

Digital Panel Meters 40 Series
RTD INPUT DIGITAL PANEL METER
(4 digits, process meter)

Model: 40DR

OPERATING MANUAL

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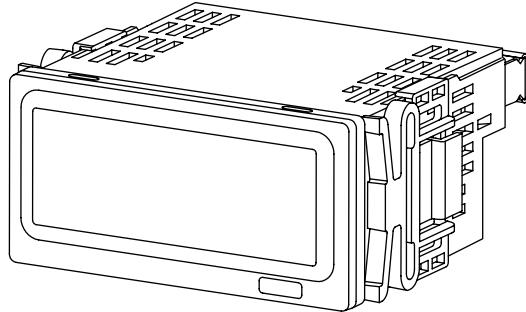
1. INTRODUCTION

1.1 BEFORE USE....

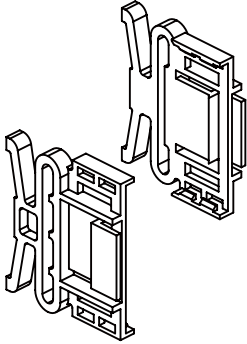
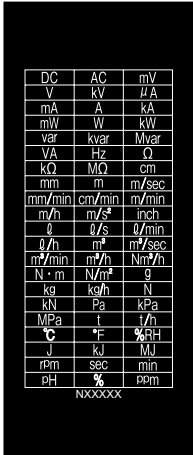
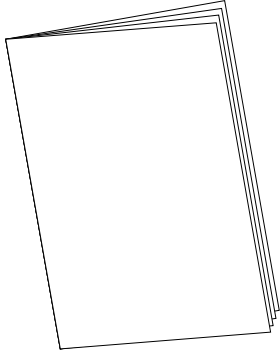
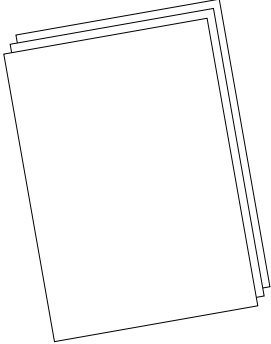
Thank you for choosing us. Before use, please check contents of the package you received as outlined below.

■ PACKAGE INCLUDES

Digital panel meter



Accessories

<p>Mounting bracket (2)</p> 	<p>Engineering unit sticker label sheet (1)</p>  <table border="1" data-bbox="719 969 874 1294"> <tr><td>DC</td><td>AC</td><td>mV</td></tr> <tr><td>V</td><td>kV</td><td>μA</td></tr> <tr><td>mA</td><td>A</td><td>KA</td></tr> <tr><td>mW</td><td>W</td><td>KW</td></tr> <tr><td>var</td><td>kvar</td><td>Mvar</td></tr> <tr><td>VA</td><td>Hz</td><td>Ω</td></tr> <tr><td>kΩ</td><td>MΩ</td><td>cm</td></tr> <tr><td>mm</td><td>m</td><td>m/sec</td></tr> <tr><td>mm/min</td><td>cm/min</td><td>m/min</td></tr> <tr><td>m/h</td><td>m/s²</td><td>inch</td></tr> <tr><td>l</td><td>l/s</td><td>l/min</td></tr> <tr><td>l/h</td><td>m³</td><td>m³/sec</td></tr> <tr><td>m³/min</td><td>m³/h</td><td>Nm³/h</td></tr> <tr><td>N · m</td><td>N/m²</td><td>g</td></tr> <tr><td>kg</td><td>kg/h</td><td>N</td></tr> <tr><td>kN</td><td>Pa</td><td>kPa</td></tr> <tr><td>MPa</td><td>t</td><td>t/h</td></tr> <tr><td>°C</td><td>°F</td><td>%RH</td></tr> <tr><td>J</td><td>kJ</td><td>MJ</td></tr> <tr><td>rpm</td><td>sec</td><td>min</td></tr> <tr><td>pH</td><td>%</td><td>ppm</td></tr> <tr><td colspan="3" style="text-align: center;">NXXXXX</td></tr> </table>	DC	AC	mV	V	kV	μA	mA	A	KA	mW	W	KW	var	kvar	Mvar	VA	Hz	Ω	kΩ	MΩ	cm	mm	m	m/sec	mm/min	cm/min	m/min	m/h	m/s ²	inch	l	l/s	l/min	l/h	m ³	m ³ /sec	m ³ /min	m ³ /h	Nm ³ /h	N · m	N/m ²	g	kg	kg/h	N	kN	Pa	kPa	MPa	t	t/h	°C	°F	%RH	J	kJ	MJ	rpm	sec	min	pH	%	ppm	NXXXXX			<p>Instruction manual</p> 
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<p>Ordering Information Sheet</p>  <p>(included with the option code 'SET' only)</p>																																																																				






■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

1.2 SAFETY PRECAUTIONS (that must be observed)

The following signs are used in this manual to provide precautions required to ensure safe usage of the unit. Please understand these signs and graphic symbols, read the manual carefully and observe the description.

The following signs show seriousness of safety hazard or damage occurred when used wrongly with the signs ignored.

 WARNING	Indicates a potentially hazardous situation which, if not avoided, may result in serious injury or death.	
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in injury or in property damage.	
 Indicates prohibitions.	 Indicates mandatory cautions.	 Indicates cautions.

WARNING



For safety, make sure that wiring is performed by qualified personnel only.

- Failure to do so may result in a fire, electric shock or injury.



Do not touch the terminals while the power is on.

- Doing so may result in electric shock.



Do not touch anything except for the buttons in removing the front panel.

- Doing so may result in malfunction or electric shock.



Check the connection diagram carefully before wire connection.

- Failure to do so may result in malfunction, a fire or electric shock.



Provide safety measures outside of the unit to ensure safety in the whole system if an abnormality occurs due to malfunction of the unit or another external factor affecting the unit's operation.



Do not splash water on the unit.

- Doing so may result in a fire, electric shock or injury.



Stop using the unit immediately if smokes, unusual smell or abnormal noises come(s) from it.

- Using the unit continuously may result in a fire or electric shock.



MANDATORY
CAUTION

Stop using the unit if it is dropped or damaged.
• Using the unit continuously may result in a fire or electric shock.



MANDATORY
CAUTION

Tighten the terminal block with a specified torque.
• Excessive fastening may result in damage of the terminal screws and loose screws may occasionally result in ignition.



PROHIBITION

Do not throw the unit into the fire.
• Doing so may result in rupture of the electronic component.

CAUTION



PROHIBITION
TO DISCOMPOSE

Never discompose or remodel the unit.
• Doing so may result in electric shock, malfunction or injury.



PROHIBITION

Do not connect or remove the unit while its power is on.
• Doing so may result in electric shock, malfunction or injury.



MANDATORY
CAUTION

Do not allow fine shavings or wire scraps to enter the unit in machining screws or wiring.
• Doing so may result in malfunction of the unit.



MANDATORY
CAUTION

Make sure to attach the terminal cover.
• Failure to do so may result in electric shock.



MANDATORY
CAUTION

Do not remove the front panel except in setting parameters.
• Doing so may result in malfunction due to mixing of foreign substances.



MANDATORY
CAUTION

Be aware of static electricity in operating buttons.
• Failure to do so may result in malfunction.



PROHIBITION

Do not pull the wires connecting to the unit.
• Doing so may result in electric shock, damage of the unit or injury.



PROHIBITION

Do not use the unit in an atmosphere where combustible gas is present.
• Doing so may result in inflammation, ignition, or smoke.



PROHIBITION

Do not cover the ventilation slits with cables, etc.
• Doing so may result in malfunction or heating.

1.3 POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- This equipment is suitable for Pollution Degree 2 and Installation Category II (transient voltage 2500 V). Reinforced insulation (input to power: 300 V) is maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.
- Our products conforming to the EU Directives conform to the standards required based on the premise that they are built into various equipment, apparatus or control panels to use. Because the EMC performance depends on the configuration, wiring or arrangement of the equipment, apparatus and control panels you build, it is necessary for you to make such equipment, apparatus or control panels to conform finally to the CE Marking by yourselves.

CAUTION

This product conforms to the EMC Directive for electrical and electronic apparatus intended for use in industrial environments. If it is used in the residential environments, it may cause radio interference, and the user is requested to take appropriate measures.

■ ENVIRONMENT

Install the unit within the installation specifications.

- Indoors use.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH without condensing.
- Altitude up to 2000 meters.
- Provide sufficient space around the unit for heat dissipation.
- Mount the unit to a panel between 1.6 and 8 mm thick.
- Install the unit in a well-ventilated place in order to prevent internal temperature rise.
- Refer to "PANEL CUTOOUT" to install several units. In mounting the unit with other equipment side by side, provide sufficient space between them, according to the dimensions in the panel cutout.
- Do not use the unit under the following environments:
 - Where the unit is exposed to direct sunlight, rain or wind. (The unit is not designed for outdoor use.)
 - Where condensation may occur due to extreme temperature changes.
 - Where corrosive or flammable gas is present.
 - Where heavy dust, iron powder or salt is present in the air.
 - Where organic solvent such like benzene, thinner, and alcohol, or strong alkaline materials such like ammonia and caustic soda may attach to the unit, or where such materials are present in the air.
 - Where the unit is subject to continuous vibration or physical impact.
 - Where there are high-voltage lines, high-voltage equipment, power lines, power equipment, equipment with transmission unit such like a ham radio equipment, or equipment generating large switching surges around the unit.

■ WIRING

- In order to prevent potential electric shock, wire the unit after turning off the power supply and making sure that the power is not supplied to the cable.
- In order to enable the operator to turn off the power input immediately, install a switch or a circuit breaker according to the relevant requirements in IEC 60947-2 and properly indicate it.
- Be sure to confirm the name and polarity of each terminal before wiring to the terminal block.
- Do not connect anything to unused terminals.
- Be sure to attach the terminal cover to prevent electric shock.

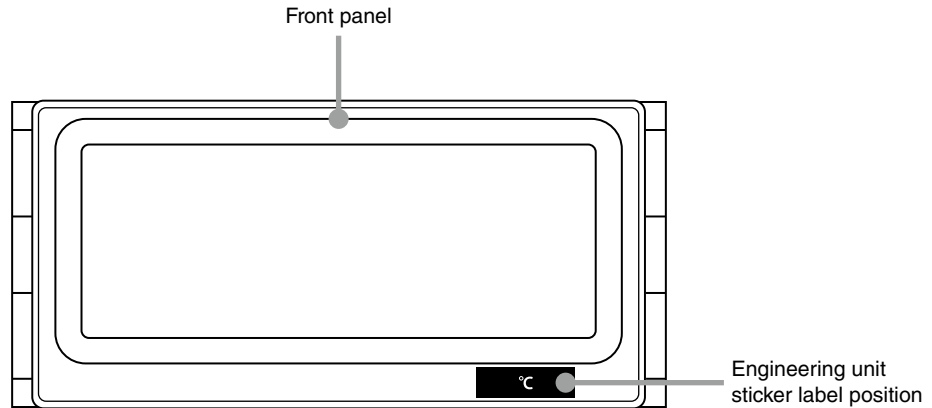
■ HANDLING CAUTIONS

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.
- Use the unit within the noted supply power voltage and rated load.
- Clean the surface of the unit with wet soft cloth. Do not use organic solvent such like benzene, thinner and alcohol. Doing so may result in deformation or discoloration of the unit.
- When abnormality is found such like smokes, unusual smell and abnormal noises coming from the unit, immediately cut the power supply and stop using it.

1.4 COMPONENT IDENTIFICATION

■ FRONT VIEW

• With Front Panel

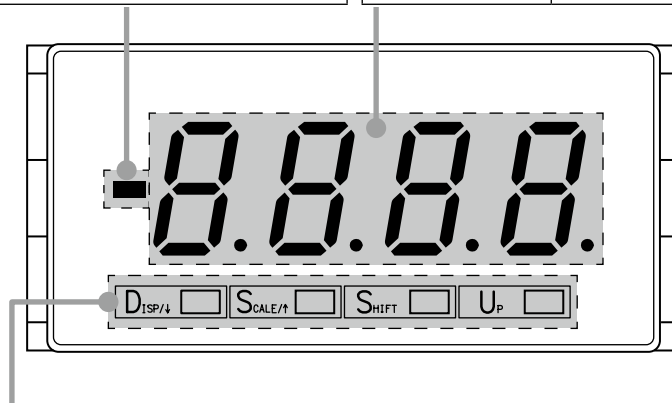


NOTE

- The engineering unit sticker label position is our recommended position.
- When an engineering unit is specified by the Ordering Information Sheet, the unit(s) will be shipped with the sticker label put on the above position.

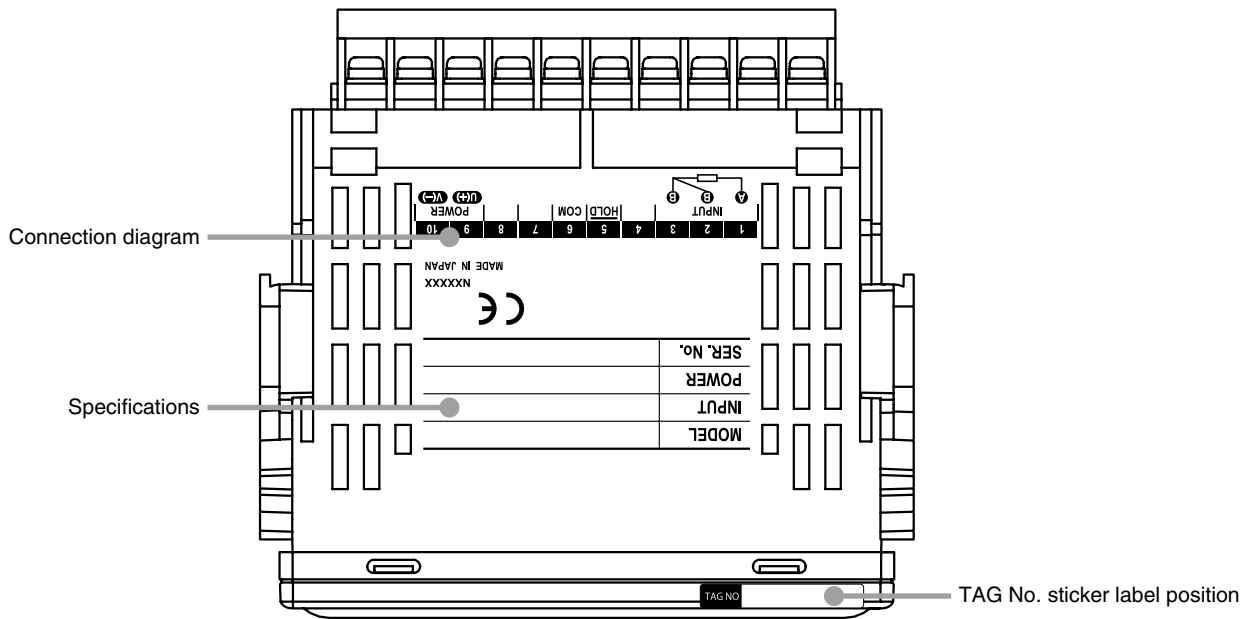
• Without Front Panel

COMPONENT	FUNCTION	COMPONENT	FUNCTION
Polarity indicator	Turns on when negative value is displayed.	4-digit display	Indicates present value, setting value and error messages. Range: 0 to 9999



BUTTON	FUNCTION
DISP/↓	Used to move on to the display setting mode; or to shift through setting items in each setting mode.
SCALE/↑	Used to move on to the zero & span adjustment mode; or to shift through setting items in each setting mode.
SHIFT	Used to move on to the setting standby status of each setting mode and to shift through display digits in each setting item.
UP	Used to change setting values in a setting standby mode.

■ TOP VIEW



NOTE

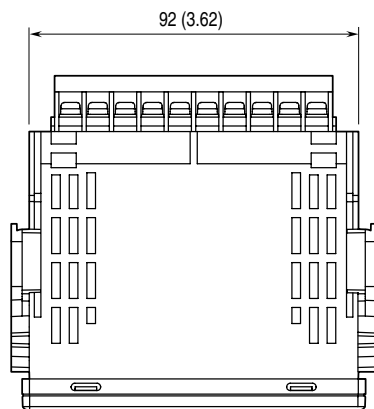
- Contents of the specification label depend on the specifications.
- The tag No. label sticker position is our recommended position.
- When a tag No. is specified, the unit(s) will be shipped with the tag No. sticker label put on the above position. Max. 17 alphanumeric characters can be specified. Please consult us.

1.5 INSTALLATION

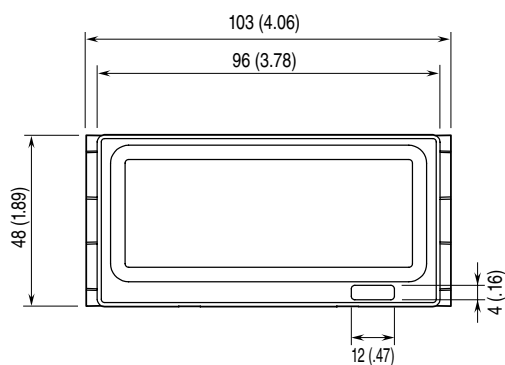
1.5.1 EXTERNAL DIMENSIONS

unit: mm (inch)

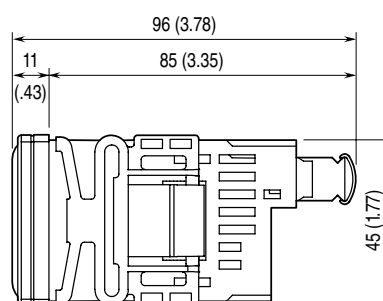
■ TOP VIEW



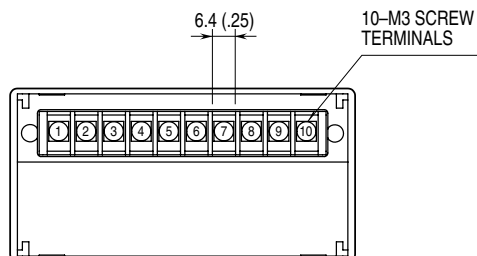
■ FRONT VIEW



■ SIDE VIEW

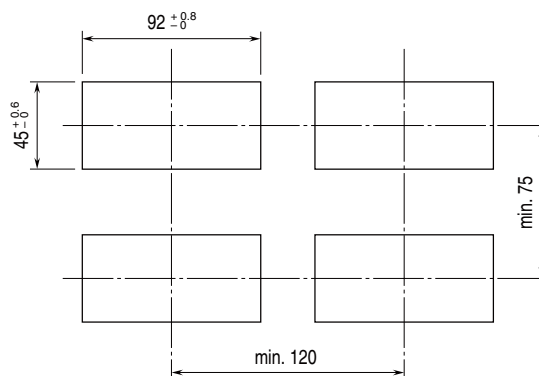


■ REAR VIEW



1.5.2 PANEL CUTOUT DIMENSIONS

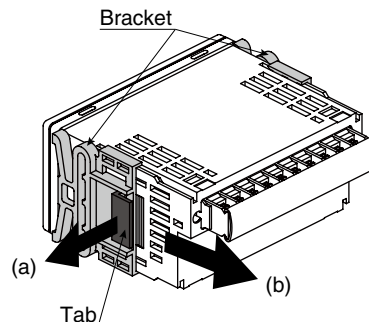
unit: mm



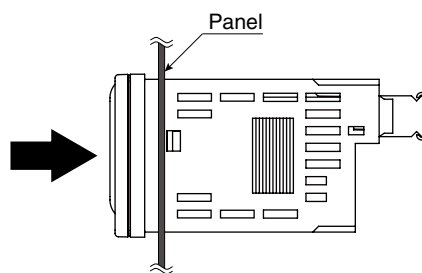
Panel thickness: 1.6 to 8.0 mm

1.5.3 INSTALLATION

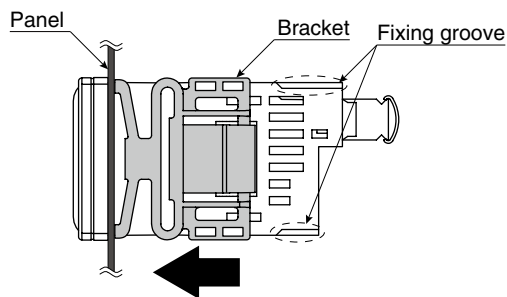
- (1) Remove the mounting brackets.
 - (a) Flip a tab of a bracket.
 - (b) Then pull the bracket toward the terminal block to remove it.



- (2) Insert the unit into the panel cutout.



- (3) Push the mounting brackets into the grooves on both sides of the rear module, until they hit the panel's rear side.



1.6 WIRING INSTRUCTIONS

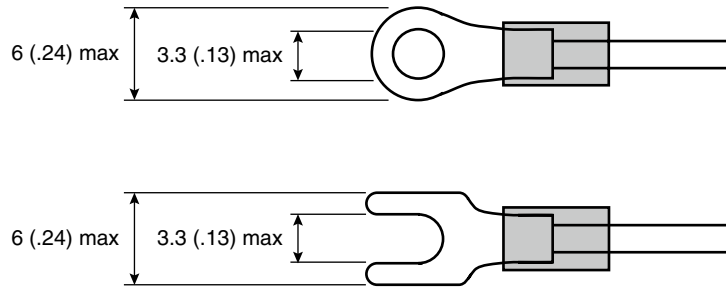
1.6.1 CAUTION IN WIRING

- For safety, make sure that wiring is performed by qualified personnel only.
- In order to prevent potential electric shock, wire the unit after turning off the power supply and making sure that the power is not supplied to the cable.
- Be sure to confirm the name and polarity of each terminal before wiring to it.
- Do not connect anything to unused terminals.
- We offer a series of lightning surge protectors for protection against induced lightning surges. Please contact us to choose appropriate models.

1.6.2 RECOMMENDED SOLDERLESS TERMINAL

- Use solderless terminals for M3. Refer to the drawings below.

unit: mm (inch)



Applicable wire size: 0.25 to 1.65 mm²

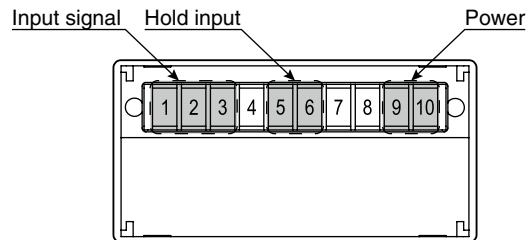
Torque: 0.6 N·m

Recommended manufacturer: Japan Solderless Terminal MFG. Co., Ltd., Nichifu Co., Ltd.

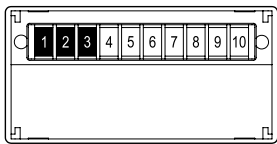
IMPORTANT

- Insulated solderless terminals are recommended.
- In using non-insulated solderless terminals, cover them with insulating caps or tubes.
- Ring tongue terminals are recommended rather than spade tongue terminals to prevent from falling off.

1.6.3 TERMINAL ASSIGNMENT



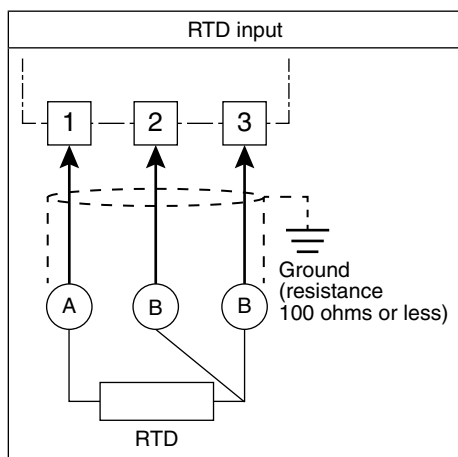
1.6.4 WIRING INPUT SIGNAL



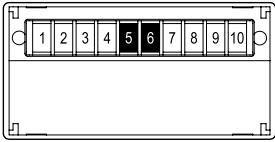
Connect a RTD.

IMPORTANT

- Use wires of the same type, width and length.
- The leadwire resistance including internal resistance such like a lightning surge protector and a barrier must be maximum 10 Ω per wire.
- The excitation is 0.5 mA. Use a RTD with excitation 0.5 mA or more.
- Take measures to reduce noise as much as possible, e.g. by using shielded twisted pair wires for the input signal. Ground the input shield to the most stable earth to prevent noise troubles.
- Do not connect anything to unused terminals.



1.6.5 WIRING HOLD INPUT

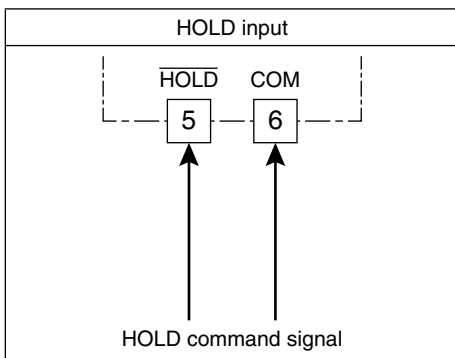


Displayed value is held with an external HOLD command input.
 Connect the contact across $\overline{\text{HOLD}}$ to COM as shown in the following figure.
 Close the contact to hold the value.

Detecting voltage	Approx. 5 V DC, 1 mA
Detecting level	≤ 1.5 V

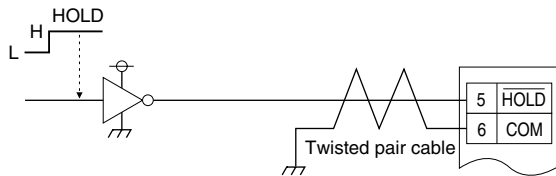
IMPORTANT

- Be sure to confirm the input polarity in wiring.
- The HOLD input is not isolated from the internal circuit.

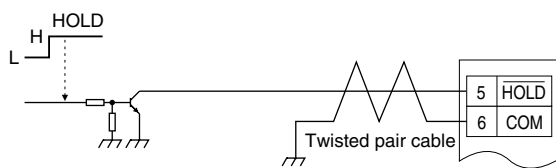


■ WIRING EXAMPLES

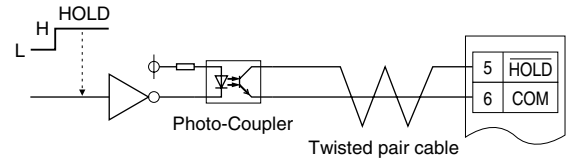
(a) 5V-CMOS, TTL



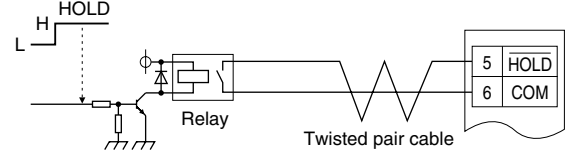
(b) Transistor



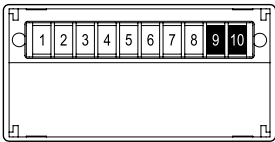
(c) Photo-Coupler



(d) Relay



1.6.6 WIRING POWER

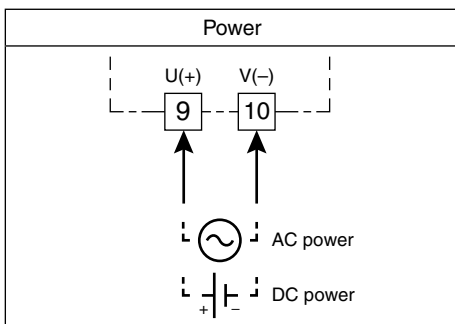


Connect power according to the power input code. The power specifications are shown in the following table.

CODE	RATING	PERMISSIBLE RANGE
K3	100 to 120 V AC	85 to 132 V AC, 47 – 66 Hz approx. 1.3 VA
L3	200 to 240 V AC	170 to 264 V AC, 47 – 66 Hz approx. 1.2 VA
R	24 V DC	±20% approx. 0.5 W

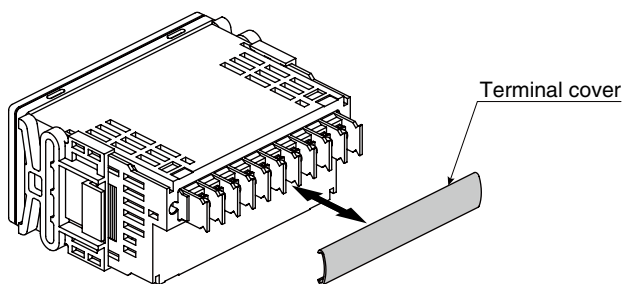
IMPORTANT

- For safety, make sure that wiring is performed by qualified personnel only.
- In order to prevent potential electric shock, wire the unit after turning off the power supply and making sure that the power is not supplied to the cable.
- Use wires as thick as possible and twist them from the end.
- For DC power, confirm the polarity.



1.6.7 ATTACHING/REMOVING TERMINAL COVER

Attach the terminal cover for safety after wiring.



2. BASIC SETTING AND OPERATION

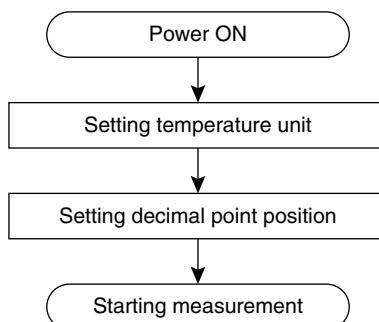
2.1 BASIC SETTING

This section describes flow and procedure of the basic setting.

The following shows the flow and procedure to set the temperature unit and the decimal point as an example. In using '°C' as temperature unit and '1 decimal place' as decimal point position, setting is not necessary.

2.1.1 BASIC SETTING FLOW

The basic setting is as shown in the following flowchart.

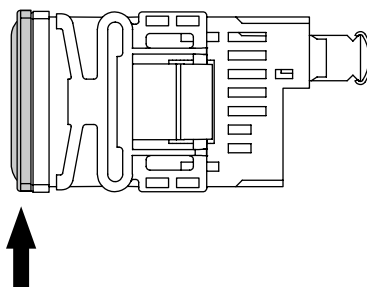


2.1.2 MOUNTING/REMOVING FRONT PANEL

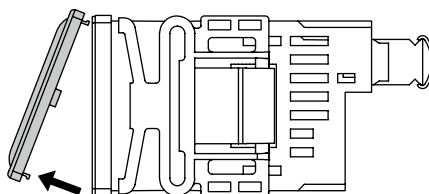
- Set parameters with the buttons inside the front panel. Remove the panel in setting.
- Mount the panel after configuration.

■ REMOVING FRONT PANEL

(1) Hold up the front panel.

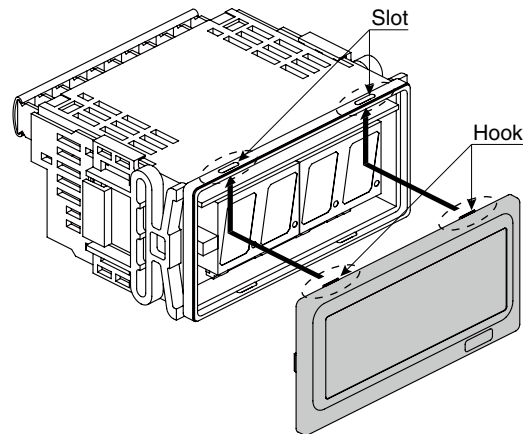


(2) Remove the panel from downside.

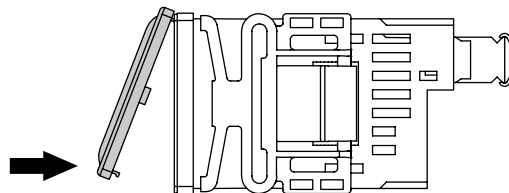


■ MOUNTING FRONT PANEL

(1) Insert the front panel hook into the case upside slots of the unit.



(2) Push the panel hook into the case downside slots of the unit.



NOTE

- Be sure to confirm the direction of the front panel in mounting.
- Make sure that there is no misalignment or space between the unit and the panel after mounting.

2.1.3 BASIC SETTING PROCEDURE

The following shows the procedure to set the temperature unit to '°C' and the decimal point position to 'no decimal point' as an example. Set a temperature unit and decimal point position actually used. Refer to 3. SETTING TEMPERATURE UNIT and after for details of setting.

■ PARAMETER LIST FOR BASIC SETTING

Parameters used in the basic setting are as shown in the following table.

PARAMETER	SETTING VALUE	SETTING
Temperature unit	C	Temperature indication in °C
Decimal point position	8888	No decimal point

■ BASIC SETTING PROCEDURE

The basic setting procedure is as follows.

1 Confirm the wiring, turn on the power and move on to Zero & Span Adjustment Mode (measurement stopped).

- Hold down SCALE/↑ button for 3 seconds or more.

2 Set temperature unit.

- Press DISP/↓ or SCALE/↑ button to go to the next or previous parameter setting.
- Press SHIFT button to shift the display into the setting standby mode and UP button to select the temperature unit.

3 Set decimal point position.

- Press DISP/↓ or SCALE/↑ button to apply the new setting and go to the next or previous parameter setting.
- Press SHIFT button to shift the display into the setting standby mode and UP button to select the decimal point position.

4 Return to Measuring Mode (measurement started).

- Hold down DISP/↓ or SCALE/↑ button for 1 second or more to apply the new setting and return to Measuring Mode.

2.2 BASIC SETTING OPERATION AND INSTRUCTIONS

This section describes basic operation and instructions when setting parameters.

2.2.1 BASIC SETTING OPERATION

Parameters can be grouped into three setting types, “numerical value setting”, “setting value selection” and “decimal point position selection”. Basic operation of each type is as shown below.

■ NUMERICAL VALUE SETTING

1 Press **SHIFT** button to shift the display into the setting standby mode.

- The 4th digit starts blinking.



2 Press **SHIFT** and **UP** buttons to set a numerical value.

- Press **SHIFT** button to go to the next digit.
- Press **UP** button to change the blinking value.



3 Press **DISP/↓** or **SCALE/↑** button to apply the new setting.

- The next or previous parameter setting is indicated.

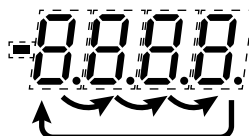


*1 Display depends on the settings.

NOTE

■ SHIFTING DIGITS

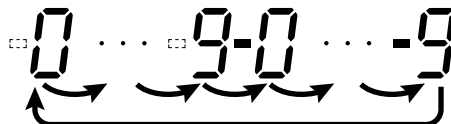
Each time pressing **SHIFT** button, the blinking digit moves to the right.



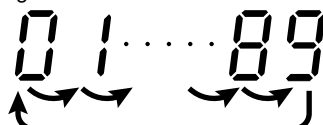
■ SETTING A NUMERICAL VALUE

- Each time pressing **UP** button, the numeral is incremented by 1.
- The negative sign (-) must be set together with the 4th digit. For example, set '-004.0' instead of '-4.0'.

- 4th digit

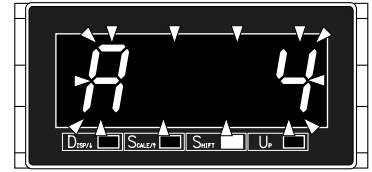


- Other digits

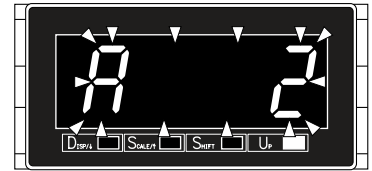


■ SETTING VALUE SELECTION

- 1 Press **SHIFT** button to shift the display into the setting standby mode.
 - The current set value starts blinking.



- 2 Press **UP** button to select your desired setting value.



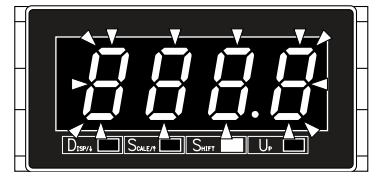
- 3 Press **DISP/↓** or **SCALE/↑** button to apply the new setting.
 - The next or previous parameter setting is indicated.



*1 Display depends on the settings.

■ DECIMAL POINT POSITION SELECTION

- 1 Press **SHIFT** button to shift the display into the setting standby mode.
 - The current set value starts blinking.



- 2 Press **UP** button to select a desired decimal point position.



- 3 Press **DISP/↓** or **SCALE/↑** button to apply the new setting.
 - The next or previous parameter setting is indicated.

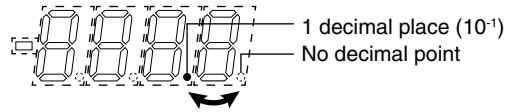


*1 Display depends on the settings.

NOTE

■ MOVING THE DECIMAL POINT

Pressing UP button moves the decimal point.



■ DECIMAL POINT POSITION

“No decimal point” or “1 decimal place” can be selected in the decimal point position setting.

SETTING VALUE	FUNCTION
0000.	No decimal point
000.0	1 decimal place (10 ⁻¹)

2.2.2 INSTRUCTIONS ON BASIC OPERATION

■ IF THE FRONT BUTTONS ARE LEFT UNTOUCHED...

- The indication turns on with applying the last changes after approximately 1 minute while it is in the setting standby mode.
- The display goes back automatically to Measuring Mode after approximately 1 minute in one of the other modes.

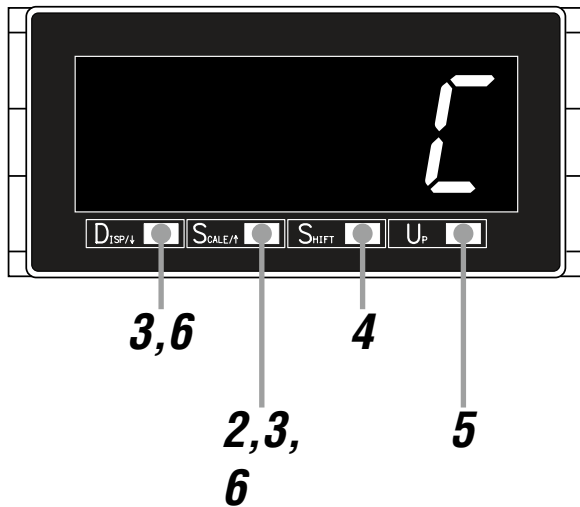
■ TO ABORT A SETTING...

- Hold down SHIFT button for 3 seconds or more to return to Measuring Mode without applying the last changes while the display is in the setting standby mode.
- If you get lost in a setting mode, you can execute initialization. Refer to 12.2 INITIALIZING SETTING VALUES.

3. SETTING TEMPERATURE UNIT

The temperature indication in °C ('C') or °F ('F') can be selected. The default value is °C.

3.1 OPERATING PROCEDURE



NOTE

- Procedures to change 'C' to 'F' are described here.
- To change 'F' to 'C', the procedures are the same. Select 'C' in Step 5.

1 Confirm the wiring, and turn on the power.

- All the indications turn on for approximately 3 seconds and then the display moves on to Measuring Mode.

NOTE

- Indication 'S.ERR' may blink, which shows the input out of the permissible range and does not show the unit failure.
- Indication 'B.ERR' may blink, which shows the input open or out of the range and does not show the unit failure.

- Immediately after power on (all indicators on)



- Measuring Mode



*1 Display depends on the settings and input.

2 Hold down SCALE/↑ button for 3 seconds or more to move on to Zero & Span Adjustment Mode.

- The zero adjustment is indicated.
- The first decimal point starts blinking.

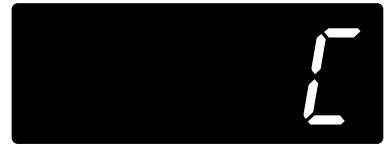


NOTE

When the temperature unit is set to °F, the temperature unit is indicated.

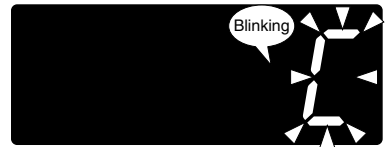
3 Press **DISP/↓** or **SCALE/↑** button to go to the temperature unit setting.

- 'C' is indicated.

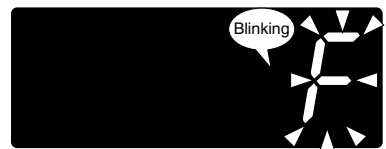


4 Press **SHIFT** button to shift the display into the setting standby mode.

- The indication starts blinking, to which you can apply changes.



5 Press **UP** button to select 'F'.



6 Press **DISP/↓** or **SCALE/↑** button to apply the new setting.

- And the next parameter setting is indicated.

NOTE

- When the temperature unit is set to °F, other parameters are not indicated.
- When the temperature unit is set to °C, the decimal point position will be indicated with **DISP/↓** button pressed, or the span adjustment will be indicated with **SCALE/↑** button.

7 ■ **TO GO ON TO SET THE DECIMAL POINT POSITION,**
Skip to Step 3 in "4. SETTING DECIMAL POINT POSITION"

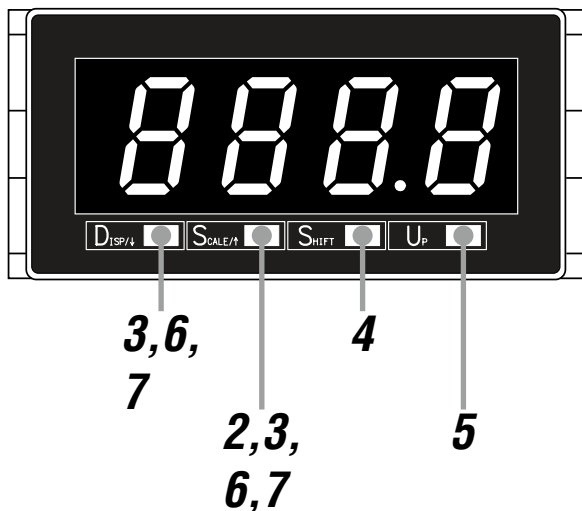
■ **TO QUIT,**

Hold down **DISP/↓** or **SCALE/↑** button for 1 second or more to return to Measuring Mode.

4. SETTING DECIMAL POINT POSITION

The decimal point position “1 decimal place” or “no decimal point” can be selected. The default value is 1 decimal place.

4.1 OPERATING PROCEDURE



NOTE

- Procedures to change 1 decimal place to no decimal point are described here.
- To change no decimal point to 1 decimal place, the procedures are same.

1 Confirm the wiring, and turn on the power.

- All the indications turn on for approximately 3 seconds and then the display moves on to Measuring Mode.

NOTE

- Indication ‘S.ERR’ may blink, which shows the input out of the permissible range and does not show the unit failure.
- Indication ‘B.ERR’ may blink, which shows the input open or out of the range and does not show the unit failure.

- Immediately after power on (all indicators on)



- Measuring Mode



*1 Display depends on the settings and input.

2 Hold down SCALE/↑ button for 3 seconds or more to move on to Zero & Span Adjustment Mode.

- The zero adjustment is indicated.
- The first decimal point starts blinking.



3 Press DISP/↓ or SCALE/↑ button to go to the decimal point position setting.

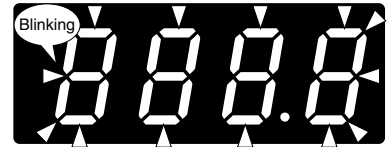
- ‘888.8’ is indicated.



.....

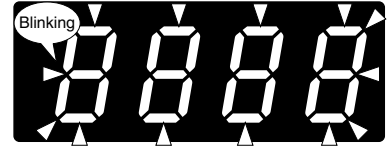
4 Press **SHIFT** button to shift the display into the setting standby mode.

- The indication starts blinking, to which you can apply changes.



.....

5 Press **UP** button to select '8888'.



.....

6 Press **DISP/↓** or **SCALE/↑** button to apply the new setting.

- And the next parameter setting is indicated.

NOTE

- Press **DISP/↓** button, and the zero adjustment will be indicated.
- Press **SCALE/↑** button, and the temperature unit 'C' will be indicated.

.....

7 Hold down **DISP/↓** or **SCALE/↑** button for 1 second or more to return to Measuring Mode.

5. OPERATION

Make sure that the input Pt 100 (JIS '97, IEC), -50 to +50°C is correctly indicated.

IMPORTANT

Before operating, make sure that the wiring is correct, the input and the power supply are within the specification range.

1 Provide -50°C input and make sure that -50°C is indicated.

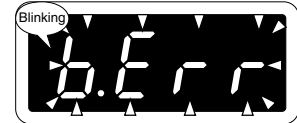
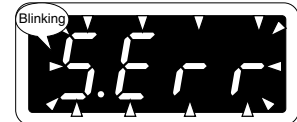


*1 Display depends on the settings and input.

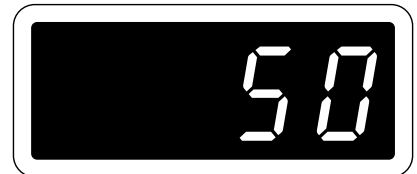
NOTE

■ WHEN THE FOLLOWING IS INDICATED...

- When 'S.ERR' is indicated, the input is not applied correctly. Check the wiring.
- When 'B.ERR' is indicated, one or some of the input wires is/are disconnected, or the input is beyond the 'S.ERR' indication range. Check the wiring.



2 Provide 50°C input and make sure that 50°C is indicated.



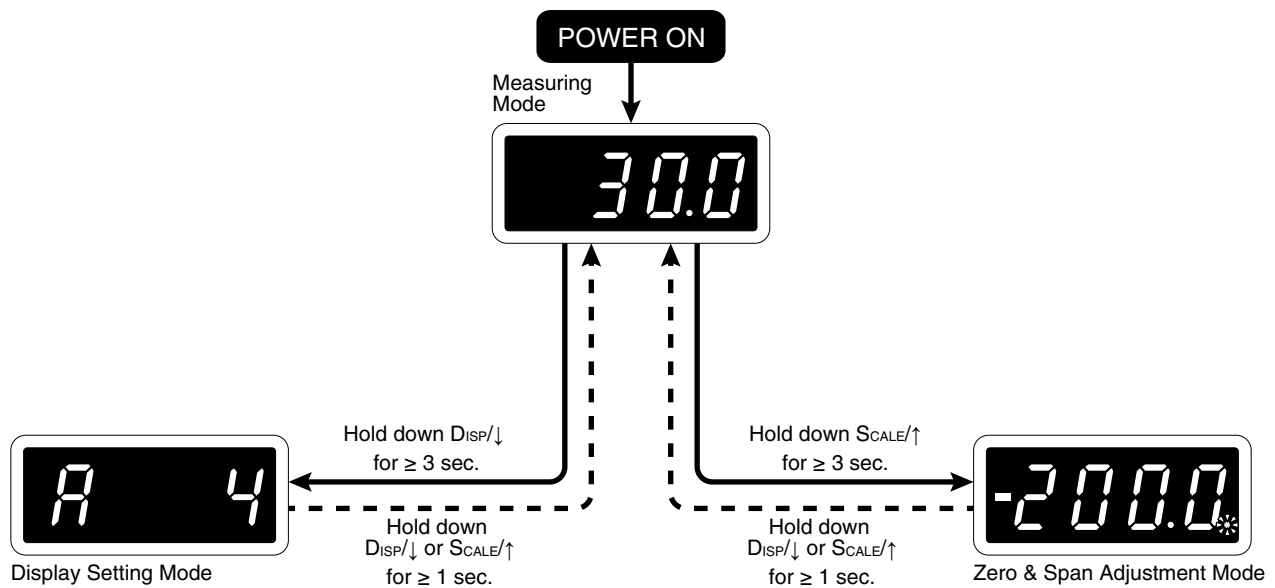
6. PARAMETER CONFIGURATION

■ MODE

Parameters can be grouped in several modes.
The 40DR has modes as shown in the following table.

MODE	FUNCTION	MEASUREMENT
Measuring	Normal measurement state where the unit takes in input. When the power is supplied, the unit operates in Measuring Mode.	Measuring
Zero & Span Adjustment	Temperature unit setting, decimal point position setting, and zero & span adjustments can be performed.	Measuring stopped
Display Setting	Moving average and brightness can be set. Settings can be initialized. Also the firmware version can be confirmed.	

■ MODE TRANSITION



■ TRANSITION FROM MEASURING MODE TO EACH MODE

To Zero & Span Adjustment Mode	Hold down SCALE/↑ button for 3 seconds or more.
To Display Setting Mode	Hold down DISP/↓ button for 3 seconds or more.

■ TRANSITION FROM EACH MODE TO MEASURING MODE

Hold down DISP/↓ or SCALE/↑ button for 1 second or more to return to Measuring Mode.

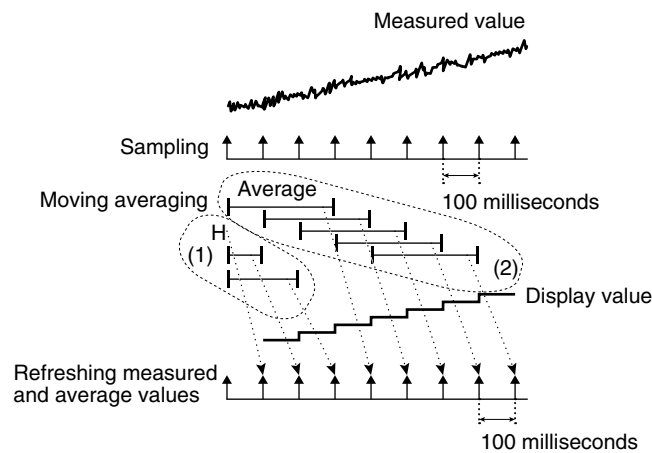
7. AVERAGING INPUT

Moving average processing of measured values is configurable. The number of samples in processing the moving average can be selected in the following table. This operation averages sampled values, and then, averages with a new sample added and the oldest one omitted. Such operation is repeated as shown in the following figure. For instance, when 'A 4' is selected, the moving average processing with 4 samples (400 millisecond intervals) is repeated. Moving average is used to remove periodic varied noise superimposed on the input signal and suppress the display flickering.

■ NUMBER OF SAMPLES

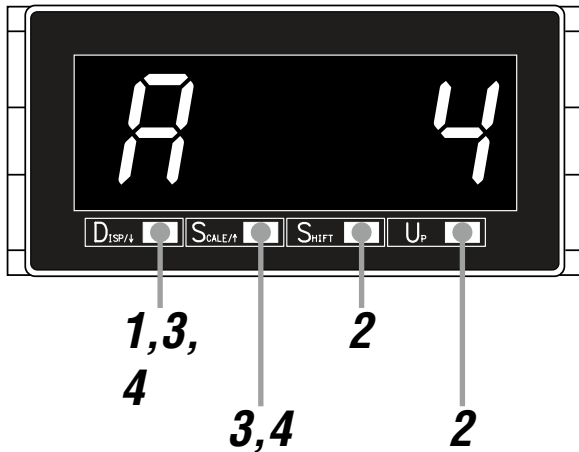
DISPLAY	FUNCTION	DEFAULT VALUE
[R 0 F F]	No moving averaging	[R 4]
[R 2]	Moving average with 2 samples (200 millisecond intervals)	
[R 4]	Moving average with 4 samples (400 millisecond intervals)	
[R 8]	Moving average with 8 samples (800 millisecond intervals)	
[R 16]	Moving average with 16 samples (1600 millisecond intervals)	

■ EXAMPLE OF MOVING AVERAGE WITH 4 SAMPLES



- (1) The moving average operation starts immediately after the power is on or the moving average is set. Until the sampling No. reaches the set value, all samples are averaged every 100 milliseconds.
- (2) After the sampling No. reaches the set value, a new sample is added to be averaged with the oldest one omitted. Such operation is repeated.

7.1 OPERATING PROCEDURE

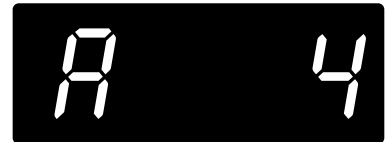


NOTE

The following figures are display examples. The displays depend on the settings.

1 Hold down DISP/↑ button for 3 seconds or more to move on to Display Setting Mode.

- The moving average sampling No. is indicated.



NOTE

'AOFF', 'A 2', 'A 4', 'A 8' or 'A 16' is indicated depending on the setting.

2 Press SHIFT or UP button to select.

- Select one among 'AOFF', 'A 2', 'A 4', 'A 8' and 'A 16'.



3 Press DISP/↓ or SCALE/↑ button to apply the new setting.

- And the next parameter setting is indicated.

NOTE

- Press DISP/↓ button, and the brightness 'C 1', 'C 2', 'C 3', 'C 4' or 'C 5' will be indicated depending on the setting.
- Press SCALE/↑ button, and the version indication will be indicated.

4 Hold down DISP/↓ or SCALE/↑ button for 1 second or more to return to Measuring Mode.

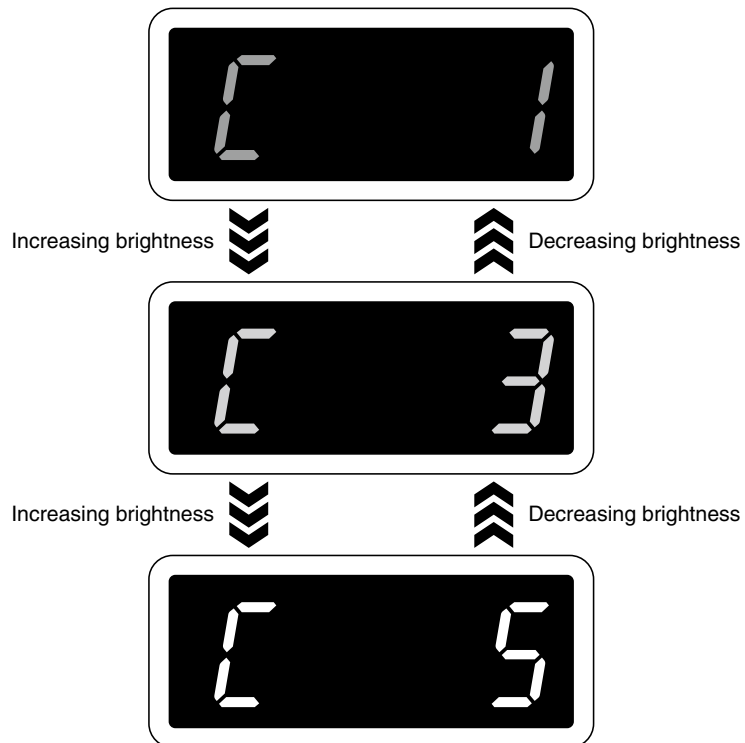
8. ADJUSTING BRIGHTNESS OF DISPLAY

The brightness of the display can be adjusted (figures below). The brightness can be selected in the following table.

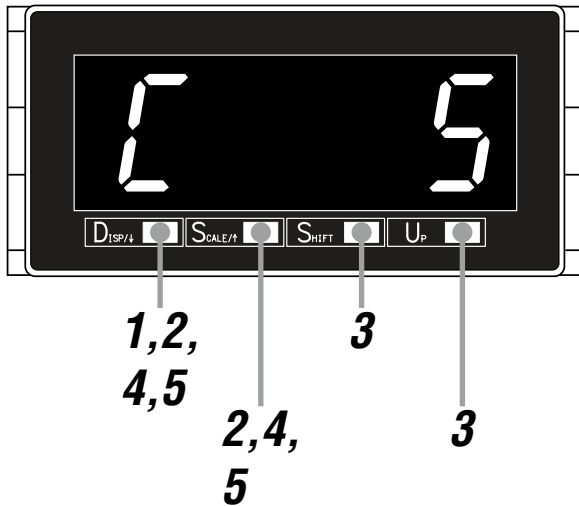
■ DISPLAY BRIGHTNESS

DISPLAY	FUNCTION	DEFAULT VALUE
	Brightness level 1 (dark)	
	Brightness level 2	
	Brightness level 3	
	Brightness level 4	
	Brightness level 5 (bright)	

■ ADJUSTMENT IMAGE



8.1 OPERATING PROCEDURE

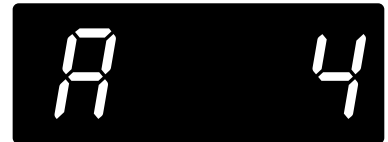


NOTE

The following figures are display examples. The displays depend on the settings.

- 1** Hold down **DISP/↑** button for 3 seconds or more to move on to Display Setting Mode.

- The moving average sampling No. is indicated.

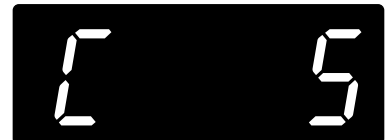


NOTE

'A OFF', 'A 2', 'A 4', 'A 8' or 'A 16' is indicated depending on the setting.

- 2** Press **DISP/↓** or **SCALE/↑** button to go to the brightness setting.

- The brightness is indicated.



NOTE

'C 1', 'C 2', 'C 3', 'C 4' or 'C 5' is indicated depending on the setting.

- 3** Press **SHIFT** or **UP** button to select.

- Select one among 'C 1', 'C 2', 'C 3', 'C 4' and 'C 5'.



.....

4 Press DISP/↓ or SCALE/↑ button to apply the new setting.

- And the next parameter setting is indicated.

NOTE

- Press DISP/↓ button, and the initialization 'ROFF' will be indicated.
 - Press SCALE/↑ button, and the moving average sampling No. 'AOFF', 'A 2', 'A 4', 'A 8' or 'A 16' will be indicated depending on the setting.
-

.....

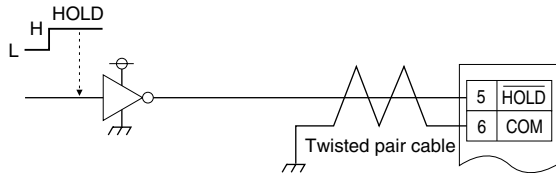
5 Hold down DISP/↓ or SCALE/↑ button for 1 second or more to return to Measuring Mode.

9. HOLDING DISPLAY

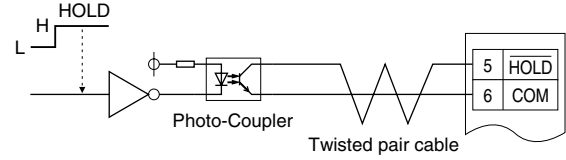
Displayed value is held with an external HOLD command input. Connect the contact across $\overline{\text{HOLD}}$ to COM as shown in the following figures. Close the contact to hold the value.

■ WIRING EXAMPLES

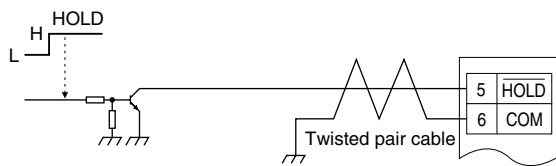
(a) 5V-CMOS, TTL



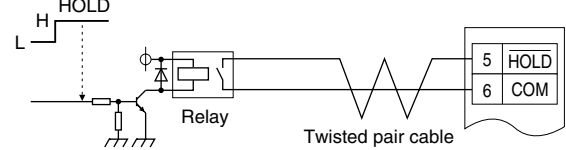
(c) Photo-Coupler



(b) Transistor



(d) Relay



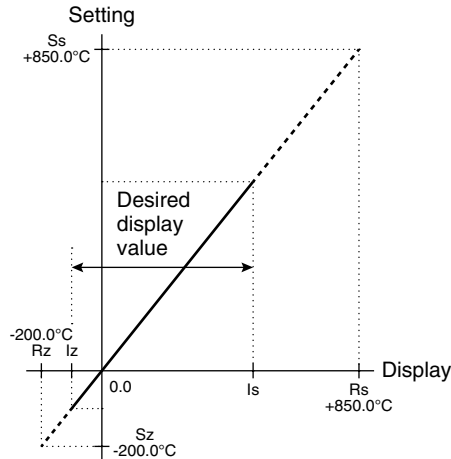
NOTE

- When the unit detects burnout, 'B.ERR' is indicated even while the HOLD command is input.
- While the HOLD command is input, the display keeps the value at the HOLD command turning on, even though the input is out of range.
- In supplying power with the HOLD command on, '0' or '0.0' is indicated.

10. USER CALIBRATION

The 40DR does not have a function to calibrate (adjust) the input signal. When there is an offset in displayed temperature, compensate as the procedure shown below.

- (1) Calculate the values (compensated display values: 0%, 100%) which cancel the difference between max./min. values to set (desired display values: 0%, 100%) and measured values (actual display values: 0%, 100%).
- (2) Obtain the values parallel shifted from the compensated display values 0% and 100% to the measurement range 0% and 100%.
- (3) Set the values obtained in step (2) as zero and span adjustments.



Refer to the example shown below to calculate the zero/span adjustment.

Example: The display range is set to -100.0 to +200.0°C (desired display values), however the display shows -101.0 to +202.0°C (actual display values).

- Compensated display value calculation

$$Dz = Iz - Cz + Iz$$

$$Ds = Is - Cs + Is$$

$$Dz = -100 - (-101) + (-100) = -99$$

$$Ds = 200 - 202 + 200 = 198$$

Iz Desired display value 0%

Is Desired display value 100%

Cz Actual display value 0%

Cs Actual display value 100%

Dz Compensated display value 0%

Ds Compensated display value 100%

- Zero/span adjustment setting value calculation

$$Sz = \frac{Rz \times Dspan + Dz \times Is - Ds \times Iz}{Ispan}$$

$$Ss = \frac{Rs \times Dspan + Ds \times Is - Ds \times Iz}{Ispan}$$

Rz Measurement range -200°C (conformance range 0%)

Rs Measurement range 850°C (conformance range 100%)

Dspan Compensated display value span (Ds - Dz)

Ispan Desired display value span (Is - Iz)

Sz Zero adjustment

Ss Span adjustment

$$S_z = \frac{-200 \times 297 + (-99) \times 200 - 198 \times (-100)}{300}$$

$$= \frac{-59400 - 19800 + 19800}{300} = \frac{-59400}{300} = -198$$

$$S_s = \frac{850 \times 297 + (-99) \times 200 - 198 \times (-100)}{300}$$

$$= \frac{252450 - 19800 + 19800}{300} = \frac{252450}{300} = 841.5$$

By the above calculations, zero/span adjustment value settings are as shown below.

Zero adjustment = -198.0

Span adjustment = 841.5

IMPORTANT

- The zero & span adjustments are not indicated with the temperature unit set to Fahrenheit (°F).
- The zero & span adjustments are effective even when the temperature unit is switched to Fahrenheit (°F).
- To compensate the offset in the displayed temperature with the temperature unit set to Fahrenheit (°F), switch the unit to Celsius (°C), set the zero and span adjustments with the offset converted in °C. Then return the temperature unit to °F.

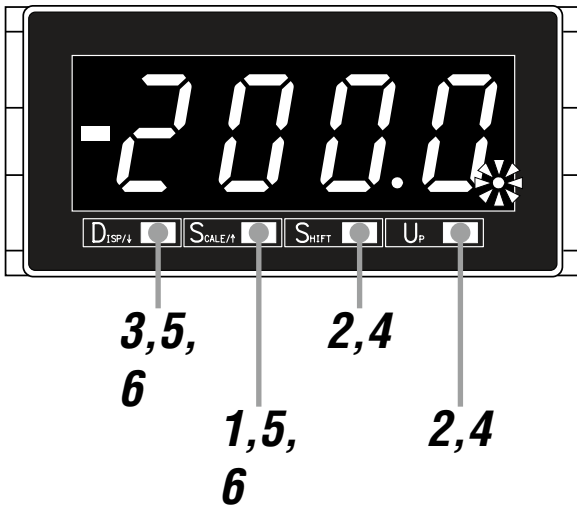
$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5 / 9$$

NOTE

To distinguish from the span adjustment, the first decimal point blinks in setting the zero adjustment.

10.1 ZERO/SPAN ADJUSTMENT

10.1.1 OPERATING PROCEDURE



NOTE

The following figures are display examples. The displays depend on the settings.

- 1** Hold down **SCALE/↑** button for 3 seconds or more to move on to Zero & Span Adjustment Mode.

- The zero adjustment is indicated.
- The first decimal point starts blinking.



- 2** Press **SHIFT** button to shift the display into the setting standby mode, and press **SHIFT** and **UP** buttons to set.

- The fourth digit starts blinking, to which you can apply changes.
- Set any value within the range of -9999 to 9999.



- 3** Press **DISP/↓** button to apply the new value and go to the span adjustment setting.

- The zero adjustment is registered.
- The span adjustment is indicated.



- 4** Press **SHIFT** button to shift the display into the setting standby mode, and press **SHIFT** and **UP** buttons to set.

- The fourth digit starts blinking, to which you can apply changes.
- Set any value within the range of -9999 to 9999.



.....
5 Press **DISP/↓** or **SCALE/↑** button to apply the new value.

- The span adjustment is registered.
- And the next parameter setting is indicated.

NOTE

- Press **DISP/↓** button, and the temperature unit 'C' will be indicated.
 - Press **SCALE/↑** button, and the zero adjustment will be indicated.
-

.....
6 Hold down **DISP/↓** or **SCALE/↑** button for 1 second or more to return to Measuring Mode.

11. INSPECTION / CLEANING

To use the unit in the normal and best conditions, inspect and clean the unit routinely or periodically.

- When the front panel have dirt, wipe them with wet soft cloth. Do not use organic solvent such like benzine, thinner and alcohol. Doing so may result in deformation or discoloration of the unit.
- Make sure that abnormality such like smokes, unusual smell or abnormal noises is not found. Using the unit continuously with such abnormality may result in a fire or electric shock.
- Check the terminal screws periodically. In checking the screws, for safety, interrupt electricity to the power and input.
- Make sure periodically that the mounting brackets are fixed tightly. Loosened brackets may cause drop of the unit.

12. TROUBLESHOOTING

12.1 ERROR MESSAGES

DISPLAY	ERROR MESSAGE	WHAT TO DO
SEFF blinking	The input signal is out of the permissible range.	Set the input signal within the permissible range.
EEFF blinking	The input signal shows breaking of wire.	Check the input signal.

NOTE

While an external HOLD command is input, the display keeps the value at the HOLD command turning on, even though the input is out of range.

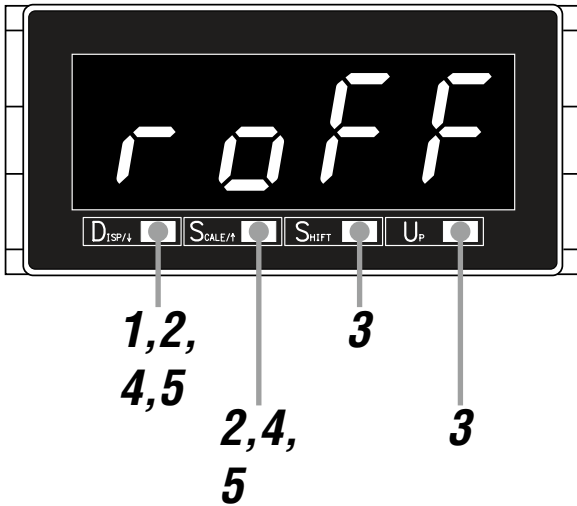
12.2 INITIALIZING SETTING VALUES

To restart setting from the default state, initialization can be used. Refer to attached 13.3 PARAMETER LIST for the default values.

IMPORTANT

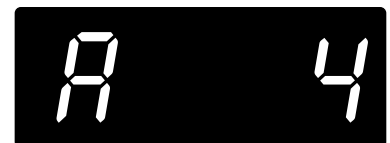
- Currently set parameters will be lost after an initialization. It is recommended to record the parameters before initialization.
- Even if the unit is shipped with the specified parameters with the option code '/SET'; such parameters will be lost after an initialization. Be careful that the initialization does not recover the ex-factory settings.

12.2.1 OPERATING PROCEDURE



1 Hold down DISP/↑ button for 3 seconds or more to move on to Display Setting Mode.

- The moving average sampling No. is indicated.



NOTE

'A OFF', 'A 2', 'A 4', 'A 8' or 'A 16' is indicated depending on the setting.

.....

2 Press DISP/↓ or SCALE/↑ button to go to the initialization.

- 'ROFF' is indicated.



.....

3 Press SHIFT or UP button to select 'REST'.



.....

4 Press DISP/↓ or SCALE/↑ button to execute the initialization.

- The settings are initialized and then the next parameter setting is indicated.

NOTE

- Press DISP/↓ button, and the version indication will be indicated.
 - Press SCALE/↑ button, and the brightness 'C 5' will be indicated.
-

.....

5 Hold down DISP/↓ or SCALE/↑ button for 1 second or more to return to Measuring Mode.

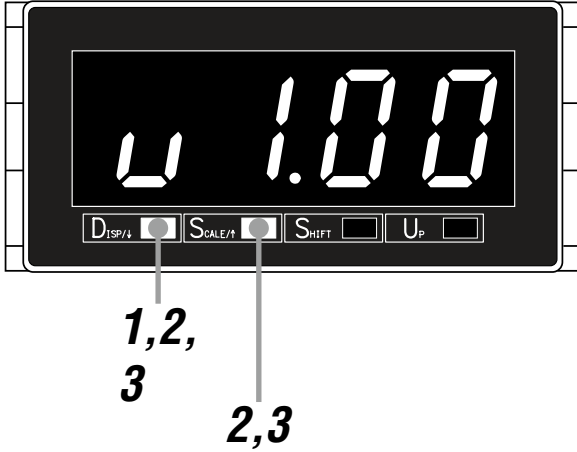
12.3 CONFIRMING FIRMWARE VERSION

The firmware version of the unit can be confirmed.

Confirm the version in the following cases:

- The display is different from the one described in the operating manual.
- The firmware version is necessary to consult us for troubles.

12.3.1 OPERATING PROCEDURE



1 Hold down DISP/↑ button for 3 seconds or more to move on to Display Setting Mode.

- The moving average sampling No. is indicated.



NOTE

'A OFF', 'A 2', 'A 4', 'A 8' or 'A 16' is indicated depending on the setting.

2 Press DISP/↓ or SCALE/↑ button to go to the version indication.

- The firmware version number is indicated.



NOTE

The displays depend on the firmware version number.

3 Hold down DISP/↓ or SCALE/↑ button for 1 second or more to return to Measuring Mode.

13. APPENDICES

13.1 SPECIFICATIONS

■ GENERAL SPECIFICATIONS

Construction		Panel flush mounting
Connection		M3 screw terminals (torque 0.6 N·m)
Screw terminal		Nickel-plated steel
Housing material		Flame-resistant resin (gray)
Isolation		Input to power
Setting (front button)	Zero & span adjustment mode	Zero adjustment, span adjustment, temperature unit, decimal point position
	Display setting mode	Moving average, brightness, initialization, version indication
A/D conversion		$\Sigma - \Delta$
Sampling rate		10 times/sec. (100 msec.)
Averaging		None or moving average

■ DISPLAY

Display	4 digits of 20.3 mm (0.8 inch) height, 7-segment, red LED
Display range	-9999 to 9999
Decimal point position	10 ⁻¹ or none
Zero indication	Higher-digit zeros are suppressed
Over-range indication	'S.ERR' blinks surpassing the permissible range. 'B.ERR' blinks at burnout.

■ INPUT SPECIFICATIONS

RTD		3-wire
	Maximum leadwire resistance	10 Ω per wire
	Sensing current	Approx. 0.5 mA
	Usable range (conformance range)	Pt 100 (JIS '97, IEC) -200 to +850°C or -328 to +1562°F
		Pt 100 (JIS '89) -200 to +650°C or -328 to +1202°F
Operational range	-230 to +880°C or -382 to +1616°F	
Hold input		Dry contact input
	Detecting level	≤ 1.5 V
	Sensing	Approx. 5 V DC, 1 mA

■ INSTALLATION

Power consumption	AC power	K3: 100 – 120 V AC	Operational voltage range 85 – 132 V, 47 – 66 Hz Approx. 1.3 VA
		L3: 200 – 240 V AC	Operational voltage range 170 – 264 V, 47 – 66 Hz Approx. 1.2 VA
	DC power	R: 24 V DC	Operational voltage range 24 V $\pm 20\%$ Ripple 10% p-p max. Approx. 0.5 W
Operating temperature		-10 to +55°C (14 to 131°F)	
Operating humidity		30 to 90% RH (non-condensing)	
Mounting		Panel flush mounting	
Weight		160 g (0.35 lb)	

■ PERFORMANCE

Accuracy	-200 – +200°C: ±0.2°C rdg ±1 digit 200 – 850°C: ±0.6°C rdg ±1 digit -328 – +1562°F: ±1°F rdg ±1 digit
Temp. coefficient	±0.1°C/°C
Line voltage effect	±1 digit over voltage range
Insulation resistance	≥ 100 MΩ with 500 V DC
Dielectric strength	1500 V AC @ 1 minute (input to power to ground)

■ STANDARDS & APPROVALS

EU conformity	EMC Directive EMI EN 61000-6-4 EMS EN 61000-6-2 Low Voltage Directive EN 61010-1 Installation Category II Pollution degree 2 Input to power: Reinforced insulation (300 V) RoHS Directive
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13.2 MODEL NUMBERING

Code number: **40DR-R1-[1][2]**

INPUT

R1: Pt 100 (JIS '97, IEC) (usable range -200 to +850°C, -328 to +1562°F)
Pt 100 (JIS '89) (usable range -200 to +650°C, -328 to +1202°F)

[1] POWER INPUT

AC Power

K3: 100 – 120 V AC (operational voltage range 85 – 132 V, 47 – 66 Hz)

L3: 200 – 240 V AC (operational voltage range 170 – 264 V, 47 – 66 Hz)

DC Power

R: 24 V DC (operational voltage range 24 V \pm 20%, ripple 10% p-p max.)

[2] OPTIONS

Blank: None

/Q: With options (specify the specification)

■ SPECIFICATIONS OF OPTION: Q

COATING (For the detail, refer to our web site.)

Moving parts and indicators are not coated.

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

EX-FACTORY SETTING

/SET: Preset according to the Ordering Information Sheet (No. ESU-9533)

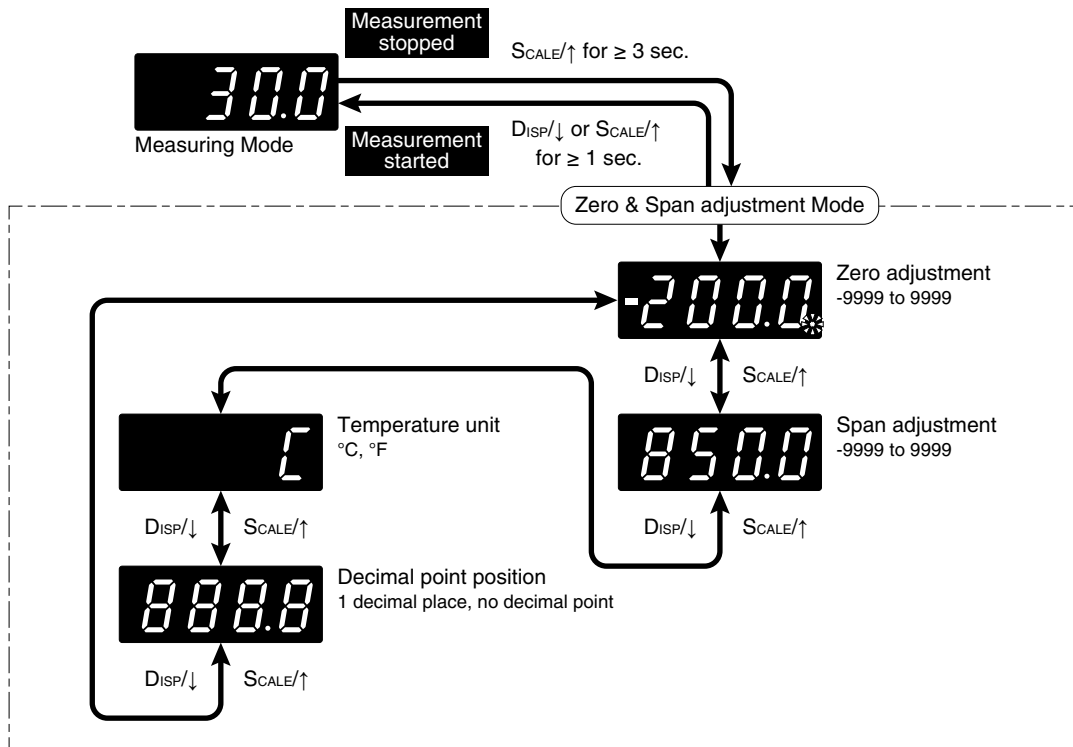
13.3 PARAMETER LIST

MODE	PARAMETER	SETTING RANGE	DISPLAY	DEFAULT VALUE	DECIMAL POINT POSITION	UNIT
Measuring	Present value	-9999 – 9999	----	----	*1	°C/°F
Zero & span adjustment	Zero adjustment	-9999 – 9999	[9999] to [9999]	[2000]	*1	°C
	Span adjustment	-9999 – 9999	[9999] to [9999]	[8500]	*1	°C
	Temperature unit	°C, °F	[C] [F]	[C]	----	----
	Decimal point position	1 decimal place, no decimal point	[.0000] [0000]	[.0000]	----	----
Display setting	Moving average	None, 2, 4, 8, 16	[OFF] [A 2] [A 4] [A 8] [A 16]	[A 4]	----	Sample
	Brightness	1 (dark) to 5 (bright)	[1] [2] [3] [4] [5]	[5]	----	----
	Initialization	OFF, initialization	[OFF] [ESE]	[OFF]	----	----
	Version indication	----	----	----	----	----

*1 Conforms to decimal point position setting.

13.4 PARAMETER MAP

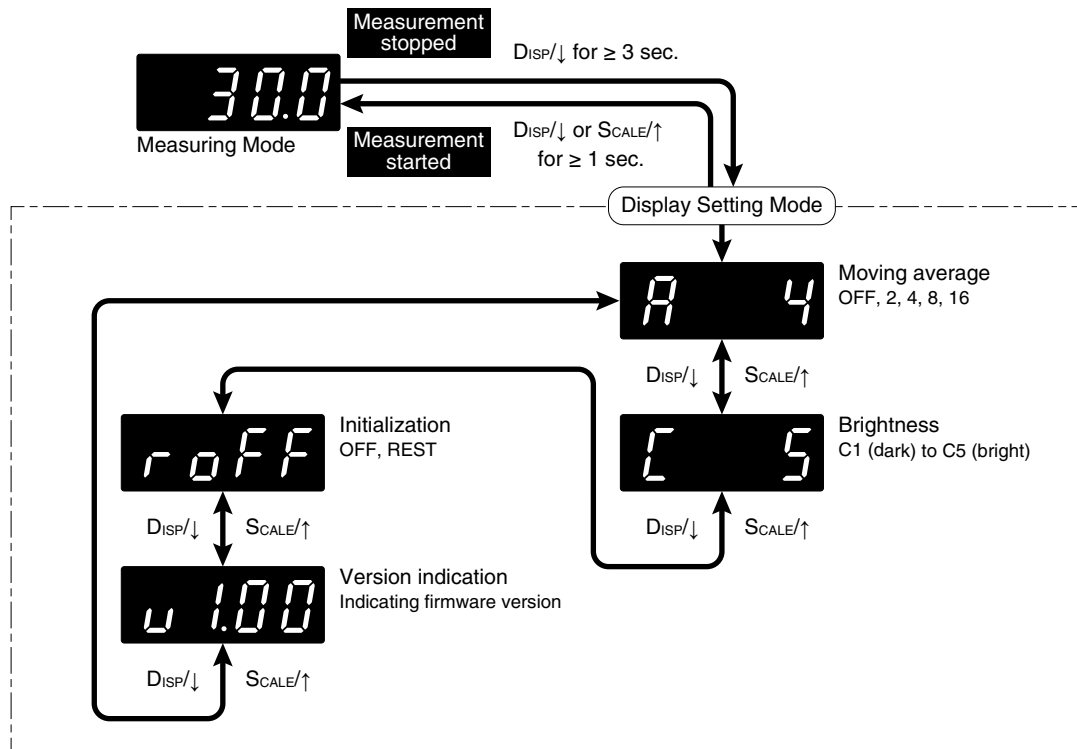
13.4.1 ZERO & SPAN ADJUSTMENT MODE



NOTE

- The display depends on the settings and input.
- When the temperature unit is set to Fahrenheit (°F), other parameters are not indicated.

13.4.2 DISPLAY SETTING MODE






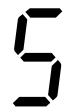






NOTE





















- The display depends on the settings and input.
- Version indication is for indication only, not for setting.

13.5 CHARACTER SET

■ NUMERALS

0	1	2	3	4	5	6	7	8	9
									

■ ALPHABET

A	B	C	D	E	F	G	H	I	J
									
K	L	M	N	O	P	Q	R	S	T
									
U	V	W	X	Y	Z				
