Instruction Manual

Model UP30 (Style B) Program Controller Operation Manual

CONTENTS

1. HANDLING CAUTIONS

The controller is thoroughly factory-tested before shipment. When the controller is delivered, check visually if any external damage on the controller and accessories has occurred during transit. Confirm that all standard accessories are supplied.

If you have any problem or question, please contact the nearest YOKOGAWA service station or the dealer from whom the controller was purchased.

1.1 Accessories

The accessories shown in Table 1.1 should be supplied with the controller. Check that nothing is missing.

Table 1.1 Accessories List

Accessories
1. Mounting Bracket .... 2 pcs.
2. Instruction Manual, Reference Manual .. 2 copies (If RS-422 interface is added, a separate copy of manual for the RS-422 interface is also attached.)
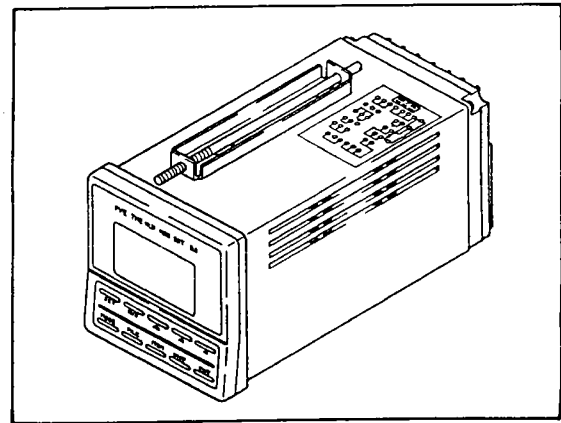
Figure 1.1 External View of UP30 Program Controller

2. CONTROLLER OUTLINES

2.1 Outline

Model UP30 Program Controller is a controller which changes the target setpoint according to the predetermined program to carry out PID control of processes. The controller can accommodate a large capacity of programs of max. 19 patterns (max. 99 segments per pattern), total 200 segments into a mere front size of 96 mm×96 mm. The controller uses a fluorescent matrix display tube for the front panel display and carries out operation guide to the operator through numerics, characters and graphics. Specifically, program progressing status can be traced clearly and accurately with the graphic screen.

As input signals, direct inputs from thermocouples (TCs) or RTDs and DC voltages and current signals (0 to 10 mV, 4 to 20 mA, etc.) can be used. Since the controller employs the multi-range system, users can freely set input types and ranges.

Multiple of functions such as auto-tuning, output/setpoint limiter, and output rate-of-change limiter are normally provided by skillful use of the one-chip microprocessor.

Optional specifications include transmitting output and communications (RS-422) functions.

3. CAUTION FOR OPERATION

For cleaning the front panel and key switches, do not use solvent such as alcohol, benzine, etc.

4. MOUNTING

4.1 Mounting Location

Mount the controller in the following places.
(1) A location where mechanical vibration is less.
(2) A location where corrosive gases are less.
(3) A location where there is little temperature variation and where the temperature is near normal value (23°C).
(4) A location where the controller is not directly subjected to high radiant heat.
(5) A location where electromagnetic field gives little influence on the controller.

4.2 Mounting Procedure

(1) Use a panel of 2 mm or more thick.
(2) Insert the controller from the panel front.
(3) Mount the controller to the panel using the attached mounting brackets. Do not tighten the bracket too strongly.
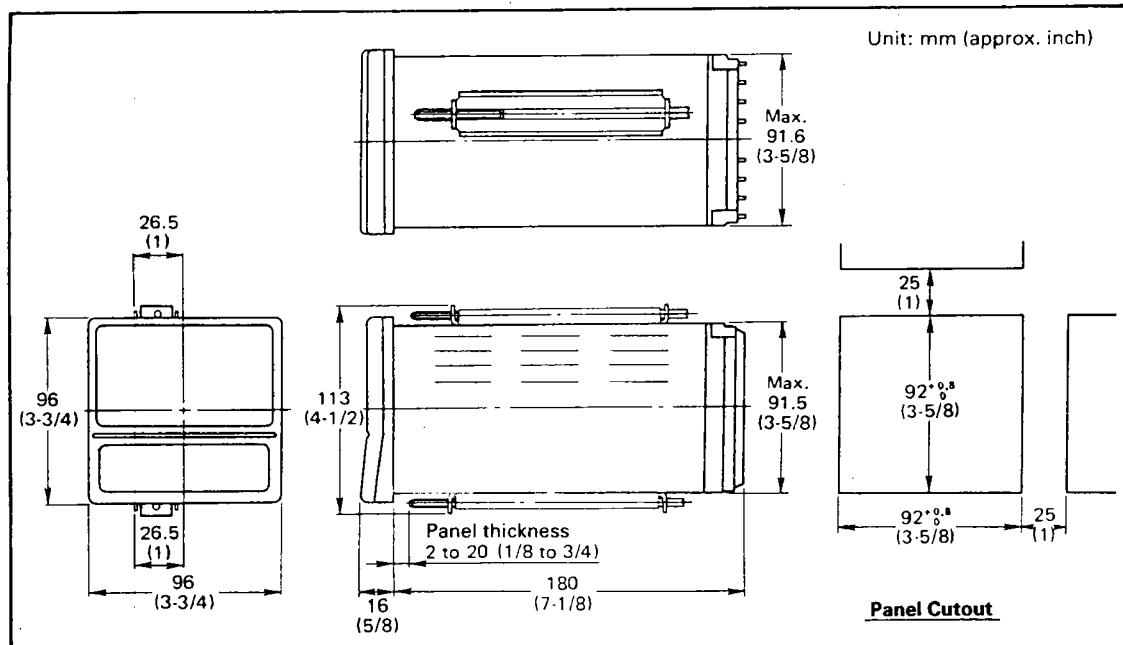
4.3 External Dimensions and Panel Cutout Dimensions

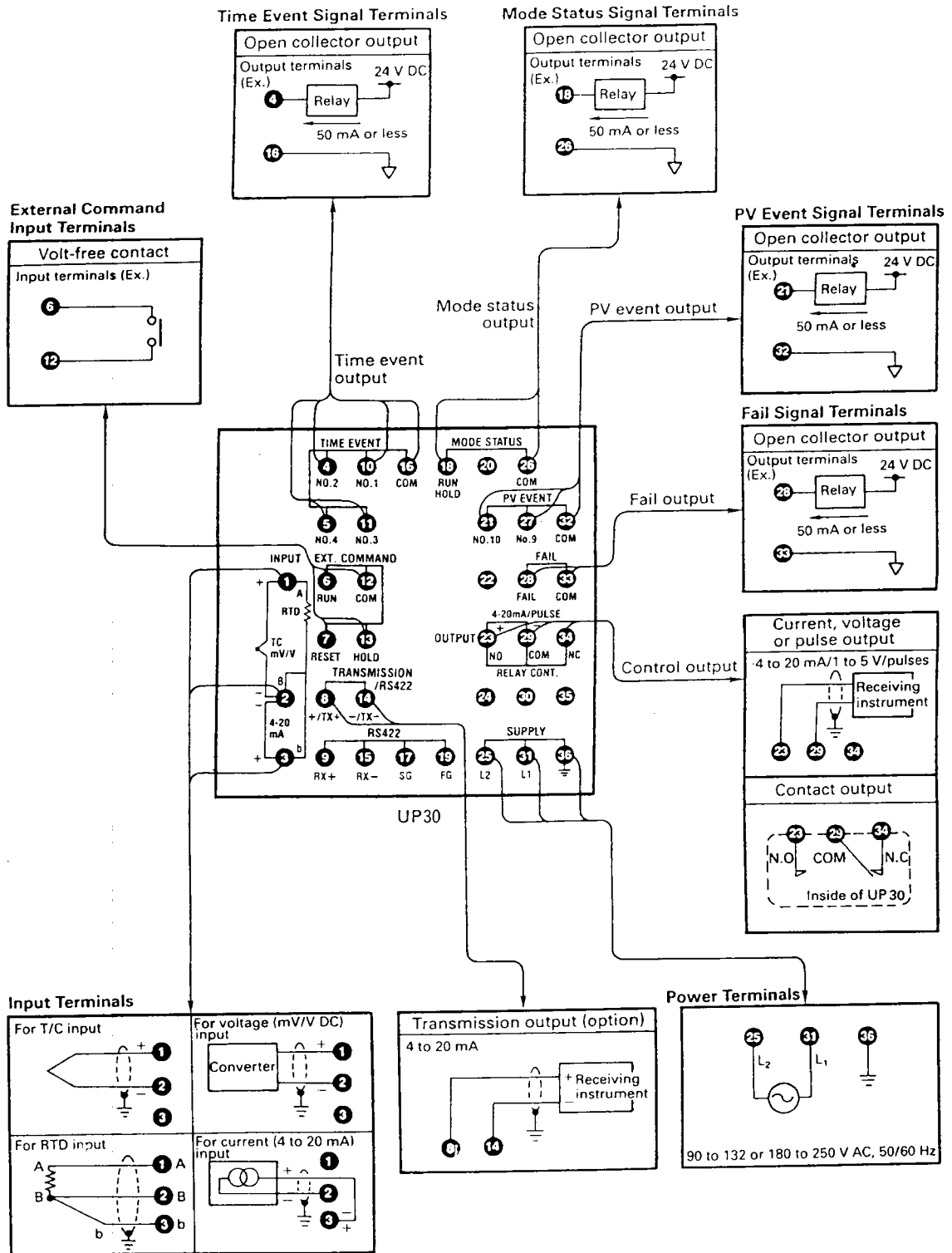Figure 4.1 UP30 External Dimensions

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5. TERMINAL WIRING

Figure 5.1 UP30 Terminal Assignment

Table 5.1 UP30 Terminal Description

Left group	No.	Signal	Description	Right group	No.	Signal	Description
Input terminals	1	+	mV/V input	Fail signal terminals	28	FAIL	Transistor open collector output
	2	−	TC input		33	COM. (Common)	
	3			Status signal terminals	18	RUN, HOLD	Transistor open collector output
	1	A	RTD input		26	COM. (Common)	
	2	B		Output terminals	23	+ Current/Voltage or Voltage pulse	
	3	b			29	− output	
	1				34		
	2	−	Current input		23	*NO (Normal open)	*(Note 3) Contact output
	3	+			29	COM. (Common)	
Power and ground terminals	31	L1	90 to 132 V AC or 180 to 250 V AC (to be specified) 50/60 Hz		34	*NC (Normal close)	
	25	L2		Transmission signal terminals	8	+ Measured input value (PV), Setpoint (SP) or Output transmission	
	36	⏚	Ground		14	− (Optional)	
Time event terminals	10	No.1		Communication terminals	8	TX+	
	4	No.2	Transistor open collector output		14	TX−	
	11	No.3			9	RX+	RS-422 (Optional)
	5	No.4			15	RX−	
	16	COM. (Common)			17	SG	
(Note 1) PV event terminals	27	No.9	Transistor open collector output		19	FG	
	21	No.10					
	32	COM. (Common)					
External command terminals	6	RUN (Operation)					
	7	RESET	(Note 2)				
	13	HOLD					
	12	COM. (Common)					

Note 1: Hereafter "measured value" is referred to "PV (process variable)" or "PV value".

Note 2: Give an external command with a make (ON) signal of 2 seconds or more via a volt-free contact.
The command that can be given in one operation is limited to one.

Note 3: Mark * shows NO or NC contact of a relay only.

6. WIRING

6.1 Wiring Instructions

Make wiring by referring to Figure 5.1 "UP30 Terminal Assignment" and the following descriptions.

(1) Use the specified compensating leadwires for thermocouple inputs.
(2) Use three wires which are each has low resistance and differences between any two wire resistances are nearly equal for RTD inputs.
(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 and its wiring. If necessary, insert a noise filter into the power supply circuit.
(4) Ground an earth terminal with a thick wire whose cross section is 2 mm^2 or more so that the grounding resistance is 100 Ω or less.
(5) Specifically devise wiring of input circuits so as not to induce noises.
  (a) Make input circuit wiring keeping it away from the power circuits and ground circuits.
  (b) Against noises due to static induction, use of shielded wire is effective. Connect the shield to the earth terminal of the controller as necessary. (Be careful not to make two-point grounding as a result.)
  (c) Against noises due to electromagnetic induction, input wiring twisted in a short pitch is relatively effective.
(6) When connecting wires to each terminal, it is recommended to use the crimping type terminal lug with insulating sleeve (for screws of ISO 3.5 mm).

CAUTIONS

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1) A fuse and power switch is not provided for the controller. If necessary, mount them inside the mounting panel.
2) In using the relay contact output which exceeds the contact rating of 250 V AC, 3 A, resistive load, turn ON/OFF the load by using an auxiliary relay.
3) If an inductive load such as an auxiliary relay is used as relay contact output, connect a CR filter (for AC) or a diode (for DC) in parallel with the load for spark elimination.

● **For DC Relay**
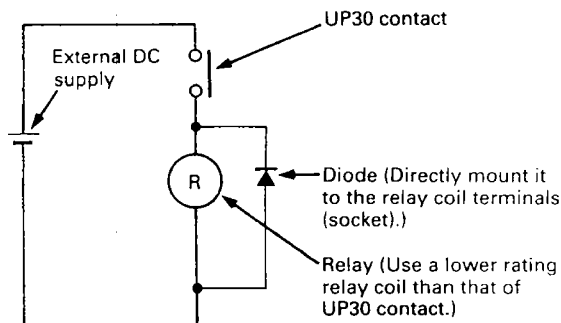
● **For AC Relay**

Attach the surge suppressor circuit across the relay coil terminals to protect the contact and prevent noises.

External DC supply — UP30 contact — Diode (Directly mount it to the relay coil terminals (socket).) — Relay (Use a lower rating relay coil than that of UP30 contact.)

UP30 contact — Surge suppressor circuit (Mount the components directly to the relay socket terminals.)
C = 0.01 to 1 μF (Withstand voltage : 3 times or more the working voltage)
R = 0.3Re to 1 Re

Re = Relay DC resistance
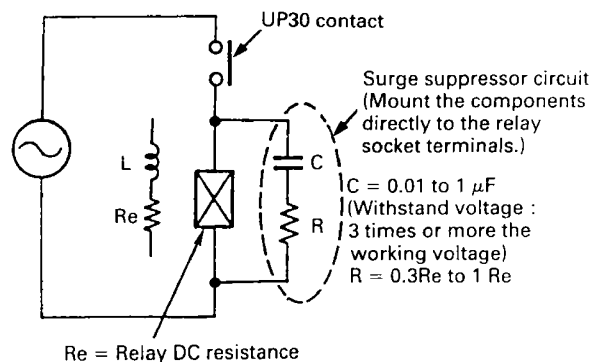
7. DISPLAYS

7.1 Indicator Lamps
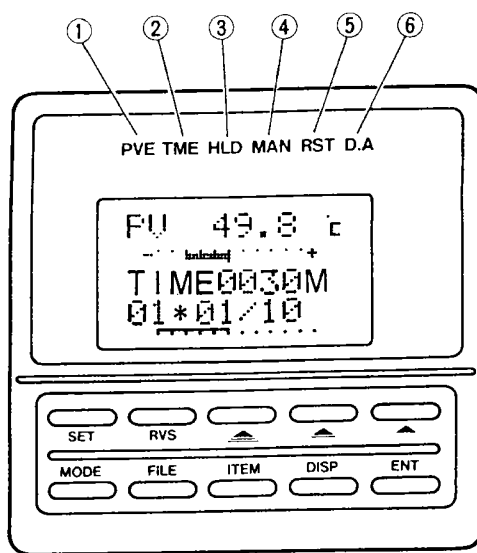
No.	Indicator Lamps	Description
①	**PVE** (red)	The lamp goes ON when the PV event output is ON. Which PV event output is ON can be confirmed by indicating Operation Display (the sixth display) with ⟨DISP⟩ key.
②	**TME** (red)	The lamp goes ON when the time event output is ON. Which time event output is ON can be confirmed by indicating Operation Display (the sixth display) with ⟨DISP⟩ key.
③	**HLD** (yellow)	This indicates a program progress holding (HOLD) status. However, control is carried out.
④	**MAN** (yellow)	The lamp goes ON in manual (MAN) status. The output value (OUT) can be controlled by key operation.
⑤	**RST** (yellow)	The lamp goes ON when reset (RESET). Indicates program operation and automatic control stopping status. Can be manually controlled (MAN).
⑥	**DA** (yellow)	The lamp goes ON when ⟨FILE⟩ and ⟨SET⟩ key is pressed and indicates program or parameter setting status. The lamp flashes in auto-tuning status.

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7.2 Operation Display

When power is turned ON, the Initial Display (the First Display) is first indicated.

There are six operation displays including the first display. During operation, leave the screen indicating any of the operation displays.

Bargraphs indicated in the first and second displays correspond to the full scale of 0 to 100% for indicating outputs and to the full scale of ±10% for indicating deviations.

Initial (First) Display

```
PV    325. 1 ℃
_ · · · · · · · · · · · +
TIME0030M
01*06/10
  ▫ · · · · · · · · ·
```
← Measured value (PV)
← Deviation (bargraph)
← Remaining time (TIME)
← Pattern No., Segment No., and Program size
← Output value (bargraph)

(Note)

Second Display

```
PV    325. 1 ℃
SP    325. 0 ℃
*06/10♯1
OUT    10. 0 %
  ▫ · · · · · · · · ·
```
← Measured value (PV)
← Target setpoint (SP)
← Segment No., Program size, and Current PID No.
← Output value (OUT)
← Output value (bargraph)

Third Display

```
PV    325. 1 ℃
SP    325. 0 ℃
TIME  0030M
01*06/10
  ▫ · · · · · · · · ·
```
← Measured value (PV)
← Target setpoint (SP)
← Remaining time (TIME)
← Pattern No., Segment No., and Program size
← Output value (bargraph)

Fourth Display

```
PV 325. 1    ℃
01*06/10
```
← Measured value (PV)
← Pattern No., Segment No., and Program size

} Pattern diagram
← Pattern progress diagram

Fifth Display

```
325. 1 ℃

01*06/10
```
← Measured value (PV)

← Pattern No., Segment No., and Program size

← **Sixth Display**

```
EV_ _ _ _ _ _ _ _
REP002/005
01*01~*08
```
} Event status display (EV)
  (Indicates the event output No. in ON state)
← Number of repeats executed, and Number of repeat settings
← Start segment, Repeat start segment, and Repeat end segment

Note: In manual operation (MAN), these displays only are indicated.

8. CONTROL

8.1 Control Keys

No.	Key and its Name	Description
Ⓐ	SET Set key	The key is valid only when reset (RST lamp is lit). This is used when the pattern No. of the program used for operation, the operation start segment No. and others at the start of program operation, are set.
Ⓑ	RVS Reverse key	This key is used together with the DATA SET keys, FILE key or ITEM key when a numerical value of data is to be decreased or a parameter item advance is to be reversed. This key is also used for output control in manual operation.
Ⓒ	Data set keys	The key is used when various data are to be set or changed at the keyboard. Use ▲ key for changing the least significant digit value of the data to be set. Use ▲ key for changing the numeric value of the second digit from the right. Use ▲ key for changing the numeric values of the third and more digits from the right. Any of these keys changes the value one digit by one if pressed in one touch every time but if continued to press, it changes the value subsequently. In addition, these keys can shift digits bidirectionally, not limited to carry. Pressing these keys while pressing RVS key decreases the numeric values. This key is also used for output control in manual operation.
Ⓓ	MODE Mode key	This key is used for specifying the following each mode. ○ Auto/Manual ○ Program advancing (ADVANCE) ○ Program operation/reset ○ Tuning ○ Program execution/hold
Ⓔ	FILE File key	The key is used for changing or indicating the setting contents. There are two types of file for this controller. ○ Parameter file ○ Program file
Ⓕ	ITEM Item key	The key is used when the setting item (ITEM) in the parameter file or program file is changed or displayed.
Ⓖ	DISP Display key	The key is used for the following purposes. ○ Transfer of Operation Display ○ Return to Operation Display from each mode such as mode selection, program or parameter setting. ○ Halt of auto tuning on its way (press together with RVS key).
Ⓗ	ENT Enter key	The key is used for the following purposes. ○ Data entry when setting various data. ○ Designation of executing auto tuning. ○ Selection of modes.

8.2 Key Operation Rules

Designation of Operation Program / **Setting and Selection of Operation Mode** / **Operation Display** / **Pattern Selection** / **Parameter Selection** / **Program Pattern Setting** / **Parameter Setting**

- Be sure to perform $\overset{ENT}{\Longrightarrow}$ when various data is to be set or modes are to be selected (for manual output only, $\overset{ENT}{\Longrightarrow}$ key is not necessary).
- When $\overset{}{\underset{SET}{\bigcirc}}$, $\overset{FILE}{\Longrightarrow}$, $\overset{MODE}{\Longrightarrow}$, or $\overset{ITEM}{\Longrightarrow}$ key is to be used, be sure to start operation at the Operation Display.

  For example, if $\overset{MODE}{\Longrightarrow}$ key is pressed to perform mode selection on the way of parameter setting, the controller does not operate.
- The screen returns to the initial display wherever $\overset{DISP}{\Longrightarrow}$ key is pressed.
- If a numerical value of data is to be decreased, press $\overset{}{\underset{RVS}{\bigcirc}}$ set key while continuing to press $\overset{}{\underset{SET}{\bigcirc}}$ key. If the parameter item advancing is to be reversed, press $\overset{}{\underset{RVS}{\bigcirc}}$ key while continuing to press $\overset{ITEM}{\Longrightarrow}$ key.

8.3 Data Key-in Operation

Key-in operation to store numeric values to setting items should be carried out in a common procedure.

Display	Operation
Lighting ──►D.A PV 24 °C # 1 P I D S E T P= 100. 0 %	• This display appears when $\overset{FILE}{\Longrightarrow}$ →PC=1 $\overset{ENT}{\Longrightarrow}$ operation is executed. • Invoke the setting items in the lower display. • When the setting items are invoked, D.A lamp is lit.
D.A PV 24 °C # 1 P I D S E T P= 50. 0? Flashing─┘	• Use $\overset{}{\underset{\blacktriangle}{\bigcirc}}$, $\overset{}{\underset{\blacktriangle}{\bigcirc}}$, $\overset{}{\underset{\blacktriangle}{\bigcirc}}$ (and $\overset{}{\underset{RVS}{\bigcirc}}$) keys to key-in numeric values. • Flashing "?" indicates that the displayed data is the key-in data.
D.A PV 24 °C # 1 P I D S E T P= 50. 0%	• Use $\overset{ENT}{\Longrightarrow}$ key to enter data. • Flashing "?" is changed to "%". • Control by new set values starts at the time when $\overset{ENT}{\Longrightarrow}$ key is pressed.

9. IMPLEMENTING PROGRAMMED OPERATION

For programmed operation of UP30 Controller, it is required to complete settings shown in ①, ②, and ③ in Figure 9.1. After setting, the controller is operated as shown in ④ and ⑤ in Figure 9.1.

Flow of settings ①, ②, and ③ is described in Chapter 10. SETTING in more details.

In this chapter, outline of the contents of those settings is described.
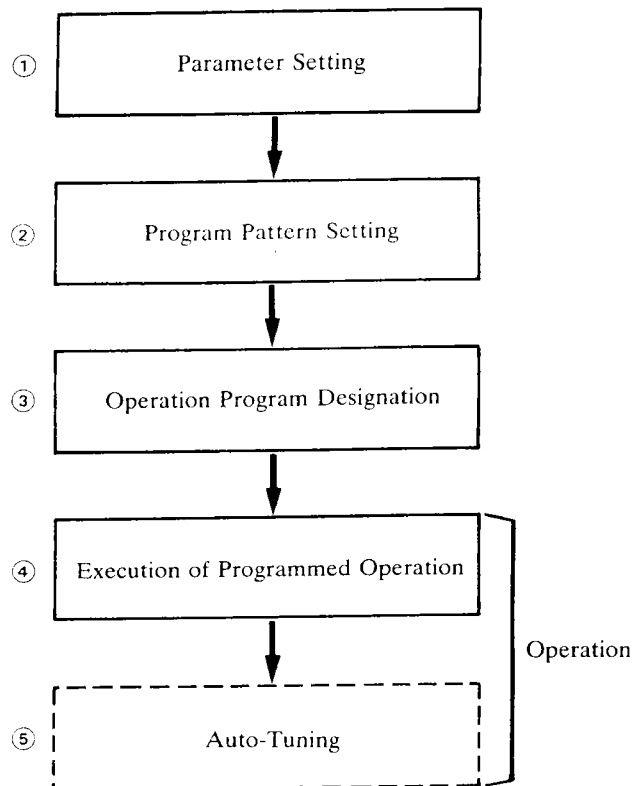
Figure 9.1 Outline of Programmed Operation

9.1 Parameters

Six types of parameter groups, common parameters PC = 0, control parameters PC = 1 to 8, zone table parameters PC = 9, ranging parameters PC = 10, setup parameters PC = 20, and file lock code PC = Pass Word, are provided in UP30 controllers.

Set each parameter referring to section 10.1 Flow of Setting. For each parameter contents, see section 10.2.1 Parameter Lists or Reference Manual (IM 4P2F3-20E).

9.2 Program Pattern

One program pattern is composed of segments as shown in Figure 9.2 (line-segment method *). Total applicable number of segments is 200. A segment is composed of the following items.

- Target value of setting to be reached [TSP]
  (target value to be reached in one segment)
- Segment time [TIME]
  (time for executing one segment)
- Event [EV#, EVA, and EVB]
  (see Table 10.3.)
- Junction code [JC]
  (see Table 10.4.)

Note: The start point of SP (target value) can be selected out of the following three using the start code [STC] and low limit setting value [E4].

(1) The low limit value of the measuring range

(2) The low limit value of measuring limit

(3) Measured value at the start point

If SP is to be started from 0°C for a measuring range having its zero point in negative region such as −200 to 1200°C of type K thermocouple, set either the low limit setting value [E4] to 0°C or TSP to 0°C and TIME to 0 minute in the first segment.

* Make use of the program pattern setting table provided at the end of this manual.
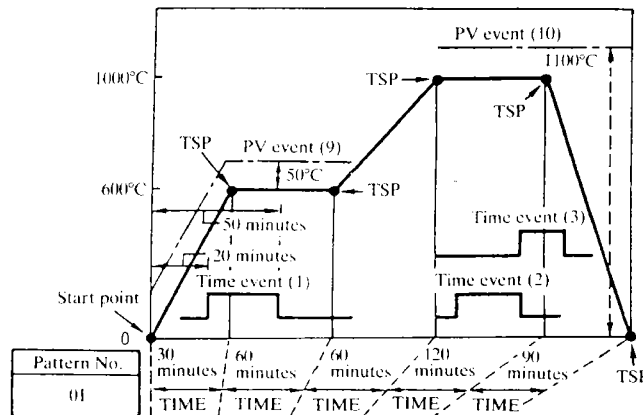
Segment No.		1	2	3	4	5	Remarks
Target setpoint TSP		600°C	600°C	1000°C	1000°C	0°C	Target setpoint to be reached
Time (TME)		30 min	60 min	60 min	120 min	90 min	Segment time
Event setting	EV#	1	—	—	2	—	Max. 4 sets per 1 segment
	EVA	20 min	—	—	20 min	—	
	EVB	50 min	—	—	80 min	—	
	EV#	—	—	—	3	—	
	EVA	—	—	—	100 min	—	
	EVB	—	—	—	140 min	—	
	EV#	9	—	9	10	—	
	EVA	3	—	0	1	—	
	EVB	50°C	—	50°C	1100°C	—	
	EV#	—	—	—	—	—	
	EVA	—	—	—	—	—	
	EVB	—	—	—	—	—	
Junction code (JC)		1	0	1	0	0	

Figure 9.2 Example of Program Pattern Setting List

9.3 Operation Program

Select and set programs to be used for actual subsequent operation out of some program patterns preset to this controller.

In addition, by designating repeated operation, operation with a program pattern can be executed again and again.

The following five items are provided for setting items.

① Program Pattern No.

② Operation start Segment No.

③ Number of Program Operation Repeats *

④ Repeat end Segment No.

⑤ Operation Start Segment No. at Repeated Operation

For example, assume that the following program pattern is set as described below.
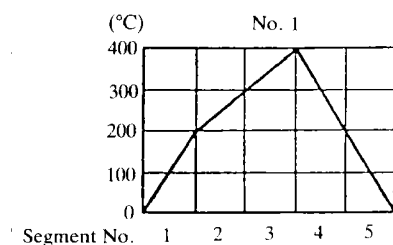
Figure 9.3 An Example of Program Pattern

Figure 9.4 shows the operation program when the following is set.

① Program pattern No. = 1

② Operation start segment No. = 2

③ Number of program operation repeats = 2 *

④ Repeat end Segment No. = 4

⑤ Operation start segment No. at repeated operation = 2
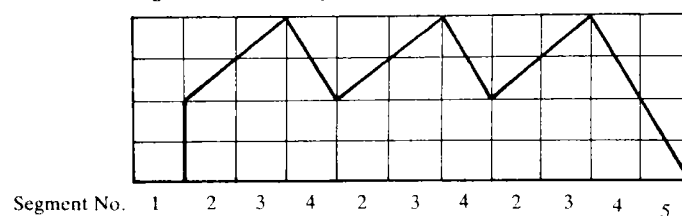
Figure 9.4

* If the number of program operation repeats = 0 is designated (no repeat), the display designating ④ Repeat end segment No. and ⑤ Operation start segment No. at repeated operation is not presented.

10. SETTING (DESIGNATION)

10.1 Flow of Setting (Designation)

Set various parameters, program patterns, and operation programs of the controller in accordance with the flow of setting shown on next page. If a measuring range is designated in advance, the already set ranging parameter (PC = 10) is file-locked (pass word is set to 100). Set parameters (PC = 0, PC = 1 to 8, PC = 9, PC = 10, PC = 20, PC = pass word) as necessary (unless otherwise set, operation is started with the values set on shipment from the factory as shown in Parameter List).

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Operation Display

Note : Setting the measuring range acts to change other target
values (TSP) or parameter values set previously.
If a measuring range is set, check the other set item values.

FILE

FILE FILE

① Program pattern setting

SET ② Operation program designation

**PC = 0
Common Parameters**

ENT D.A. is lit.

Wait zone (WZ)
Wait time (WT)
Manual reset value (MR)
Cycle time (CT) *1
Tuning code (TC)
Start code (STC)
Key lock code (LC)

ITEM

**PC = 9
Zone Table Parameters**

ENT D.A. is lit.

PID reference point No.1 (RP1)
PID reference point No.2 (RP2)
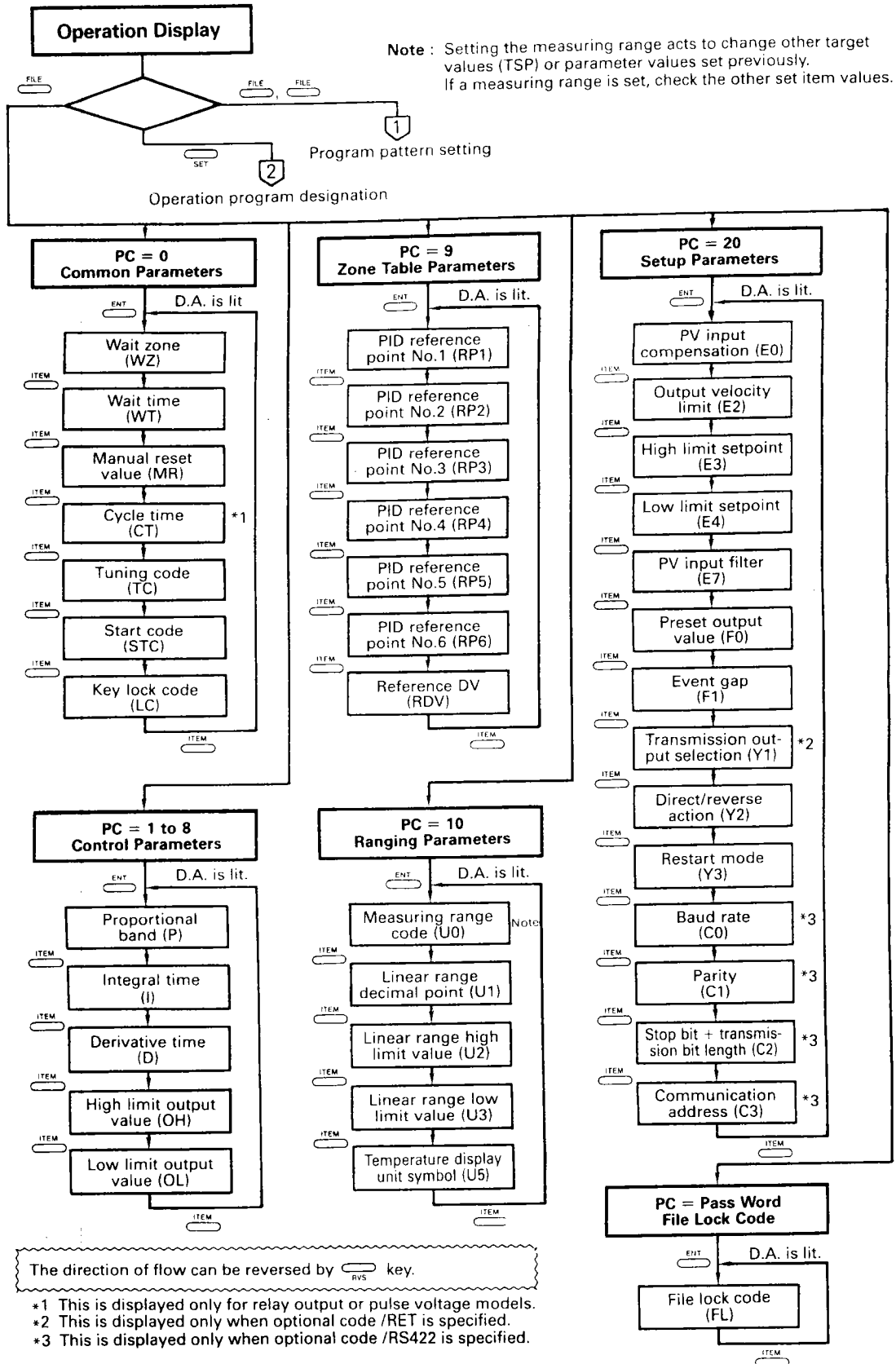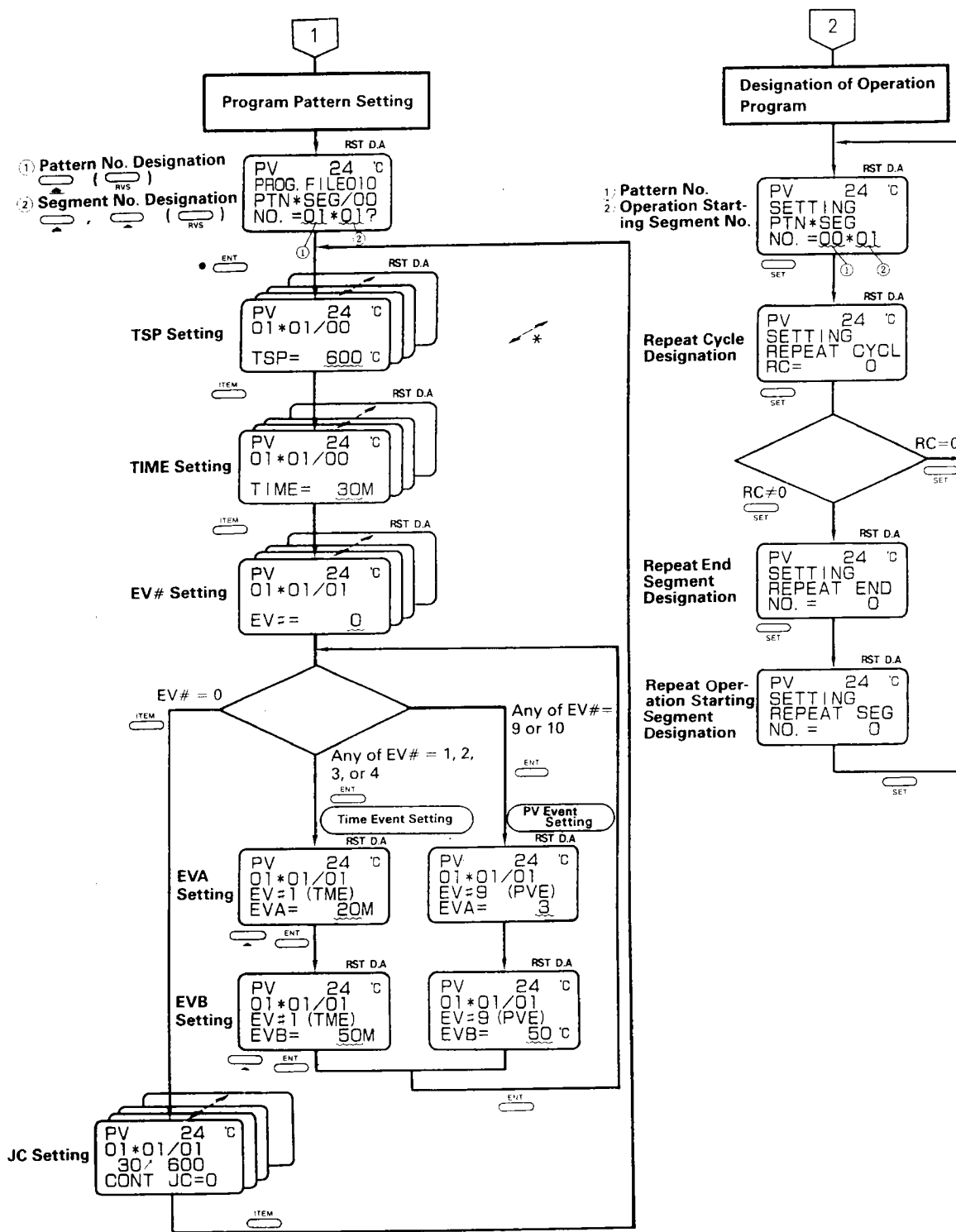PID reference point No.3 (RP3)
PID reference point No.4 (RP4)
PID reference point No.5 (RP5)
PID reference point No.6 (RP6)
Reference DV (RDV)

ITEM

**PC = 20
Setup Parameters**

ENT D.A. is lit.

PV input compensation (E0)
Output velocity limit (E2)
High limit setpoint (E3)
Low limit setpoint (E4)
PV input filter (E7)
Preset output value (F0)
Event gap (F1)
Transmission output selection (Y1) *2
Direct/reverse action (Y2)
Restart mode (Y3)
Baud rate (C0) *3
Parity (C1) *3
Stop bit + transmission bit length (C2) *3
Communication address (C3) *3

ITEM

**PC = 1 to 8
Control Parameters**

ENT D.A. is lit.

Proportional band (P)
Integral time (I)
Derivative time (D)
High limit output value (OH)
Low limit output value (OL)

ITEM

**PC = 10
Ranging Parameters**

ENT D.A. is lit.

Measuring range code (U0) Note
Linear range decimal point (U1)
Linear range high limit value (U2)
Linear range low limit value (U3)
Temperature display unit symbol (U5)

ITEM

**PC = Pass Word
File Lock Code**

ENT D.A. is lit.

File lock code (FL)

ITEM

The direction of flow can be reversed by ⊂⊃ RVS key.

*1 This is displayed only for relay output or pulse voltage models.
*2 This is displayed only when optional code /RET is specified.
*3 This is displayed only when optional code /RS422 is specified.

Figure 10.1 Flow of Setting Sequence (1/2)

IM 4P2F3-02E

Program Pattern Setting

Designation of Operation Program

① Pattern No. Designation (RVS)

② Segment No. Designation (,) (RVS)

RST D.A

```
PV      24  ℃
PROG. FILE010
PTN*SEG/00
NO. =01*01?
```

1: Pattern No.
2: Operation Start-
ing Segment No.

RST D.A

```
PV      24  ℃
SETTING
PTN*SEG
NO. =00*01
```

ENT

TSP Setting

RST D.A

```
PV      24  ℃
01*01/00

TSP=   600 ℃
```

Repeat Cycle Designation

RST D.A

```
PV      24  ℃
SETTING
REPEAT CYCL
RC=      0
```

ITEM

TIME Setting

RST D.A

```
PV      24  ℃
01*01/00

TIME=  30M
```

RC=0

RC≠0

ITEM

EV# Setting

RST D.A

```
PV      24  ℃
01*01/01

EV#=    0
```

Repeat End Segment Designation

RST D.A

```
PV      24  ℃
SETTING
REPEAT END
NO. =    0
```

EV# = 0

Any of EV# = 9 or 10

Repeat Oper-ation Starting Segment Designation

RST D.A

```
PV      24  ℃
SETTING
REPEAT SEG
NO. =    0
```

Any of EV# = 1, 2, 3, or 4

ENT

Time Event Setting

PV Event Setting

EVA Setting

RST D.A

```
PV      24  ℃
01*01/01
EV#=1 (TME)
EVA=   20M
```

RST D.A

```
PV      24  ℃
01*01/01
EV#=9 (PVE)
EVA=    3
```

EVB Setting

RST D.A

```
PV      24  ℃
01*01/01
EV#=1 (TME)
EVB=   50M
```

RST D.A

```
PV      24  ℃
01*01/01
EV#=9 (PVE)
EVB=   50 ℃
```

ENT

JC Setting

```
PV      24  ℃
01*01/01
30/  600
CONT  JC=0
```

ITEM

* If another segment data is to be seen or changed in the same setting item, transfer to the next segment can be done by FILE key.
In addition, if the above key is used together with RVS key, return to the previous segment can be done.

Figure 10.1 Flow of Setting Sequence (2/2)

10.2 Setting Items

10.2.1 Parameter Lists

For more detailed explanation of parameters, see Reference Manual (IM 4P2F3-20E).

> **Note:** Presentation on setting range and units specific to the controller will be described below.
>
> EU : Engineering unit
> EU ( ) : Presentation in engineering unit (°C, °F or scaling unit in linear input) corresponding to the position over the full scale.
> Example : When a full scale is −200 to 1200°C, the span is 1400°C and thus EU(5%) becomes −130°C.
> EU ( )S : Presentation in engineering unit (°c, °F or scaling unit in linear input) corresponding to the ratio of span.
> Example : When a full scale is −200 to 1200°C, the span is 1400°C and thus EU(5%)S becomes 70°C.

Common Parameter   PC = 0

Code	Setting Item	Unit	Setting Range	Value Set on Shipment	Remarks
WZ	Wait zone	EU	EU * (0.0 to 10.0%)S	0	When the PV set lies in the wait zone (WZ) at the end of one segment of operating program, the program advances to the next segment.
WT	Wait time	min.	0 to 100	0	Even if PV does not reach the wait zone, the next segment program is executed after WT time elapses.
MR	Manual reset value	%	−5.0 to 105.0	50.0	Use the parameter when the controller operates in P or PD action.
CT	Cycle time	sec.	1 to 100	10	Set transfer cycle of relay output ON-OFF. Displayed only for relay or voltage pulse outputs.
TC	Tuning code	—	0, 1, 2	2	0 : No auto tuning 1 : For processes likely to be hunting 2 : For general processes
STC	Start code	—	0, 1	0	0 : Zero start 1 : PV start See (Note 1) "Start Code".
LC	Key lock code	—	0 to 3	0	See (Note 2) "Key Lock Code".

(Note 1) Start Code

STC Code	Contents
0	Designates the zero point in PV input range (if the low setpoint limit (E4) is set, use this value) to the program starting point.
1	Designates the PV input value at the start to the program starting point.

(Note 2) Key Lock Code

By setting this code, keys shown in the following table are locked. Even if [FILE] key is locked, key lock codes only can be displayed and altered.

LC Code	Keys to be Locked
0	None
1	FILE , ITEM
2	FILE , ITEM , MODE
3	FILE , ITEM , MODE , SET

Control Parameters   PC = 1 to 8

Code	Item	Unit	Setting Range	Value Set on Shipment	Remarks
P	Proportional band	%	0.1 to 999.9	100.0	
I	Integral time	sec.	0, or 1 to 6000	0	0 = OFF
D	Derivative time	sec.	0, or 1 to 6000	0	0 = OFF
OH	Output high limit value	%	−5.0 ≦ OL < OH ≦ 105.0	100.0	
OL	Output low limit value	%		0.0	

Zone Table Parameters   PC = 9

Code	Item	Unit	Setting Range	Value Set on Shipment	Remarks
RP (No. 1 to No. 6)	PID reference point	EU	EU (0%) to EU (100%)	EU (100%)	No.1 to No.6 are provided. Set PV values where PID parameter set is changed.
RDV	Reference DV	EU	EU (0%)S to EU (10%)S	EU (0%)S	EU (0%) = OFF

Ranging Parameters   PC = 10

Code	Item	Unit	Setting Range	Value Set on Shipment	Remarks
U0	Measuring range code	—	000 to 215	131 for TCs, DC voltage, and DC current 201 for RTDs.	Refer to Table 10.1 and Table 10.2.
U1	Linear range decimal point	—	0 to 3	1	0 : −1999 to 9999 1 : −199.9 to 999.9 2 : −19.99 to 99.99 3 : −1.999 to 9.999
U2	Linear range high limit value	EU	−1999≦U3 <U2≦9999	100.0	
U3	Linear range low limit value	EU	−1999≦U3 <U2≦9999	0.0	
U5	Temperature display unit	—	0, 1, or 2	0	0 : °C 1 : °F 2 : None (Can be set only for linear inputs)

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Table 10.1 Thermocouple and Voltage Input Code

Types of Input		Measuring Range Code	Measuring Range	
			°C	°F
Thermo-couple	R	100	0 to 1700	32 to 3100
	S	110	0 to 1700	32 to 3100
	B	120	0 to 1800	32 to 3300
	K	130	0.0 to 800.0	32 to 1500
	K	131	−200 to 1200	−300 to 2300
	E	140	0.0 to 800.0	32 to 1500
	J	150	0.0 to 800.0	32 to 1500
	L(DIN)	151	0.0 to 800.0	32 to 1500
	T	160	−199.9 to 400.0	−300 to 750
	U(DIN)	161	−199.9 to 400.0	−300 to 750
	N	170	0 to 1300	32 to 2400
	W	180	0 to 2300	32 to 4200
mV or mA DC		000	0.00 to 10.00 mV	−1999 to 9999 Scaling available (Decimal point changeable)
		001	−10.00 to 10.00 mV	
		010	0.0 to 100.0 mV	
		011	−100.0 to 100.0 mV	
		050	4.00 to 20.00 mA	
DC voltage		020	0.000 to 1.000 V	−1999 to 9999 Scaling available (Decimal point changeable) Optional spec.
		021	−1.000 to 1.000 V	
		030	0.000 to 5.000 V	
		031	1.000 to 5.000 V	
		040	0.00 to 10.00 V	

Applicable to Model code UP30-1□□.

Table 10.2 RTD Input Code Table

Measuring Range Code	RTD Type	Measuring Range	
		°C	°F
200	Pt100Ω (JIS)	0.0 to 100.0	32.0 to 212.0
201		0.0 to 200.0	32.0 to 400.0
202		0.0 to 400.0	32.0 to 750.0
203		−50.0 to 150.0	−50.0 to 300.0
204		−100.0 to 100.0	−150.0 to 212.0
205		−199.9 to 500.0	−300 to 1000
210	Pt100Ω (DIN)	0.0 to 100.0	32.0 to 212.0
211		0.0 to 200.0	32.0 to 400.0
212		0.0 to 400.0	32.0 to 750.0
213		−50.0 to 150.0	−50.0 to 300.0
214		−100.0 to 100.0	−150.0 to 212.0
215		−199.9 to 500.0	−300 to 1000

Applicable to Model code UP30-2□□.

Setup Parameters   PC = 20

Setup parameters enables the controller to be operated with more advanced functions.

If these parameters are not specifically required, operate the controller without setting them (operated at the value set on shipment from the factory).

Code	Setting Item	Unit	Setting Range	Value Set on Shipment	Description
E0	PV input compensation	EU	EU(−5.0%)S to EU (5.0%)S	EU(0%)S	
E2	Output velocity limit	%/s	0, 1 to 100	0	Set output velocity limit in AUTOmatic operation (0 means OFF.)
E3	High limit of setting	EU	EU(0%)≦E4 <E3≦EU(100%)	EU(100%)	Designate settable range of target setpoint (TSP).
E4	Low limit of setting	EU		EU(0%)	
E7	PV input filter	sec.	0, 1 to 120	0	Set time constant of the filter for rejecting noises in PV input. (0 means OFF.)
F0	Preset output	%	−5.0 to 105.0	0.0%	Set the output values in burnout status or operation reset status.
F1	Event gap	EU	EU(0%)S to EU(5%)S	EU(0.5%)S	Set hysteresis width for PV event ON/OFF.
Y1	Transmission output selection	—	0 to 4	0	0: PV (for that range) 1: SP (for that range) 2: Output value 3: PV (for E3 to E4) 4: SP (for E3 to E4)
Y2	Direct/reverse action	—	0, 1	0	0: Reverse action 1: Direct action
Y3	Restart mode	—	0, 1, 2	0	0: succession (the as status of before power interruption) 1: Manual operation 2: Reset
C0	Baud rate	—	0 to 6	6	Displayed only for communication/RS-422 (optional specification) designated. Refer to Instruction Manual for RS-422 Interface for UT30, UT40, UP30 or UP40 Communications. (IM 5B4B3-10E)
C1	Parity	—	0, 1, 2	0	
C2	Stop bit + character length	—	0, 1, 2, 3	2	
C3	Communication address	—	1 to 16	1	

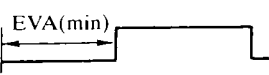**File Lock Code   PC = Pass Word**

Code	Setting Item	Unit	Setting Range	Value Set on Shipment	Description
FL	File lock code	—	0, 1, and 2	0	Parameters to be locked: 0: None, 1: PC = 10, 2: PC = 10 and 20

10.2.2 Program Pattern Setting Items

Code	Setting Item	Unit	Setting Range	Value Set on Shipment	Description
PTN	Pattern No.	—	0 to 19	No entry	Although 19 patterns and total 200 segments can be set in UP30, the number of segments settable in one pattern is max. 99.
SEG	Segment No.		0 to 99		
TSP	Target set point to be reached	EU	E4 to E3	EU (0%)	
TIME	Segment time	min.	0 to 9999	No entry	
EV#	Event No.	—	●0 ●1 to 4 ●9 and 10	0	●0: No event output ●1 to 4: Time event ●9 and 10: PV event
EVA	Event data	Refer to Table 10.3.			
EVB					
JC	Junction code	Refer to Table 10.4.			

Table 10.3 Event Setting Items

Setting Item	Time Event Setting Contents	PV Event Setting Contents
Event No. EV#	#1 to #4 ; Time event output	#9 and #10 ; PV event output
Event data EVA	ON time EVA(min)	Event mode 0: OFF, 1: PV high limit, 2: PV low limit 3: Positive deviation high limit 4: Negative deviation low limit
Event data EVB	OFF time EVB(min)	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 event setpoint and PV or deviation is started.

● Event setting is effective after startup until termination of operation over segments.

● Event can be set by changing the setting content again and again for the same number. The preceding setting becomes invalid whenever resetting of event is restarted.

● The event setting can be done four times per segment.

Table 10.4 Junction Code List

JC = 0	This is set when the next segment is subsequently executed after executing the program of the segment.
JC = 1	This is set when the program is moving to the next segment after executing the wait operation is carried out.
JC = 2	This provides the holding action after executing the program of that segment. In this case, the HOLD lamp is lit. If ADVANCE is performed in that segment, HOLD action is not executed and the program proceeds to its next segment.
JC = 8	This is set if the specific program segment is to be added and inserted. (See Reference Manual IM 4P2F3-20E)
JC = 9	This is set when the specific program segment is to be cancelled. (See Reference Manual IM 4P2F3-20E)
JC = /	This shows that the segment is not programmed (the segment time setting is not performed).

10.2.3 Operation Program Designation Items

Code	Setting Item	Unit	Setting Range	Value Set on Shipment	Description
PTN SEG	Pattern No. Segment No.	—	Range in which the program pattern is set	No entry	Designate the program pattern No. and the operation start segment.
RC	Repeat cycle	times	0 to 999	0	A program between the operation start segment and repeat end segment is repeated by the designated number of times.
RE	Repeat end	—	Range in which the program pattern is set	No entry	Designate the repeat end segment.
RS	Repeat start	—	Range in which the program pattern is set	No entry	Designate the operation start segment No. at the repeat operation.

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11. OPERATION

11.1 Operation Start

When setting is completed to designation of operation program, once return to the Operation Display (Initial Display) with ⊂DISP⊃ key.

Then, as shown in the flow diagram, call the reset—operation selecting display with twice pressing ⊂MODE⊃ key (MODE MODE) and press ⊂ENT⊃ key to start operation.

```
                          RST
        ┌─────────────────────┐
        │ Designation of      │
        │ Operation Program   │
        └─────────────────────┘
                  │        DISP
                  │       ⊂═⊃
                  ▼        RST
        ┌─────────────────────┐
        │ Operation Display   │
        │ (Initial Display)   │
        └─────────────────────┘
                  │    MODE   MODE
                  │   ⊂═⊃    ⊂═⊃
                  ▼        RST
        ┌─────────────────────┐
        │ Reset → Operation   │
        │ (RESET → RUN)       │
        └─────────────────────┘
                  │         ENT
                  │        ⊂═⊃
                  ▼
        ┌─────────────────────┐
        │ Operation Display   │    "Operation Start"
        │ (Initial Display)   │
        └─────────────────────┘
```
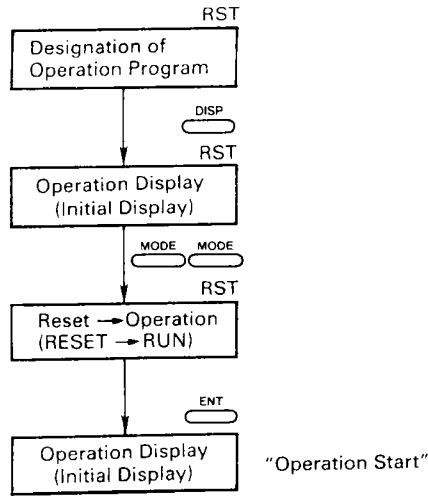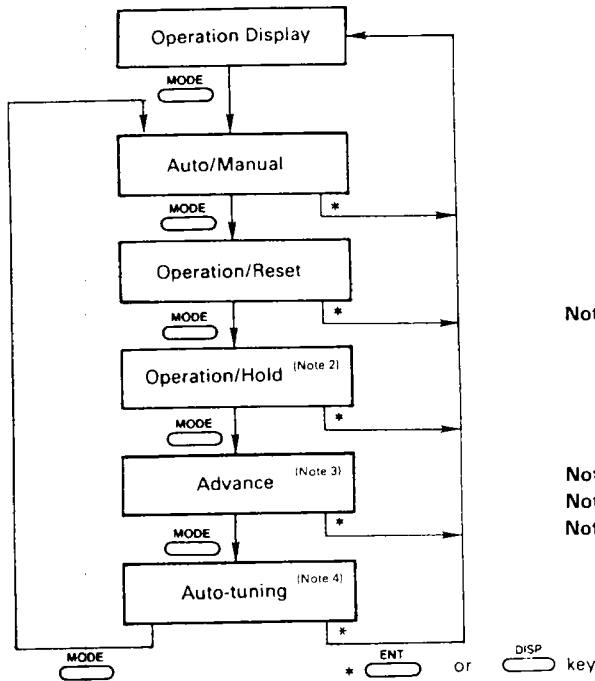
11.2 Flow of Operation Mode Selecting Procedure

```
        ┌─────────────────────┐ ◄───────────┐
        │ Operation Display   │             │
        └─────────────────────┘             │
            │ MODE                           │
            ▼                                │
        ┌─────────────────────┐             │
        │ Auto/Manual         │             │
        └─────────────────────┘             │
            │ MODE          * ──────────────┤
            ▼                                │
        ┌─────────────────────┐             │
        │ Operation/Reset     │             │
        └─────────────────────┘             │
            │ MODE          * ──────────────┤
            ▼                                │
        ┌─────────────────────┐             │
        │ Operation/Hold (Note 2)│          │
        └─────────────────────┘             │
            │ MODE          * ──────────────┤
            ▼                                │
        ┌─────────────────────┐             │
        │ Advance    (Note 3) │             │
        └─────────────────────┘             │
            │ MODE          * ──────────────┤
            ▼                                │
        ┌─────────────────────┐             │
        │ Auto-tuning (Note 4)│             │
        └─────────────────────┘             │
            │              * ───────────────┘
       MODE
                    * ⊂ENT⊃  or  ⊂DISP⊃ key
```

Note 1 : If ⊂ENT⊃ key is pressed with "?" flashing in each mode, the current mode is changed to the next mode and at last returned to the initial display.
If ⊂DISP⊃ key is pressed, the current screen is returned to the initial display without mode change.

Note 2 : This is not displayed in reset status.

Note 3 : This is not displayed in reset status.

Note 4 : This is not indicated in any of the following statuses.
● Reset status
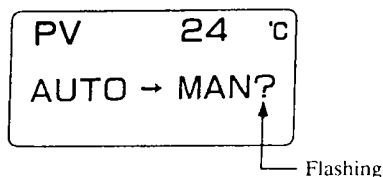● Manual status
● Tuning code = 0

IM 4P2F3-02E

11.2.1 Auto/Manual Transfer (AUTO/MAN)

The controller can control the output by transferring to manual operation during program operation and by operating keys on the front panel.

Manual operation can also be returned to the program operation.

Auto ⇄ manual transfer is balanceless bumpless in either direction.

① Present the display shown below with ⊂MODE⊃ key.

```
┌──────────────────┐
│ PV      24   ℃   │
│                  │
│ AUTO → MAN?      │
│             ↑    │
└──────────────────┘
              └── Flashing
```
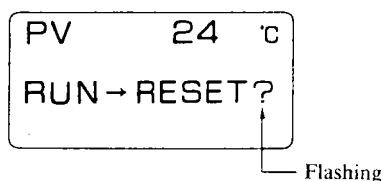
② Enter the mode with ⊂ENT⊃ key.

11.2.2 Operation/Reset Transfer (RUN/RESET)

When the program operation is to be suspended, select the reset (RESET) mode.

The output becomes the preset output value (in AUTO) or the manual control value (in MAN).

① Present the display shown below with ⊂MODE⊃ key.
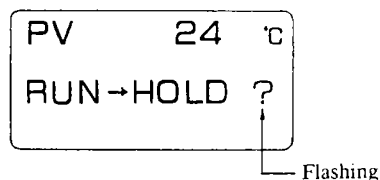
```
┌──────────────────┐
│ PV      24   ℃   │
│                  │
│ RUN → RESET?     │
│             ↑    │
└──────────────────┘
              └── Flashing
```

② Enter the mode with ⊂ENT⊃ key.

11.2.3 Operation/Hold Transfer (RUN/HOLD)

Program progress can be temporarily stopped in program operation status. This function is called Hold Function.

Control and event actions are continued.

① Present the display shown below with ⊂MODE⊃ key.

```
┌──────────────────┐
│ PV      24   ℃   │
│                  │
│ RUN → HOLD  ?    │
│             ↑    │
└──────────────────┘
              └── Flashing
```

② Enter the mode with ⊂ENT⊃ key.

(1) If auto tuning is executed in hold status, hold status continues after auto tuning is completed.
(2) Transfer to the Hold status cannot be obtained during executing auto tuning (DA lamp is flashing).
(3) Transfer to the Hold status cannot be obtained in other than program operation status (RUN).

11.2.4 Advance Function (ADVANCE)

Program progress can be advanced by one segment forward in the program operation status. This function is called Advance Function.

Advance function cannot be executed in other than program operation status (RUN).

① Present the following display with $\overset{\text{MODE}}{\longleftrightarrow}$ key.

```
PV      24   'c

→  ADVANCE?
                │
```
└── Flashing
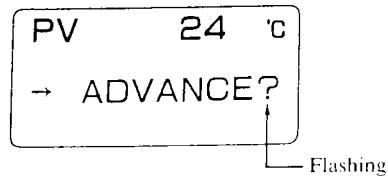
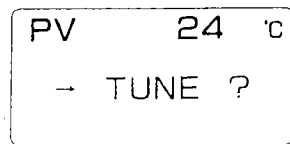② Enter it with $\overset{\text{ENT}}{\longleftrightarrow}$ key.

If two segments or more is to be advanced, repeat the above procedure by times required.

11.2.5 Auto Tuning Function

Auto tuning is a function to compute optimum PID parameters at a setpoint and set those automatically.

When auto tuning is started, the D.A lamp on the front panel flashes and when terminated, the lamp goes OFF.

① Present the display shown below with $\overset{\text{MODE}}{\longleftrightarrow}$ key.

```
PV      24   'c

→   TUNE  ?
```

② Enter it with $\overset{\text{ENT}}{\longleftrightarrow}$ key.
   D.A lamp flashes and the second operation display is indicated.

(1) The status where auto tuning is possible is such that the controller is executing program operation. Thus, when auto tuning is executed, PID setpoints for the PID No. with which the controller is operated are updated at that instant.

(2) If auto tuning action is to be aborted, return the display to Operation Display by pressing $\overset{\frown}{\underset{\text{RVS}}{}}$ and $\overset{\text{DISP}}{\longleftrightarrow}$ key at the same time.
   If auto tuning is aborted, PID parameters are not updated (the existing setpoints remain). Those values cannot also be changed by key operation during auto tuning.

(3) During auto tuning action, program progress is temporarily stopped.

During auto tuning
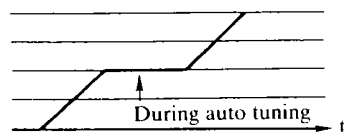
[Specifically, if the hold status is not given with $\overset{\text{MODE}}{\longleftrightarrow}$ key, HLD lamp is not lit even if program progress is halted.]

After auto tuning is terminated, the program again starts advancing.

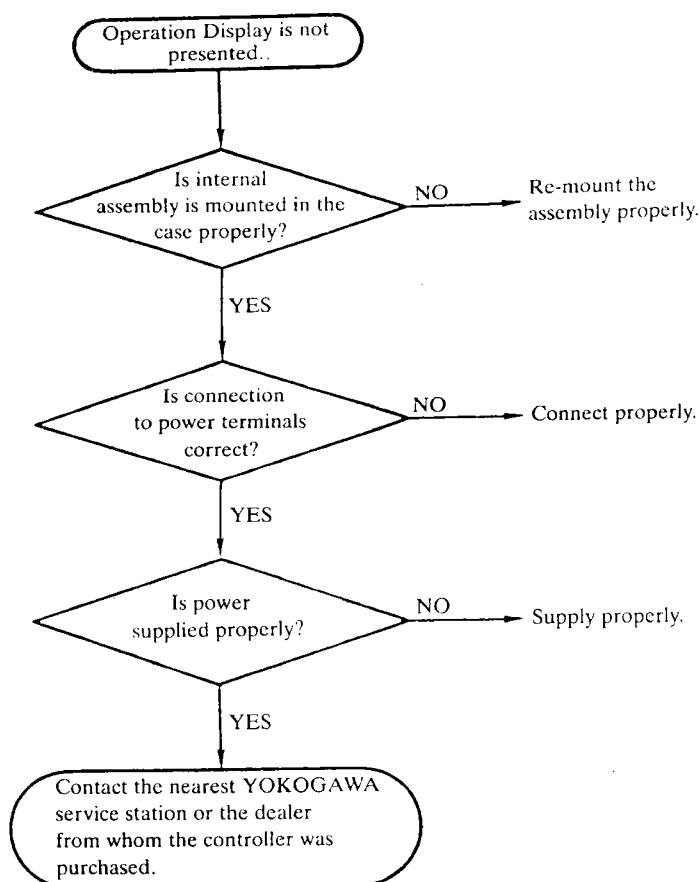Time event set time is compensated for auto tuning time.

12. MAINTENANCE AND INSPECTION

12.1 Troubleshooting Flow

If the Operation display is not presented even when power is supplied to the controller, take measures according to the troubleshooting flow.

If the trouble is considered to be complicated failure, contact the nearest YOKOGAWA service station.

● **Troubleshooting Flow**

```
      ( Operation Display is not
               presented.. )
                   |
                   v
         /  Is internal  \
        < assembly is mounted in the >  --NO-->  Re-mount the
         \  case properly? /                      assembly properly.
                   |
                  YES
                   |
                   v
         /  Is connection  \
        <  to power terminals >  --NO-->  Connect properly.
         \    correct?  /
                   |
                  YES
                   |
                   v
         /   Is power   \
        <  supplied properly? >  --NO-->  Supply properly.
         \             /
                   |
                  YES
                   |
                   v
   ( Contact the nearest YOKOGAWA
     service station or the dealer
     from whom the controller was
     purchased. )
```

12.2 Failure Checking Function

The controller has a function which automatically checks failures in the predetermined items whenever power is supplied.

When power is supplied, checks are carried out on each item in the order shown in the table below. If failures are found, each faulty content is displayed (if normal, Initial Display is presented).

	Item	Condition	Display	Measure
①	RAM error	RAM cannot be read/written.	Displays **FAIL** after indicating Err-000	Repair is required. Contact the nearest YOKOGAWA service station or the dealer from whom the controller was purchased.
②	ROM error		Displays **FAIL** after indicating Err-001	Note: When FAIL is displayed, the output becomes 0 and signal across FAIL signal terminals becomes OFF. For calibration request, the preset output value is sent out.
③	Calibration request	Calibration data is destroyed.	**REQ. CALIB**	
④	CPU failure		**FAIL**	

12.3 Other Failure Display List

Failure status	Display	Action
PV input disconnection	**BURN OUT**	The preset output value is obtained (in AUTO operation). Check thermocouple and its connections.
PV input overscale ⊕ line ⊖ line	**PV + OVER** **PV − OVER**	Control is continued with PV limit value. Check whether the set PV input range is appropriate and PV input is properly connected.
Reference cold junction compensation failure	**RJC ERROR**	Control is continued ignoring the reference cold junction compensation. Repair is required.
Auto tuning impossible	**Err − 200**	Control is continued with PID values set before auto tuning (delete **Err − 200** display with $\overline{\text{RVS}}$ key). Try tuning again. If failure display is still presented again, use the controller by manually setting PID parameters because it seems to be out of auto-tunable range.
A/D converter error	**Err − 300**	Control becomes manual mode and the output maintains the current status. Repair is required.

APPENDIX. PROGRAM PATTERN SETTING TABLE

SEG	Segment No.								
TSP	Target setpoint								
TIME	Segment time								
EV#	Event No.								
EVA	Event data								
EVB	Event data								
EV#	Event No.								
EVA	Event data								
EVB	Event data								
EV#	Event No.								
EVA	Event data								
EVB	Event data								
EV#	Event No.								
EVA	Event data								
EVB	Event data								
JC	Junction code								