Instruction Manual

Model UP25
Program Controller
Operation Manual

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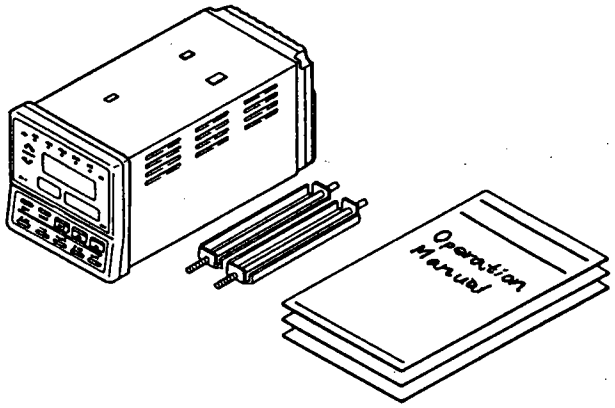
APPENDIX Program Pattern Setting Table 47

1. HANDLING CAUTIONS

The controller is thoroughly factory-tested before shipment. When the controller is delivered, check visually if for external damage of the controller and accessories that may have occurred during transit. Confirm that all standard accessories shown in Figure 1.1 are supplied in proper quantities. (Also confirm that ordered specifications and model codes agree with the contents described on the attached tag.)



UP25 controller ..... 1 set
Mounting bracket ..... 2 pcs.
Operation Manual ..... 1 copy
Reference Manual ..... 1 copy
Communication Manual .. *1 copy

* Supplied only when option RS422 or RS232 is specified.

Figure 1.1 External View of UP25 and Accessories

Cautions for Cleaning the Product

Clean the front panel and key switches by gently wiping with a piece of dry cloth. Do not use water or solvents such as alcohol or benzine.

2. MOUNTING

2.1 Mounting Location

Select a location as shown below to mount the controller, where :

(1) There is less mechanical vibration.
(2) No corrosive gases are present.
(3) Temperature is around normal temperature (23°C) and its change is less.
(4) The controller is not subject to direct high radiant heat.
(5) The controller is not exposed to electromagnetic fields.
(6) The controller is not exposed to rain water or other liquids without installation of our Nema 4 cover.

2.2 External Dimensions and Panel Cut Dimensions

Refer to Figure 2.1.

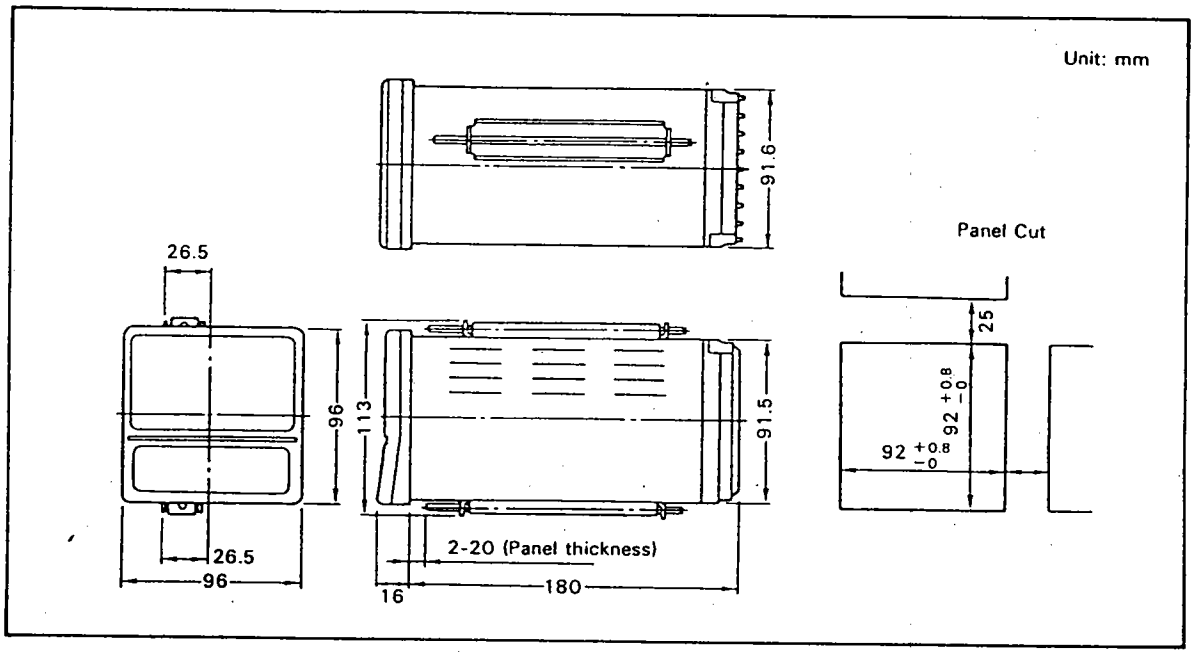


Figure 2.1 External Dimensions and Panel Cut

2.3 Mounting Procedure

(1) Insert this controller into a panel cutout from the panel front.
(2) Mount the controller to a panel using the attached mounting brackets. When mounting, do not apply the brackets too tightly.

3. WIRING

Make wiring connections by referring to Chapter 4 "Terminal Wiring Diagram" and the following descriptions. Use correct instrument practices.

(1) Use the correct leadwires for thermocouple inputs.

(2) Use three wires which each have low resistance and all have equal wire resistances for RTDs (Resistance Temperature Detector) inputs.
This is specifically the case for cryogenic RTDs. For example, when the measuring temperature is 10 K, resistance difference of 100 mΩ causes an error of about 1 K.

(3) Use leadwires or cables which have performance characteristics equivalent to or better than 600 V grade Polyvinyl Chloride insulated wires (JIS C3307) for power supply wiring. If necessary, insert a noise filter into the power supply circuit.

(4) Perform grounding with a thick wire whose cross section is 2 mm² or more so that the grounding resistance is 100 Ω or less.

(5) Correctly install wiring of input circuits so as not to induce noises.
   (a) Install input circuit wiring keeping it away from the power circuits and ground circuits.
   (b) For field transmitters and long runs, use of shielded wire is recommended. Connect the shield to the earth terminal of the controller as necessary. (Be careful not to create a grounding fault as a result.)

(6) When connecting wires to each terminal, it is recommended to use a crimping terminal lug with an insulating sleeve (for screws of ISO 3.5 mm).

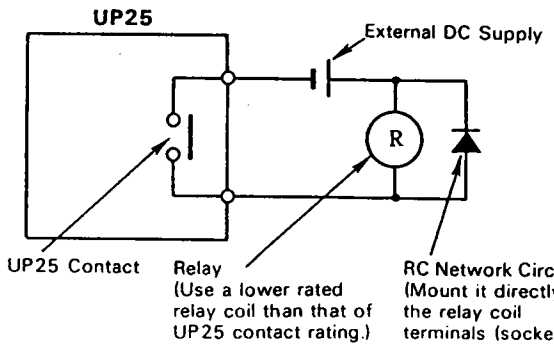
CAUTION

1) A fuse and power switch are not provided for the controller. If necessary, mount them separately from the controller.
Use a time lag fuse of rated voltage 250 V, at a rated current of 1 A.

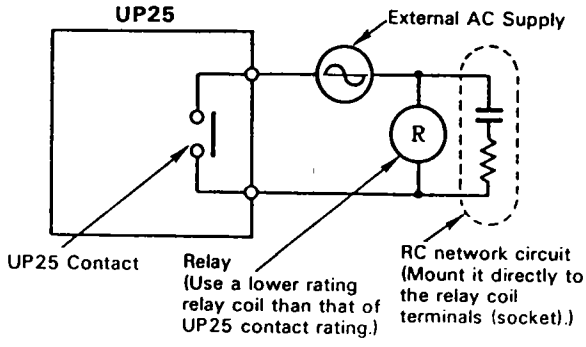
2) In controlling a load with the relay contact output which exceeds the contact rating (250 V AC, 3 A, resistive load, for control output and 250 V AC, 0.3 A, resistive load, for the alarm output), control the load by using an auxiliary relay.

3) If an inductive load such as an auxiliary relay is used with the relay contact output, connect an RC network (for AC) or a diode (for DC), as a surge suppressor circuit for spark elimination, in parallel with the load.

- **For DC Relay:**



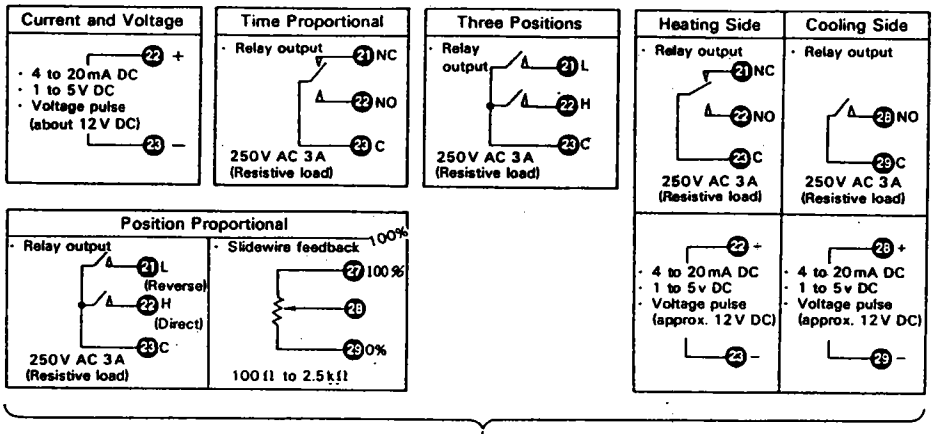
- **For AC Relay:**



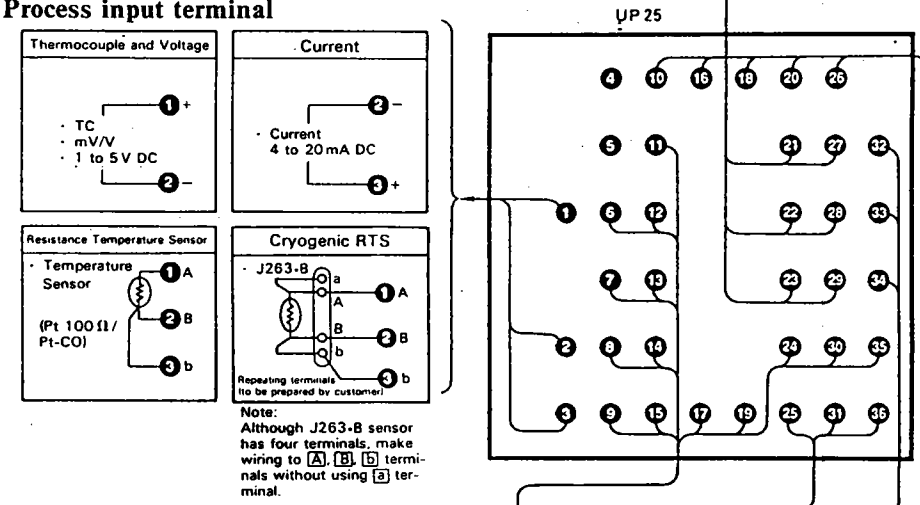
For RC filter parameters, contact manufacturers of auxiliary relays used.

4. TERMINAL WIRING DIAGRAM

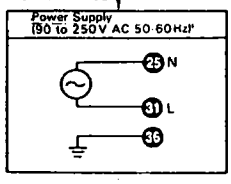
• Control output terminal



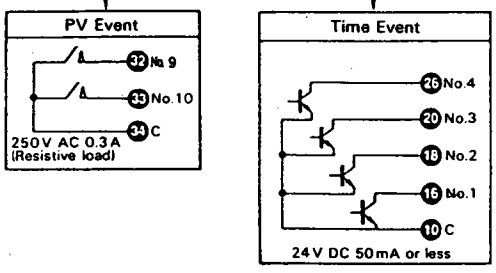
• Process input terminal



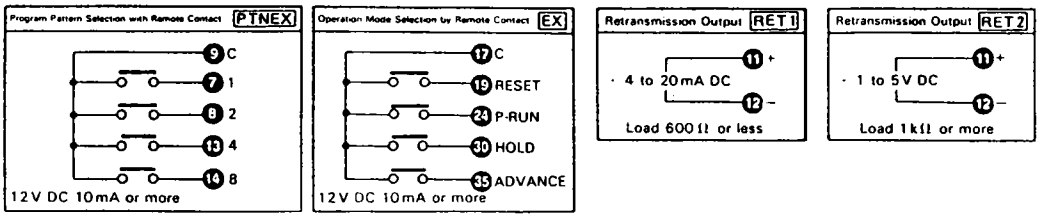
• Power terminals



• Event output terminals



• Option I/O terminals



For communications, see Communications Manual.

5. PROGRAM OPERATION TERMS

Some program operation terms are described.

5.1 Program Pattern

As shown in Figure 5, Program Pattern is what controls the relationship between setpoints and times for the control to be executed. The UP25 includes a four pattern model and eight pattern model.

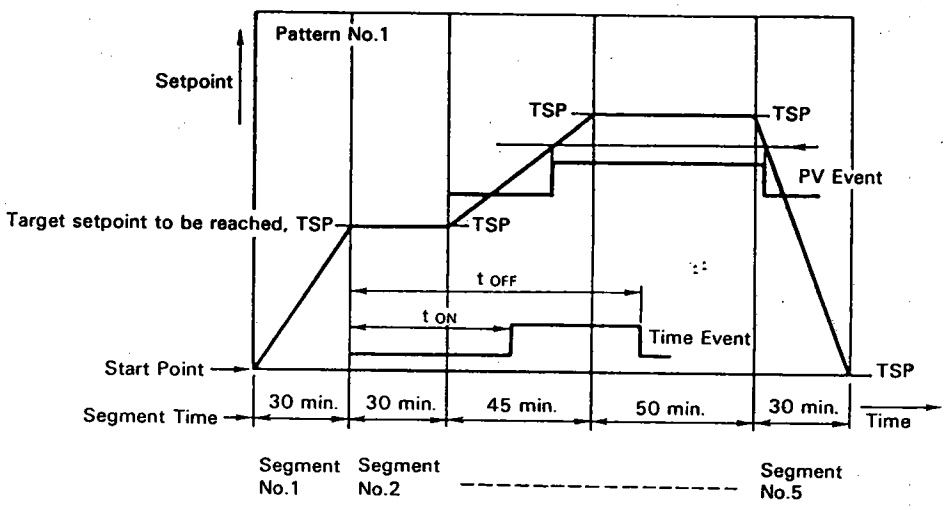


Figure 5.1 Example of Program Pattern

5.2 Segment

As found in Figure 5.1, one program pattern can be expressed with several straight lines. A process expressed with a line segment is called "Segment". In a four pattern model, a maximum of 30 segments can be set for a pattern (but up to 60 segments for four patterns).

In an eight pattern model, a maximum of 60 segments can be set for a pattern (but up to 118 segments for eight patterns).

Setting items for a segment are as shown in Table 5.1.

Table 5.1 Setting Items to be Set for A Segment

Item Code	Name	Description
SEG	Segment No.	Serial No. 01 to 30 or No.01 to 60 assigned to a segment
TSP	Target setpoint to be reached	Control target value at the end of the segment.
TIME	Segment time	Time interval of segment
EV No. EVA EVB	Event No. Event data A Event data B	There are two types of event: Time Event and PV Event. Up to four events can be specified per segment. Refer to "Pattern Set Parameter".
JC	Junction code	A parameter to control the connection of a segment to the next segment (see Table 11.2).

5.3 Wait, Wait Zone, and Wait Time

It is not certain that deviation is zero at the end of a segment. It may be undesirable for the program to advance to the next segment, if a significant deviation exists. In such a case, if "wait" is specified with a junction code, the program waits until the deviation comes within a permissible width ("wait zone") at the end of the segment even if the segment time has elapsed. If the deviation does not come into the wait zone, however, after a maximum preselected time ("wait time"), it will continue on to the next segment anyway.

[Ex.1]

The measured value (PV) reaches the wait zone t minutes (within the wait time) after the program starts wait action and then the program proceeds to the next segment. In this example, PV is late to SP (control target value) but if PV exceeds the SP, the same principle applies (see Figure 5.2).

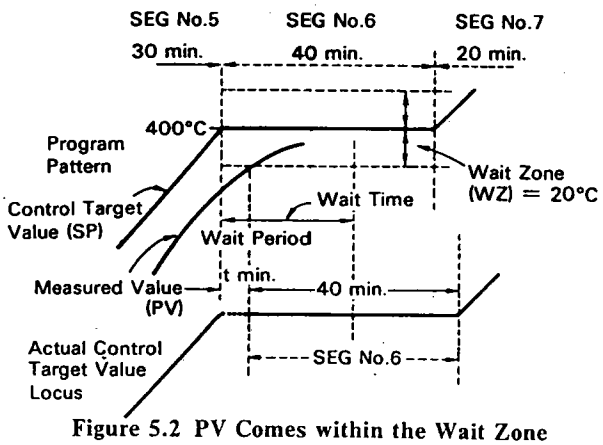


Figure 5.2 PV Comes within the Wait Zone

[Ex.2]

Even if the wait time has elapsed after entering in the wait action, the measured value (PV) does not enter the wait zone. Thus, the program proceeds to the next segment. If PV > SP + WZ, the case is the same (Figure 5.3).

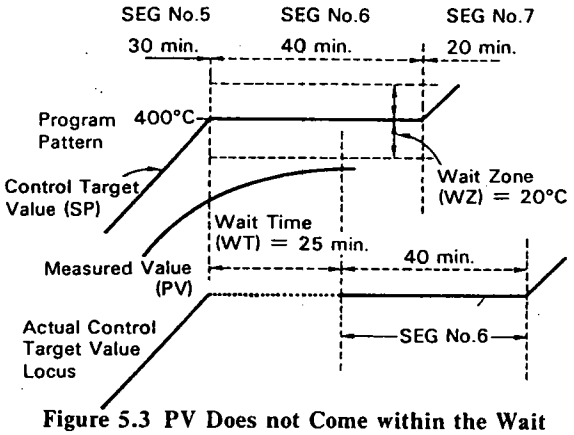


Figure 5.3 PV Does not Come within the Wait Zone in the Wait time

5.4 Hold, Program, and Advance

In some processes, an operator intervenes in the program progress and the operator judges to move the program to the next segment. In such a case, if the junction code is HOLD, the program temporarily pauses at the end of the segment and does not move to the next segment.

When PROG. (program) mode is again set with key operation or the remote contact signal, the program restarts at the point where it was HOLDed

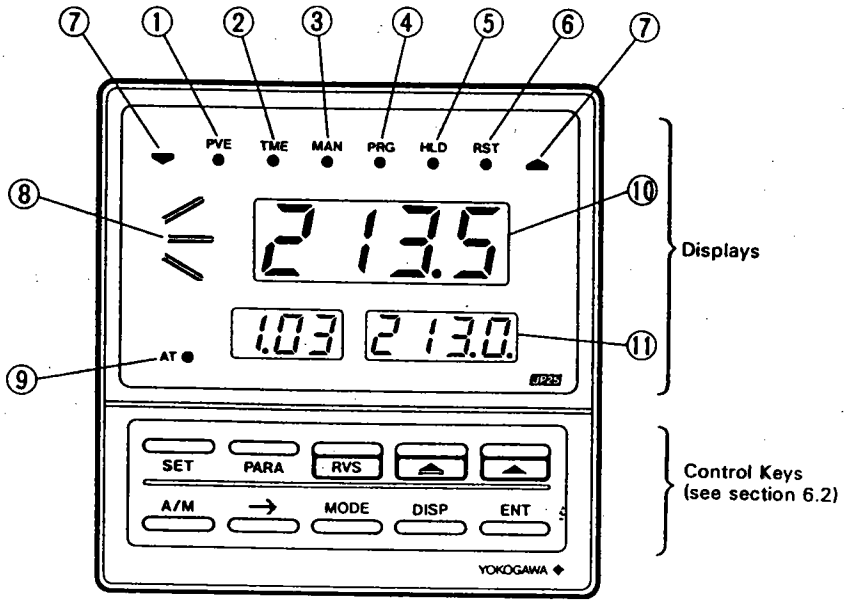
If an ADVANCE (step) command is given, the program moves to the next segment unconditionally.

5.5 Repeat and Reset

In some process plants, one manufacturing process may comprises repetition of the same pattern several times. In such a case, a pattern can be repeated by specifying that repeating what times (number of repeats) from which segment (repeat start) to which segment (repeat end) of a pattern.

For terminating a program in the midst of a program, select the RESET mode. Also stop control computation.

6. FRONT PANEL DISPLAYS AND CONTROL KEYS



6.1 Displays

No.	Display	Function	No.	Display	Function
①	**PVE** (PV event lamp)	Lights when PV event (9 and 10) is generated.	⑧	(Program monitor)	When a program segment in operation is an ascending ramp, ⟋ is lit, when in a soaking condition, ⟺ is lit, and when in a descending ramp, ⟍ is lit.
②	**TME** (Time event lamp)	Lights when time event (1 to 4) is generated.			
③	**MAN** (Manual mode indicating lamp)	Lights in MAN mode. [Goes off in AUTO mode.]	⑨	**AT** (Auto-tuning execution indicating lamp)	Flashes during auto-tuning.
④	**PRG** (Program operation mode indicating lamp)	Lights during the program operation. [Goes off in fixed setpoint control (local) mode and RST (reset) mode.]	⑩	(PV display)	Displays measured value (PV).
⑤	**HLD** (Program hold indicating lamp)	Lights when the program is in HOLD status.			
⑥	**RST** (Reset mode indicating lamp)	Lights in RESET mode. It is the program operation stop and automatic control stop status. MAN control is also not available.	⑪	(Setpoint and parameter display)	Displays the target setpoint to be reached, output value, segment No., segment remaining time, number of remaining repeat times, and various parameters.
⑦	(Output monitor)	▽ is lit when the output value decreases (only for the position proportional PID or three position control) and △ is lit when it increases.			

6.2 Control Keys

Key	Function
SET (Set key)	Scrolls thru setting display panels for Operation Parameters and Set Parameters (described later).
PARA (Parameter key)	Scrolls thru setting display panels for Basic Parameters, Pattern Set Parameters and Engineering Parameters (described later).
RVS (Reverse key)	· Data numeric values can be reduced or the direction of sequential scrolling of panels can be reversed by using another key simultaneously. · In MAN mode, the output can be reduced using ▽, △ numeral keys together with RVS key.
△ (Numeral key)	· Used for various numeric data setting. When setting numeric values of four digits, the upper two digit values are controlled with this key (either advance or reversal is available). The key changes the value one digit each time by one if pressed and released, but if held down, it increases its speed. · In MAN mode, this key increases the output.
△ (Numeral key)	· Used for various numeric data setting. When setting numeric values of four digits, the lower two digit values are controlled with this key (either advance or reversal is available). The key changes the value one digit each time by one if pressed and released, but if held down, it increases its speed. · In MAN mode, this key increases the output individually.
A/M (Auto-manual key)	Used for transfer between AUTOmatic and MANual operation.
→ (Arrow key)	· This key enables a setting panel for any parameter in each parameter group to move to the setting panel for the first parameter of the adjacent parameter group (shift to the RVS direciton is also available using Reverse key together. · For two or more target setpoints (SP) (4 or 8 settings), if this key is pressed during the Operation Display ①, set parameters including target setpoint are displayed in turn. · For transferring target setpoints, subsequently press → key.
MODE (Mode key)	This key is used for selecting the following modes: STOP/RUN and LOCAL/REM and for initiation of the auto-tuning function.
DISP (Display key)	This key is used for the following purposes. · Transfer to Operation Display · To escape from Mode selection and parameter setting display to Operation Displays.
ENT (Entry key)	This key is used for the following purposes. · Data entry when setting various functions · Execution of mode selection · Execution of auto-tuning

7. KEY OPERATION

Cautions for Key Operation

① The keys of the UP25 click. Press the keys so that fingers feel the clicks.
② Do not press keys with a sharp object because it may penetrate the membrane and cause key failure.

7.1 Key Operation Rules

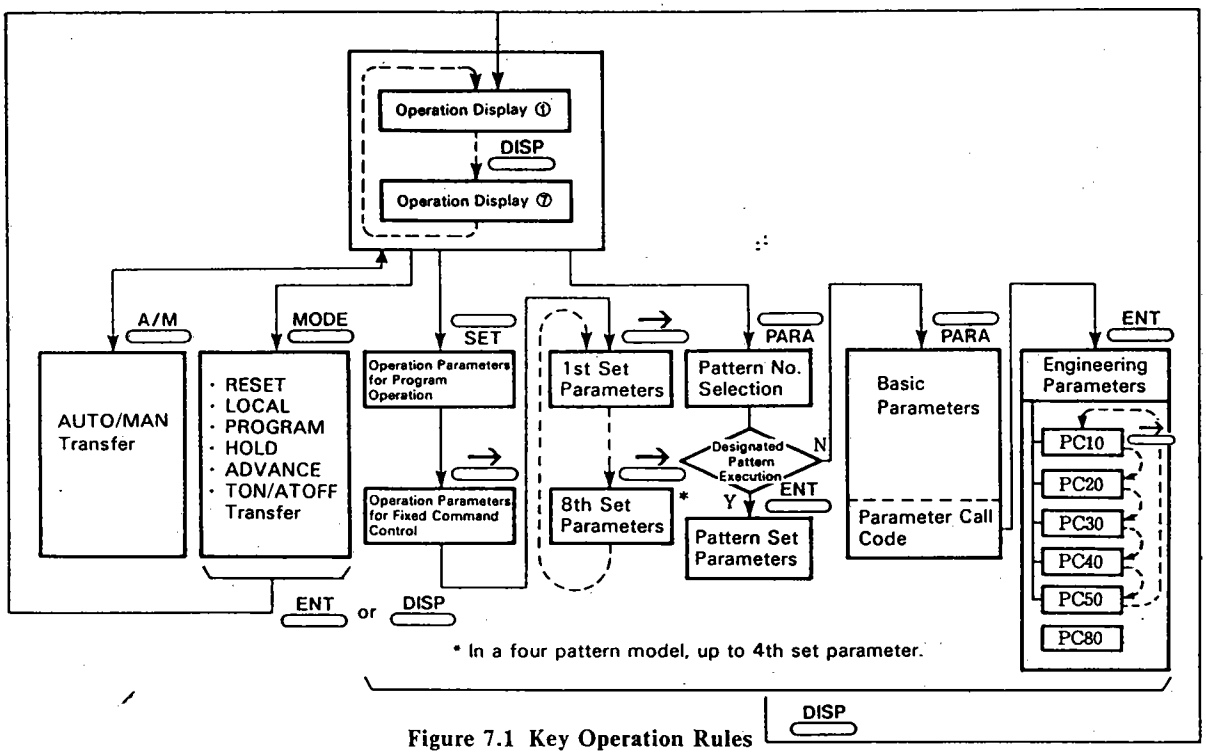


Figure 7.1 Key Operation Rules

- When using SET, PARA, A/M, or MODE key, be sure to return to the Operation Display first (see section 7.2). For example, pressing the MODE key making an attempt at mode transfer while in parameter setting menu will not give any result.
- Pressing DISP key in any setting status other than Operation Display returns the screen to Operation Display ①.
- When various data settings or mode selection is to be performed, be sure to press ENT key to enter them (except when changing the manual output, ENT key operation is unnecessary).
- When the numeric value of data is to be decreased, press numeral keys while pressing RVS key.
- If scroll sequence for Operation Parameters and Set Parameters (see Ch. 9) is to be reversed, press RVS key while pressing SET key.
- If scroll sequence for Pattern Set Parameters, Basic Parameters, and Engineering Parameters displays (see Ch. 9) is to be reversed, press PARA key while pressing RVS key.
- When setting is moved between parameter groups with the arrow key →, the moving direction can be reversed using → key together with the RVS key.

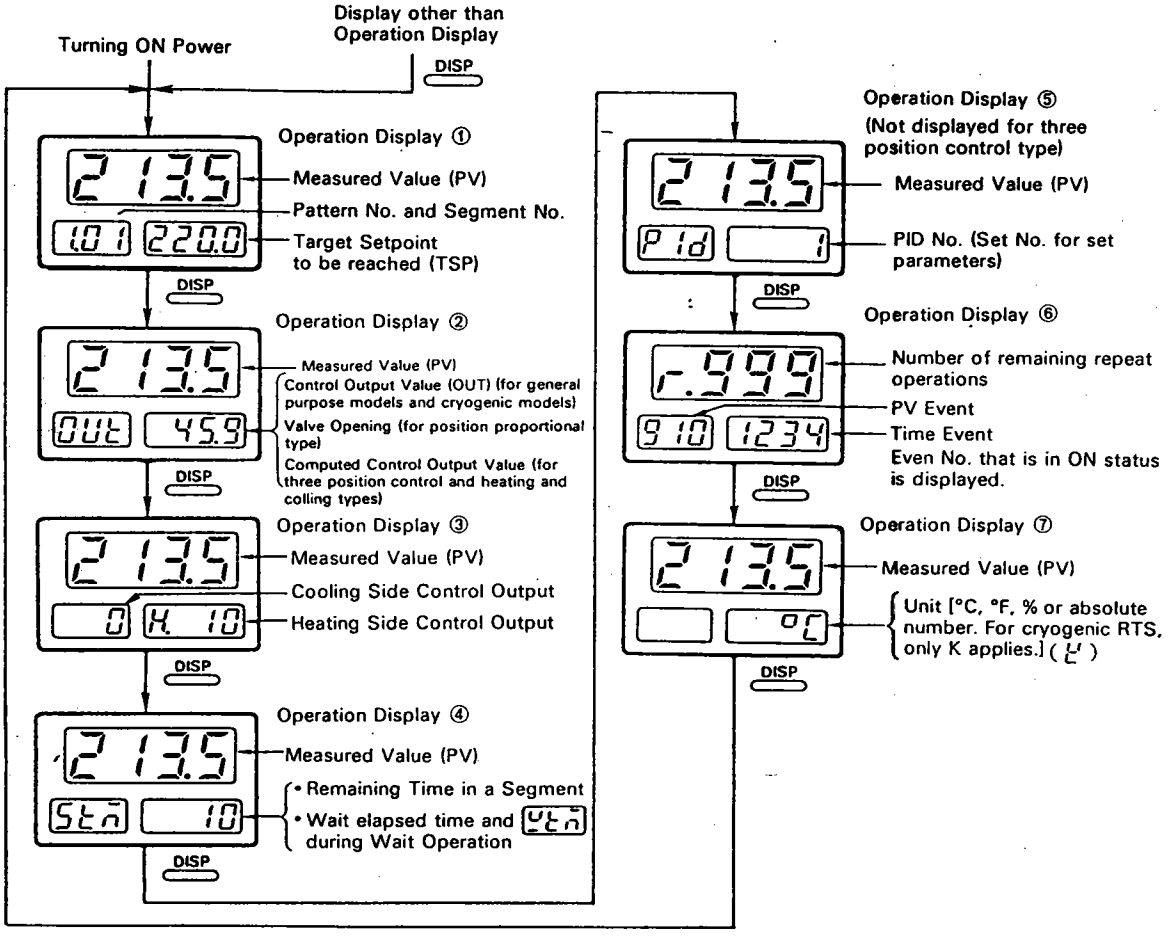
7.2 Transferring Operation Displays

The UP25 controller displays the Operation Display ① when power is turned ON.

The Operation Display consists of seven screens. During operation, display any one of these Operation Displays.

Press DISP key for transferring each Operation Display.

In addition, if a display other than Operation Displays is presented on the screen, Operation Display ① appears by pressing DISP key.



7.3 Mode Selection

7.3.1 AUTO (Automatic Operation)/MAN (Manual Operation) Selection

If A/M key is pressed with an Operation Display on the screen, AUTO mode and MAN mode are alternately selected with each. (This transfer is balanceless bumpless).

In MAN mode, MAN lamp is lit (for manual operation procedure, see section 14.3).

7.3.2 Operation Mode Selection

If MODE key is pressed with an Operation Display on the screen, the MODE selecting display is presented. For the UP25, the display given with the MODE key varies with the operation modes at that instant (see Notes 1 to 6 below).

A mode displayed with "." flashing is not the current mode, but a mode to which the mode is going to be transferred. By pressing ENT key, the mode is transferred to the mode being displayed and the screen is returned to Operation Display ①.
(If DISP key is pressed, the screen is returned to Operating Display ① with the mode unchanged.)

Note 1) RESET [rSt] is not displayed in RESET mode and during auto-tuning.

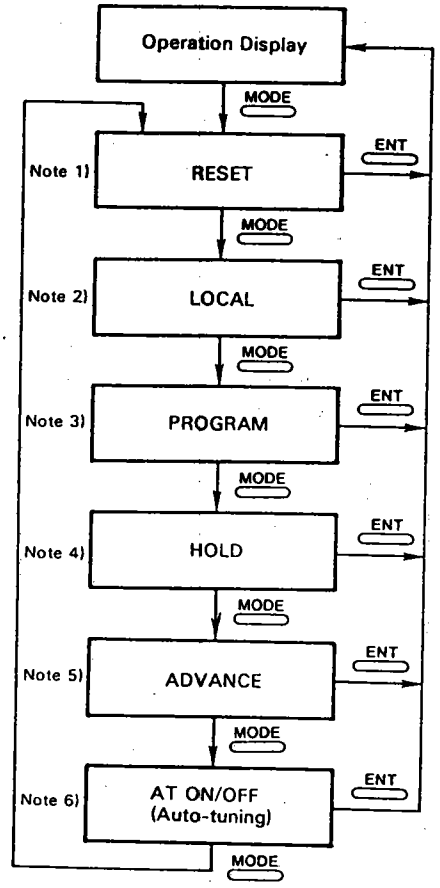
Note 2) LOCAL [LoCL] is not displayed in LOCAL mode and during auto-tuning.

Note 3) PROGRAM [Pro] is not displayed in PROG. mode and during auto-tuning.

Note 4) HOLD [HoLd] is not displayed in RESET, LOCAL, or HOLD mode and during auto-tuning.

Note 5) ADVANCE [Adv] is not displayed in RESET or LOCAL mode and during auto-tuning.

Note 6) AT ON [At.on] is not displayed in MAN or RESET mode, with tuning code = 0, and inheating and cooling model and three position control model, and during auto-tuning.
· AT OFF [At.oF] is displayed during auto-tuning.



- On shipment, the controller is set to tuning code = 2, in MAN mode, and RESET mode.
- For transferring operation modes through a remote contact, see subsection 14.12.

8. SETTING PRIOR TO OPERATION

Settings ①, ②, and ③ shown in Figure 8.1 are required before UP25 Operation.

Then, execute operation with ④.

For ① "Parameter Setting", see next Chapter 9.

For ② "Program Pattern Setting", see section 9.3 and details are described in Chapter 12.

For ③ "Operation Program Designation", see Chapter 13.

For ④ "Starting Operation", see section 14.1.

For ⑤ "Auto-tuning", see section 14.9.

In addition, in the position proportional types, the valve opening adjusting work is needed. For this work, see section 14.10 "Adjusting Valve Opening".

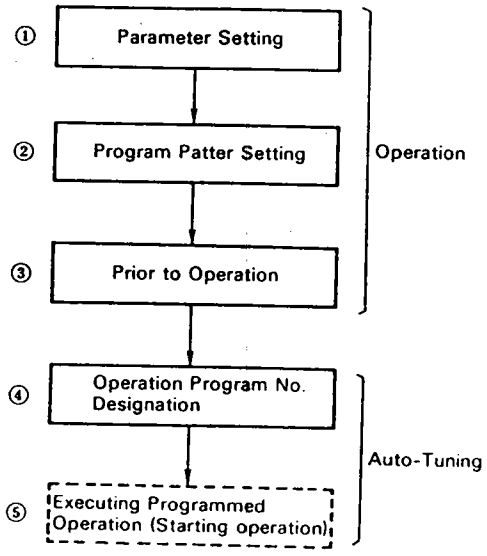


Figure 8.1

9. PARAMETER SETTING

- Set numeric data for each parameter with the two numeral keys and RVS key and register it with ENT key. (The decimal point "·" flashes when updating numeric values and stops flashing by entering the data with ENT key.)
- When all the parameters are completely set, press DISP key to return the screen to the Operation Display.

9.1 Operation Parameter Setting

The operation parameter includes two types : those for program operation and those for fixed setpoint control.

- When SET key is pressed with the operation display indicated, the setting display for Pattern No. (PTN) of operation parameters for program operation.
- Items of operation parameter for program operation is displayed in turn in every pressing of SET key (see section 10.1).

In the display for setting items for Program operation, the setting display for (Fixed Setpoint), the item of fixed setpoint control is displayed if the → key is pressed (see section 10.1).

Note: 1 Set the parameters for program operation when a program is about to be started while pattern setting and others are already set.
2 The parameters for fixed setpoint control is the one for setting target setpoint (fixed setpoint SP) in using the UP25 as a fixed setpoint controller.

9.2 SET Parameter Setting

- Press SET key once and the → key twice successively with the Operation Display presented. The setting display for proportional band (1. P) of the first SET parameter set appears (see section 10.1).
- Parameter items in the first SET parameter set is in turn displayed with each pressing of SET key.
- In the setting display for the first SET parameter set (any of the display for 1.P to 1. RP), if the → key is pressed, the setting display for proportional band (2. P) of the second SET parameter set is indicated. Subsequently, with each pressing of the → key, the display is transferred to those for the third set to the eighth set in turn and, if the → key is pressed once more, the screen is returned to the setting display for operation parameters (see section 10.1).

9.3 Pattern Set Parameter Setting

- Press PARA key once with the Operation Display presented to obtain the pattern No. selecting (PTC) display.
- Set the pattern No. using the numeral key ▲ and set the segment No. using the numeral key ▼. Enter them with ENT key.
- The setting display for target setpoint to be reached (TSP) which is the first item of pattern set parameters, is presented.
- Items of the pattern set parameter is displayed in turn with each pressing of PARA key (see section 10.1).

9.4 Basic Parameter Setting (set these when the operation based on the initial values is incorrect. The initial values are listed on page 23 to 24).

- Press PARA key twice with the Operation Display presented.
  The setting display for the first item of the basic parameters, Wait Zone (WZ), is indicated. (Note: Items included in basic parameters vary with designation of the UP25 suffix codes and option codes. see section 10.1).
- Items of the basic parameter are displayed in turn with each pressing of PARA key.

9.5 Engineering Parameter Setting

(Set these when the operation according to the initial values is incorrect. The initial values are listed on page 25 to 27).

- Indicate the setting display for key lock code (LC), one of the items in Basic Parameter menu.
- Change the key lock code from 0 to 1 (using RVS and numeral keys).
  If LC is a numeral other than 0, enter once 0 (ENT key) and subsequently enter −1 (ENT key).
- When −1 is entered with ENT key, the setting display for engineering parameters is presented (in this case, PC 0 is displayed).
- Set the PC code of a parameter set in which the parameter to be set is included using numeral keys and (and RVS key), and enter it with ENT key. For example, If PC = 10 is set and entered, the input code (P-0) display appears (see Table 9.1. However, do not update data but display only (for the reason, see P.17 CAUTION)).
- Each item in the same parameter group is displayed in turn with each pressing of PARA key (see section 10.1).
- Pressing the arrow key → enables the current setting item display to move to the setting display of the first item of the adjacent parameter group [for example, if the arrow key → is pressed in the setting display of display unit (P-4) of PC10, the screen transfers to the setting display for PC20 Setting limit high limit value (E-0)].
  If the arrow key → is used together with RVS key, the direction can be reversed.

Table 9.1 Meter Range Codes

Measured Input Range	Type of Input (Range)				Meter Range Code
Thermocouple and mV group		R	0 to 1700°C	32 to 3100°F	100
		S	0 to 1700°C	32 to 3100°F	110
		B	0 to 1800°C	32 to 3300°F	120
		K	−200 to 1200°C	−300 to 2300°F	131
		K	−199.9 to 200.0°C	−300 to 400°F	132
		E	−199.9 to 800.0°C	−300 to 1500°F	141
		J	−199.9 to 800.0°C	−300 to 1500°F	150
	DIN	L	−199.9 to 800.0°C	−300 to 1500°F	151
		T	−199.9 to 200.0°C	−300 to 400°F	160
		T	0.0 to 400.0°C	32.0 to 750.0°F	161
	DIN	U	−199.9 to 200.0°C	−300 to 400°F	165
		U	0.0 to 400.0°C	32.0 to 750.0°F	166
		N	0 to 1300°C	32 to 2400°F	170
		W	0 to 2300°C	32 to 4200°F	180
		0 to 10 mV		−1999 to 999 Scaling available (Decimal point place changeable)	000
		−10 to 10 mV			001
		0 to 100 mV			010
DC voltage (V) and DC current (mA) group		0 to 1 V			020
		−1 to 1 V			021
		0 to 5 V			030
		1 to 5 V			031
		0 to 10 V			040
		4 to 20 mA			050
RTD group	JPt100 (Note 1)	−199.9 to 500.0°C		−300 to 1000°F	200
	Pt100 (Note 1)	−199.9 to 500.0°C		−300 to 1000°F	201
	PtCo (Note 2)	0.0 to 300.0K		−	250
Special thermocouple group (Note 3)	PR20-40	0 to 1900°C		32 to 3400°F	190
	Platinel 2	0 to 1390°C		32 to 2500°F	191
	$W_{97}Re_3W_{75}Re_{25}$	0 to 2000°C		32 to 3600°F	192

(Note 1) · Pt100 (Revised DIN/JIS) and JPt100 (JIS '89).
(Note 2) · Applied only to cryogenic type controllers.
· Be sure to combine this element with YOKOGAWA J263*B sensor (it cannot be combined with other company's sensors).
(Note 3) · Specify an option code STC for using special thermocouples.

CAUTION

If any of the range specifying parameters (Table lower left) are changed, matching with the other parameters already set are destroyed. In such a case, all the parameters shown in the table lower right are automatically initialized.

If the parameters shown in the table lower left are changed, check whether or not the other parameters are mismatched.

Meter range code (P-0)
Max. value in measuring range (P-2)
Min. value in measuring range (P-3)
Display unit (P-4)

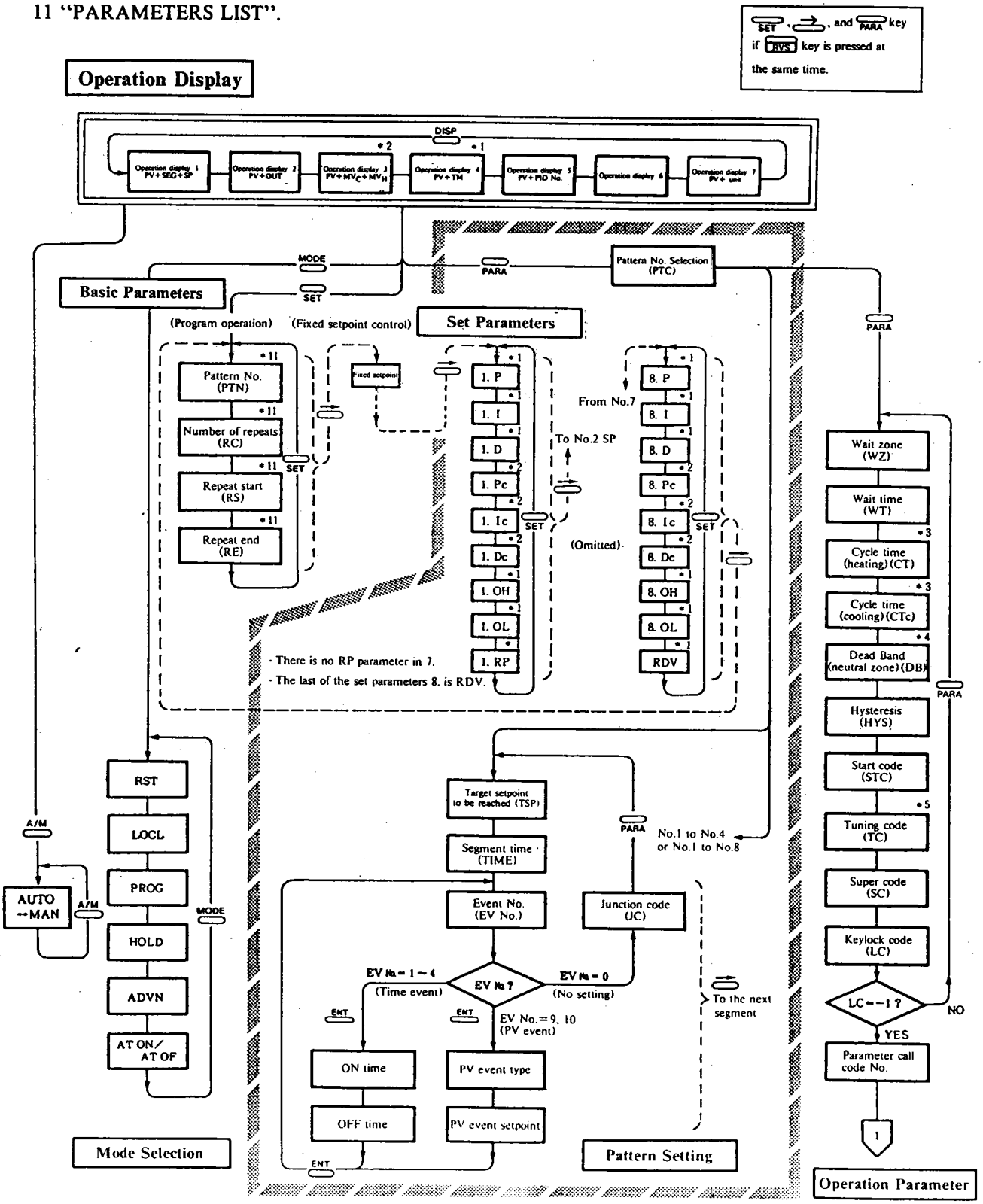
- (1.OH to 8.OH), (1.OL to 8.OL), (1.RP to 6.RP), and (RDV) of the set parameters.
- (WZ), (HYS) and (DB) of the basic parameters.
- (P-1), (P-2), (P-3), (P-4), (P-5), (E-0), (E-1), (F-0), (F-2), (F-3), (G-1), (G-2), (G-5), and (G-6) of the engineering parameters.

The progrsm pattern does not cancelled by changing the table shown left. However, numeric values related to the range such as TSP are changed to the form multiplied by the ratio of (new range)/(old range).

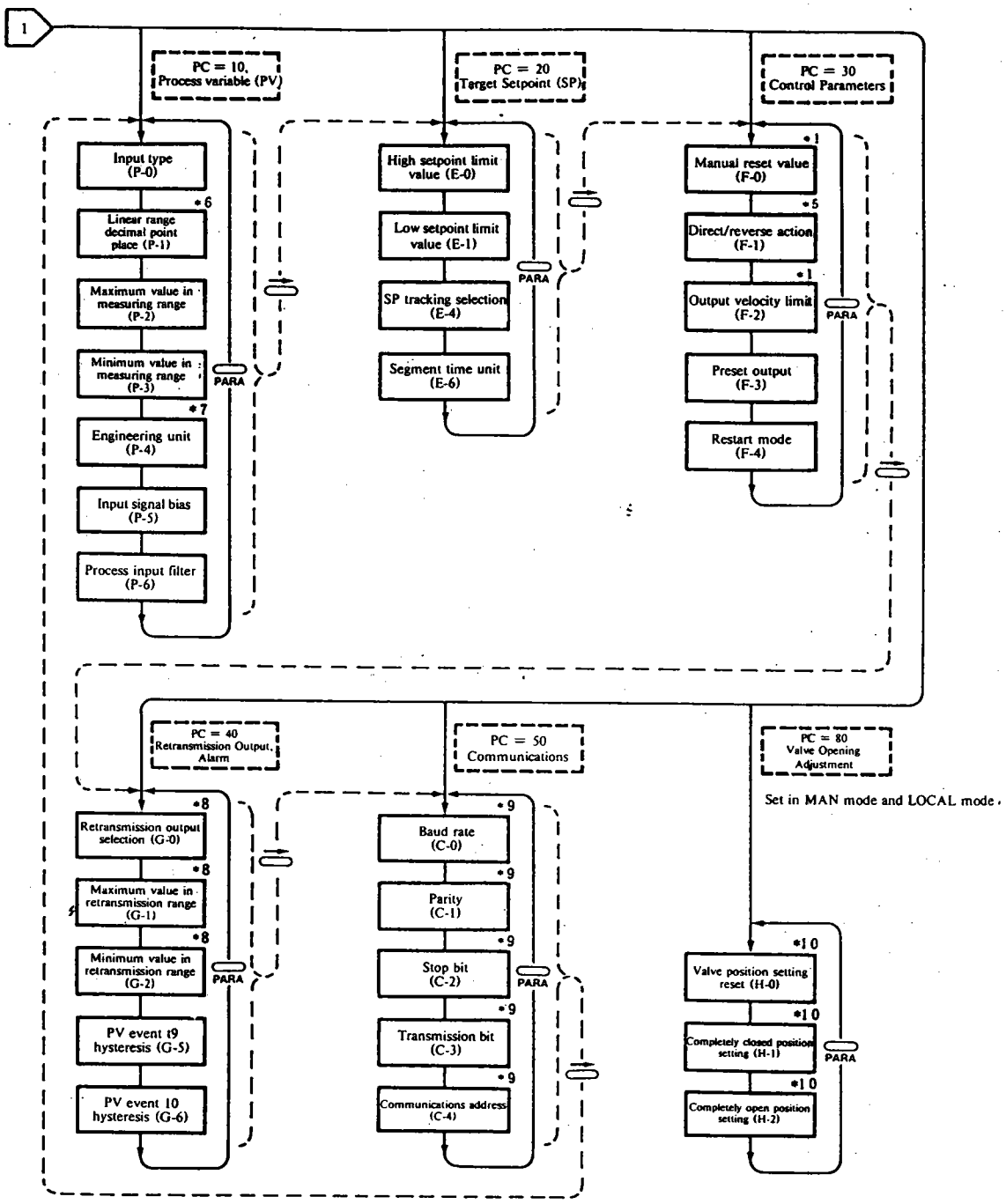
10. SETTING FLOW CHART

10.1 Setting Flowchart

Set parameters outside the frame as necessary. (Unless otherwise specified, the controller is operated with those parameters at the values on shipment from the factory as shown in Ch. 11 "PARAMETERS LIST".



Engineering Parameters



*1 This is not displayed in three position control.
*2 This is displayed only when the heating/cooling type controller is used.
*3 This is displayed in time proportional type controllers.
*4 This is displayed in position proportional type, heating/cooling type and three position control type controllers.
*5 This is not displayed in three position control type or heating/cooling type controllers.
*6 This is displayed only for V, mV, and mA inputs.
*7 This is not displayed in cryogenic type controllers.
*8 This is displayed when optional codes RET1 or RET2 is specified.
*9 This is displayed when optional codes RS232 or RS422 is specified.
*10 This displayed when a position proportional type controller is specified.
*11 This is not displayed when the program operation is being performed or the pattern No. is selected with remote contact.
*12 This is not displayed in heating/cooling type controllers.

11. PARAMETERS LIST

This chapter describes various parameters of the UP25 controller. For more detailed explanation of parameters, see Reference Manual (IM 4P2F3-20E).

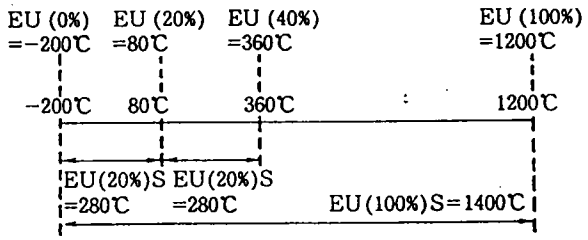
Presentation on setting range and units specific to the controller will be described below.

EU : Engineering unit (°C, °F or scaling unit in linear input)

EU ( ) : Absolute value in engineering unit corresponding to the position over the full scale.

EU ( ) S : Presentation in engineering unit (°C, °F or scaling unit in linear input) corresponding to the ratio of span.

Relationship of EU ( ) to EU ( )S is shown below (if the range is −200 to 1200°C).



Operation Parameters

(1) For Program Operation (For program operation start, see Ch.13.)

Designate an actually operated program pattern and the operation times (number of repeats) by setting these parameters.

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
PtN	PTN	Pattern No.	—	0 to 4 for 4 pattern models 0 to 8 for 8 pattern models	0	Program is started at the first segment of the designated pattern (except 0).
rC	RC	Repeat cycle	time	0 to 999	0	A program between segments designated with repeat start (RS) and repeat end (RE) is repeated by designated times.
rS	RS*	Repeat start segment No.	—	Range of segment Nos. set in the program pattern.	1	Repeat start segment No. at the repeat operation.
rE	RE*	Repeat end segment No.	—	Range of segment Nos. set in the program pattern.	The last segment No. in a pattern	Repeat operation end segment No.

* : RS and RE are not displayed if RC is not set.

(2) For Fixed Setpoint Control (For starting the fixed setpoint control, see section 14.5).

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
LSP	LSP	Fixed SP	EU	EU(0%) to EU(100%)	EU(0%)	Setpoint in fixed setpoint control operation

Set Parameters

Eight sets of set parameters are provided.

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
*8.P	P	Proportional band	%	0 and 0.1 to 999.9	100.0	0 specifies ON/OFF action. 0 is not provided for position proportional PID model. No display for three position control model.
8.I	I	Integral time	s	0 and 1 to 6000	0	0 shows that integral action is off.*** No display for three position control.
8.d	D	Derivative time	s	0 and 1 to 6000	0	0 shows that derivative action is off. No display for three position control.
8.Pc	Pc	Proportional	%	0 and 0.1 to 999.9	100.0	Display only in heating/cooling models. 0 shows ON/OFF action.
8.Ic	Ic	Integral time	s	0 and 1 to 6000	0	Displayed only in heating/cooling models. 0 : No integral action.****
8.dc	Dc	Derivative	s	0 and 1 to 6000	0	Displayed only in heating/cooling models. 0 : No derivative action.
8.oH	OH	High output limit value	%	$-5.0 \leq OL < OH \leq 105.0$	100.0	
8.oL	OL	Low output limit value			0.0	
8.rP	RP No.1 to No.6	Reference point **	EU	EU(0%) to EU(100%)	EU (100%)	Six transfer points in measuring range for selecting set parameter sets of No.1 to No.7.
rdV	RDV	Reference point ***	EU	EU(0%) to EU(100%)	EU (100%)	EU(0%) is OFF.

* 8. is the No. which shows which set of parameters they are.
** Reference point setting displays are present in No.1 to No.6 sets but no display in No.7 set parameters.
*** Reference DV is present only in No.8 set of parameters.
**** If P = 0, Pc = 0, the integral action becomes OFF for both heating and cooling regardless of setpoints when either one of I and Ic is made 0.

Pattern Set Parameters

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
PtC	PTC	Pattern No. and Segment No.	—	0 to 4 or 0 to 8 01 to 30 or 01 to 60	No.0 No.01	Program pattern No. and segment No. to be created or altered. (Note 1)
tSP	TSP	Target set point to be reached	EU	EU (0% to EU(100%)	EU(0%)	(E-1) ≦ (TSP) ≦ (E-0)
tIME	TIME	Segment time	min. or s	0 to 9999 min. or 0 to 9999 s	—	Set the unit in (E-6) of engineering parameter PC = 20.
EV 1	EVNo.	Event No.	—	0, 1 to 4, 9 and 10	0	0: No event 1 to 4: Time event 9 and 10: PV event
EvA1	EVA	Event data A	Refer to Table 11.1.			
Evb1	EVB	Event data B				
JC	JC	Junction code	Refer to Table 11.2.			

(Note 1) Set pattern No. with a numeral key using cary of segment NO. Designation of a segment No. which does not exist is invalid.
When a pattern No. has 0 value, if successively PARA key is pressed, the next pattern setting parameter item "TSP" setting display cannot be obtained but in this case, the setting display for basic parameters is displayed.

Table 11.1 Event Setting Items

Setting Item	Time Event Setting Contents	PV Event Setting Contents
Event No. EV No.	#1 to #4; time event output	Nos. 9 and 10; PV event output
Event data A EVA	Start point of each segment ON time EVA (min/sec)	PV Event mode 0: OFF, 1: PV high limit 2: PV low limit 3: Positive deviation high limit 4: Negative deviation low limit
Event data B EVB	Start point of each segment OFF time EVB (min/sec)	PV Event setpoint PV for EVA = 1 or 2 Deviation for EVA = 3 or 4

- Event setting is started at that segment starting. For example, time counting is begun for time event and detection by comparison between the PV event setpoint and PV or deviation is started.
- Time event setting is effective after startup until OFF time is reached even over segments.
- PV event setting is effective until EVA = 0 is set even over segments.
- The event can be set by changing the setting content again and again for the same number. The preceding setpoint is updated to the new setpoint whenever the event resetting is restarted.

Table 11.2 Junction Code List

JC = 0	The next segment is subsequently executed after the program of the current segment is executed.
JC = 1	The program moves to the next segment after performing the wait operation following execution of the current segment program.
JC = 2	This provides the holding action after executing the current segment program. In this case, the HOLD lamp is lit. HOLD status is continued until HOLD status is released with key operation or an external contact.
JC = 3	This provides LOCAL (local setting) and RUN (operation) status after executing the current segment program. That is, the controller is succeeded to a fixed setpoint control at the value set in LSP (fixed SP). *
JC = 8	This is set if the specific program segment is to be added and inserted (see section 12.4).
JC = 9	This is set when the specific program segment is to be cancelled (see section 12.5).
JC = –	· This shows that the segment is not programmed (the segment time setting is not performed). · After the controller executes segments in succession, if this segment is reached, it goes to the LOCAL (local setting) and RESET status. · In this case, control output shows the preset output value (regardless of auto/man). However, if the preceding segment JC is 3, the controller goes to the LOCAL and RUN status.

* JC = 3 can be written only in the last segment.

Basic Parameters

The basic parameter (wait zone) setting display is called by pressing PARA key twice in the Operation Display status.

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
WZ	WZ	Wait zone	EU	EU(0%)S to EU(10%)S	EU (0%)S	When a PV reaches in the wait zone set here at the end of one segment of the operating program, the program advances to the next segment. (Valid in the segment set with JC=1.)
WT	WT	Wait time	min. or s	0 to 100	0	Even if PV does not reach the wait zone, the next segment program is executed after WT time elapses. The unit must be the same as the segment time.
CT	CT	Cycle time	s	1 to 100	10	Displayed only for relay outputs and voltage pulse output models.
CTc	CTc	Cycle time (cooling side)	s	1 to 100	10	Displayed only for relay or voltage pulse output in heating/cooling model.
db	DB	Dead band	%	1.0 to 10.0 (Position proportional PID) 1.0 to 10.0 (Three position control) −10.0 to 10.0 (Heating/cooling model)	1.0	Displayed only for position proportional PID type, three position control type and heating/cooling model.

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
HYS	HYS	Hysteresis (control output relay)		EU(0.0%)S toEU(5.0%)S (in single output ON/OFF control)	EU (0.5%)S	This is set to prevent chattering of the control output when the proportional band is set to 0 for single output models or for position control PID or three position control type or heating/cooling model.
				0.1 to 0.5% (for position control PID or three position control type or heating/cooling model)	0.1	
STC	STC	Start code	—	0, 1 or 2	0	0: Fixed point start (Control target at start point of a program is set to the fixed setpoint) 1: PV start (SP velocity has priority) 2: PV start (Time has priority.) (See Explanatory manual.)
TC	TC	Tuning code	—	0, 1, or 2	2	0: No auto tuning 1: Critically damped response 2: General purpose
SC	SC	Super code	—	0, 1 or 2	0	0: Super OFF 1: Super ON 2: Super ON (weak)
LC	LC	Key lock code	—	0, 1, 2, 3, 4 or −1	0	When −1 is set, the display for parameter call codes is obtained. For each codes meaning, see Table 9.3.
PC	PC	Parameter call code	—	0, 10, 11, 20, 30, 40, 50, 80	0	For each parameter call code meaning, see Table 9.4.

Table 11.3 Key Lock Code

LC Code	Keys to be Locked
0	None
1	PARA
2	PARA MODE
3	PARA MODE SET
4	PARA MODE SET A/M

Note 1) If PARA key is locked, key lock code can be displayed and changed.

Table 11.4 Program Call Code

PC Code	Parameter Group to be Called	PC Code	Parameter Group to be Called
0	None is called out.	40	Related to transmission output and PV event
10	Related to measuring input.	50	Related to communication
20	Related to target setpoint	80	Related to valve adjustment
30	Related to control parameter		

Engineering Parameter

Measuring Input (PC10)

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
P-0	P-0	Input type	–	000 to 250	As described at right	The controller is delivered with input range code specified when ordering (see Table 7.2).
P-1	P-1	Linear range decimal point place		0, 1, 2 or 3	1	0: 0 to 9999 1: 0.0 to 999.9 2: 0.00 to 99.99 3: 0.000 to 9.999
P-2	P-2	Max. value in measuring range	EU	For TC or RTD input (Range min. value) ≦ P-3 < P-2 ≦ (Range max. value) For linear input −1999 ≦ P-3 < P-2 ≦ 9999	EU (100%)	(P-2) − (p-3) ≧ 1
P-3	P-3	Min. range in measuring range	EU		EU(0%)	
P-4	P-4	Engineering unit	–	0, 1, 2 or 3	0	0: °C, 1: °F 2: % 3: Absolute Since only K is used in cryogenic type unit, this parameter is not displayed.
P-5	P-5	Input signal bias	EU	EU(−5%)S to EU(5%)S	EU(0%)S	
P-6	P-6	Process input filter	s	0 and 1 to 120	0	First order lag filter, 0: OFF

Target Setpoint Input (PC20)

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
E-0	E-0	High setpoint limit value	EU	EU(0%) ≦ E-1 < E-0 ≦ EU(100%)	EU (100%)	If TSP is set outside these limits, it is automatically modified to limits.
E-1	E-1	Low setpoint limit value			EU(0%)	
E-4	E-4	SP tracking selection	–	0 or 1	0	0: with SP tracking 1: w/o SP tracking
E-6	E-6	Segment time unit	–	0 or 1	0	0: min. 1: sec. Unify the units of segment time (TIME), wait time (WT), time event ON and OFF times to minutes or seconds.

Control Parameters (PC30)

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
F-0	F-0	Manual reset value	%	−5.0 to 105.0	50	Used for P or PD action
F-1	F-1	Direct/reverse action	—	0 or 1	0	0: Reverse action 1: Direct action
F-2	F-2	Output velocity limit	%/s	0 or 0.1 to 100.0	0	0 means OFF.
F-3	F-3	Preset output value	%	−5.0 to 105.0	0.0	Set the output value when burnout or running stop (RST lamp is lit) occurs. Not limited by output limit OH/OL.
F-4	F-4	Restart mode	—	0, 1 or 2	0	0: Continues operation as immediately before power failure. 1: After power recovery, default to MAN mode. 2: After power recovery, default to RESET mode.

Retransmission Output and PV Event (PC40)

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
G-0	G-0	Retransmission output selection	—	0, 1, 2, 3 or 4	0	Displayed only when option RET1 or RET2 is specified 0: Measured value [corresponding to (P-3) to (P-2)] 1: Target setpoint [Corresponding to (P-3) to (P-2)] * 2: Output value 3: Measured value [Corresponding to (G-2) to (G-1)] 4: Target setpoint [Corresponding to (G-2) to (G-1)] *
G-1	G-1	Max. value in retransmission	EU	EU(0%) ≦ (G-2) < (G-1) ≦ EU(100%)	EU (100%)	Displayed only when option RET1 or RET2 is specified.
G-2	G-2	Min. value in retransmission			EU(0%)	
G-5	G-5	PV event 9 hysteresis	EU	EU(0.0%)S to EU(5.0%)S	EU (0.5%)S	
G-6	G-6	PV event 10 hysteresis	EU	EU(0.0%)S to EU(5.0%)S	EU (0.5%)S	

* For code 1 or 4, if high or low or both setting limits (E-0) or (E-1) are set, the retransmitted output is affected by them.

Communications (PC50)

(Displayed only when option RS232 or RS422 is specified.)

For communications, see Communications Manual.

Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
C-0	C-0	Baud rate	—	0 to 6	6	0: 150, 1: 300, 2: 600, 3: 1200, 4: 2400, 5: 4800, 6: 9600 BPS
C-1	C-1	Parity	—	0, 1, or 2	0	0: Non-parity 1: Even 2: Odd
C-2	C-2	Stop bit	—	1 or 2	1	1: 1 bit, 2: 2 bits
C-3	C-3	Transmission bit length	—	7 or 8	8	7: 7 bits, 8: 8 bits
C-4	C-4	Communication address	—	1 to 16	1	

Valve Opening Adjustment (PC80)

(Displayed only in position proportional PID models):

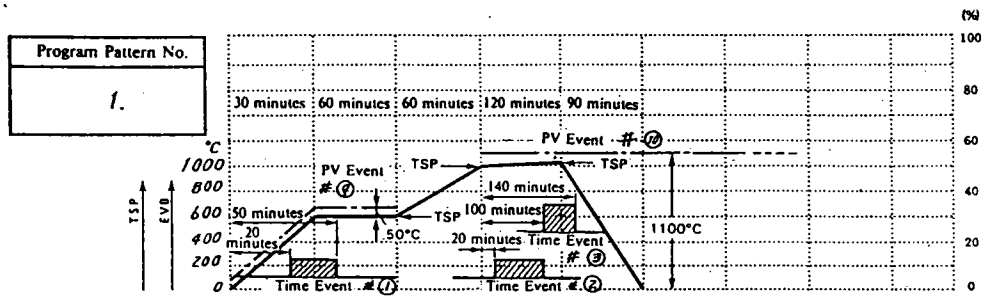
Display	Code	Setting Item	Unit	Setting Range	Initial Value	Description
H-0	H-0	Valve position reset	—	Valve position	—	Clears the position memory
H-1	H-1	Valve fully closed position entry	—	Valve position	—	Sets valve opening 0% position.
H-2	H-2	Valve fully open position entry.	—	Valve position	—	Sets valve opening 100% position.

Note) Display H-1 (flashing) shows the unadjusted status and H-2 shows the adjusted conditions.

12. PROGRAM PATTERN SETTING

12.1 Program Pattern Setting

- Set the program pattern by setting each item of pattern set parameters (see Ch.11 "Pattern Set Parameters").
- When the program pattern is to be set, it is recommended to perform it, referring to a program pattern setting table as shown in Figure 12.1, which is filled with required data in advance (for its form, see APPENDIX).
- As tooling functions for program pattern generation, four functions are provided : Program pattern copying, progam pattern deletion, segment insertion, and segment deletion. These are useful for creating modified patterns from the basic patterns.



SEG	Segment No.	1	2	3	4	5				
TSP	Target setpoint	600°C	600°C	1000°C	1000°C	0°C				
TIME	Segment time	30min.	60min.	60min.	120min.	90min.				
EV No.	Event No.	# 1	–	–	# 2	–				
EVA	Event data	20min.	–	–	20min.	–				
EVB	Event data	50min.	–	–	100min.	–				
EV No.	Event No.2	–	–	–	# 3	–				
EVA	Event data	–	–	–	100min.	–				
EVB	Event data	–	–	–	140min.	–				
EV No.	Event No.3	–	–	–	–	–				
EVA	Event data	–	–	–	–	–				
EVB	Event data	–	–	–	–	–				
EV No.	Event No.4	# 9	–	# 9	# 10	–				
EVA	Event data	3	–	0	1	–				
EVB	Event data	50°C	–	50°C	1100°C	–				
JC	Junction code	1	0	1	0	0				

Figure 12.1

12.2 Copying Program Pattern

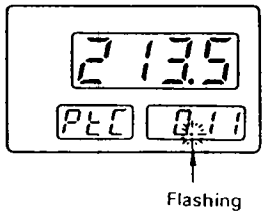
A program pattern can be copied as another No. program pattern.

Copying Procedure:

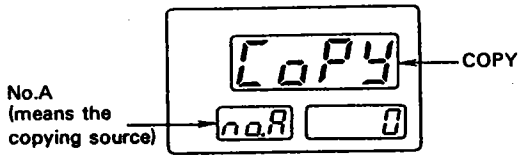
(1) Select a mode other than PROGRAM operation (PRG lamp goes off).

(2) Press PARA key to present the display for setting PTC of pattern setting parameters.

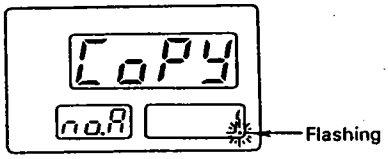
(3) Set pattern No.0 and segment No.11 using numeral ▲, ▼ keys and R/S key.



(4) Enter them with ENT key. Then a setting display for pattern No. in the copying source is presented.



(5) Set the pattern No. in the copying source using numeral ▲, ▲ keys and RVS key (the following is an example for No.1).



(6) Enter the number with ENT key. Then the setting display for pattern No. in the copying destination is presented (display for No.B). Set the pattern No. in the copying destination and enter it using ENT key. Then copying is executed and the screen returns to Operation Display ①.

12.3 Deleting Program Pattern

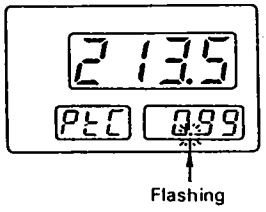
If a program pattern becomes unnecessary, it can be deleted on a pattern No. basis.

Deleting Procedure:

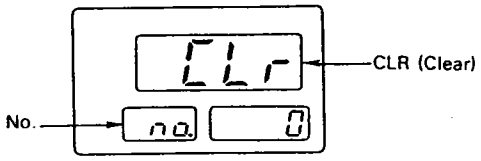
(1) Select a mode other than PROGRAM operation (PRG lamp goes off).

(2) Press PARA key to present the display for setting PTC of pattern setting parameters.

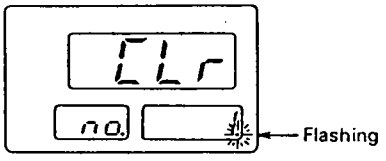
(3) Set pattern No.0 and segment No.99 using numeral ▲, ▲ keys and RVS key.



(4) Enter them with ENT key. Then a setting display for pattern No. to be deleted is presented.



(5) Set the pattern No. to be deleted using numeral ▲, ▲ keys and RVS key (the following is an example for No.1).



(6) When it is entered with ENT key, deletion is executed and the screen returns to the Operation Display ①.

Note: If copying or deleting of a program pattern cannot be performed, one of the error codes shown in Table 12.1 is displayed. The error codes can be erased with numeral keys.

Table 12.1 Error Codes

Error Code	Reason why deletion of copying cannot be performed
Er-0	The program pattern to be the source of copying is not entered.
Er-1	Other program pattern is already entered in the pattern No. in the copying destination.
Er-2	If coyping is done, the total number of segments exceeds the limit value (60 segments for four pattern model and 118 segments for eight pattern model).
Er-3	The program pattern to be deleted is not entered.

12.4 Inserting Program Segment

Segments can be inserted in a program pattern.
The insertion procedure and variation before and after insertion are described below.

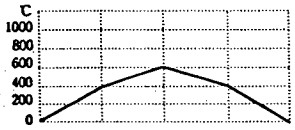
Insertion Procedure:

(1) Select a mode other than PROGRAM operation (PRG lamp goes off).

(2) Call the junction code (JC) setting display for the segment to be inserted. * (In the example below, it is segment No.3.)
* Refer to subsection 7.4.3 "Pattern Set Parameter Setting".

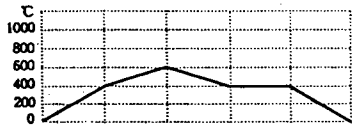
(3) Set the junction code to 8 using numeral key ▲ (and RVS key) and enter it with ENT key. At this instant the segment is inserted (insertion of the segment can be confirmed by checking the increase of number of segments in the pattern with the arrow → key).

① Example of pattern before inserting segment No.3



SEG	Segment No.	1	2	3	4
TSP	Target setpoint	400°C	600°C	400°C	0°C
TIME	Segment time	20min.	30min.	10min.	20min.
EV No.	Event No.	–	–	–	–
EV No.	Event No.	–	–	–	–
EVA	Event data	–	–	–	–
EVB	Event data	–	–	–	–
JC	Junction code	0	1	0	0

② Example of pattern after inserting segment No.3



SEG	Segment No.	1	2	3	3—4	4—5
TSP	Target setpoint	400°C	600°C	400°C	400°C	0°C
TIME	Segment time	20min.	30min.	10min.	10min.	20min.
EV No.	Event No.	–	–	–	–	–
EV No.	Event No.	–	–	–	–	–
EVA	Event data	–	–	–	–	–
EVB	Event data	–	–	–	–	–
JC	Junction code	0	1	0	0	0

- Segment No.3 data before insertion is pushed out to No.4 segment after insertion and that data also remains in the new No.3 segment.

12.5 Deleting Program Segment

A segment in a program pattern can be deleted.
The deleting procedure and variation before and after deletion are described below.

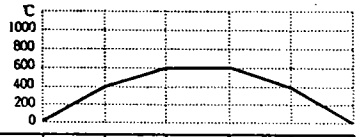
Deleting Procedure:

(1) Select a mode other than PROGRAM operation (PRG lamp goes off).

(2) Call the junction code (JC) setting display for the segment to be deleted. * (In the example below, it is segment No.3.)
* Refer to section 9.3 "Pattern Set Parameter Setting".

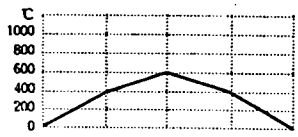
(3) Set the junction code to 9 using numeral key (and RVS key) and enter it with ENT key. At this instant the segment is deleted (deletion of the segment can be confirmed by checking the decrease of number of segments in the pattern with the arrow key).

① Example of pattern before deleting segment No.3



SEG	Segment No.	1	2	3	4	5
TSP	Target setpoint	400°C	600°C	600°C	600°C	0°C
TIME	Segment time	20min.	30min.	20min.	10min.	20min.
EV No.	Event No.	–	–	–	–	–
EV No.	Event No.	–	–	–	–	–
EVA	Event data	–	–	–	–	–
EVB	Event data	–	–	–	–	–
JC	Junction code	0	1	0	0	0

② Example of pattern after deleting segment No.3



SEG	Segment No.	1	2	3—4	4—5
TSP	Target setpoint	400°C	600°C	400°C	0°C
TIME	Segment time	20min.	30min.	10min.	20min.
EV No.	Event No.	–	–	–	–
EV No.	Event No.	–	–	–	–
EVA	Event data	–	–	–	–
EVB	Event data	–	–	–	–
JC	Junction code	0	1	0	0

- Subsequent segments to the deleted No.3 segment advances by one in number together with their data.

13. PROGRAM OPERATION DESIGNATION

13.1 Designating Program Pattern No. and Repeat

Select and set program patterns to be used for actual sebsequent operation out of some program patterns preset to the UP25 controller. In addition, by designating repeated operation, operation with a program pattern can be executed again and again.

Designate the operation program using each item of the operation parameters (for programmed operation) (see Ch.11).

The following four items are provided for setting items.

① Pattern No. *　　② Number of repeats

③ Repeat start segment No.　④ Repeat end segment NO.

(* Programmed operation always starts at the first segment.)

For example, assume that the program pattern is set as shown in Figure 13.1. When the operation program is designated as described below, the UP25 is operated as shown in Figure 13.2.

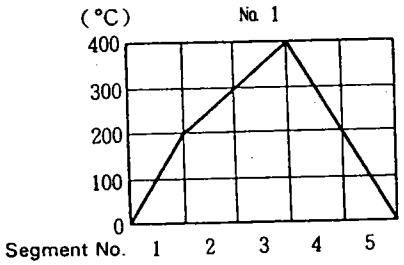


Figure 13.1 Example of Program Pattern

① Pattern No. = 1

② Number of repeats = 2**

③ Repeat start segment No. = 2

④ Repeat end segment No. = 4

** If the number of repeats = 0 is set (without repeat), the setting display for 3 repeat start and 4 repeat end Nos. is not displayed.

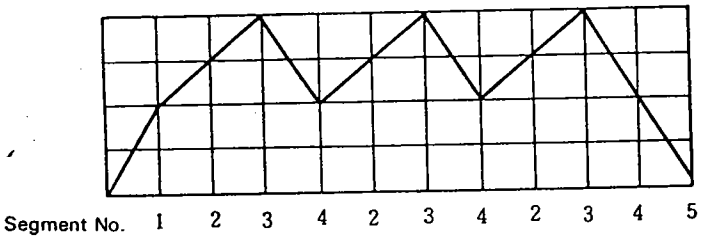


Figure 13.2 Operation Program

At the repeat start point, the basic parameter start code STC is referred to.

STC	
0	Fixed SP start : Repeat is begun at the repeat end segment.
1	PV start (SP velocity has priority) : Starts from PV at the repeat.
2	PV start (time has priority) : Starts from PV at the repeat.

13.2 Start Code

Designate with the start code (STC) at which value the program operation is started.

(1) Target setpoint (fixed SP) in local mode

(2) Measured value at start (PV start)

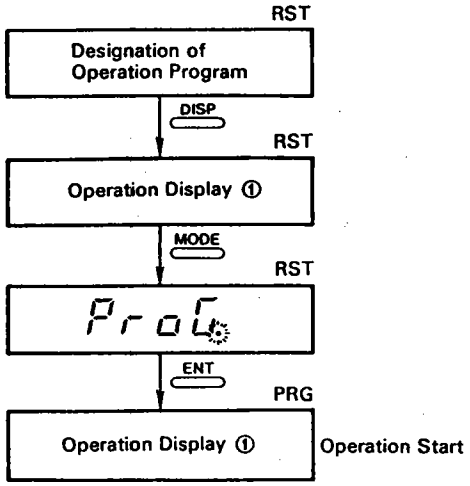
If starting TSP at 0°C as shown in Figure 12.1 with the measuring range zero point in negative region such as −200 to 1200°C of type K thermocouple, either start at fixed SP by setting the fixed SP to 0°C or set the actual program to the second and subsequent segments while setting TSP = 0°C and TIME = 0 min.(or seconds) for the first segment.

14. OPERATION

14.1 Starting Operation

When operations up to the designation of operation program is complete, once return to the Operation Display ① with DISP key.

Then, call the PROG. display with MODE key and subsequently press the ENT key to start operation (PRG lamp is lit).



14.2 Updating Pattern Setting Parameters during Operation

The UP25 controller pattern setting parameters can be updated during operation.

① If data updating affects the segment under execution, control is executed with the pattern and data before updating and the updated pattern and data are used in the next operation or the next repeat succeedingly.

② If data updating does not affect the segment under execution, control is immediately executed with updated new pattern and data.

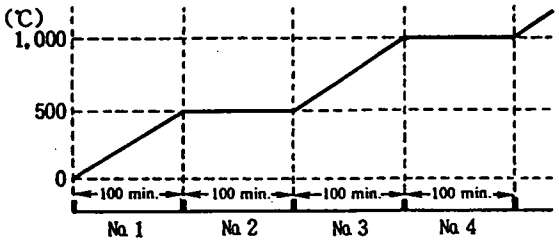
Table 14.1 Relationship Between Parameters and Modes

Item \ Mode	PROG. or HOLD	LOCAL	RST
[Operation Parameters] Pattern No. Number of repeats Repeat start Repeat end	×	○	○
[Program Pattern Selection with Remote Contact]	×	○	○
[Valve Opening Adjustment] PC 80 parameters	△ Permitted only in MAN mode	△ Permitted only in MAN mode	×
[Segment] TSP, TIME EV No. EVA, EVB	○	○	○
(Junction Code (JC) updating) Segment insertion Segment deletion	×	○	○
[Program] Program creation Program copying Program deletion	×	○	○

○ Possible △ Conditionally possible × Impossible

Example of Updating during Operation:

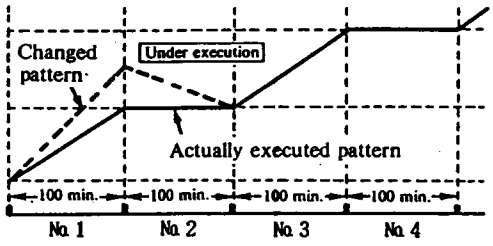
Two examples are shown when updating is performed during operation of the pattern shown in Figure 14.1.



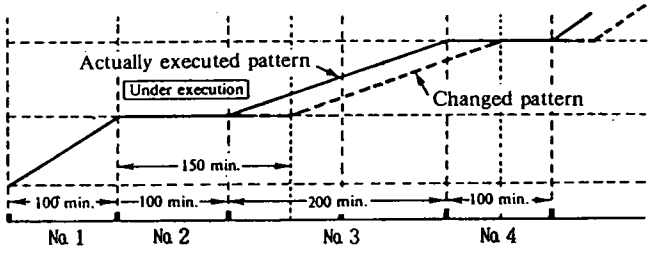
SEGNo.	1	2	3	4
TSP (℃)	500	500	1000	1000
TIME (分)	100	100	100	100

Figure 14.1 Example of Program Pattern

① During operation of No.2 segment, TSP of No.1 segment is changed to 750°C (the next operation is executed with the changed pattern):



② During operation of No.2 segment, TIME for No.2 segemnt is changed to 150 minutes and Time for No.3 segment, to 200 minutes (the next operation is executed with the changed pattern).



14.3 AUTO/MAN Operation

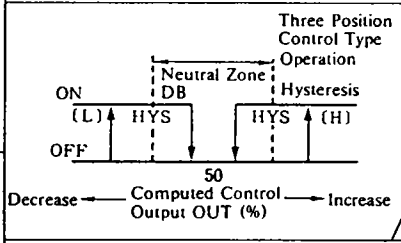
Refer to section 7.3 for changing modes with keys.

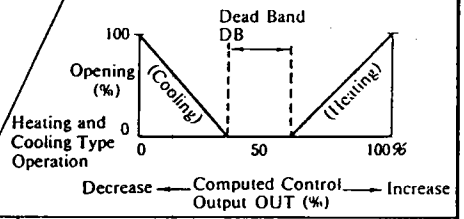
- Control output is transferred balanceless bampless in AUTO/MAN selection in either direction.
- In AUTO mode, operation is carried out with UP25 control output.
- In MAN mode, MAN lamp is lit.
- Output control in MAN mode should be performed using numeral ▲ , ▼ keys and RVS key with the screen in Operation Display ②.
  Only in MAN mode, ENT key operation for data entry is not necessary.
  In addition, the heating and cooling type controller can also be operated in Operation Display ③.

Relationship between key operation and control output is as shown in Table 14.2 (exapmples are of reverse action; action is reversed with direct action).

Table 14.2 Relationship between Key Operation and Control Output

Output type		▲ (or ▲*)	RVS + ▼ (or ▼*) (at a time)
Time proportional PID type	Proportional band P = 0	A relay or voltage pulse goes to ON state.	A relay or voltage pulse goes to OFF state.
	P ≠ 0	Relay or voltage pulse ON time increases.	Relay or voltage pulse ON time decreases.
Continuous output PID type	Proportional band P = 0	Control output 100% or high output limit value (OH) time increases.	Control output 0% or low output limit value (OL) is output.
	P ≠ 0	Control output increases.	Control output decreases.
Position proportional PID type		H (positive direction drive) relay circuit is closed.	L (reverse direction drive) relay circuit is closed.
Three position control type		Computed control output increases. As a result it operates as shown in the figure below left.	Computed control output increases. As a result it operates as shown in the figure below left.
Heating and cooling type		Computed control output increases. As a result it operates as shown in the figure above right.	Computed control output decreases. As a result it operates as shown in the figure above right.





14.4 Starting Programmed Operation

- When PROG. (porgram operation) mode is selected, program operation starts. When a program operation (repeat operation) is comlpeted, the mode is automatically changed to RESET or LOCAL.
- For operation mode selection with keys, see section 7.3.
- For operation mode selection through remote contact, see section 14.12.

14.5 Starting Fixed Setpoint Control

- When LOCAL mode is selected,a fixed setpoint control operation starts (PRG lamp goes off).
- For operation mode selection, see sesction 7.3.

14.6 Transferring to HOLD Mode

- HOLD mode is to temporarily halt the program progress during program operation. Control and event actions are continued.
- For operation mode selection with keys, see section 7.3.
  In HOLD mode, the HLD lamp is lit.
- For operation mode selection through remote contact, see section 14.12.
- If auto-tuning is executed in HOLD mode, the HOLD mode continues after completing auto-tuning.
- HOLD mode cannot be selected during auto-tuning (AT lamp flashes).

14.7 Executing ADVANCE Function

- Program progress can be advanced by one segment forward in the program operation status. This function is called ADVANCE Function.
- ADVANCE function can be executed only in PRG mode.
- For operation mode selection with keys, see section 7.3.
- For operation mode selection through remote contact, see section 14.12.
- If two segments or more are to be advanced, repeat the above procedure by times required.

14.8 Aborting Programmed Operation or Fixed Setpoint Control Operation

- Abort the operation by selecting the RESET mode.
  RST lamp is lit in RESET mode.
- For operation mode selection with keys, see section 7.3.
- For operation mode selection through remote contact, see section 14.12.
- Control output value when operation is aborted is the value set in item "preset output value (F-3)" in engineering parameters. This is the same either in AUTO or MAN mode.

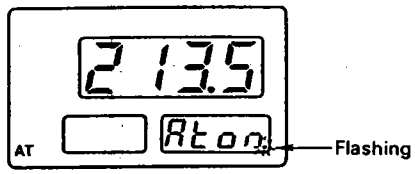
  (Note) When operation is aborted, the control output value cannot be updated with numeral , keys and key even in MAN mode.

- When the program operation is terminated, RESET mode is automatically selected if the junction code (JC) is 0 or 1 and the output takes the preset value. When JC = 3, LOCAL mode is automatically selected and the fixed point control operation status succeeds.

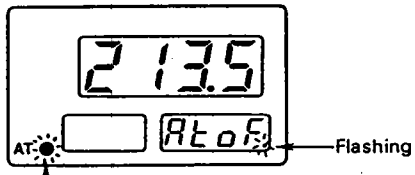
14.9 Executing Auto-Tuning (This function is not provided in ON/OFF operation (P = 0), three position control type, and heating/cooling model.)

- Auto-tuning is executed by pressing MODE key with Operation Display presented, displaying ATON (auto-tuning start) display, and entering it with ENT key (as a result the screen returns to Operation Display ①).
  AT lamp is lit while auto-tuning is carried out.
  When auto-tuning is completed, AT lamp goes off.
  If auto-tuning is to be aborted, press MODE key presenting ATOF (auto-tuning abortion) display and enter it with ENT key. If auto-tuning is aborted, AT lamp also goes off.

ATON (auto-tuning start) Display



ATOFF (auto-tuning abortion) Display



Flashing (ATON display is presented only during auto-tuning.)

Auto-tuning is a function for the UP25 controller to measure process characteristics and automatically set PID parameters. When auto-tuning is executed, the UP25 becomes an ON/OFF controller and outputs alternatively the maximum output*1 and the minimum output*2. The UP25 grasps the change of the process variable for this output, computes PID parameters suitable for the object process, and changes the PID parameters to these new ones.

*1 100% or high output limit value (OH)
However, 100% only for relay output or voltage pulse output.

*2 0% or low output limit value (OL)
However, 0% only for relay output or voltage pulse output.

There are two sets of PID parameters to be computed, which is selected with the tuning code (TC) in basic parameters (see Ch.11 Basic Parameter Table).

The target setpoint is fixed to the measured value at the start of auto-tuning during auto-tuning execution. The program progress goes into the status of temporary pause. After auto-tuning termination, the program continues to progress regardless of auto-tuning period. During auto-tuning, key-in operation, communication (RS-232-C or RS-422-A interface) and the remote setting functions are also stopped.

When auto-tuning is terminated, PID parameters for the target setpoint No. which have been executed are updated to the newly computed values. If auto-tuning is aborted on the way, PID parameters before starting auto-tuning are used for continuing the operation.

CAUTION

Do not apply auto-tuning to the following processes.
(1) Very fast response process such as flow or pressure processes.
(2) Processes which are largely affected by ON/OFF output even on a temporary basis.

14.10 Execution of "Super" Functions

To activate the overshoot suppression function, "Super", set the "super" code (SC) in the basic parameters to 1 or 2 (see the table below).

Set Tuning code (TC) to 0, in case of setting PID parameters manually.

"Super" Code (SC) \ Tuning Code (TC)		0	1 or 2
0	"Super" OFF	"Super" functions do not work.	"Super" functions do not work.
1	"Super" ON	Set PID parameters. "Super" functions work with PID parameters.	Execute Auto-tuning. "Super" functions work after executing Auto-tuning.
2		Set RID parameters. Super functions work slightly with PID parameters.	Execute Auto-tuning. "Super" functions work after completing Auto-tuning. Super functions work slightly.

14.11 Adjusting Valve Opening (Only with Position Proportional PID Control)

■ **Adjusting procedure is as shown below.**

(1) Select MAN and LOCL mode (see section 7.3 for mode selection). Apply power to final control elements (valve and others) to make them ready for driving with control signals from the UP25 controller.

(2) Call PC80 (valve opening adjustment) of the engineering parameters.
Using ENT key, the following display is presented.

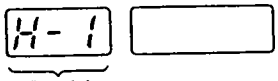
← Current valve position

Press the ENT key to reset the previous adjustment value. (Even when adjusting for the first time, press ENT key.) The display does not change.

(3) Press PARA key once to present the display for setting the fully closed valve position.

H-1 is displayed flashing (if the above resetting has not been done, it does not flash).

Drive the valve to the 0% position using numeral keys ▲, ▲ and RVS key [it is also permitted to obtain 0% position by manually operating the final control elements (valve and others)].
Enter it with ENT key.

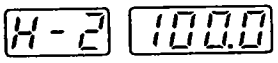


Flashing

(4) Press PARA key once to present the display for setting the fully open valve position.

H-2 is displayed flashing.

Drive the valve to the 100% position using numeral keys ▲, ▲ and RVS key [it is also permitted to obtain 100% position by manually operating the final control elements (valve and others)].
Enter it with ENT key (flashing stops).



(5) Operate the valve using numeral keys ▲, ▲ and RVS key (manual operation is also permitted) and confirm that the display is as shown below in the 0% position again. After confirmation, press DISP key to return to the Operation Display.

Displays for position 0% and 100% may vary slightly vary high or low because of the repeatability of the feedback resistor.

14.12 Restarting Operation at Power Recovery

- Entered data items are not lost even if power fails.
- For momentary power failure of 2 seconds or shorter, operation as immediately before power failure continues after power recovery.
- For power failure longer than 2 seconds duration, operation after power recovery can be designated with the restart code (F-4) of engineering parameters (see parameters list).

14.13 External Contact Signal and Event Signal Output (see Ch. Terminal Arrangement)

■ **Selection of Operation Mode with External (Remote) Contact**

If an optional code [EX] is specified, the operation mode can be selected with an external contact.

The contact employs a voltage-free contact and transfers the operation mode at the instant when the contact is closed for 2 seconds or more.

Since the contact has priority to key operation, when the contact is closed, selection of operation mode with keys cannot be performed.

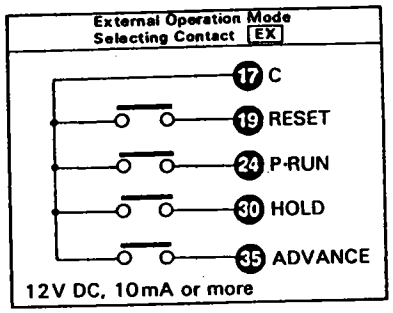


Figure 14.2

(Note) During program setting, selection of operation mode with external contacts cannot be performed.

> **NOTICE**
>
> When the UP25 receives a set command, data are stored in the EEP ROM. The EEP ROM's life expectancy (memory cell life) is about 100,000 writes. So, use the set command only when stored data must be changed; do not write data unnecessarily.

■ **Selection of Program Pattern No. with External Contacts**

If an optional code [PTNEX] is specified, the program pattern No. can be selected with an external contacts.

The contacts employ voltage-free hold contacts assigned with binary codes. Selection of program pattern No.with keys can be performed when all the contacts are open.

(Ex.)
- When designating the second pattern, close across the terminals ❽ and ❾.
- If designating the third pattern, close across the terminals ❾, ❼, and ❽.

(Note)
- In eight pattern model (same as four pattern model), even if the circuits are closed across terminals ❾, ❼, and ⓮, the pattern is not transferred because the ninth pattern does not exist.
- Selection of pattern No. with the external contacts is permitted when the UP 25 mode is either RESET or LOCAL.

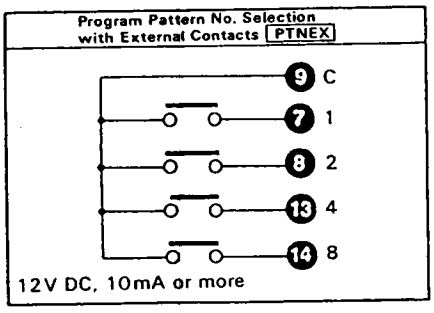


Figure 14.3

- When a program No. selecting signal or mode selecting signal is input during program setting, this selection is performed if the contact is closed when the program setting is completed and the screen is returned to Operation Display with [DISP] key.
  In this case, if the contact is open when the program setting is completed, the above selection is not performed.

■ Time Event Signal Output

The time event signal is output from a transistor open collector output. Four output contacts of No.1 to No.4 are provided as standard.

If the output is to be converted to relay output, use the relay box AU20 (supplied by YOKOGAWA).

When power is turned on, a time event output may instantaneously be output.

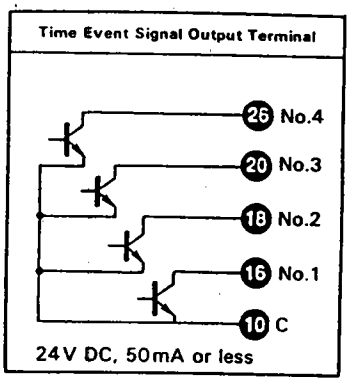


Figure 14.4

■ PV Even Signal Output

If the specification code of "with alarm" (alarm output = 1) is designated, the PV event signal terminals are added. This output is provided in the form of relay output.

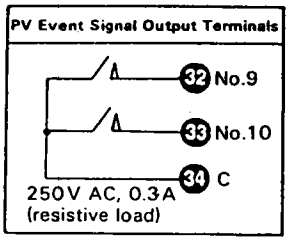


Figure 14.5

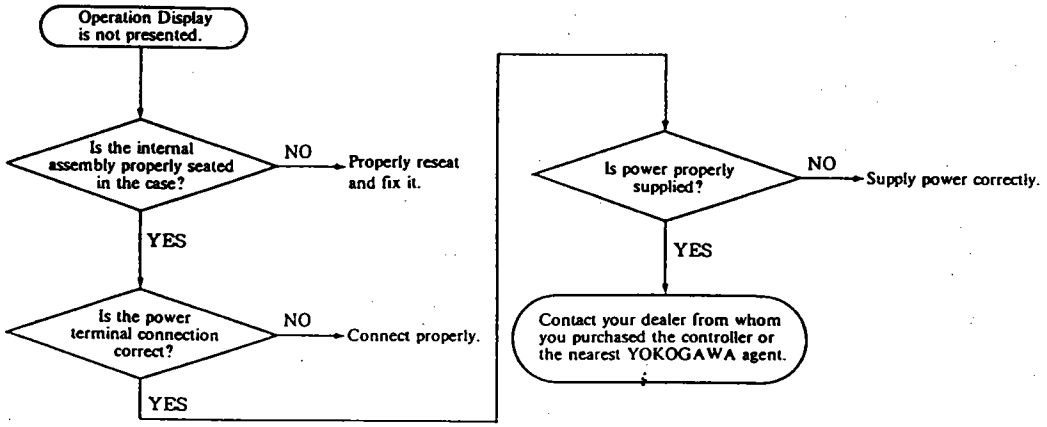
15. MAINTENANCE

- **Troubleshooting Flow**

If the Operation Display is not displayed even if UP25 power is turned on, treat it according to the troubleshooting flow.

If a complex problem is suspected, contact your dealer or the nearest YOKOGAWA agent.

Troubleshooting Flow



■ Performance of Failure Check Function

The UP25 controller has automatic failure check functions for the predetermined items at power ON.

When power is turned ON, items shown in Table 15.1 are automatically checked in the indicated sequence. If a failure is found, the display that shows the failed contents appears (if normal, Operation Display 1 appears).

Table 15.1 Failure Checking Items

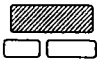
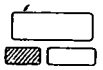
Sequence	Display Part	Failure Indication	Failure Name	Control Output	Disposition
①	Note ①	E000 / FAIL After showing displays	RAM error	Note ④	Requires repair. Note ⑤
②		E001 / FAIL After showing displays	ROM error	Note ④	Requires repair. Note ⑤
③		Decimal point of PV "." flashes	Calibration required.	Continues operation with error state.	Requires repair. Note ⑤
④		××20 is displayed (Notes ② and ③)	Range code error	Note ④	Re-set range code.
⑤		××40 is displayed (Notes ② and ③)	Parameter failure	Note ④	Re-set parameter Note ⑥
⑥		××80 is displayed (Notes ② and ③)	Data may differ before and after power failure	Continues control.	Press any one of operation keys.

Note ① Displayed in ▨ part.
Note ② Supply frequency used (50 or 60 Hz) is displayed in ×× part.
Note ③ Display other than 20, 40 or 80 shows that these failures coexist (C0.E0 etc.).
Note ④ Refer to "Selection of output value when failure occurs" described later.
Note ⑤ Contact your dealer where you purchased the controller or the nearest YOKOGAWA agent.
Note ⑥ Set all the items of set parameters, basic parameters and engineering parameters again.

■ Other Failure Displays List

For each item shown in Table 15.2, they are continuously monitored and when a failure is detected, it is displayed.

Table 15.2 Other Failure Items

Display part	Failure display	Failure type	Control output	Disposition
	After stopping updating for about 5 sec., displays FAIL	CPU failure	Note ②	Requires repair. Note ③
	b.oUt	Measuring input disconnection	Preset output value for AUTO mode. Manual output value for MAN mode.	Check thermocouple and its connection.
	oUr	Measuring input out of range (105% or more)	Control is continued at either limit of measuring input.	Check for measuring input range and sensor connection to determine if they are proper or not.
	-oUr	Measuring input out of range (−5% or less)	:	
	PV data and rJC (RJC) are alternately displayed.	Reference cold junction compensation failure	Control is continued ignoring reference cold jucntion compensation.	Requires repair. Note ③
	E200	Auto-tuning (AT) failure	Control is continued using PID parameters bvefore autotuning. Note ④	E200 can be erased by pressing any key. Execute AT again at another PV state.
	PV data and E300 are alternately displayed.	A/D converter error	Holds output value immediately before failure.	Requires repair. Note ③
	Parameter item display flashes.	EEPROM error	Control mode continues but operation mode and parameters cannot be updated. While power is normal, they are readable.	Requires repair. Note all parameters before turning off plower and replace the device. Then operation can be restarted by setting noted nparameters again. Note ③

Note ① Displayed in ▨ part.
Note ② Refer to "Selection of output value when failure occurs" described later.
Note ③ Contact your dealer where you purchased the controller or the nearest YOKOGAWA agent.
Note ④ In some processes, auto-tuning may be impossible. In that case, set PID parameters manually.

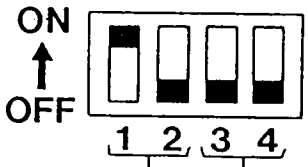
■ Selection of Output Value When Failure Occurs

Output values, in the case of failure, can be set in advance using a DIP switch.

When the DIP switch is to be operated, do it after turning off power and drawing out the internal assembly. (The internal assembly drawing out procedure and the DIP switch location are as shown in Figure 13.1.) Although the DIP switch is of four pole type, use only No.3 and No.4 subswitches for this purpose.

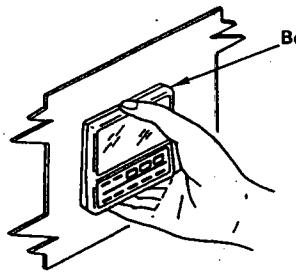
CAUTION

1) If No.1 and No.2 subswitches of the DIP switch are changed, problems may be realized. Never operate these two subswitches.
2) On shipment, No.1 subswitch is set to ON and the remaining No.2, No.3 and No.4 switches are set to OFF.

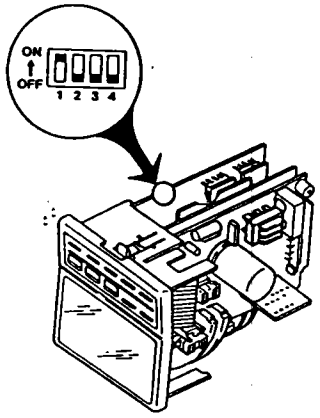


If No.1 and No.2 subswitches of the DIP switch are charged, problems may be realized. Never operate these two subswitches.

Relations of No.3 and No.4 subswitches to control output values in failed condition for each control action are as shown in Table 13.3.
(The output conditions not described in Table 13.3 are as described in Table 13.2.)



· Draw the entire bezel towared you while pressing the stopper at the bottom of the bezel.



· The DIP switch is located at the lower part of the internal assembly.

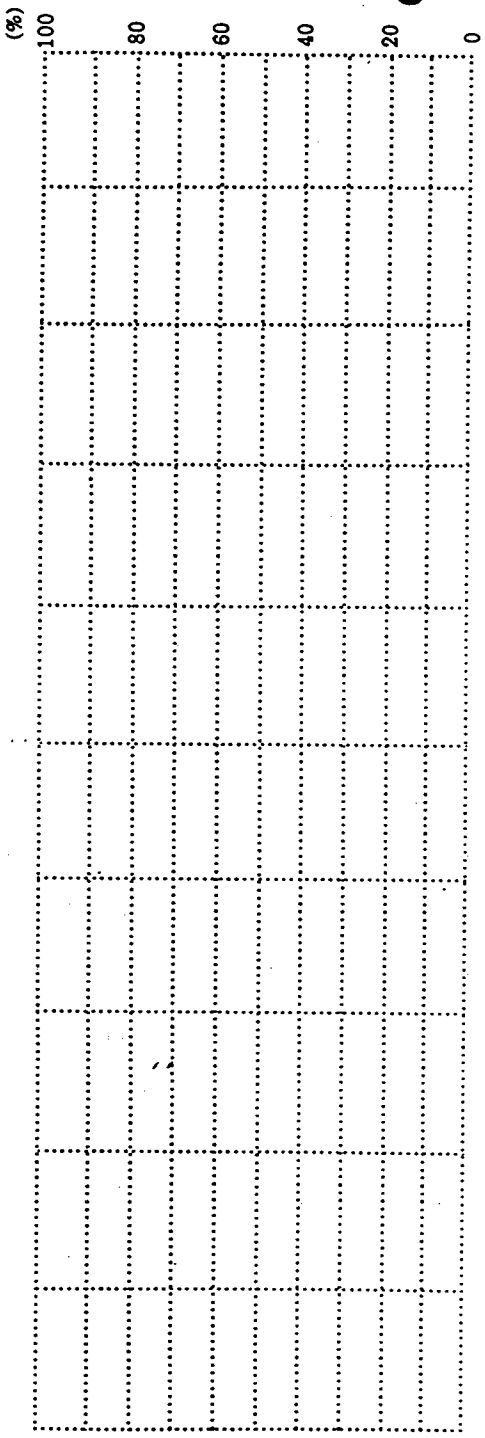
Figure 15.1 DIP Switch

Table 15.3

<table>
<tr><th colspan="2">Switch Position</th><th>Time proportional one output type (relay, voltage pulse)</th><th>Time proportional one output type (4 to 20 mA DC 1 to 5 V DC)</th><th>Heating/Cooling Type</th><th>Three position type/ position proportional PID type</th></tr>
<tr><td rowspan="2">No.3</td><td>ON</td><td>100% output</td><td>100% output (about 12.5% output for one with FAIL display)</td><td colspan="2" rowspan="2">Always set No.3 subswitch to OFF position for heating/cooling type, three position type and position proportional PID type.</td></tr>
<tr><td>OFF</td><td>0% output</td><td>0% output (about −25% output for one with FAIL display)</td></tr>
<tr><td rowspan="2">No.4</td><td>ON</td><td colspan="2" rowspan="2">Always set No.4 subswitch to OFF position for time proportional PID one output type and continuous output PID one output type.</td><td>Heating side: 100% output
Cooling side: 0% output
For one with FAIL display, 0% output on both heating and cooling sides. For continuous output PID, about −25% output</td><td>100% output
For one with FAIL display, both H and L releays are OFF. (regardless of No.4 subswitch ON/OFF)</td></tr>
<tr><td>OFF</td><td>Heating side: 0% output
Cooling side: 100% output
For one with FAIL display, 0% output on both heating and cooling sides. For continuous output PID, about −25% output</td><td>0% output
For one with FAIL display, both H and L relays are OFF. (regardless of No.4 subswitch ON/OFF)</td></tr>
</table>

* Failure accompanied by FAIL display : RAM error, ROM error, and CPU failure.
  Failure without FAIL display : Range code failure and engineering parameter failure

APPENDIX Program Pattern Setting Table



Program Pattern No.	

SEG	Segment No.															
TSP	Target setpoint to be reached															
TIME	Segment time															
EV1	Event No.1															
EVA	Event data															
EVB	Event data															
EV2	Event No.2															
EVA	Event data															
EVB	Event data															
EV3	Event No.3															
EVA	Event data															
EVB	Event data															
EV4	Event No.4															
EVA	Event data															
EVB	Event data															
JC	Junction code															