

FP21
Programmable Controller
Brief Instruction Manual

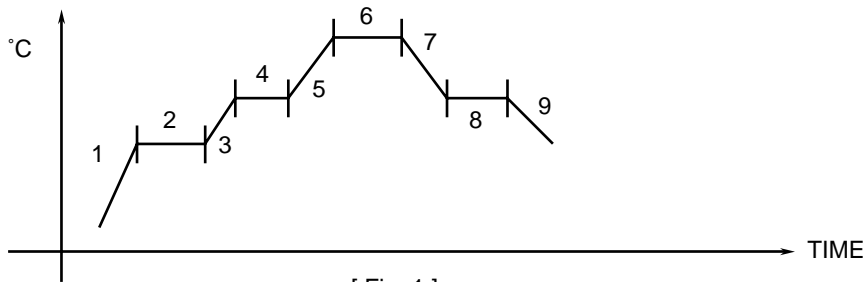
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[1] OUTLINE AND DISTINCTIVE FEATURES

The series FP21 programmable controller has a program capacity of 9 patterns of 9 steps. When linked, the capacity can be extended to $9 \times 9 = 81$ steps.



[Fig. 1]

- Easy operation by menu driven on LCD screens
- Multiple inputs and multiple ranges for each group
- High accuracy: $\pm (0.1\% + 1 \text{ digit})$
- Interface function (RS232 or RS-422A) available by option

[2] FRONT PANEL INFORMATION

Names

Status Display

RUN: Lit during program run.

HLD: Lit during temporary stop of program.

ADV: Lit forcibly advancing to next step during program run.

GUA: Lit during guarantee soak.

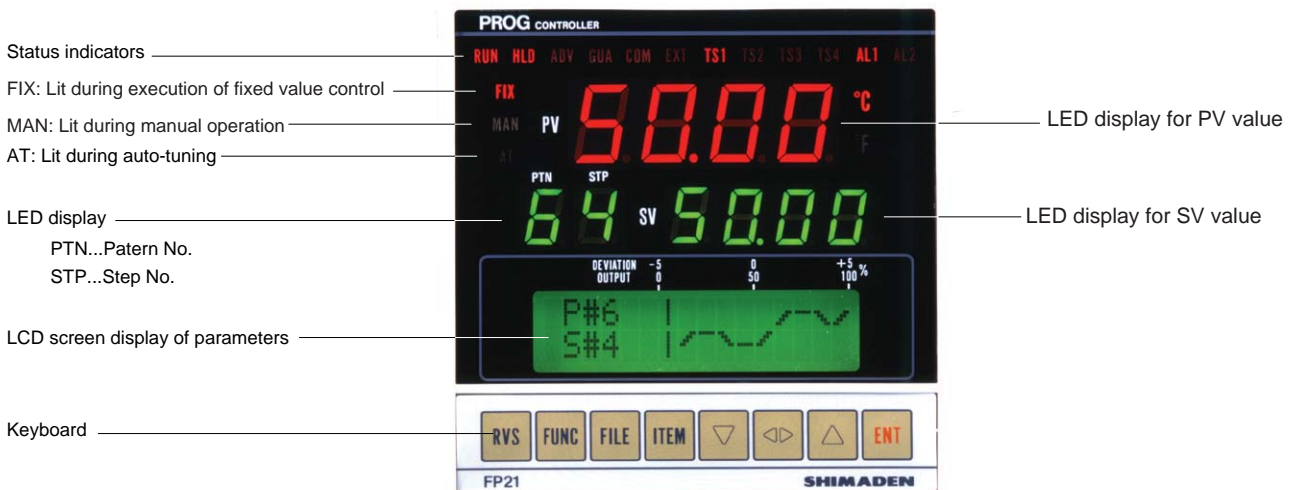
COM: Lit during use of interface function.

EXT: Lit when external control is input.

TS1~4: Lit when time signal is output.

AL1: Lit when alarm AL1 is output.

AL2: Lit when alarm AL2 is output.



[Fig. 2]

Functions of the Keys:

- [RVS] : Reverse key
- [FUNC] : Function key
- [FILE] : File key
- [ITEM] : Item key
- [▽] : Down key
- [◀▶] : Shift key

used together with other keys for reverse or limit operation.

used to move from a screen group to another (Group Nos. 1~6).

used to move from a screen to another in the same screen group.

used to move from a data No. to another in the same screen.

used to decrease a value when data in number (in letters) is changed.

used to move from a figure to another of a number and to move from a parameter to another in the same screen.

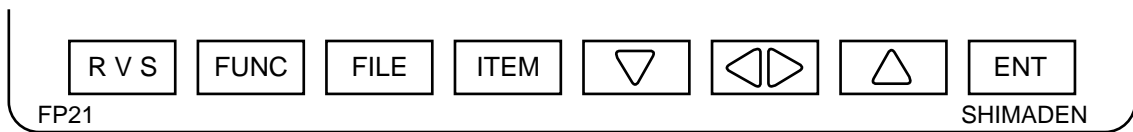
- [△] : Up key

used to increase a value when data in number (in letters) is changed.

- [ENT] : Enter key

used to register a changed data in number or letters or to move from a parameter to another in the same screen.

[3] KEY BOARD OPERATION

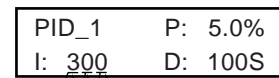


[Fig. 3]

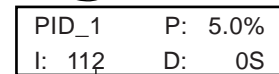
For keyboard operation, refer to the FP21 screen diagram on pages 28~30.

1. The **[FUNC]** key is used to move from the initial screen of a screen group to the initial screen of another group. (There are Group Nos. 1 to 6.) *(Horizontal move)
2. The **[FILE]** key is used to move from a screen to another downward in each screen group. *(Vertical move)
When the **[FILE]** key is pressed after pressing the **[RVS]** key, screens are moved upward.
3. The **[RVS]** key does not function independently. When used in combination with another key, it functions in various ways. Pressing the **[RVS]** key always brings the □ mark onto the lower left side of the screen. Whichever screen may be on display, it is possible to return to the initial screen of Group No.1 by pressing the **[RVS]** key and then the **[FUNC]** key.
4. The **[ITEM]** key is used to move crossways from Block A to Block B and Block C respectively in the No.3 program data screen group, the No.4 control data screen group, and No.6 initial data screen group. When the **[RVS]** key and the **[ITEM]** key are pressed, screens are moved the other way round, i.e., from Block C to Block B and to Block A crossways.

5. The **[<>]** shift key is used to move the cursor from a figure to another of a number.

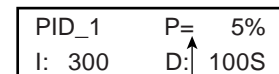


6. The **[▽]** down and the **[△]** up keys are used to decrease or increase a constant (numerical value).

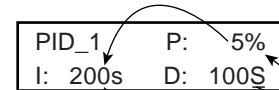


- a. When the **[RVS]** key and then the **[▽]** key are pressed, the minimum value allowed to be set in the screen is displayed for possible setting.
- b. When the **[RVS]** key and then the **[△]** key are pressed, the maximum value allowed to be set in the screen is displayed for possible setting.

7. The **[ENT]** key is used to enter (register) a value. When the **[ENT]** key is pressed, "=" changes to ":" and the value is registered.

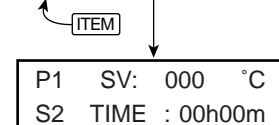
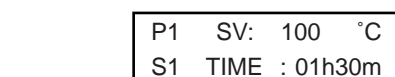


- a. The **[ENT]** key moves the cursor among data in the same screen.
- b. The cursor is moved in the same way as "a." above by pressing the **[RVS]** key and then the **[<>]** key.

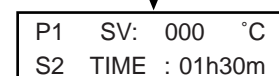


8. When the **[RVS]** key and then the **[ENT]** key are pressed, a value registered immediately before is copy-displayed, and it is registered by pressing the **[ENT]** key again.

This procedure can be used to copy the deviation alarm, the time, and the time signal, etc., of a step to another step.



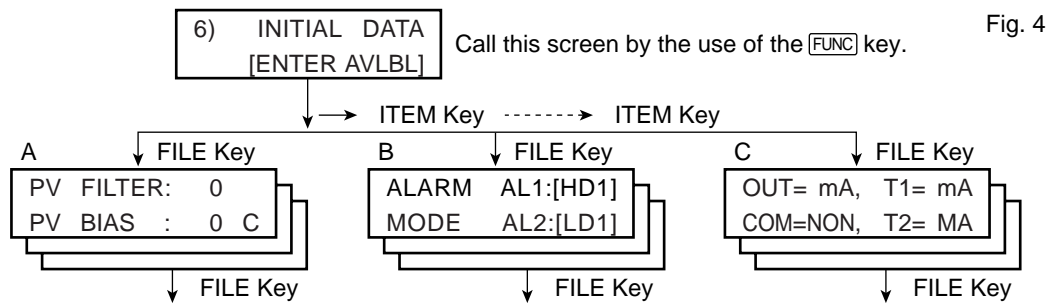
Press **[RVS]** and **[ENT]**.
Then press **[ENT]**.



Screen with copied value

[4] INITIALIZE BEFORE USING

Prior to using the FP21 programmable controller, desired settings should be made in it. This is called "initialization".



(1) Four Check Items in Block A

⊙ In case Block A is not checked, press the [FILE] key and then the [ITEM] key to move the top screen of Block B.

⊙ To check Block A,

1. Press the [FILE] key to call the top screen of Block A onto display.

(a) Will you use the PV filter which serves as a noise cutter?

(b) Will you compensate sensor errors?

(The compensation range is $\pm 99.9^{\circ}\text{C}$.)

For (a) and (b) above, values are set by the use of the ∇ or \triangle key and registered by pressing the [ENT] key.

```

PV FILTER:  0
PV BIAS:  00.0°C
    
```

2. Call the screen shown on the right by the use of the [FILE] key.

(a) Select direct or reverse action of control output.

(* The initial value is R = reverse action.)

(b) Set the cycle time in case the control output is contact output (Y) or SSR output (P).

(* The initial values are 30s for contact output and 3s for SSR output.)

Select values for (a) and (b) above by the use of the ∇ or \triangle key and register them by pressing the [ENT] key.

```

R/D ACTION: [R]
CYC TIME: 30 sec
    
```

3. Press the [FILE] key to call the analog output signal screen onto display.

(a) Which will you select, PV or SV type analog output signals?

(b) Will you set the higher or lower limit for the analog output signals (1)?

(c) Will you set the higher or lower limit for the analog output signals (2)?

Select for (a), (b) and (c) above by the use of the ∇ or \triangle key and register the selected values by pressing the [ENT] key.

Use the [FILE] key for moving to the next screen.

```

TMT1 MODE : [ SV ]
TMT2 MODE : [ PV ]
TMT1 HL : 800.0°C
( SV ) LL : 0.0°C
TMT2 HL : 800.0°C
( PV ) LL : 0.0°C
    
```

* If your apparatus is without analog output, these screens are not displayed.

4. Call the interface function screen by pressing the [FILE] key and operate by the use of the interface function. Refer to the instruction manual of the interface function.

Use the [FILE] key to move to the next screen.

Select values by using the ∇ or \triangle key and register them by the use of the [ENT] key.

```

RS232C ADDR: 1
RATE: [ 2400bps ]
RS232C ADDR: 0
(BITS=7PRTY=E)
    
```

* If your apparatus is without interface function, these screens are not displayed.

(2) Four Check Items in Block B

- ⊙ In case Block B is not checked, press the [ITEM] key to move to the top screen of Block C.
- ⊙ To check Block B,

1. Press the [ITEM] key to call the top screen of the Block B onto display.
 - (a) Select the type (mode) of alarm actions.
Ten types (modes) of alarm actions are available.
Selection should be made with reference to page 12.
Use the [▽] or [△] key for mode selection and press the [ENT] key to register the selected mode.

```
ALARM AL1:[LD1]
MODE AL2:[HD1]
```

Move to the next screen with the [FILE] key.

```
AL1 SENS. : 0.2%
STBY : [Y]
```

Move to the next screen with the [FILE] key.

```
AL2 SENS. : 0.5%
STBY : [N]
```

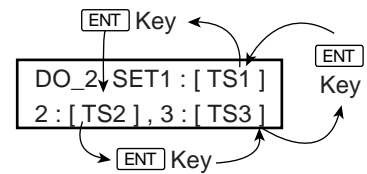
[FILE]

```
DI_1 MODE:[PTN]
DI:[SEL]
```

- (b) Call the screen shown on the right by the use of the [FILE] key and select the sensitivity and standby or non-standby of the alarm action selected in (a) above.
Sensitivity is variable between 0.1 and 5% of FS and its initial value is 0.2%. [Y] stands for yes, meaning standby, while [N] stands for no, i.e., non-standby.
Select values by the use of the [▽] or [△] key and register them by the [ENT] key.
 - (c) The pattern No., the step No. and the temperature °C or °F at which the alarm is activated are to be set in the "control screen group".

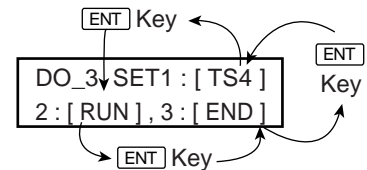
2. Call the next screen "DI-1" by pressing the [FILE] key.
 - (a) This screen is used for "external control operation" in the operation mode [EXT].

3. Call the "DO2" event setting screen by the use of the [FILE] key.
 - (a) Three output signals can be selected from the 8 types of events listed in the table below. (See page 13.)
 - (b) These are open collector signals from the 24-pin connector at the back.



Select event outputs by the [▽] or [△] key and register it by the [ENT] key.

4. Call the "DO3" event setting screen by the use of the [FILE] key.
 - (a) Three output signals can be selected from the 8 types of events listed in the table below. (See page 13.)
 - (b) These are contact outputs from terminals at the back of the apparatus.



Select event outputs by the [▽] or [△] key and register it by the [ENT] key.

The eight event outputs mentioned above are:

1	TS1	Time Signal 1	5	SO	In case of scale over output = "ON"
2	TS2	Time Signal 2	6	RUN	Program in execution = "ON"
3	TS3	Time Signal 3	7	END	Program stopped = "ON"
4	TS4	Time Signal 4	8	EXT	External control in operation = "ON"

The pattern Nos. and step Nos. in which the event signals selected in 3 and 4 above are output and their values, are to be set in the No.3 program data screen group.

(3) Confirmation necessary for the Three points

☉ Even when Block C is not checked, the following three points need to be confirmed.

1. Select °C or °F. Initial value : °C
 Select Pt or JPt in the case of Pt 100Ω input (RTD). Initial value : Pt
2. Is the measuring range as ordered by you? Initial value : T/C : 0-800°C
 Pt : 0-200°C
 mV : 0-10mV
 V : 0-10V
 mA : 4-20mA
3. Select the unit of ramping time, minute or second. Initial value : Minute

☉ To check Block C,

Press the **[ITEM]** key, and the top screen of Block C is on display.

This is a monitor screen to confirm:

- (a) Type of control output signal (OUT)
- (b) Type of analog output signals (T1, T2)
- (c) Type of interface functions

OUT=SSR,	T1=V
COM=NON,	T2=V

(4) Seven Check Items in Block C

1. Selection by **[FILE]** key
 - (a) Select either °C or °F. Initial value : °C
 - (b) Select either Pt or JPt in case of RTD input.
 Use the **[▽]** or **[△]** key for the selection and register it by pressing the **[ENT]** key. Initial value : Pt

UNIT:	[°C]
-------	--------

UNIT:	[°C]
RTD TYPE:	[Pt]

2. Set scale range by **[FILE]** key
 - (a) Set the scale range.
 Use the **[▽]** or **[△]** key for setting and the **[ENT]** key for entry.

Pt RANGE:	[7]
0.0	200.0°C

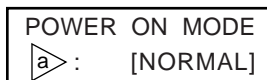
3. V/C input by **[FILE]** key
 This screen is used in case of V/C input.
 - (a) Carry out scaling.
 - (b) Press the **[FILE]** key to call the screen for deciding the position of the decimal point.
 Use the **[▽]** or **[△]** key for setting and the **[ENT]** key for entry.

SCALE	H:200.0%
	L: 0.0%
D. POINT: [xxx.x]	

4. Call the scale over screen on display by **[FILE]** key
 When an output signal is scale over, will you select (a) to stop (RST) the signal, i.e., 0%, or (b) to hold and output in a range from 0 to 100%?
 Use the **[▽]** or **[△]** key for selection and the **[ENT]** key for entry.

SO_MODE:	[RST]
SO_OUT:	0.0%

5. Call "POWER ON MODE" by **[FILE]** key



Initial value : NORMAL

This is to select the mode in which the program starts when power is applied.

Five modes are available for selection by the use of the **[▽]** or **[△]** key and entry by the **[ENT]** key.

The following table and Fig.5 explain the relation between the types of power supply and the modes in which the program is executed.

Examples A show the courses of action:

Power ON → Start of program → Power OFF in the middle → Power ON again → End of program

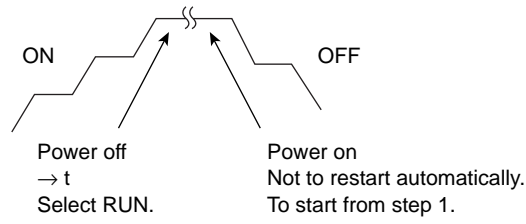
Examples B show the courses of action:

Power ON → Start of program → End of program → Power OFF → Power ON again → Start of program → End of program

	KIND OF POWER SUPPLY	USE	POWER ON IN OPERATION MODE			SCREEN DISPLAY WITH POWER ON
			PROGRAM START	WHILE POWER IS OFF	POWER ON AGAIN	
1	NORMAL	Suitable when the FP21 is used alone.	1 2 3 4	↗ RST → RUN → FIX → MAN	→ RST → RST → FIX → MAN	None
2	ALL RST	Suitable when the FP21 is used alone.	1 2 3 4	↗ RST → RUN → FIX → MAN	→ RST → RST → RST → RST	– ALL RST ON –
3	AUTO RUN	Suitable when the FP21 is interlocked with a sequencer, calendar timer, etc.	1 2 3 4	↗ RST → RUN → FIX → MAN	→ RUN → RST → FIX → MAN	– AUTO RUN ON –
4	GUA RUN	Suitable when the FP21 is interlocked with a sequencer, calendar timer, etc.	1 2 3 4	↗ RST → RUN → FIX → MAN	→ RST → RUN → FIX → MAN	– GUA RUN ON –
5	AUTO & GUA	Suitable when the FP21 is interlocked with a sequencer, calendar timer, etc.	1 2 3 4	↗ RST → RUN → FIX → MAN	→ RUN → RUN → FIX → MAN	– AUTO & GUA ON –

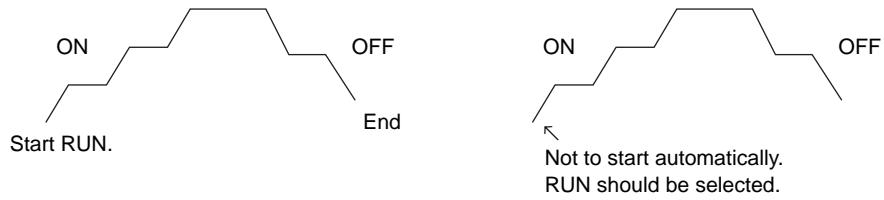
[Fig.5]

1) NORMAL
Example A

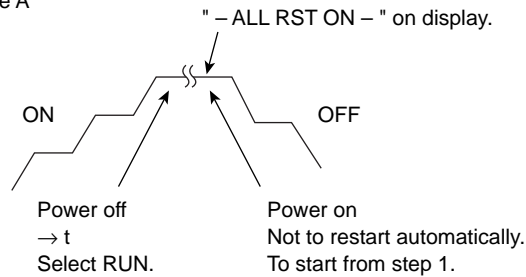


Example B

→ Power on next day

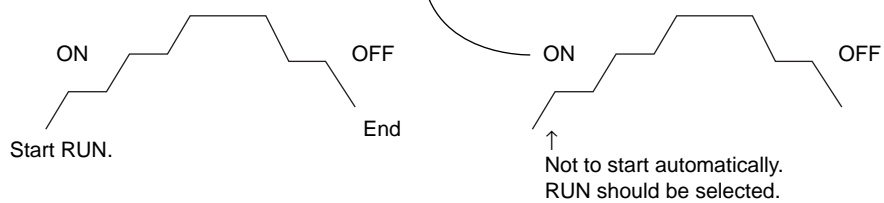


2) ALL RST
Example A

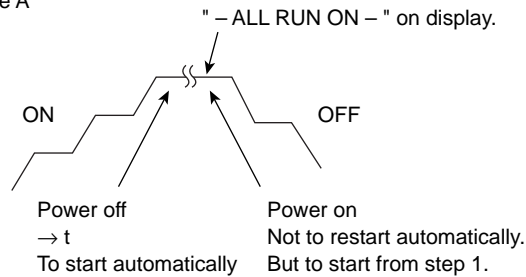


Example B

" - ALL RST - " on display.
→ Power on next day

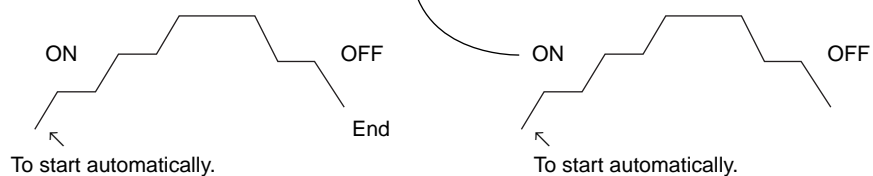


3) AUTO RUN
Example A



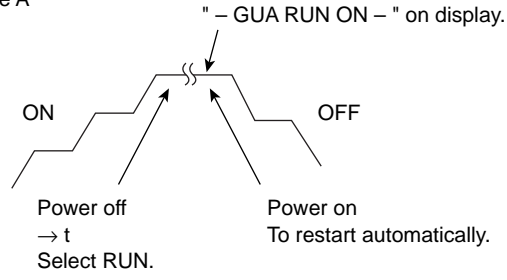
Example B

" - AUT RUN ON - " on display.
→ Power on next day

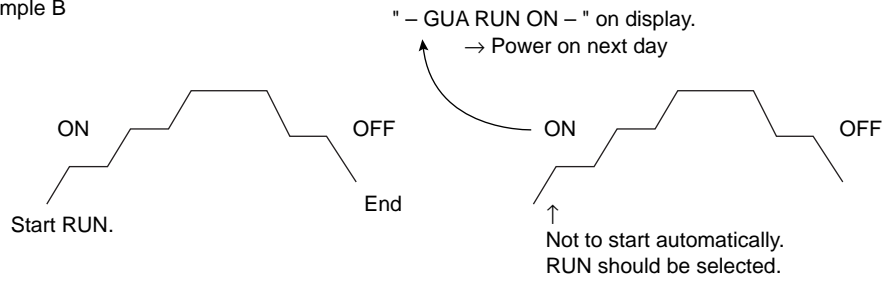


4) GUA RUN

Example A

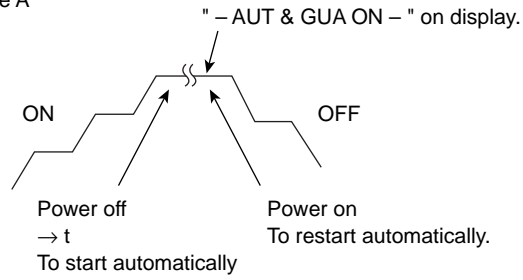


Example B

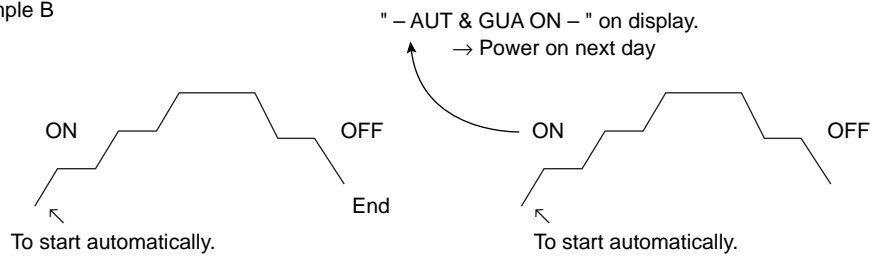


5) AUTO & GUA

Example A



Example B



6. Call "TIME UNIT" by **FILE** key

```
TIME UNIT : [ min ]
PID: [SERIES]
```

(a), (b) on display.

Use the **▽** or **△** key for selection and the **ENT** key for entry.

- (a) Select "min" or "sec" as the time unit for ramping.
(b) Next, select the computing circuit of PID from the following 3 types.

For temperature control, the initial value, i.e., "SERIES" is appropriate.

1. SERIES The AT circuit of the FP21 series has been adjusted for optimum control by the SERIES PID circuit.
2. PARA To be used for special control systems.
3. D_PARA To be preferred for special control systems, and particularly those which require high-speed operation.

7. Call "MEMORY INITIAL" by **FILE** key

```
MEMORY INITIAL
( Ver 1.00): 0
```

Ⓐ

Ⓐ Select whether to initialize data or not.

Select 0, 1 or 2 by the use of the **▽** or **△** key and press the **ENT** key.

- a. -0 -- not to initialize
- b. -1 -- to initialize partially (limited to data stored by the user)
- c. -2 -- to initialize all data

■ ALARM ACTIONS (The No. 6 initialization screen group)

<1> Call the alarm mode screen of the No.6 initialization screen group on display and select the alarm modes.

6) INITIAL DATA

ALARM AL1: [LD1]
MODE AL2: [HD1]

FILE

<2> The following 10 alarm modes are available for selection.

A. Absolute Value Alarm Group [Fig. 6]

① LL 1	② HL 1	③ LL 2	④ HL 2
<p>21°C</p>	<p>25°C</p>	<p>21°C</p>	<p>25°C</p>

① and ② are for setting a temperature at which the relay contact turns ON. ③ and ④ are for setting a temperature at which the relay contact turns OFF.

The above are absolute value settings.

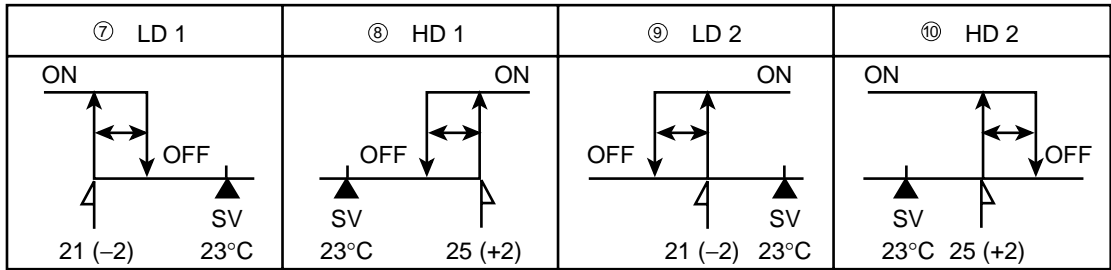
B. Absolute Deviation Alarm Group

⑤ AD 1	⑥ AD 2
<p>21°C SV 23°C 25°C</p>	<p>21°C SV 23°C 25°C</p>

⑤ and ⑥, using one relay, operate both high and low limits of alarm output.
Example: The temperature is set at 23°C and the deviation at 2°C.

In the case of ⑥:
The temperature rises and upon reaching 21°C, the relay contact is turned ON. A further rise to 25°C + sensitivity turns the relay contact OFF. When the temperature lowers to 25°C, the relay contact is turned ON and a further fall to 21°C + sensitivity turns the relay contact OFF.

C. Deviation Alarm Group



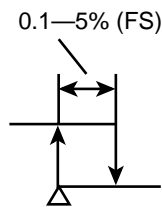
⑦, ⑧, ⑨ and ⑩ are examples in which the temperature is set at 23°C (SV) and the lower limit and the higher limit are set -2°C and +2°C respectively.

AL1 SENS: 0.2%
STBY: [Y]

AL2 SENS: 0.2%
STBY: [N]

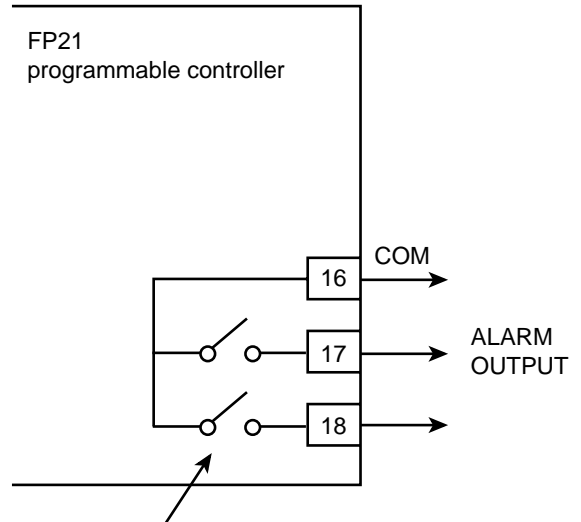
<3> Then, set the sensitivity of the alarm actions and select either non-standby or standby.

◎ Sensitivity adjustment (Sensitivity)

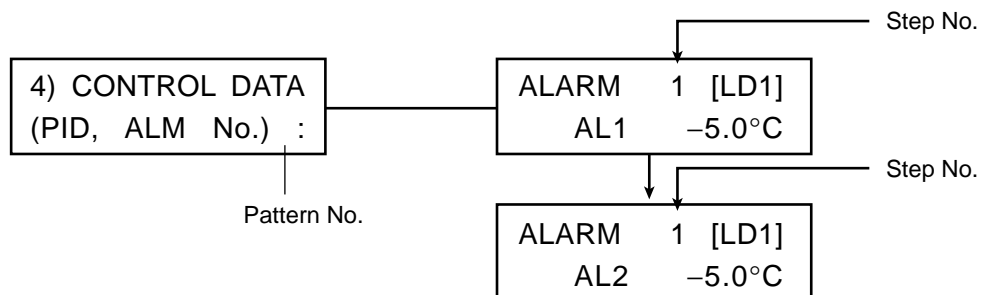


◎ Selection of standby or non-standby.

N---- NO
Y---- YES

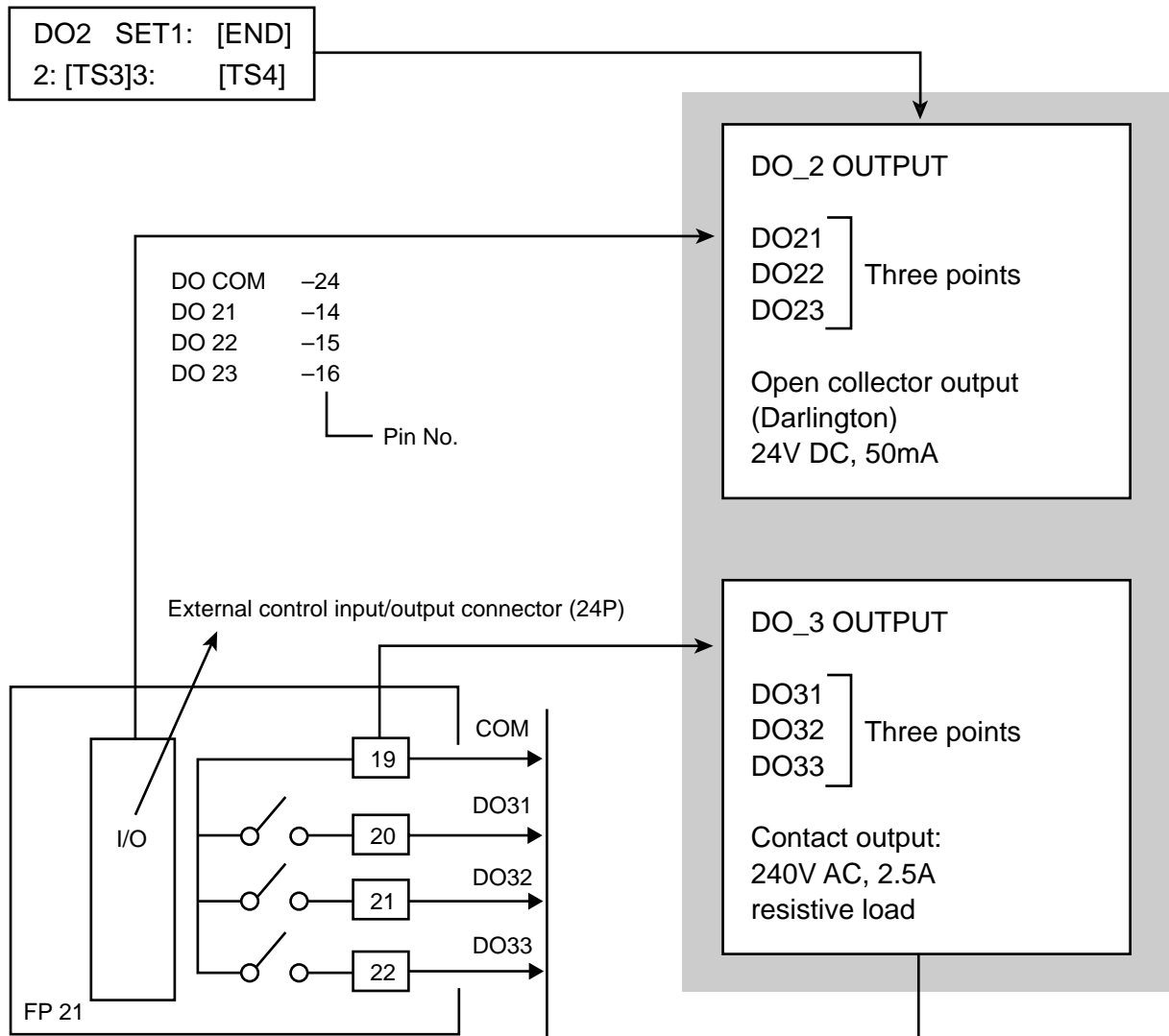


<4> Numerical values of alarm functioning points are set in the No. 4 control screen group.

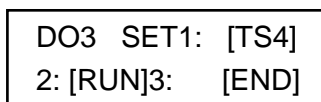


■ Eight Event Signals (The No. 6 initialization screen group) [Fig. 7]

<1> Three of the eight event signals can be selected and set as open collector signals.



<2> Any three of the eight events can be selected and set as contact signals.

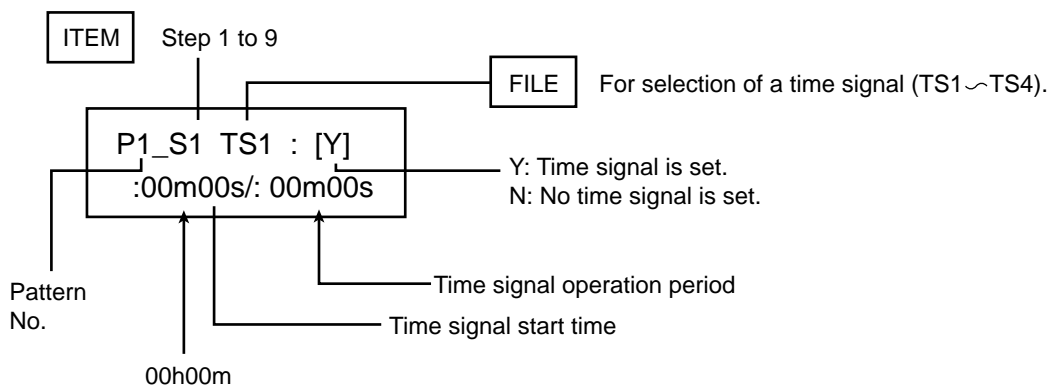


<3> During program operation, six out of the following eight types can be selected and set to output as signals.



EIGHT EVENTS		
1	TS1	TS1 signal (time signal No. 1) set in the No. 3 program data screen group can be output.
2	TS2	TS2 signal (time signal No. 2) set in the No. 3 program data screen group can be output.
3	TS3	TS3 signal (time signal No. 3) set in the No. 3 program data screen group can be output.
4	TS4	TS4 signal (time signal No. 4) set in the No. 3 program data screen group can be output.
5	SO	The output is activated when PV value goes out of range (scale-over).
6	RUN	The output is activated during the whole period of program execution.
7	END	The output is activated 1. when program execution ends. 2. when CFM operation ends (about 1 second). 3. when program is stopped by RST.
8	EXT	The output is activated when EXT (external control input) is selected from the operation modes.

<4> Call the No. 3 program data screen group.
 The pattern No. and the step No. in which a time signal (TS1, TS2, TS3 or TS4) is output are set in this No. 3 program data screen group.



[5] SETTING OF PROGRAM PATTERNS

(1) Set the Program Pattern (I).

Prior to setting the temperature, time, PID and alarm of the program pattern, the following 5 items have to be checked.

1. By pressing the **[FUNC]** key, call **3) PROGRAM DATA PATTERN No.: 1** the initial screen of the program

3) PROGRAM DATA
PATTERN No.: 1

data screen group to confirm that the pattern No. is "1".

The FP21 controller has a capacity of 9 patterns.

Use the **[▽]** or **[△]** key to set a number and register it by pressing the **[ENT]** key.

2. Call

P1	START	SV
:	0.0	°C

 by using the **[FILE]** key and set the starting value of the program. In this example, it is set at 0°C.

P1 START SV
: 0.0 °C

3. Call

P1	GUA	SOAK
:	0.0°C,	: 00m00s

 with the **[FILE]** key. Guarantee soak can be set by time or temperature. In this example, it is not set.

P1 GUA SOAK
: 0.0°C, : 00m00s

4. Call

P1	PTN	END	:	9
	PTN	RPT	:	0

 with the **[FILE]** key. Set the ending step No. of Pattern No.1. In this example, Step No. 9 is set.

P1 PTN END : 9
PTN RPT : 0

5. Next, the number of repeats is set. In this example "0" is set, which means no repeat is required.

Each of the above values is set by means of the **[▽]** or **[△]** key and is registered by pressing the **[ENT]** key.

6. Call

P1
S1

 with the **[FILE]** key. This is a monitor screen to confirm the values set for the program pattern.

P1|
S1|

(2) Set the Program Pattern (II)

1. Call the "P1 SV: 0.0°C" (Pattern No./Temperature/Time)

- a. Call

P1	SV	:	0.0	°C
S1	TIME	:	00h00m	

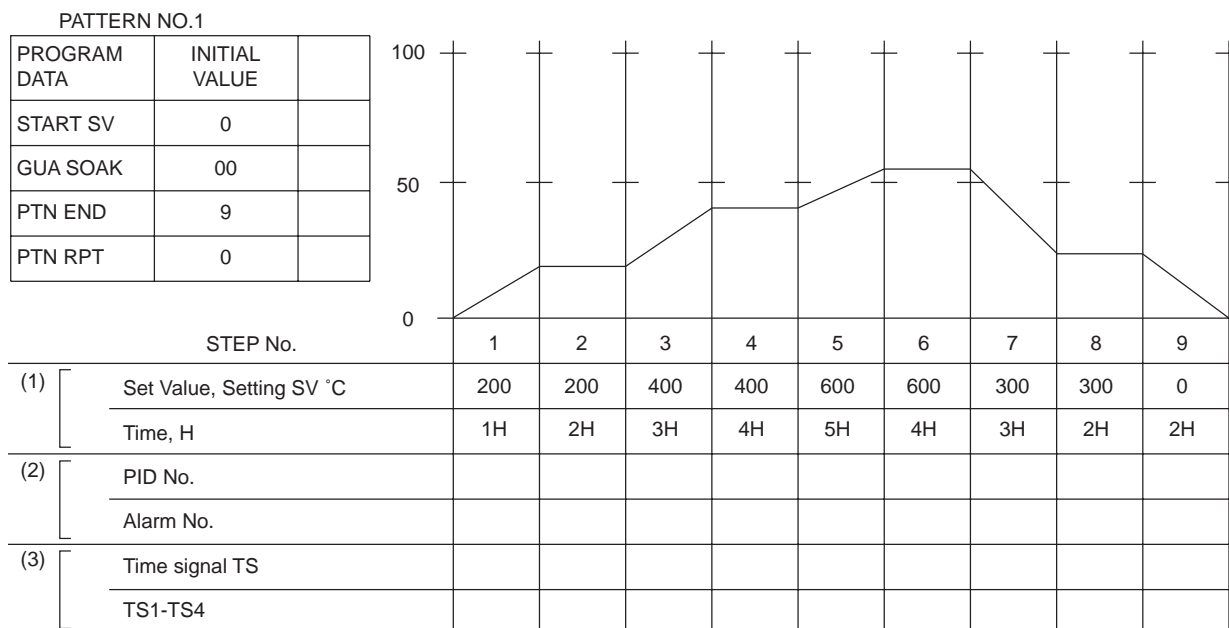
 with the **[FILE]** key.

P1 SV : 0.0 °C
S1 TIME : 00h00m

Use the **[ITEM]** key to call each step.





Now, data to execute the program are set in this screen.






In this example, set the program pattern shown in Fig. 8 in order.













[Fig. 8]





b. Set the temperature and time of each step.






STEP 1
 Start setting with Step No.1.
 Set SV at 200°C by the use of the ,  or  key and register it with the  key.






Move the cursor to "TIME" by the use of the  key.
 Set the time at 1h by the use of the ,  or  key and register it by pressing the  key.

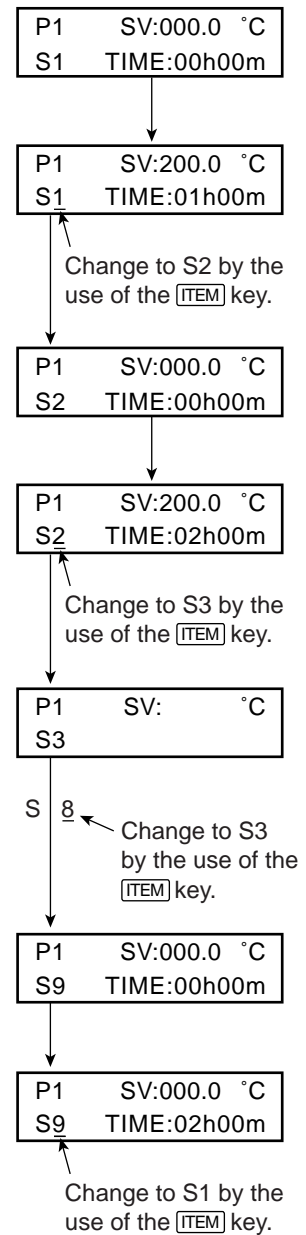
STEP 2
 Use the  key to change to the Step 2 screen.
 Set SV at 200°C by the use of the ,  or  key and register it with the  key.

Move the cursor to "TIME" with the  key and set it at 2h by using the ,  or  key and enter it with the  key.


STEP
 Use the  key to change to the Step 3 screen.
 Set the temperature and time with the ,  or  key in the same manner as above.


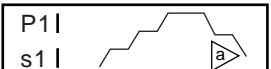
STEP 9
 Use the  key to change to the Step 9 screen.
 Set SV at 0°C with of the ,  or  key and register it with the  key.

Move the cursor to "TIME" by the use of the  key.
 Set it at 2h with the ,  or  key and register it with the  key.



The procedure to set the temperature and time of each step of Pattern No.1 has been completed.

c. Confirm that the pattern has been set as intended.
 Press the  key 9 times and the following screen and similar ones are on display successively.
 (See (5) on page 14.)

Press the  key, and  is on display.

2. Call the "P1-S1 PID No: 0" (Pattern No./PID values/Alarm values)

A. Start with PID values.

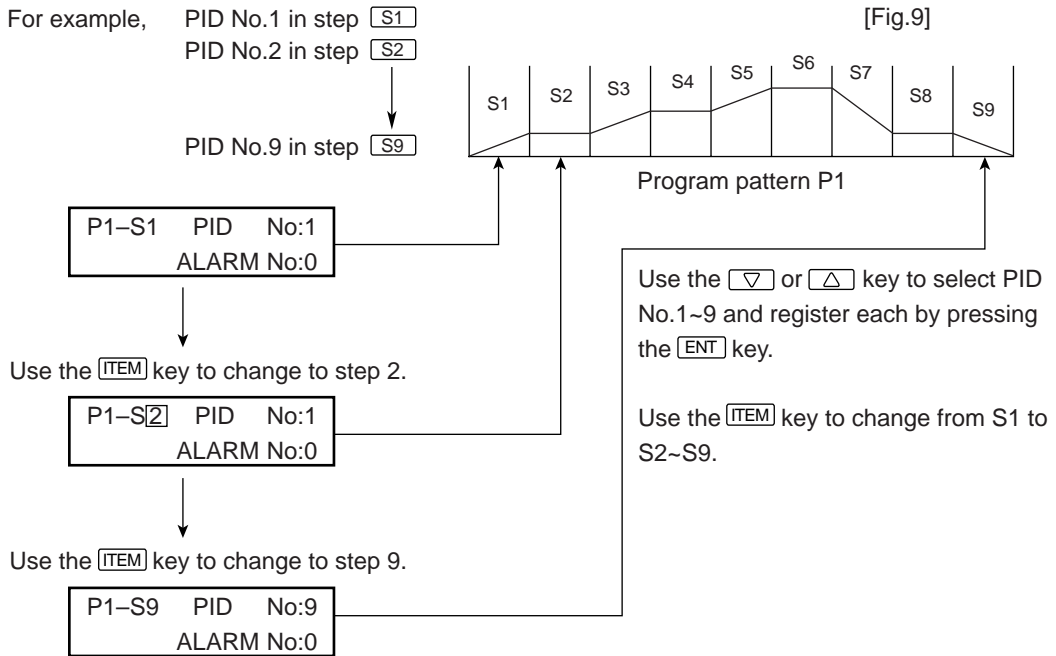
Call

P1-S1	PID	No:0
	Alarm	No:0

 by pressing the **[FILE]** key.

- a. This screen is not used in case auto-tuning (AT) is executed.
- b. This screen is used in case auto-tuning (AT) is executed and PID values during the AT operation need to be stored for each step.
- c. This screen is used in case PID values are set for each step without auto-tuning (AT).
- d. Procedure for "b." and "c." above.

Prior to setting PID values, the PID No. to be activated in each of the steps S1~S9 is set as shown in Fig 9.

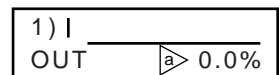


When the above procedure is completed, the PID values automatically obtained in each step by the auto-tuning function during the execution of auto-tuning (AT) are stored.

4) CONTROL DATA (PID, ALM No.):1

 ← They are stored in the PID DATA screens in the No.4 control data screen group.

e. Press the **[RVS]** key and then the **[FUNC]** key to return to the initial screen.

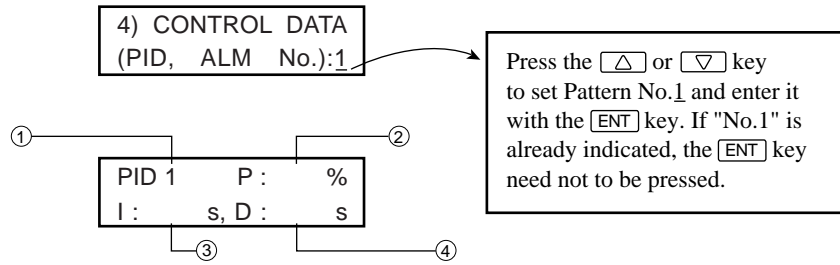


Set PID values for each step of Pattern No.1, referring to Fig.10.

PATTERN No.1 TIME	SV	1	2	3	4	5	6	7	8	9	STEP
	----->	1H	2H	3H	4H	5H	4H	3H	2H	2H	
PID_1 P : %		5	5	5	10	10	10	15	15	15	
I : S		300	300	300	400	400	400	500	500	500	
D : S		3	3	3	5	5	5	10	10	10	
PID_1 OH : %		100	100	100	90	90	90	70	70	70	
(OUTPUT LIMITER) OL : %		0	0	0	0	0	0	0	0	0	

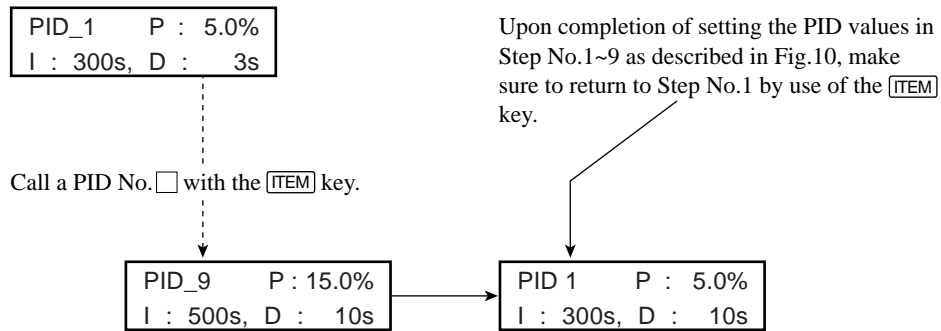
[Fig.10]

- f. Press the **[FUNC]** key three times to call the No.4 control data screen group and display the following screen by the use of the **[FILE]** key.
From this screen group, call the following screen.



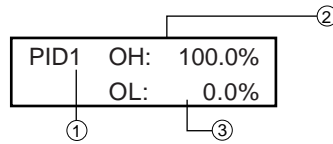
- ① Call the Step No._by the use of the **[ITEM]** key (from PID1 to 9).
- ② Select the proportional band value (P) by the use of the **[▽]** or **[Δ]** key and register it with the **[ENT]** key.
Move the cursor to "I" with the **[ENT]** key.
- ③ Select the integral time "I" by the use of the **[▽]** or **[Δ]** key and register it with the **[ENT]** key.
Move the cursor to "D" with the **[ENT]** key.
- ④ Select the derivative time "D" by the use of the **[▽]** or **[Δ]** key and register it with the **[ENT]** key.

* In case the program is executed by auto-tuning, PID values need not be set.



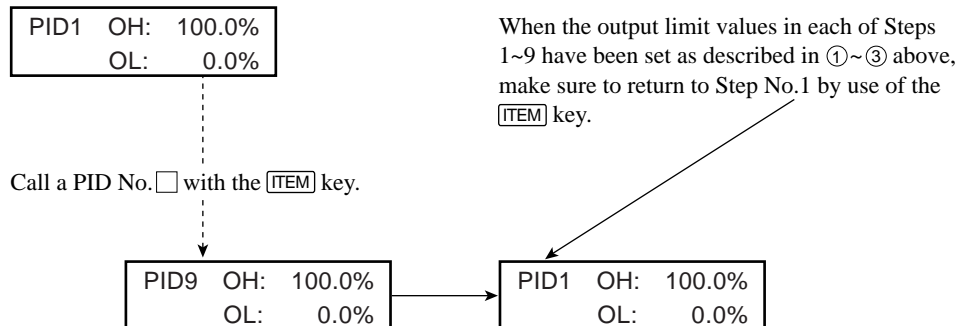
Call a PID No.□ with the **[ITEM]** key.

- g. Next, call the output limiter screen with the **[FILE]** key.




This is not necessary if the output is not restricted by a higher or lower limit.
When limits are required, values are set as follows.

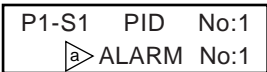
- ① Call a step No. (PID No.1~9) by the use of the **[ITEM]** key.
- ② Select the higher limit output value by the use of the **[▽]** or **[Δ]** key and register it with the **[ENT]** key.
- ③ Select the lower limit output value by the use of the **[▽]** or **[Δ]** key and register it with the **[ENT]** key.



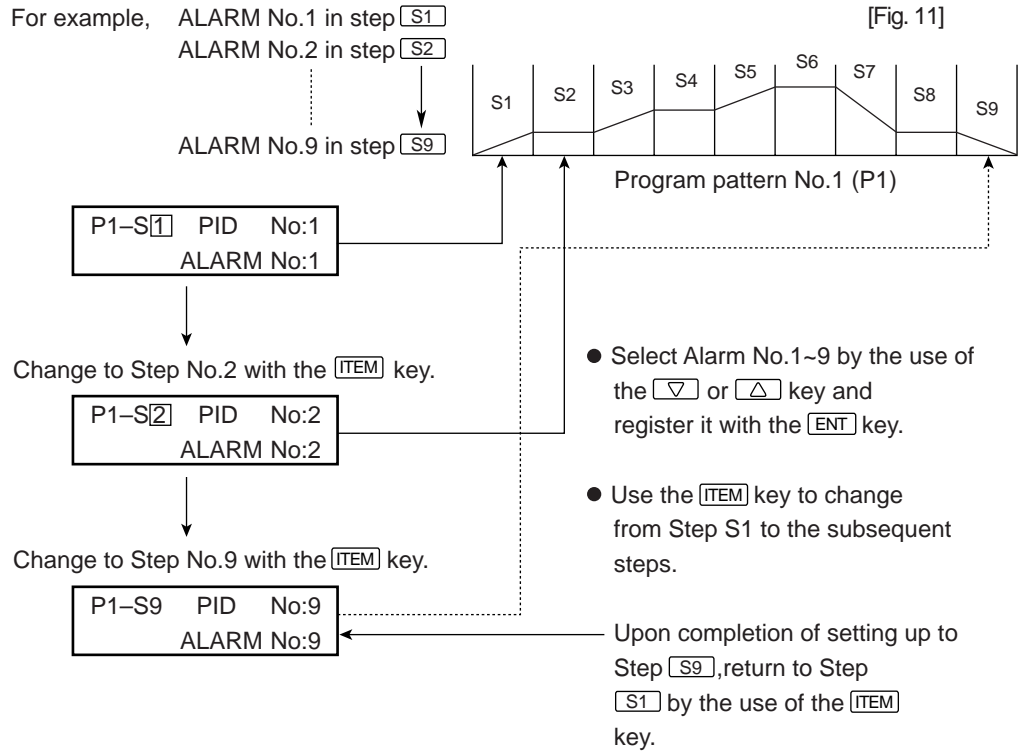
Call a PID No.□ with the **[ITEM]** key.

B. Next, alarm values are to be set.

Call **3) PROGRAM DATA** on display by pressing the **[RVS]** key and then the **[FUNC]** key three times,


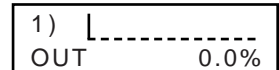
and move to **P1-S1 PID No:1** by the use of the **[FILE]** key.


- a. This screen is not used in case alarm actions are not required.
- b. For the selection of the alarm mode, refer to page 12.
- c. Prior to setting numerical values to activate the alarm function, the Alarm No. to be activated in each of Step Nos.1~9 is set as shown in Fig.11.

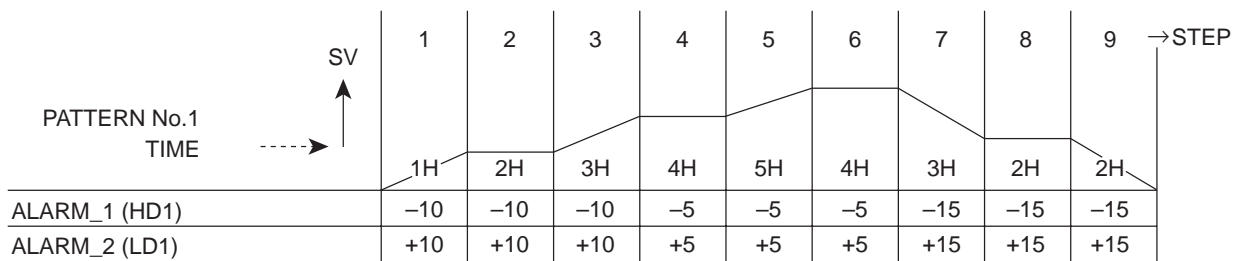


Numerical values for activating the alarm function are selected and set into the No.4 control data screen group.

d. Press the **[RVS]** key and then the **[FUNC]** key to return to the initial screen. ___

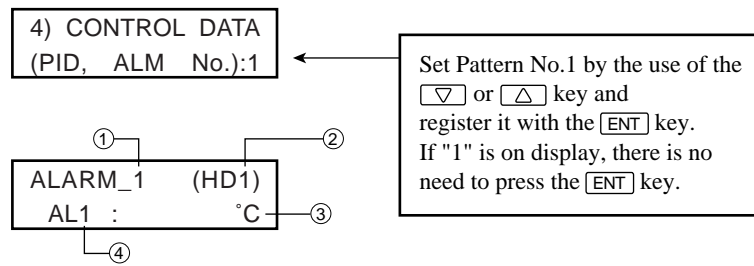


Set the alarm action points in each step of Pattern No.1, referring to the example shown in Fig.12.



[Fig.12]

- e. Press the **[FUNC]** key three times to call the No.4 control data screen group. Then, press the **[FILE]** key three times to call the following screen onto display.



Starting with the **[AL1]** screen....

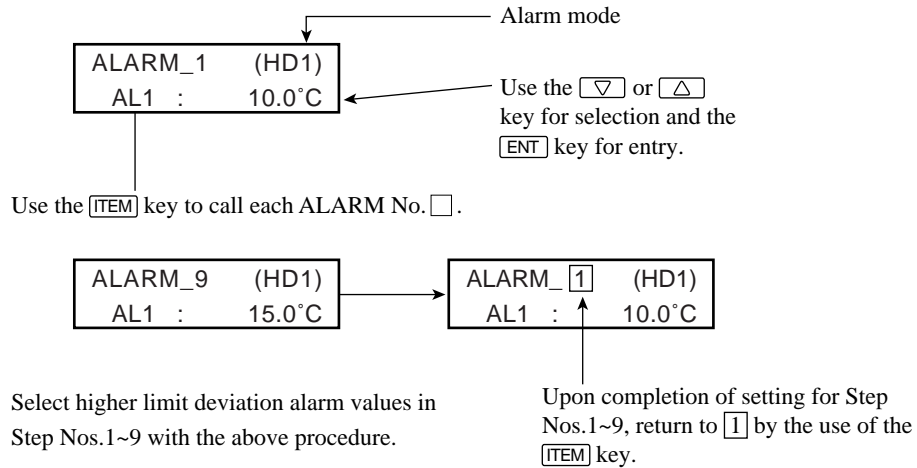
- ① Call the Step No._ by means of the **[ITEM]** key (ALARM 1~9).
- ② The screen shows the alarm mode.
If you want to change it, see page 12.
- ③ Press the **[▽]** or **[△]** key to select the value at which the alarm is activated and register it with the **[ENT]** key.

Next comes the **[AL2]** screen....

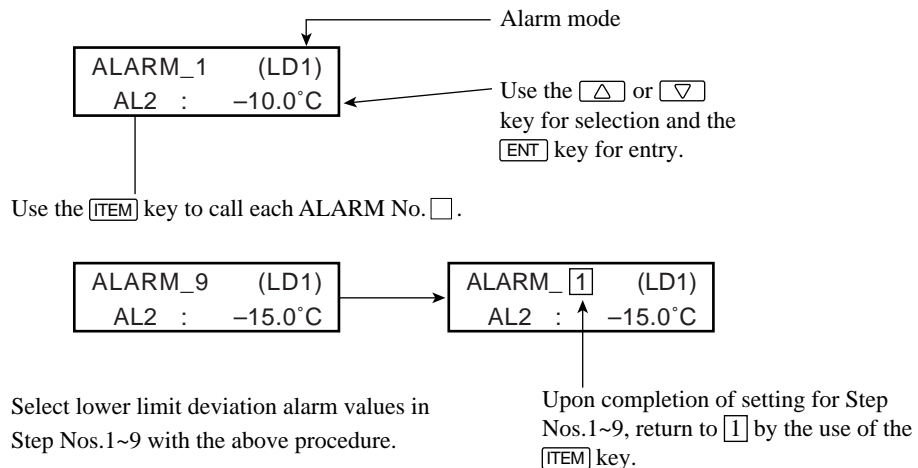
- ④ Press the **[FILE]** key to move to the **[AL2]** screen.
Carry out the selection and entry as described in ①, ② and ③ above.

- f. Now, set numerical values of the alarm actually, referring to Fig.12.

To begin with, the higher limit deviation alarm (HD1) is set in the **[AL1]** alarm screen and the lower limit deviation alarm (LD1) in the **[AL2]** screen as follows.

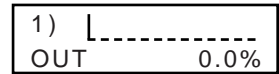


Next, press the **[FILE]** key to call the **[AL2]** screen.

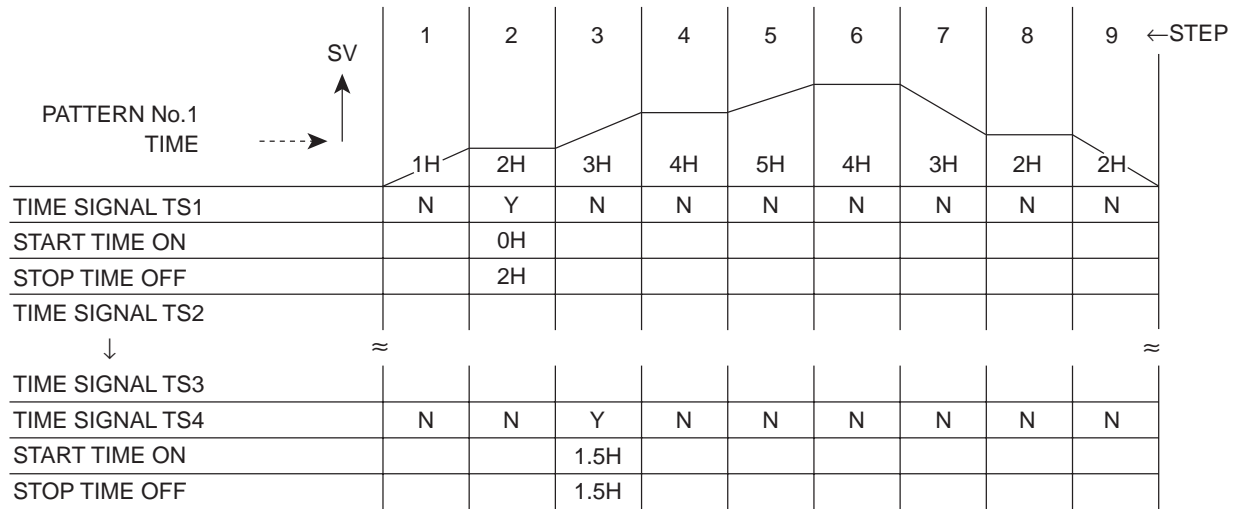


3. Call the "P1-S1 TSI: [N]" (Pattern No./Time signal TS)

Press the **[RVS]** key and then the **[FUNC]** key to return to the initial screen of the monitor screen group.

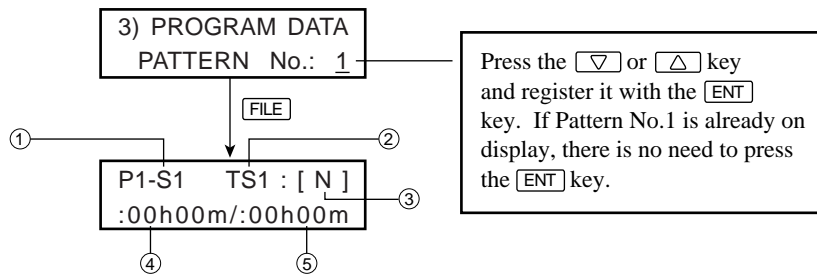


a. Fig.13 shows an example of setting time signals for the respective steps of Pattern No.1.



[Fig.13]

Then, press the **[FUNC]** key twice to move to the No.3 program data screen group and call the following screen by the use of the **[FILE]** key.

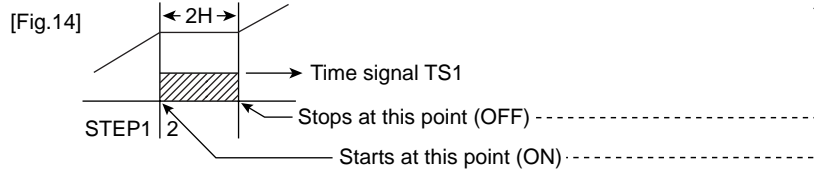


- ① Call the Step No. by the use of the **[ITEM]** key (S1~9).
- ② Select TS1, TS2, TS3, or TS4 as the time signal by means of the **[FILE]** key.
- ③ Select "Yes" or "No" to the use of time signal by pressing the **[▽]** or **[△]** key and register it with the **[ENT]** key.
- ④ Set the starting time (ON time) of the time signal by the use of the **[▽]** or **[△]** key and register it with the **[ENT]** key.
- ⑤ Set the stop time of the time signal (OFF time) by the use of the **[▽]** or **[△]** key and register it with the **[ENT]** key.

- b. Set the time signals in numerical values.
Use the TS1~TS4 examples shown in Fig.13.

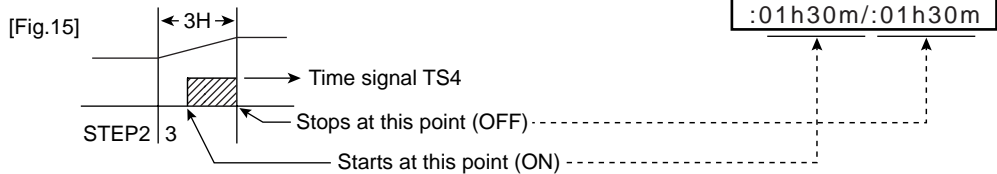
- ① In step S1, TS1: [N], which means no time signal is set.
N: No-Not to be set.
Y: Yes-To be set.
- ② Use the [ITEM] key to change to S2.
Set [Y] by the use of the [▽] or [△] key and register it with the [ENT] key.
Move the cursor by the use of the [ENT] key and set the start time of TS1 at 00h00m and the stop time at 02h00m by the use of the [▽] or [△] key and register them with the [ENT] key.

The time signal functions as follows.

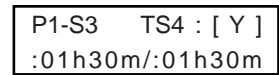
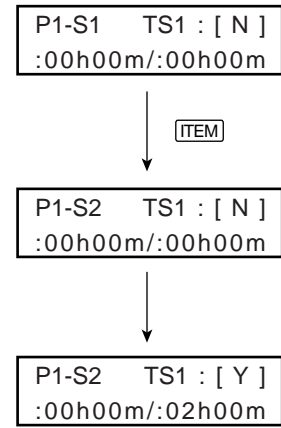


- ③ Change to S3 by the use of the [ITEM] key. Then, move to TS4 by the use of the [FILE] key.
Press the [▽] or [△] key to set [Y] and register it with the [ENT] key and press the [ENT] key again.
Set the start time of TS4 at 01h30m and the stop time at 01h30m by the use of the [▽] or [△] key and register them with the [ENT] key.

The time signal functions as follows.



The time signals have now been set.



c. Activation of time signals (TS1~TS4).

- ① Even when [Y] has been set for the time signal TS1, it is not activated if the starting time is "0".
} →

P1-S1	TS1 : [Y]
:00h00m/	:00h:30m
- ② When [N] has been set for the time signal TS1, it is not activated even if the times are set.
} →

P1-S1	TS1 : [N]
:00h20m/	:00h:15m
- ③ When [Y] is set for the time signal TS1 and the starting and stop times are set at 30m and 00m respectively, it is activated for 1 second at the starting time.
} →

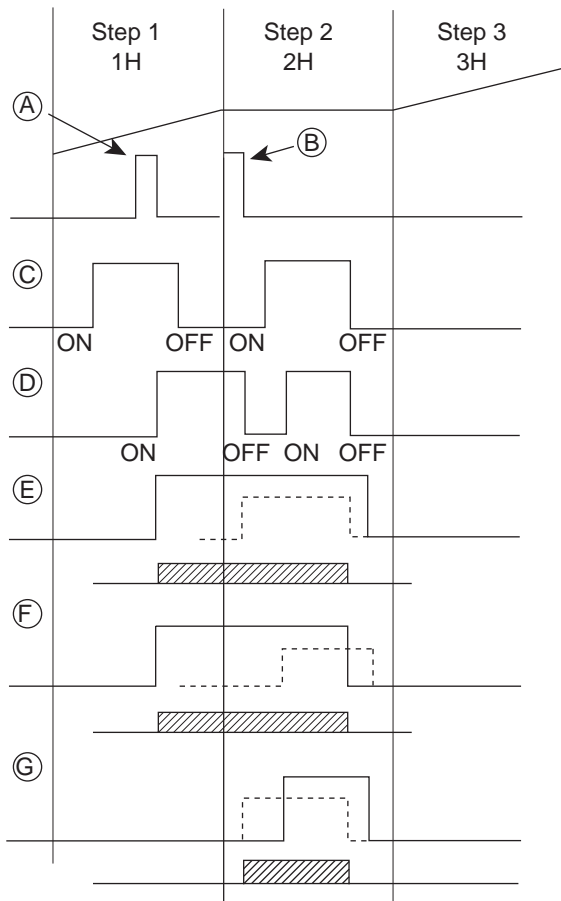
P1-S1	TS1 : [Y]
:00h30m/	:00h:00m

↗ (A)
- ④ When [Y] is set for the time signal TS2 and both the start and stop times are set at 00m, it is activated for 1 second at the starting point of the step.
} →

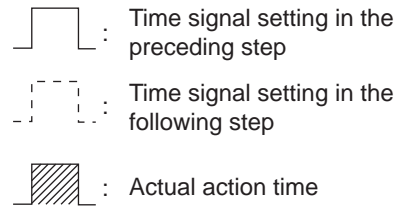
P1-S2	TS1 : [Y]
:00h00m/	:00h:00m

↖ (B)

[Fig. 16]



When the action time (▨) of the time signal in a step overlaps that (□) of the following step as seen in (E), (F) and (G) in Fig. 16, its actual action time is as shown by (▨).



[6] Program Operation

(1) Preparations for Operation

The execution parameter screen group comprises screens for operating the FP21 programmable controller by starting, suspending, stopping, etc.

1. Press the **[FUNC]** key to call the operating parameter screen, in which an execution parameter is called.

2) EXEC KEY:[KEY]
(RST)

In this space a parameter (in three letters) selected from 1~8 by the use of the **[▽]** or **[△]** key is displayed.

1	RUN Program start	5	RST Program stop
2	FIX Fixed value control start	6	ADV ADVANCE start/stop
3	MAN MANUAL operation ON	7	HLD HOLD start/stop
4	CFM Pattern output ON	8	AT AUTO-TUNING start/stop

When a parameter has been called, press the **[ENT]** key to execute it.
Prior to starting program operation, check the following.

2. Press the **[FILE]** key.
 - a. Which pattern No. is the program started with?
 - b. Which step No. is the program started with?
 - ◎ Here, the starting pattern and step Nos. are both "1".

START PTN No: 1
STP No: 1

3. Press the **[FILE]** key to set the link format.
 - a. The order of linking should be decided.
 - ◎ In this example, no link is required and so setting is not necessary.

LINK FORMAT
:[_]

4. Press the **[FILE]** key.
 - a. In case the link format is set, do you want to repeat the linked steps?
If so, how many times? No repeat = 0
 - b. Do you want to execute PV START?
Select Y for Yes or N for No. by the use of the **[▽]** or **[△]** key and register it with the **[ENT]** key.
 - ◎ In this example, [N] is registered.

LINK EXEC. : 0
PV START : [N]

5. For advancing the program, press the **[FILE]** key, and select either of the following.
 - a. Advance by STEP

ADV MODE: [STEP]
(TIME) : 00h01m

- b. Advance by TIME
If TIME is selected, set the time by pressing the **[▽]** or **[△]** key and register it with the **[ENT]** key.
The program can be advanced by the time set.

ADV MODE: [TIME]
(TIME) : 0

(2) Start of Operation

Call 2)EXEC KEY : [KEY]
(RST) by pressing the FILE key.

1. To start (RUN) the program, call [RUN] by the use of the ▽ or △ key and press the ENT key to execute. The RUN lamp is lit on the front panel.

2)EXEC KEY=[RUN]
(RST)

2)EXEC KEY:[KEY]
(RUN)

2. To start auto-tuning (AT), call [AT] by the use of the ▽ or △ key and press the ENT key to execute. The AT lamp is lit on the front panel.

2)EXEC KEY=[AT]
(RUN)

2)EXEC KEY:[KEY]
(RUN)

3. Upon starting (RUN) the program, call the No.1 monitor screen group to check the pattern. To return to the monitor screen group, press the RVS key and then the FUNC key. Use the FILE key to check the pattern.

1) | ↗ | ██████████
OUT 90.0%

P 1 | ↗ |
S 1 | ██████████

Blink

4. To stop auto-tuning during execution, use the FUNC key to call. Call [AT] here.

2)EXEC KEY:[KEY]
(RUN)

Call [AT] by the use of the ▽ or △ key. When the ENT key is pressed, the AT lamp goes out and auto-tuning is stopped.

2)EXEC KEY:[AT]
(RUN)

5. To stop (RST) the program, use the FUNC key to call this. Call [RST] here.

2)EXEC KEY:[KEY]
(RUN)

Call [RST] by the use of the ▽ or △ key. Upon pressing the ENT key, the RST lamp goes out and the program is stopped. When the program is stopped temporarily or terminated, the LCD display changes to the following.

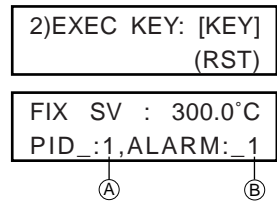
- MESSAGE -
RET RUN BRK 1

To start (RUN) again, press the RVS key and the FUNC key, and then the FUNC key. The display returns to the No.2 execution parameter screen group.

[7] SETTING AND OPERATION OF FIXED VALUE CONTROL

(1) Setting of Temperature, PID Values and Alarm Values for Fixed Value Control.

- To set the temperature, call the operation mode screen by the use of the **[FUNC]** key and the FIX screen by the use of the **[FILE]** key. Set the temperature at, for example, 300°C with the **[▽]** or **[△]** key and register it with the **[ENT]** key.



- To set PID values and ALARM values,

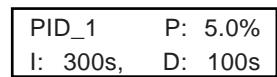
- The PID No. **Ⓐ** and ALARM No. **Ⓑ** to store these data should be decided. Assuming that No.1 is selected for both, set them at 1 with the **[▽]** or **[△]** key and register them with the **[ENT]** key.
- Next, set PID and ALARM values in the control data screen group.

Return to the initial screen by pressing the **[RVS]** key and then the **[FUNC]** key and press **[FUNC]** key again to move to

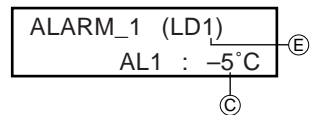


- Call the PID screen with the **[FILE]** key. Set PID values with the **[▽]** or **[△]** key and register them with the **[ENT]** key.

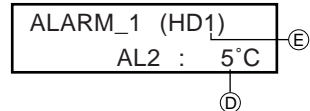
In case auto-tuning is carried out, these need not be set.



- Call the ALARM_1 screen with the **[FILE]** key and set the value for AL1: **Ⓒ**.



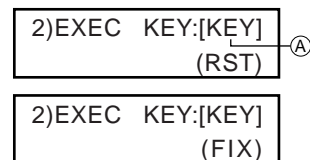
- Change the screen to AL2: **Ⓓ** with the **[FILE]** key and set the value.



- In the above, the alarm mode **Ⓔ** and sensitivity are assumed to have already been set in the initial data screen group described on page 12. To change them or some other item, refer to page 12.

(2) Start of Fixed Value Control Operation

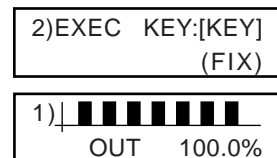
- To start fixed value control (FIX), call the execution parameter screen by the use of the **[FUNC]** key. Call **Ⓐ**: [FIX] by the use of the **[▽]** or **[△]** key and press the **[ENT]** key. **The FIX lamp is lit on the front panel.**



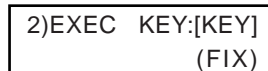
- To execute auto-tuning (AT), call **Ⓑ**: [AT] by the use of the **[▽]** or **[△]** key and press the **[ENT]** key. **The AT lamp is lit on the front panel.**



After starting fixed value control (FIX), press the **[RVS]** key and the **[FUNC]** key to return to the monitor screen.



- To stop auto-tuning during execution, bring onto display by the use of the **[FUNC]** key to call [AT]



Use the **[▽]** or **[△]** key to call [AT] and press the **[ENT]** key. The AT lamp on the front panel goes out and the AT operation is stopped.

4. To change from fixed value control (FIX) to manual operation (MAN),

① Display this screen by the use of the **[FUNC]** key to call [MAN]

```
2)EXEC KEY:[KEY]
(FIX)
```

Use the **[▽]** or **[△]** key to call [MAN]. Press the **[ENT]** key, and the MAN lamp lights.

② Manual operation is carried out through the monitor screen.

Call

```
1) | _____
   |
   | OUT : 0.0%
```

 by pressing the **[RVS]** key and the **[FUNC]** key.

Adjust the output manually, using the **[▽]**, **[◀▶]** and **[△]** keys.

③ To return from manual control to fixed value control (FIX):

Display this screen by the use of the **[FUNC]** key to call [FIX].

```
2)EXEC KEY:[KEY]
(MAN)
```

Use the **[▽]** or **[△]** key to call [FIX] and press the **[ENT]** key to start (FIX).

5. To stop fixed value control (FIX):

Display

```
2)EXEC KEY:[KEY]
(FIX)
```

 by the use of the **[FUNC]** key to call [RST].

Use the **[▽]** or **[△]** key to call [RST]. Press the **[ENT]** key, and the [FIX] lamp on the front panel goes out and fixed value control (FIX) is stopped.

When fixed value control (FIX) is stopped, the LCD display changes to the following.

```
- MESSAGE -
# RET FIX BRK 1
```

To resume fixed value control (FIX), press the **[RVS]** key and the **[FUNC]** key and repeat the above procedure from (1) on page 25.

[8] PROGRAM OPERATION BY EXTERNAL CONTROL

(1) Before calling the operation mode screen,

- a. Set the program pattern.
 - 1) Set the temperature of each step.
Set the time of each step.
 - 2) Set the PID values of each step. (Not necessary in case of auto-tuning.)
Set the alarm values of each step. (Not necessary in case of auto-tuning.)
 - 3) Set a time signal, etc., for each step.

For the above setting, refer to pages 14 to 22.

b. For external control, provide external switches and wire them as follows.

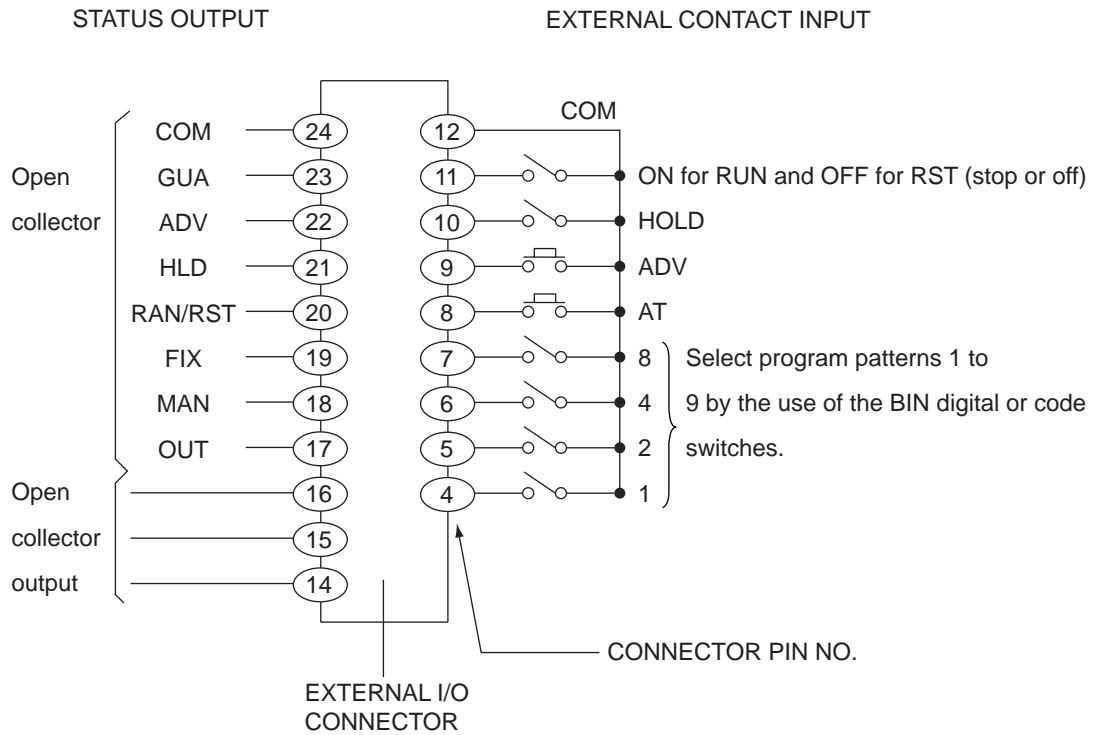


Fig.17

(2) External Control

To switch to external control, display 1) [-----]
OUT 0.0% by the use of the FJNC key and

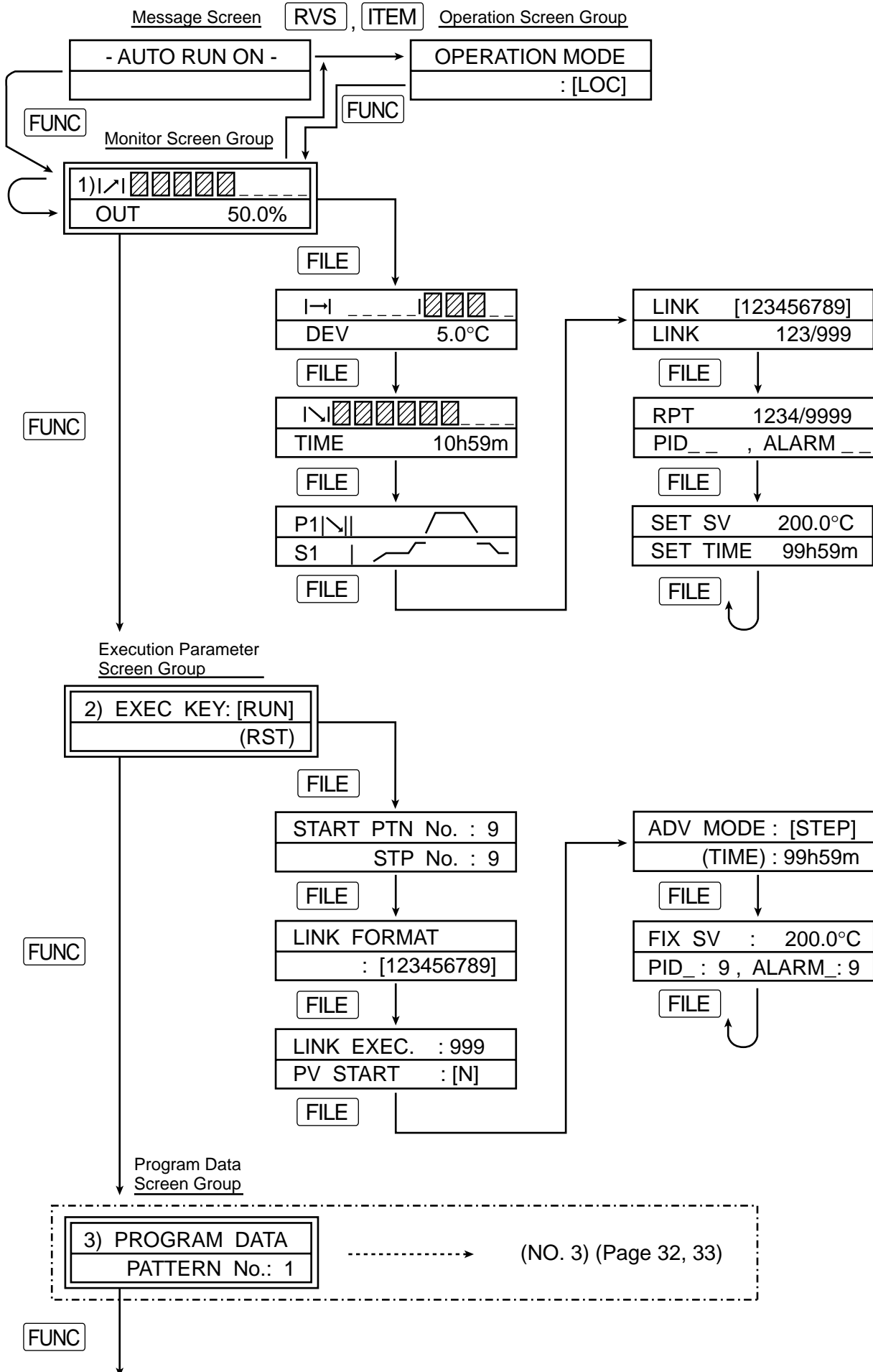
then call OPERATION MODE
:(LOC) by the use of the RVS key and the ITEM key.

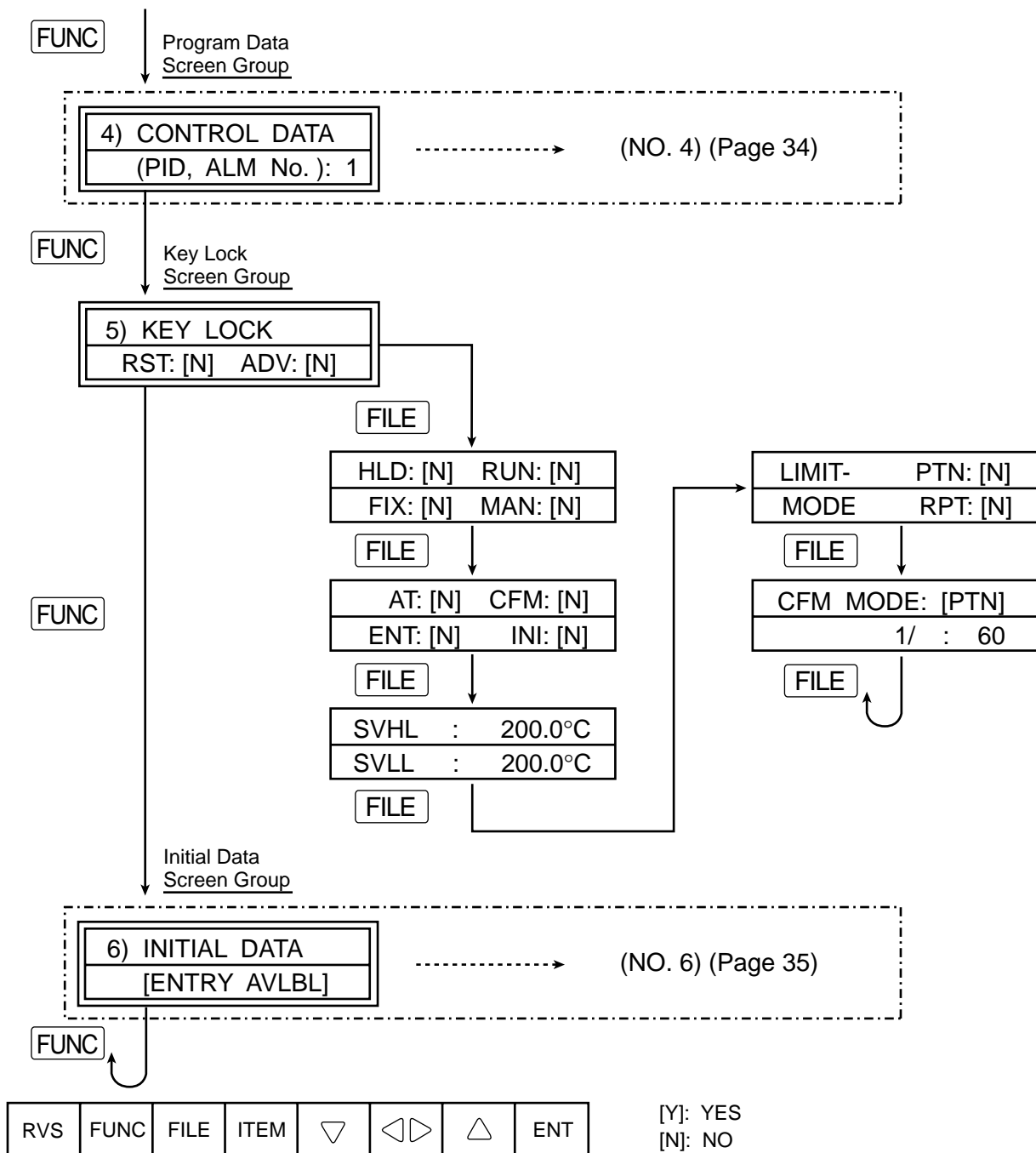
Call A: [EXT] with the ▽ or △ key and press the ENT key.

(3) To start external control, select the program pattern No._ by the use of the BIN code switches. When the external RUN/STOP switch is turned ON, the program is started.

Note: Regarding switches for the ADV and AT, use the push-button switches as illustrated in Fig.17.

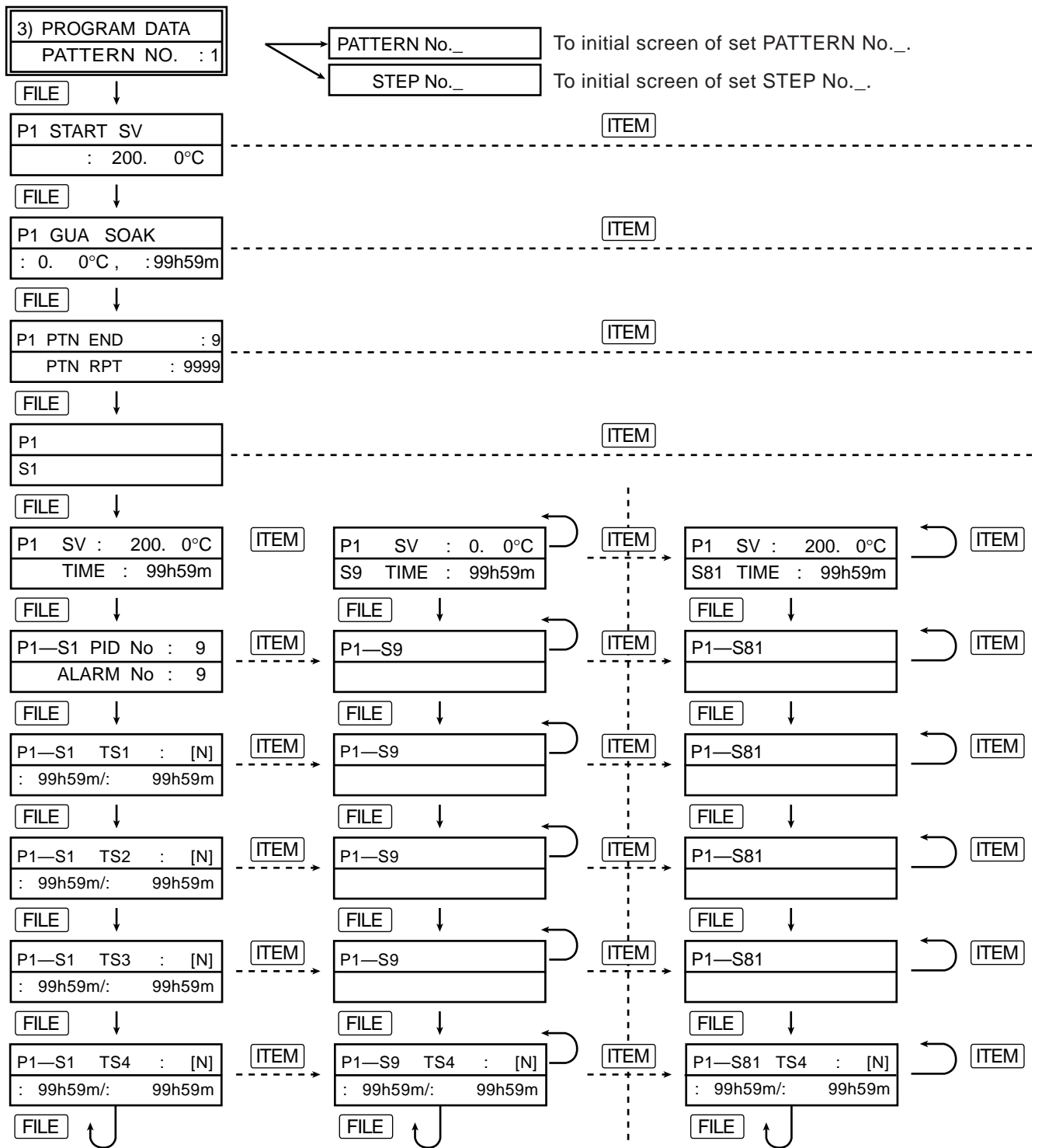
[9] LCD SCREEN DIAGRAM & KEY SEQUENCE





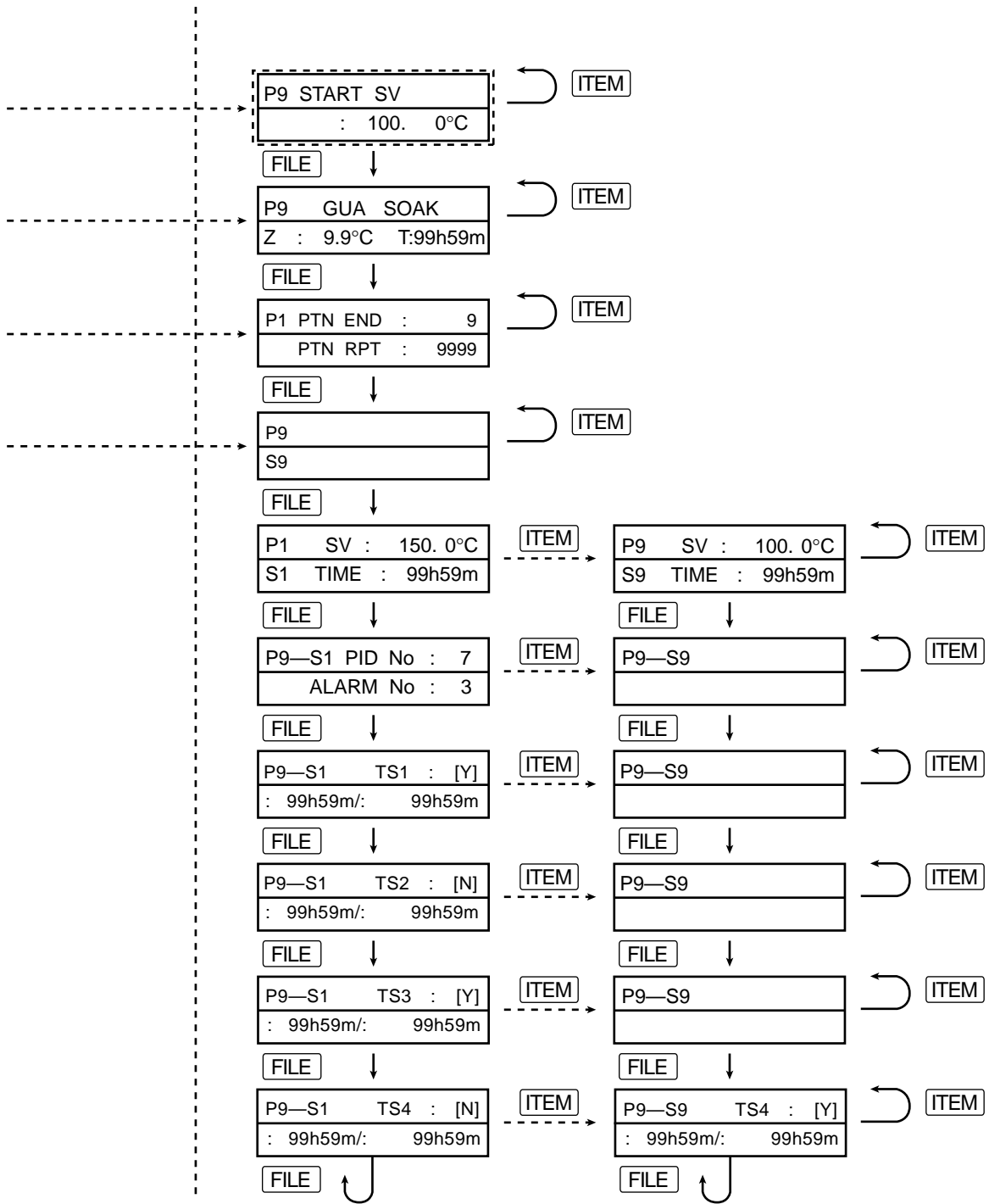
- (1) Whichever screen may be on display, you can move to the initial screen () of the monitor screen group by pressing the **[RVS]** and **[FUNC]** keys.
- (2) When any screen other than the initial one () of each screen group is on display, you can call the initial screen of the same group by pressing the **[FUNC]** key.
- (3) By pressing the **[FILE]** key and the **[ITEM]** key respectively after pressing the **[RVS]** key, you can call a screen opposite to the direction of the **[FILE]** or **[ITEM]** key.
- (4) The **[RVS]** and **[<>]** keys are used to move the cursor from a parameter to another in the same screen. The **[<>]** key is used to move from a figure to another of a number.
- (5) The **[▽]** and **[△]** keys are used to change data in number or in letter(s). When "=" is displayed, the set data is registered by pressing the **[ENT]** key.
- (6) When the **[ENT]** key is pressed with "." on display, the cursor can be moved from a parameter to another in the same way as the **[RVS]** and **[<>]** keys are pressed, and changed data is registered when the **[ENT]** key is pressed with "=" on display.
- (7) Pressing the **[RVS]** and **[▽]** keys displays the lower limit value possible to be set.
- (8) Pressing the **[RVS]** and **[△]** keys displays the higher limit value possible to be set.
- (9) Pressing the **[RVS]** and **[ENT]** keys calls back data set immediately before if data is a numerical value.
- (10) When the **[RVS]** key is pressed, is displayed on the lower left side of the screen. If no key is pressed subsequently, the reverse mode is automatically released in 5 seconds. When the **[RVS]** key is pressed while is on display, goes out.

Program Data Screen Group & Key Sequence (No.3)



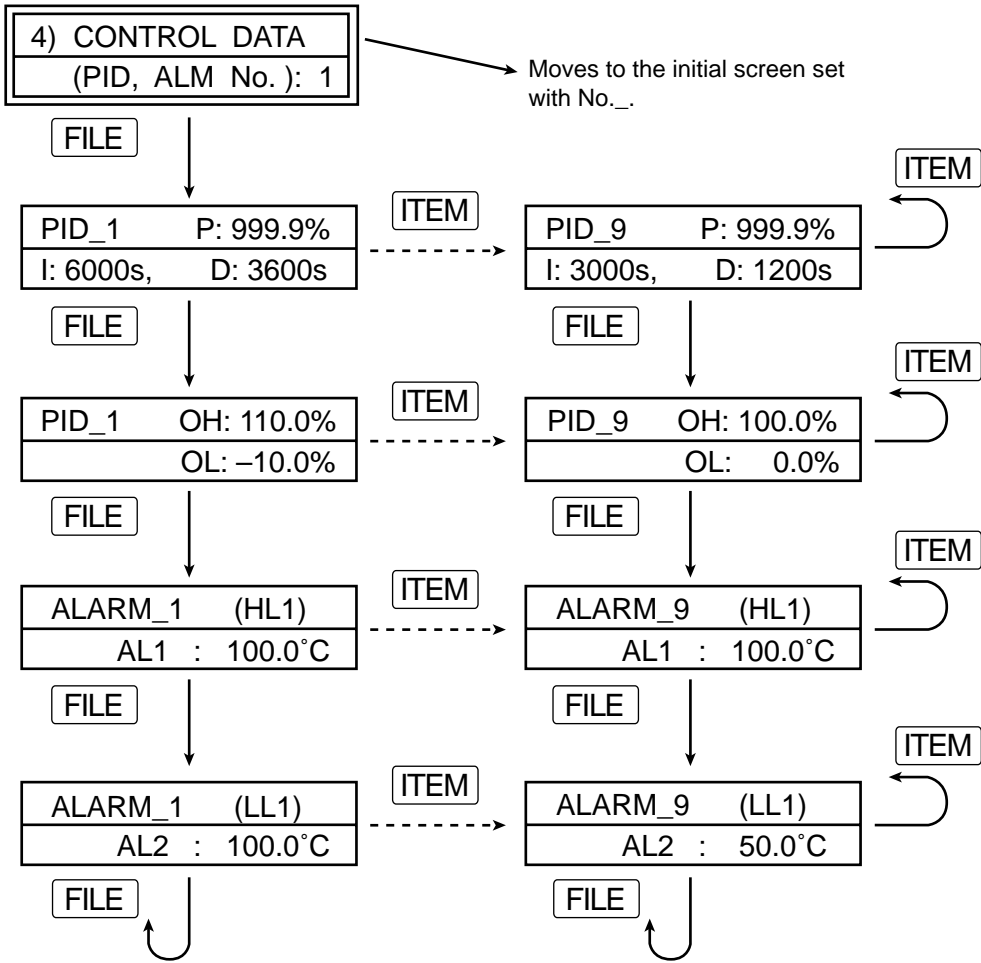
- (1) In LIMIT MODE PTN [N], indication is of nine patterns and nine steps.
In LIMIT MODE PTN [Y], indication is of one pattern and 81 steps.
- (2) If PATTERN No. _ is set on the initial screen () upon [N], the screen moves to the initial screen () of the pattern No. (P_) set.
- (3) If STEP No. _ is set on the initial screen () upon [Y], the screen moves to the initial screen (SV, TIME) of the step No. (P1-S_) set.

Indicated upon LIMIT MODE [Y]

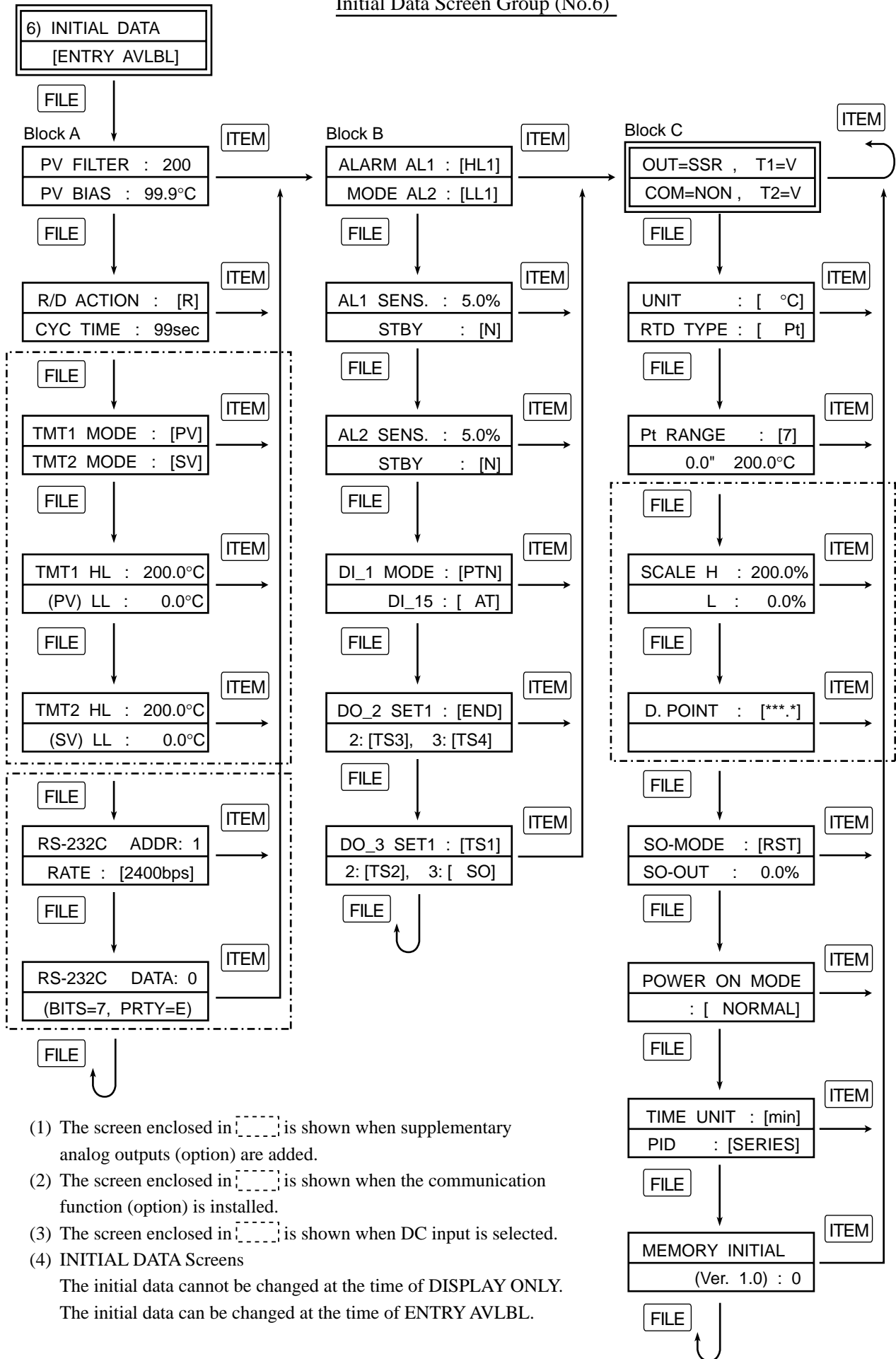


Not indicated upon LIMIT MODE [Y]

Control Data Screen Group (No.4)



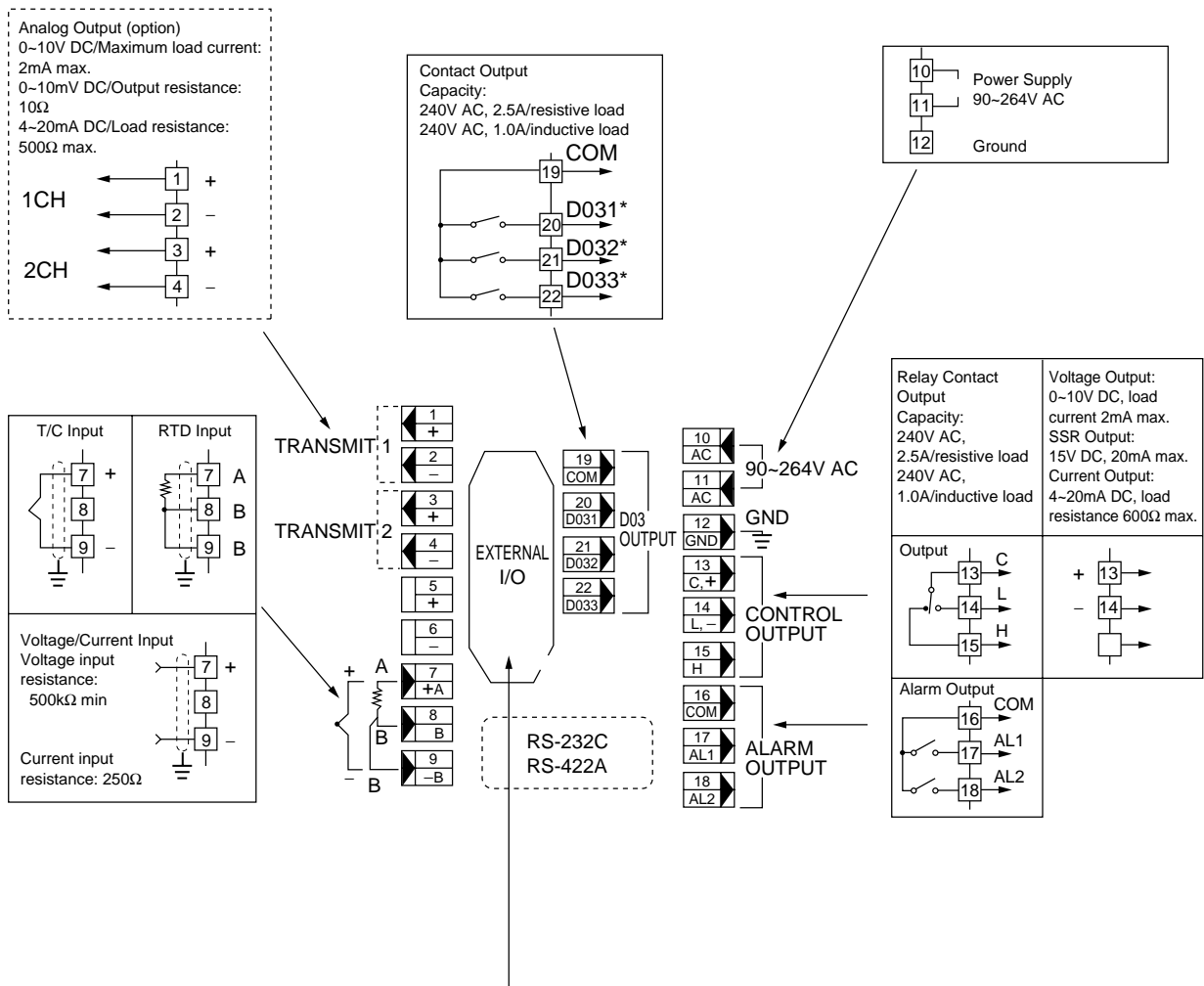
Initial Data Screen Group (No.6)



- (1) The screen enclosed in [dashed box] is shown when supplementary analog outputs (option) are added.
- (2) The screen enclosed in [dashed box] is shown when the communication function (option) is installed.
- (3) The screen enclosed in [dashed box] is shown when DC input is selected.
- (4) INITIAL DATA Screens
The initial data cannot be changed at the time of DISPLAY ONLY.
The initial data can be changed at the time of ENTRY AVLBL.

[10] TERMINAL ARRANGEMENT AND EXTERNAL VIEWS

(1) Terminals



Status Output	External Contact Input/Output (24 - pin)		External Contact Input
	OUTPUT	INPUT	
	(24) DO-COM	DI-COM (12)	Non-Voltage Contact: Max 2mA Max 5V DC When AT selected (- o -) BIN CODE - o - = Level Input - o - = Edge Input
OUTPUT DO1 Open Collector Output Max 5mA Max 24V DC On Voltage ≤ 0.6V	(23) DO17 (GUA)	(RUN) DI18 (11)	
	(22) DO16 (ADV)	(HLD) DI17 (10)	
	(21) DO15 (HLD)	(ADV) DI16 (9)	
	(20) DO14 (RUN or RST)	(SEL16 or AT) DI15 (8)	
	(19) DO13 (FIX)	(SEL8) DI14** (7)	
	(18) DO12 (MAN)	(SEL4) DI13** (6)	
OUTPUT DO2 Open Collector Output (Darlington) Max 5mA Max 24V DC On Voltage ≤ 1.5V	(17) DO11 (AT)	(SEL2) DI12** (5)	
	(16) DO23*	(SEL1) DI11** (4)	
	(15) DO22*	(3)	
	(14) DO21*	(2)	
	(13)	(1)	

* On Terminals DO21, DO22, DO23, DO31, DO32, DO33, only one each Status Signal comes out selected from TS1, TS2, TS3, TS4, SO, RUN, END, EXT
 ** SEL1, SEL2, SEL4, SEL8 (SEL16) BIN Code Input

(2) Mounting and Wiring

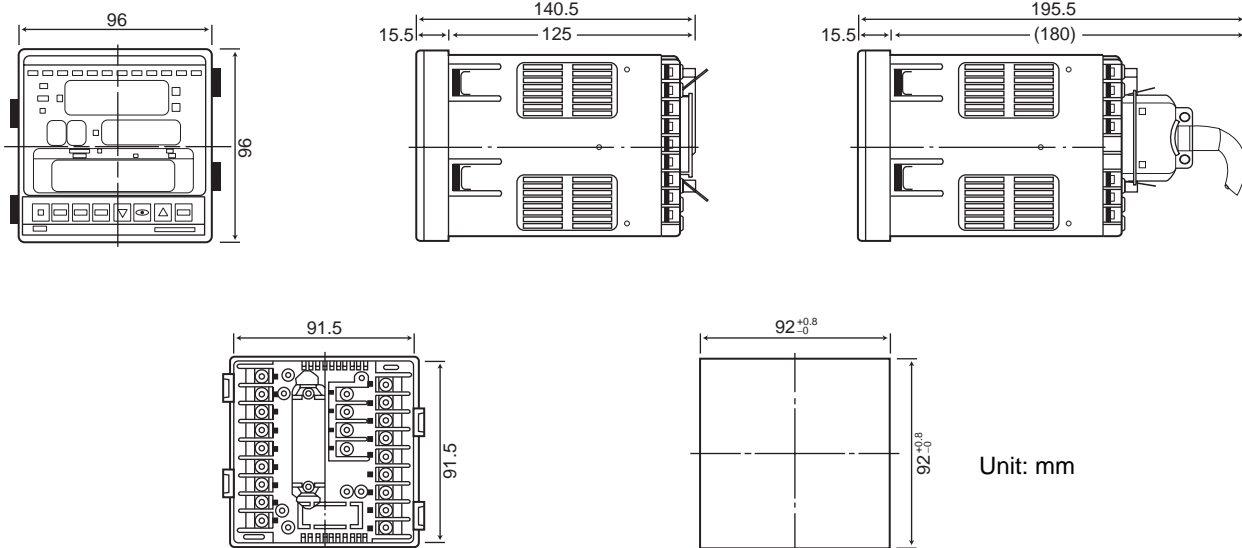
1. Place of Installation

Choose a place in a desirable environment. The following conditions are required:

- 1) There is no inflammable or corrosive gas, soot or dust to impair insulation.
- 2) The ambient temperature is between -10°C and $+50^{\circ}\text{C}$.
- 3) The ambient humidity does not exceed 90%RH and no dew condensation occurs.
- 4) The apparatus is not subjected to shocks and strong vibration.
- 5) There is no strong electric circuit in the surrounding areas nor anything which tends to cause induced fault.
- 6) There is no exposure to direct sunlight or drops of water.

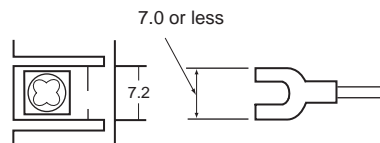
2. Mounting

- 1) Cut out a hole in accordance with following cutout drawings. Then mount the apparatus by pressing it firmly through the cutout hole from the front of the panel.
- 2) Select the thickness of the mounting panel between 1.0 and 3.5mm.
3. Exterior Measure and Cutout Drawings



4. Wiring

- 1) Use the designated compensating conductor in case of thermocouple input.
- 2) Use lead wire of low resistance and without difference in resistance between 3 wires in case of RTD input.
- 3) For power supply and its wiring, use wire or cable which is equivalent to or above the 600V vinyl-insulated wire (JIS C3307). Use a noise filter in the power source as needed.
- 4) Ground the earth terminal through 2mm^2 or thicker wire and with an earthing resistance below 100Ω .
- 5) Take care to prevent noise in wiring input circuits in particular.
 - a) Wire input circuits away from power and earthing cables.
 - b) The use of shielded cable may effectively prevent noise caused by static induction. If necessary, connect shielded cables to the earth terminal of the apparatus. (Two-point earthing must be avoided.)
 - c) Against noise caused by electromagnetic induction, input wiring with cables twisted at equal, short intervals has some effect.
- 6) For connecting cables to terminals, the use of solderless terminals with insulated sleeves (for 3.5mm terminal screw) is recommended.

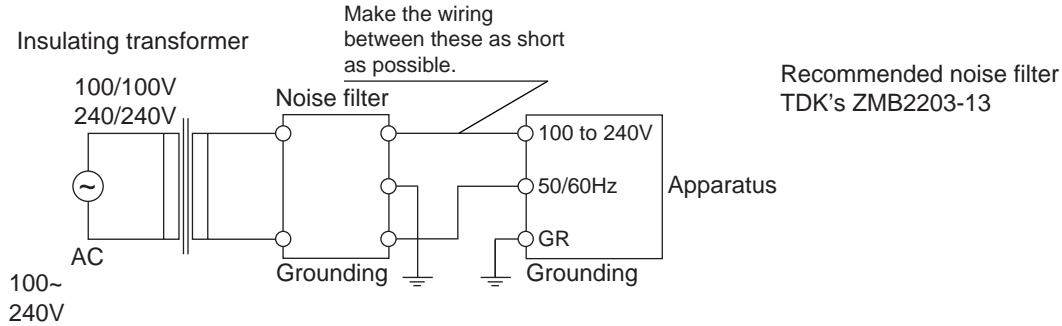


(3) Request

■ Anti-noise Measures

- When the power line generates excessive noise, recommend that you add an insulating transformer and use a noise filter.

Caution!



- In the event equipment, such as a magnet coil, a solenoid, an electromagnetic valve or a motor, placed near the apparatus produces noise, install a noise filter or a surge absorber (CR filter, varistor) in parallel with the exciter coil or any equipment which is the source of the noise.

- If an L load (for example, a relay or an electromagnetic valve) is used for a contact output of the instrument, fit a CR filter (in the case of an AC circuit) or a diode (in the case of a DC circuit) in parallel with the load.

How to Select CR Recommended by Relay Manufacturers:

$C = 0.5 \sim 1.0 \mu F$ per 1A of contact current

Dielectric Strength should be more than 3 times as high as the operating voltage.

$R = 0.5 \sim 1.0 \Omega$ per 1V of voltage between contacts

Examples for Reference

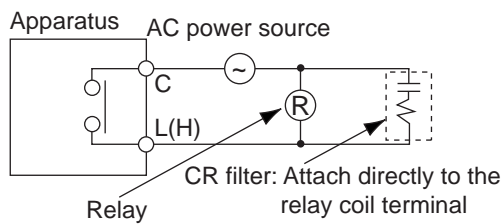
In the case of Omron's MY or ML type relay:

$C = 0.033 \mu F$ $R = 120 \Omega$

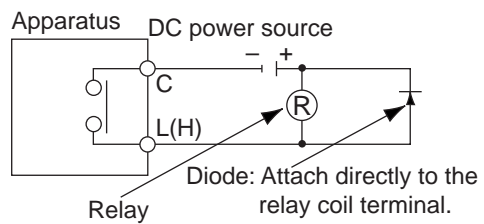
In the case of an electromagnetic contactor:

$C = 0.1 \sim 0.47 \mu$ $R = 120 \Omega$

In the case of AC relay



In the case of DC relay



* Since noise may result in erroneous operation, fit a spark killer, across output terminals to be used (between C and L or between C and H).

- If a separate power supply is used for SSR/SSC driving, however, it should not be fitted.

[11] a. SERIES FP21 CODES FOR ORDERING

– Codes for Ordering –

CODE		SPECIFICATION
FP21-		MPU-Based Auto-Tuning Programmable Controller, DIN 96 × 96mm
INPUT	1	Thermocouples, User-selectable inputs and ranges
	2	R. T. D. (Pt100), User-selectable ranges
	3	DC Voltage, User-selectable –10~10, 0~10, 0~20, 0~50, 10~50, 0~100mV linear inputs and ranges
	4	DC Current, User-selectable 4~20, 0~20mA linear inputs and ranges
	6	DC Voltage, User-selectable –1~1, 0~1, 0~2, 0~5, 1~5, 0~10V linear inputs and ranges
CONTROL OUTPUT	Y-	Contact: PC 1~120 seconds variable, Capacity: 240V AC 2.5A/Resistive load, 1A/inductive load
	I-	Current: 4~20mA DC, Load resistance: 600Ω max. (Factory set = RA)
	P-	SSR Voltage: PC 1~120 seconds variable, Output rating: 15V DC/20mA max.
	V-	Voltage: 0~10V DC, Maximum load current: 2mA max. (Factory set = RA)
ANALOG OUTPUT (TRANSMISSION)	00	None
	13	1-Output, Voltage: 0~10mV DC/Output resistance: 10Ω
	14	1-Output, Current: 4~20mA DC/Output resistance: 500Ω max.
	16	1-Output, Voltage: 0~10V DC/Load current: 2mA max.
	23	2-Output, Voltage: 0~10mV DC/Output resistance: 10Ω
	24	2-Output, Current: 4~20mA DC/Load resistance: 500Ω max.
INTERFACE	0	None
	6	RS-422A
	7	RS-232C
PLUG CORD FOR EXTERNAL I/O	0	None
	1	24-Pin Plug w/1-Meter wire
REMARKS	0	Without
	9	With (Please consult before ordering.)

[11] b. STANDARD RANGE AND USER-PROGRAMMABLE SCALING

Since the Series FP21 has been designed for user-selectable inputs, user-selectable ranges and user-programmable scaling, the unit will be shipped with one factory-set standard range.

If a range selection other than the standard is required, user-selectable inputs (T/C's) and user-selectable ranges (T/C's & RTD) are available as listed below at the specific application.

Standard Range (Factory-Set when shipping)

Input	Standard/Rating	Ranges
1 Thermocouple	JIS (K)	0 ~ 800.0°C
2 R.T.D.	JIS Pt100	0 ~ 200.0°C
3 DC Voltage	0 ~ 10mV	0 ~ 100.0%
4 DC Current	4 ~ 20mA	0 ~ 100.0%
6 DC Voltage	0 ~ 10V	0 ~ 100.0%

User-Selectable Range (Thermocouple & R.T.D.)

*1 = Effective range: 400 ~ 1800°C (750 ~ 3300°F)

*2 = Not our standard accuracy

INPUT	TYPE	JIS ANSI	DIN	OTHERS	°C	°F
THERMOCOUPLES	T	○	○		-199.9 ~ 200.0	-300 ~ 400
	J	○	○		0.0 ~ 600.0	0 ~ 1100
	E	○	○		0.0 ~ 700.0	0 ~ 1300
	K	○	○		-100.0 ~ 400.0	-150 ~ 750
	K	○	○		0.0 ~ 800.0	0 ~ 1500
	K	○	○		0 ~ 1200	0 ~ 2200
	N			○	0 ~ 1300	0 ~ 2300
	PLII			○	0 ~ 1300	0 ~ 2300
	R	○	○		0 ~ 1700	0 ~ 3100
	S	○	○		0 ~ 1700	0 ~ 3100
	B*1	○	○		0 ~ 1800	0 ~ 3300
	PR40-20			○	0 ~ 1800	0 ~ 3300
	WRe5-26			○	0 ~ 2300	0 ~ 4200
	U (DIN 43710)			○	-199.9 ~ 200.0	-300 ~ 400
L (DIN 43710)			○	0.0 ~ 600.0	0 ~ 1100	
P.T.D. (Pt100)	Pt100	○	○		-199.9 ~ 600.0	-300 ~ 1100
	Pt100	○	○		-100.0 ~ 100.0	-150.0 ~ 200.0
	Pt100	○	○		-100.0 ~ 300.0	-150.0 ~ 600.0
	Pt100	○	○		-40.0 ~ 60.0	-40.0 ~ 140.0
	Pt100	○	○		0.00 ~ 50.00	0 ~ 120.0
	Pt100*2	○	○		0 ~ 100.0	0 ~ 200.0
	Pt100	○	○		0 ~ 200.0	0 ~ 400.0
	Pt100				0 ~ 500.0	0 ~ 1000

User-Programmable Scaling

DC Voltage & DC Current Inputs

For DC voltage and DC current inputs, user-programmable scaling is available with scaling range of -1990 ~ 9999 digits.

[11] c. INITIAL VALUES

ITEM	INITIAL VALUE	ITEM	INITIAL VALUE
Operation mode screen		AT. CFM	N. N
OPERATION	LOC	ENT. INI	N. N
Execute parameter menu group		SV HL	100%FS value
START PTN	1	SV LL	0%FS value
STP	1	LIMIT MODE PTN	N
LINK FORMAT	No value	LIMIT MODE RPT	N
LINK EXEC.	0	CFM MODE	PTN
PV START	N		1/60
ADV MODE	STEP	Initial data menu group	
(TIME)	00h01m	PV FILTER	0
FIX SV	0	PV BIAS	0
PID	1	R/D ACTION	R
ALARM	1	CYC TIME	SSR: 3s, CONTACT: 30s
Program data menu group		TMT1. TMT2	PV. SV
PATTERN NO.	1	TMT1 HL	100%FS value
SIARI SV	0	(PV) LL	0%FS
GUA SOAK	0	TMT2 HL	value
	00h00m	LL	100%FS value
P1_9 PTN END	1	ALARM AL1	0%FS
PTN RPT	0	MODE AL2	value
P1_9 SV	0	AL1 SENS.	HL1
S1_9 TIME	00h01m	⋮	LL1
P1_S1 PID No.	0	AL2 STBY	0.2%
⋮	⋮	DI_1 MODE	N
P9_S9 ALARM No.	0	DI_15	PTN
P1_S1 TS1-TS4	N	DO_2 SET1	AT
: (ON TIME)	00h01m	2, 3	END
P1_S9 (OFF TIME)	00h01m	DO_3 SET1	TS3, TS4
Control data menu group		2, 3	TS1
CONTROL DATA	1	UNIT TC, Pt	TS2, SO
(PID, ALM No.)	⋮	mV, V, mA	°C
PID_1 P	5.0%	RTD TYPE	%
⋮	⋮	RANGE TC	Pt
: I	300s	Pt	0.0 – 800.0°C
PID_9 D	100s	Mv, V	0.0 – 200.0°C
⋮	⋮	mA	0 – 10mV, 01 – 0V
PID_1 OH	100.0%	SCALE H	4 – 20mA
⋮	⋮	L	100.0%
PID_9 OL	0.0%	D.POINT	0.0%
ALARM_1	HL1	SO-MODE	***.*
⋮	⋮	SO-OUT	RST
ALARM_9 AL1	100% FS value	POWER ON MODE	0.0%
⋮	⋮	TIME UNIT	NORMAL
ALARM_1	LL1	PID	min
⋮	⋮	MEMORY INITIAL	
ALARM_9 AL2	0% FS value		
Key lock menu group			
KEY LOCK RST. ADV	N. N		
HLD. RUN	N. N		
FIX. MAN	N. N		

N = No., FS = Measuring range, h= hour, m= minute, and s= second

[12] Maintenance and Troubleshooting

1. Procedure of Maintenance Replacement and Matters to Be Attended to (Steps for replacing defective items)

- ① Confirmation of Model Code:
Check the model code of the component part in trouble. (Open the control box, and you can find an appropriate code in the model label affixed to the instrument case.)
- ② Inquiry on Input Data:
Ask the manufacturer if input data (control date of external operation, event output, set value of position, etc. at the time when an error occurs) is necessary or not.
- ③ Confirmation of Present Wiring Condition:
Check and record the present wiring condition. Please note that in case input data is necessary for control, the same control operation as before is not possible with a replaced product unless such data is input.
- ④ Confirmation of Present Input Data:
When data is not known, call the input date for the product, check and record it. In case input data is required, the same control operation as before is not possible with a replaced product unless such data is input.
- ⑤ Repair of Present Product or Procurement of New Product:
In case the product in trouble is removable from the site of installation, remove and have it repaired. If it is not possible, arrange to acquire a new product for replacement.
- ⑥ Setting before Starting Operation:
When replaced by a new product, check the wiring, apply power and set items as described in [10]-(2) Mounting and Wiring, [10]-(3) Request (Anti-noise Measures), and [4] INITIALIZE BEFORE USING.

2. Cause of Trouble and Troubleshooting

Problem	Cause	Remedy
① Error code is displayed.	Refer to "Error Codes, Causes and Remedies."	Refer to "Error Codes, Causes and Remedies."
② Displayed PV value seems to be incorrect.	① Set measuring range code is different from that of input sensor/input signal. ② Erroneous wiring to input terminals of sensor	① Check if set measuring range code is correct for input signal. ② Correct wiring to input terminals of sensor.
③ Display on the front panel goes out and the instrument does not operate.	① Problem with power supply and wiring connection. ② Deterioration of the product.	① Inspect portions related to power source and wire connection. Check wiring. ② Examine the product and repair or replace.
④ Key unable to be operated.	① Keylock is in effect. ② Deterioration of the product. ③ In case communication function is added, the communication mode (Com) has been set.	① Release keylock. ② Examine and repair or replace the product. ③ Change the communication setting to the local mode (Loc).
⑤ ON-OFF action of control output is too fast.	① ON-OFF is set for P of PID. ② Too small a value set for hysteresis of ON-OFF action.	① Change the OFF set for P to two-position type ON-OFF action. ② Increase the hysteresis value of ON-OFF action.

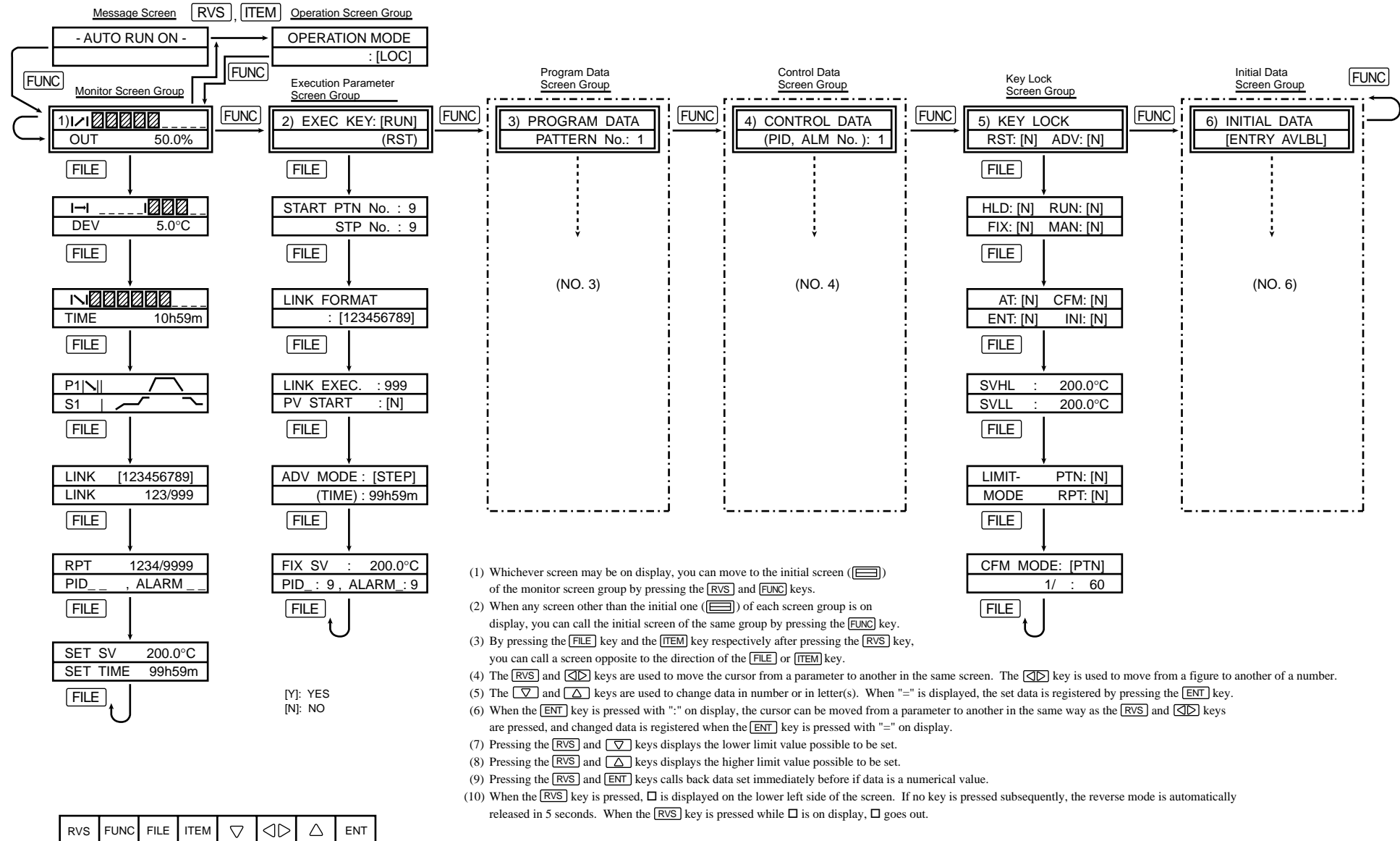
3. Error Codes, Causes and Remedies

Screen display	Problem	Cause	Remedy
<i>HHHH</i> (HHHH)	Higher limit side scaleover	<ul style="list-style-type: none"> ① A break of thermocouple input wiring ② A break of R.T.D. input A wiring ③ Input measured value exceeded higher limit of measuring range by 10%. 	<ul style="list-style-type: none"> ① Check thermocouple input wiring for a possible break. ② Check R.T.D. input A wiring for a possible break. If wiring has no problem, replace R.T.D. ③ For voltage or current input, check the transmitting unit of measured values. Check if set code of measuring range is correct for input signal.
<i>LLLL</i> (LLLL)	Lower limit side scale over	<ul style="list-style-type: none"> ① Input measured value fell ② A break of input wiring A ③ Breaks of input wiring ABB ④ Voltage, current input measured value fell from lower limit of measuring by 10%. 	<ul style="list-style-type: none"> ① Check wiring of inversed polarity for measured value input. ②③ Check R.T.D. input terminals A, B for possible break. ④ For voltage or current input, check the transmitting unit of measured values. Check if set code of measuring range is correct for input signal.
<i>HH--</i> (HH--)	Higher limit side scaleover of reference contact (CJ) of thermocouple input	Ambient temperature of the product has exceeded 80°C	<ul style="list-style-type: none"> ① Reduce ambient temperature to the level provided in the environment conditions for the product. ② In case ambient temperature has not exceeded 80°C, examine the FP21.
<i>LL--</i> (LL--)	Lower limit side scaleover of reference contact (CJ) of thermocouple input	Ambient temperature of the product has fallen to 20°C or lower.	<ul style="list-style-type: none"> ① Raise ambient temperature to the level provided in the environment conditions for the product. ② In case ambient temperature has not fallen to 20°C, examine the product.
<i>4000</i> ~ <i>4999</i>	For Voltage or current input, abnormality of input value	Indicates that in case of voltage and current input, the PV value falls in a range from 10000 to 10999 but is not above + 10% of the scaling value.	For voltage or current input, check the transmitting unit of measured values. Check if set code of measuring range is correct for input signal.
<i>7000</i> ~ <i>7999</i>	For Voltage or current input, abnormality of input value	Indicates that in case of voltage and current input, the PV value falls in a range from -2000 to -2999 but is not below -10% of the scaling value.	For voltage or current input, check the transmitting unit of measured values. Check if set code of measuring range is correct for input signal.

◎ Data Back-up

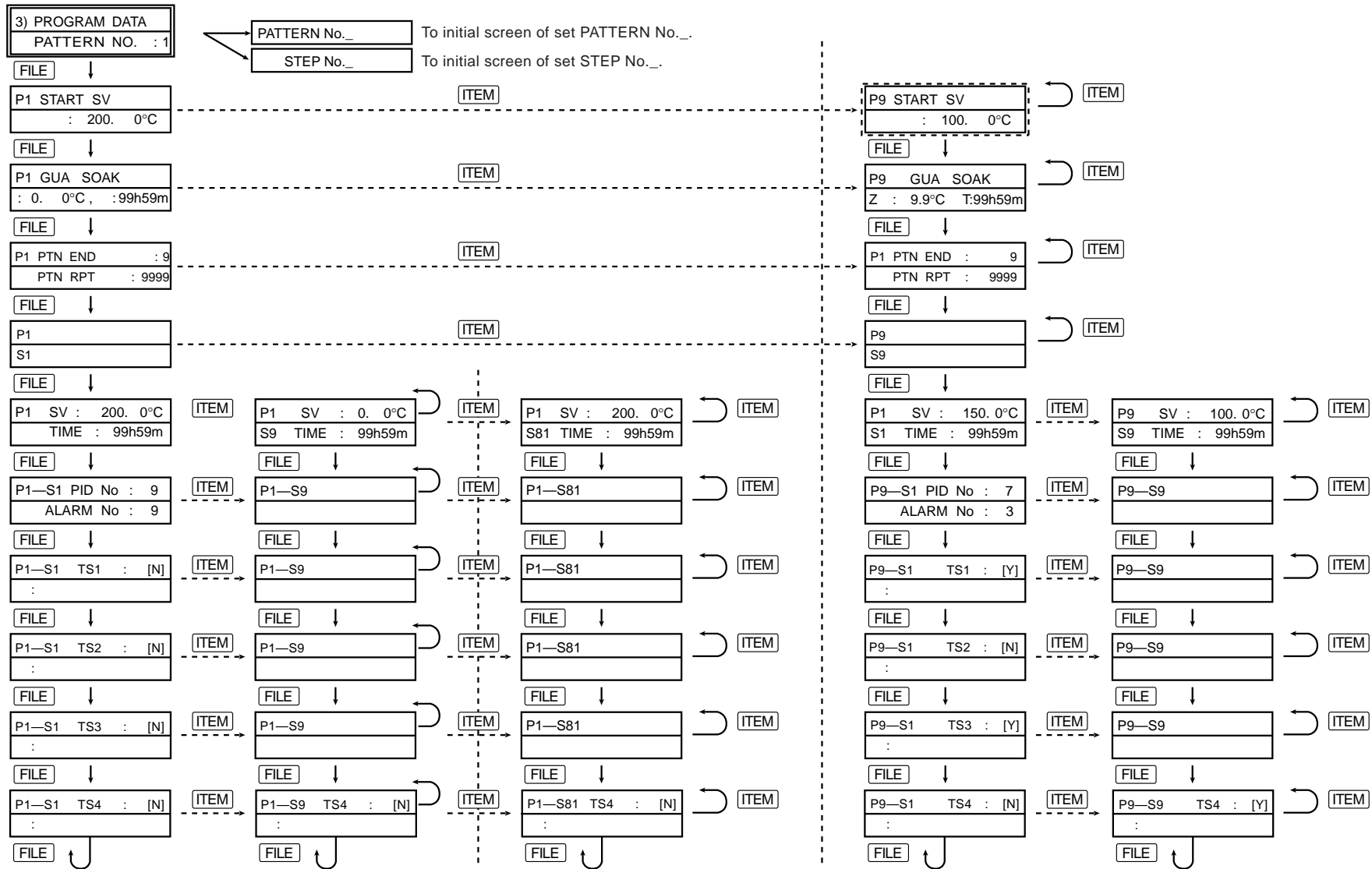
As a countermeasure to power failure and to protect the memory when power is turned OFF, the FP21 Series uses a lithium battery for back-up (about 10 years). Besides, a non-volatile memory is also used for a part of data.

[9] LCD SCREEN DIAGRAM & KEY SEQUENCE



- Whichever screen may be on display, you can move to the initial screen (☐) of the monitor screen group by pressing the [RVS] and [FUNC] keys.
- When any screen other than the initial one (☐) of each screen group is on display, you can call the initial screen of the same group by pressing the [FUNC] key.
- By pressing the [FILE] key and the [ITEM] key respectively after pressing the [RVS] key, you can call a screen opposite to the direction of the [FILE] or [ITEM] key.
- The [RVS] and [◀▶] keys are used to move the cursor from a parameter to another in the same screen. The [◀▶] key is used to move from a figure to another of a number.
- The [▽] and [△] keys are used to change data in number or in letter(s). When "=" is displayed, the set data is registered by pressing the [ENT] key.
- When the [ENT] key is pressed with ":" on display, the cursor can be moved from a parameter to another in the same way as the [RVS] and [◀▶] keys are pressed, and changed data is registered when the [ENT] key is pressed with "=" on display.
- Pressing the [RVS] and [▽] keys displays the lower limit value possible to be set.
- Pressing the [RVS] and [△] keys displays the higher limit value possible to be set.
- Pressing the [RVS] and [ENT] keys calls back data set immediately before if data is a numerical value.
- When the [RVS] key is pressed, ☐ is displayed on the lower left side of the screen. If no key is pressed subsequently, the reverse mode is automatically released in 5 seconds. When the [RVS] key is pressed while ☐ is on display, ☐ goes out.

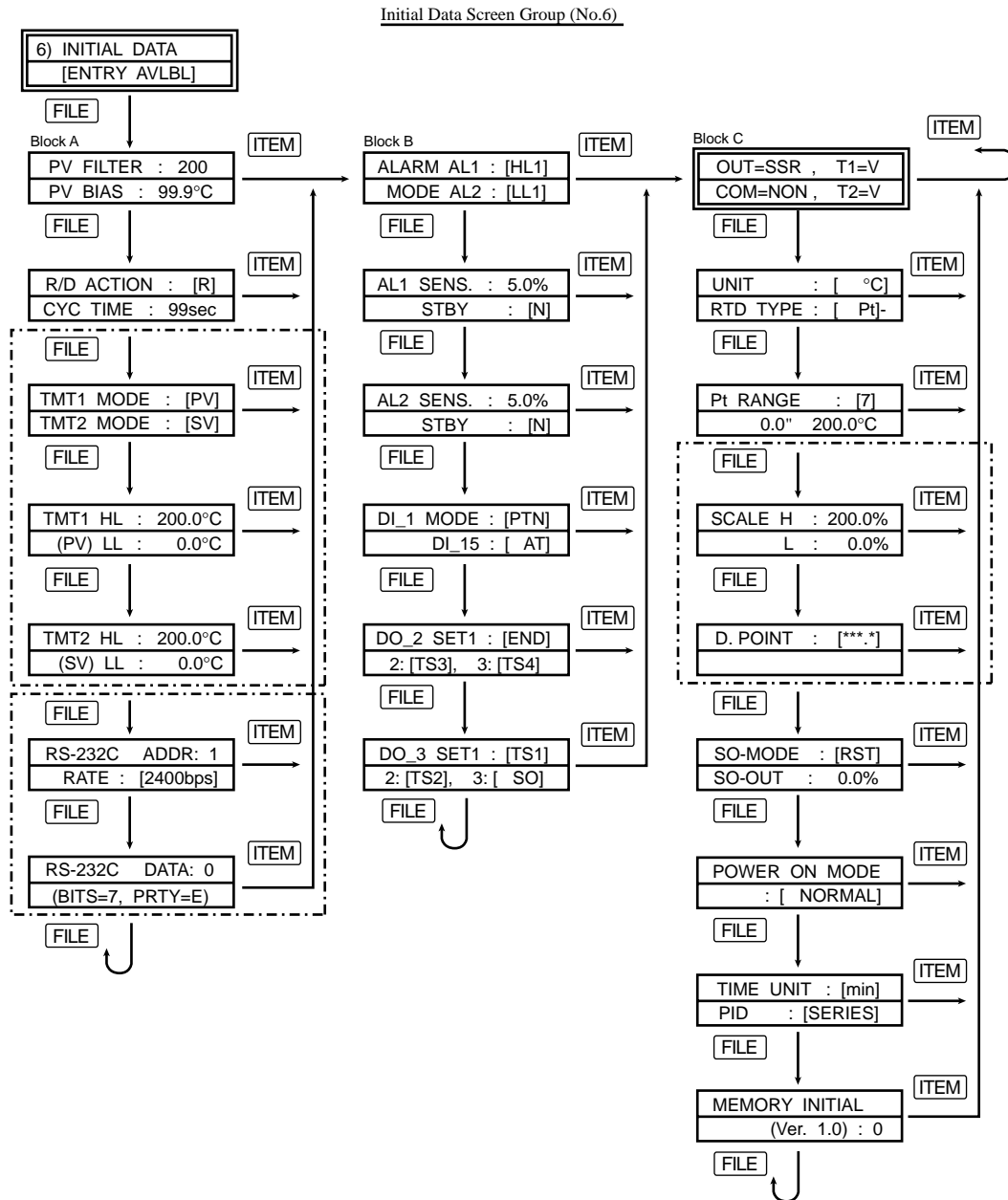
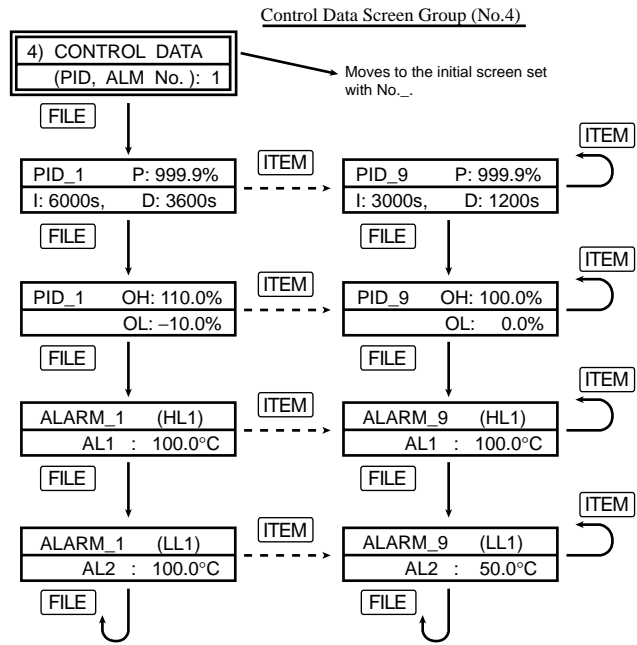
Program Data Screen Group & Key Sequence (No.3)



- (1) In LIMIT MODE PTN [N], indication is of nine patterns and nine steps.
In LIMIT MODE PTN [Y], indication is of one pattern and 81 steps.
- (2) If PATTERN No. _ is set on the initial screen () upon [N], the screen moves to the initial screen () of the pattern No. (P_) set.
- (3) If STEP No. _ is set on the initial screen () upon [Y], the screen moves to the initial screen (SV, TIME) of the step No. (P1-S_) set.

Indicated upon LIMIT MODE [Y]

Not indicated upon LIMIT MODE [Y]



- (1) The screen enclosed in [dashed box] is shown when supplementary analog outputs (option) are added.
 (2) The screen enclosed in [dashed box] is shown when the communication function (option) is installed.
 (3) The screen enclosed in [dashed box] is shown when DC input is selected.
 (4) INITIAL DATA Screens
 The initial data cannot be changed at the time of DISPLAY ONLY.
 The initial data can be changed at the time of ENTRY AVLBL.