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1. HANDLING CAUTIONS

The controller is thoroughly factory-tested before shipment. When the controller is delivered, check visually 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.)

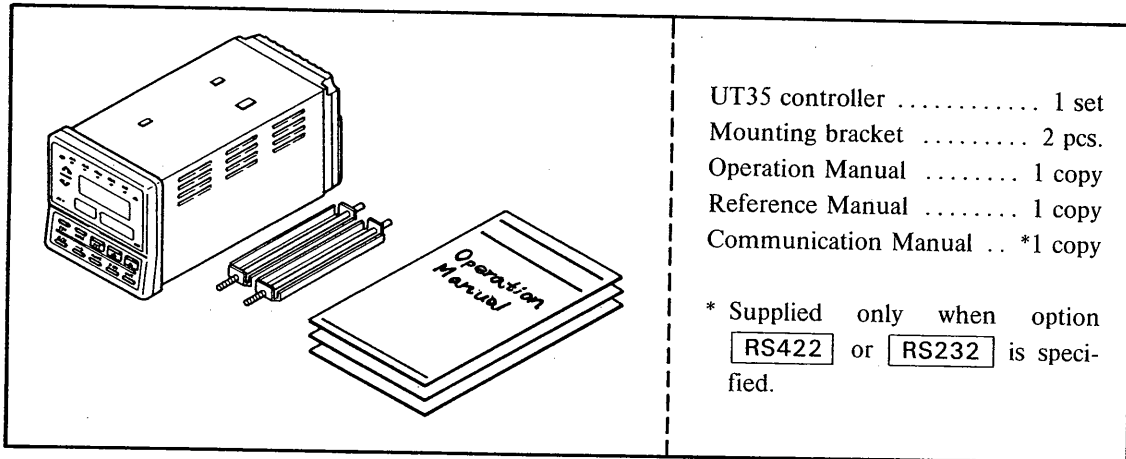


Figure 1.1 External View of UP25 and Accessories

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 room 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.

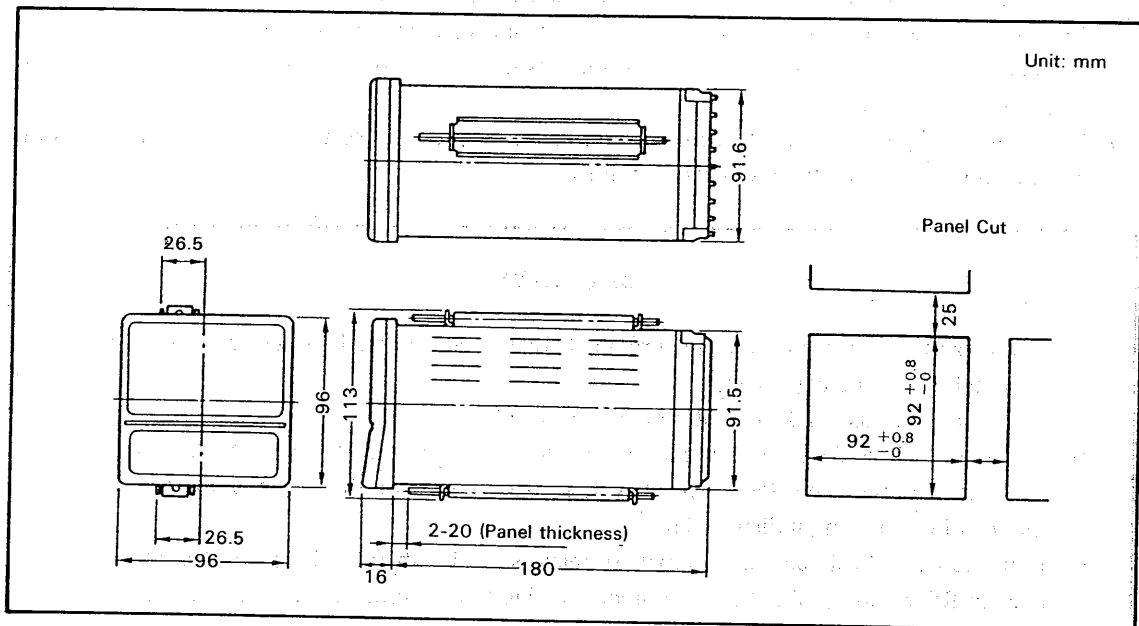


Figure 2.1 External Dimensions and Panel Cut

2.3 Mounting Procedure

- (1) Insert this controller into a panel cutout from the front of the panel.
- (2) Mount the controller to a panel using the attached mounting brackets. When mounting, do not install 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 resistance for RTDs (Resistance Temperature Detector) inputs.

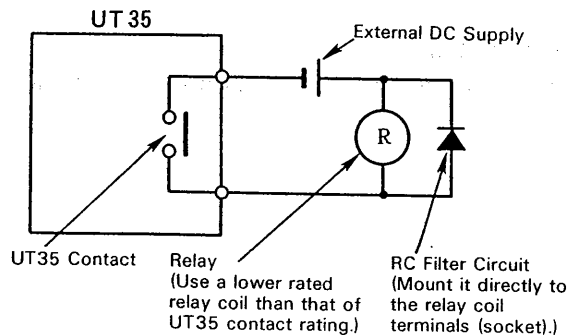
This is especially the case for cryogenic RTDs. For example, when the measuring temperature is 10 K, resistance difference of 100 m Ω causes an error of about 1 K.

- (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).

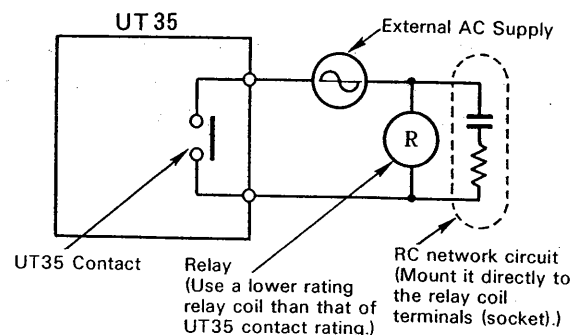
CAUTIONS

- 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 250 V, at a rated current of 1A.
- 2) Use an auxiliary device 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 outputs), 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:



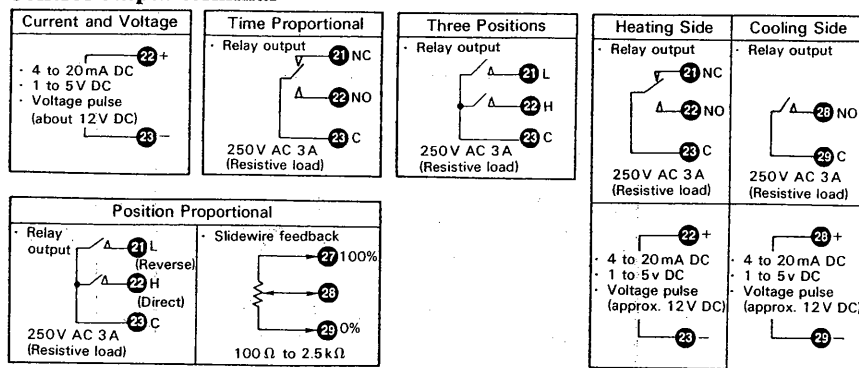
• For AC Relay:



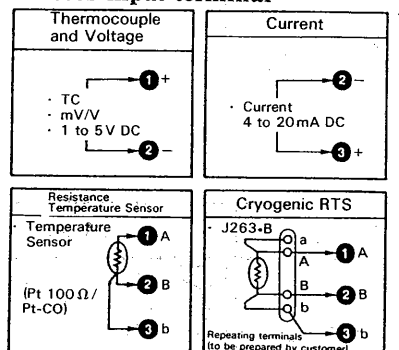
For RC filter parameters, contact manufacturers of auxiliary relays used.

4. TERMINAL WIRING DIAGRAM

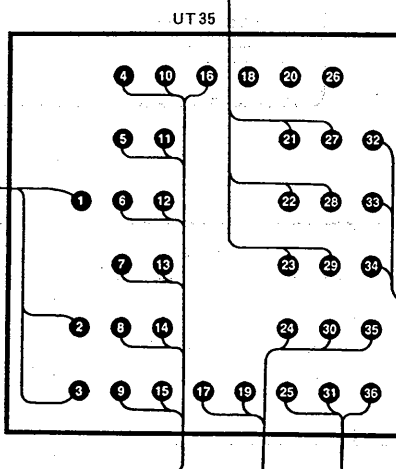
• Control output terminal



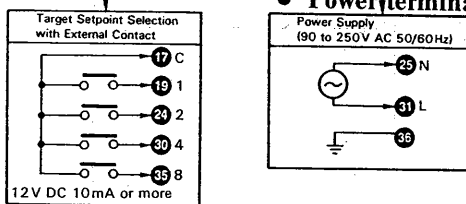
• Process input terminal



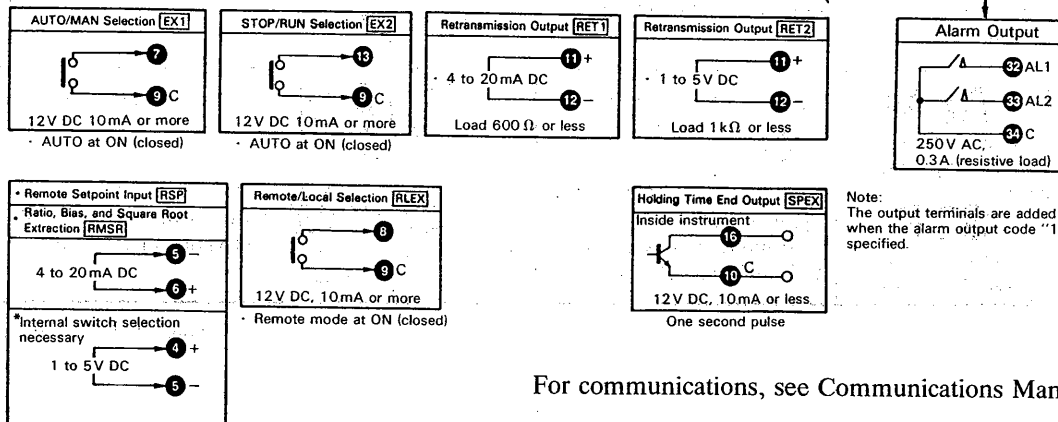
Note:
Although J263-B sensor has four terminals, make wiring to [A], [B], [b] terminals without using [a] terminal.



• Power terminals



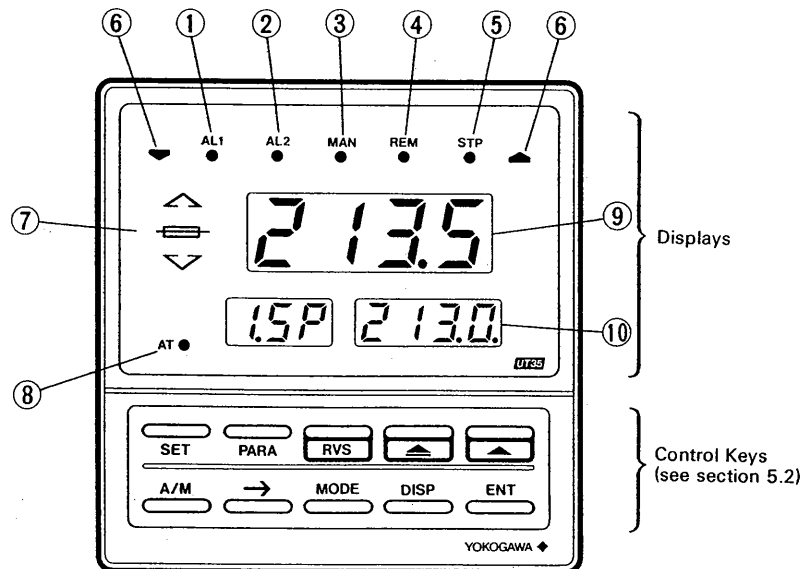
• Option I/O terminals



Note:
The output terminals are added only when the alarm output code "1" is specified.

For communications, see Communications Manual.

5. FRONT PANEL DISPLAYS AND CONTROL KEYS








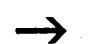







5.1 Displays

No.	Display	Function	No.	Display	Function
①	AL1 (Alarm 1 lamp)	Lights when alarm 1 is activated.	⑥	 (Output monitor)	is lit when the output value decreases only for the position proportional PID or three position control output types and is lit when, increases.
②	AL2 (Alarm 2 lamp)	Lights when alarm 2 is activated.	⑦	 (Deviation monitor)	When deviation (PV - SP) is within $\pm 1.0\%$ of F.S., (green) is lit. When it is over $+1.0\%$ of F.S., (orange) is lit. When it is under -1.0% of F.S., (orange) is lit. Those are displayed only during Operation Display.
③	MAN (Manual mode indicating lamp)	Lights in MAN mode. [Goes off in AUTO mode.]	⑧	AT (Auto-tuning execution indicating lamp)	Flashes during auto-tuning.
④	REM (Remote mode indicating lamp)	Lights in REM (remote) mode. [Goes off in LOCAL mode.]	⑨	 (PV display)	Displays process variable (PV).
⑤	STP (Stop mode indicating lamp)	Lights in STP (operation stop) mode. [Goes off in RUN (operation) mode.]	⑩	 (Setpoint and parameter display)	Displays the setpoint (SP) and various parameters.

Note) F.S. = Full scale

5.2 Control Keys

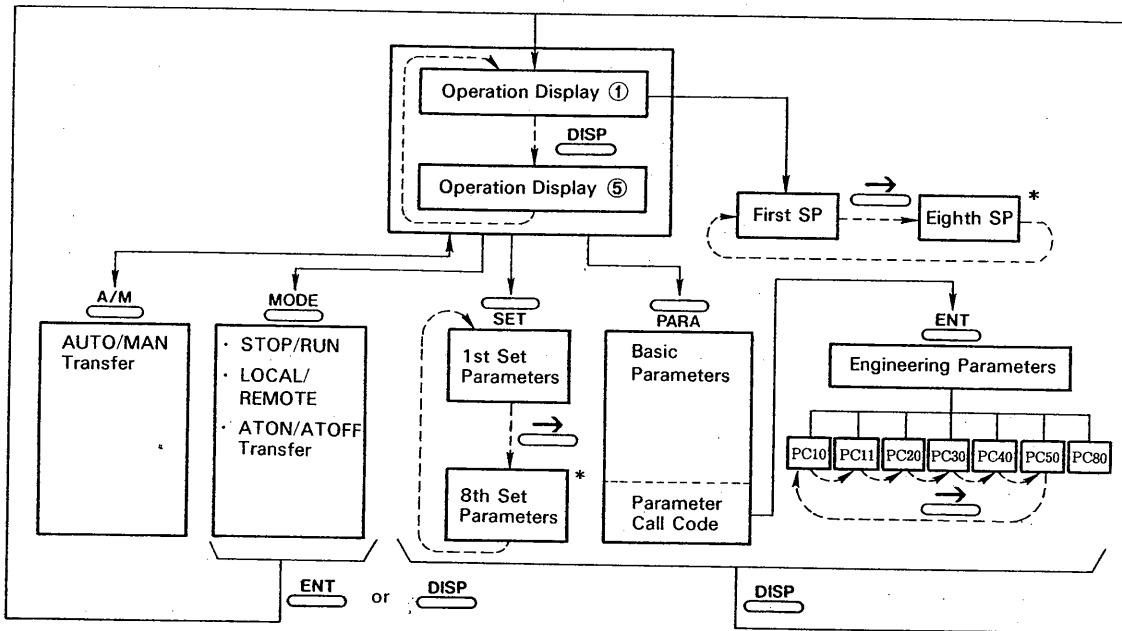
Key	Function
 SET (Set key)	Scrolls thru setting display panels for setting parameters (described later target setpoint (SP), alarm, PID, etc.
 PARA (Parameter key)	Scrolls thru setting display panels for basic parameters and engineering parameters (described later).
 RVS (Reverse key)	<ul style="list-style-type: none"> 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 Reverse key.
 (Numeral key)	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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 if pressed in 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)	<ul style="list-style-type: none"> 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 reverse direction is also available using  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. <ul style="list-style-type: none"> Transfer 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. <ul style="list-style-type: none"> Data entry when setting various functions Execution of mode selection Execution of auto-tuning

6. KEY OPERATION

Cautions for Key Operation

- ① The keys of the UT35 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 card and cause key failure.

6.1 Key Operation Rules



* In a four local setpoint model, up to 4th set parameter.

Figure 6.1 Key Operation Rules

- When using **SET**, **PARA**, **A/M**, or **MODE** key, be sure to return to the Operation Display first (see section 6.2). 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 area other than the Operation Display returns the screen to Operation Display ①.
- When various data setting or mode selection is to be performed, be sure to press **ENT** key to enter them (except when changing the manual output, then the **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 the set parameters program display panels (see section 6.4) is to be reversed, press the **RVS** key while pressing the **SET** key.
- If scroll sequence for the basic parameters and the engineering parameters program display panel (see P.16 to P.22) 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 **RVS** key together with the arrow key.

6.2 Changing Operation Displays

The UT35 controller displays the Operation Display ① when power is turned ON. The Operation Display presents this data during operation at that time.

The Operation Display consists of five screens as standard (of these, one for the heating and cooling type specified and one for option code **[SPEX]** is specified). During operation, display any one of these Operation Displays.

Press **[DISP]** key for transferring to the next Operation Display.

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

6.3 Mode Selection

6.3.1 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 pressing (this transfer is balanceless, bumpless).

In MAN mode, MAN lamp is lit (for manual operation, see section 9.1).

6.3.2 STOP/RUN and LOCAL/REM Selection

If **[MODE]** key is pressed with an Operation Display on the screen, the mode selecting display is presented as shown to the right.

If **[ENT]** key is pressed when period “.” is flashing in each display, the mode is transferred and display returns to the Operation Display ①. (If **[DISP]** key is pressed, the screen returns to Operation Display 1 with the mode unchanged.)

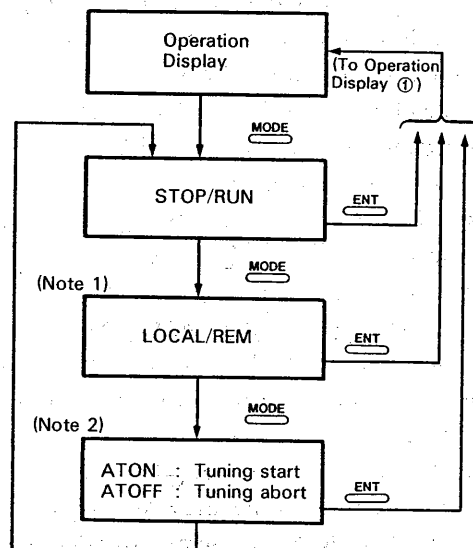
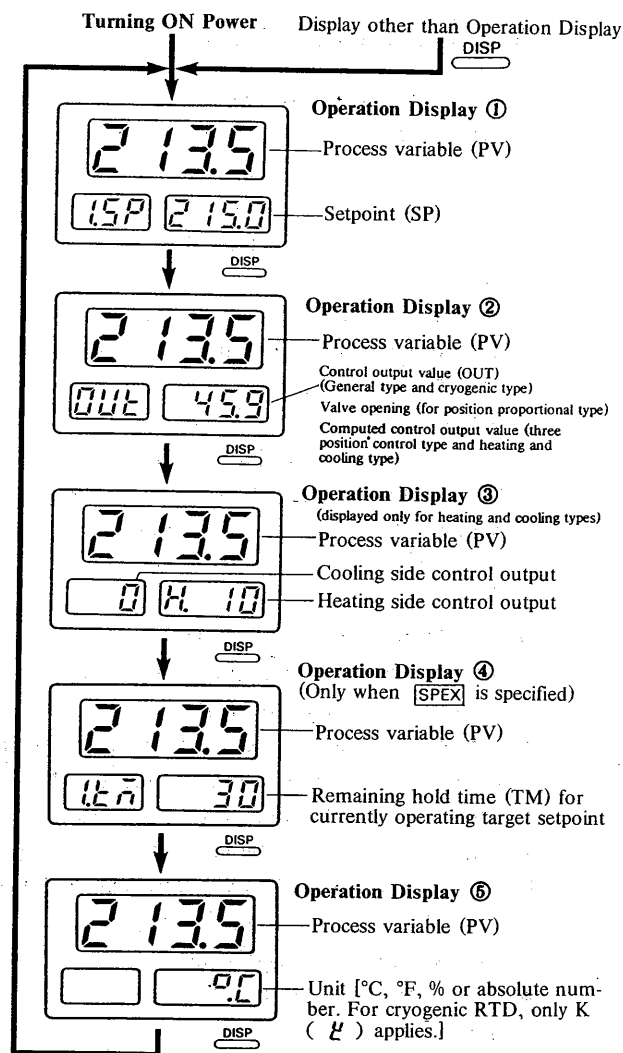
(Note 1) When an external contact for RUN/STOP selection is closed, RUN/STOP selection with keys cannot be carried out.

(Note 2) When an external contact for LOCAL/REM selection is closed, LOCAL/REM selection with keys cannot be carried out.

(Note 3) Auto-tuning is not performed in MAN mode, with the tuning code = 0, or during operation stoppage (also not displayed).

(For executing auto-tuning, see section 9.7.)

(Note 4) On shipment, the controller is set to tuning code = 2, in RUN mode, and LOCAL mode.



6.4 Parameter Setting

6.4.1 SET Parameter Setting

- When the **SET** key is pressed with the Operation Display on the screen, the setting display for the target setpoint (n.SP) in the SET parameters is presented. (Note: Numeral n includes 1 to 4 (or 1 to 8). When the Operation Display ① is changed to the setting display for the target setpoint (n.SP) in SET parameters, the display panel is the same but deviation monitor disappears. For single setpoint type, SP only is displayed and “n.” is not displayed.)
- Parameter items are displayed in sequence with each pressing of the **SET** key (see P.15).
- Set numeric value data using two numeral keys **▲**, **▼** and **RVS** key and enter it with **ENT** key. (The decimal point “.” flashes when updating numeric values and stops flashing when the data is entered with **ENT** key.)
- If a four setpoint or eight setpoint model is used, advancing from the second target setpoint (2.SP) to the fourth (or eighth) setpoint (4.SP or 8.SP) can be performed with the **→** key.
- When setting of the SET parameters is completed, press **DISP** key to return the screen to Operation Display ①.

6.4.2 Basic Parameter Setting







(Set these when the operation, due to the preset values causes a problem. The initial values are listed in the basic parameter list in P.16)

- When **PARA** key is pressed with Operation Display on the screen, the setting display for the first item of basic parameters is presented (Note: Items included in basic parameters vary with UT35 suffix codes and options ordered. See P.16).
- The basic parameter items are displayed in turn with each push of **PARA** key (see P.16).
- Set numeric value data using two numeral keys **▲**, **▼** and **RVS** key and enter it with **ENT** key. (The decimal point “.” flashes when updating numeric values and stops flashing when the data is entered with **ENT** key.)
- When setting of the basic parameters is completed, press **DISP** key to return the screen to Operation Display ①.

6.4.3 Engineering Parameter Setting

(Set these when operation by the initial values causes a problem. The initial values are listed in the basic parameter list in Ch.8)

- Scroll to the setting display for key lock code (LC), one of the setting items in basic parameters.
- Change the key lock code (LC) 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 screen for engineering parameters is displayed (in this case, **PC** **U** is displayed).
- Adjust the PC code to a parameter set in which the desired parameter is to be set using numeral keys **▲** and **▼** (and **RVS** key), and enter it with **ENT** key. For example, if PC = 10 is set and entered, the INPUT range code (P-0) display appears.
- Each item in the same parameter set is displayed in turn scrolling by pressing **PARA** key (see section 8.1).
- Pressing the arrow key **→** enables the scrolling to the first item of the adjacent parameter set [for example, if the arrow key **→** is pressed with the display “target setpoint ascending velocity” (E-2) of PC20, the screen transfers to the first display for PC30 “manual reset value” (F-0) or “direct/reverse action” (F-1) or “preset output value” (F-3)].

- Set numeric data using the two numeral keys ,  and  key and enter it with  key. (The decimal point "." flashes when updating numeric values and stops flashing when the data is entered with  key.)
- When setting of the engineering parameters is completed, press  key to return the screen to Operation Display ①.

CAUTION

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

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

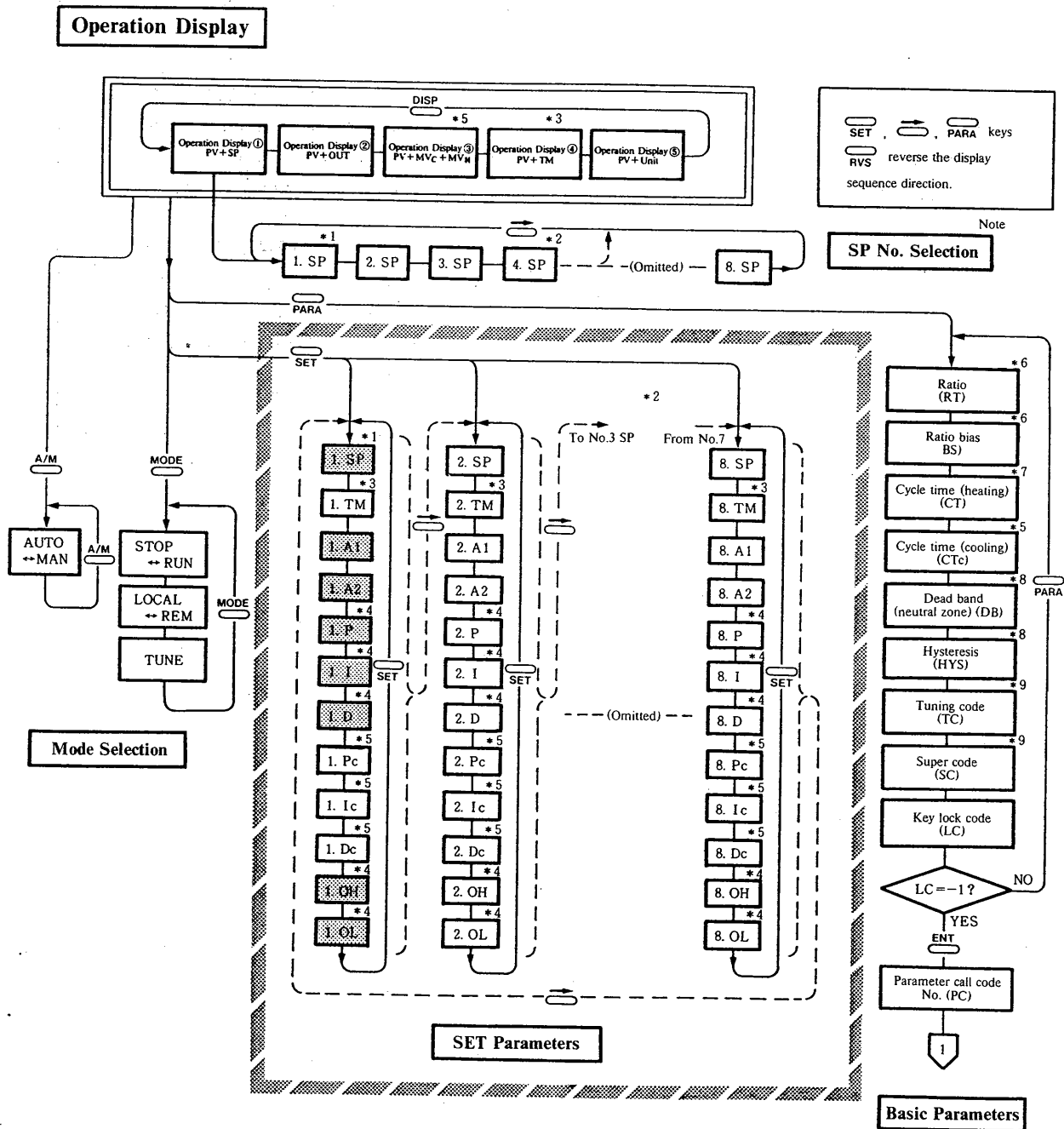
Meter range code (P-0) Max. value in measuring range (P-2) Min. value in measuring range (P-3) Display unit (P-4)
--

- | |
|--|
| <ul style="list-style-type: none"> • (1.SP to 8.SP), (1.A1 to 8.A1), (1.A2 to 8.A2), (1.OH to 8.OH), and (1.OL to 8.OL) of the set parameters. • (BS), (HYS) and (DB) of the basic parameters. • (P-1), (P-2), (P-3), (P-4), (P-5), (P-8), (R-2), (R-3), (R-8), (E-0), (E-1), (E-2), (E-3), (F-0), (F-2), (F-3), (G-1), (G-2), (G-5) and (G-6) of the engineering parameters. |
|--|

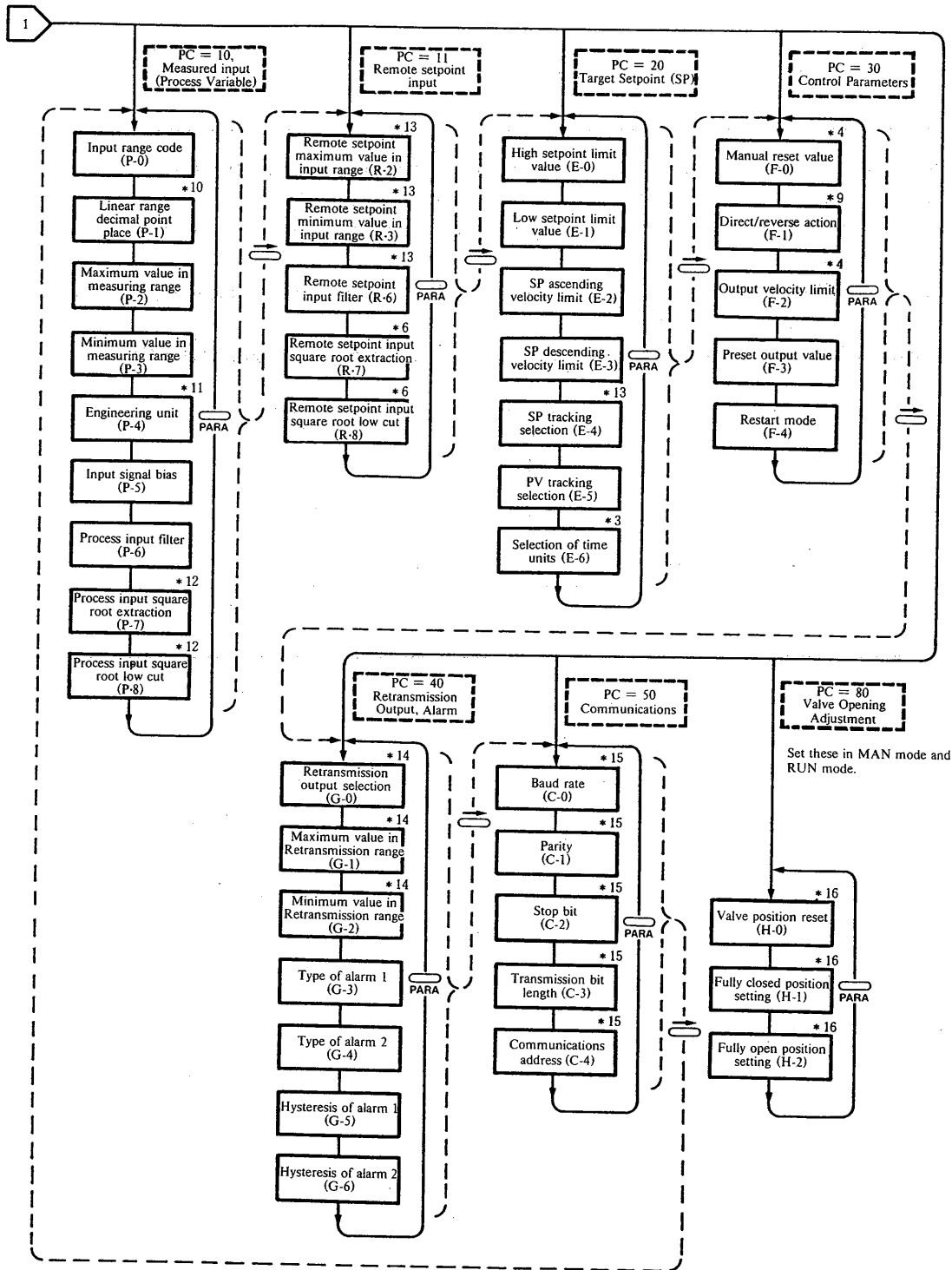
7. SETTING FLOW CHART

- Operation can be started by setting parameters shown in .
- Set parameters outside the frame as necessary. (Unless otherwise specified, the controller is operated with those parameters set prior to shipment from the factory as shown in Ch. 8 "PARAMETERS LIST".

(Note) If the target setpoint No. in "SP No. Selection" is changed with the arrow key and entered with \Rightarrow key, the ENT parameters including that target setpoint are selected on the set basis (all from SP to OL).



Engineering Parameters



- *1 Only "SP" is displayed in single setpoint model.
- *2 For four setpoint model, 1.SP to 4.SP are displayed.
- *3 Displayed only when option [SPEX] is specified.
- *4 Not displayed for three position control.
- *5 Displayed only for heating/cooling model.
- *6 Displayed only when option [RMSR] is specified.
- *7 Displayed only for time proportional control type.
- *8 Displayed for position proportional control type, three position control type and heating/cooling model.

- *9 Not displayed in three position control types and heating/cooling models.
- *10 Displayed only for V, mV, and mA inputs.
- *11 Not displayed for cryogenic models.
- *12 Displayed only when option [PVSR] is specified.
- *13 Displayed with any options [RSP], [RMSR], and [RLEX].
- *14 Displayed with either options [RET1] or [RET2].
- *15 Displayed with either options [RS232] or [RS422].
- *16 Displayed with position proportional type only.

8. PARAMETERS LIST

This chapter describes various parameters of the UT35 controller. For more detailed explanation of parameters, see Explanatory Manual (IM 5B4B6-20E).

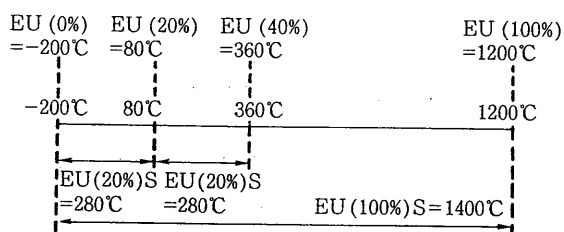
Presentation on setting range and units specific to the controller will be described below.

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).



Set Parameters

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
SP	SP	Target setpoint	EU	EU(0%) to EU(100%)	EU(0%)	Set the target value for control.
TM	TM	Target setpoint holding time	min. or sec.	0 to 9999 min. or 0 to 9999 sec.	0	Displayed only when option <u>SPEX</u> is specified. Set the unit in engineering parameter PC=20 (E-6).
A1	A1	Alarm 1 setpoint	EU	EU(0%) to EU(100%) EU(0%)S to EU(100%)S (EU()S in deviation alarm)	EU(100%)	Set alarm type in engineering parameter PC=40 (G-3) and (G-4).
A2	A2	Alarm 2 setpoint			EU(0%)	
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.*
I	I	Integral time	s	0 and 1 to 6000	0	0 shows that integral action is off. No display for three position control.*
D	D	Derivative time	s	0 and 1 to 6000	0	0 shows that derivative action is off. No display for three position control.
Pc	Pc	Proportional band (cooling side)	%	0 and 0.1 to 999.9	100.0	Display only in heating/cooling models. 0 shows ON/OFF action.*
Ic	Ic	Integral time (cooling side)	s	0 and 1 to 6000	0	Displayed only in heating/cooling models. 0 : No integral action.*
Dc	Dc	Derivative (cooling side)	s	0 and 1 to 6000	0	Displayed only in heating/cooling models. 0 : No derivative action.
OH	OH	High output limit value	%	$-5.0 \leq OL < OH \leq 105.0$	100.0	Restricts the high and low limits of computed control output
OL	OL	Low output limit value			0.0	

Note: SET parameters are provided with SP set to the minimum of the range for single setpoint type (though parameter items may vary with suffix codes and options specified).

In four point or eight setpoint types, four or eight sets of items are provided respectively. In UT35 display, the following display is obtained for indicating each set No. Selection of target values with the → key and ENT key is performed for each set.

Ex. For the second target setpoint, "2. SP" (for one setpoint type, set No. is not displayed).

*: 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.

Basic Parameters

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
rt	RT	Ratio	—	0.000 to 9.999	1.000	Displayed only when option RMSR is specified.
bs	BS	Ratio bias	EU	EU(-105%S) to EU(105%S)	EU(0%)	Displayed only when option RMSR is specified.
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 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. Position proportional PID type (dead band), three position control type and heating/cooling model (neutral zone).
hys	HYS	Hysteresis	EU	EU(0.0%)S to EU(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	
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 8.1.
pc	PC	Parameter call code	—	0, 10, 11, 20, 30, 40, 50, 80	0	For each parameter call code meaning, see Table 8.2.

Table 8.1 Key Lock Code

LC Code	Keys to be Locked	Note 1) If PARA key is locked, key lock code can be displayed and changed. Note 2) When LC code = 3, target setpoint can be altered. When LC code = 4, target setpoint cannot be changed.
0	None	
1	PARA	
2	PARA MODE	
3	PARA MODE SET	
4	PARA MODE SET A/M	

*: If $P \neq 0$, $P_c \neq 0$, the integral action becomes OFF for both heating and cooling regardless of setpoints when either one of I and Ic is made 0.

Table 8.2 Program Call Code

PC Code	Parameter Group to be Called	PC Code	Parameter Group to be Called
10	Input functions	40	Retransmission and alarm functions
11	Remote setpoint functions	50	Communications functions
20	Target setpoint functions	80	Valve adjustment functions
30	Control functions		

Engineering Parameter

Measuring Input (PC10)

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
P-0	P-0	Input range code	—	000 to 250	As described at right	The controller is delivered with input range code specified when ordering (see Table 8.3).
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) $\leq P-3 < P-2 \leq$ (Range max. value) For linear input $-1999 \leq P-3 < P-2 \leq 9999$	EU (100%)	(P-2) - (p-3) \geq 1
P-3	P-3	Min. value 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
P-7	P-7	Process input square root extraction		0, 1	0	Displayed only when option [PVSR] is specified. 0: Not provided 1: Provided
P-8	P-8	Process input square root low cut	%	0.0 to 5.0	1.0	Displayed only when option [PVSR] is specified. Set value is in % of input signal before square root extraction.

Table 8.3 Input Range Codes

Measured Input Range		Type of Input (Range)		Input 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 position can be changed.)	000
			-10 to 10 mV		001
			0 to 100 mV		010
			0 to 1 V		020
	-1 to 1 V	021			
	0 to 5 V	030			
DC voltage (V) and DC current (mA) group		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
		Pt-Co (Note 2)	0.0 to 300.0K	-	250
Special thermocouple group (Note 3)	PR20-40	0 to 1900°C	32 to 3400°F	190	
	Platine1 2	0 to 1390°C	32 to 2500°F	191	
	W ₉₇ Re ₃ W ₇₅ Re ₂₅	0 to 2000°C	32 to 3600°F	192	

(Note 1) • Pt100 (Revised JIS/DIN) and JPt100 (JIS '89).

(Note 2) • Only for 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 option **STC** for using special thermocouples.

Remote Setpoint Input (PC11)(Displayed only when option **RSP** or **RMSR** is specified)

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
<i>r-2</i>	R-2	Remote setpoint max. value in input range	EU	$EU(-25\%) \leq R-3 < R-2 \leq EU(125\%)$	EU (100%)	Remote setpoint input is set to 4 to 20 mA DC input on shipment. For changing it to 1 to 5 V DC input, see Reference Manual.
<i>r-3</i>	R-3	Remote setpoint min. value in input range.	EU		EU(0%)	
<i>r-6</i>	R-6	Remote setpoint input filter	sec.	0 and 1 to 120	0	First order lag filter. 0 : OFF
<i>r-7</i>	R-7	Remote setpoint input square root extraction	—	0 and 1	0	Displayed only when option RMSR is specified. 0: Not provided 1: Provided
<i>r-8</i>	R-8	Remote setpoint input square root low cut	%	0.0 to 5.0	1.0	Displayed only when optional code RMSR is specified. Set value is in % of input signal before square root extraction.

Target Setpoint Input (PC20)

Display	Code	Setting Item	Unit	Setting Range	Initial value	Description
<i>E-0</i>	E-0	High setpoint limit value	EU	$EU(0\%) \leq < E-0 \leq EU(100\%)$	EU (100%)	If target setpoint is set outside these limits, control target value is automatically modified to limits.
<i>E-1</i>	E-1	Low setpoint limit value			EU(0%)	
<i>E-2</i>	E-2	Setpoint ascending velocity limit	EU/min	EU(0%)S/min to EU(100%)S/min	EU(0%)S/min	EU(0%)S/min shows OFF.
<i>E-3</i>	E-3	Setpoint descending velocity limit				
<i>E-4</i>	E-4	SP tracking selection	—	0 or 1	0	0: with SP tracking* 1: w/o SP tracking
<i>E-5</i>	E-5	PV tracking selection	—	0 or 1	1	0: with PV tracking 1: w/o PV tracking
<i>E-6</i>	E-6	Selection of time units	—	0 or 1	0	Displayed only when option SPEX is specified. 0: min. 1: sec.

* Displayed when any one of optional codes **RSP**, **RMSR**, and **RLEX** is specified.

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 (STP 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 STOP mode.

* Not displayed for three position control type.

** Not displayed for three position control type or heating and cooling type.

Retransmission Output and Alarm (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 range	EU	$EU(0\%) \leq (G-2) < (G-1) \leq EU(100\%)$	EU (100%)	Displayed only when option RET1 or RET2 is specified.
G-2	G-2	Min. value in retransmission range			EU(0%)	
G-3	G-3	Type of alarm 1	—	0 to 8	1	For relation between alarm type and parameter codes, see Table 8.4.
G-4	G-4	Type of alarm 2			2	
G-5	G-5	Hysteresis of alarm 1	EU	EU(0.0%)S to EU(5.0%)S	EU (0.5%)S	
G-6	G-6	Hysteresis of alarm 2	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 retransmission output is affected by them.

Table 8.4 Relationship between Alarm Type and Parameter Codes

Code	Alarm Type *1	Contact *2
0	Alarm off	Open
1	PV high limit alarm	Open
2	PV low limit alarm	Open
3	Positive deviation high limit alarm *3	Open
4	Negative deviation low limit alarm *3	Open
5	Positive deviation high limit alarm *3	Closed
6	Negative deviation low limit alarm *3	Closed
7	Standby PV low limit alarm *4	Open
8	Standby negative deviation low limit alarm *4	Open

- *1 High limit alarm occurs when the measured value (PV) exceeds the setpoint and alarm lamp is lit. For low limit alarm occurs when the measured value is under the setpoint and alarm lamp is lit.
 *2 Shows the normal state (alarm lamp goes off).
 *3 The set unit for deviation alarm is EU()S.
 *4 After power is turned on, first the alarm function does not operate but once the low limit alarm setpoint is passed, the alarm function starts operating.

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 for 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 setting	—	Valve position	—	Sets valve opening 0% position.
H-2	H-2	Valve fully open position setting	—	Valve position	—	Sets valve opening 100% position.

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

9. OPERATION

9.1 AUTO (Automatic)/MAN (Manual) Operation

- Refer to section 6.3 for changing modes with keys.
- If the option **EX1** is specified, AUTO/MAN can be selected with an external contact. [Terminals ⑦ and ⑨ are used. When the contact is closed, AUTO operation is performed. See also **Ch.4 TERMINAL WIRING DIAGRAM**. Note: Since the external contact has priority to key operation, if the contact is closed, selection of MAN with keys cannot be performed.]
- In AUTO mode, operation is carried out with UT35 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 9.1 (examples are of reverse action; action is reversed with direct action).

Table 9.1 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.
	$P \neq 0$	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.
	$P \neq 0$	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 right.
		<p>Three Position Control Type Operation</p> <p>ON (L) HYS OFF Neutral Zone DB HYS ON (H)</p> <p>50</p> <p>Decrease ← Computed Control Output OUT (%) → Increase</p>	<p>Heating and Cooling Type Operation</p> <p>100</p> <p>Opening (%) 0 50 100%</p> <p>Dead Band DB</p> <p>(Cooling) (Heating)</p> <p>Decrease ← Computed Control Output OUT (%) → Increase</p>
Heating/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.

9.2 STOP (Operation Stop)/RUN (Operation) Selection

- Refer to section 6.3 for changing modes with keys.
- If the option **EX2** is specified, STOP/RUN can be selected with an external contact. [Terminals ⑧ and ⑨ are used. When the contact is closed, RUN (operation) is performed. See also Ch.4 TERMINAL ARRANGEMENT. Note: Since the external contact has priority to key operation, if the contact is closed, selection of STOP with keys cannot be performed.]
- In STOP mode, the control output value defaults to the Preset Output value (F-3), in Engineering Parameters

9.3 LOCAL/REM Setting Operation

(When option **RSP**, **RLEX**, **RMSR**, or **SPEX** is specified:)

- Refer to section 6.3 for changing modes with keys.
- If the option **RSP** is specified, the remote setpoint can be set with an external 4 to 20 mA DC or 1 to 5 V DC signal (for selection of 4 to 20 mA DC/1 to 5 V DC, see Reference Manual, Remote setpoint input range max. value and min. value).

Note: If the option **RLEX** or **RMSR** is specified, **RSP** function is included.

- The remote setpoint input circuit is isolated from the process input circuit.
- The remote setpoint input terminals are ⑤ and ⑥ for 4 to 20 mA DC and ④ and ⑤ for 1 to 5 V DC (see also Ch.4 TERMINAL ARRANGEMENT).
- If the option **RLEX** is specified, LOCAL/REM selection can be performed with an external contact (Terminals ⑧ and ⑨ are used. When the contact is closed, REM operation is carried out. See Ch.4.)

Note: Since the external contact has priority to key operation, LOCAL operation cannot be selected if the external contact is closed.

- When the remote setpoint is transferred to the local setpoint, either the local setpoint is unchanged (bumpless tracking) or the previously set local setpoint is used (without tracking).
Select which is to be used (see engineering parameters (E-4)).
If the engineering parameter SP ascending velocity limit (E-2) and SP descending velocity limit (E-3) are set, the above transfer is affected by these limits.
- When the option **RMSR** is specified, ratio, ratio bias, and square root extraction can be set to the remote setpoint input. Refer to ratio (RT) and ratio bias (BS) of the basic parameters and remote setpoint input square root extraction (R-7) and remote setpoint input square root low cut (R-8) of the engineering parameters respectively (see Ch.8 PARAMETERS LIST).

9.4 Automatic Target Setpoint Selection

If the option **SPEX** is specified, operation is controlled by automatically transferring sequentially to each target setpoint [1.SP to 4.SP for four setpoint model and 1.SP to 8.SP for eight setpoint model] at each target setpoint holding time (TM) (of SET parameters) and correct time unit (E-6) (of engineering parameters). When a target setpoint is transferred, "segment time end signal" of one second is output from the terminals ⑩ and ⑪ (see Figure 9.1). (When the target setpoint (SP) is transferred, SET parameters including that SP are transferred on the set basis.)

Start of the automatic program operation can be initiated by transferring the UT35 to REM (remote setting) mode with an external contact. When operation at the final (fourth or eighth) target setpoint is completed, the mode is automatically transferred to LOCAL and operation continues at the final target setpoint which is held.

Automatic program operation cannot be specified to repeat. If it is to be restarted, transfer the UT35 to the REM mode.

Automatic target setpoint program operation starts in REM mode and ends in LOCAL mode regardless of RUN/STOP selection.

[Notice] Do not use the external contact SP selection terminals when specifying an optional code **SPEX**.

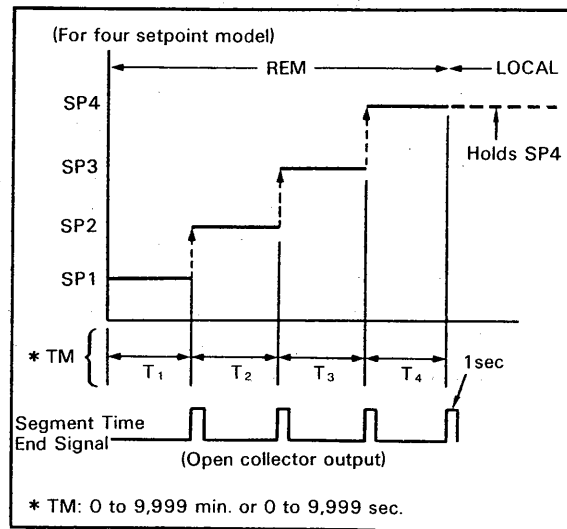


Figure 9.1

9.5 Target Setpoint Selection With Keys (only for four point or eight point setting types)

When the \Rightarrow key is pressed with Operation Display ① on the screen, the display of target setpoints (SP) Nos. are in turn selected from the first to the fourth (eighth). In a display in which the newly desired target setpoint No. is presented, by entering it with **ENT** key, at that instant operation is started using SET parameters for that target setpoint No.

9.6 Target Setpoint Selection with External Contact

- For four target setpoint models or eight target setpoint models, any target setpoint can be designated with external contacts (terminals 17, 19, 24, 30, and 35 are used.) See Figure 9.2. Signals are binary coded.

Similar to the selection with keys, a single group of SET parameters, including target setpoint, is transferred at a time.

(Example)

- For designating the second set, close terminals 17 and 24.
- For designating the third set, close terminals 17, 19, and 24.

(Note)

- When the eight setpoint type (similar to the four setpoint) is used, even if terminals 17, 19, and 35 are closed, the setpoint is not transferred because the ninth target setpoint does not exist.
- Since the external contact has priority to the key operation, when the contact is closed, selection with keys cannot be performed.

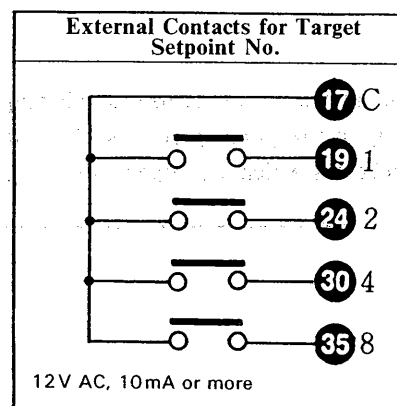
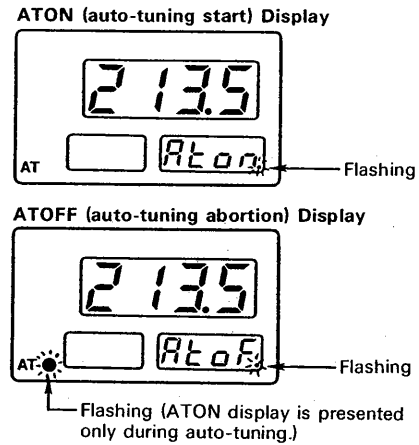


Figure 9.2

9.7 Auto-Tuning Execution (This function is not provided in 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.



Auto-tuning is a function for the UT35 controller to measure process characteristics and automatically set PID parameters. When auto-tuning is executed, the UT35 becomes an ON/OFF controller and outputs alternatively the maximum output*¹ and the minimum output*². The UT35 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.8 Basic Parameter Table).

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.

9.8 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.

When an instrument with remote-set functions (RSP, RMSR or RLEX code option) is in remote mode, the “Super” functions cannot be executed.

“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.

9.9 Valve Opening (Only with Position Proportional PID Control) Adjustment

■ Adjusting procedure is as shown below.

- (1) Select MAN and RUN mode (see section 6.3 for mode selection). Apply power to final control elements (valve and others) to make them ready for driving with control signals from the UT35 controller.
- (2) Call PC80 (valve opening adjustment) of the engineering parameters.
Using ENT key, the following display is presented.

H-0 ← 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 0, 1 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.

H-1
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).

H-2 **100.0**

- (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.

H-2 **0.0**

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

9.10 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).

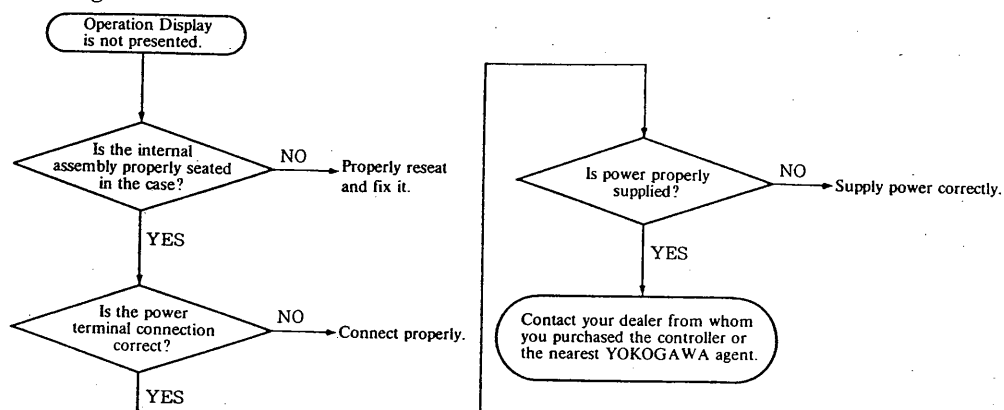
10. MAINTENANCE

● Troubleshooting Flow

If the Operation Display is not displayed even if UT35 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 UT35 controller has automatic failure check functions for the predetermined items at power ON.

When power is turned ON, items shown in Table 10.1 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). Although *FAIL* display may be temporarily presented immediately after turning on power, this is not a failure.

Table 10.1 Failure Checking Items

Sequence	Display Part	Failure Indication	Failure Name	Control Output	Disposition
①		<i>E000</i> After showing displays <i>FAIL</i>	RAM error	Note ④	Requires repair. Note ⑤
②		<i>E001</i> After showing displays <i>FAIL</i>	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		$\times \times$ <i>20</i> is displayed Notes ② and ③	Range code error	Note ④	Re-set range code.
⑤		$\times \times$ <i>40</i> is displayed Notes ② and ③	Parameter failure	Note ④	Re-set parameter Note ⑥
⑥		$\times \times$ <i>80</i> 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 $\times \times$ part.

Note ③ Display other than *20*, *40* or *80* shows that these failures coexist (*E0.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 10.2, they are continuously monitored and when a failure is detected, it is displayed.

Table 10.2 Other Failure Items

Display part	Failure display	Failure type	Control output	Disposition
	After stopping updating for about 5 sec., displays <i>FAIL</i>	CPU failure	Note ②	Requires repair. Note ③
	<i>b.out</i>	Measuring input disconnection	Preset output value for AUTO mode. Manual output value for MAN mode.	Check thermocouple and its connection.
	<i>odr</i>	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.
	<i>-odr</i>	Measuring input out of range (-5% or less)		
	PV data and <i>rjc</i> (RJC) are alternately displayed.	Reference cold junction compensation failure	Control is continued ignoring reference cold junction compensation.	Requires repair. Note 3
	<i>E200</i>	Auto-tuning (AT) failure	Control is continued using PID parameters before autotuning. Note ④	can be erased by pressing any key. Execute AT again at another PV state.
	PV data and <i>E300</i> 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 power and replace the device. Then operation can be restarted by setting noted parameters 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.

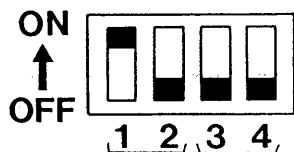
■ Selection of Output Value When Failure Occurs

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 10.1.) Although the DIP switch is of four pole type, use only No.3 and No.4 sub-switches for this purpose.

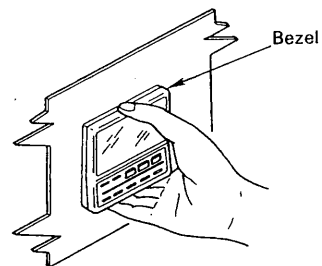
CAUTION

- 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.

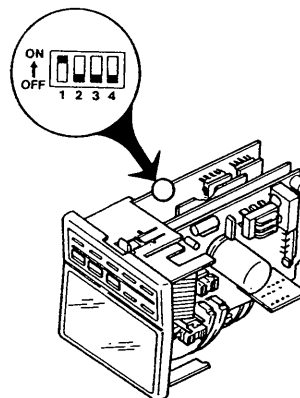


If No.1 and No.2 subswitches of the DIP switch are changed, problems may be realized. Never operate these two subswitches.

Relations of No.3 and No.4 sub-switches to control output values in failed condition for each control action are as shown in Table 10.3. (The output conditions not described in Table 10.3 are as described in Table 10.2.)



- Draw the entire bezel toward 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 10.1 DIP Switch

Table 10.3

Switch Position		Time proportional one output type (relay, voltage pulse)	Time proportional one output type (4 to 20 mA DC 1 to 5 V DC)	Heating/Cooling Type	Three position type/ position proportional PID type
No.3	ON	100% output	100% output (about 12.5% output for one with FAIL display)	Always set No.3 subswitch to OFF position for heating/cooling type, three position type and position proportional PID type.	
	OFF	0% output	0% output (about - 255 output for one with FAIL display)		
No.4	ON	Always set No.4 subswitch to OFF position for time proportional PID one output type and continuous output PID one output type.		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	100% output For one with FAIL display, both H and L relays are OFF. (regardless of No.4 subswitch ON/OFF)
	OFF			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	0% output For one with FAIL display, both H and L relays are OFF. (regardless of No.4 subswitch ON/OFF)

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