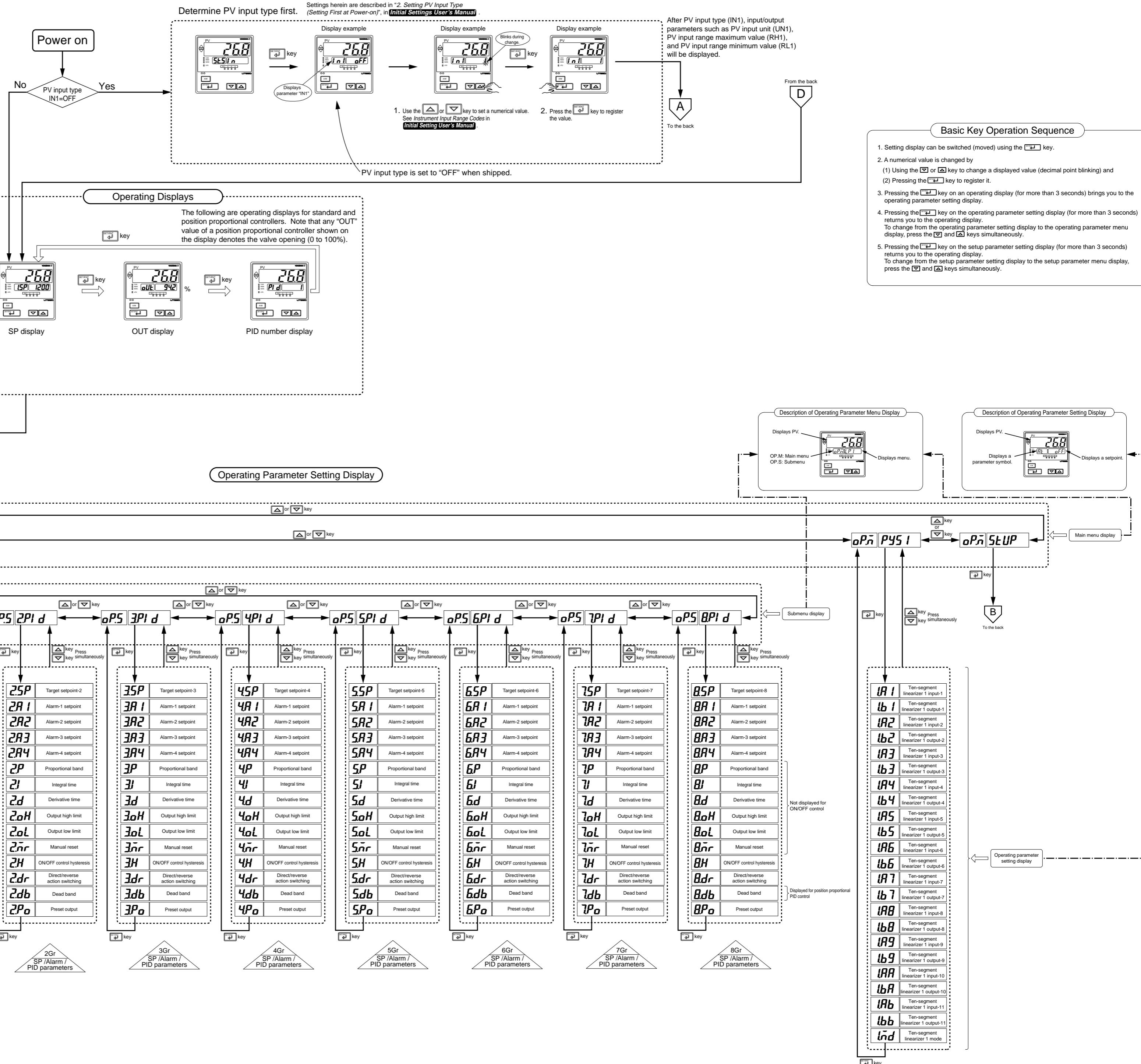
**with Active Color PV Display and Embedded**

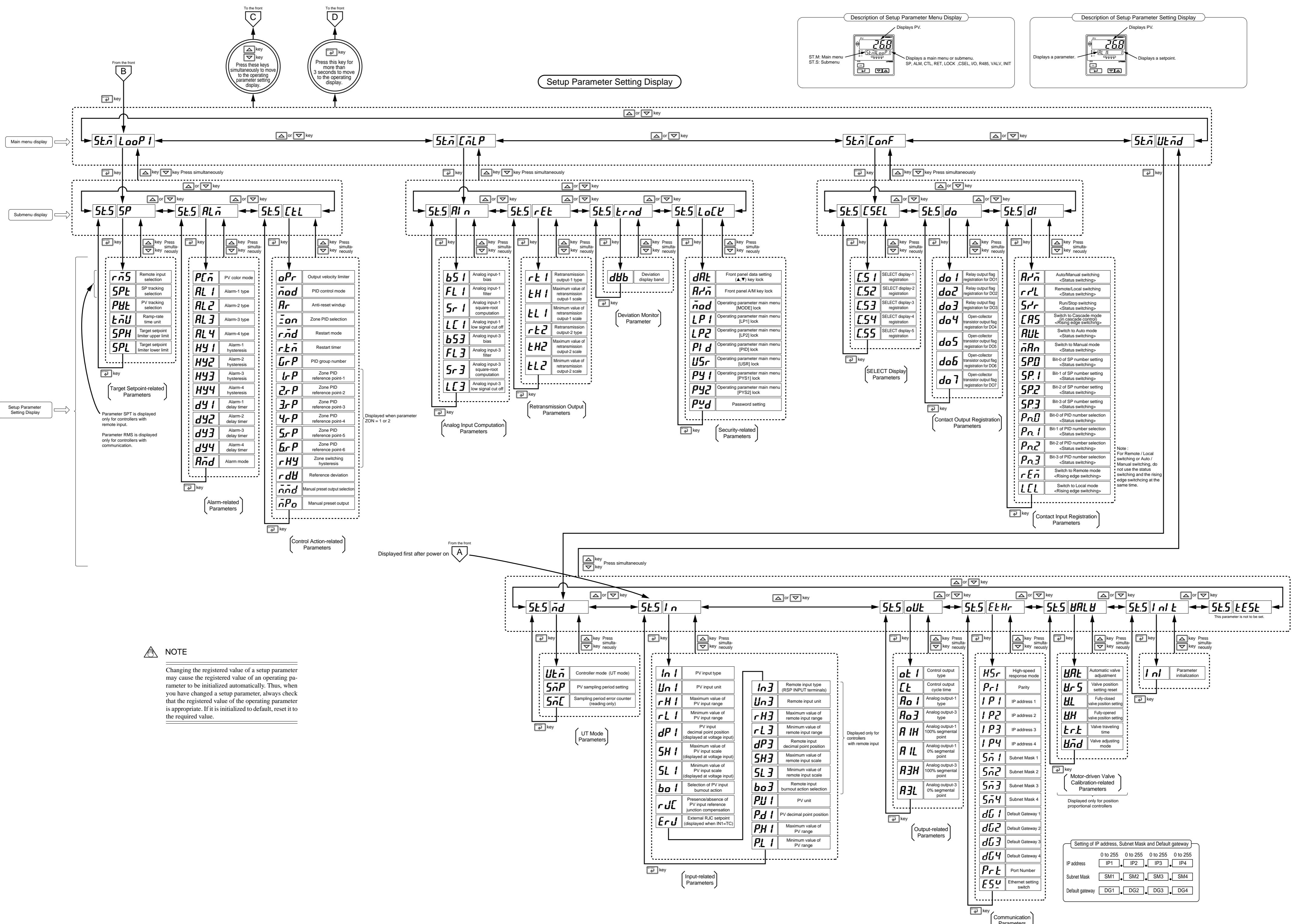
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**G GREEN**  
SERIES

IM 05D01C03-04E

**YOKOGAWA** ♦  
Yokogawa Electric Corporation

3rd Edition: Mar.25, 2005





# User's Manual

## Model UT551 Digital Indicating Controller



IM 05D01C03-05E

**YOKOGAWA** ♦  
Yokogawa Electric Corporation

3rd Edition: Mar.25, 2005

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.

### ■ Operating Parameters

#### ● Operation Mode Parameters

Located in: Main menu = **node** (MODE)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>nod</b> (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		—
<b>nod</b> (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		—
<b>SPn</b> (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		—
<b>P.NO</b> (P.NO)	PID number selection	Displayed when the setup parameter "ZON=3". Setting range: Depends on the setup parameter "GRP". This parameter cannot be set when the PID number is selected by DI. Displays PID number only.	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
<b>AT</b> (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		—
<b>SC</b> (SC)	"SUPER" function	1: Overshoot suppressing function 2: Supresses overshoots generated by abrupt changes in the target setpoint or by disturbances. 3: Hunting suppressing function (Stable mode) 4: Suitable to stabilize the state of control when the load varies greatly, or the target setpoint is changed. 5: 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: PD control 3: PI control for proportional band only 4: PI 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)

<b>b5</b> (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)
<b>FL</b> (FL)	PV input filter	OFF, 1 to 120 second Used when the PV input value fluctuates.	OFF		Same as above
<b>UPr</b> (UPR)	Setpoint ramp-up-rate	OFF, 0 to +100% of PV input range span per hour or minute. Set ramp-up-rate or ramp-down-rate per hour or minute. Sets unit in ramp-time-unit (TMU).	OFF		Ref.4.1(4)
<b>dnr</b> (DNR)	Setpoint ramp-down-rate	Used to prevent the target setpoint from changing suddenly. The target setting works when: 1. the target setpoint is changed (e.g., "1.SP" is changed from 100°C to 150°C); 2. the power 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.  A graph shows the relationship between target setpoint and power number (SPN). It includes points 1.SP=500°C, 2.SP=640°C, and 1.SP=2.SP. The graph also shows the rate of temperature change of 70°C/min (i.e., 14°C/2 min) and the switch from 1.SP to 2.SP at a rate of 2 min.	OFF		Same as above

<b>PCH</b> (PCH)	High limit for PV color change	When PCM (PV color mode parameter) = 6 or 7: -100.0 to 100.0 % of PV input range When PCM (PV color mode parameter) = 8 or 9: -100.0 to 100.0 % of PV input range span	When PCM = 6 or 7: PCH = 100%, PCL = 0 % When PCM = 8 or 9: PCH and PCL = 10 %		—
<b>PCL</b> (PCL)	Low limit for PV color change				
<b>rt</b> (RT)	Ratio setting	0.001 to 9.999 Target setpoint = Remote input × Ratio setpoint + Remote bias	1.000		Ref.1.2(3)
<b>rbs</b> (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
<b>rfl</b> (RFL)	Remote input filter	OFF, 1 to 120 second Used when the remote input value fluctuates.	OFF		Same as above

<b>orb</b> (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)
<b>orH</b> (ORH)	ON/OFF rate high limit	ORL + 1 digit to 105.0%	100.0 %		Same as above
<b>orL</b> (ORL)	ON/OFF rate low limit	-5.0% to ORH - 1 digit	0.0%		Same as above

\* 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.

#### ● Setpoint-, Alarm- and PID-related Parameters

Located in: Main menu = **LP1** (LP1); Submenu = **PI** (PID)

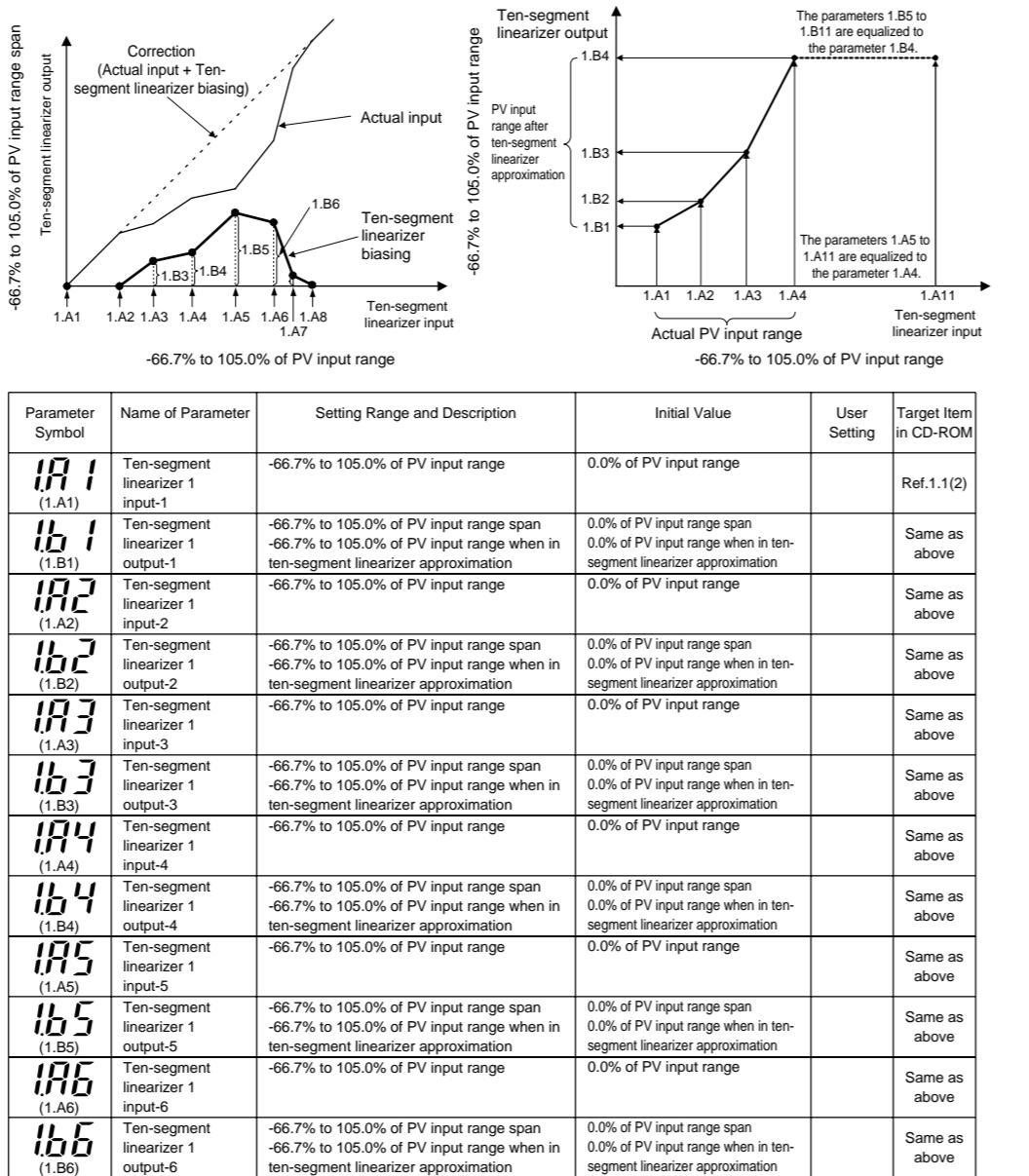
The table below lists the Target Setpoint-1 (1.SP) operating parameter and parameters that apply to the 1.SP parameter.

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>1SP</b> (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)
<b>1A1</b> (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	PV high limit(SP high limit alarm): 100.0% of PV input range Deviation alarm: 0.0% of PV input range span		Ref.4.1(1)
<b>1A2</b> (1.A2)	Alarm-2 setpoint	Output alarm: -5.0 to 105.0% Timer alarm for alarm-1 only: 0.00 to 99.59 (hour, min) or (min, sec)	Output alarm: -5.0 to 105.0% of PV input range Deviation alarm: 0.0% of PV input range span		Same as above
<b>1A3</b> (1.A3)	Alarm-3 setpoint	Allows alarms 1 to 4 (1.A1 to 1.A4) to be set for target setpoint 1 (1.SP).	Output high limit: 100.0% Output Low limit: 0.0%		Same as above
<b>1A4</b> (1.A4)	Alarm-4 setpoint	Four alarms can also be set for target setpoints 2 to 8.	Same as above		Same as above
<b>1P</b> (1.P)	Proportional band	0.1 to 999.9% of PV input range	5.0%		Same as above
<b>1I</b> (1.I)	Integral time	OFF, 1 to 6000 second	240 second		Same as above
<b>1d</b> (1.D)	Derivative time	OFF, 1 to 6000 second	60 second		Same as above
<b>1OH</b> (1.OH)	Output high limit	-5.0 to 105.0% (1.OL < 1.OH)	100%		Ref.2.1(3)
<b>1OL</b> (1.OL)	Output low limit	-5.0 to 105.0% (1.OH < 1.OL)	0.0%		Ref.4.1(1)
<b>1MR</b> (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)
<b>1H</b> (1.H)	ON/OFF control hysteresis	In ON/OFF control: 0.0 to 100.0% of PV input range span Position proportional PID 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: 0.5%		Same as above
<b>1DR</b> (1.DR)	Direct/reverse action switching	RVS: reverse action, DIR: direct action Control output: 100% Reverse action: 0% Deviation (PV-SF): 100% Hysteresis: 0% On: 100% Off: 0% PV value: 0% Point of ON/OFF action (Target setpoint): On Hysteresis: Hysteresis	RVS		Ref.2.1(1) Ref.4.1(1)
<b>1db</b> (1.DB)	Dead band	In position proportional PID control: 1.0 to 10.0% • In position proportional control: Set the range so none of the outputs turn on.	3.0%		Ref.4.1(1)
<b>1Po</b> (1.PO)	Preset output	-5.0 to 105.0% In Stop state, fixed control output can be generated.	0.0%		Ref.2.1(8) Ref.4.1(1)

#### ● Ten-segment Linearizer1 Parameters

Located in: Main menu = **PYS1** (PYS1)

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



Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>1A1</b> (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)
<b>1B1</b> (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
<b>1A2</b> (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
<b>1B2</b> (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
<b>1A3</b> (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
<b>1B3</b> (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
<b>1A4</b> (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
<b>1B4</b> (1.B4)	Ten-segment linearizer 1 output-4	-66.7%			

## ● Retransmission Output Parameters

Located in: Main menu = **L****N****L****P** (CMLP) ; Submenu = **R****E****L** (RET)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>rL1</b> (RT1)	Retransmission output-1 type	Retransmission output-1 / -2 type OFF: Disable 1: PV1, 2: SP1, 3: OUT1; 4: LPS loop power supply (15 V), 5: PV2, 6: SP2, 7: OUT2, 8: SP1, 11: OUT1, 12: TSP1, 15: OUT2, 16: FAIL output Setpoints "5" to "7", and "12" to "15" are not available for single-loop control. • Retransmission output 1 is always provided via terminals 14 and 15. • Retransmission output 2 is available only when "relay" is selected as type of control output. Retransmission output 2 is provided via terminals 16 and 17.	1		Ref.2.2(1) Ref.2.2(3)
<b>EH1</b> (TH1)	Maximum value of retransmission output-1 scale	100.0% of PV input range		Ref.2.2(1)	
<b>EL1</b> (TL1)	Minimum value of retransmission output-1 scale	0.0% of PV input range		Same as above	
<b>rL2</b> (RT2)	Retransmission output-2 type	OFF		Ref.2.2(1) Ref.2.2(3)	
<b>EH2</b> (TH2)	Maximum value of retransmission output-2 scale	Minimum value of retransmission output-1 / -2 scale RT1=1, 2, 5, 6, 8, 12, 16, 17: -19999 to TH1 - 1 digit RT2=1, 2, 5, 6, 8, 12, 16, 17: -19999 to P.D1 • Decimal point position is P.D2 for retransmission type "5", "6", "12", DP1 for "16" and DP3 for "17".		Ref.2.2(1)	
<b>EL2</b> (TL2)	Minimum value of retransmission output-2 scale	—		Same as above	

## ● Deviation Monitor Parameters

Located in: Main menu = **L****N****L****P** (CMLP) ; Submenu = **L****r****n****d** (TRND)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>dBb</b> (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 = **L****N****L****P** (CMLP) ; Submenu = **L****o****l****c** (LOCK)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>drf</b> (DAT)	Front panel data setting ( $\Delta$ , $\nabla$ ) key lock	OFF: Unlock ON: Lock	OFF		Ref.7.1(2)
<b>Arn</b> (A/M)	Front panel A/M key lock	OFF: Unlock ON: Lock	OFF		Same as above
<b>nod</b> (MOD)	Operating parameter main menu [MODE] lock	OFF: Unlock ON: Lock	OFF		Same as above
<b>LP1</b> (LP1)	Operating parameter main menu [LP1] lock	OFF: Unlock ON: Lock	OFF		Same as above
<b>LP2</b> (LP2)	Although not used in single-loop control, it is shown on the display.	—	—	—	—
<b>PId</b> (PID)	Operating parameter main menu [PID] lock	OFF: Unlock ON: Lock	OFF		Same as above
<b>U5r</b> (USR)	Although not used in single-loop control, it is shown on the display.	—	—	—	—
<b>Py1</b> (PY1)	Operating parameter main menu [PY1] lock	OFF: Unlock ON: Lock	OFF		Same as above
<b>Py2</b> (PY2)	Although not used in single-loop control, it is shown on the display.	—	—	—	—
<b>PwD</b> (PWD)	Password setting	0: Password not set 1 to 30000	0		Ref.7.1(1)

## ● SELECT Display Parameters

Located in: Main menu = **L****o****n****F** (CONF) ; Submenu = **L****S****E****L** (CSEL)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>C51</b> (C.S1)	SELECT display-1 registration	OFF, 201 to 1039 Select the desired parameter from among the operating and setup parameters, then register the number (D register No.) for that parameter.	OFF		Ref.6.1(1)
<b>C52</b> (C.S2)	SELECT display-2 registration	For example, registering "302" for C.S1 allows you to change alarm-1 setpoint in operating display.	Same as above		
<b>C53</b> (C.S3)	SELECT display-3 registration	For operating display: Alarm-1 setpoint: 302 Alarm-2 setpoint: 303 Alarm-3 setpoint: 304 Alarm-4 setpoint: 305	Same as above		
<b>C54</b> (C.S4)	SELECT display-4 registration	Above numbers are alarm setpoint parameters for target setpoint-1 (1.SP).	Same as above		
<b>C55</b> (C.S5)	SELECT display-5 registration	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.	Same as above		

## ● Contact Output Registration Parameters

Located in: Main menu = **L****o****n****F** (CONF) ; Submenu = **d****o** (DO)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>do1</b> (D01)	Relay output flag registration for DO1	The following setpoints are registration numbers for Single-loop Control only: 5689: Alarm-1 output 0: No function	5689		Ref.3.2(1)
<b>do2</b> (D02)	Relay output flag registration for DO2	5690: Alarm-2 output 5691: Alarm-3 output 5693: Alarm-4 output	5690		Same as above
<b>do3</b> (D03)	Relay output flag registration for DO3	1609: FAIL output	5691		Same as above
<b>do4</b> (D04)	Open-collector transistor output flag registration for DO4	0		Same as above	
<b>do5</b> (D05)	Open-collector transistor output flag registration for DO5	0		Same as above	
<b>do6</b> (D06)	Open-collector transistor output flag registration for DO6	0		Same as above	
<b>do7</b> (D07)	Open-collector transistor output flag registration for DO7	1609		Same as above	

## ● Contact Input Registration Parameters

Located in: Main menu = **L****o****n****F** (CONF) ; Submenu = **dI** (DI)

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>Arn</b> (A/M)	Auto/Manual switching <Status switching>	These parameters determine which contact input to use to make selections/switches listed on the left. D1: 5161 No function: 0	5161		Ref.3.1(3)
<b>rls</b> (R/L)	Remote/Local switching <Status switching>	D2: 5162 D3: 5163 D4: 5164 D5: 5165 D6: 5166 D7: 5167 D8: 5168	5168		Same as above
<b>Sts</b> (S/R)	Run/Stop switching <Status switching>	0		Same as above	
<b>Es</b> (CAS)	Switch to Cascade mode (in cascade control) <Rising edge switching>	The contact inputs are factory-set as shown below. Contact input 1 (D1): Auto (ON)/Manual (OFF) switching Contact input 2 (D2): Run (OFF)/Stop (ON) switching Contact inputs 3 to 6 (D3 to D6): SP selection (see table below)	0		Same as above
<b>Aut</b> (AUT)	Switch to Auto mode <Rising edge switching>	Contact input 8 (D8): Remote (ON)/Local (OFF) switching	0		Same as above
<b>rn</b> (MAN)	Switch to Manual mode <Rising edge switching>	SP Selection: 1.SP 2.SP 3.SP 4.SP 5.SP 6.SP 7.SP 8.SP D3 ON OFF ON OFF ON OFF ON OFF D4 ON OFF ON OFF ON OFF ON OFF D5 OFF OFF OFF OFF ON ON ON OFF D6 OFF OFF OFF OFF OFF OFF ON ON D7 OFF OFF OFF OFF OFF OFF ON ON D8 OFF OFF OFF OFF OFF OFF ON ON	0		Same as above
<b>Sp0</b> (SP,0)	Bit-0 of SP number setting <Status switching>	5163		Same as above	
<b>Sp1</b> (SP,1)	Bit-1 of SP number setting <Status switching>	5164		Same as above	
<b>Sp2</b> (SP,2)	Bit-2 of SP number setting <Status switching>	5165		Same as above	
<b>Sp3</b> (SP,3)	Bit-3 of SP number setting <Status switching>	5166		Same as above	
<b>pn0</b> (PN,0)	Bit-0 of PID number selection <Status switching>	0		Same as above	
<b>pn1</b> (PN,1)	Bit-1 of PID number selection <Status switching>	0		Same as above	
<b>pn2</b> (PN,2)	Bit-2 of PID number selection <Status switching>	0		Same as above	
<b>pn3</b> (PN,3)	Bit-3 of PID number selection <Status switching>	0		Same as above	
<b>rn</b> (REM)	Switch to Remote mode <Rising edge switching>	0		Same as above	
<b>ll</b> (LCL)	Switch to Local mode <Rising edge switching>	0		Same as above	

<b>dP3</b> (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	Ref.1.2(1)
<b>SH3</b> (SH3)	Max. value of remote input scale	-19999 to 30000, where SL3 = SH3, SH3 - SL3 $\leq$ 30000 Under normal operation, set the values of these parameters as shown below: • When PV is temperature - Maximum and minimum values of PV input range • When PV is voltage - Maximum and minimum values of PV input scale	Maximum value of PV input scale	Same as above
<b>SL3</b> (SL3)	Min. value of remote input scale	-19999 to 30000, where SL3 = SH3, SH3 - SL3 $\leq$ 30000 Under normal operation, set the values of these parameters as shown below: • When PV is temperature - Maximum and minimum values of PV input range • When PV is voltage - Maximum and minimum values of PV input scale	Minimum value of PV input scale	Same as above
<b>bo3</b> (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 if set to "Upscale" • -5.0% of remote input if set to "Downscale"	OFF	—
<b>Pv1</b> (P,V1)	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(6)
<b>Pd1</b> (P,D1)	PV decimal point position	Under normal operation, set the same value as in the PV Input Decimal Point (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.	-	—
<b>PH1</b> (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	Maximum value of PV input range or scale	same as above
<b>PL1</b> (P,L1)	Minimum value of PV range	P.L1 < P.H1, where P.H1-P.L1 $\leq$ 30000 Under normal operation, keep the values of these parameters between the maximum and minimum values of the PV input range. -100 to 255	Minimum value of PV input range or scale	same as above

## ● Output-related Parameters

Located in: Main menu = **L****o****n****d** (UTMD) ; Submenu = **o****u****t** (OUT)

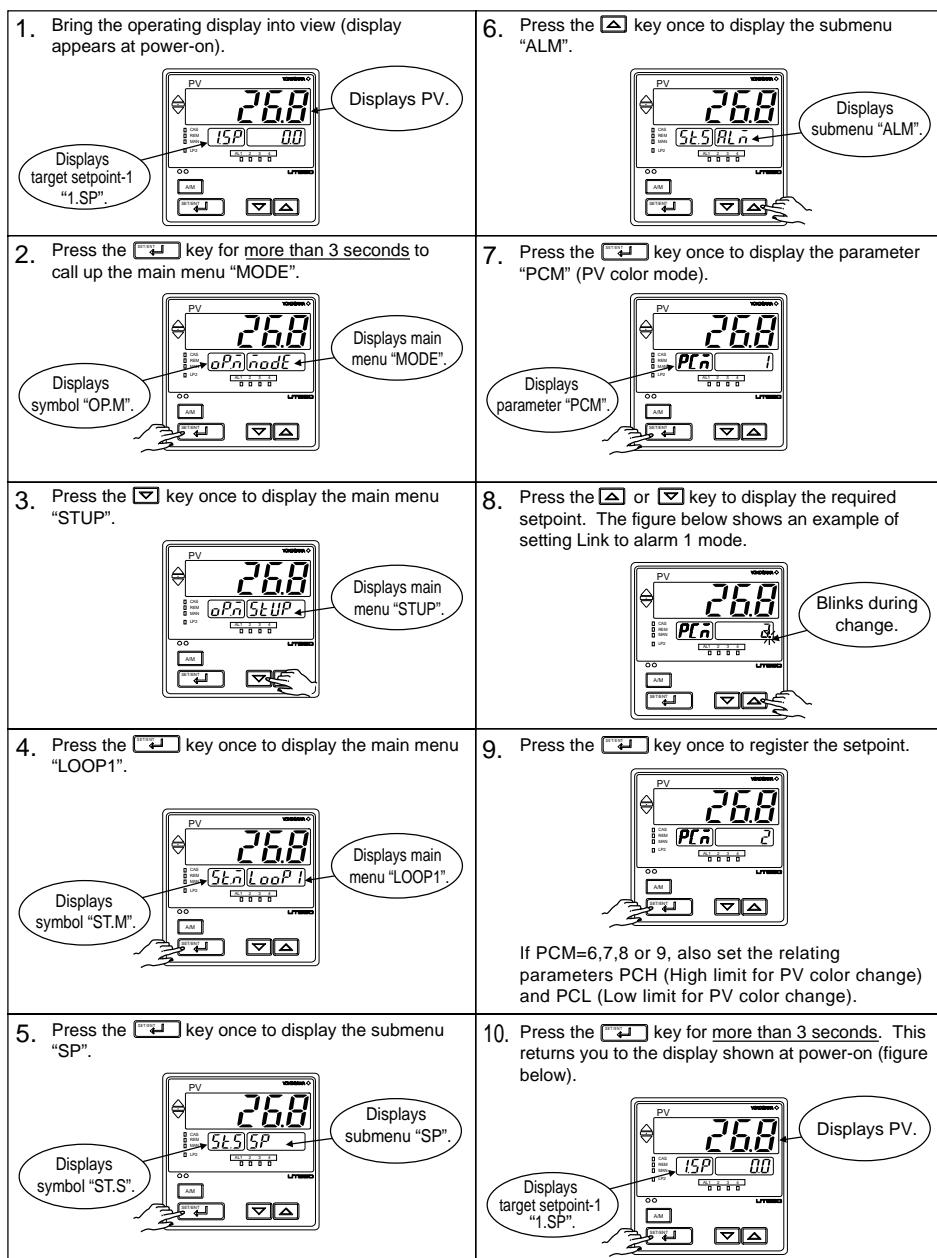
This manual describes the PV display color changing function "Active Color PV Display."

Carry out settings according to the following procedures after referring to "Functions of Active Color PV Display" on the back of this manual. Use Parameter Map User's Manual to understand the required parameters. 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.

## ■ Setting the PV Display Color Changing Function "Active Color PV Display"

The following operating procedure describes an example of changing the PV color mode (factory-set default: "Fixed in red mode") to "Link to alarm 1 mode."

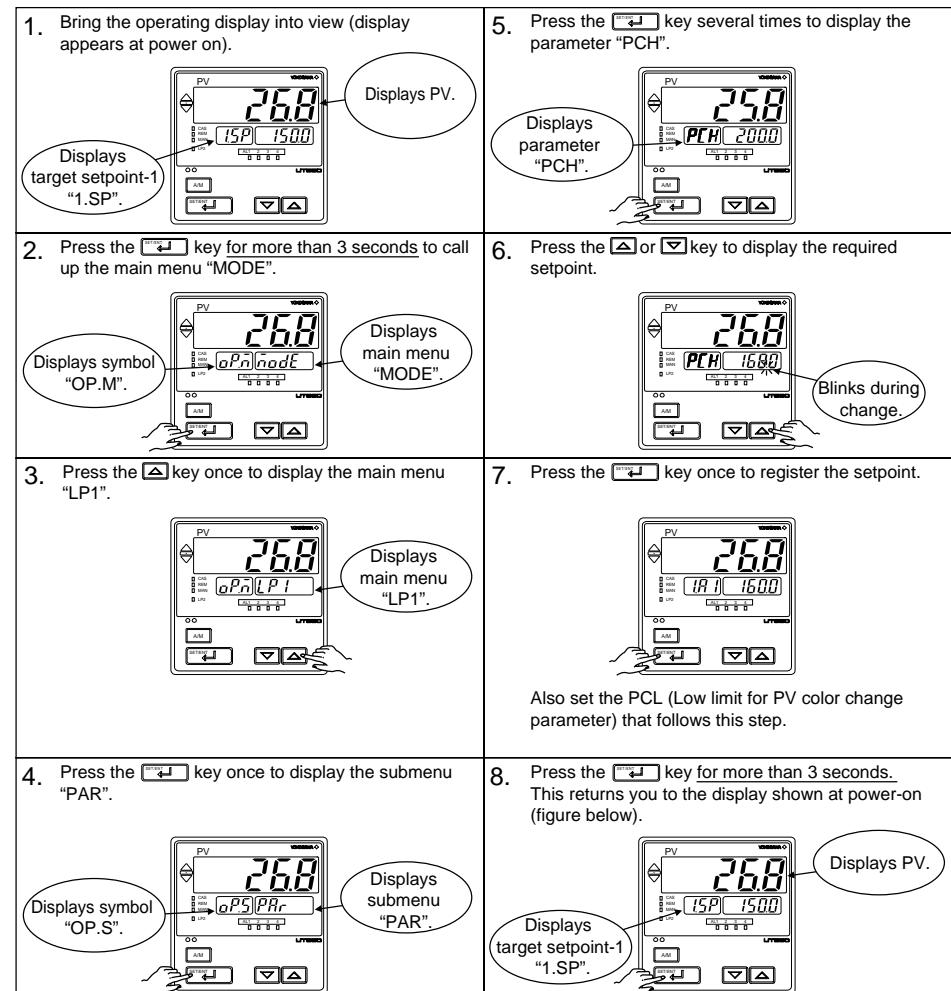
Parameter Symbol	Name of Parameter	Setting Range	Initial Value
<b>PCh</b> (PCM)	PV color mode	0: Fixed in green 1: Fixed in red 2: Link to alarm 1 (Alarm OFF:green, Alarm ON:red) 3: Link to alarm 1 (Alarm OFF:red, Alarm ON:green) 4: Link to alarm 1 and 2 (Alarm OFF:green, Alarm ON:red) 5: Link to alarm 1 and 2 (Alarm OFF:red, Alarm ON:green) 6: PV limit (Within PV range:green, Out of range:red) 7: PV limit (Within PV range:red, Out of range:green) 8: SP deviation (Within deviation:green, Out of deviation:red) 9: SP deviation (Within deviation:red, Out of deviation:green)	1



## ■ Setting the High Limit and Low Limit for PV Color Change

The following operating procedure describes an example of changing PV display color by PV limit(s). Set the High limit and/or Low limit for PV color change.

Parameter Symbol	Name of Parameter	Setting Range	Initial Value
<b>PCh</b> (PCH)	High limit for PV color change	When PCM (PV color mode parameter) = 6 or 7: -100.0 to 100.0 % of PV input range. When PCM (PV color mode parameter) = 8 or 9: -100.0 to 100.0 % of PV input range span.	When PCM = 6 or 7: PCh:100.0 %, PCL:0.0 % When PCM = 8 or 9: PCh and PCL:1.0 %
<b>PCL</b> (PCL)	Low limit for PV color change		



## ■ Functions of Active Color PV Display

This part describes the functions of "Active Color PV Display." PV display color is changed by the following four actions.

PV display color is selectable from red-to-green or green-to-red changing action, or fixed color.

- Link to alarm 1 mode (when PCM = 2, 3) (Setting example-1)

Link to alarm 1 and 2 mode (when PCM = 4, 5) is the same. When either of the alarms occurs, the display color is changed.

- SP deviation mode (when PCM = 8, 9) (Setting example-2)

- PV limit mode (when PCM = 6, 7) (Setting example-3)

- Fixed color mode (when PCM = 0, 1) (Setting example-4)

### Setting Example-1 : Link to Alarm

Works linking to alarm 1.

Set "PV high limit alarm" for alarm-1 type, and "80°C" for alarm-1 setpoint.  
If PCM (PV color mode parameter) = 2, PV display color is changed from green to red  
when PV input value exceeds alarm-1 setpoint.  
The red-to-green changing action is selectable.

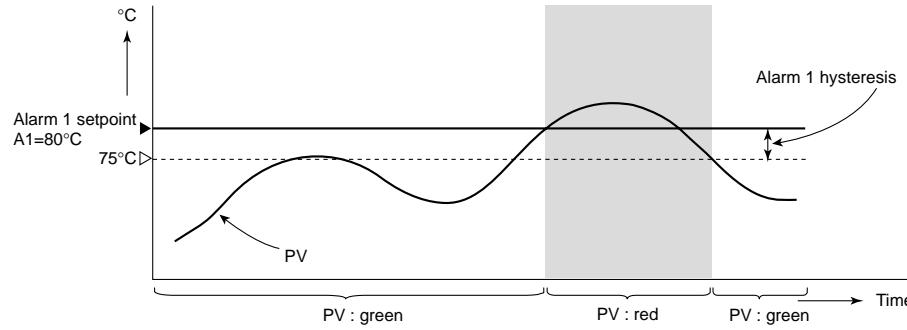
Setting parameters :

PCM (PV color mode parameter) = 2

AL1 (Alarm-1 type parameter) = 1

A1 (Alarm-1 setpoint parameter) = 80°C

HY1 (Alarm-1 hysteresis parameter) = 5°C



### Setting Example-3 : Link to PV

Set the high limit "70°C" for PCH, and the low limit "20°C" for PCL.

PV display color is changed from green to red when PV input value is out of the range.  
The red-to-green changing action is selectable.

Setting parameters :

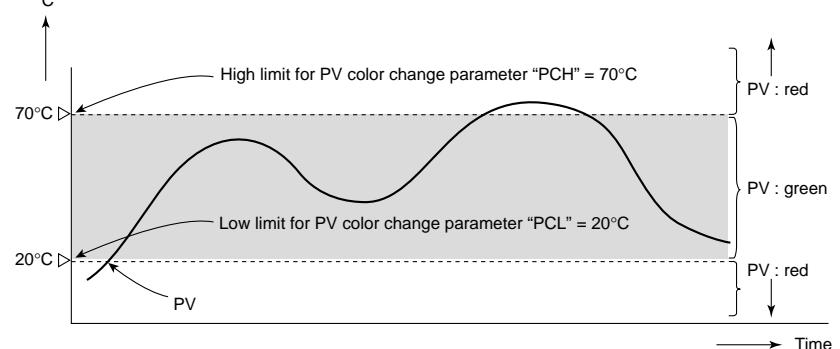
PCM (PV color mode parameter) = 6

PCH (High limit for PV color change parameter) = 70°C

PCL (Low limit for PV color change parameter) = 20°C

Hysteresis fixed to 0.25% is inserted where PV display color is changed.

In the example below, where changed from red to green.



### Setting Example-2 : Change by Deviation

Set high limit deviation band "10°C" for PCH and low limit deviation band "5°C" for PCL,  
for the current setpoint "50°C".

PV display color is changed from green to red when PV input value is out of the deviation.  
The red-to-green changing action is selectable.

Setting parameters :

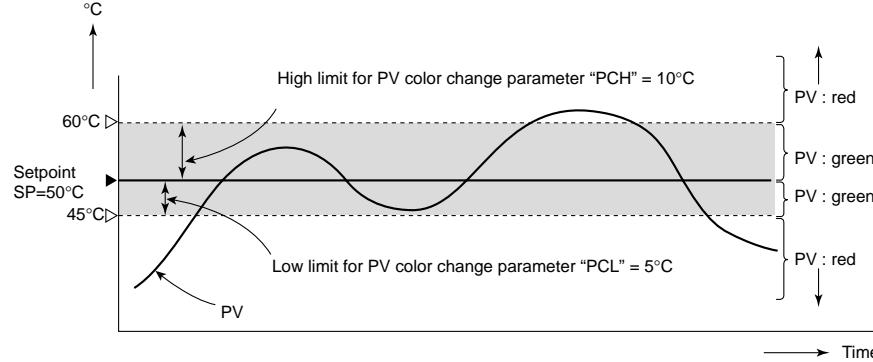
PCM (PV color mode parameter) = 8

PCH (High limit for PV color change parameter) = 10°C

PCL (Low limit for PV color change parameter) = 5°C

Hysteresis fixed to 0.25% is inserted where PV display color is changed.

In the example below, where changed from red to green.

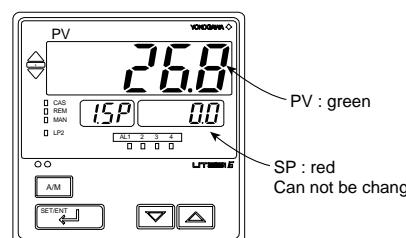


### Setting Example-4 : Fixed in Red or Green

Fix the PV display color in green. Setting of Fixed in red mode is also possible.

Setting parameter :

PCM (PV color mode parameter) = 0



## ■ External RJC

The external RJC is not a compensation function built in a controller but a compensation function working outside the controller.

The external RJC is used when the input is thermocouple, and RJC=OFF.

Using external RJC makes the accuracy of RJC higher and shortens the compensating wire.

Parameter Symbol	Name of Parameter	Setting Range	Initial Value
<i>E<sub>ru</sub></i> (ERJ)	External RJC setpoint	-50.0 to 50.0°C, -58.0 to 122.0°F For thermocouple input, temperature compensation value outside the controller can be set. Available only when RJC=OFF.	0.0°C 32.0°F

