# Instruction Manual

## UP27
## Program Controller
## Initial Setup Manual

IM 4P2F5-02E
1995. Jan. 1st Edition

YOKOGAWA ◆
Yokogawa Electric Corporation

# Instruction Manual

UP27
Program Controller
Initial Setup Manual

## CONTENTS


1. WHEN THE INSTRUMENT IS DELIVERED ..... 2
   1.1 Checking Instrument Specifications and Accessories ..... 3
   1.2 Component Names and Functions ..... 4
   1.3 Checking Measurement Input Range Code and Control Output Type Code ..... 5
   1.4 Preparing for Operation ..... 6
2. CHANGING INPUT/OUTPUT TYPES ..... 7
   2.1 Changing Measurement Input Range Code ..... 8
   2.2 Changing Control Output Type Code ..... 10
3. DIP SWITCH TYPE SETTINGS AND MODE SELECTIONS ..... 11
   3.1 Selecting Control Output Behavior During Error Conditions ..... 11
   3.2 Selecting Operating/Setup Parameter Setup Mode ..... 12
4. MOUNTING ..... 13
   4.1 Mounting Location ..... 13
   4.2 Mounting Procedure ..... 13
   4.3 Outline Drawings and Panel Cutout Dimensions ..... 14
5. WIRING ..... 16
   5.1 Wiring Procedure ..... 16
   5.2 Notes on Wiring ..... 17
   5.3 Terminal Wiring Diagrams ..... 18
6. COMPONENT NAMES AND FUNCTIONS ..... 20
7. KEY OPERATION PRINCIPLES ..... 22
8. OPERATING PARAMETERS ..... 24
   8.1 Operating Parameter Setup Flow ..... 24
   8.2 Summary of Operating Parameters ..... 26
   8.3 Description of Operating Parameters ..... 29
9. SETUP PARAMETERS ..... 42
   9.1 Setup Parameter Setup Flowchart ..... 42
   9.2 Setup Parameter Summary ..... 44
   9.3 Description of Setup Parameters ..... 47
10. OTHER FUNCTIONS ..... 54
   10.1 Coordinated Operation ..... 54
   10.2 /LPS: Transmitter Loop Power Supply (Option Specification) ..... 55
11. STANDARD SPECIFICATIONS ..... 56



YOKOGAWA ◆
Yokogawa Electric Corporation

IM 4P2F5-02E
1995. Jan. 1st Edition

# 1. WHEN THE INSTRUMENT IS DELIVERED

Thank you for purchasing the UP27 program controller.

This instrument is provided with two user manuals: this "Initial Setup Manual" and a separate "Operation Manual". Information is divided between these manuals as follows.

**Initial Setting Manual**

- ◎ When the instrument is delivered (instrument checkout)
- ◎ Changing input/output types
- ◎ Mounting
- ◎ Wiring Procedure
- ◎ Component names and functions
- ◎ Summary and description of parameters
- ◎ Coordinated operation (overview)
- ◎ Standard specifications

**Operation Manual**

- ◎ Handling instructions
- ◎ Key operations
  - ● Setting the operating parameters
    - • PID constants
    - • Fixed set point control (local mode) parameters
    - • Program patterns Etc.
  - ● General operation
    - • Start/stop
    - • Mode switching Etc.
- ◎ Maintenance, and Response to Malfunctions

**History**

IM 4P2F5-02E
Jan, 1995 1st Edition New Publication

This manual covers these topics. For details, see the Table of Contents.

## 1.1 Checking Instrument Specifications and Accessories

Verify that the specifications of the instrument that you have received match the model and suffix codes of the instrument ordered.

### Model and Suffix Code Table

| Model | Suffix code | Description |
|---|---|---|
| UP27 | ..... | Program controller |
| Option codes | /RET | Retransmission (4 to 20 mA DC) |
| | /RS422 | RS-422A communication interface |
| | /LPS | Transmitter Loop Power Supply |

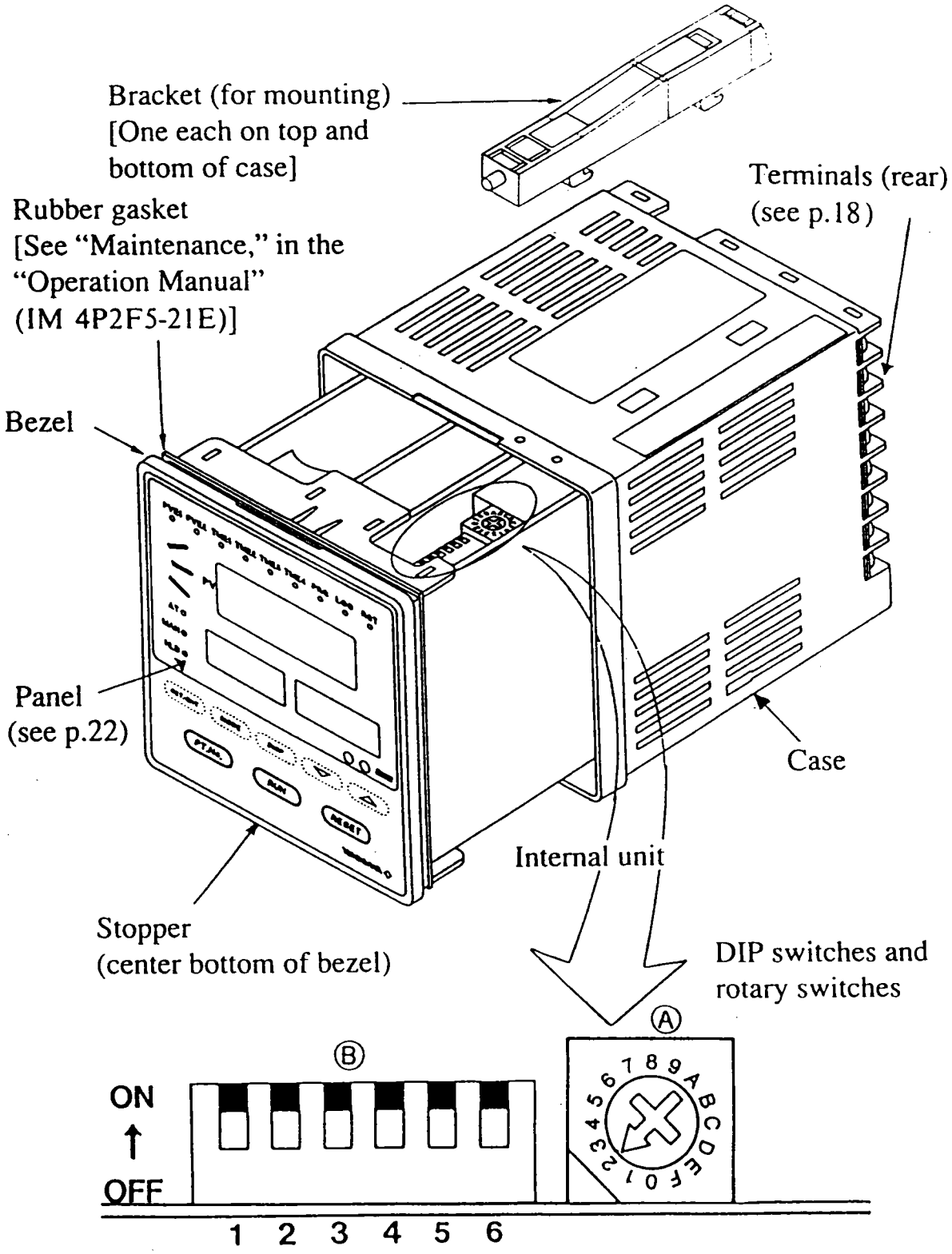
Check that the following items are included.

- UP27 ..... 1
- Brackets (for mounting hardware) ..... 2
- Initial Setup Manual (this manual) ..... 1
- Operation Manual ..... 1
- Communication Manual ..... 1*

* Included with option code /RS422 only

# 1.2 Component Names and Functions

- The UP27 is made up of the components shown in the diagram.



## 1.3 Checking Measurement Input Range Code and Control Output Type

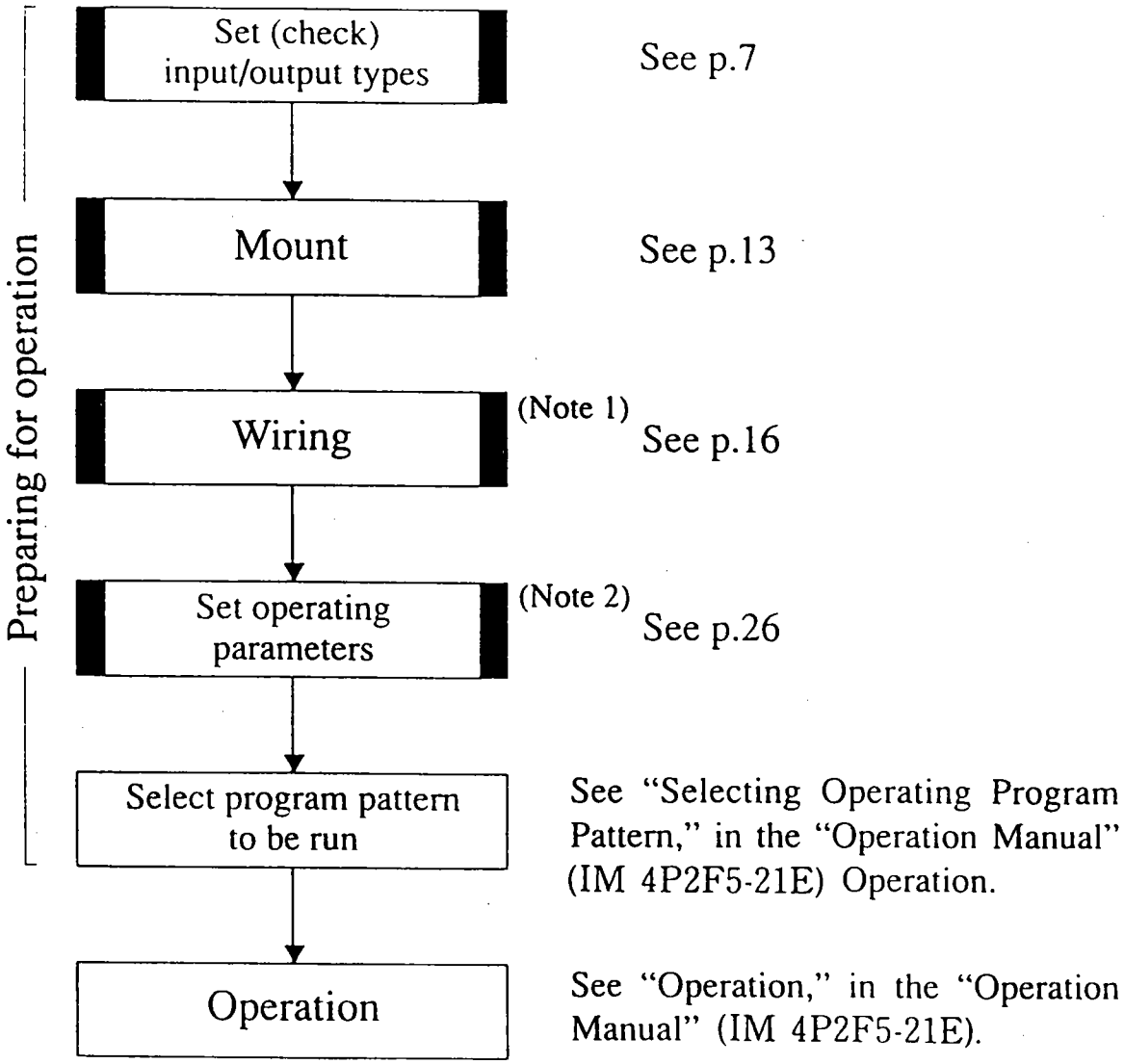
- Unless otherwise specified, the UP27 is shipped from the factory with the following measurement input range code and control output type.

| | Measurement input range code | Control Output type |
|---|---|---|
| UP27 | 0 (thermocouple type K, –200 to 1200 °C)<br>DIP switch No. 1: ON | (time proportioning PID, relay output)<br>DIP switch No.5:ON,No.6:ON |

- As shipped from the factory, the UP27 control action is set for reverse action.
- If a change is required in order to use this instrument, refer to Section 2, "Changing Input/Output Types".

## 1.4 Preparing for Operation

Follow the flow diagram shown below to prepare the UP27 for operation.




Note 1: The UP27 has no power switch. When power is supplied to it, the UP27 goes to immediately to an operating condition and begins to execute control operations. Therefore we recommend that you not connect its output to the device to be controlled until just before you are ready to begin actual operation.

Note 2: When received, this instrument's setpoint and operating parameters will be set to the default values in effect when it was shipped from the factory, as given in Section 8.2, "Operating Parameter Summary" (p. 26).

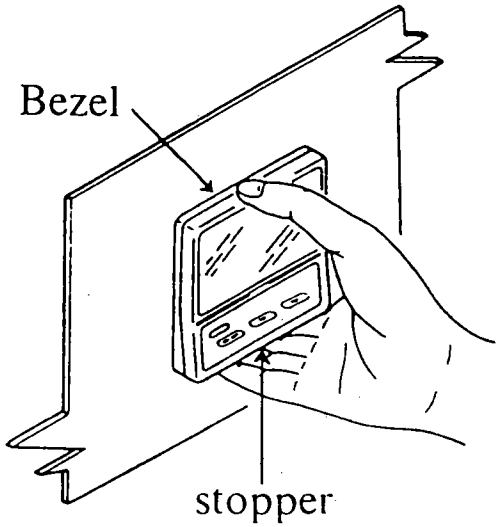
# 2. CHANGING INPUT/OUTPUT TYPES

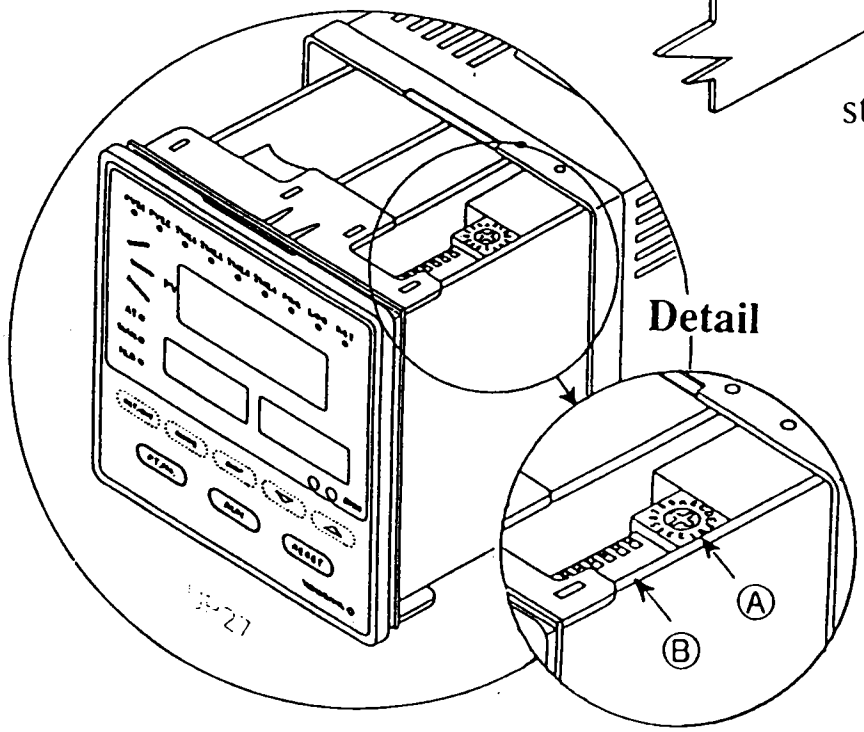
The measurement input range code and the control output type code on the UP27 can be changed using switches inside the UP27.

To do this, first perform the following procedure to pull out the internal unit.

① Turn OFF power to the UP27.
② Pull out the internal unit.

Pressing the stopper at the bezel bottom, pull the internal chassis forward.



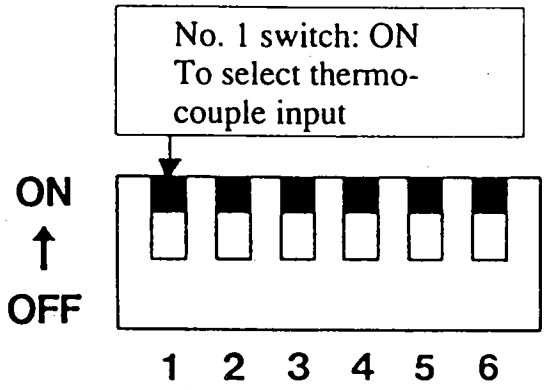




Note: After making the changes, return the internal unit to the case, and turn power ON.

## 2.1 Changing Measurement Input Range Code

DIP switch Ⓑ and rotary switch Ⓐ (see p. 4) are used to change the measurement input range code.

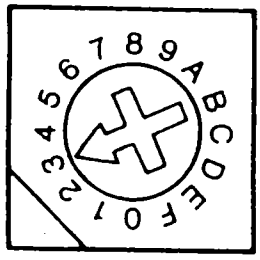
Use a small Phillips screwdriver to turn the rotary switch Ⓐ arrow to the appropriate range code No. (Unless otherwise specified, this is set to "thermocouple type K, –200 to 1200 °C" when the UP27 is shipped from the factory.)



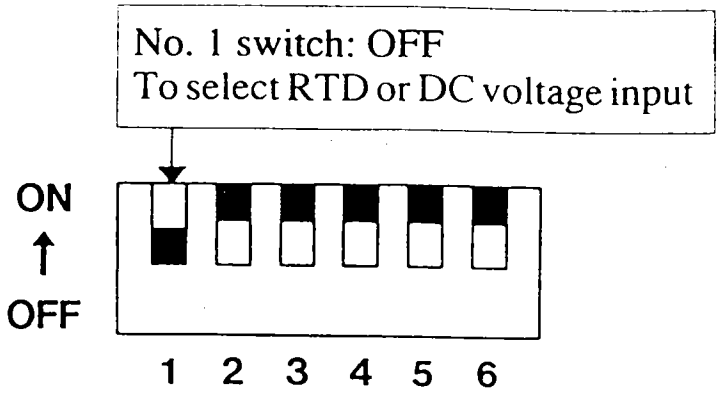

To select thermocouple input, set DIP switch No. 1 to ON

### Table 1. Thermocouple Input Range Codes

| Thermo-couple type | Instrument range | | DIP switch No.1 | Input range code (Note 1) |
|---|---|---|---|---|
| K | –200~1200°C | –300~2300°F | ON | 0 |
| K | –199.9~999.9°C | 0~2300°F | | 1 |
| K | –199.9~500.0°C | –199.9~999.9°F | | 2 |
| J | –199.9~800.0°C | –300~ 1500°F | | 3 |
| T | –199.9~400.0°C | –199.9~750.0°F | | 4 |
| T | 0.0~400.0°C | –300~ 750°F | | 5 |
| T | –199.9~200.0°C | –199.9~400.0°F | | 6 |
| B | 0~ 1800°C | 32~ 3300°F | | 7 |
| S | 0~ 1700°C | 32~ 3100°F | | 8 |
| R | 0~ 1700°C | 32~ 3100°F | | 9 |
| N | 0~ 1300°C | 32~ 2400°F | | A |
| W | 0~ 2300°C | 32~ 4200°F | | B |
| E | –199.9~800.0°C | –300~ 1500°F | | C |
| L | –199.9~800.0°C | –300~ 1500°F | | D |
| U | –199.9~400.0°C | –300~ 750°F | | E |
| U | 0.0~400.0°C | –199.9~750.0°F | | F |



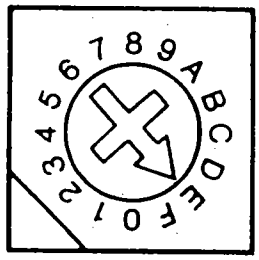

Note 1:
Turn the rotary switch Ⓐ arrow to the No. for the range code No. (Example shows thermocouple type J selected.)




To select RTD or DC voltage input, set DIP switch No. 1 to OFF

## Table 2. RTD/DC Voltage Input Range Code

| RTD/ DCV Type | Instrument range | | DIP switch No.1 | Input range code (Note 2) |
|---|---|---|---|---|
| JPt100 | -199.9~500.0°C | -199.9~999.9°F | OFF | 0 |
| | 0.0~200.0°C | 32.0~400.0°F | | 1 |
| | 0.0~100.0°C | 32.0~200.0°F | | 2 |
| | -100.0~100.0°C | -199.9~200.0°F | | 3 |
| Pt100 | -199.9~640.0°C | -300~ 1200°F | | 4 |
| | -199.9~500.0°C | -199.9~999.9°F | | 5 |
| | 0.0~200.0°C | 32.0~400.0°F | | 6 |
| | 0.0~100.0°C | 32.0~200.0°F | | 7 |
| | -100.0~100.0°C | -199.9~200.0°F | | 8 |
| -10~10mV | Scaling can be performed within the following four ranges.<br>-1999 ~ 9999<br>-199.9 ~ 999.9<br>-19.99 ~ 99.99<br>-1.999 ~ 9.999 | | | 9 |
| 0~10mV | | | | A |
| 0~100mV | | | | B |
| 0~1V | | | | C |
| 0~5V | | | | D |
| 1~5V | | | | E |
| 0~10V | | | | F |



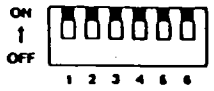

Note 2:

Turn the rotary switch Ⓐ arrow to the No. for the range code No.
(Example shows DC voltage, 1 to 5 V selected.)

Note: After changing the measurement input range code, return the internal unit to the case, and turn power ON.
Changing between °C and °F is done by changing the setup parameter (in the measurement input parameters) for the display units (UNI).

## 2.2 Changing Control Output Type Code

To set the control output type, turn ON or OFF DIP switch No.5 and No.6 (Unless otherwise specified, the control output type is preset to "Time-proportional PID (relay) output" on shipment.)

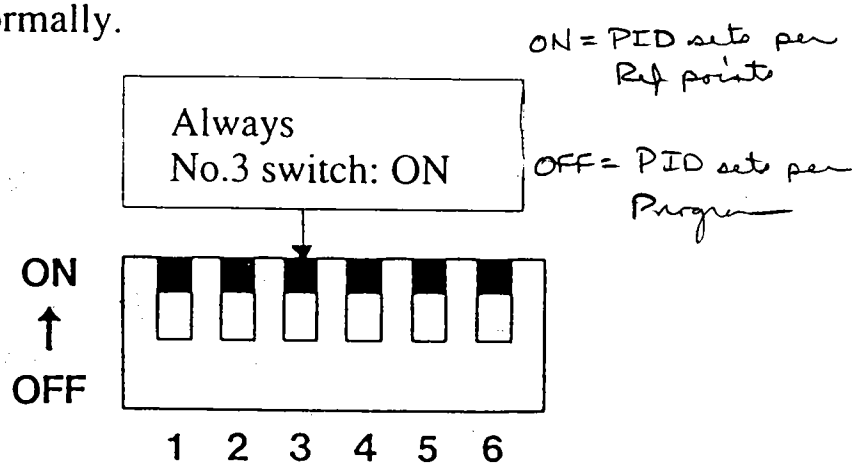
| Control output type | Specifications | DIP switch |
|---|---|---|
| Time-proportional PID relay output (Note 1) | Contact rating: 250V AC, 3A (resistive load)<br>Cycle time: 1 to 240 seconds (selectable) |  |
| Time proportioning PID voltage pulse output | ON voltage: 12V DC (approx.) or greater<br>OFF voltage: 0.1V DC maximum (load resistance: 600Ω minimum)<br>Cycle time: 1 to 240 seconds (selectable) | |
| Continuous PID output | Output current: 4 to 20mA DC (load resistance: 600Ω maximum)<br>Accuracy, ±0.3% (of full scale)<br>Output update interval: 200ms | |
| ON/OFF relay output (Note 1) | Contact rating: 250V AC, 3A (resistive load)<br>Output update interval: 200ms | |

Note 1: The relay is socketed and replaceable. If necessary, replace with a DS power relay (Model DSP1, 12 V DC, AGP20139, Matsushita Electric).

# 3. DIP SWITCH TYPE SETTINGS AND MODE SELECTIONS

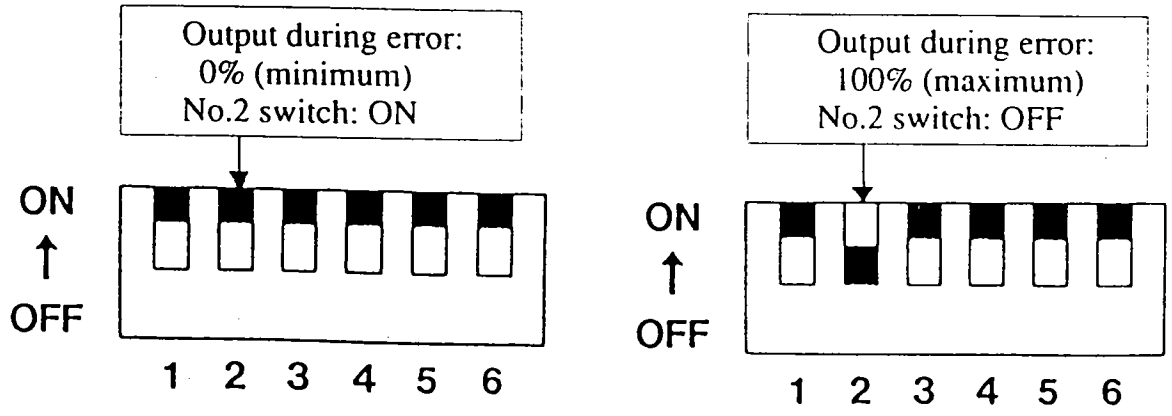
The DIP switch is located inside the UP27. (See p.7), and pull out the internal unit. All DIP switch positions are set to ON when the UP27 is shipped from the factory.

Note: DIP switch No.3 always must be ON. Otherwise, UP27 does not operate normally.



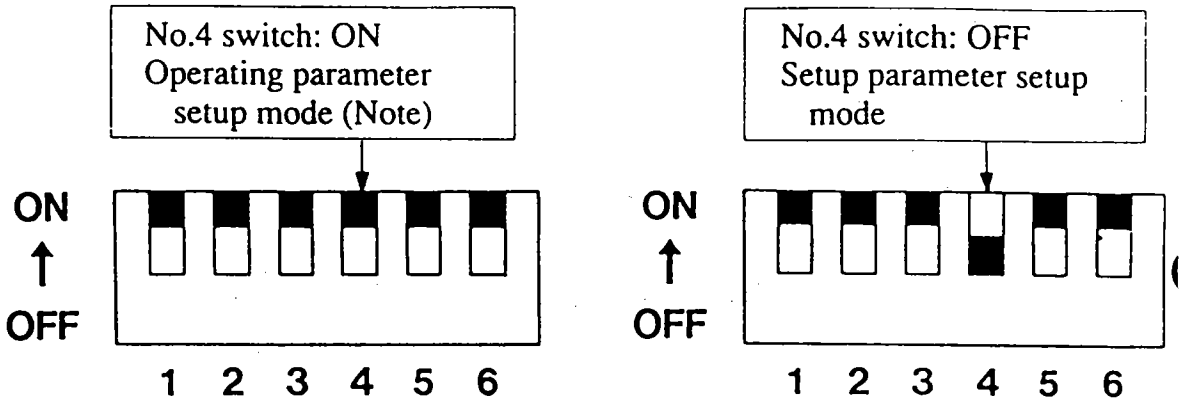

## 3.1 Selecting Control Output Behavior During Error Conditions (See IM5B4B7-20E, Chapter6.3)

By setting DIP switch No. 1 to ON or OFF, you can select whether the output during error conditions will be set to 0% (minimum) or 100% (maximum).



## 3.2 Selecting Operating/Setup Parameter Setup Mode

By setting DIP switch No. 4 to ON or OFF, you can select whether the UP27 will operate in operating parameter setup mode or setup parameter setup mode.




Note: Operating parameter setup mode is called up by pressing the (SET/ENT) key for at least three seconds from the Operation Display (see p.22).

# 4. MOUNTING

## 4.1 Mounting Location

Select a location that meets the following conditions to install this instrument.

(1) Minimal mechanical vibration

(2) Free of corrosive gases

(3) Near normal room temperature (23 °C), with minimal temperature variation

(4) No direct exposure to high radiant heat levels

(5) Free of electromagnetic field effects

(6) Not exposed to contact with water

## 4.2 Mounting Procedure

(1) Insert the UP27 from the front of the panel.

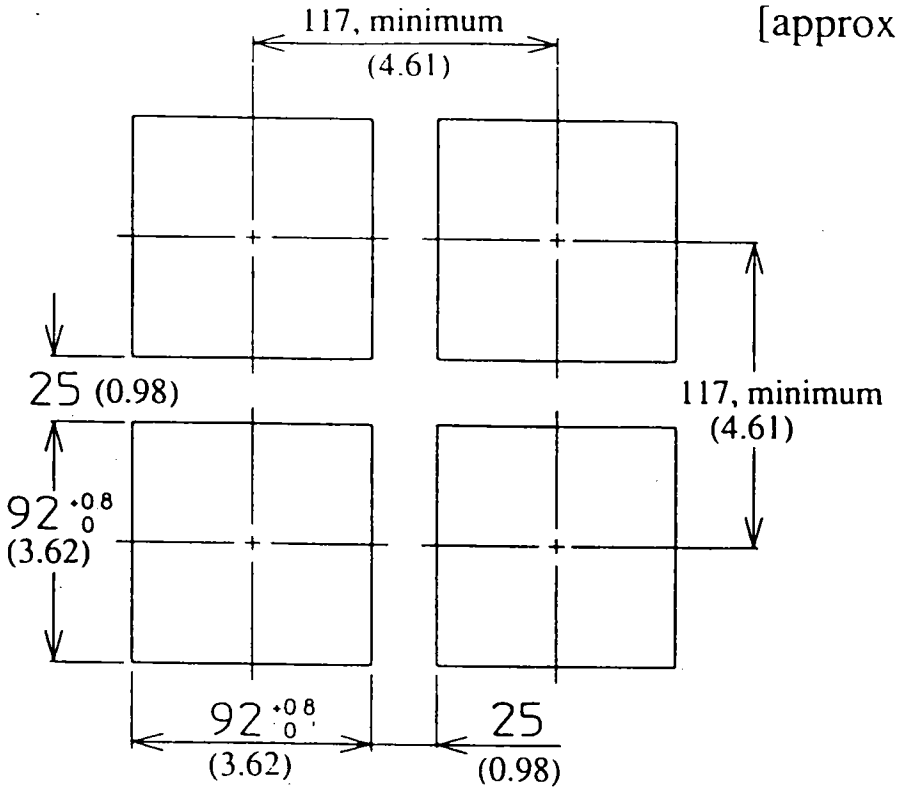
(2) Use the accessory brackets to mount the UP27 to the panel. Be careful not to overtighten the screws when mounting.

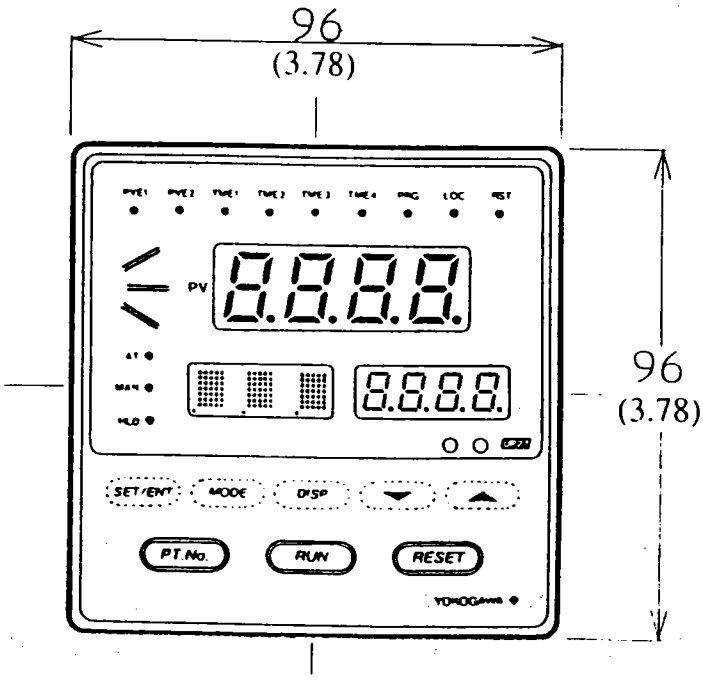
### CAUTION

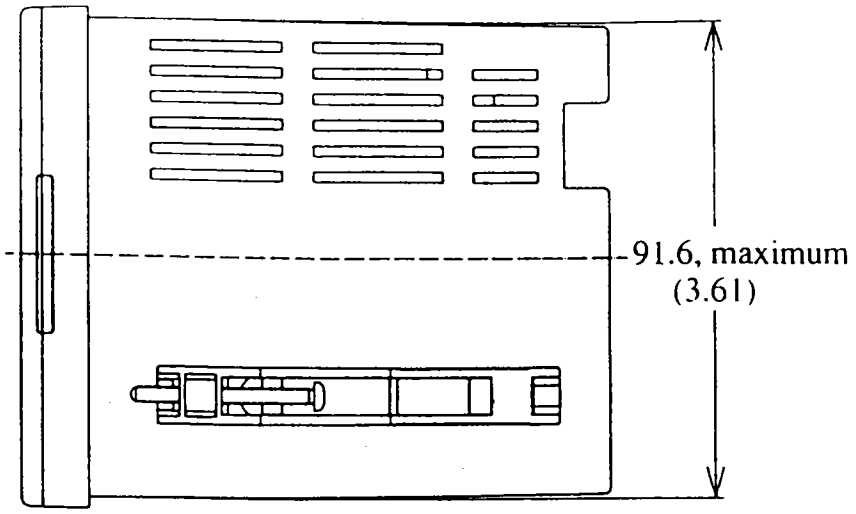
CAUTION: WHEN MOUNTING ON OR OVER A COMBUSTIBLE SURFACE, A PLATE OF AT LEAST 1.43mm GALVANIZED OR 1.6mm UNCOATED STEEL EXTENDED AT LEAST 150mm BEYOND THE EQUIPMENT ON ALL SIDES MUST BE INSTALLED
and
AVERTISSEMENT: LORSQUE L'APPAREIL EST INSTALLÉ SUR OU AU-DESSUS D'UNE SURFACE COMBUSTIBLE, ON DOIT PRÉVOIR UNE PLAQUE D'ACIER GALVANISÉ D'AU MOINS 1.43mm OU UNE PLAQUE D'ACIER SANS REVÊTEMENT DE 1.6mm SE PROLONGEANT SUR AU MOINS 150mm TOUT AUTOUR DE L'APPAREIL.

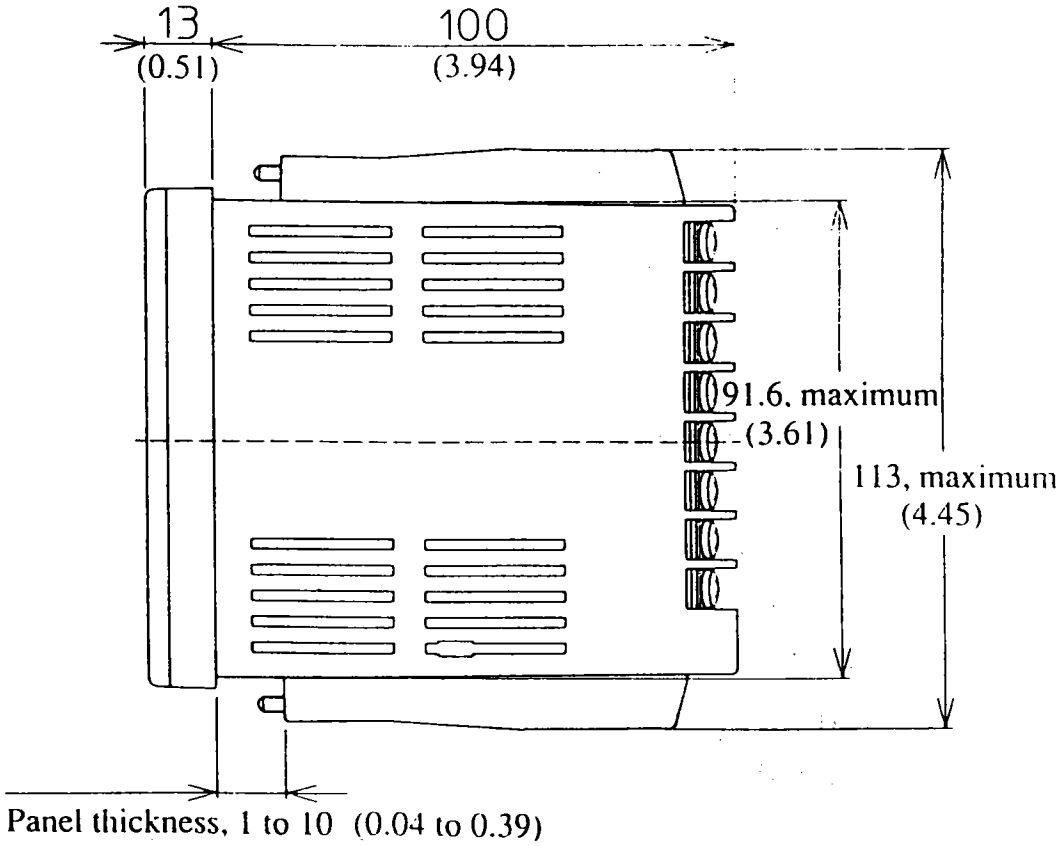
# 4.3 Outline Drawings and Panel Cutout Dimensions

Units: mm
[approx. inch]




91.6, maximum
(3.61)


13
(0.51)
100
(3.94)
91.6, maximum
(3.61)
113, maximum
(4.45)
Panel thickness, 1 to 10 (0.04 to 0.39)

# 5. WIRING

## 5.1 Wiring Procedure

When wiring, refer to Section 5.3, "Terminal Wiring Diagrams," and conform to the instructions below.

(1) For thermocouple input, use the prescribed type of compensating lead wires (thermocouple extension wire).

(2) For RTD input, use wiring with low lead wire resistance and no difference in resistance between the three wires.

(3) For power supply wiring, use wire or cable equivalent or superior to 600 V PVC insulated wire (JIS C3307). If required, insert a noise filter in the wiring.

(4) Ground the UP27 so that resistance to ground does not exceed 100Ω, using wire having a cross-sectional area of at least 2 $mm^2$.

(5) Plan the routing of input circuit wiring so as to avoid noise pickup in the input circuit.
   (a) Keep the input circuits separated as far as possible from the power supply and ground circuits.
   (b) Shielded wire can be used to counter noise caused by electrostatic induction. The shield can be connected to the UP27 ground terminal if necessary (but be careful to avoid 2-point grounding — ground the shield either at the signal source or UP27, but not both).
   (c) To counter noise from magnetic induction, you can obtain relatively good results by using twisted-pair input wiring with a short pitch between twists.

(6) We recommend that you use insulated sleeve crimp terminals (for 3.5 mm screws) to connect the wiring to the terminals.

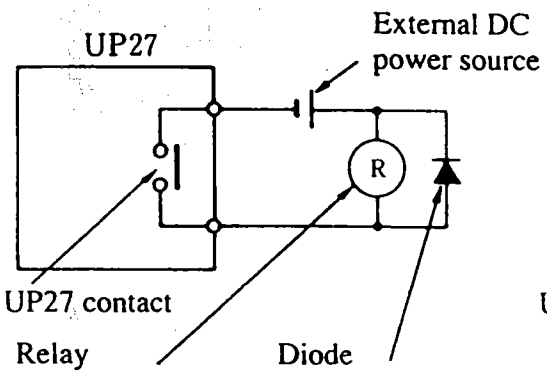
## 5.2 Notes on Wiring

(1) There is no fuse or power supply switch in the UP27. If required, you should provided these separately.
For fusing, use a time-lag fuse with a rated voltage of 250 V and a rated current of 1 A.

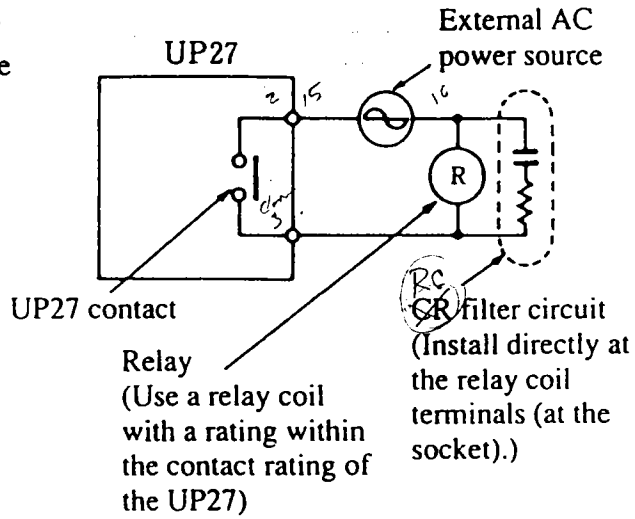
(2) If the load exceeds the contact rating when using relay contact output (control output: 250 V AC, 3 A, resistive load; alarm output: 250 V AC, 1 A, resistive load), use an auxiliary relay to switch the load.

(3) When using an inductive load such as an auxiliary relay on the relay contact output, connect an RC (for AC) or diode (for DC) surge suppresser circuit in parallel with the contacts to prevent arcing across the contacts.

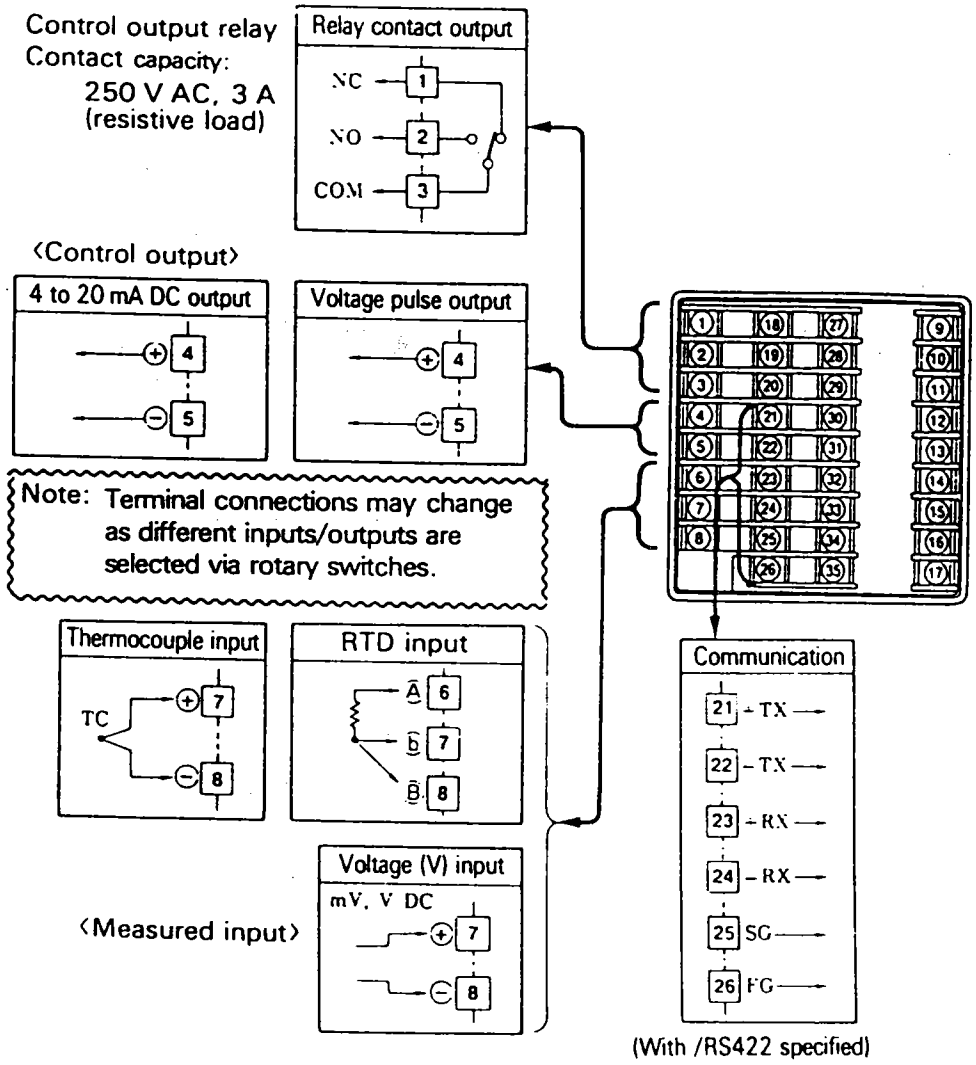
### • For a DC Relay:

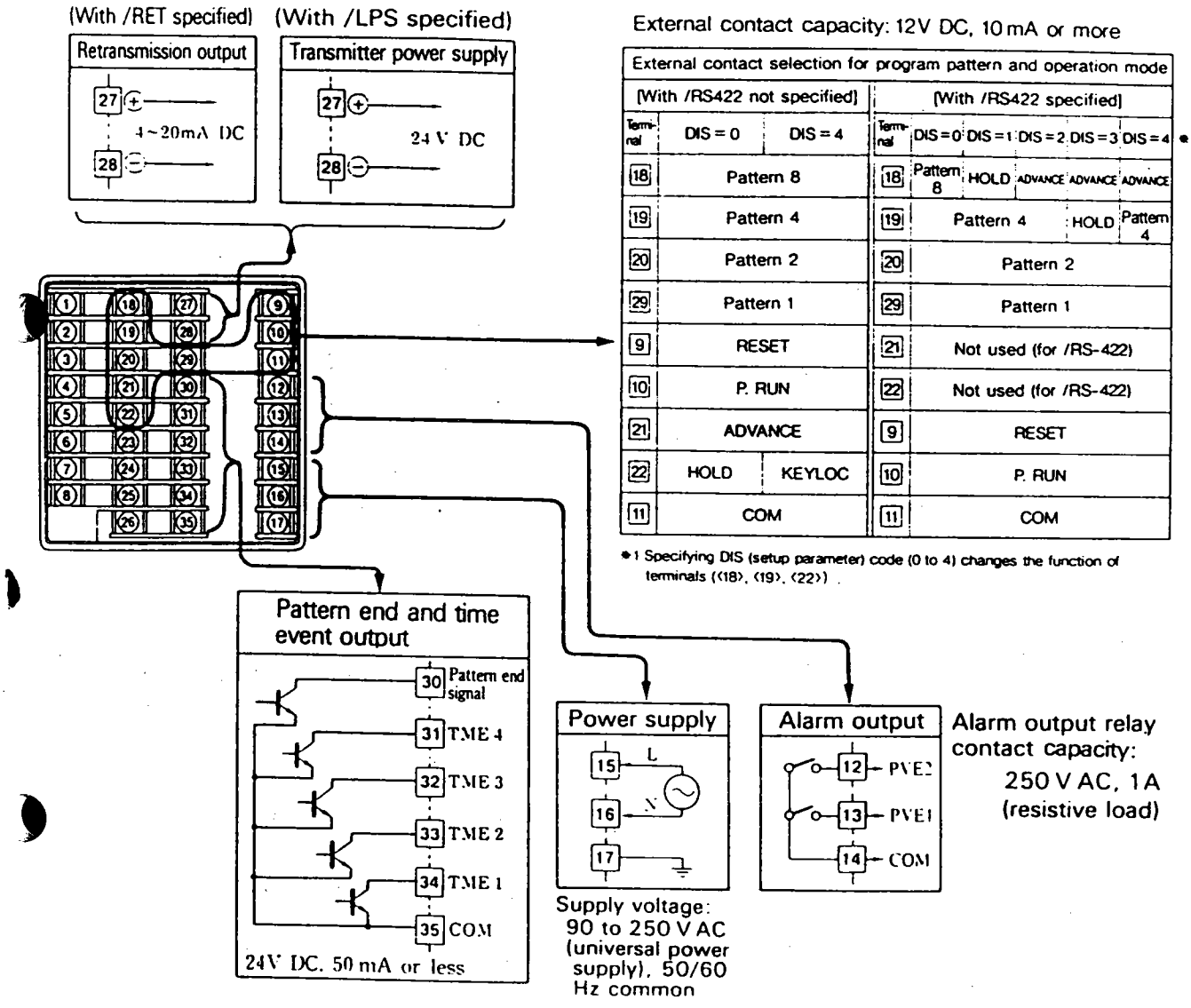



### • For an AC Relay:



# 5.3 Terminal Wiring Diagram



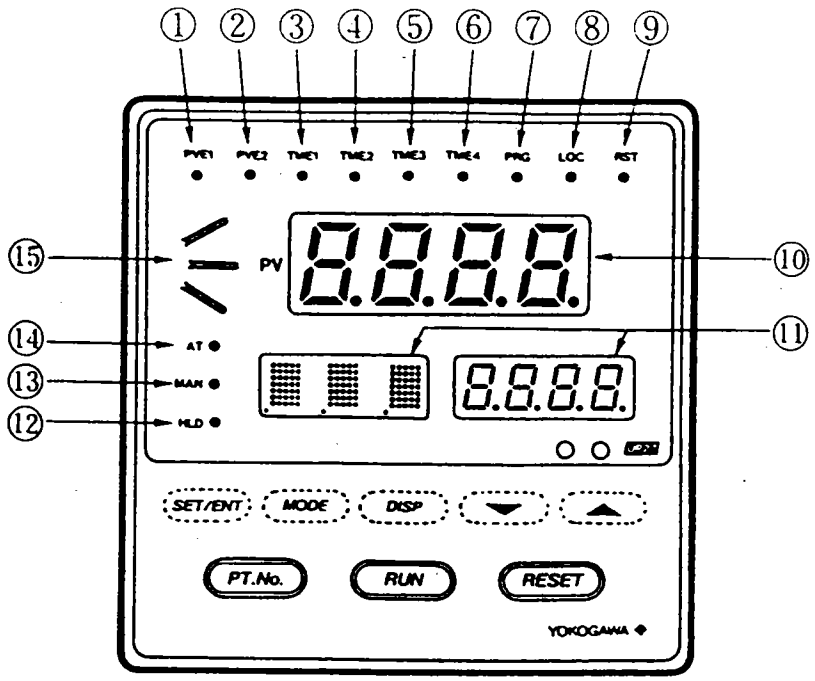



External contact capacity: 12V DC, 10 mA or more

| External contact selection for program pattern and operation mode | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| [With /RS422 not specified] | | | [With /RS422 specified] | | | | | | | |
| Terminal | DIS = 0 | DIS = 4 | Terminal | DIS = 0 | DIS = 1 | DIS = 2 | DIS = 3 | DIS = 4 * | |
| 18 | Pattern 8 | | 18 | Pattern 8 | HOLD | ADVANCE | ADVANCE | ADVANCE | |
| 19 | Pattern 4 | | 19 | Pattern 4 | | | HOLD | Pattern 4 | |
| 20 | Pattern 2 | | 20 | Pattern 2 | | | | | |
| 29 | Pattern 1 | | 29 | Pattern 1 | | | | | |
| 9 | RESET | | 21 | Not used (for /RS-422) | | | | | |
| 10 | P. RUN | | 22 | Not used (for /RS-422) | | | | | |
| 21 | ADVANCE | | 9 | RESET | | | | | |
| 22 | HOLD | KEYLOC | 10 | P. RUN | | | | | |
| 11 | COM | | 11 | COM | | | | | |

* 1 Specifying DIS (setup parameter) code (0 to 4) changes the function of terminals (<18>, <19>, <22>).

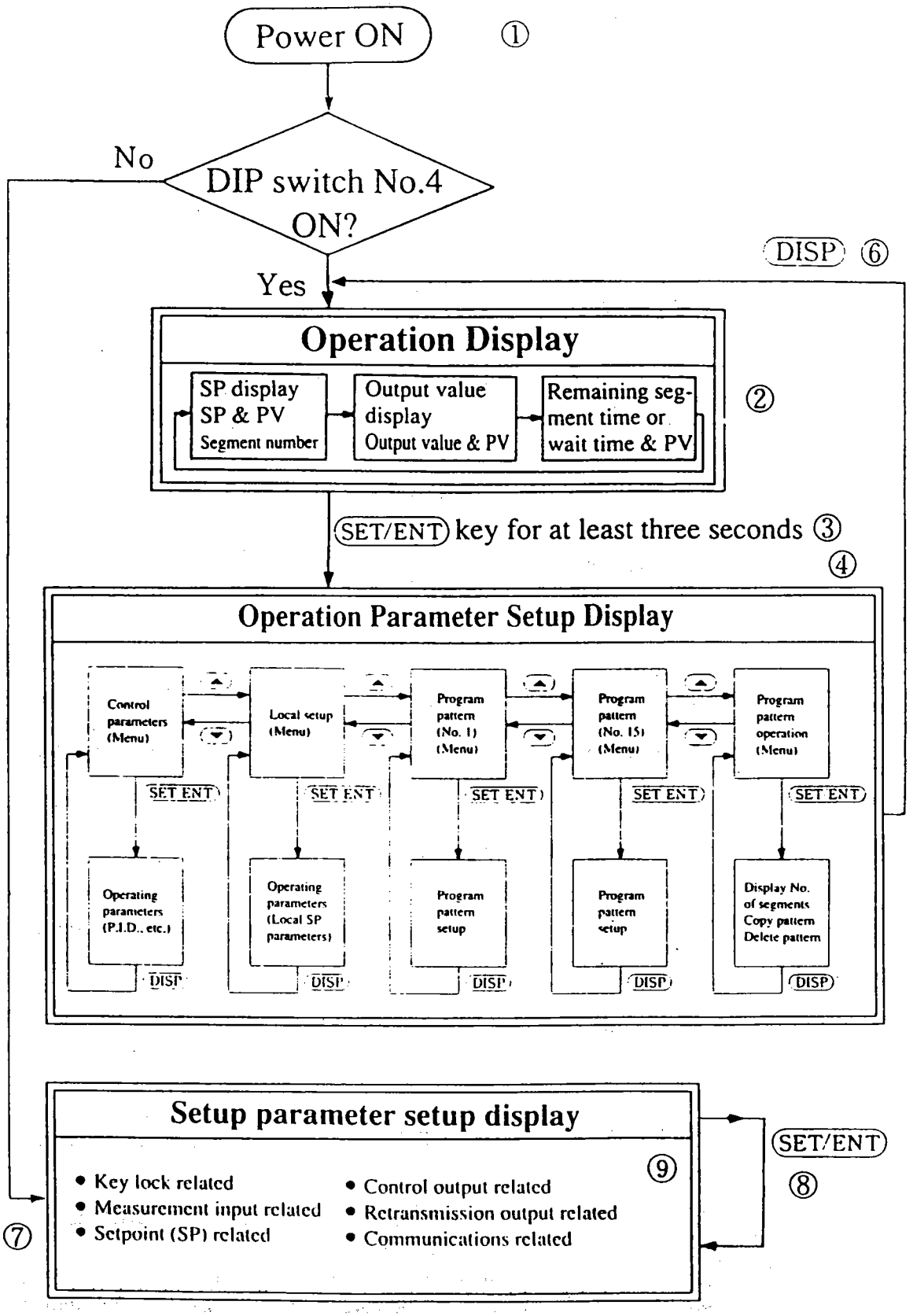
# 6. COMPONENT NAMES AND FUNCTIONS




| Key | Function |
|---|---|
| PT.No. | • Selects a program pattern No. with the Operation Display on display. |
| RUN | • Starts operation when pressed and held for about two seconds with the Operation Display on display. |
| RESET | • Stops operation when pressed and held for about two seconds in program operation mode, local operation mode, or hold mode. |
| SET/ENT | • Switches front panel from Operation Display to Operating Parameter Setup Display.<br>• Scrolls the display through the setup displays for the various parameters.<br>• Enters numeric values. |
| MODE | • Transfers UP27 between its modes: hold, advance, auto/manual, local, auto tuning, etc. |
| DISP | • Switches UP27 to Operation Display.<br>• Returns UP27 from Operating Parameter Setup Display to Operation Display. |
| ▼<br>▲ | Used to alter numeric values displayed for target set points and parameters, and also for output when in manual operation mode.<br>The (▼) (down) key decreases the displayed value; the (▲) (up) key increases it. Pressing either key once and releasing it will change the numeric value one digit at a time; pressing and holding the key will speed the rate of change. |

| No. | Indicator or Display | Function |
|---|---|---|
| ① | PVE 1 ○ (PV event 1 lamp) | Lights when PV event 1 occurs. |
| ② | PVE 2 ○ (PV event 2 lamp) | Lights when PV event 2 occurs. |
| ③ | TME 1 ○ (Time event 1 lamp) | Lights when time event 1 occurs. |
| ④ | TME 2 ○ (Time event 2 lamp) | Lights when time event 2 occurs. |
| ⑤ | TME 3 ○ (Time event 3 lamp) | Lights when time event 3 occurs. |
| ⑥ | TME 4 ○ (Time event 4 lamp) | Lights when time event 4 occurs. |
| ⑦ | PRG ○ (Program operation mode indicating lamp) | Lights when program is running (OFF when in fixed setpoint control mode (local mode) or in reset state). |
| ⑧ | LOC ○ (Local mode indicating lamp) | Lights when UP27 is in fixed setpoint control mode (local mode). |
| ⑨ | RST ○ (Reset mode indicating lamp) | Lights when UP27 is in reset state. Program operation stops, and automatic control stops. Note that manual (MAN) mode operation is also disabled when in this state. |
| ⑩ | 8.8.8.8. (Measured value display) | Displays measured value (PV) |
| ⑪ | ■ ■ ■ 8.8.8.8 (Setpoint & parameter display) | Displays target setpoint, output, segment No., remaining time in segment, and the various parameters of the UP27. |
| ⑫ | HLD ○ (Program hold indicating lamp) | Lights when program operation is in HOLD mode (temporary stop). Control continues while in this mode. |
| ⑬ | MAN ○ (Manual mode indicating lamp) | Lights when UP27 is in MAN (manual operation) mode [OFF when UP27 is in AUTO (automatic operation) mode]. |
| ⑭ | AT ○ (Auto tuning execution indicating lamp) | Flashes while auto tuning is executing. |
| ⑮ | ／ ― ＼ | These indicate the nature of the currently running program segment: ／ indicates an ascending ramp; ― indicates a soak segment; and ＼ indicates a descending ramp. |

# 7. KEY OPERATION PRINCIPLES



① When power is first applied, the UP27 displays the Operation Display. [This is if DIP switch No. 4 is set to ON (default when shipped from the factory is ON). For approximately 2 seconds after power is applied, before the Operation Display is presented, the model, input range, etc. are displayed on the measured value display.]

② There are three Operation Displays (SP display, output value display, and time display). The (DISP) key can be used to switch between these Operation Displays.

- In local mode, the SP value can be changed from the SP display. ( (▼), (▲) + (SET/ENT) )
- In MAN (manual) operation, the control output value can be changed from the output value display using the (▼) and (▲) keys..
- From the time display, the remaining segment time can be changed if the UP27 is in hold mode or a soak segment.

③ With the Operation Display on display, pressing the (SET/ENT) key for at least three seconds will transfer the UP27 to the Operating Parameter Setup Display.

④ The operating parameter menu group can be changed using the (▼) and (▲) keys. Each time the (SET/ENT) key is pressed, the display switches to the next item in the sequence.

⑤ The individual operating parameters can be set (or displayed) using the (▼) and (▲) keys. (The period will be flashing while the number is being changed.) After changing a parameter value, press the (SET/ENT) key to register the change.

⑥ Pressing the (DISP) key with the Operating Parameter Setup Display on display returns the UP27 to the Operation Display. Pressing the (DISP) key while setting a parameter returns the display to the menu display.

⑦ If DIP switch No. 4 is OFF when power is turned ON (see p.12), the UP27 goes to the Setup Parameter Setup Display. (Note 1)

⑧ Each depression of the (SET/ENT) key (for less than three seconds) advances the display to the next setup parameter in the sequence.

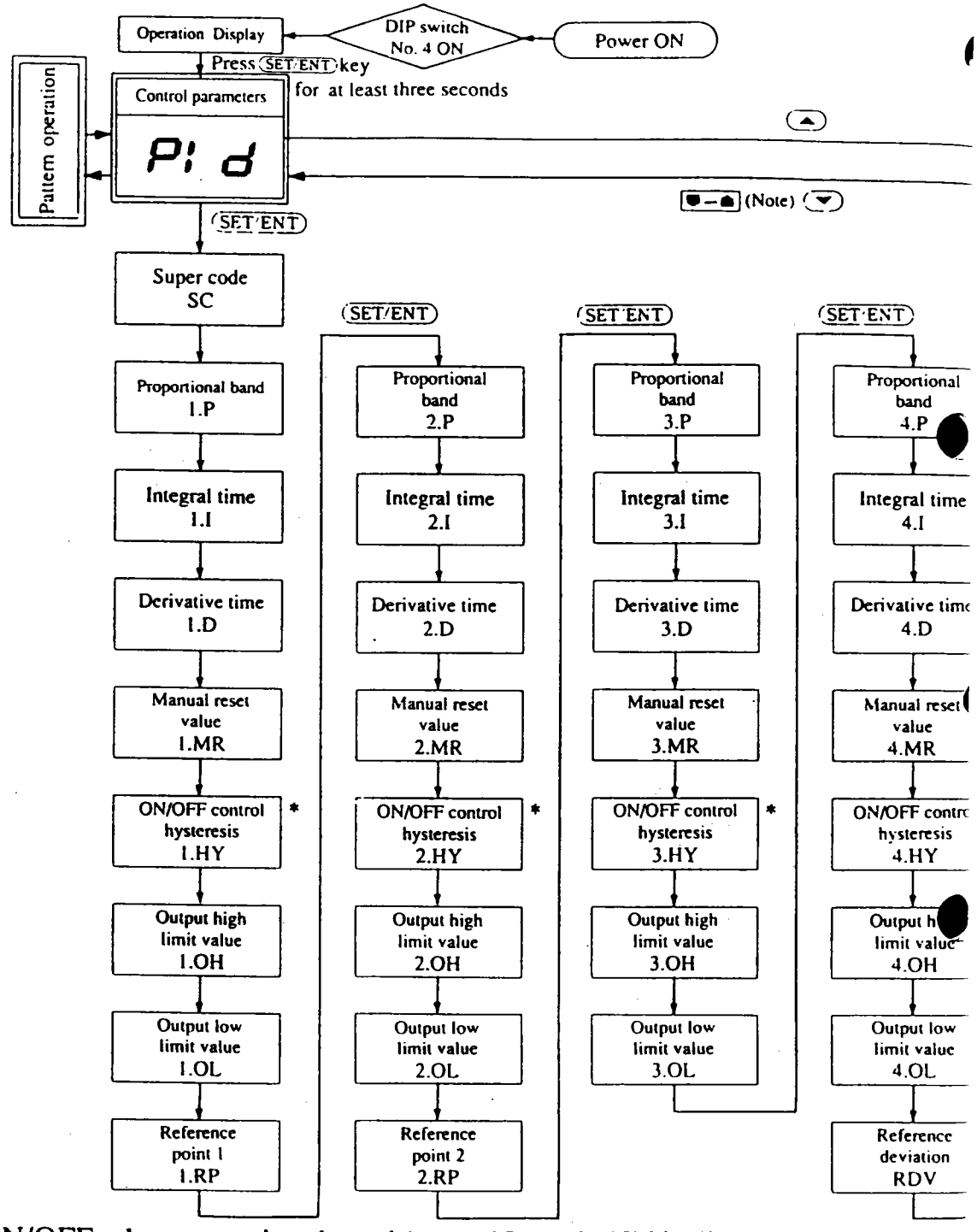
⑨ Individual setup parameters can be set (or displayed) using the (▼) and (▲) keys. (The period will be flashing while the number is being changed.)

After changing a parameter value, press the (SET/ENT) key to register the change.

Note 1: After the setup parameters have been set, return DIP switch No. 4 to the ON position.

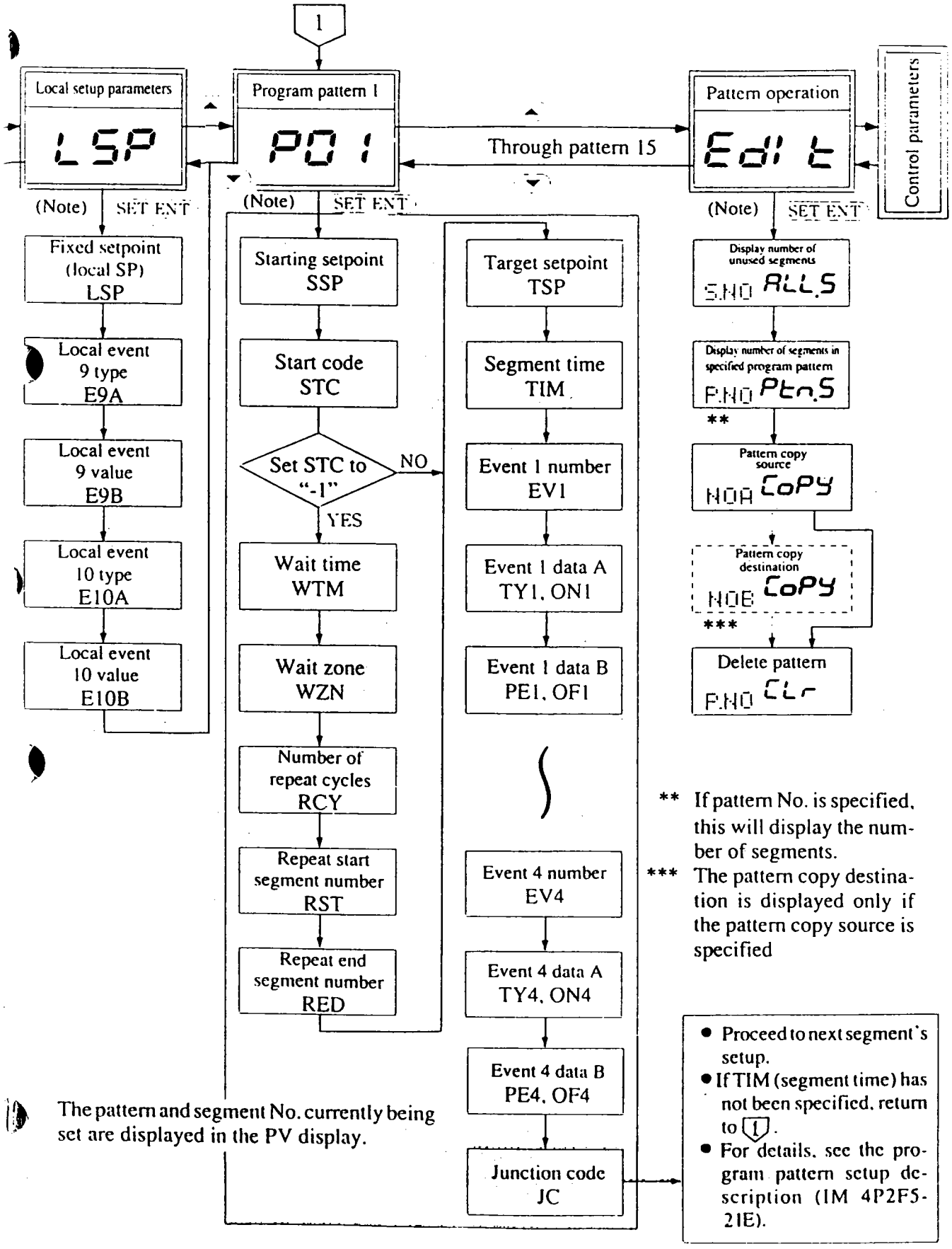
# 8. OPERATING PARAMETERS

## 8.1 Operating Parameter Setup Flow




* If ON/OFF relay output is selected (see p.10), only HY is displayed; P, I, D, MR, OH, OL, RP, and RDV are not displayed.

Note: [▼–▲] is displayed in the setpoint and parameter display area (the left-hand display). This indicates that the ▼ : (▼) and ▲ : (▲) keys can be used to move between parameter groups (from control parameters to local setup related parameters).


1
Local setup parameters
LSP
Program pattern 1
P01
Through pattern 15
Pattern operation
Edit
Control parameters
(Note)
SET ENT
Fixed setpoint (local SP) LSP
Local event 9 type E9A
Local event 9 value E9B
Local event 10 type E10A
Local event 10 value E10B
Starting setpoint SSP
Start code STC
Set STC to "-1"
NO
YES
Wait time WTM
Wait zone WZN
Number of repeat cycles RCY
Repeat start segment number RST
Repeat end segment number RED
Target setpoint TSP
Segment time TIM
Event 1 number EV1
Event 1 data A TY1, ON1
Event 1 data B PE1, OF1
Event 4 number EV4
Event 4 data A TY4, ON4
Event 4 data B PE4, OF4
Junction code JC
Display number of unused segments
S.NO ALL.S
Display number of segments in specified program pattern
P.NO PtnS
**
Pattern copy source
NOA CoPy
Pattern copy destination
NOB CoPy
***
Delete pattern
P.NO CLr
The pattern and segment No. currently being set are displayed in the PV display.
** If pattern No. is specified, this will display the number of segments.
*** The pattern copy destination is displayed only if the pattern copy source is specified
• Proceed to next segment's setup.
• If TIM (segment time) has not been specified, return to 1.
• For details, see the program pattern setup description (IM 4P2F5-21E).

## 8.2 Summary of Operating Parameters

| Item | Symbol | Description | Setting Range | Default when shipped from factory | Customer-specified value | Reference page |
|---|---|---|---|---|---|---|
| Control parameters | SC | "SUPER" function ON/OFF | ON or OFF | OFF | | P.30 |
| | *.P (Note) | Proportional band | 0.1 to 999.9% | 5.0% | | P.30 |
| | *.I (Note) | Integral time | OFF, 1 to 6000 seconds | 240 seconds | | P.31 |
| | *.D (Note) | Derivative time | OFF, 1 to 6000 seconds | 60 seconds | | P.31 |
| | *.MR (Note) | Manual reset value | –5.0 to 105.0% | 50% | | P.32 |
| | *.HY (Note) | ON/OFF control hysteresis | EU(0.0%)S to EU(100.0%)S | EU(0.5%) | | P.32 |
| | *.OH (Note) | Output high limit value | –5.0%<OL<OH <105.0% (% of computed control output value) | 100% | | P.32 |
| | *.OL (Note) | Output low limit value | | 0% | | P.32 |
| | 1.RP 2.RP | Reference point 1, 2 | EU(0%)<1.RP <2.RP<EU (100%) | EU(100%) | | P.33 |
| | RDV | Reference deviation | EU(0%) to EU(100%) | OFF | | P.33 |

Note: * represents the PID group number (1 to 4).
(See 8.1 Operating Parameter Setup Flow)

| Item | Symbol | Description | Setting Range | Default when shipped from factory | Customer-specified value | Reference page |
|---|---|---|---|---|---|---|
| Local setup parameters | LSP | Fixed setpoint (SP) | EU(0%) to EU(100%) | EU(0%) | | P.34 |
| | PID | Local PID number | 1 to 4 | 1 | | P.34 |
| | E9A | Local event 9 (PVE 1) type | OFF, 1 to 20 (For codes, see p.40) | OFF | | P.34 |
| | E9B | Local event 9 (PVE 1) value | EU(–100%) to EU(100%) | EU(0%) | | P.34 |
| | EIOA | Local event 10 (PVE 2) type | OFF, 1 to 10 (For codes, see p.40) | OFF | | P.34 |
| | EIOB | Local event 10 (PVE 2) value | EU(–100%) to EU(100%) | EU(0%) | | P.32 |
| Program pattern setup parameters (continued) | SSP | Starting setpoint | EU(–100%) to EU(100%) | EU(0%) | | P.36 |
| | STC | Start code | 0, 1, or 2 (For codes, see p.36) | 0% | | P.36 |
| | WTM | Wait time | OFF<br>0.01 ~ 99.59 (hr. or min.)<br>(1min to 99hr 59min or 1sec to 99min 59sec)<br>(Note) | OFF | | P.38 |
| | WZH | Wait zone | EU(0%) to EU(10%) | EU(0%)S | | P.38 |
| | RCY | Number of repeat cycles | 0 to 999, CONT (continued) | 0 | | P.39 |

(Note) Use "TMU" (P.42, P.45, P.49) for setting time unit (hr. or min).

| Item | Symbol | Description | Setting Range | Default when shipped from factory | Customer-specified value | Reference page |
|---|---|---|---|---|---|---|
| (Continued) | RST | Repeat start segment No. | 1<RST<RED<60 | 1 | | P.39 |
| | RED | Repeat end segment No. | | 1 | | P.39 |
| Program setup parameters | TSP | Target setpoint | EU(0%) to EU(100%) | EU(0%) | | P.39 |
| | TIM | Segment time | 00.00 to 99.59 (hr. or min.) (0sec to 99min 59sec or 0min to 99hr 59min) —: Not used (Note1) | — | | P.39 |
| | EV■ | Event No. | 0, 1 to 4, 9, 10 (None) (Time event) (PV event) (Note2) | 0 | | P.40 |
| | ON■ TY■ | Event data A | PV event: OFF, 1 to 10 Time event: ...: Not used 00.00 to 99.59 (hours.minutes) | OFF or 00.00 | | P.40 |
| | OF■ PE■ | Event data B | | OFF or 00.00 | | P.40 |
| | JC | Junction code | 0 to 3, INS, DEL | 0 | | p.41 |

(Note1) Use "TMU" (P.42, P.45, P.49) for setting time unit (hr. or min.).

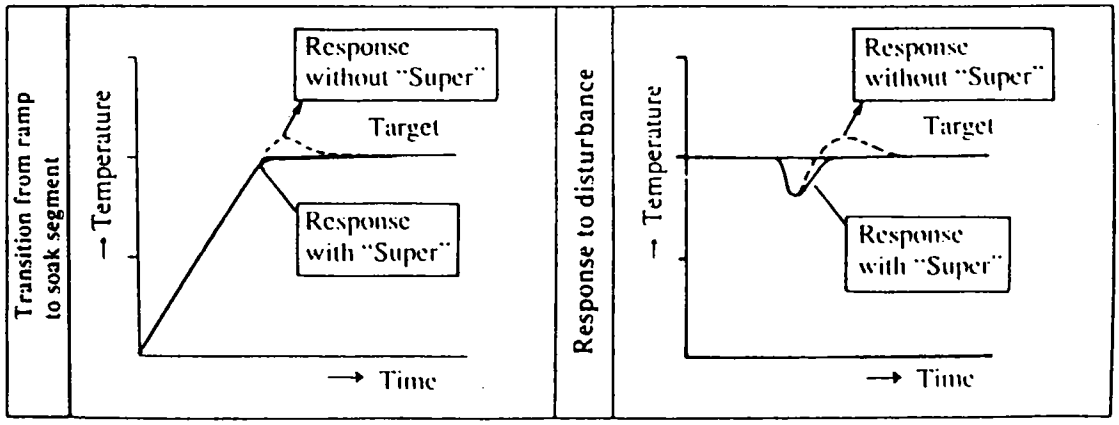
(Note2) UP27 has 4 (four) events.
When 1 to 4 is specified, the events become Time events.
When 9 or 10 is specified, the events become PV events.
That is, you can use 4 (four) Time events, or use 2 (two) PV events and 2 events (or 3 Time events & 1 PV events also) at the same time.

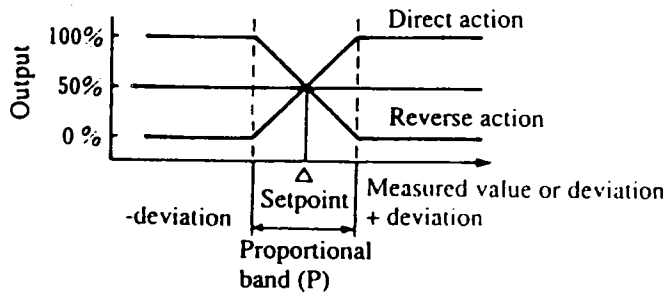
| Item | Symbol | Description | Remark |
|---|---|---|---|
| Program pattern manipulation related | ALL.S<br>S.NO | Display number of unused segments | See the "Operator's Manual" (IM 4P2F5-21E) for a description of the use of these items. |
| | Ptn.S<br>P.NO | Display number of segments in specified program pattern | |
| | CoPy<br>NOA | Copy source program pattern No. | |
| | CLr<br>P.NO | Copy destination program pattern No. | |

## 8.3 Description of Operating Parameters

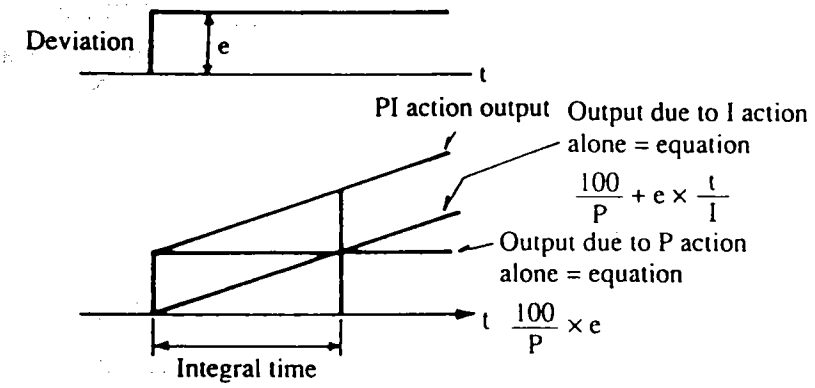
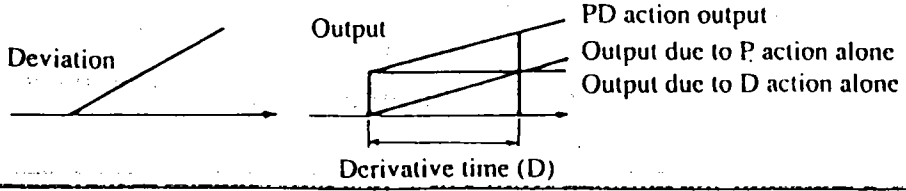
| Parameter | Description |
|---|---|
| Super Function ON/OFF<br>SC | ○ Effects of "Super" function (overshoot suppresser)<br>Use to:<br>● Limit overshoot<br>● Increase ramp-up rate (Fixed SP control mode)<br>● Cope with frequent load variations |

"Super" is available during PID control.

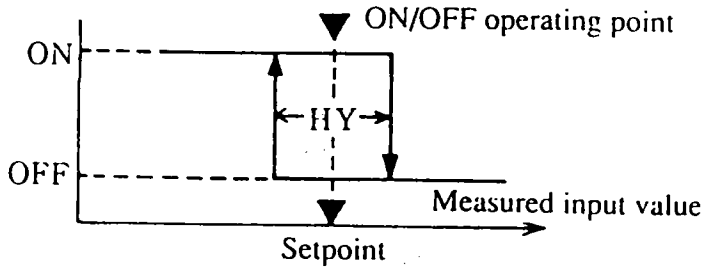
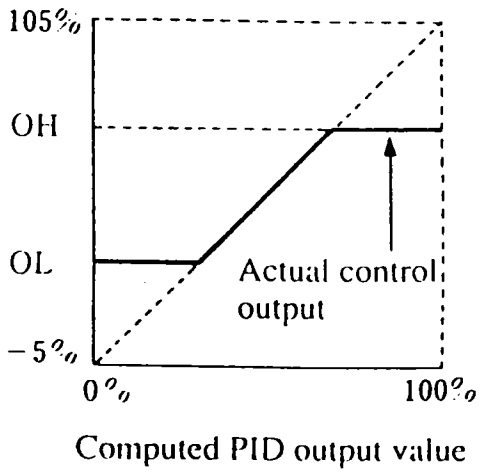


| Parameter | Description |
|---|---|
| Proportional Band<br>P | That control algorithm which generates a control output of magnitude proportional to the deviation is called proportional action (P action). In proportional action, the parameter called "proportional band" represents the amount of measured value (or deviation) variation (expressed in percent) required to cause the control output (control algorithm computation output) to change from 0% to 100%.<br>Generally it is arranged that the output is 50% when the measured value equals the setpoint.<br>Proportional action makes it possible to eliminate the output oscillation which is a disadvantage of ON/OFF action.<br>  <br><br>Deviation = Measured value – Setpoint |

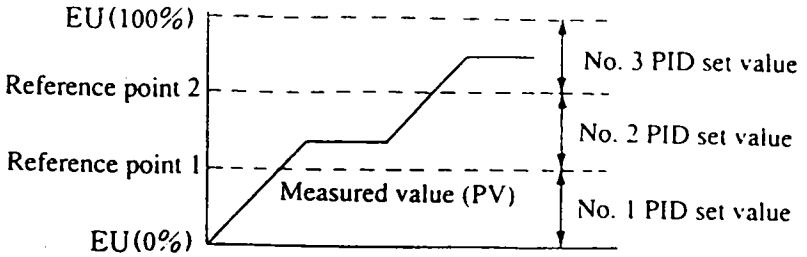
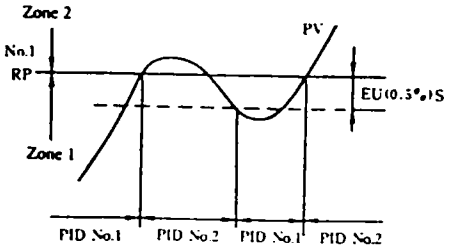
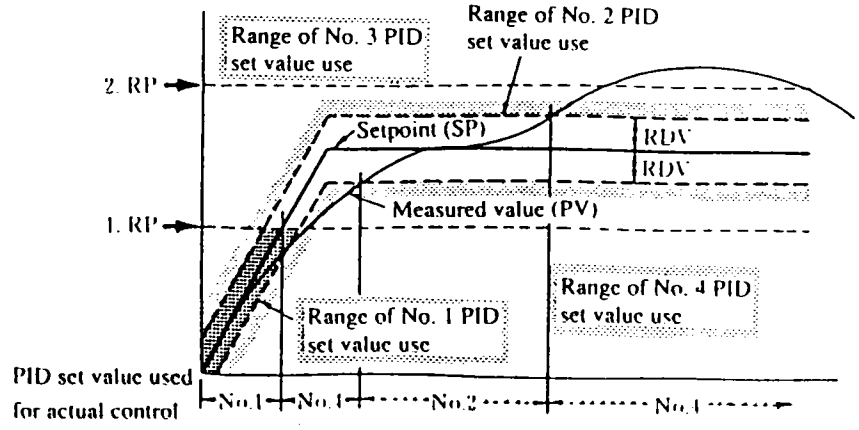
*: Represents the number, from 1 to 4, that will indicate to which group the parameter belongs.

| Parameter | Description |
|---|---|
| Integral Time<br>*.I | P action alone usually cannot bring the measured value exactly to the set point, since there must be some deviation to generate any output other than 50%. That control method which reduces the deviation automatically to zero by continuing to impose changes on the output as long as some deviation remains is called integral action (I action). In integral action, the parameter that determines the output rate-of-change corresponding to a given amount of deviation is called the "integral time". The shorter the integral time, the stronger the integral action (the greater the output rate-of-change).<br>I action is normally combined with P action in actual use, as PI action. In PI action, the integral time (I) is the time from the instant when a step input is applied to the controlled system until the time when the additional output change due to I action is equal to that caused by the P action acting alone.<br>  <br> |
| Derivative Time<br>*.D | If the controlled system has a long time constant or dead time, P or PI action alone may give slow response, or overshoot and make the controlled system unstable. In such cases, derivative action (D action), which imposes an output change proportional to the input (deviation) velocity, can be used to make the control system respond faster or operate stably.<br>In actual use, D action is combined with P or PI action as PD or PID action.<br>In PD action, the derivative time (D) is defined as the time from the instant when a ramp input (input with constant rate-of-change) is applied until the time when the output change due to P action alone equals the output change due to D action alone. The longer the derivative time, the stronger the derivative action.<br>  <br> |

*: Represents the number, from 1 to 4, that will indicate to which group the parameter belongs.

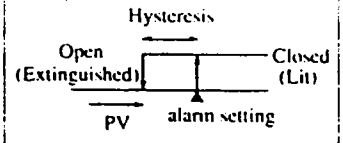
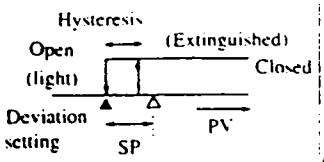
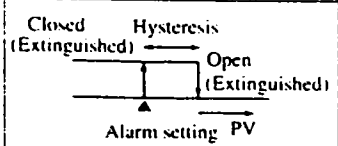
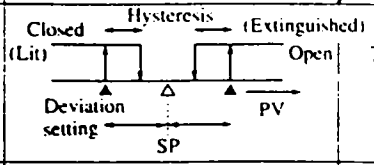
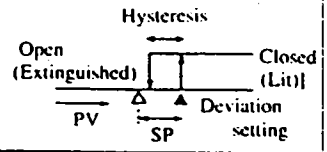
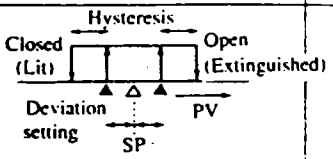
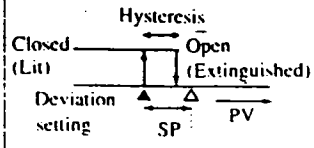
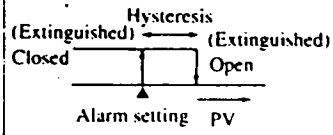
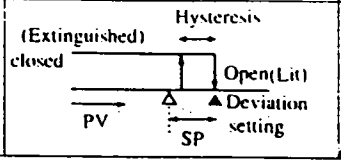
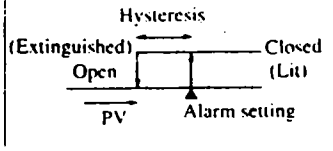
| Parameter | Description |
|---|---|
| Manual Reset Value<br>*.MR<br><br>ON/OFF | The manual reset parameter has no effect except when the integral time (I) has been set to "OFF".<br>As indicated in the integral time description, P action cannot be relied upon to bring deviation to zero (the same holds for PD action). The residual deviation is referred to as "offset". By manually re-setting this "manual reset value", the operator can introduce and adjust a bias such as to eliminate the offset. (Integral action performs this reset action automatically.) |
| Control Hysteresis<br>*.HY | This parameter is displayed only when ON/OFF relay output is selected (using DIP switch Ⓑ; see p.4).<br>The hysteresis is applied symmetrically around the ON/OFF operating point, and can be set as needed to prevent chatter in the control output.<br>  |
| Output High Limit Value<br>*.OH<br><br>Output Low Limit Value<br>*.OL | The UP27 limits its control output operating range to the range between the OL and OH.<br>These parameters let you specify minimum output and maximum output values in order to protect equipment, etc.<br>  |

*: Represents the number, from 1 to 4, that will indicate to which group the parameter belongs.

| Parameter | Description |
|---|---|
| Reference Point 1, 2<br>1.RP<br>2.RP | There are two reference points, each of which defines a PV (measured) value at which the PID set value is to be switched over to a different value.<br>  <br><br>When the UP27 is shipped from the factory, the reference points are both set at EU(100%). Unless these values are changed, the No. 1 PID set value applies to the entire measurement range.<br>In addition, a hysteresis band is provided for the PID set value switchover as shown in the figure. This band is fixed at EU(0.5%S).<br>  <br> |
| Reference Deviation<br>RDV | The reference deviation parameter defines a deviation (DV) value which, if exceeded during programmed control, will cause a different PID set value (No. 4 PID set value) to be employed. This set value selection function has priority over the reference-point set value selection functions described above. It can therefore be applied to bring deviation quickly back within a target deviation band whenever a large excursion occurs, by increasing the control sensitivity (i.e., by narrowing the proportional band).<br>If the reference DV is set to OFF, this function is disabled.<br>The accompanying figure shows the ranges in which the No. 1 to No. 3 PID set value, and the No. 4 PID set value selected by the reference deviation, will apply in operation. A hysteresis like that provided for the reference points is provided for reference deviation, also.<br>  <br> |

| Parameter | Description |
|---|---|
| Fixed setpoint (SP)<br>L SP | This is the setpoint value used during fixed (local) setpoint control operation (local mode).<br>It sets the target (SP) value for constant-value control. |
| Local event 9, 10 type<br>E 9A<br>E 10A | These parameters set event types (code range is 1 to 10). Parameter E9A sets the PV event 1 type (PVE1 terminal output), and parameter E10A sets up PV event 2 (PVE2 terminal output). When setting these parameters, see Table 8-1 for the event type code meanings. |
| Local event 9, 10 set value<br>E 9 B<br>E 10 B | These parameters set the measured value or deviation that triggers the event. (The event type defines whether to monitor the measured value or the deviation.)<br>The diagrams in Table 8-1 show the relationships between this parameter's value and the UP27's operation. |

## Table Alarm Type Code

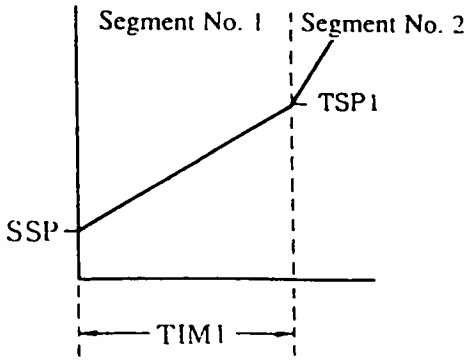
| Alarm type | Alarm action<br>Open/Closed represents relay contact status. (Lit)/ (Extinguished) represents lamp status. | Alarm type code<br>Contact closed on alarm generation | Alarm type code<br>Contact open on alarm generation | Alarm type | Alarm action<br>Open/Closed represents relay contact status. (Lit)/ (Extinguished) represents lamp status. | Alarm type code<br>Contact closed on alarm generation | Alarm type code<br>Contact open on alarm generation |
|---|---|---|---|---|---|---|---|
| Without alarm | | OFF | | | | | |
| PV high limit |  | 1 | | De-energize on deviation low limit alarm |  | | 6 |
| PV low limit |  | 2 | | Deviation high/ low limit |  | 7 | |
| Deviation high limit |  | 3 | | Within deviation high/low limit |  | 8 | |
| Deviation low limit |  | 4 | | De-energize on PV high limit |  | | 9 |
| De-energize on deviation high limit |  | | 5 | De-energize on PV low limit |  | | 10 |

| Parameter | Description |
|---|---|
| Starting setpoint SSP | This parameter is the control setpoint value from which the program pattern starts when a program operation is begun. It is used if the start code (STC) is set to "0" or "1". For details, see the start code (STC) action descriptions below. |
| Start code STC | This parameter selects one of three modes (numbered 0 to 2) for UP27 behavior at the start of a program operation. It can also be set to "-1" during setup, in which case the UP27 allows the user to set the WTM, WZN, RCY, RST, and RED parameters (the actual STC parameter will remain unchanged at its last previously set value). |

**(1) When STC = 0 (start at Starting SP)**

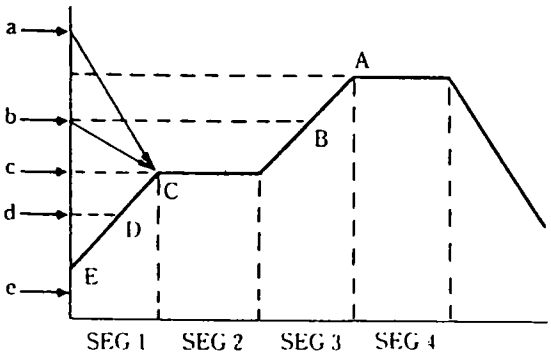
Regardless of the PV value at time of start, the control setpoint pattern begins at the Starting SP (SSP) and ramps towards TSP1 along a straight line having a slope of

$$\frac{(TSP1 - SSP)}{TIM1}$$



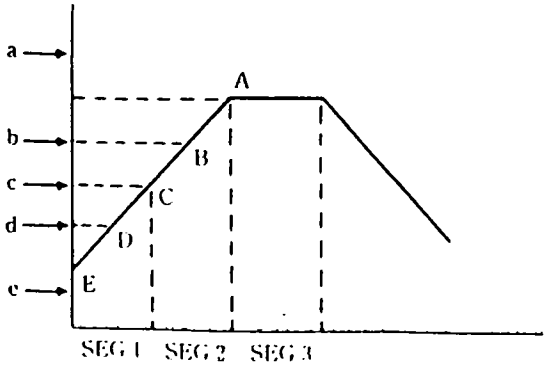

**(2) When STC = 1 (PV-dependent start)**

①Example where Segment No. 2 is a soak segment:



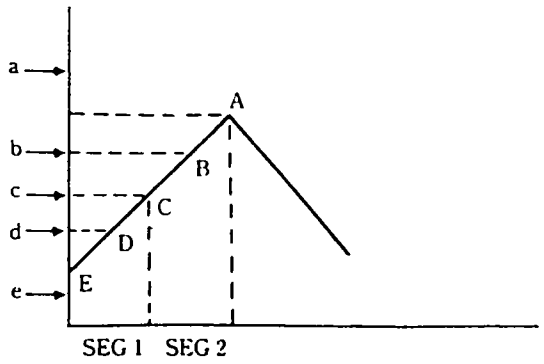

| Measured value (PV) at program operation start | Program operation start point |
|---|---|
| a | C |
| b | C |
| c | C |
| d | D |
| e | E |

②Example where Segment No. 3 is a soak segment:



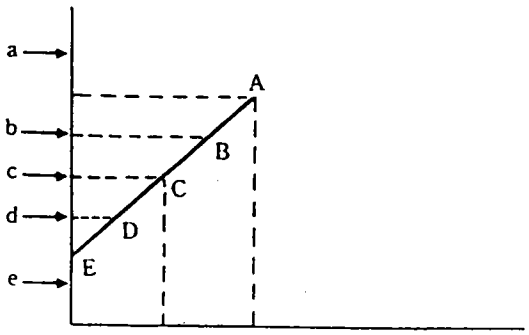

| Measured value (PV) at program operation start | Program operation start point |
|---|---|
| a | A |
| b | B |
| c | C |
| d | D |
| e | E |

③Example with no soak segment:



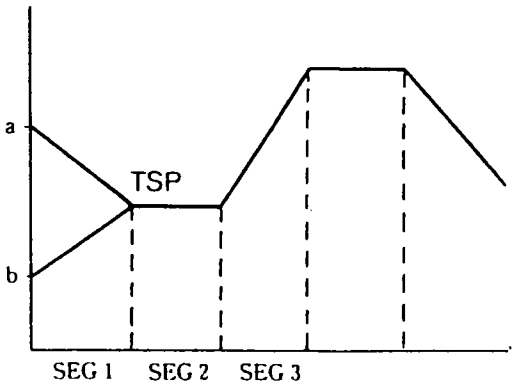

| Measured value (PV) at program operation start | Program operation start point |
|---|---|
| a | A |
| b | B |
| c | C |
| d | D |
| e | E |

④Example with ascending ramp only:




| Measured value (PV) at program operation start | Program operation start point |
|---|---|
| a | Program operation will not be started |
| b | C |
| c | C |
| d | D |
| e | E |

## (3) When STC = 2




Regardless of the measured value (PV) at program operation start, the program pattern begins with a setpoint equal to the PV and moves linearly toward the target setpoint (TSP) of Segment No. 1.

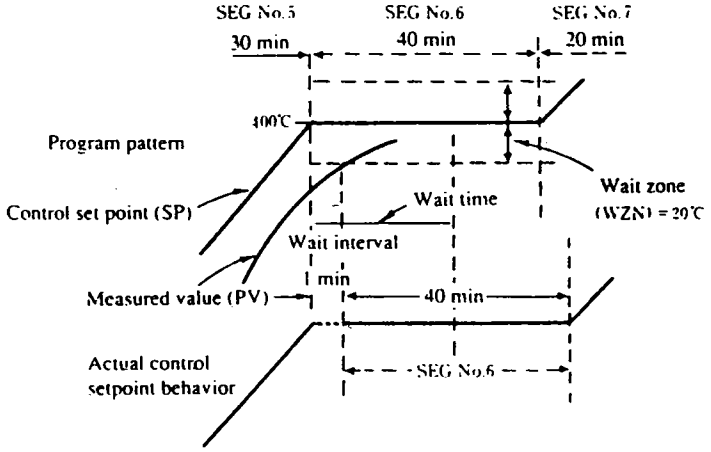
The slope is determined by the Segment No. 1 segment time parameter value.

| Parameter | Description |
|---|---|
| Wait time<br>WTM | This parameter acts together with a wait zone (see item below), setting the maximum wait time (WTM) which can elapse; after the wait time has elapsed, the program will proceed to the next segment even if the measured value has not reached the wait zone. This parameter affects operation only when junction code JC = 1 (see p41) is specified for the segment. |
| Wait zone<br>WZN | This parameter defines a zone which the measured value (PV) must reach at the end of a program segment before the program will be allowed to advance to the next segment. This parameter affects operation only when junction code JC = 1 (see p.41) is specified for the segment. |

There is no guarantee that the deviation will be zero at the end of a segment, and in some cases, problems will arise if the UP27 proceeds to the next segment while a large deviation is still present. In such cases, the user can specify a junction code that will delay the advance to the next segment until the deviation has decreased to within a tolerance range (called a "wait zone"), even though the segment time has already been exceeded. The user can also set a "wait time" such as to limit the maximum wait so that the program will eventually advance if the deviation does not reach the wait zone even after a considerable wait.

## [Example 1]

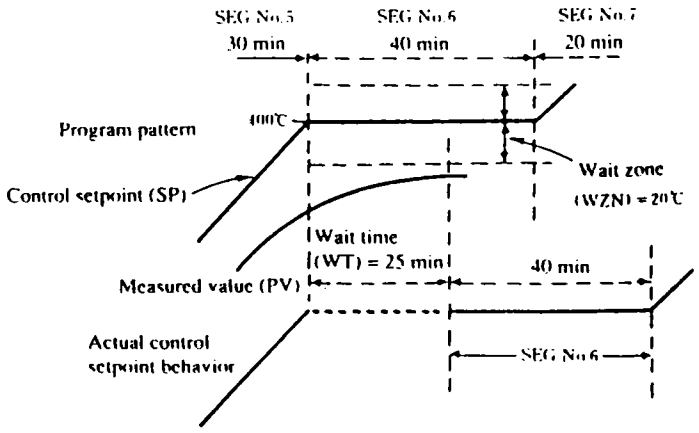
Here the measured value reaches the wait zone one minute after the wait action begins, and the program then moves to the following segment. This example shows the case where the PV is slow to rise to the SP, but the action would be the same if it had overshot the SP.




## [Example 2]

Here, since the measured value has not reached the wait zone even after the wait time (WT) has elapsed (following the beginning of the wait), the UP27 advances to the next segment.

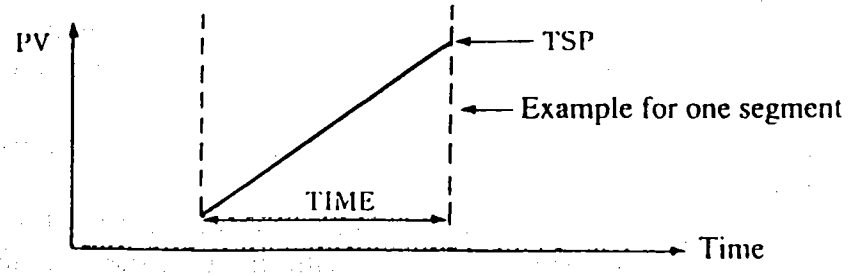
The delay in advance would be the same for PV > SP + WZ.

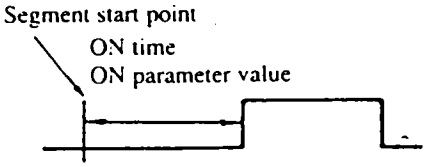
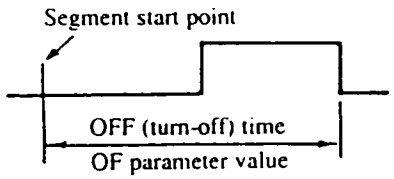


| Parameter | Description |
|---|---|
| Number of repeat cycles<br>RCY | Specifies the number of times that the program is repeated for the segment specified by the repeat start (RST) and repeat end (RED) parameters. |
| Repeat start segment No.<br>RST | Specifies the repeat start segment No. for a repeat operation. |
| Repeat end segment No.<br>RED | Specifies the repeat operation end segment No. |

Depending on the process, a single phase may repeat the same program pattern a number of times. In such cases, the repeat can be performed from a given segment (repeat start) to a given segment (repeat end) for a given number of times (number of repeat cycles). [Note: If the number of repeat cycles is "1", the pattern is run twice (including the original cycle).

To stop the program while it is running, select RESET (this also stops control computation).

| Parameter | Description |
|---|---|
| Target setpoint<br>TSP | The target setpoint (TSP) is the control setpoint value that is to reached at the end of the segment. The segment time (TIM) is the length of the segment in terms of time. |
| Segment time<br>TIM |  |

| Parameter | Time event value | PV event value |
|---|---|---|
| Event No.<br>EV▦ | Time event output<br>No.1: Terminal TME1 (㉞)<br>No.2: Terminal TME2 (㉝)<br>No.3: Terminal TME3 (㉜)<br>No.4: Terminal TME4 (㉛) | PV event output<br>No. 9: Terminal PVE1 (⑬)<br>No.10: Terminal PVE2 (⑫) |
| Event data A<br>ON▦<br>TY▦ |  | PV event type<br>OFF: Without alarm<br>1: PV high limit<br>2: PV low limit<br>3: Deviation high limit<br>4: Deviation low limit<br>5: Deenergized on deviation high limit<br>6: Deenergized on deviation low limit<br>7: Deviation high-low limit<br>8: Within high-low limit deviation<br>9: Deenergized on PV high limit<br>10: Deenergized on PV low limit |
| Event data B<br>OF▦<br>PE▦ |  | PV event value<br>IF, TY = 1, 2, 9 and 10<br>Measured value<br>IF, TY = 3, 4, 5, 6, 7, and 8<br>Deviation value |

▦ : Indicates event No. 1 to 4

(Nos. of Events are 1 to 4.)

- Up to 4 events (Time and PV event) can be set at same time.
- Set 1 to 4, when you use Time event (care the terminal No. of output signal). EV▦ 1 to 4
- Set 9 or 10, when you use PV event (care the terminal No. of output signal).
- The event is activated at the start of the segment for which they are set. For example for a timer event, the timer begins counting. For a PV event, the UP27 begins making comparisons to detect the PV (measured value) or the deviation value.
- The time event parameter values can continue to have an effect even after the end of the segment, until the off (turn-off) time has passed.
- The PV event parameter value will remain in effect after the end of the segment until the operator sets EVA = 0.
- The event parameters can be re-set any number of times for the same event number. This will reactivate the event along with changing the parameters to their new values.

| Parameter | Description |
|---|---|
| Junction code<br>JC | This parameter specifies how the UP27 is to behave when it finishes executing this segment and is about to move on to the next. |

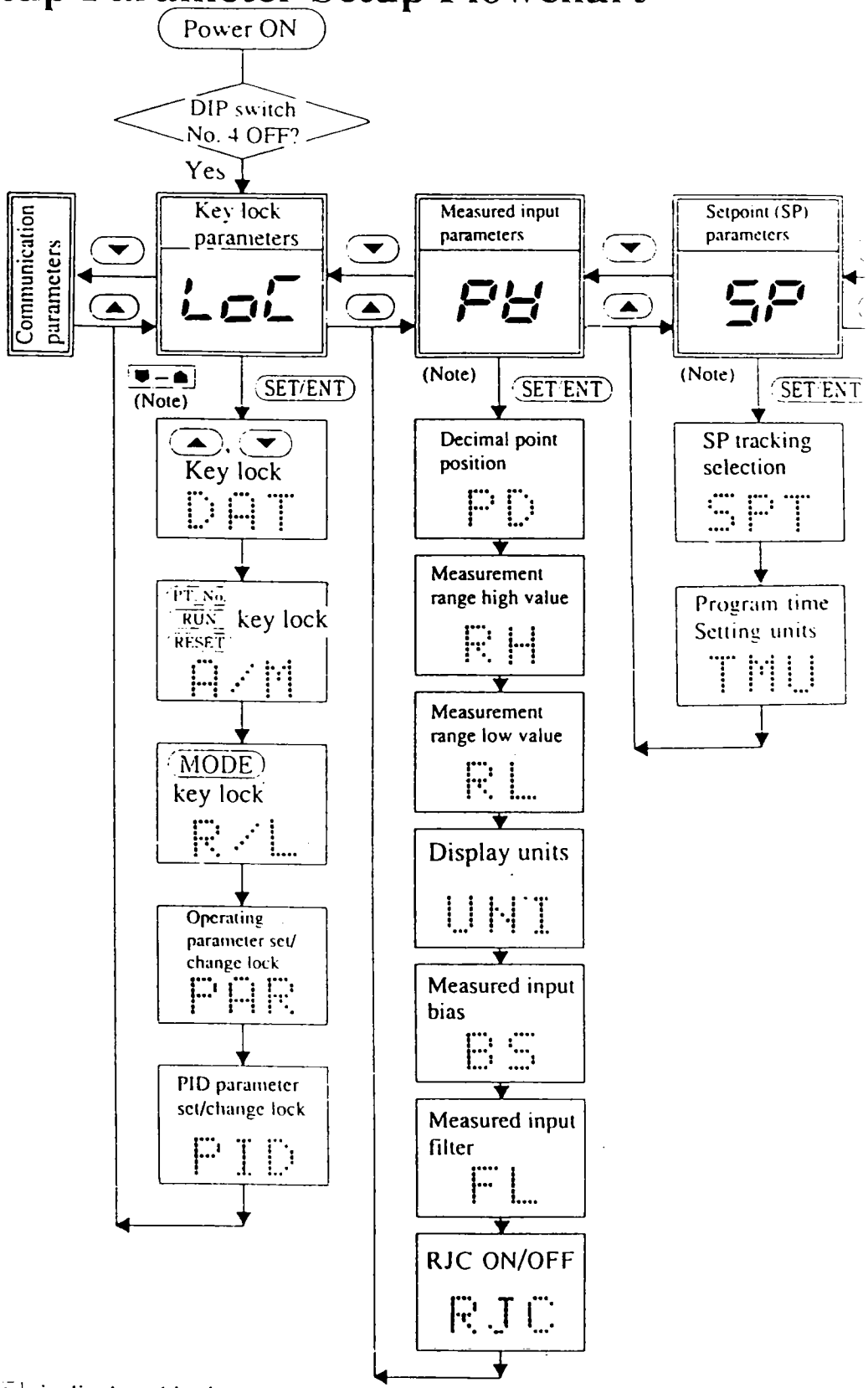
| | |
|---|---|
| JC = 0 | After executing this segment, the UP27 continues and executes the following segment.<br>If this value is set for the last segment, the UP27 will go to reset status when program execution ends. |
| JC = 1 | After executing this segment, the UP27 executes a wait operation before continuing to the next segment.<br>If this value is set for the last segment, the UP27 will go to wait status and then go to reset status when program execution ends. |
| JC = 2 | After executing this segment, the UP27 goes to HOLD mode. The HLD lamp turns ON. HOLD mode continues until it is released by a key operation or external contact.<br>In case that "JC = 2" is set for the last segment, UP27 goes to reset status when HOLD mode is released. |
| JC = 3 | After executing this segment, the UP27 goes to the LOCAL and RUN statuses. Note that if SP tracking is ON, the local SP will be set to the SP in effect at program end. |
| JC = INS | Set to insert a particular program segment. |
| JC = DEL | Set to delete a particular program segment. |

* "JC = 3" has no effect except if set for the last segment.

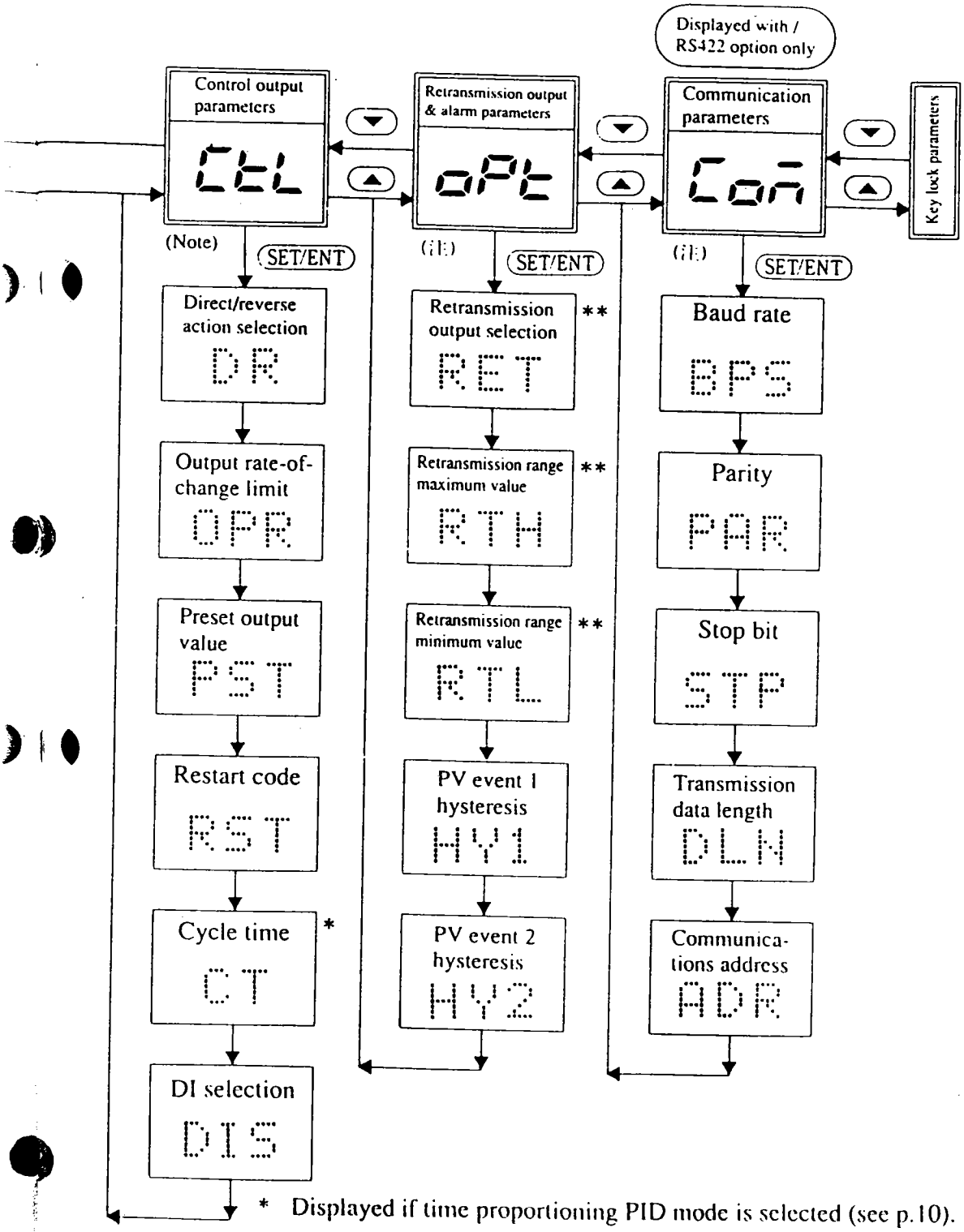
Note: See "Appendix," in the "Operator's Manual" (IM 4P2F5-20E).

# 9. SETUP PARAMETERS

## 9.1 Setup Parameter Setup Flowchart




Note: [▼–▲] is displayed in the set point and parameter display (left).
This indicates that the ▼ : (▼) and ▲ : (▲) keys can be used to move between parameter groups (from key lock parameters to measurement input parameters).




* Displayed if time proportioning PID mode is selected (see p.10).

** Displayed with /RET option only.

# 9.2 Setup Parameter Summary

| Item | Symbol | Description | Parameter range | Default when shipped from factory | User-set value | Reference page |
|---|---|---|---|---|---|---|
| Key lock parameters | DAT | ▲ ▼ key lock | OFF or ON | OFF (no lock) | | P.47 |
| | RUN | PT. No. RUN RESET key lock | OFF or ON | OFF (no lock) | | P.47 |
| | MOD | MODE key lock | OFF or ON | OFF (no lock) | | P.47 |
| | PAR | Operating parameter setup mode key lock | OFF or ON | OFF (no lock) | | P.47 |
| | PID | PID setting key lock | OFF or ON | OFF (no lock) | | P.47 |
| Measured input parameters | PD | Linear range decimal point position | 0, 1, 2, or 3 | Corresponds to input type when shipped from factory | | P.48 |
| | RH | Measurement range maximum value | EU (0%) < RL < RH < EU (100%) | EU (100%) [With linear input, −1999] | | P.48 |
| | RL | Measurement range minimum value | With linear input −1999 < RL ≤ RH < 9999 | EU (100%) [With linear input, −1999] | | P.48 |
| | UNI | Display units | °C or °F | °C | | P.48 |
| | BS | Measured input bias | EU(−100.0%)S to EU(100.0%)S | EU (0.0%)S | | P.48 |
| | FL | Measured input filter | OFF, 1 to 120 seconds | OFF (no filter) | | P.48 |
| | RJC | RJC ON/OFF | OFF or ON | ON | | P.49 |

| Item | Symbol | Description | Parameter range | Default when shipped from factory | User-set value | Reference page |
|---|---|---|---|---|---|---|
| Set point (SP) parameter | SPT | SP tracking selection | OFF or ON | OFF (no tracking) | | P.49 |
| | TMU | Program time setting units | "0" (○○H△△M) or "1" (○○M△△S) | 0 (○○H△△M) | | P.49 |
| Control output parameters | DR | Direct/ reverse action selection | "0" (reverse action) or "1" (direct action) | 0 (reverse action) | | P.50 |
| | OPR | Output rate-of-change limit | 0.0% to 100.0%/S (of output value) per second | 0.0%/ second (OFF) | | P.50 |
| | PST | Preset output value | -5.0% to 105.0% (of output value) | 0.0% | | P.51 |
| | RST | Restart code | 0, 1, or 2 (For meaning of codes, see p.51) | 0 (continuation start) | | P.51 |
| | CT | Cycle time | 1 to 240 seconds | 30 seconds | | P.51 |
| | DIS | DI selection | 0, 1, 2, 3 or 4 | 0 Pattern select 8 ⑱ / pattern select 4 ⑲ | | P.52 |

| DIS | ⑱ | ⑲ |
|---|---|---|
| 0 | Pattern select 8 | Pattern select 4 |
| 1 | Hold | Pattern select 4 |
| 2 | Advance | Pattern select 4 |
| 3 | Advance | Hold |
| 4 | Advance | Pattern select 4 |

| Item | Symbol | Description | Parameter range | Default when shipped from factory | User-set value | Reference page |
|---|---|---|---|---|---|---|
| Retransmission output/event parameters | RET | Retransmission output selection | 0, 1, 2, 3, or 4 (For meaning of codes, see p.53) | 0 | | P.53 |
| | RTH | Retransmission range maximum value | EU(0.0%) < RTL < RTH < EU(100.0%) | Same as RH (measurement range maximum value)[EU(100.0%)] | | P.53 |
| | RTL | Retransmission range minimum value | | Same as RL (measurement range minimum value)[EU(0.0%)] | | P.53 |
| | HY1 | PV event 1 hysteresis | EU(0.0%)S to EU(100.0%)S | EU(0.5%)S | | P.53 |
| | HY2 | PV event 2 hysteresis | EU(0.0%)S to EU(100.0%)S | EU(0.5%)S | | P.53 |
| Communication parameters | BPS | Baud rate | 9600, 4800, 2400, 1200, 600, 300, or 150 bps | 9600 BPS | | See "Communications Manual" |
| | PAR | Parity | NONE, EVEN, or ODD | NONE (no parity) | | |
| | STP | Stop bit | "1" or "2" (1 bit) (2 bits) | 1 (1 bit) | | |
| | DLN | Transmission data length | "7" or "8" (7 bits) (8 bits) | 8 (8 bits) | | |
| | ADR | Communications address | 1 to 98 or 99 ("99" is for coordinated operation) (Up to 16 units can be connected) | 1 | | |

# 9.3 Description of Setup Parameters

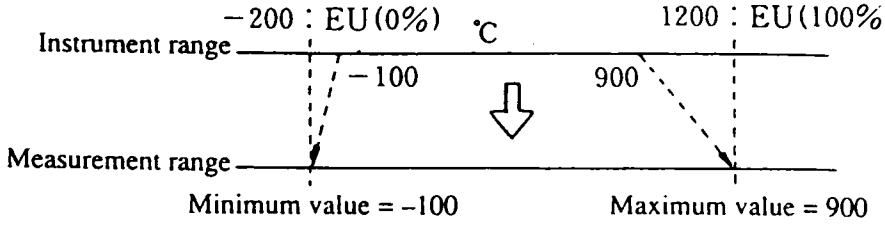
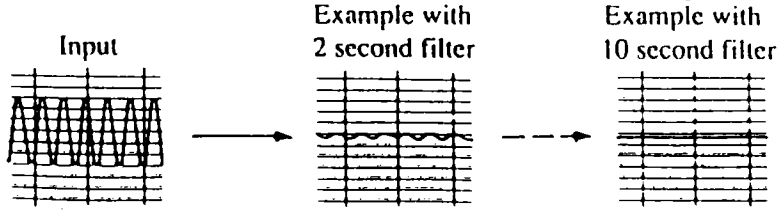
## 9.3.1 Description of Key Lock Parameters

Each of these parameters selects either key lock (ON) or no key lock (OFF) for certain key functions. Key lock is used to prevent inadvertent actuation of these functions.

The Operation Display can be changed even if key lock is in effect.

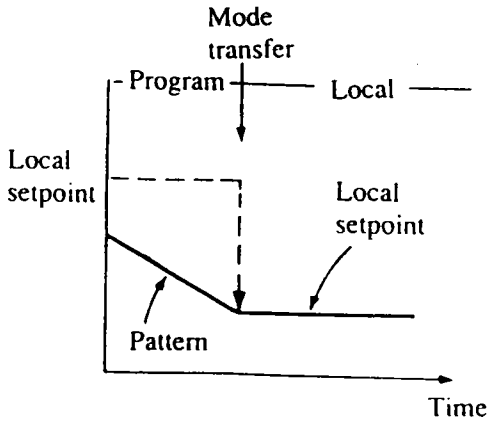
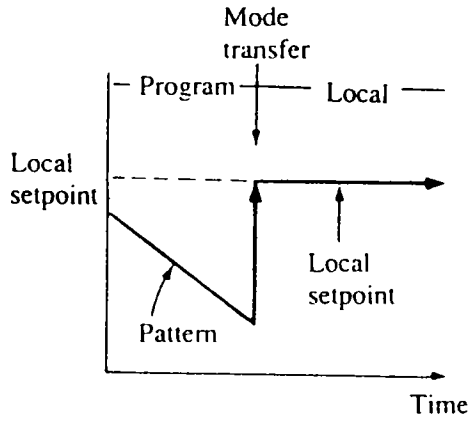
| Parameter | **Description** (description with lock ON) |
|---|---|
| DAT | Locks (▼) and (▲) keys.<br>Disables all key operations that set or change any parameter. (Key operations can be used only to cancel this key lock status.) |
| RUN | Locks (PT. No.) , (RUN) , and (RESET) keys.<br>Disables the keys that select program patterns, and run and stop programs. |
| MOD | Locks (MODE) key.<br>Disables the key used to select the hold (HLD), advance (ADV), auto (AUT) / manual (MAN), local (LOC), and auto-tuning (AT) modes. |
| PAR | Prevents the UP27 from going to operating parameter setup mode even if the (SET/ENT) key is pressed for three seconds. |
| PID | Disables the setting or changing (and display) of the control related parameters (PID parameters, manual reset value, ON/OFF control hysteresis, output maximum/minimum limit, reference points, reference deviation). |

## 9.3.2 Description of Measurement Input Parameters

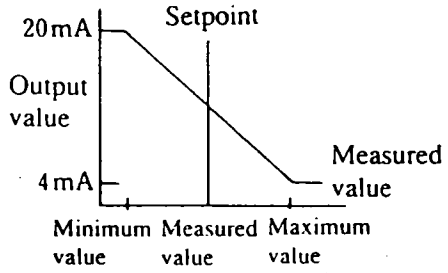
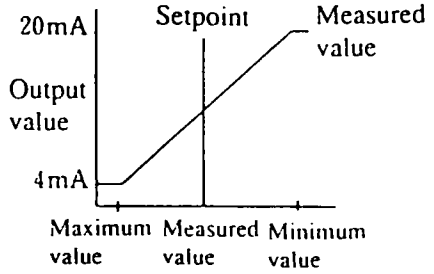
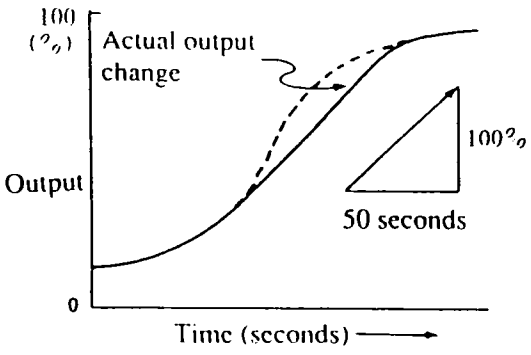
| Parameter | Description |
|---|---|
| Decimal point position<br>PD | This can be used to set the decimal point position in the input range for a voltage input such as 1 to 5 VDC.<br>0 : –1999 to 9999 (no decimal point)<br>1 : –199.9 to 999.9 (one digit below decimal point)<br>2 : –19.99 to 99.99 (two digits below decimal point)<br>3 : –1.999 to 9.999 (three digits below decimal point) |
| Measurement range maximum value<br>RH | These parameters are used to set the desired measurement range within the range determined by the instrument range code, by setting the measurement maximum and minimum range-values.<br>  <br> |
| Measurement range minimum value<br>RL | Instrument accuracy does not change when a new measurement range is set. |
| Display unit<br>UNIT | This can be used to set the unit (and input range) for temperature input (thermocouple or RTD) to °C or °F. This cannot be specified for voltage input. (Use accessory unit label stickers.) |
| Measured input bias<br>BS | This functions adds a bias value to the measured input value; the result is used on the UP27 display and in control.<br>[Measured value internal to instrument] =<br>[Measured input value] + [bias value]<br>[EU(–100.0%)S ~ EU(100.0%)S] |
| Measured input filter<br>FL | This is used when there is a great deal of fluctuation in the displayed value due to noise in the input. The filter is a first-order lag type; this parameter sets the time constant. The larger the time constant, the greater the filtering action.<br>  <br> |

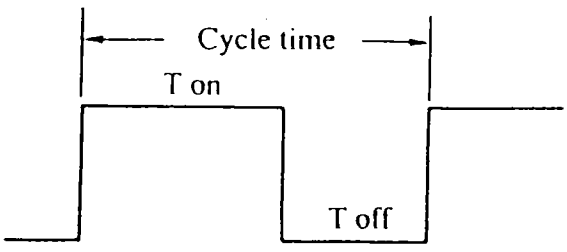
| Parameter | Description |
|---|---|
| Reference junction temperature compensation<br>RJC | An electromotive force of thermocouple is generated by a temperature difference between the measurement junction and reference junction.<br>Consequently, any temperature variation at the reference junction will cause an error. In order to measure temperatures accurately at the measurement junction, the reference junction must be set at a fixed temperature. |

## 9.3.3 Description of Setpoint Parameters

| Parameter | Description |
|---|---|
| SP tracking selection<br>SPT | SP tracking prevents bumps to the output due to abrupt changes in deviation on mode transfers from PRG to LOCAL, by forcing the LOCAL (local = internal) setpoint to track the remote setpoint.<br>This parameter can be used to select OFF or ON in the SP tracking function.<br>OFF : No tracking ON : Tracking<br>**• With SP tracking function ON**<br>  <br><br>**• With SP tracking function OFF**<br>  <br> |
| Program time setting units<br>TMU | Selects the time units as follows:<br>0: Hours.Minutes<br>1: Minutes.Seconds |

## 9.3.4 Description of Control Output Parameters

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Direct/Reverse action selection<br>OPR</td><td>Direct action and reverse action define whether the output increases or decreases in response to a positive change in deviation (PV – SP); the relationship between these is as shown in the table below.
<table>
<tr><td></td><td colspan="2">When measured > setpoint</td><td colspan="2">When measured value < setpoint</td></tr>
<tr><td>Action</td><td>Reverse action</td><td>Direct action</td><td>Reverse action</td><td>Direct action</td></tr>
<tr><td>ON-OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>mA output</td><td>Current reduction</td><td>Current increase</td><td>current increase</td><td>Current reduction</td></tr>
<tr><td>ON OFF time proportional</td><td>ON time reduced</td><td>ON time increased</td><td>ON time increased</td><td>ON time reduced</td></tr>
<tr><td>Position-proportional</td><td>In direction to close L-C</td><td>In direction to close H-C</td><td>In direction to close H-C</td><td>In direction to close L-C</td></tr>
<tr><td>Direction of output change</td><td colspan="2">24) Reverse action<br> 
</td><td colspan="2">31) Direct action<br> 
</td></tr>
</table></td></tr>
<tr><td>Output rate of change limit<br>OPR</td><td>To prevent sudden disturbance to equipment and operation, an output rate of change limit can be set to limit the rate at which the output can vary. (Note: Setting the output rate of change limit may negate the effect of derivative action.)<br> 
<br>Example<br>Limited rate of change = 2.0 (%/second)<br>Set to 2.0 (%/second) for to limited rate of change so that change of output from 0% to 100% requires 50 seconds.</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Preset output value<br>PST</td><td>When the operating mode goes from RUN to STOP, the output value goes neither to the automatic output value nor the manual output value, but rather to a third value: this preset output value.<br>When this occurs, the output maximum limit/output minimum limit, and output velocity limit are ignored.<br>The transition from STOP to RUN is balanceless and bumpless.
<table>
<tr><td rowspan="2">Mode</td><td colspan="2">RUN (operation)</td><td>STOP</td></tr>
<tr><td colspan="2">Mode in which control program is running</td><td>Mode in which control program is stopped</td></tr>
<tr><td></td><td>AUTO (automatic)</td><td>MAN (manual)</td><td>—</td></tr>
<tr><td>Output</td><td>Output value based on control computation result</td><td>Output value based on manual key operations</td><td>Preset output value</td></tr>
</table>
</td></tr>
<tr><td>Restart code<br>RST</td><td>This can be used to specify the status for operation restart when power is recovered (after a power failure, etc.)<br>0 : Operation continues as before power failure when power is recovered.<br>1 : When power is recovered, the UP27 goes to MAN (manual) status. The output is the value specified by the preset output value (see above).<br>2 : When power is recovered, the UP 27 goes to stopped (reset) mode. The output is the value specified by the preset output value (see above).</td></tr>
<tr><td>Cycle time<br>CT</td><td>This determines the pulse output widths when the PID computation is output as an ON/OFF signal when using time proportioning PID output (relay or voltage pulse output). The output in percent corresponds to the ratio of the Ton time to the total cycle time.<br> 
</td></tr>
</table>

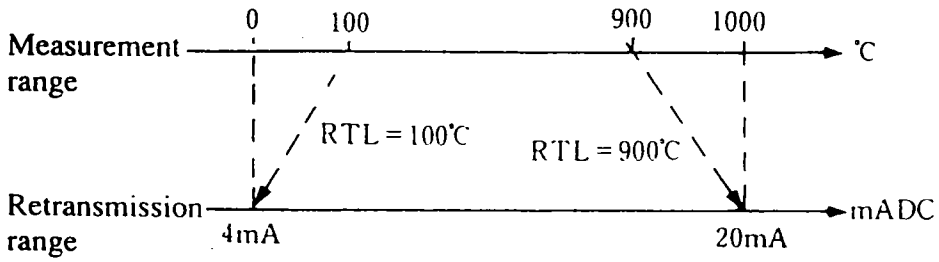
| Parameter | Description |
|---|---|
| DI selection<br>DIS | This parameter assigns the functions of input terminals ⑱ and ⑲ as follows. |

External contact capacity: 12V DC, 10 mA or more

| External contact selection for program pattern and operation mode | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [With /RS422 not specified] | | | [With /RS422 specified] | | | | | | |
| Terminal | DIS = 0 | DIS = 4 | Terminal | DIS = 0 | DIS = 1 | DIS = 2 | DIS = 3 | DIS = 4 ※ |
| 18 | Pattern 8 | | 18 | Pattern 8 | HOLD | ADVANCE | ADVANCE | ADVANCE |
| 19 | Pattern 4 | | 19 | Pattern 4 | | | HOLD | Pattern 4 |
| 20 | Pattern 2 | | 20 | Pattern 2 | | | | |
| 29 | Pattern 1 | | 29 | Pattern 1 | | | | |
| 9 | RESET | | 21 | Not used (for /RS-422) | | | | |
| 10 | P. RUN | | 22 | Not used (for /RS-422) | | | | |
| 21 | ADVANCE | | 9 | RESET | | | | |
| 22 | HOLD | KEYLOC | 10 | P. RUN | | | | |
| 11 | COM | | 11 | COM | | | | |

※ Specifying DIS (setup parameter) code (0 to 4) changes the function of terminals (<18>, <19>).

## 9.3.5 Retransmission Output and Alarm Type Parameters

| Parameter | Description |
|---|---|
| Retransmission output selection<br>RET | Displayed only if the /RET option has been specified. Selects one of the following five types of output for the retransmission output (4 to 20 mA DC).<br>0 : Measured value (scaled according to measurement range, from range low (RL) to range high (RH) value).<br>1 : Setpoint value (scaled according to measurement range, from range low (RL) to range high (RH) value).<br>2 : Output value<br>3 : Measured value (scaled according to retransmission range, from range low (RTL) to range high (RTH) value.)<br>4 : Setpoint value (scaled according to retransmission range, from range low (RTL) to range high (RTH) value). |
| Retransmission range maximum value<br>RTH | When the retransmission output selection parameter is set to "3" or "4", the value output through the retransmission output is scaled using the retransmission range minimum and maximum values RTL and RTH. The accuracy conforms to that of the relationship between instrument range and measurement range (see page 48). |
| Retransmission range minimum value<br>RTL |  |
| PV event 1 hysteresis<br>HY1 | If PV event ON/OFF switching is too frequent, a hysteresis band can be set around the events to prevent this. These bands can be set independently for PV events 1 and 2. See page 35 for a description of the event types and hysteresis action. |
| PV event 2 hysteresis<br>HY2 | |

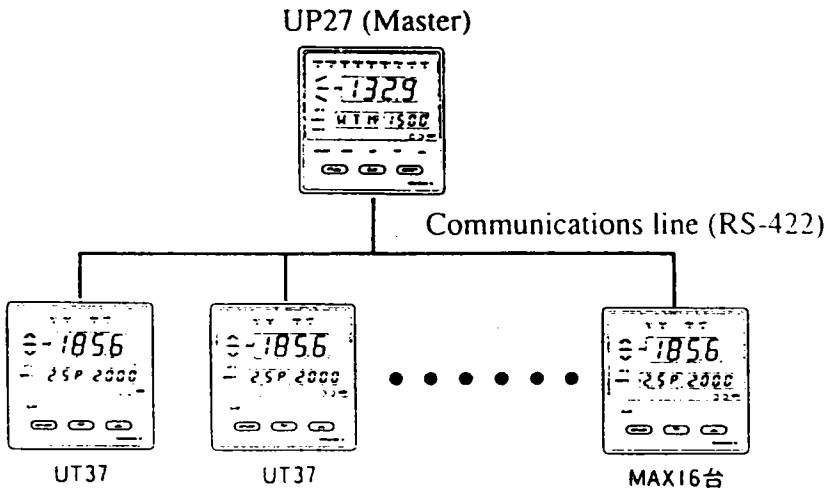
# 10. OTHER FUNCTIONS

## 10.1 Coordinated Operation

Coordinated operation works when /RS422 is specified. (UT38 has no coordinated operation function.)

**Feature of Coordinated operation**

- With a UP27 as the master station, UT37s (up to 16 units) can be connected using the communications bus for program operation.




(Note: UT38 has no coordinated operation function)

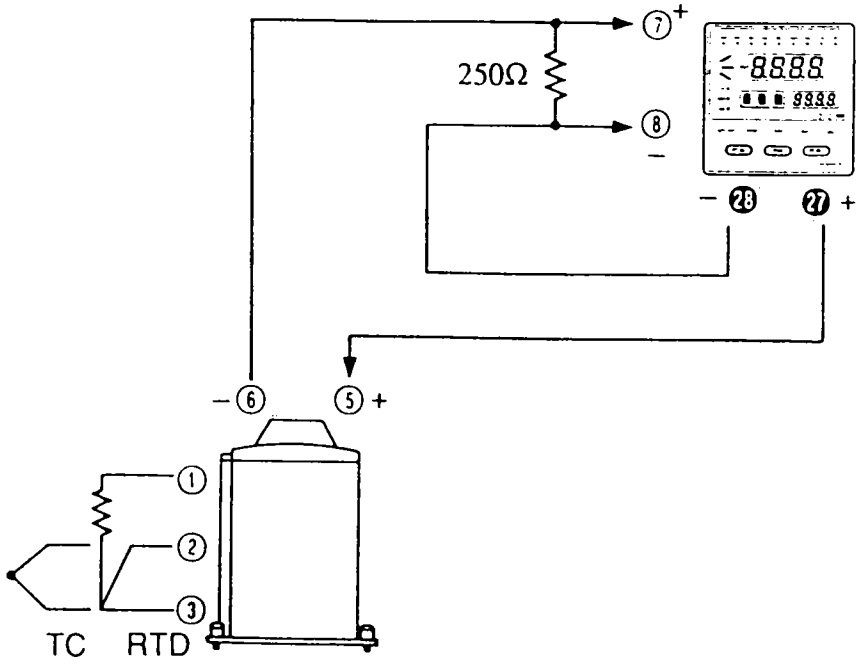
- Through coordinated operation, the following information can be downloaded by the UP27:
  ① Select UT37's PID parameters on a zone basis.
  ② Select UT37 operation mode.
  ③ Transmit setpoints to UT37 without error.
  ④ Transfer information required to optimize SUPER operation.
- In the details, see Instruction Manual (Communication Manual) IM5B4B7-51E.

# 10.2 /LPS: Transmitter Loop Power Supply (Option Specification)

## • Example of Connection with FP100

Power supply voltage: 21.6 ~28.0V(30mA MAX)
Terminal No.: ㉗(+), ㉘(–)

Example of ZT1000 (2-wire temperature Transmitter Connection)




Note: /LPS is not available if digital communication is simultaneously performed, overlaying the signal line.

# 11. STANDARD SPECIFICATIONS

## Input: Universal Method (Input Type Selectable)

| | |
|---|---|
| Input sampling period: | 200 ms |
| Input accuracy: | ±0.1% of F.S. ±1 digit<br>(Input Accuracy is different according to input type/range.)<br>Refer to General Specifications GS 4P2F5-02E |
| Input resistance: | Thermocouple input ..... 1MΩ or more<br>Voltage input ..... Approx. 1MΩ |
| Permissible signal source resistance: | Thermocouple ..... 250Ω or less<br>Voltage ..... 2kΩ or less |
| Permissible wiring resistance: | RTD input ..... 10Ω or less/wire |
| Permissible input voltage: | Thermocouple, DC voltage input<br>..... within ±10V |
| Noise rejection ratio: | Normal mode ..... 40 dB (50/60Hz) or more<br>Common mode ..... 120db (50/60 Hz) or more |
| Filter: | OFF, 1 to 120 sec (first order lag. OFF: no filter.) |
| Measured input bias: | −100.0 to 100.0% of measuring span |
| Thermocouple standards: | IEC/DIN (U and L)/JIS |
| RTD standards: | IEC/DIN/JIS '89 JPT100, PT100 |

**Display function**

| | |
|---|---|
| Display contents: | Process variable (PV), setpoint/parameter, status lamps (12) |
| Process variable display: | 4-digit, 7-segment LEDs (red) |
| Setpoint or parameter display: | 3-digit 5 × 7 Dot matrix LEDs + 4-digit, 7-segment LEDs (red) |
| Deviation monitor: | Green LED lights when deviation is within ±1.0% of F.S. If deviation exceeds this range, Orange LED lights. |

## Setting Specifications

**Setting range**

| | |
|---|---|
| Measured input: | Within measuring range |
| Proportional band (P): | 0.1 to 999.9% |
| Integral time (I): | OFF, 1 to 6000 sec (OFF: Integral action is OFF) |
| Derivative time (D): | OFF, 1 to 6000 sec (OFF: Derivative action is OFF) |
| Number of program patterns/segments: | 15 patterns/192 segments (MAX. 60 segments per pattern) |
| Segment time: | 0 to 99 hr. 59 min or 99 min 59 sec |
| Wait zone: | 0 to 10% |
| Wait time: | OFF, 1 min to 99 hr. 59 min or 1 sec to 99 min 59 sec |

**Setpoint Resolution for Process Input**

| | |
|---|---|
| Thermocouple input | 1°C or 0.1°C (1°F or 0.1°F) |
| RTD input | 0.1°C (0.1°F) |

## Output: Universal Method (Output Type Selectable)

| | |
|---|---|
| Output type: | Time proportional PID (relay output)<br>Time proportional PID (voltage pulse output for driving external SSR)<br>Continuous output PID (4 to 20mA DC output)<br>ON/OFF (relay output) |
| Relay output contact rating: | 250V AC, 3A (resistive load) |
| Voltage pulse output: | ON voltage .....Approx. 12V DC or more (load resistance: 600Ω or more)<br>OFF voltage.....0.1V DC or less |
| 4 to 20mA DC output: | Load resistance of 600Ω or less, accuracy of ±0.3% of F.S., output updating period of 200 ms |
| Cycle time: | 1 to 240 sec (relay and voltage pulse output) |
| Output high and low limits: | –5 to 105% |
| Output action selection | Direct reverse action selectable |
| AUTO/MAN selection: | Balanceless, bumpless selection |
| Output velocity limit: | 0.0 to 100.0%/sec (0.0%/sec means OFF.) |
| Other functions: | Auto-tuning, key lock, input burn-out, and SUPER.<br>Measured input and control output circuits are isolated from each other. |
| Isolation: | Measured input and control output circuits are isolated from each other. |

## PV Event Alarm Function

| | |
|---|---|
| Setting content: | Process variable high and low limits, deviation high and low limits, etc. (selectable for each point from among 10 types. |
| Alarm value: | 0 to 100% of the set range |
| Number of settings: | 2 |
| Output: | Relay output contact capacity: 250V AC 1A (resistive load) |
| Display: | LED lamp display on the front panel |

**Time Event**

| | |
|---|---|
| Number of settings: | 4 (Open collector output) |
| Output capacity: | 24V DC 50mA or less |
| Pattern end signal: | 1 (Open collector output) |
| Output capacity: | 24V DC 50mA or less |

## Environmental Condition

**Normal operating condition**

| | |
|---|---|
| Ambient Temperature: | 0 to 50°C |
| Ambient Humidity: | 20 to 90% R.H. (non-condensing) |
| Reference Junction: | |
| Temperature Compensation Error: | 0 to 50°C: ±1°C |
| Magnetic Field: | 400 AT/m or less |
| Worm-up Time: | 30 min or more |

**Effects on operating conditions**

| | |
|---|---|
| Ambient Temperature Effect: | Input stability<br>Within (±1μV/°C or ±0.01%/°C, whichever is greater)<br>Output stability<br>Within (4 to 20mA DC) ±0.05%/10V |
| Power Supply Variation: | Input stability<br>Within (±1μV/10V or ±0.01%/10V, whichever is greater)<br>Output stability<br>Within (4 to 20mA DC) ±0.05%/10V |

## Transmit/storage conditions

| | |
|---|---|
| Temperature: | –25 to 70°C |
| Humidity: | 5 to 95% R.H. (non-condensing) |

## Construction, Dimensions, and Weight

| | |
|---|---|
| Construction: | Dustproof, drip-proof construction (front panel) |
| Mounting: | Flash mounting |
| Case: | Plastic molding (ABS resin) |
| Dimension: | 96W × 96H × 100D mm |
| Weight: | Approx. 1Kg |

## General Specifications

| | |
|---|---|
| Insulation resistance: | Between each terminal and ground: 20 MΩ or more at 500 V DC |
| Withstand voltage: | Between power terminals and ground:<br>1500V AC for 1 min<br>Between input terminals and ground:<br>1000V AC for 1 min<br>Between output terminals and ground:<br>1500V AC for 1 min |
| Supply voltage: | 100 to 240V AC (universal power supply)<br>(permissible supply voltage range: 90 to 250V AC) |
| Power frequency: | 50/60 Hz common |
| Power consumption: | Approx. 12VA (100V) |
| Memory protection: | Nonvolatile memory |

## Recovery from Power Failure

**Power failure of 2 sec or less**

Instrument continues normal operation as if there were no power failure.
Alarm with standby action enters standby action

**Power failure of more than 2 sec**

| | |
|---|---|
| Alarm | Alarm with standby action restart at the status of standby |
| Setting parameter | Resistered |
| Auto-tuning | Canceled |
| Control | For RST = 0<br>Operation continues before power failure<br>Control output is preset output value<br>For RST = 1<br>Controller enters MAN mode<br>Control output applies preset output value<br>For RST = 2<br>Controller enters reset mode<br>Control output applies preset output value |

If power failure occurs during setting using a key, error code ⌜ XX04 ⌟ may appear.

YOKOGAWA ◆

**YOKOGAWA ELECTRIC CORPORATION**
*TOKYO SALES OFFICE:* IZUMI HOSHI-ICHI Bldg.
7-22-12 Nishi Shinjuku, Shinjuku-ku, Tokyo 160, JAPAN
Phone: 81-3-5389-0940. Fax: 81-3-5389-5368

**YOKOGAWA CORPORATION OF AMERICA**
2 Dart Road, Shenandoah Industrial Park, Newnan, GA 30265, U.S.A
Phone: 404-253-7000. Fax: 404-251-2088

**YOKOGAWA EUROPE B.V.**
Radiumweg 30, 3812 RA Amersfoort, THE NETHERLANDS
Phone: (0)33-641611. Fax: (0)33-631202

*CORPORATE HEADQUARTERS*
9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180, JAPAN
Phone: Tokyo 81-422-52-5565. Fax: 81-422-55-6549

Subject to change without notice

# YOKOGAWA ◆


## YOKOGAWA ELECTRIC CORPORATION

### Headquarters
9-32, Nakacho 2-chome, Musashino-shi, Tokyo, 180 JAPAN
Telex 02822-327 YEW MT J

### Tokyo Office
Shinjuku Center Bldg. (50F)
25-1, Nishi-shinjuku 1-chome, Shinjuku-ku, Tokyo, 163-06 JAPAN
Phone : 03-3349-0611 Fax : 03-3348-3705
Telex : J27584 YEWTOK

### Branch Sales Offices
Nagoya, Osaka, Hiroshima, Fukuoka, Sapporo, Sendai, Omiya, Ichihara, Kawasaki, Toyoda, Kanazawa, Kobe, Takamatsu, Okayama, and Kitakyusyu.

### Overseas Representative Offices / Service Centers
Beijing, Shanghai (The People's Republic of China), Jakarta (Indonesia)

---

## YOKOGAWA CORPORATION OF AMERICA

### Headquarters
2 Dart Road, Newnan, Ga. 30265-1094, U.S.A.
Phone : 1-404-253-7000 Fax : 1-404-251-2088
Telex : 230-244880 YCA

**Branch Sales Offices** / Chagrin Falls, Elk Grove Village, Santa Fe Springs, Hope Valley, Peachtree City, Houston

## JOHNSON YOKOGAWA CORPORATION

### Headquarters
4 Dart Road, Newnan, Ga. 30265-1040, U.S.A
Phone : 1-404-254-0400 Fax : 1-404-254-0928

**Branch Sales Offices** / Carrollton, Anaheim, Bensenville, Rutherford, Houston, Greenwood, Bartlesville, Carnegie

## YOKOGAWA EUROPE B. V.

### Headquarters
Radiumweg 30, 3812 RA Amersfoort, NETHERLANDS
Phone : 31-33-641611 Fax : 31-33-631202
Telex : 44-79118 YEF NL

**Branch Sales Offices** / Maarssen (Netherlands), Wien (Austria), Zaventem (Belgium), Ratingen (Germany), Madrid (Spain), Runcorn (United Kingdom), Milano (Italy)

## YOKOGAWA ELECTRICA DO BRASIL IND. E COM. LTDA.
Praca Acapulco, No.31 Parque Industrial Jurubatuba CEP 04675 Santo Amaro – Sao Paulo, SP BRAZIL
Phone : 55-11-548-2666 Telex : 38-1157755 YOKO BR
Fax : 55-11-522-5231

## YOKOGAWA ELECTRIC ASIA PTE. LTD.
11 Tampines Street 92, Singapore 1852, SINGAPORE
Phone : 65-783-9537 Fax : 65-786-2606
Telex : RS-26137 YASSIN

## HANKUK YOKOGAWA ELECTRIC CO., LTD.
K.P.O.Box 1481, Korean Reinsurance Bldg. 205, 80 Susong-Dong, Chongro-ku, Seoul, KOREA
Phone : 82-2-733-0771 to-0775 Fax : 82-2-739-3987

## YOKOGAWA AUSTRALIA PTY. LTD.

### Head Office
Private mail bag 24, Centre Court D3, 25-27 Paul Street North, North Ryde, N.S.W.2113, AUSTRALIA
Phone : 61-2-805-0699 Fax : 61-2-888-1844

## YOKOGAWA BLUE STAR LTD.

### Headquarters
40 / 4 Lavelle Road Bangalore 560 001, INDIA
Phone : 91-80-2211513 Fax : 91-80-2214270
Telex : 81-8458702 YKCO IN

## YOKOGAWA CONTROLE BAILEY S. A.
5, avenue Newton, 92140 Clamart, FRANCE
Phone : 33-1-46-29-10-00 Fax : 33-1-46-32-70-72
Telex : 33-1-631 251


Sep. '94