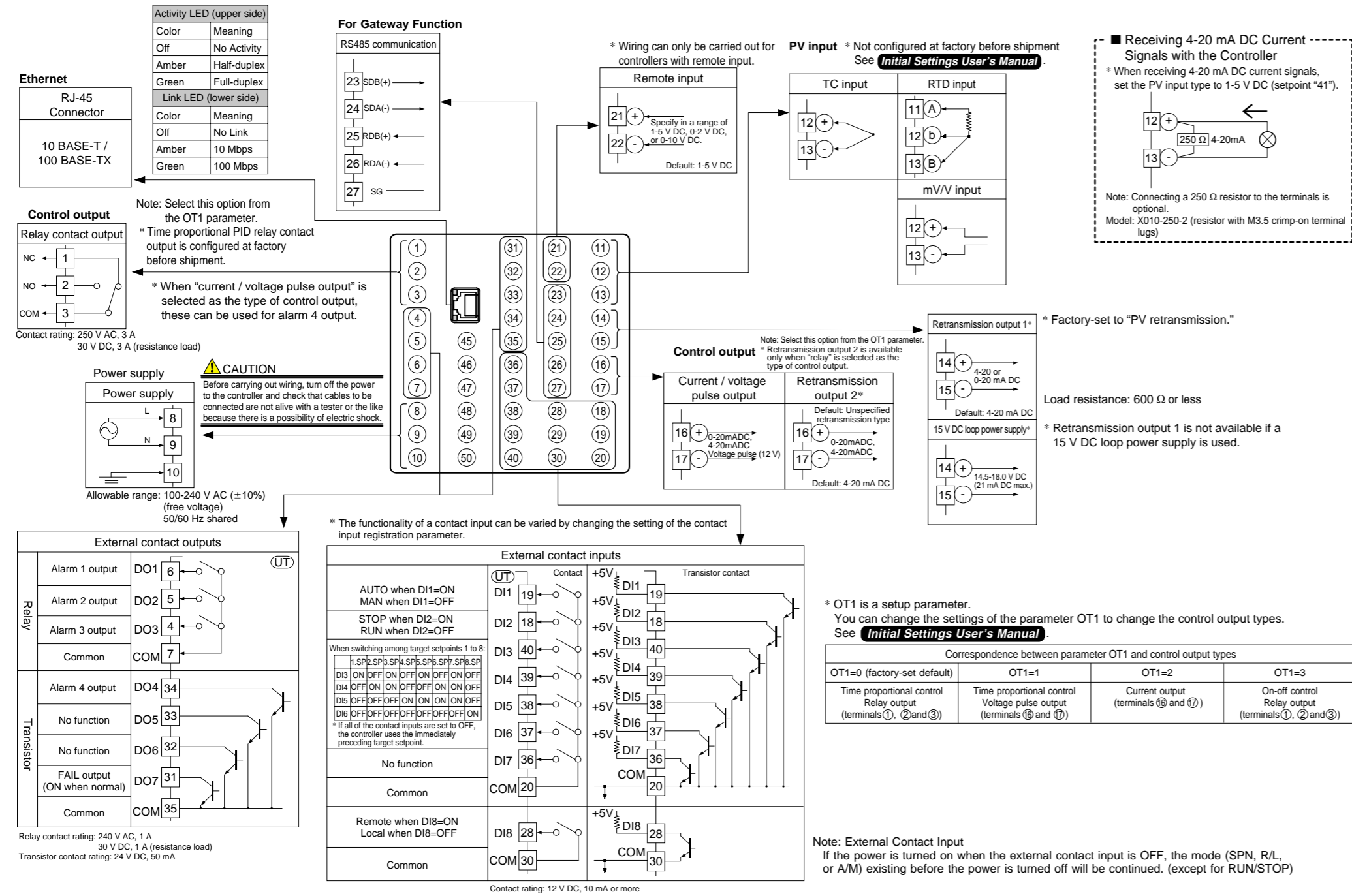




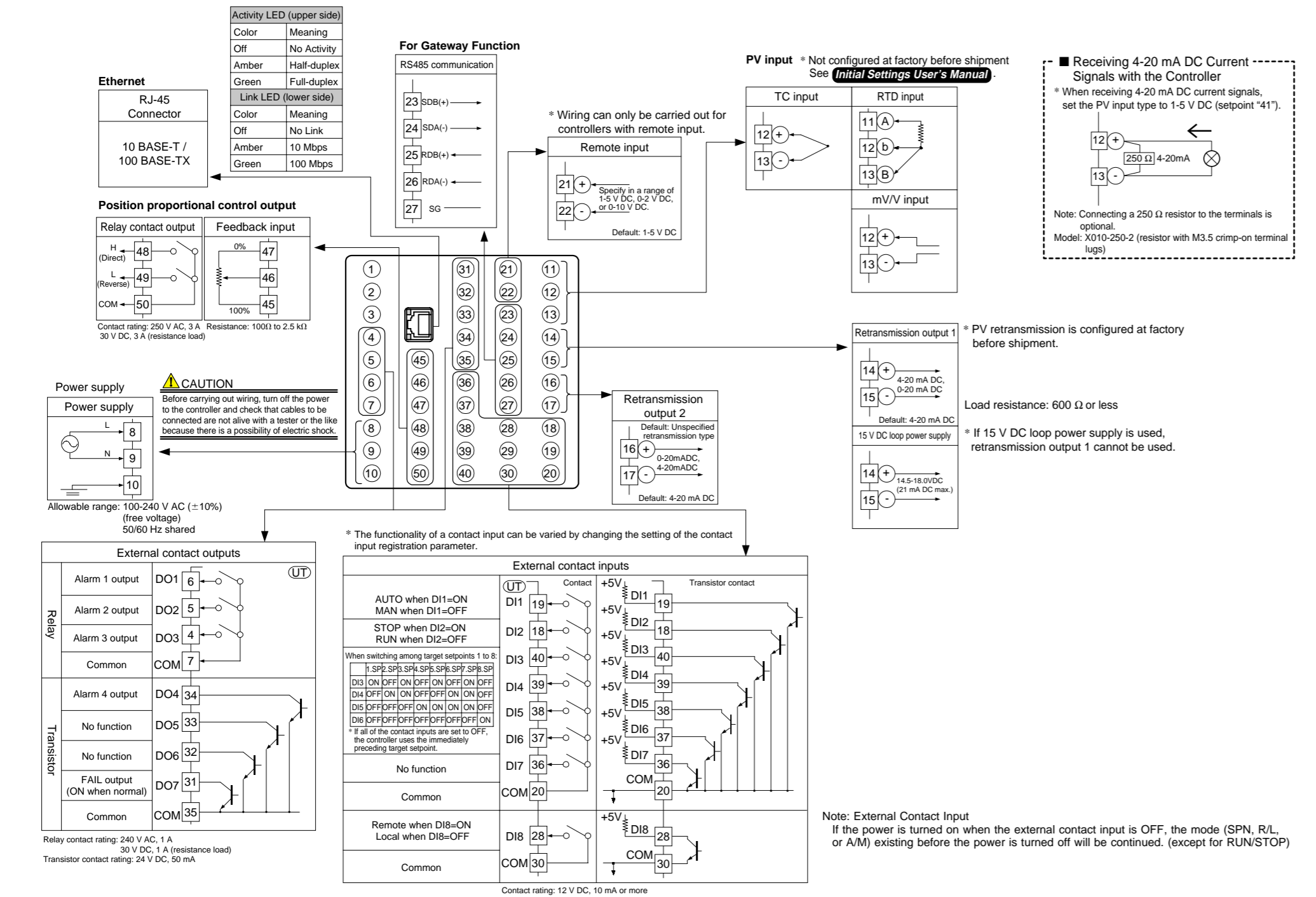
## 6. Terminal Wiring Diagrams NOTE

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





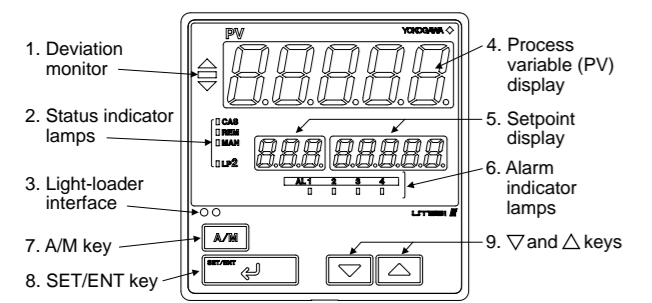
3rd Edition: Mar.25, 2005

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 **Parameter Map 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 **▽** key for more than 3 seconds. This brings you to the display (operating display) that appears at power-on.

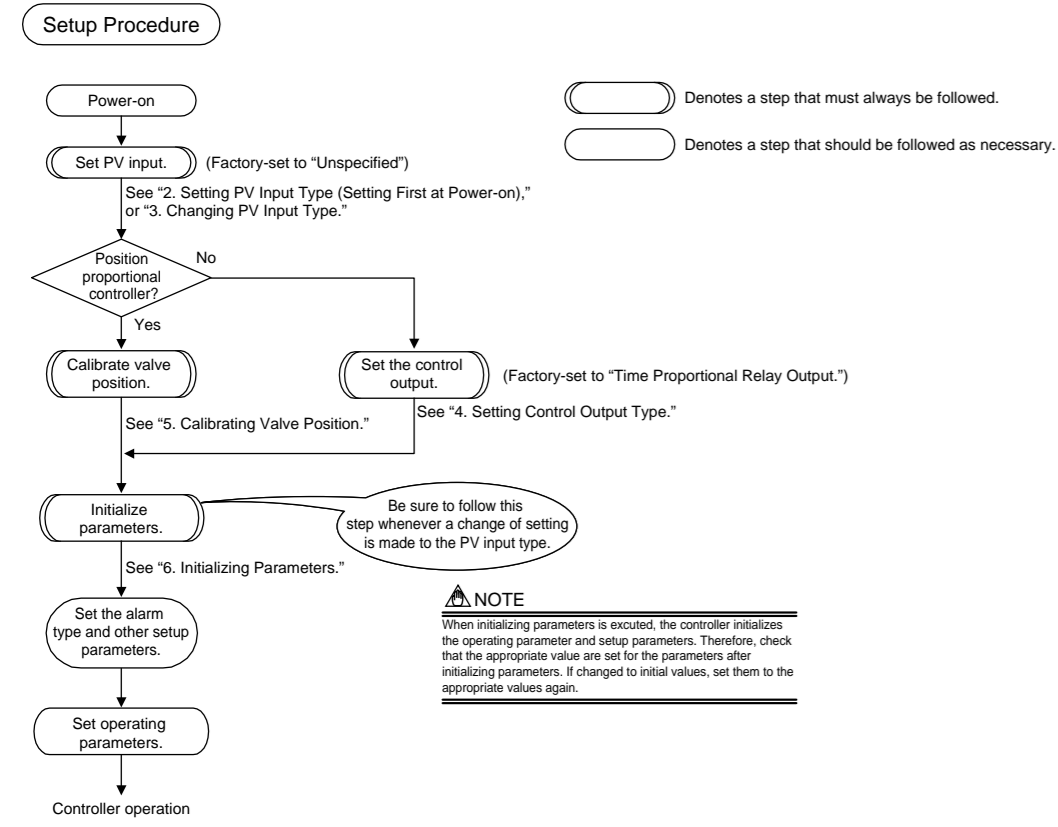
**Contents**

- Names and Functions of Front Panel Parts
- Setting PV Input Type (Setting First at Power-on)
- Changing PV Input Type
- Setting Control Output Type (Except for a Position Proportional Controller)
- Calibrating Valve Position (for a Position Proportional Controller Only)
- Initializing Parameters
- Changing Alarm Type
- 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. Displays the setpoint of a parameter in 5-digit LED.
6. Alarm indicator lamps	Is lit (in orange) 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 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.



**NOTE**  
 When initializing parameters is executed, 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.

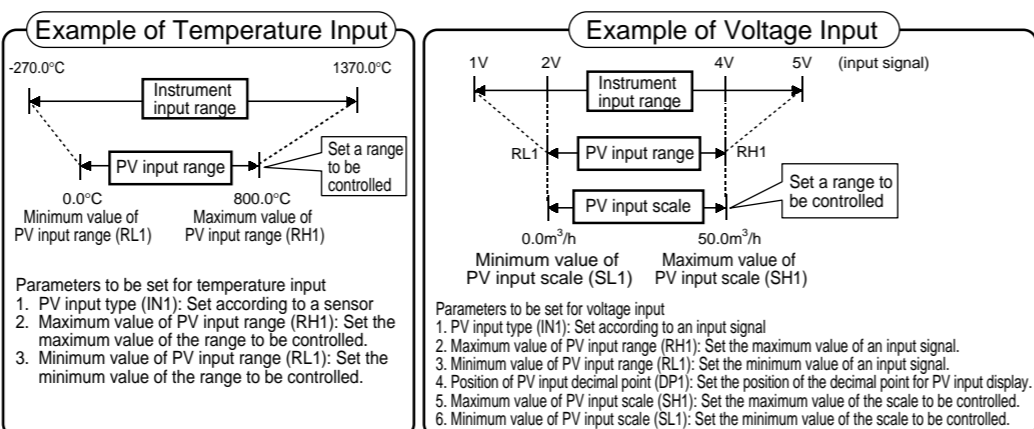
**Setting of Main Parameters at the Factory before Shipment**

Item	Factory-shipped values for standard type controllers	Factory-shipped values for position proportional type controllers
Remote input signal (only for controllers with remote inputs)	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 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 **▽** 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 **▽** 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.

- Display screen at power-on. (Displays "IN" submenu)
- Press the **▽** key once to display the parameter IN1 (PV input type). (Displays "IN1")
- Press the **△** or **▽** key to display the required setpoint. The figure below shows an example of setting a K-type thermocouple (-200.0°C to 500.0°C). See "Instrument Input Range Codes." (Displays "RL1")
- Press the **▽** key once to register the setpoint. (Displays "RH1")
- Press the **▽** key once to display the parameter "UN1" (PV input unit). (Displays "UN1")
- Press the **▽** key once 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. (Displays "1.SP")
- 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. (Displays "RH1")
- Press the **▽** key once to register the setpoint. (Displays "1.SP")
- 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. (Displays "SL1")
- Press the **▽** key once to register the setpoint. (Displays "STUP")
- 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. (Displays "RH1")
- Press the **▽** key once to display the main menu "LOOP1". (Displays "LOOP1")
- 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. (Displays "RH1")
- Press the **▽** key once to display the main menu "UTMD". (Displays "UTMD")
- 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. (Displays "RL1")
- Press the **▽** key once to display the submenu "MD". (Displays "MD")
- Press the **▽** key once to display the parameter "RL1" (minimum value of PV input range). (Displays "RL1")
- Press the **△** key once to display the submenu "IN". (Displays "IN")
- 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). (Displays "IN1")
- Press the **▽** key once to register the setpoint. (Displays "RH1")
- Press the **▽** key for more than 3 seconds. This returns you to the display shown at power-on (figure below). (Displays "1.SP")
- Press the **▽** key once to display the parameter "RH1" (maximum value of PV input range). (Displays "RH1")
- Press the **▽** key for more than 3 seconds. This returns you to the display shown at power-on (figure below). (Displays "1.SP")

The PV display in the figure above shows the error code for input burnout (0000) if PV input wiring is not yet complete. The error code disappears when you wire the PV input terminals correctly.

**Instrument Input Range Codes**

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.	
		2	-270.0 to 1000.0°C -450.0 to 2300.0°F		
		3	-200.0 to 500.0°C -300.0 to 1000.0°F		
		4	-200.0 to 1200.0°C -300.0 to 2300.0°F		
		5	-270.0 to 400.0°C -450.0 to 750.0°F		
		6	0.0 to 400.0°C -200.0 to 750.0°F		
		7	0.0 to 1800.0°C 32 to 3300°F		
		8	0.0 to 1700.0°C 32 to 3100°F		
		9	0.0 to 1700.0°C 32 to 3100°F		
RTD	P100	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	
		11	-270.0 to 1000.0°C -450.0 to 1800.0°F		
		12	-200.0 to 900.0°C -300.0 to 1600.0°F		
		13	-200.0 to 400.0°C -300.0 to 750.0°F		
		14	0.0 to 400.0°C -200.0 to 1000.0°F		
		15	0.0 to 2300.0°C 32 to 4200°F		
		16	0.0 to 1390.0°C 32 to 2500.0°F		
		17	0.0 to 1800.0°C 32 to 3400°F		
		18	0.0 to 2000.0°C 32 to 3600°F		
		30	-200.0 to 500.0°C -300.0 to 1000.0°F		±0.1% of instrument range ±1 digit (Note1) (Note2)
		31	-150.00 to 150.00°C -200.0 to 300.0°F		±0.2% of instrument range ±1 digit (Note1)
		35	-200.0 to 850.0°C -300.0 to 1560.0°F		±0.1% of instrument range ±1 digit (Note1) (Note2)
		36	-200.0 to 500.0°C -300.0 to 1000.0°F		
		37	-150.00 to 150.00°C -200.0 to 300.0°F		±0.2% of instrument range ±1 digit (Note1)
Standard signal	DC voltage	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.	
		41	1.000 to 5.000 V		
		50	0.000 to 2.000 V		
		51	0.00 to 10.00 V		
		55	-10.00 to 20.00 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 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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**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.

- Bring the operating display into view (display appears at power-on). (Displays PV)
- Press the **▽** key for more than 3 seconds to call up the main menu "MODE". (Displays "MODE")
- Press the **▽** key once to display the main menu "STUP". (Displays "STUP")
- Press the **▽** key once to display the main menu "LOOP1". (Displays "LOOP1")
- Press the **▽** key once to display the main menu "UTMD". (Displays "UTMD")
- Press the **▽** key once to display the submenu "MD". (Displays "MD")
- Press the **△** key once to display the submenu "IN". (Displays "IN")
- Press the **▽** key once to display the parameter "IN1" (PV input type). (Displays "IN1")
- 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). (Displays "IN1")
- Press the **▽** key once to register the setpoint. (Displays "RH1")
- Press the **▽** key once to display the parameter "UN1". (Displays "UN1")
- 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. (Displays "RH1")
- Press the **▽** key once to display the main menu "LOOP1". (Displays "LOOP1")
- 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. (Displays "RH1")
- Press the **▽** key once to display the main menu "UTMD". (Displays "UTMD")
- 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. (Displays "RL1")
- Press the **▽** key once to display the submenu "MD". (Displays "MD")
- Press the **▽** key once to display the parameter "RL1" (minimum value of PV input range). (Displays "RL1")
- Press the **△** key once to display the submenu "IN". (Displays "IN")
- 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). (Displays "IN1")
- Press the **▽** key once to register the setpoint. (Displays "RH1")
- Press the **▽** key for more than 3 seconds. This returns you to the display shown at power-on (figure below). (Displays "1.SP")
- Press the **▽** key once to display the parameter "RH1" (maximum value of PV input range). (Displays "RH1")
- Press the **▽** key for more than 3 seconds. This returns you to the display shown at power-on (figure below). (Displays "1.SP")

#### 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..... ④-⑦

- Bring the operating display into view (display appears at power-on).  
 Displays PV.
- Press the [ ] key for more than 3 seconds to call up the main menu "MODE".  
 Displays main menu "MODE".
- Press the [ ] key once to display the main menu "STUP".  
 Displays main menu "STUP".
- Press the [ ] key once to display the main menu "LOOP1".  
 Displays main menu "LOOP1".
- Press the [ ] key once to display the main menu "UTMD".  
 Displays main menu "UTMD".
- Press the [ ] key once to display the submenu "MD".  
 Displays submenu "MD".
- Press the [ ] key twice to display the submenu "OUT".  
 Displays submenu "OUT".
- Press the [ ] key once to display the parameter "OT1" (control output type).  
 Displays parameter "OT1".
- 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).  
 Blinks during change.
- Press the [ ] key once to register the setpoint.  
 Displays PV.

#### 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 ④-⑦)
		2	Current output (terminals ④-⑦)
		3	On/off control relay contact output (terminals ①-②-③)

#### 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**.

- Bring the operating display into view (display appears at power-on).  
 Displays PV.
- Press the [ ] key for more than 3 seconds to call up the main menu "MODE".  
 Displays main menu "MODE".
- Press the [ ] key once to display the main menu "STUP".  
 Displays main menu "STUP".
- Press the [ ] key once to display the main menu "LOOP1".  
 Displays main menu "LOOP1".
- Press the [ ] key once to display the main menu "UTMD".  
 Displays main menu "UTMD".
- Press the [ ] key once to display the submenu "MD".  
 Displays submenu "MD".
- Press the [ ] key three times to display the submenu "VALV".  
 Displays PV.
- Press the [ ] key once to display the parameter "VAT".  
 Displays parameter "VAT".
- Press the [ ] key to display "ON".  
 Blinks during change.
- Press the [ ] key once. The controller automatically calibrates the valve position (fully open or closed).  
 Blinks during change.
- The controller is viewed as shown below when the valve position is being automatically calibrated.  
 The indication "ON" blinks.
- Calibration has ended successfully when the indication changes from "ON" to "OFF". Go to step [14].  
 Displays PV.
- Calibration has ended unsuccessfully if the indication changes from "ON" to "ERR". Check the feedback input wiring and carry out automatic calibration again.  
 Displays "ERR".
- Press the [ ] key for more than 3 seconds. This returns you to the display shown at power-on (figure below).  
 Displays PV.

#### 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.

- Bring the operating display into view (display appears at power-on).  
 Displays PV.
- Press the [ ] key for more than 3 seconds to call up the main menu "MODE".  
 Displays main menu "MODE".
- Press the [ ] key once to display the main menu "STUP".  
 Displays main menu "STUP".
- Press the [ ] key once to display the main menu "LOOP1".  
 Displays main menu "LOOP1".
- Press the [ ] key once to display the main menu "UTMD".  
 Displays main menu "UTMD".
- Press the [ ] key once to display the submenu "MD".  
 Displays submenu "MD".

- Press the [ ] key twice to display the submenu "INIT".  
 Displays submenu "INIT".
- Press the [ ] key once to display the parameter "INI".  
 Displays parameter "INI".
- Press the [ ] key to display "ON".  
 Blinks during change.
- Press the [ ] key once. The display momentarily becomes blank (which is normal), indicating the parameters have been initialized.  
 Displays PV.
- Press the [ ] key for more than 3 seconds. This returns you to the display shown at power-on (figure below).  
 Displays PV.

#### 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 ①-②).....PV high limit alarm  
 Alarm-2 (terminal numbers ③-④).....PV low limit alarm  
 Alarm-3 (terminal numbers ⑤-⑥).....PV high limit alarm  
 Alarm-4 (terminal numbers ⑦-⑧).....PV low limit alarm

- Bring the operating display into view (display appears at power-on).  
 Displays PV.
- Press the [ ] key for more than 3 seconds to call up the main menu "MODE".  
 Displays main menu "MODE".
- Press the [ ] key once to display the main menu "STUP".  
 Displays main menu "STUP".
- Press the [ ] key once to display the main menu "LOOP1".  
 Displays main menu "LOOP1".
- Press the [ ] key once to display the submenu "SP".  
 Displays submenu "SP".
- Press the [ ] key once to display the parameter "AL1".  
 Displays parameter "AL1".
- Press the [ ] or [ ] key to display the required setpoint. The figure below shows an example of setting the PV low limit alarm.  
 Blinks during change.
- Press the [ ] key once to register the setpoint.  
 Displays PV.
- 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.
- 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, 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		OFF			
PV high limit	Hysteresis Open (unit) / Closed (lit) PV Alarm setpoint	1	De-energized on deviation low limit alarm (Note 3)	Hysteresis Open (lit) / Closed (unit) Deviation setpoint SP	6
PV low limit	Hysteresis Closed (lit) / Open (unit) Alarm setpoint PV	2	De-energized on PV high limit	Hysteresis Open (unit) / Closed (lit) Deviation setpoint SP	7
Deviation high limit (Note 3)	Hysteresis Open (unit) / Closed (lit) PV SP	3	De-energized on PV high limit	Hysteresis Open (unit) / Closed (lit) Deviation setpoint SP	8
Deviation low limit (Note 3)	Hysteresis Closed (lit) / Open (unit) Deviation setpoint PV	4	De-energized on PV high limit	Hysteresis Open (unit) / Closed (lit) Alarm setpoint PV	9
De-energized on deviation high limit alarm (Note 3)	Hysteresis Closed (lit) / Open (unit) PV SP	5	De-energized on PV low limit	Hysteresis Open (lit) / Closed (unit) Alarm setpoint PV	10
Upward (hour/minute)		21	Sensor grounding alarm		25
Downward (hour/minute)		22	Fault diagnosis output (Note 1)		26
Upward (minute/second)		23	FAIL output (Note 2)	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
Downward (minute/second)		24			
SP high limit	Hysteresis Open (unit) / Closed (lit) SP Alarm setpoint	28	Output high limit	Hysteresis Open (unit) / Closed (lit) Output value Alarm setpoint	30
SP low limit	Hysteresis Closed (lit) / Open (unit) Alarm setpoint SP	29	Output low limit	Hysteresis Open (unit) / Closed (lit) Alarm setpoint Output value	31
Deviation high limit for target setpoint (Note 3)	Hysteresis Open (unit) / Closed (lit) PV Target SP	33	De-energized on deviation low limit alarm for target setpoint (Note 3)	Hysteresis Open (unit) / Closed (lit) Deviation setpoint PV Target SP	36
Deviation low limit for target setpoint (Note 3)	Hysteresis Closed (lit) / Open (unit) Deviation setpoint PV Target SP	34	De-energized on deviation high and low limits for target setpoint (Note 3)	Hysteresis Open (unit) / Closed (lit) Deviation setpoint PV Target SP	37
De-energized on deviation high limit alarm for target setpoint (Note 3)	Hysteresis Open (unit) / Closed (lit) PV Target SP	35	De-energized on deviation within high and low limits for target setpoint (Note 3)	Hysteresis Open (unit) / Closed (lit) Deviation setpoint PV Target SP	38

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).

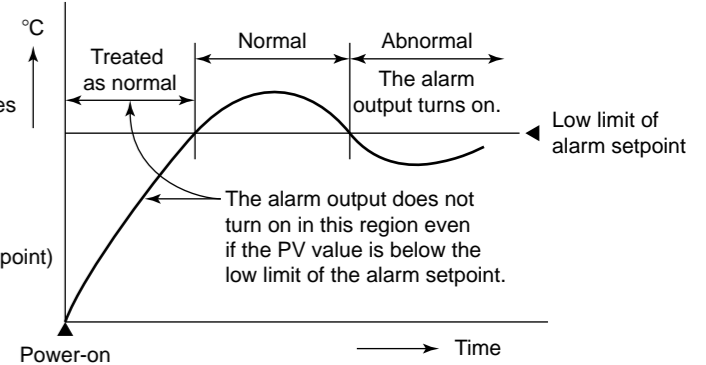
Note 2: The FAIL output is on during normal operation and turns off in case of failure.

Note 3: The difference of alarm action between the alarm type codes 3 to 8, 13 to 18 and 33 to 38, 43 to 48 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

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 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



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 **ESC** key for more than 3 seconds. This brings you to the display (operating display) that appears at power-on.

Contents

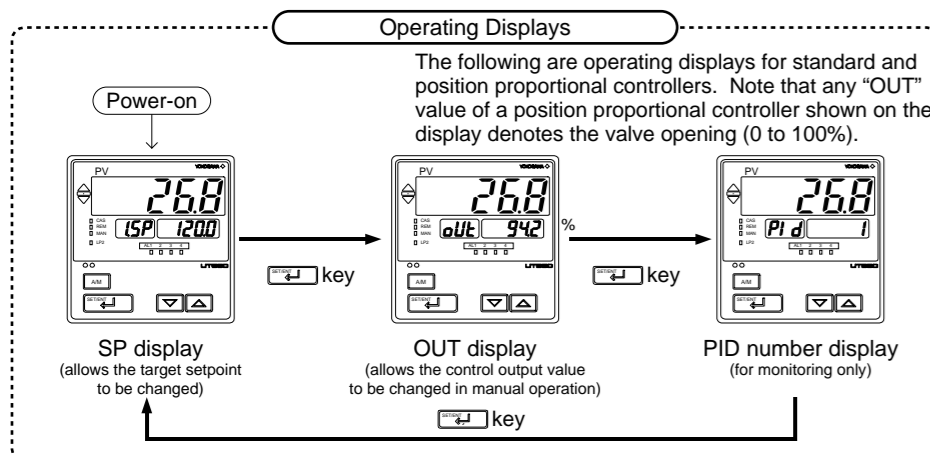
- Monitoring-purpose Operating Displays Available during Operation
- Setting Target Setpoint (SP)
- Performing/Canceling Auto-tuning
- Setting PID Manually
- Setting Alarm Setpoints
- Selecting Target Setpoint Numbers (SPN)
- Switching between Run and Stop
- Switching between AUTO and MAN
- Manipulating 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.

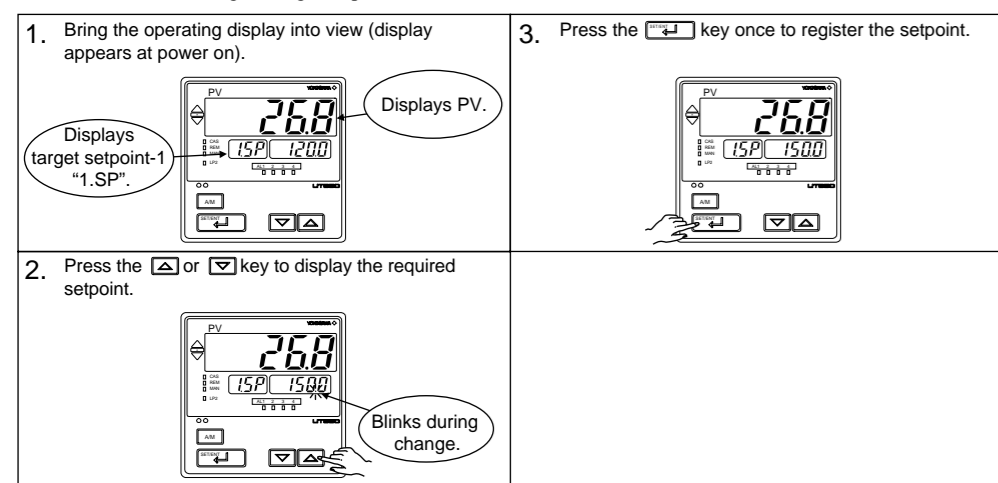
Operating Displays for Standard and Position Proportional Controllers

- 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.



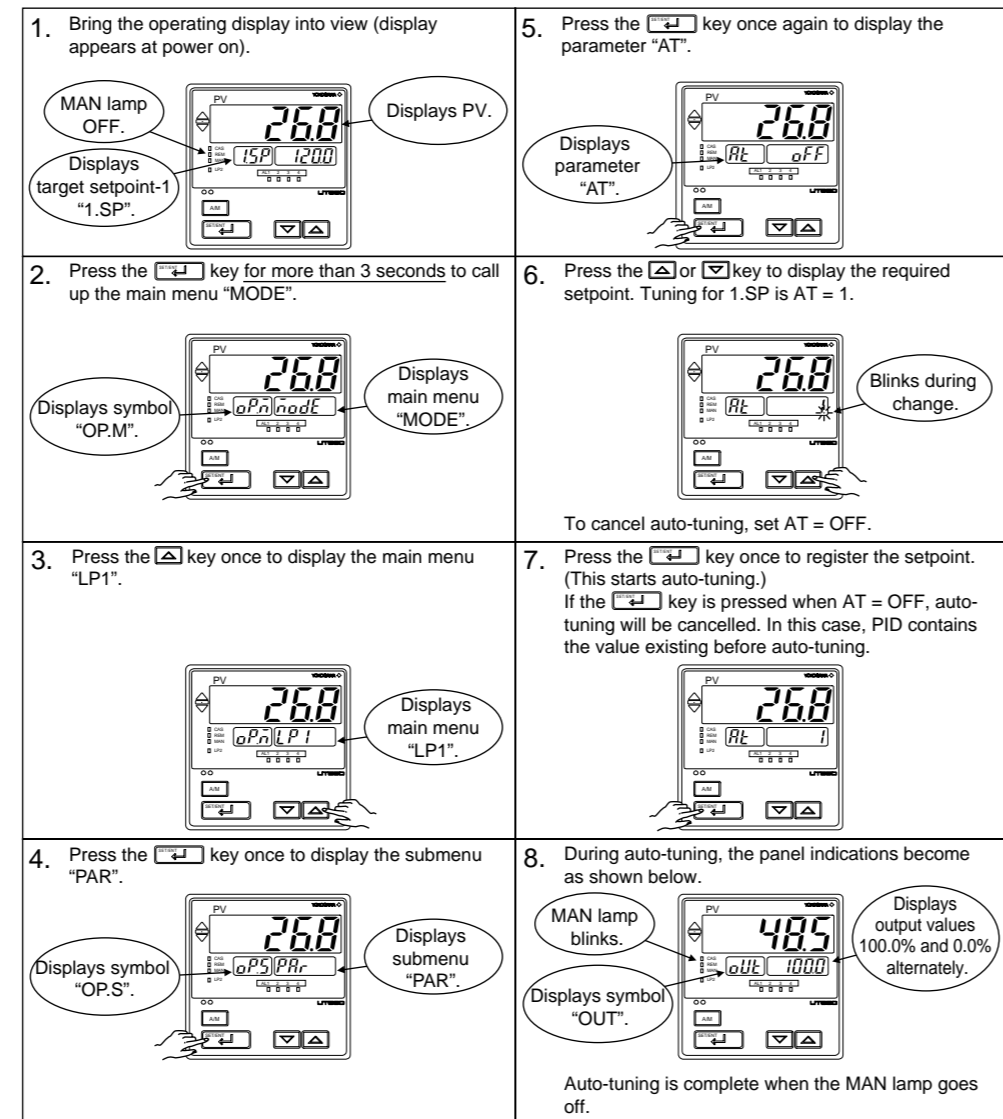
3. Performing/Canceling Auto-tuning

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

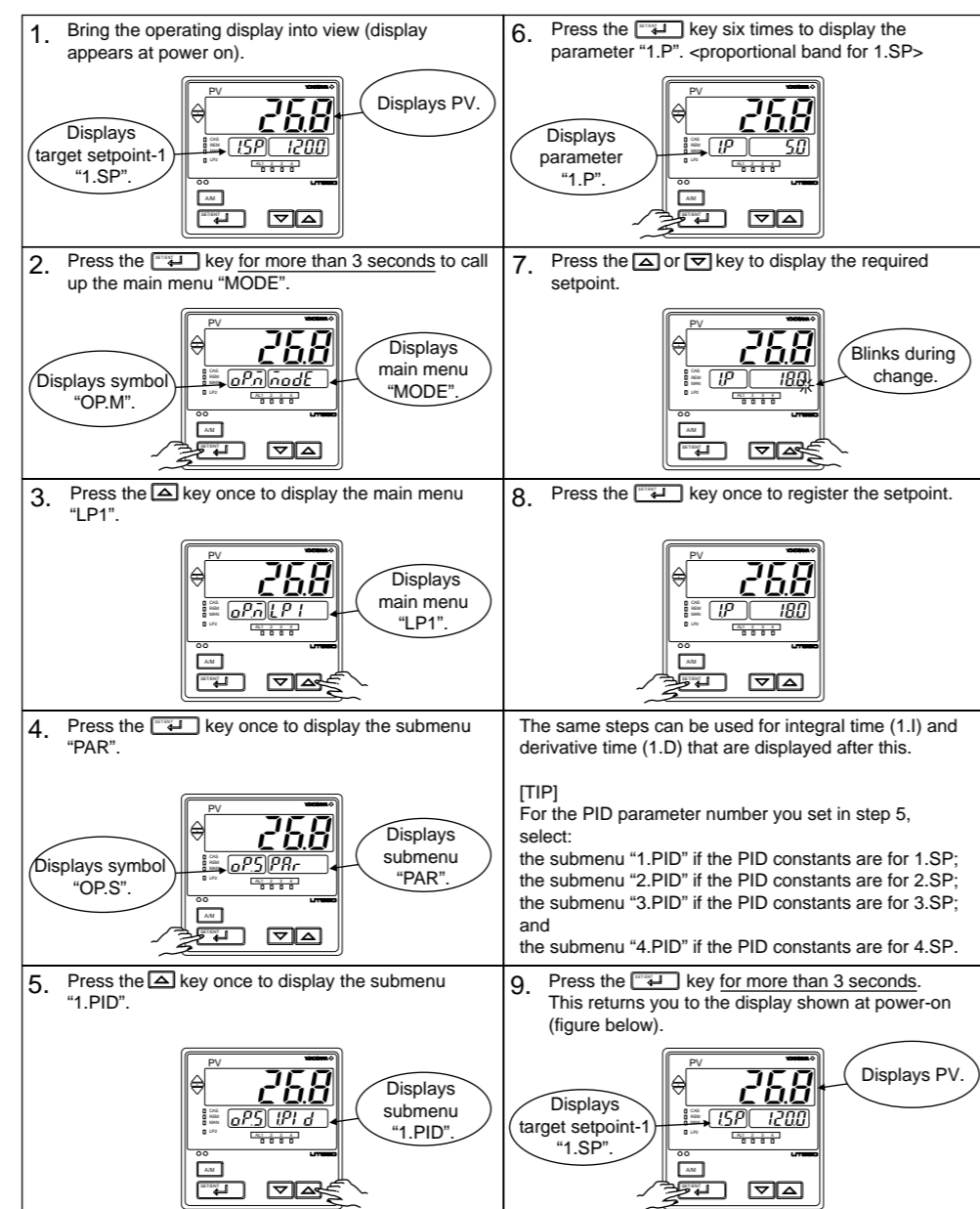
When on-off control is being used, auto-tuning cannot be carried out. Moreover, do not perform auto-tuning when controlling any of the following processes.

- 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



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.

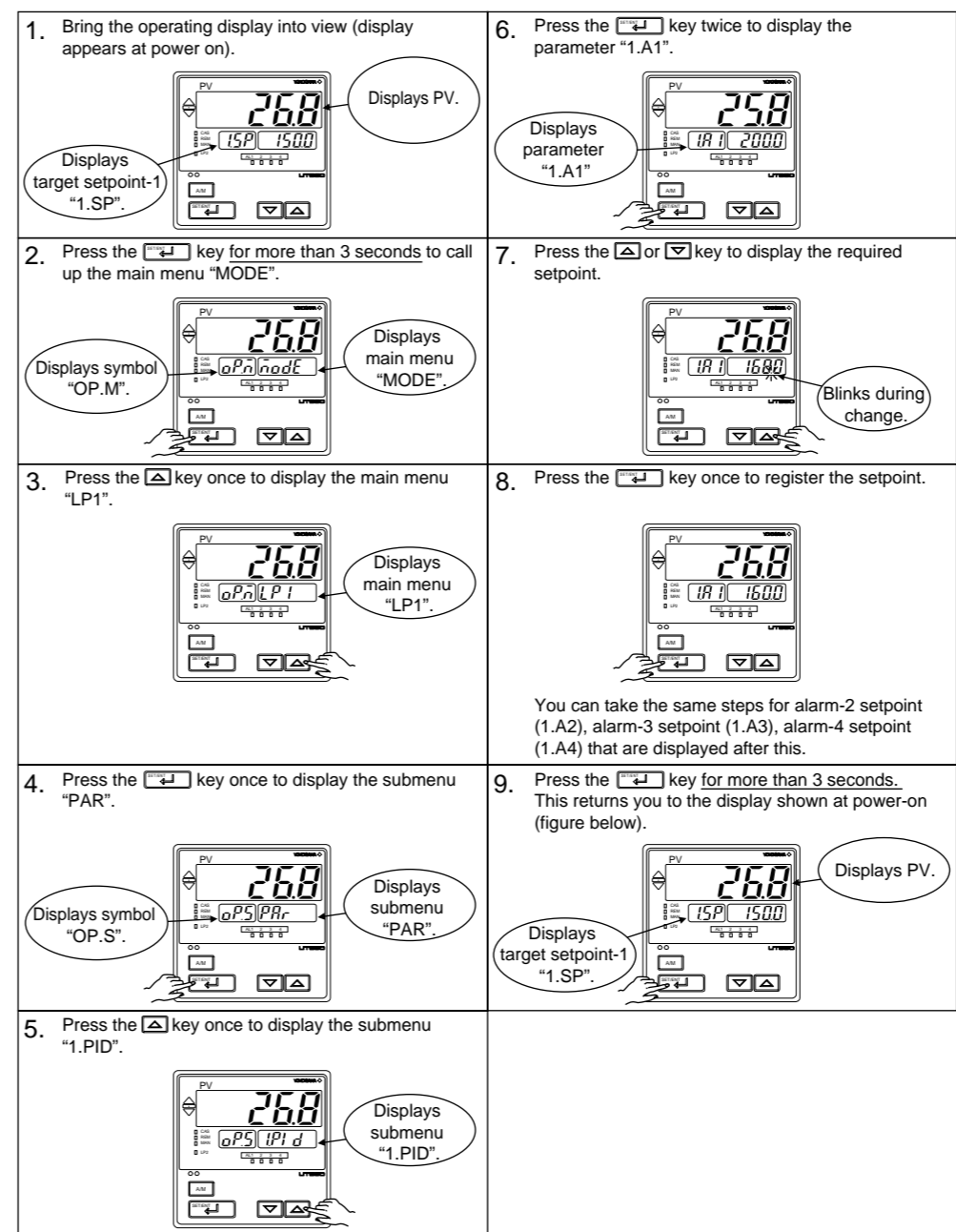


5. Setting Alarm Setpoints

The following operating procedure describes an example of setting 160.0 to alarm-1 setpoint. Check alarm type before setting the alarm setpoint.

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

When changing the alarm type, see "7. Changing Alarm Type," in **Initial Settings User's Manual**.

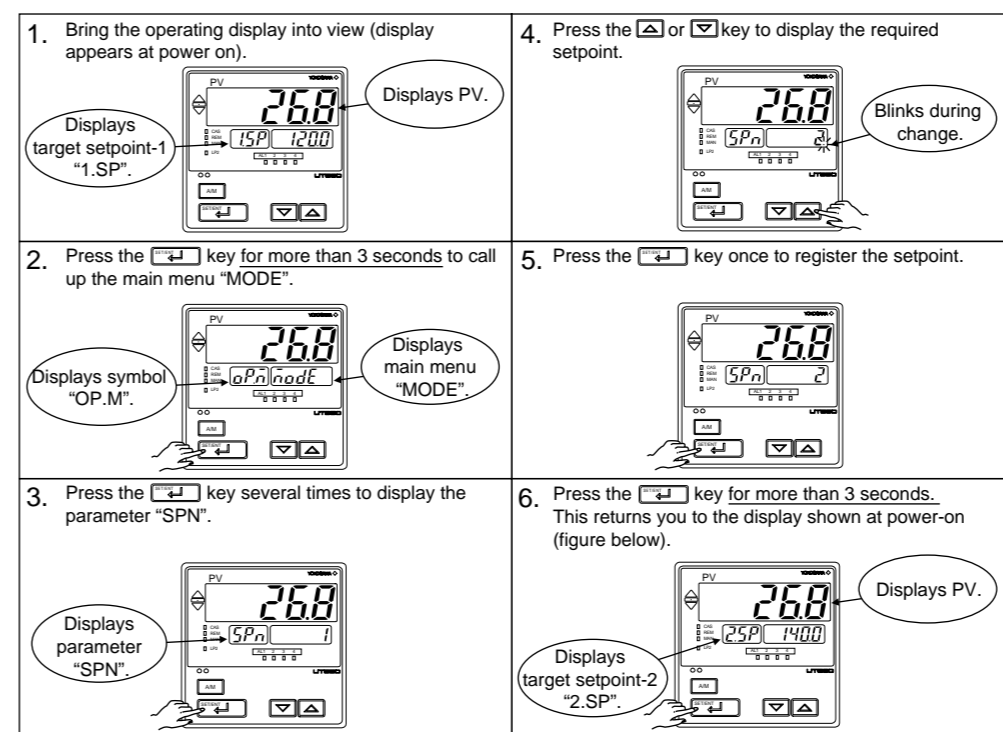


6. Selecting Target Setpoint Numbers (SPN)

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

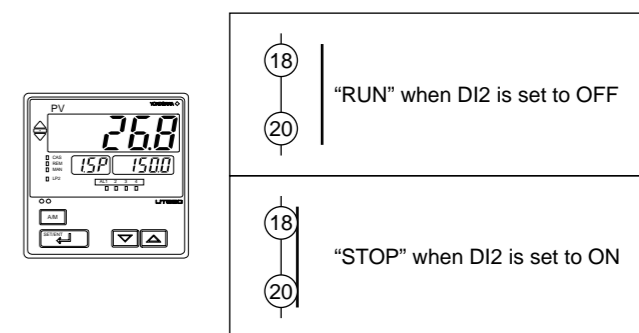
NOTE

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



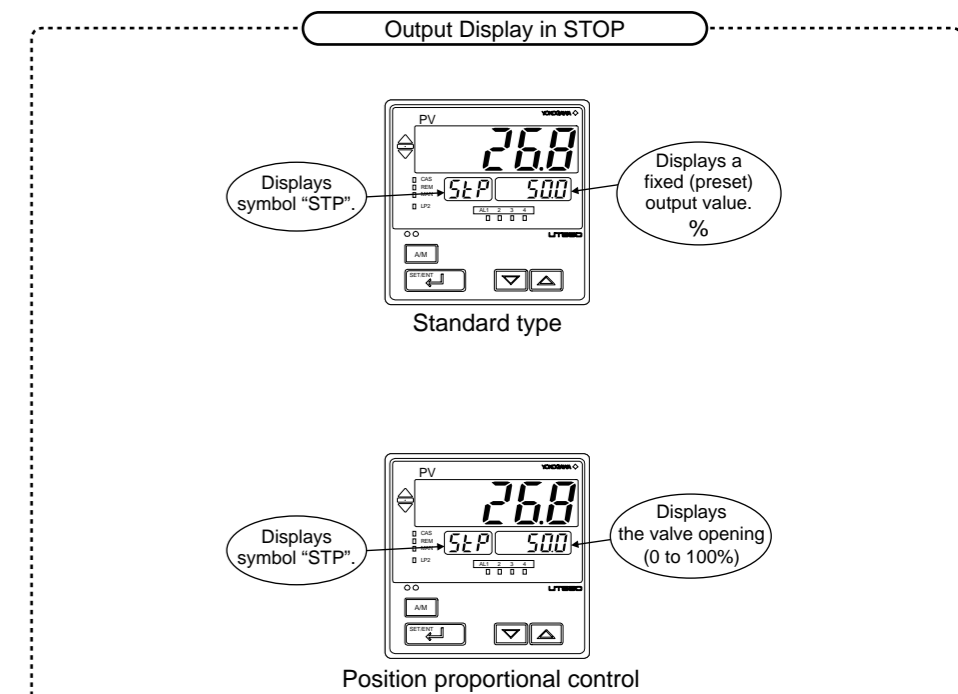
7. Switching between Run and Stop

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



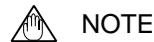
When the controller is stopped, input and outputs are as follows:

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.



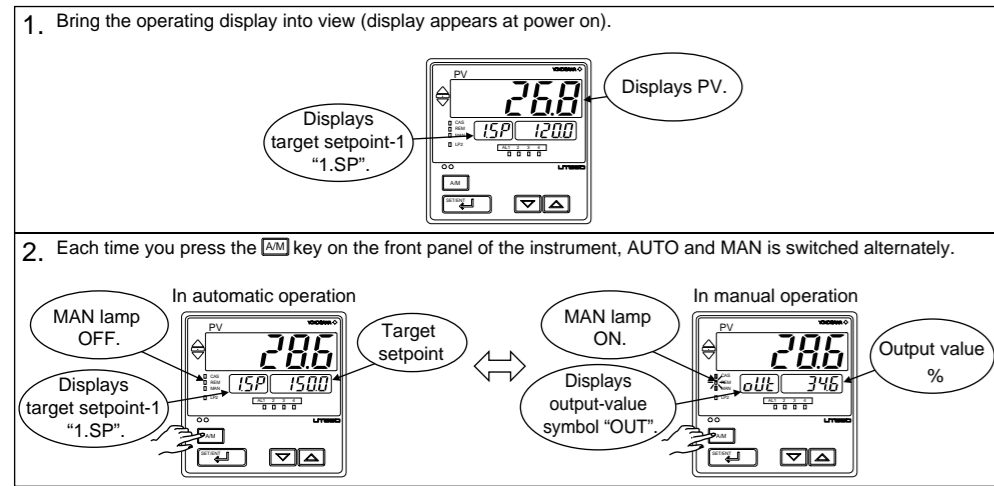
\* Switching the target setpoint number (SPN) in STOP allows any preset output value (n.PO) to be switched. The "n" is same as the target setpoint number.

## 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.



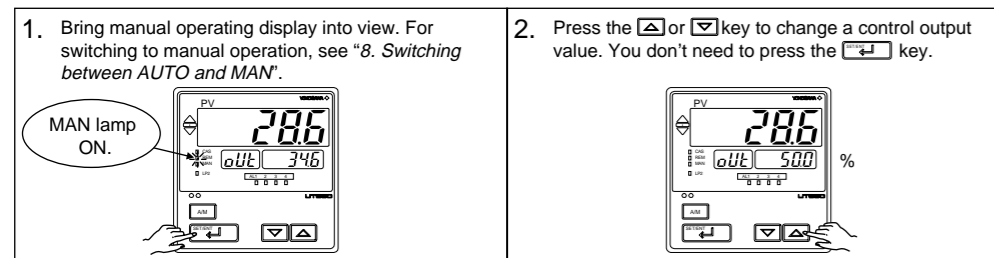
## 9. Manipulating Control Output during Manual Operation



NOTE

Control output cannot be changed if the controller is stopped. In this case, the preset output value (operating parameter PO) will be output.

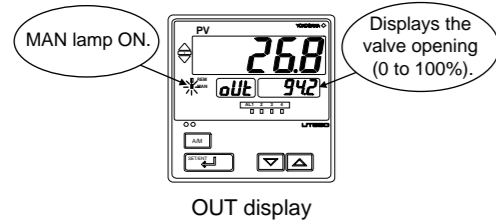
A control output value is linked with a display value changed using the  $\square$  or  $\Delta$  key. Note that the control output changes as displayed without requiring the  $\square$  key.



## Manipulating the Control Output during Position Proportional Control

The controller continues to provide control output as long as the  $\square$  or  $\Delta$  key is being pressed.

- $\square$  key: Closes the valve.
- $\Delta$  key: Opens the valve.



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

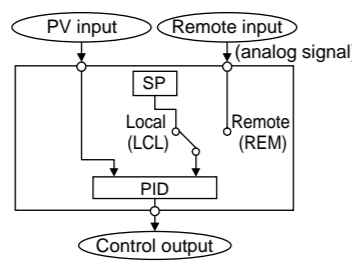
## 10. Switching between Remote (REM) and Local (LCL)

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.

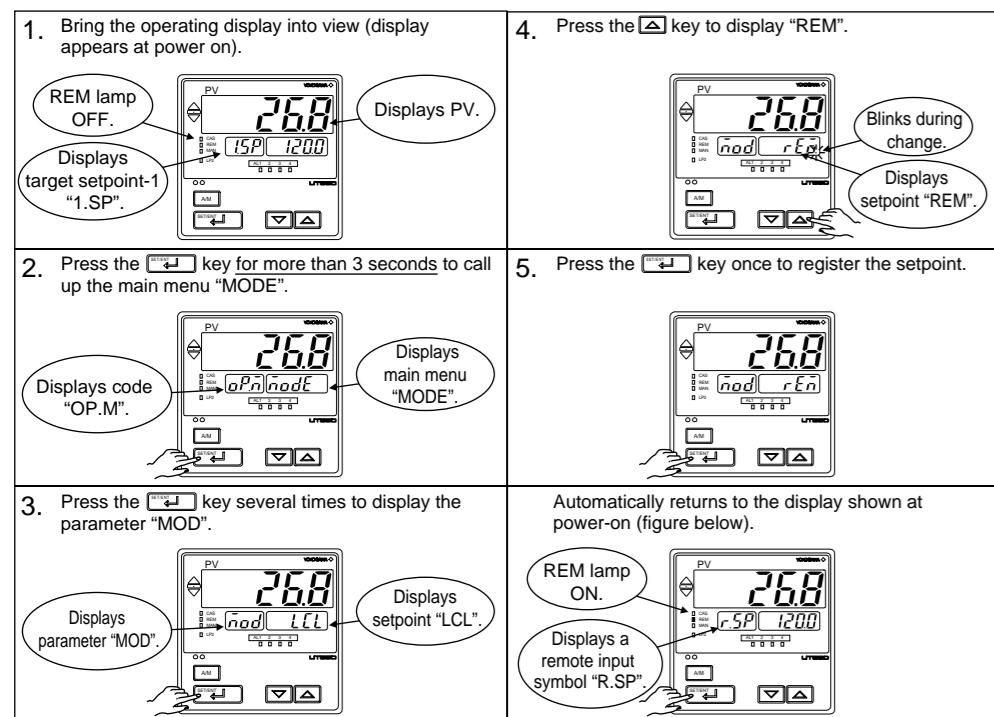
- Local: Performs control using target setpoints set in the controller.
- Remote: Performs control using external analog signals as target setpoints.

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

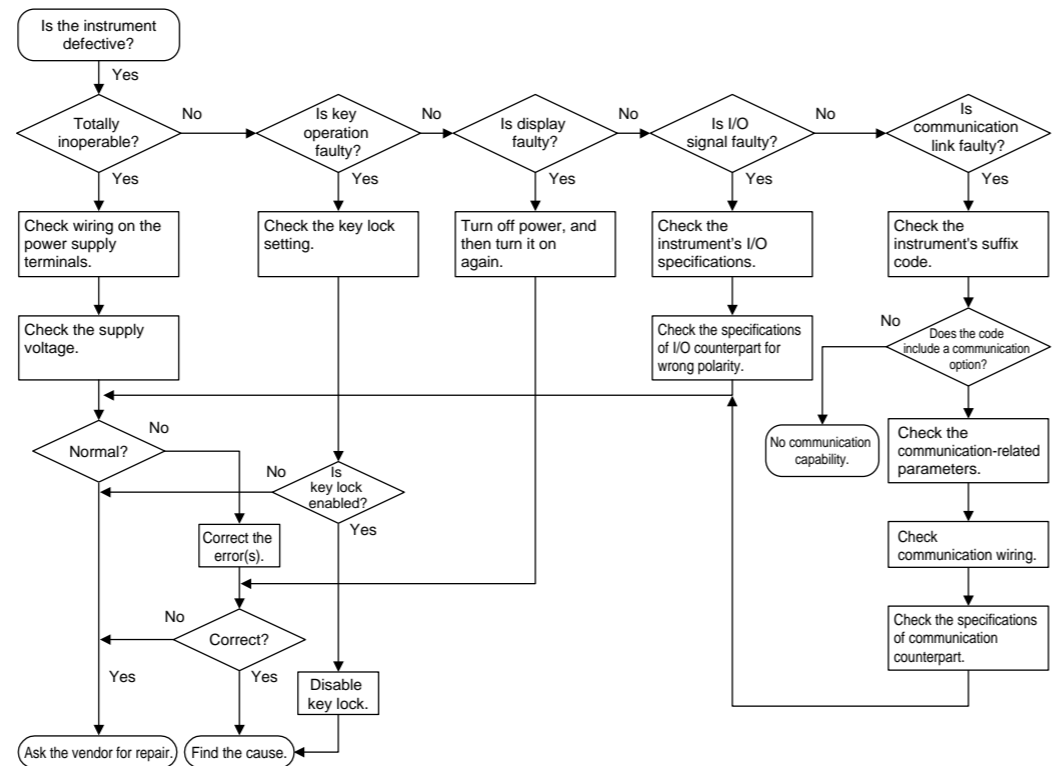
If Remote state is achieved by external contact input (contact input is ON), switching between REM and LCL cannot be achieved by keystroke.



## 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.

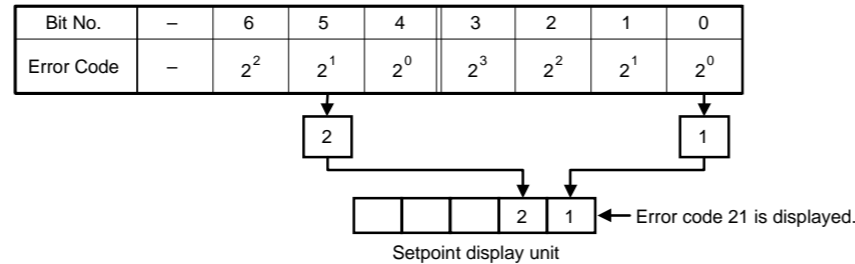
Error indication (on PV display unit)	Description of error	PV	Control output	Alarm output	Retransmission output	Communication	Remedy
E000 (E000)	Faulty RAM	None	0% or less or OFF	OFF	0% or less	Stopped	Faulty Contact us for repair.
E001 (E001)	Faulty ROM	None	0% or less or OFF	Undefined	Undefined	Stopped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



### 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				Faulty Contact us for repair.
Decimal point of item part in SP display unit blinks.	EEPROM error	Normal action					Faulty Contact us for repair.
E300 (E300)	ADC error	105%	In AUTO: Preset value output In MAN: Normal action	Normal action	Normal action	Normal action	Check wires and sensor.
baUt (B.OUT)	PV burnout error	Dependent on the BSL parameter Up-scale: 105% Down-scale: -5%					Check process.
oHEr (OVER) or -oHEr (-OVER)	Excessive PV Out of -5 to 105%	-5% or 105%	Normal action	Normal action	Normal action	Normal action	Check process. Press any key to erase error indication.
E200 (E200)	Auto-tuning failure (Time-out)		Action with PID existing before auto-tuning	Normal action	Normal action	Normal action	Check the feedback resistor.
Setpoint display	Feedback resistor breakdown		Stopped	Stopped	Stopped	Stopped	Check the Ethernet communication parameters if the error occurs continuously. When the settings are correct, it is faulty. Contact us for repair. Check the error of RS-485 side by the connected controller.
Decimal point in SP display unit blinks.	Faulty communication line	Normal action	Normal action	Normal action	Normal action	Normal action	Check the Ethernet communication parameters if the error occurs continuously. When the settings are correct, it is faulty. Contact us for repair. Check the error of RS-485 side by the connected controller.
Decimal point at right end lights.	Runaway (due to defective power or noise)	Undefined	0% or less or OFF	OFF	0% or less	0% or less	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	Cancelled.
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%. 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%.

### Troubleshooting When the Controller Fails to Operate Correctly

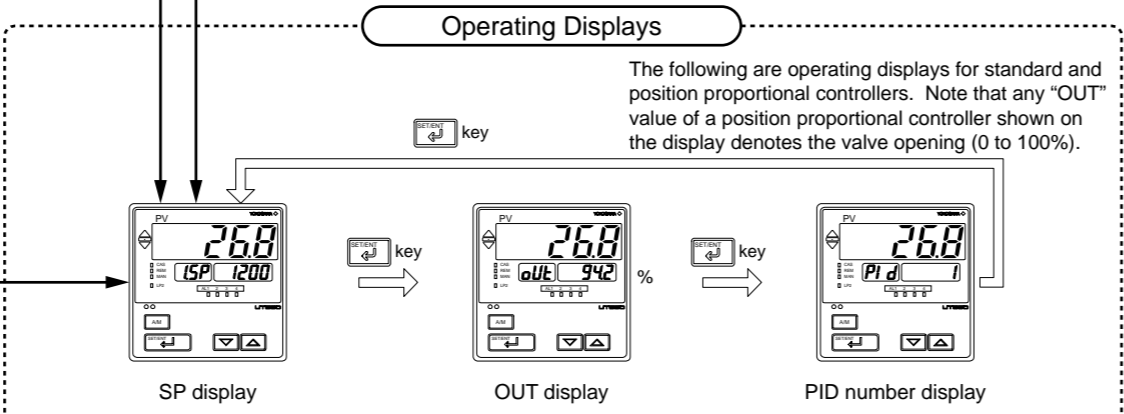
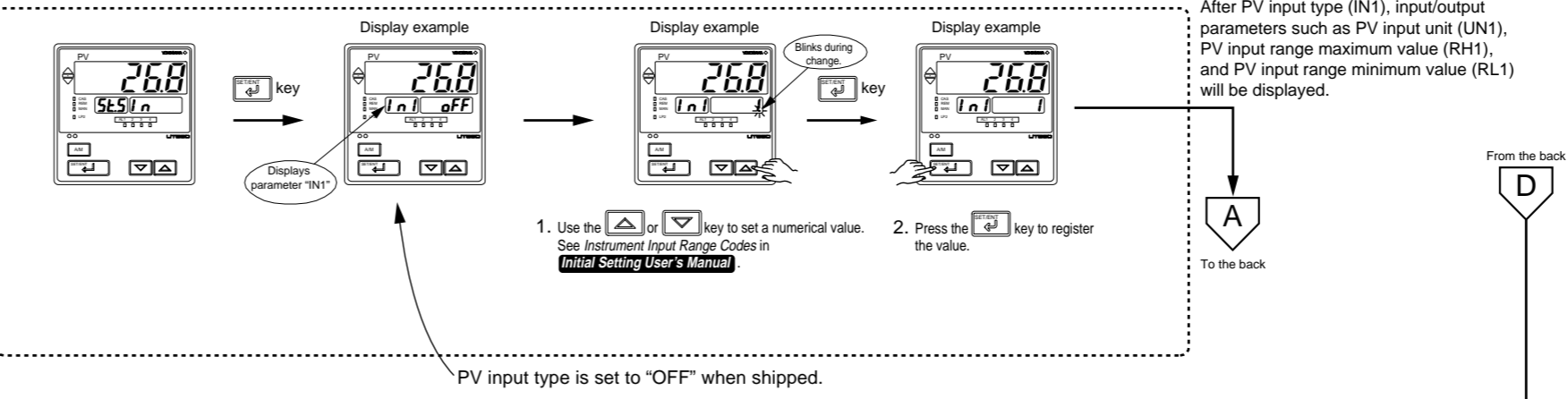
If your control tasks are not successful, check the preset parameters and controller wiring before concluding the controller to be defective. The following show some examples of troubleshooting you should refer to in order to avoid the possibility of other problems.

- The controller does not show the correct measured input (PV).
  - The UT551 controller has 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", "DPI", "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 UT551 controller has 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.

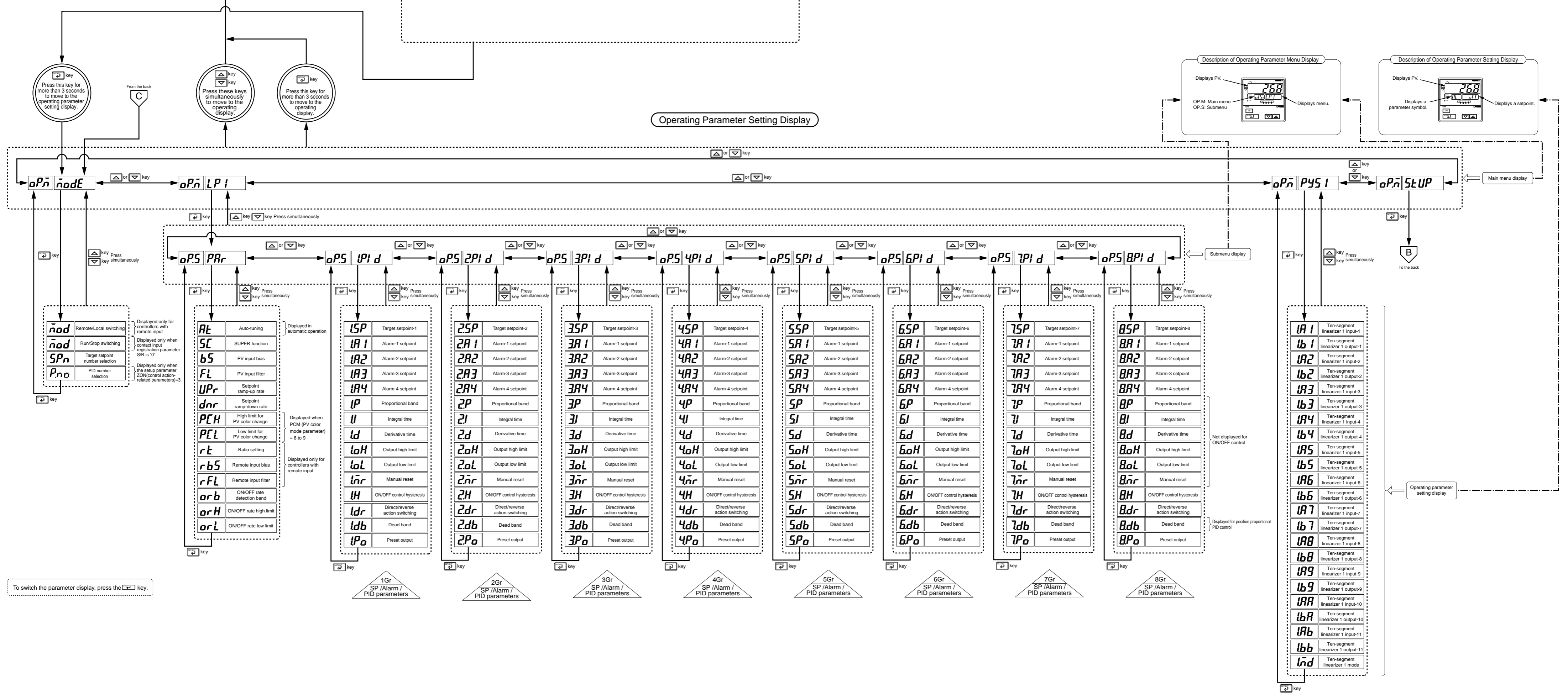
This manual contains a parameter map as a guideline for setting parameters.

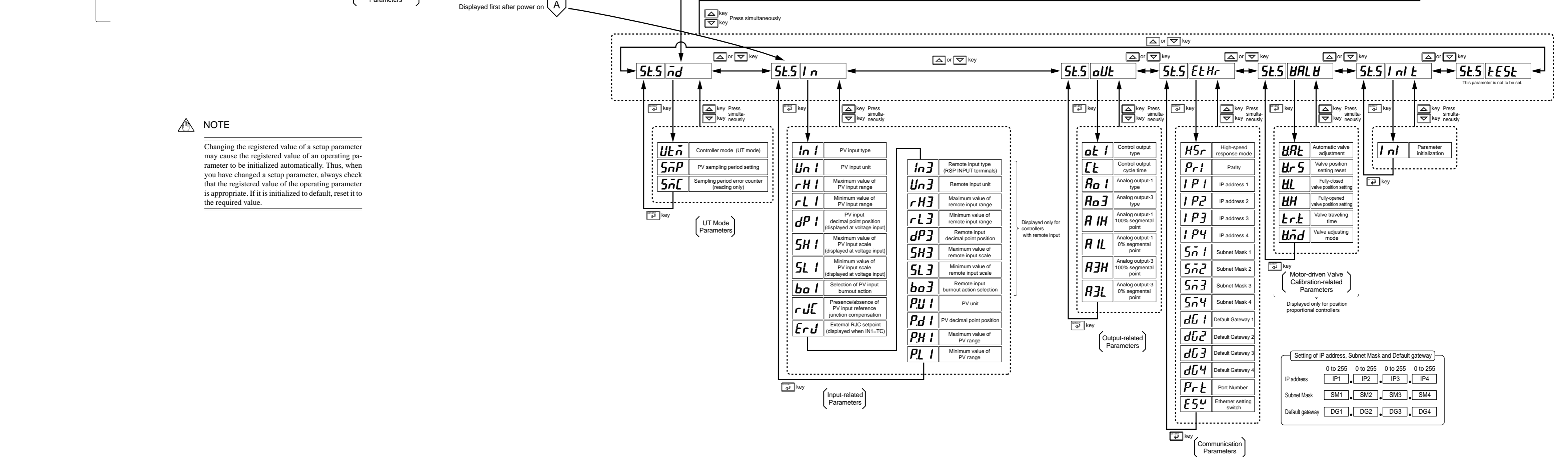
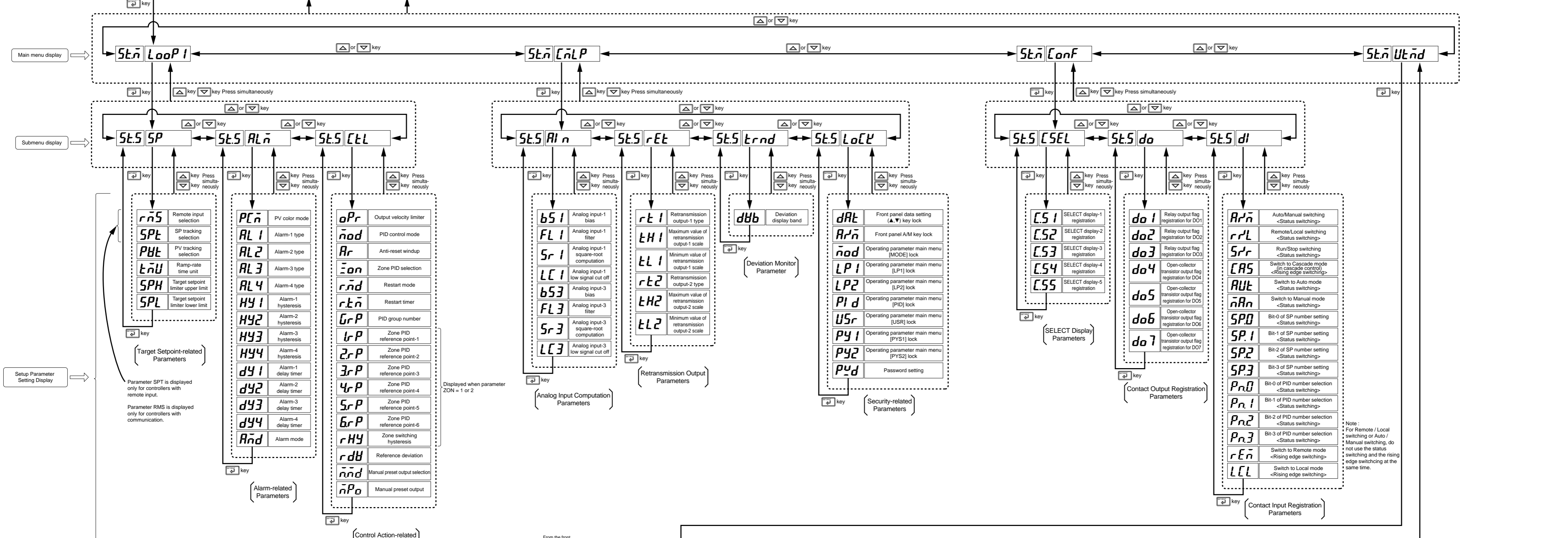
If you are unsure of the key operation sequence, press the **key** (for more than 3 seconds). This displays a screen at power on (i.e., operating display).

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**.



- Basic Key Operation Sequence**
- Setting display can be switched (moved) using the **key**.
  - A numerical value is changed by:
    - Using the **key** or **key** to change a displayed value (decimal point blinking) and
    - Pressing the **key** to register it.
  - Pressing the **key** on an operating display (for more than 3 seconds) brings you to the operating parameter setting display.
  - 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 **key** and **key** simultaneously.
  - 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 **key** and **key** simultaneously.





**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.


IP address	0 to 255	0 to 255	0 to 255	0 to 255
Subnet Mask	IP1	IP2	IP3	IP4
Default gateway	SM1	SM2	SM3	SM4
	DG1	DG2	DG3	DG4







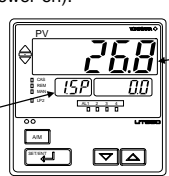

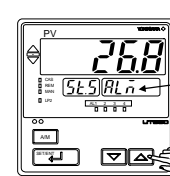

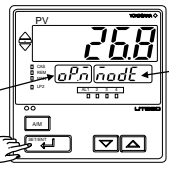

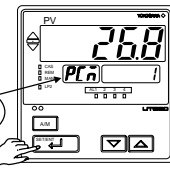




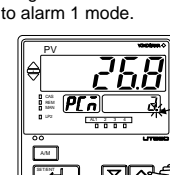

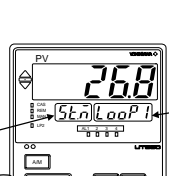

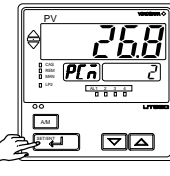

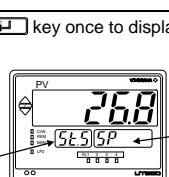

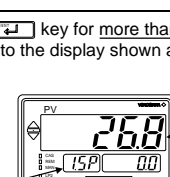
This manual describes the PV display color changing function "Active Color PV Display."

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."

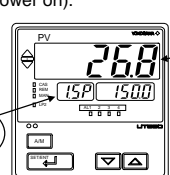

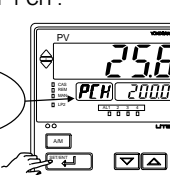

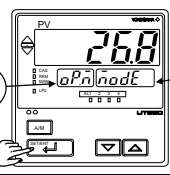


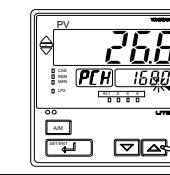

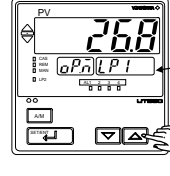

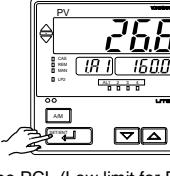

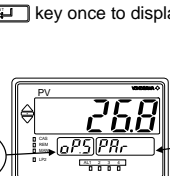

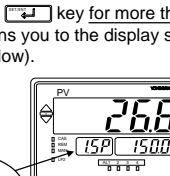
Parameter Symbol	Name of Parameter	Setting Range	Initial Value
<b>PCL</b> (PCM)	PV color mode	0 : Fixed in green 1 : Fixed in red 2 : Link to alarm 1 (Alarm OFF:green, Alarm ON: red) 3 : Link to alarm 1 (Alarm OFF:red, Alarm ON:green) 4 : Link to alarm 1 and 2 (Alarm OFF:green, Alarm ON:red) 5 : Link 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

<p>1. Bring the operating display into view (display appears at power-on).</p>  <p>Displays PV.</p> <p>Displays target setpoint-1 "1.SP".</p>	<p>6. Press the  key once to display the submenu "ALM".</p>  <p>Displays submenu "ALM".</p>
<p>2. Press the  key for more than 3 seconds to call up the main menu "MODE".</p>  <p>Displays main menu "MODE".</p> <p>Displays symbol "OP.M".</p>	<p>7. Press the  key once to display the parameter "PCM" (PV color mode).</p>  <p>Displays parameter "PCM".</p>
<p>3. Press the  key once to display the main menu "STUP".</p>  <p>Displays main menu "STUP".</p>	<p>8. Press the  or  key to display the required setpoint. The figure below shows an example of setting Link to alarm 1 mode.</p>  <p>Blinks during change.</p>
<p>4. Press the  key once to display the main menu "LOOP1".</p>  <p>Displays main menu "LOOP1".</p> <p>Displays symbol "ST.M".</p>	<p>9. Press the  key once to register the setpoint.</p>  <p>If PCM=6,7,8 or 9, also set the relating parameters PCH (High limit for PV color change) and PCL (Low limit for PV color change).</p>
<p>5. Press the  key once to display the submenu "SP".</p>  <p>Displays submenu "SP".</p> <p>Displays symbol "ST.S".</p>	<p>10. Press the  key for more than 3 seconds. This returns you to the display shown at power-on (figure below).</p>  <p>Displays PV.</p> <p>Displays target setpoint-1 "1.SP".</p>

### ■ 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 = 6 or 7: PCH:100.0 %, PCL:0.0 %
<b>PCL</b> (PCL)	Low limit for PV color change	When PCM (PV color mode parameter) = 8 or 9: -100.0 to 100.0 % of PV input range span.	When PCM = 8 or 9: PCH and PCL:1.0 %

<p>1. Bring the operating display into view (display appears at power on).</p>  <p>Displays PV.</p> <p>Displays target setpoint-1 "1.SP".</p>	<p>5. Press the  key several times to display the parameter "PCH".</p>  <p>Displays parameter "PCH".</p>
<p>2. Press the  key for more than 3 seconds to call up the main menu "MODE".</p>  <p>Displays symbol "OP.M".</p> <p>Displays main menu "MODE".</p>	<p>6. Press the  or  key to display the required setpoint.</p>  <p>Blinks during change.</p>
<p>3. Press the  key once to display the main menu "LP1".</p>  <p>Displays main menu "LP1".</p>	<p>7. Press the  key once to register the setpoint.</p>  <p>Also set the PCL (Low limit for PV color change parameter) that follows this step.</p>
<p>4. Press the  key once to display the submenu "PAR".</p>  <p>Displays symbol "OP.S".</p> <p>Displays submenu "PAR".</p>	<p>8. Press the  key for more than 3 seconds. This returns you to the display shown at power-on (figure below).</p>  <p>Displays PV.</p> <p>Displays target setpoint-1 "1.SP".</p>

## 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.

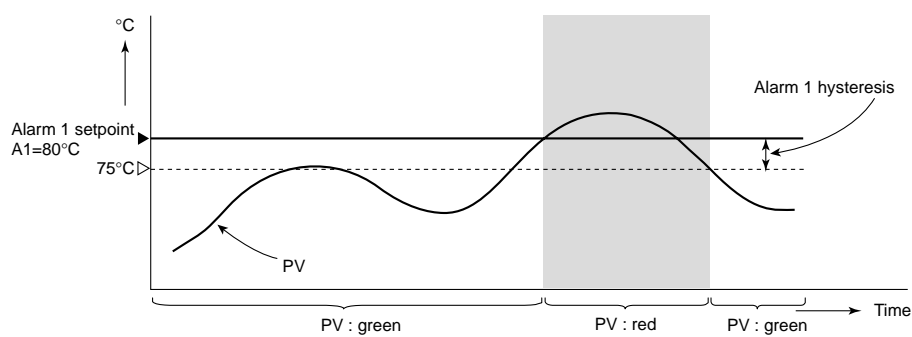
Setting parameters :

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 :

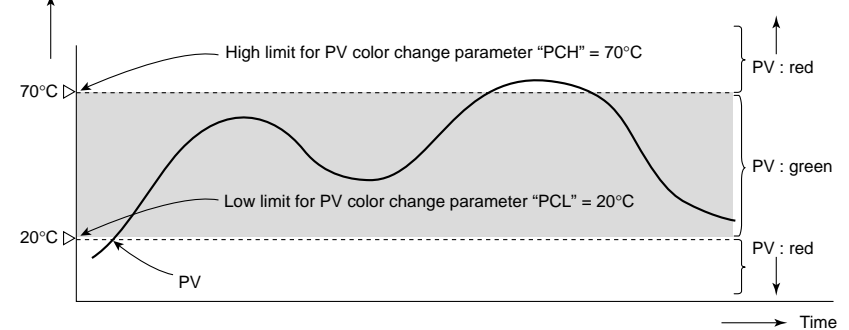
PCM (PV color mode parameter) = 6

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 :

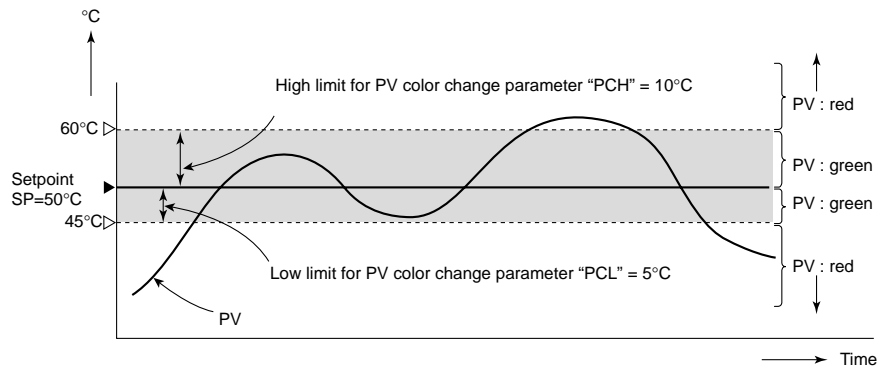
PCM (PV color mode parameter) = 8

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.

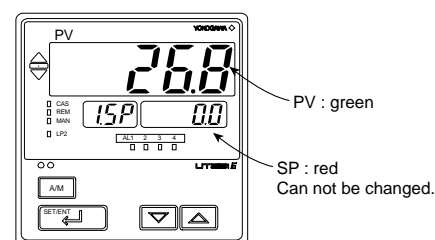


### Setting Example-4 : Fixed in Red or Green

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
<b>ErJ</b> (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

