Thank you very much for your purchase of our Model "REX-F700" digital controllers. Prior to operating the controller, carefully read this operation manual. The contents of the OPERATION MANUAL are subject to change without notice. The instrument was manufactured and delivered under close quality control by us. However, if you have any questions regarding the manual, contact one of our sales people, our nearest sales office, or the place where you have purchased this controller.

Prior to ready this manual
This manual mainly describes the operation procedure. For each function setting (engineer level), see the INSTRUCTION MANUAL (IM700F01-E□) separately prepared. Especially, if the setting content in the engineer level is changed, the specification many change.
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1. PREPARATION

1.1 Handling procedure

Conduct necessary work according to the following procedures:

- **Check of product delivered**
  - See "1.2 Check of product delivered" on page 6.

- **Check of model codes**
  - See "1.3 Check of model codes" on page 8.

- **Mounting**
  - See "2. MOUNTING" on page 10.

- **Wiring**
  - See "3. WIRING" on page 12.
  - See "9. CONTACT INPUT USAGE" on page 56.

- **Check of input range**
  - See "5.1 Calling-up procedure of each status" on page 24.
1. Connect the input signal wiring, and then turn ON the power. If the input signal wiring opens, the controller judges that input is disconnected to cause the upscale or downscale of measured-value display.
   
   Upscale ........ For TC or RTD input
   
   Downscale .......... For TC (To be specified when ordering), voltage or current input

2. For position proportioning PID action, it is recommended that feedback resistance be adjusted prior to operation. For the feedback resistance adjustment, see "8. FEEDBACK RESISTANCE ADJUSTMENT" on page 52.
1.2 Check of product delivered

Check that the following items are delivered without damage.

- REX-F700
- Mounting brackets (2 pcs.)
- Operation manual
  [IM700F02-E□]
Example of engineering unit seal affixing

Use an engineering seal meeting the controlled object.
Also use a blank seal with any comments entered.
1.3 Check of model codes

Check the model code from the following list to determine if the product delivered is as desired.

Model code

REX-F700 model code

F700 [ ] [ ] [ ] - [ ] [ ] [ ] [ ]

1. Control action
   A : ON/OFF action *1
   F : PID action with auto-tuning
   V : Heating/cooling PID action
   Y : Position proportioning PID action *2, *6

2. Input type
   See input range table "Model code" on page 60

3. Input range
   See input range table "Mode code" on page 60

4. First control output [OUT1]
   M : Relay contact
   V : Voltage pulse
   G : Trigger (for triac driving)
   4 : Continuous voltage
      0 to 5V DC
   5 : Continuous voltage
      0 to 10V DC
   6 : Continuous voltage
      1 to 5V DC
   7 : Current 0 to 20mA DC
   8 : Current 4 to 20mA DC

5. Second control output [OUT2]
   No symbol : When control action is A, F or Y
   Specified for heating/cooling PID action (V). The symbol is the same as that in item 4.
   [ However, no trigger output (G) can be specified. ]

6. First alarm
   A : Deviation high alarm *3
   B : Deviation low alarm *3
   C : Deviation high/low alarm *3
   D : Band alarm
   E : Deviation high alarm *4
   F : Deviation low alarm *4
   G : Deviation high/low alarm *4
   H : Process high alarm *3
   J : Process low alarm *3
   K : Process high alarm *4
   L : Process low alarm *4
   M : FAIL alarm
   N : No first alarm
Second alarm
A: Deviation high alarm *3
B: Deviation low alarm *3
C: Deviation high/low alarm *3
D: Band alarm
E: Deviation high alarm *4
F: Deviation low alarm *4
G: Deviation high/low alarm *4
H: Process high alarm *3
J: Process low alarm *3
K: Process high alarm *4
L: Process low alarm *4
M: FAIL alarm
P: Heater break alarm
   CTL-6-P-N *5
S: Heater break alarm
   CTL-12-S56-10L-N *5
N: No second alarm

Remote input *5
1: Voltage 0 to 10mV DC
2: Voltage 0 to 100mV DC
3: Voltage 0 to 1V DC
4: Voltage 0 to 5V DC
5: Voltage 0 to 10V DC
6: Voltage 1 to 5V DC
7: Current 0 to 20mA DC
8: Current 4 to 20mA DC
N: No remote input

Contact input
1: Memory area transfer *6
2: AUTO/MAN transfer
3: REM/LOC transfer
4: COMP/LOC transfer
5: Memory area transfer and
   AUTO/MAN transfer *6
6: Memory area transfer and
   REM/LOC transfer *6
N: No contact input

Analog output *6
1: Voltage 0 to 10mV DC
2: Voltage 0 to 100mV DC
3: Voltage 0 to 1V DC
4: Voltage 0 to 5V DC
5: Voltage 0 to 10V DC
6: Voltage 1 to 5V DC
7: Current 0 to 20mA DC
8: Current 4 to 20mA DC
N: No analog output

Communication *6
1: RS-232C
4: RS-422A
5: RS-485
N: No communication

Front sheet color
N: Standard color [Blue base]
A: Black base

---

*1 For ON/OFF action, only the [M, V and G] can be specified as control outputs.
*2 For position proportioning PID action, only the [M] can be specified as control outputs.
*3 Without hold action
*4 With hold action
*5 No common use of heater break alarm and remote input is available.
*6 A Position proportioning PID action and analog output
    B Memory area transfer contact input
    C Communication

Specify any one of A, B and C.
2. MOUNTING

2.1 Dimensions

Unit: mm (inch)

*Dimensions in inches are shown for reference.

Cautions

Avoid the following location where the controller is mounted.
- Location where ambient temperature is more than 50°C (122°F) or less than 0°C (32°F).
- Location where humidity is high.
- Location where corrosive gas is generated.
- Location where strong vibration and shock exist.
- Location where flooding and oil splash exist.
- Location where much dust exists.
- Location where inductive disturbance is large and other location where bad influence is exerted on electric instrument.
2.2 Mounting procedures

1. Mount the panel cutout corresponding to the number of units on the panel by referring to panel cutout dimensions.
2. Insert the instrument into the panel from the front side.
3. Engage each mounting bracket with the bracket insertion slots (Fig. 1).
4. Then tighten the mounting bracket setscrew from the rear with a Phillips screwdriver (Fig. 2). Do not overtighten the bracket setscrew.
5. Engage the other bracket with the slots in the same way as in items 3 and 4.
3. WIRING

3.1 Rear terminals

Conduct wiring by referring to following diagrams.

- A, F type
  - Triac drive trigger output
  - OUT
  - T2
  - G
  - OUT
  - T1
  - 7
  - 8

- V type
  - Voltage pulse. Continuous output. Current output
  - OUT
  - OUT (2)
  - NO
  - NC
  - OUT (2)
  - NO
  - NC

- V, Y type
  - Relay contact output
  - OUT (1)
  - NO
  - NC
  - OUT (1)
  - NO
  - NC

- Power terminals
  - Ground
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10
  - 11
  - 12
  - 13
  - 14
  - 15
  - 16
  - 17
  - 18
  - 19
  - 20
  - 21
  - 22
  - 23

- Output terminals
  - Alarm 1 or FAIL output
  - Alarm 2. Heater break alarm or FAIL output
  - ALM1
  - NO
  - ALM2
  - NO

Legend:
A: ON/OFF action
F: PID action with auto-tuning
V: Heating/cooling PID action
Y: Position proportioning PID action
OUT (1): Heating-side (V), Open (Y)
OUT (2): Cooling-side (V), Closed (Y)
NO: Normally open
NC: Normally closed

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Cautions

1. Terminals which are not used according to the controller type are all removed.

2. For thermocouple input, the temperature compensation element in the internal assembly is projected from the lower part of the terminal No. 15. Do not damage the above temperature compensation element when the internal assembly is removed from the case.

3. Use solderless terminals with 6.2mm wider or less.

Voltage (low) input: 0 to 10mV, 0 to 100mV, 0 to 1V
Voltage (high) input: 0 to 5V, 0 to 10V, 1 to 5V

6.2mm or less
3.2 Cautions for wiring

(1) For thermocouple input, use the specified compensation wire.
(2) For RTD input, use leads with low resistance and having no resistance differences between the 3 leads.
(3) Conduct input signal wiring away from instrument, electric equipment power and load lines as much as possible to avoid noise induction.
(4) When a shielded lead is used, ground the shield as follows to prevent noise generated by both stray capacitance between the shield and each conductor, and by the shield potential difference with the earth.

① When a signal source is grounded, ground one end of the shield near the source.

② If no signal source is grounded, ground one end of the shield near the instrument.
(5) Conduct instrument power wiring so as not to be influenced by noise from the electric equipment power. If it is assumed that a noise generation source is located near the controller and the controller is influenced by noise, use a noise filter.

1. To obtain a satisfactory noise filter effect, select the most suitable type after due consideration of instrument power supply voltage and filter frequency characteristics.

2. For instrument power wiring, if it is assumed that noise exerts a bad influence upon the controller, shorten the distance between twisted power supply wire pitches. (The shorter the distance between the pitches, the more effective for noise reduction.)

3. Install the noise filter on the panel which is always grounded and minimize the wiring distance between the noise filter output side and the controller power terminals. Otherwise, the longer the distance wiring, the less effective for noise.

4. Do not install fuses and/or switches on the filter output signal since this may lessen filter effect.

(6) For wiring, use wires conforming to the domestic standard of each country. (For instrument grounding, use wires with nominal sectional area of 1.25 to 2.0mm², and securely ground the instrument at the minimum distance.)

(7) About 3 sec. are required as the preparation time of contact output during power-ON. Use a delay relay when the output line, is used for an external interlock circuit.
3.3 Circuit configuration

The following diagram shows the REX-F700 circuit configuration. Since the inside output circuit, inside input circuit, and MCU section and input circuit, and the communications and contact input sections are not isolated, exercise care in wiring.
3.4 Wiring example

- PID action with auto-tuning type

F700F□□-M*AN-N4N-1□

- Power supply
- Magnet switch
- CR circuit
- Alarmer
- Host computer
- TC
- RS-232C
- Dry contact input (Mode selection)
- Controlled object

Input signal wire
Heating/Cooling PID action type

F700V □□-MM*AP-N5N-N□

Diagram showing electrical connections and control areas:
- Power supply
- Magnet switch
- CR circuit
- Current transformer
- Controlled object
- TC
- Input signal wire
- Alarmer

Legend:
- Dry contact input (Control area selection)
- Dry contact input (Mode selection)

Note: * Heater break alarm
Position proportioning PID action type

F700Y□□-M*AM-631-N□

Recorder

0 to 10mV

Dry contact input
Mode selection

Remote setting input
Program setter

1 to 5V

Input signal wire

TC

Control motor

Fluid →

Alarmer

* FAIL alarm

Controlled object
4. NAME OF PARTS

- **Display unit**
  1. Measured-value (PV) display unit [Green]
     - Displays measured-value (PV).
     - Displays various characters depending on the instrument status.
  2. Set-value (SV) display unit [Orange]
     - Displays set-value (SV).
     - Displays each parameter set-value.
     - Displays input value, output value and various characters depending on the instrument status.
  3. Memory area display unit [Orange]
     - Displays memory area No. used for control.
     - Displays memory area No. at which the setting is changed for operator level 1 and 2.
  4. Bar-graph display unit [Green]
     - Manipulated output value (MV) or deviation of measured-value (PV) from set-value (SV) is displayed on 10-dot LEDs.
     - Displays feedback resistance or deviation for position proportioning PID action.

- **Indication lamps**
  5. Manipulated output (MV) lamp [Orange]
     - Flashes when manipulated output value (MV) is displayed on the set-value (SV) display unit.
  6. Auto-tuning (AT) lamp [Green]
     - Flashes during auto-tuning execution.
7. Computer (COMP) mode lamp [Green]
   • Lights in the computer mode (during communication).

8. Remote (REM) mode lamp [Green]
   • Lights in the remote mode.

   • Lights in the manual mode.

10. External (EXT) mode lamp [Green]
    • Lights in the external mode (at control area external selection).

11. First alarm (ALM1) lamp [Red]
    • Lights with the first alarm turned ON.

12. Second alarm (ALM2) lamp [Red]
    • Lights with the second alarm turned ON.
    • When heater break alarm (HBA) is selected as the second alarm, this lamps lights at heater break.

13. Failure (FAIL) lamp [Red]
    • Lights in the fail status.

14. First control output (OUT 1) lamp [Green]
    • Lights with the first control output turned ON.

15. Second control output (OUT 2) lamp [Green]
    • Lights with the second control output turned ON.

   Heating/cooling PID action type: Heating-side
   Position proportioning PID action type: Open-side

   Heating/cooling PID action type: Cooling-side
   Position proportioning PID action type: Closed-side

 Operation keys

16. Mode (MODE) key
    • Used when the instrument is set to the mode status and each display is selected in the mode status.

17. Monitoring (MONI) key
    • Used when the instrument is set to the monitoring status and each monitoring display is selected.

18. Area (AREA) key
    • Used when the instrument is set to the area status.

19. Set (SET) key
    • Used when the instrument is set to the set status (operator level 1, operator level 2 and engineer level).

20. Setting digit shift key
    • Used when the cursor (brightly lit) is moved to the digit whose numeric value needs to be changed for set-value change.

21. Set-value decrementing key
    • Used when the numeric value needs to be decreased for set-value change.
    • Used for operation mode transfer in the mode status.

22. Set-value incrementing key
    • Used when the numeric value needs to be increased for set-value change.
    • Used for operation mode transfer in the mode status.
Bar-graph display

With the respect to bar-graph displays, both the manipulated output value (MV) and deviation display are available.

- Manipulated output value (MV) display
  [Display example]

![Bar-graph example]

When manipulated output value (MV) becomes 0% or less, the dot at the left end of the bar-graph flashes and when it exceeds 100%, that at the right end flashes.

- For heating/cooling PID action
  When the output indication lamp “OUT1” at the left side of bar-graph lights, the bar-graph displays heating output and when “OUT2” lights, the bar-graph displays cooling output.
  When both “OUT1” and “OUT2” light, this means overlapping, but in this case the bar-graph displays only the heating output.

- For position proportioning PID action
  The bar-graph indicates feedback resistance input value (POS).
Deviations display
[Display example]

The deviation between the set-value (SV) and measured-value (PV) is displayed.
The dots at both ends of bar-graph light to indicate deviation display. Both dots light at 0 deviation only.
5. OPERATION

5.1 Calling-up procedure of each status

Broadly, the following four statuses are available for this instrument.

- Monitoring (MONI) status: Status in which each input/output monitoring and checking are performed
- Set (SET) status: Status in which set-value (SV) and various parameters are set and checked
- Area (AREA) status: Status in which the memory area used for control (control area) is transferred
- Mode (MODE) status: Status in which each operation mode is transferred

The calling-up procedure of each status is shown in the next page.

--- Description of *1, *2 or *3 in the next page ---

*1 For transfer from the SET status to the MONI status, basically press the MONI key. However, if the instrument is set to the operator level 1 in the SET status, it is set to the MONI status even if the SET key is pressed.

*2 When the control area is changed in the AREA status, the instrument is set to the MONI status automatically. Also, when the control area is not changed, the instrument is set to the MONI status even if either the MONI or SET key is pressed.

*3 It is impossible to set the SET status directly from the AREA status.

Caution

The instrument is set to the MONI status automatically if key operation is not performed for more than 1 min.
MONI: Press the monitoring (MONI) key.
SET: Press the set (SET) key.
AREA: Press the area (AREA) key.
MODE: Press the mode (MODE) key.
Input type/input range display

This instrument immediately confirms input type and range following power-ON.

1. Input type display
   - Display changes automatically

2. Input range display
   - Display changes automatically

Monitoring (MONI) status
[P. 28]
(1) **Input type display** (Display for approx. 2 sec)

   - a: Input display character (InP)
   - b: Unit

<table>
<thead>
<tr>
<th>Display</th>
<th>Unit</th>
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<tr>
<td>OL</td>
<td>°C</td>
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<tr>
<td>OF</td>
<td>°F</td>
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<tr>
<td>None</td>
<td>%</td>
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</table>

(2) **Input range display** (Display for approx. 2 sec)

   - a: High input range limit value
   - b: Low input range limit value

c: Input type

<table>
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<tr>
<th>Display</th>
<th>K</th>
<th>J</th>
<th>R</th>
<th>S</th>
<th>B</th>
<th>E</th>
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<th>PLII</th>
<th>W5Re/ W26Re</th>
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<tbody>
<tr>
<td><strong>Input type</strong></td>
<td>TC</td>
<td>RTD</td>
<td>Voltage input</td>
<td>Current input</td>
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5.2 Monitoring (MONI) status

This is the status to monitor and check each input/output. Each monitoring display is shown in the following. Display in the MONI status is changed by the MONI key.

A. Measured-value (PV)/set-value (SV) displays
   [Displayed during auto (AUTO) mode operation]
   In the remote (REM) mode, the display unit displays the remote setting input value (RS).
   Display range: Same as the input range

B. Measured-value (PV)/manipulated output value (MV) displays
   [Displayed during manual (MAN) mode operation]
   The point above the manipulated output value (MV) decimal-point (between the lower first and second digits) flashes to indicate that the display unit shows the manipulated output value (MV).
   Display range: Same as the input range (Measured-value (PV))
               \[-5.0 \text{ to } +105.0\% \text{ (Manipulated output value (MV))}\]

Set-value (SV) display during setting change

Display set-value (SV) which changes every moment by a setting change rate limit function when the set-value (SV) is changed. This display becomes the same as

A set-value (SV) display with the setting change rate limit function turned OFF (Setting "0.0")

Display range: Within setting limit range
Manipulated output value (MV) display during output change
Displays manipulated output value (MV) actually output from the instrument. Therefore, when the output change rate limit function is set, displays manipulated output value (MV) via that function.
Display range: Within output limit range [\%]
(For heating/cooling PID action, displays manipulated output value (MV) on the heating-side.)

Manipulated output value (MV) display during output change (Cooling-side)
[Displayed only during heating/cooling PID action]
For heating/cooling PID action, displays manipulated output value (MV) on the cooling side.
Display range: Within output limit range [\%]

Feedback resistance input value (POS) display
[Displayed only during position proportioning PID action]
Displays feedback resistance input value (POS) for position proportioning PID action.
Display range: 0.0 to 100.0\%
A. Remote setting input value (RS) display
   [Displayed only when the remote setting input function is provided]
   Displays remote setting input value (RS) which is the controlled target value in the remote (REM) mode.
   Display range: Within setting limit range

B. Current transformer input value (CT) display
   [Displayed only when the heater break alarm (HBA) function is provided]
   Displays the input value of the current transformer used when the instrument is provided with the heater break alarm (HBA) function.
   Display range: 0.0 to 105.0A

Caution
① is displayed when the power is turned ON or the instrument is transferred from the other status.
Manipulated output value (MV) setting in the manual (MAN) mode

Manipulated output value (MV) in the manual (MAN) mode can be manually set in the monitoring (MONI) mode.

[Display example]

- Press the MONI key to display "Measured-value (PV)/manipulated output value (MV) displays" (① B display).
- Press the ▲ key at this time increments manipulated output value (MV) and pressing the ▼ key decrements the same value.
  Keeping pressing the ▲ or ▼ key makes numeric value change faster.
5.3 Set (SET) status

(1) Set (SET) status outline

[Display flow example]
1. **Operator level 1**
   - Pressing the SET key in the monitoring or mode status sets the instrument to the operator level 1.
   - The operator level 1 enables a change in the control target set-value (SV).
   - No. of memory areas: 8
     (One set-value (SV): 1 memory)
     Setting range: Same as input range
     Initial value prior to shipment: 0
     (Decimal-point position varies with input type.)

2. **Operator level 2**
   - Pressing the SET key for approx. 5 sec sets the instrument to the operator level 2.
   - The operator level 2 enables changes in parameters such as alarm setting values, PID constants, etc.
   - Pressing the SET key changes each parameter in the operator level 2 in due order.
   - No. of memory areas: 8
     (All operator level 2 items: 1 memory)
     *For the details of the operator level 2, see “(2) Description of each parameter” on page 34.

3. **Engineer level**
   - The engineer level enables the setting of control action, input/output, alarm and additional function operation selection, and the presence or absence of function. Therefore, this setting is not frequently used.
   - *For the engineer level, see the INSTRUCTION MANUAL (IM700F01-E□) separately prepared. However, if the setting content in the engineer level is changed, the specification may change.*
(2) Description of each parameter (Operator level 2)

Each parameter in the operator level 2 status is shown in the following. Every time the SET key is pressed, each parameter changes in the following order. (The first parameter appears after one cycle is finished.)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1</td>
<td><strong>AL</strong> 1</td>
<td>First alarm</td>
<td>• Deviation alarm</td>
<td>50.0 or 500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High alarm, low alarm: (−span or −1999) to (+span or +9999)</td>
<td>Sets the first alarm set-value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AL1</td>
<td>High and low alarm, band alarm: 0 to (+span or +9999)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td><strong>AL</strong> 2</td>
<td>Second alarm</td>
<td>• Process alarm</td>
<td>50.0, 500, −50.0 or −500</td>
</tr>
<tr>
<td></td>
<td>AL2</td>
<td>Same as input range</td>
<td>Sets the second alarm set-value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decimal-point position varies with input type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>P</strong></td>
<td>(Heating-side) Proportional band</td>
<td>0.1 to 999.9% of span</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>(&quot;0.0&quot; cannot be set.)</td>
<td>Set when PI or PID control is performed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For heating/cooling PID action: Proportional band setting on the heating side.</td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>I</strong></td>
<td>Integral time</td>
<td>1 to 3600 sec</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>(&quot;0&quot; cannot be set.)</td>
<td>Eliminates offset occurring in proportional control.</td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>d</strong></td>
<td>Derivative time</td>
<td>0 to 3600 sec</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>d</td>
<td>(&quot;0&quot; setting: Derivative action OFF)</td>
<td>Prevents ripples by predicting output change, thereby improving control stability.</td>
<td></td>
</tr>
</tbody>
</table>

To "-P-"
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rPT</td>
<td>Control response designation parameter</td>
</tr>
<tr>
<td>rPT</td>
<td>0: Slow 1: Medium 2: Fast</td>
</tr>
<tr>
<td>3</td>
<td>Response required due to set-point change in PID control is specified. 0</td>
</tr>
<tr>
<td>PC</td>
<td>Cooling-side proportional band</td>
</tr>
<tr>
<td>PC</td>
<td>0.1 to 999.9% of span (&quot;0.0&quot; cannot be set.)</td>
</tr>
<tr>
<td>4</td>
<td>Sets cooling-side proportional band when heating/cooling PID action is performed. 3.0</td>
</tr>
<tr>
<td>db</td>
<td>Dead band</td>
</tr>
<tr>
<td>db</td>
<td>-10.0 to +10.0% of span</td>
</tr>
<tr>
<td>4</td>
<td>Sets control dead band between heating-side and cooling-side proportional bands. Minus (−) setting results in overlap. 0.0</td>
</tr>
<tr>
<td>SURL</td>
<td>Setting change rate limit</td>
</tr>
<tr>
<td>SURL</td>
<td>0.0 to 100.0%/min (&quot;0.0&quot; setting: Setting change rate limit OFF)</td>
</tr>
<tr>
<td>5</td>
<td>Setting amount of set-value (SV) change per one minute when the set-value (SV) is changed. 0.0</td>
</tr>
</tbody>
</table>

*1 Dose not display when no alarm is provided and/or FAIL is selected for the first alarm.
*2 Dose not display when no alarm is provided, there is only one alarm output, FAIL is selected for the second alarm and/or heater break alarm function is provided.
*3 No display is made for ON/OFF action.
*4 Displayed only for heating/cooling PID action.
(3) Setting change procedure
(a) When set-value (SV) is changed
   [Example] When the set-value (SV) is changed to 200.0°C

1. Set the instrument to the operator level 1 status.

![Diagram showing the instrument in level 1 status]

Press the SET key to set the instrument to the operator level 1 status.
The least significant digit on the set-value (SV) display unit lights up brightly, and other digits and the memory area display unit light up dimly. The brightly lit digit can be set.

2. Shift of brightly lit digit

![Diagram showing the bright digit shifting]

Press the ← key to move the brightly lit digit up to the most significant digit. Every time the ← key is pressed, each brightly lit digit moves as follows.

![Diagram showing digit shifting]
3 Numeric value change

Press the ↑ key to set "2".
Pressing the ↑ key increments numeric value, and pressing the ↓ key decrements the value.

4 Set-value (SV) registration

After the displayed value is changed, press the SET key.
All digits corresponding to set-value and memory area No. display are brightly lit. Thus, the instrument is set to the monitoring status to register the set-value.
(b) When another area set-value (SV) is changed without changing control area

[Example] When memory area No. 2 set-value (SV) is changed to 100.0°C with control area set to memory area No. 1

1. Press the SET key to set the instrument to the operator level 1.
2. Press the key to move the brightly lit digit up to the memory area No. display.
3. Press the key to set memory area No. to "2". The set-value (SV) display unit displays memory area No. 2 set-value (SV). Also, the memory area No. display flashes in order to indicate that the memory area now displayed differs from the control area.
Press the ≤ key again to move the brightly lit digit up to the most significant digit.

Press the ≥ key to set the digit to "1".

After the displayed value is changed, press the SET key. Thus, instrument status changes to the monitoring status and also the display is for the control area. At this time, the changed memory area No. 2 set-value (SV) is registered.
(c) When each parameter set-value (SV) is changed

[Example]

- Press the SET key for approx. 5 sec to set the instrument to the operator level 2.
- Press the SET key once each time until the parameter symbol whose setting needs to be changed is displayed.
- In the same way as in items (2) to (4) on page 36, change the setting.
For the operator level 2, pressing the SET key at the time of setting registration moves the display to the next parameter.

(d) When parameter set-value in another area is changed without changing control area

- Press the SET key for approx. 5 sec to set the instrument to the operator level 2.
- Press the SET key once each time to display the parameter symbol whose setting needs to be changed.
- In the same way as in item (b) on page 38, display the memory area No. to be changed to change the set-value.
- After the displayed value is changed, pressing the SET key registers the changed value and moves the display to the next parameter.
However, the memory area No. remains with the status changed (memory area No. display flashing). Press the MONI key when the display needs to be returned to the control area display.
*The following is also available when changing the set-value

**Set-value increase or decrease**  Example: When a temperature of 199°C is changed to 200°C.
Press the \( \downarrow \) key to shift the digit brightly lit to the least significant digit. Press the \( \uparrow \) key to change "9" to "0", thereby obtaining 200°C. The same applies to set-value decrease.

**Minus (---) value setting**  Example: For changing 200 to -100.
Press the \( \downarrow \) key to shift the digit brightly lit to the hundreds digit. Press the \( \checkmark \) key to decrement figures in order of \( 1 \rightarrow 0 \rightarrow -1 \).

--- Key operation cautions ---

- This instrument cannot register the setting just changed. The value can be registered for the first time after it is changed and then the SET key is pressed.
- If the instrument is not set to the operator level 1 even when the SET key is pressed or the set-value does not light brightly even when set to the operator level 2, the set data lock may be activated. In this case press the MODE key to set the instrument to the mode status to confirm whether the instrument is set to the unlock status by "Set data unlock/lock transfer" (See page 44).
- This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
5.4 Area (AREA) status

The AREA status is for changing memory area (control area) used for control. Control area changing procedure is described in the following.

[Example] When the control area is changed from memory area No. 1 to No. 2.

1. Press the AREA key to set the instrument to the AREA status. The measured-value (PV) display unit displays "R.E" (ArE) to indicate that the instrument is in the AREA status. The set-value (SV) display unit also shows control area No.

2. Press the \(^{\uparrow}\) key to display "2" on the set-value (SV) display unit. At this time, the control area is not as yet changed. The No. displayed on the memory area display unit corresponds to the control area.

3. Press the SET key to change the control area. The instrument is set to the monitoring status.

**Caution**

This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
5.5 Mode (MODE) status

(1) Display flowsheet

The MODE status is for each operation mode transfer, a display flowsheet in the MODE status is shown in the following. Display in the MODE status is changed by the MODE key.

Auto (AUTO)/manual (MAN) transfer
[Displayed only when the manual mode is provided]
Selected when control is performed in either the automatic or manual mode.

* The manual mode is provided for the following cases:
  • For PID action with auto-tuning (F), and voltage input or current input.
  • For position proportioning PID action.
* The manual setting of manipulated output (MV) in the manual mode is mode in the monitoring status. (See page 28).

Local (LOC)/remote (REM) transfer
[Display only when the instrument is provided with the remote setting input function]
Selected when either data within the instrument (local) is used as set-value (SV) or external (remote) setting input data is used.

Control area inside (local)/external transfer
[Displayed only when the instrument is provided with the control area external contact input function]
Selected when control area is selected either by key operation (local) or external contact input (external).
*See "9. CONTACT INPUT USAGE" on page 56.
**PID/auto-tuning (AT) transfer**

- Displayed only when the instrument is provided with the auto-tuning (AT) function.
- Selected when either PID control or auto-tuning (AT) is performed.
- The selection of auto-tuning immediately starts the auto-tuning function. After this function is completed, the controller is transferred automatically to PID action.

**Set data unlock/lock transfer**

- Selected when either the set data lock function is invalidated (unlock) or validated (lock).
- Details of set data lock are set by engineer level in set status. ("APPENDIX 1" on page 28.)

**Operation execution (RUN)/STOP transfer**

- Selected when operation is either executed (RUN) or stopped (STOP).
- When set to STOP, the set-value (SV) display unit shows "STOP" in the monitoring status.
- If the instrument is transferred to execution (RUN) from STOP, it performs the same operation as the power-ON.
Local (LOC)/computer (COMP) transfer
[Displayed only when the instrument is provided with the communication function]
Selected when either control by key operation (local) is performed or control via communication (computer) is performed.

Cautions
1. Normally, when the instrument is set to the MODE status, first ① is displayed, but ⑦ is first displayed when control via communication is performed. Also ⑥ is first displayed in the operation STOP status.
2. This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
(2) Operation mode transfer procedure

[Example] When operation is changed from execution (RUN) to STOP

Press the MODE key to set the instrument to the MODE status.
Usually, “AUTO/MAN transfer” is displayed first, but during communication “LOC/COMP transfer” is displayed first.

Press the MODE key to display “Operation execution (RUN)/STOP transfer”.
The display selected is brightly lit.
Press the ↑ key to change the instrument from RUN to STOP.
For operation mode selection, mode selection becomes valid at this time.
Press the key changes the display on the set-value (SV) display unit to that on the measured-value (PV) display unit. Pressing the ↓ key changes the above display unit in reverse order.
*If the instrument is transferred to RUN from STOP, it performs the same operation (see page 26) as the power-ON.

After the above selection is finished, press any key of MONI, SET and AREA to set the instrument to the desired status. (The figure at above shows the monitoring status.)
6. SETTING PROCEDURE FOR HEATER BREAK ALARM SET-VALUE

Heater break alarm set-value is set in the engineer level of set status. Conduct the setting in the following procedure.

1. **PV**
   
   100.0
   
   **AREA**
   
   **SV**
   
   100.0
   
   Call operator level 1 in the SET status by pressing the SET key.

   Continue pressing the SET key for approx. 5 sec without detaching the finger.

2. **PV**
   
   AL1
   
   **AREA**
   
   **SV**
   
   1050.0
   
   Press the SET key for approx. 5 sec to call the operator level 2 in the SET status.

   Continue pressing the SET key for approx. 5 sec without detaching the finger.

3. **PV**
   
   PG10
   
   **AREA**
   
   **SV**
   
   **MV**
   
   Further press the SET key for approx. 5 sec to call the engineer level.

   To ④
From ③ Pressing the key 4 times.

4 PV

Pressing the SET key 3 times.

5 PV

Press the SET key 3 times to call the heater break alarm set-value. Setting range: 0.0 to 100.0A

6 In the same way as in items “(3) Setting change procedure” on page 34, set the heater break alarm set-value.
   - Set heater break alarm set-value to a value about 85% current transformer input value (CT). However, when power supply variations are large, set the alarm to a slightly smaller value.
   - In addition, when two or more heaters are connected in parallel, set the alarm to a slightly larger value so that it is activated even with only one heater is broken (However, within the value of CT).
   - When the heater break alarm set-value is set to “0.0” or the current transformer is not connected, the heater break alarm is turned ON.
   * Monitoring status (see page 28) enables the check “Current transformer (CT)”.

7 After finishing the setting, press the MONI key to return to monitoring status.
Setting for position proportioning PID action is set in the engineer level of set status. Conduct the setting in the following procedure.

1. Call operator level 1 in the SET status by pressing the SET key.

2. Press the SET key for approx. 5 sec to call the operator level 2 in the SET status.

3. Further press the SET key for approx. 5 sec to call the engineer level.

To 4
Press the \[ \text{key} \] key 4 times to call the parameter group (PG) 16.
(Pressing the \[ \text{key} \] key 8 times can also call the above group.)
The parameter group includes setting items relating to position proportioning PID action.

The contents of parameter group (PG) 16
Each item shown in the following changes to the next item every time the SET key is pressed. The final item returns to the "PG 16" display.
In the same way as in items "(3) Setting change procedure" on page 34, set the each items.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 16</td>
<td>Parameter group 16</td>
<td></td>
<td>The first characters of parameter group (PG) 16.</td>
<td></td>
</tr>
<tr>
<td>PG 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ dB ]</td>
<td>Neutral zone</td>
<td>0.1 to 10.0% of output</td>
<td>Sets output OFF status between open-side and closed-side outputs.</td>
<td>1.0</td>
</tr>
<tr>
<td>[ db ]</td>
<td>Open/close output differential gap</td>
<td>0.1 to 5.0% of output</td>
<td>Sets differential gap of open-side and closed-side outputs.</td>
<td>0.2</td>
</tr>
<tr>
<td>YHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ybr ]</td>
<td>Action selection at feedback resistance (FBR) break</td>
<td>0: Open-side output OFF, closed-side output OFF 1: Open-side output OFF, closed-side output ON 2: Open-side output ON, closed-side output OFF</td>
<td>Selects action at feedback resistors (FBR) break.</td>
<td>0</td>
</tr>
</tbody>
</table>

After finishing the setting, press the MONI key to return to monitoring status.
Prior to shipment, this instrument has already been adjusted so as to match feedback resistance specified by the customer. However, for its more accurate control, adjust it according to the following. Also prior to the adjustment, confirm that the wiring is correct and control motor load is activated.

First connect wiring as shown in the following:

- Power supply for REX-F700
- Power supply for control motor
- REX-F700 rear terminal
- Feedback resistance input
- Control output
- PTM: Potentiometer
- Control motor
Next, perform operations in accordance with the following flowsheet:

1. **Input type display**
   The Figure at the left is for thermocouple input K and °C.

2. **Input range display**
   The Figure at the left is for the range of -199.9 to +300.0.

3. **Monitoring status**
   The Figure at the left is for measured-value (PV)/set-value (SV) display.

Press the MODE key.

To ①
Mode status
The Figure at the left is for auto/manual transfer display.

Operation execution (RUN)/STOP transfer display
Under operation execution (RUN)

Operation execution (RUN)/STOP transfer display
Operation stop

Feed back resistance adjustment mode
From (2)

Press the SET key. (adjustment start)

The display changes automatically.

The display changes automatically.

(Adjustment end)

Press the MODE key for approx. 5 sec.

Dim lighting

- Operation execution (RUN)/STOP transfer display
  Operation stop
9. CONTACT INPUT USAGE

In this instrument, the control area and each operation mode can be transferred by the front keys and also by contact input. (Optional)

(1) Control area transfer
The control area can be transferred according to the open/close status of rear terminals Nos. 17 to 20.

```
  COM (−)

17 ⬇️

18 ⬇️
  1

19 ⬇️
  2

20 ⬇️
  4
```

### Control area selection according to rear terminal open/close status

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Control area</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>No 17–18</td>
<td></td>
<td>−</td>
<td>×</td>
<td>−</td>
<td>×</td>
<td>−</td>
<td>×</td>
<td>−</td>
<td>×</td>
</tr>
<tr>
<td>No 17–19</td>
<td></td>
<td>−</td>
<td>−</td>
<td>×</td>
<td>×</td>
<td>−</td>
<td>−</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>No 17–20</td>
<td></td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

- : Open
× : Closed

### Cautions

1. When the control area is selected by contact input, set the instrument to the external mode (E) according to the MODE status “Control area internal (local)/external transfer” (see page 43).
2. In this instrument, the control area is transferred approx. 2 sec after the rear terminal (Nos. 17 to 20) open/close status is changed.
(2) Operation mode transfer
The operation mode can be transferred according to the open/close status of the rear terminal Nos. 9 and 10. The operation mode transferred by contact input is any one of AUTO/MAN, LOC REM and LOC/COMP. (To be specified when ordering)
The operation mode transfer status by contact input is shown in the following.

<table>
<thead>
<tr>
<th>Front key mode selection</th>
<th>Status of rear terminal Nos. 9 and 10</th>
<th>Actual operation mode</th>
<th>Lamp status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto/manual transfer</td>
<td>Closed</td>
<td>Auto</td>
<td>MAN (Manual mode lamp)</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Manual</td>
<td>MAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ON</td>
</tr>
<tr>
<td>Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local/remote transfer</td>
<td>Closed</td>
<td>Remote</td>
<td>REM (Remote mode lamp)</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Local</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local/computer transfer</td>
<td>Closed</td>
<td>Computer</td>
<td>COMP (Computer mode lamp)</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Local</td>
<td>COMP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OFF</td>
</tr>
</tbody>
</table>

* The open or close status of rear terminal Nos. 9 and 10 is acceptable.

**Caution**
In this instrument, the operation mode is transferred approx. 1 sec after the rear terminal (Nos. 9 and 10) open/close status is changed.
10. DISPLAY AT ABNORMALITY

- For input abnormality

<table>
<thead>
<tr>
<th>Display</th>
<th>Details</th>
<th>Action (output)</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured-value (PV)</td>
<td>Input abnormality (Measured-value (PV) exceeds the high limit of input abnormality determination point or less than the low limit of input abnormality determination point.</td>
<td>• Action at input abnormality (Outputs manual output value at abnormality. *However, only when the action at input abnormality selected.</td>
<td>Check input type, range, sensor and sensor connection. When replace the sensor, turn off the power or stop the operation by &quot;Operation execution/stop transfer&quot; in the MODE status.</td>
</tr>
<tr>
<td>Flashing</td>
<td></td>
<td>• Alarm output (Outputs by alarm action selection at input abnormality.</td>
<td></td>
</tr>
<tr>
<td><strong>0000</strong></td>
<td>Overscale (Measured-value (PV) is beyond the effective input range.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flashing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UUU</strong></td>
<td>Underscale (Measured-value (PV) is below the effective input range.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flashing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The input abnormality determination point, action selection at input abnormality, manual output value at abnormality and alarm action selection at input abnormality are set in the engineer level.
### Self-diagnostic function

<table>
<thead>
<tr>
<th>Display</th>
<th>Details</th>
<th>Action (output)</th>
<th>Measures</th>
</tr>
</thead>
</table>
| **Err 1** | Auto-tuning error  
(Auto-tuning did not end)  
(normally) | As usual | Pressing any key erases error display to display each status. |

| **Err 2** | Input value error | | |
| Flashing  
(Others extinguish) |

| **Err 3** | RAM error | All outputs: OFF  
(When FAIL is selected for the first or second alarm)  
(FAIL output; Contact open) | Turn the power-OFF once. If the instrument resets to error status after power-ON, contact your nearest RKC's agent or our sales office. |
| Flashing  
(Others extinguish) |

| FAIL lamp lights  
(Others extinguish) | • ROM error  
• CPU power supply error  
• Watch-dog timer error | | |
## 11. INPUT RANGE TABLE

<table>
<thead>
<tr>
<th>Group</th>
<th>Input type</th>
<th>Model code</th>
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<td>K (Y')</td>
<td>(-199.9 \text{ to } 300.0 \degree \mathrm{C})</td>
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<tr>
<td></td>
<td>(0.0 \text{ to } 400.0 \degree \mathrm{C})</td>
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<tr>
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<td>(0.0 \text{ to } 800.0 \degree \mathrm{C})</td>
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<td>0 to 1300 \degree \mathrm{C}</td>
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<td>0.0 to 800.0 \degree \mathrm{F}</td>
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<td>0 to 2400 \degree \mathrm{F}</td>
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<tr>
<td>J (U')</td>
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<td></td>
<td>0 to 1200 \degree \mathrm{C}</td>
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<td>0.0 to 700.0 \degree \mathrm{F}</td>
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<tr>
<td>R (r)</td>
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<td>0 to 3200 \degree \mathrm{F}</td>
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<td>0 to 1000 \degree \mathrm{C}</td>
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*Accuracy in the range of 0 to 400\degree \mathrm{C} (0 to 800\degree \mathrm{F}): Not guaranteed.*
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