Quick Manual

Temperature Measuring Digital Meter Relay, Model 452B

1. Preface

Thank you for purchasing our digital meter relay 452B series.

Before use, read this manual carefully and thoroughly, and keep this manual available for routine reference.

Please check contents of the package you received as outlined below.

(1) 452B itself   (2) packing   (3) This manual   (4) Unit label   (5) Indication label

(6) Connector with 2m flat cable (BCD output option)

For safe use of this product, please observe the following warning and caution.

In order to help the users' safe use of the products, the following symbol marks are used in this manual.

⚠ WARNING   This is the warning to avoid the danger when it is assumed that such danger as may cause fatal accident or severe injure to a user occurs in case that the product is mishandled.

⚠ CAUTION   This is the caution to avoid the danger when it is assumed that such danger as may cause minor injure to a user or generate only physical obstacle occurs in case that the product is mishandled.

⚠ WARNING

● **There is no power on-off switch on the model 452B. It immediately starts to operate after turning the power.**

● **Do not touch terminals when turning the power on.**

⚠ CAUTION

Preserve followings for your safety.

● **The rated data is, however, defines with more than 15 minutes warming-up times.**

● **When the product is installed in the cabinet, perform the appropriate heat radiation to keep less than 50 ^{o}C in it.**

● **Avoid the close-contacted mounting of the meter relay.   The rise of internal temperature affects the life of product.**

● **Do not install under the following conditions.**

   ●**Where it is exposed to direct sunlight, dust, corrosive gases, rain, etc.**

   ●**Where ambient temperature or humidity is high.**

   ●**Where it is exposed to excessive noise or static electricity.**

   ●**Where there is constant vibration or shock**

● **Store the instrument within the specified temperature range for storage (-20~70 ^{o}C).**

● **When the front panel or the case becomes dirty, wipe it with soft cloth.**

For heavy dirt, wipe it lightly with the soft cloth wetted with the neutral cleaner thinned by water, and   finish the cleaning with dry cloth.   Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.

## 2. Specifications

2.1 Installation Specifications

Power Supply	: AC100 to 240V (90-250V) 50/60Hz, DC12 to 24V (9-32V), DC110V (100-170V)
Power Consumption	: Approx. 9VA at 100VAC, 11.5VA at 200VAC, 400mA at 12VDC, 200mA at 24VDC, 40mA at 110VDC.
Comparator output	: Relay output

Relay output
   4-SPST (NO) for AL1 to AL4, and 1-SPDT for GO
      Contact capacity (resistive): AC250V 1A, DC30V 1A
      Min. 10^5 electrical operation life (ON-OFF 1200 times / hr)
      Min. 20×10^6 mechanical operation life (ON-OFF 18000 times / hr)
   Open Collector output
      5-NPN for AL1 to AL4, and GO
      Contact rating: Max. DC30V 30mA, saturation voltage: Max. DC 1.6V

Operating Temperature	: 0 to 50 ^{o}C
Storage Temperature	: -20 to 70 ^{o}C
Weight	: Approx. 300g
Mounting Method	: Panel mount with the bracket

2.2 General Specifications

Display	:	$0\sim99999$, "-" polarity, with zero-suppress function.
		PV: red or green LED (character height 15.2mm)
		SV1 and SV2: red LED (character height 7.6mm)
Input sensor	:	Selectable
Unit (^{o}C / ^{o}F)	:	Selectable by the parameter setting (^{o}F = ^{o}C $\times$ 9/5+32)
Over-range indication	:	Blinking with minimum or maximum value of display range
Burnout	:	RTD input: Blinking with maximum value of display range
		Thermocouple input: Blinking with minimum or maximum value of display range (programmable)
Resolution	:	RTD input: 0.1 ^{o}C (0.01^{o}C when Pt100Ω range 2)
		Thermocouple input: 0.1 ^{o}C
External resistance	:	500Ω Max. for Thermocouple input
Wire resistance	:	5Ω Max. per wire for Thermocouple input
Sampling rate	:	Approx. 5 times / sec.
Noise Rejection	:	Normal mode (NMR) - 50dB or more.
		Common mode (CMR) - 110dB or more.
Noise Through Power Supply Line	:	1000V (at AC voltage power supply)
Insulation Resistance	:	DC500V 100MΩ or more.
Withstanding Voltage	:	Input terminals - Case : AC2000V each for 1 min.
		Power supply terminals - Case : AC2000V each for 1 min.
		Power supply terminals - Input and output terminals : AC1500V each for 1min.
		Input terminals - Output terminals : AC500V each for 1 min.
Housing protection	:	IP65 for the front panel, IP20 for the rear case, IP00 for terminals

3. Mounting

Insert the case with the suitable gasket from the panel front.
Fix the case using the mounting bracket.
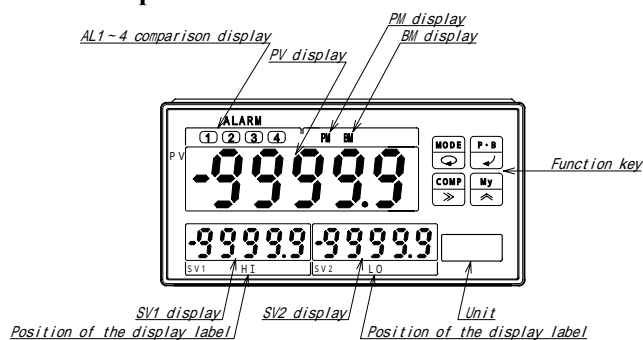Cut the panel to mount the case in accordance with the illustration.

Fixing pitch
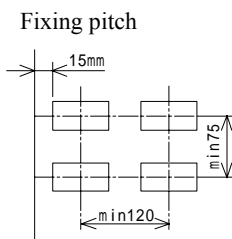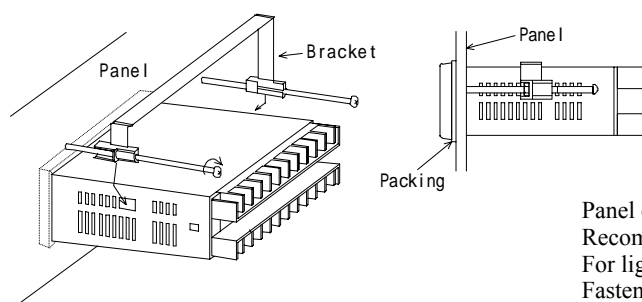
Panel cut dimension: 92 $^{+0.8/-0}$ $\times$ 45 $^{+0.6/-0}$ mm
Recommended panel thickness is 0.6 to 6mm.
For light panel, such as aluminum, should be 1.5mm or more to avoid deform.
Fasten torque of the mounting bracket is 0.2 to 0.3N m.

⚠ CAUTION

- **Do not overtighten the mounting bracket.**
- **When plural mounting, pay attention to ventilation to cool down in the panel.**
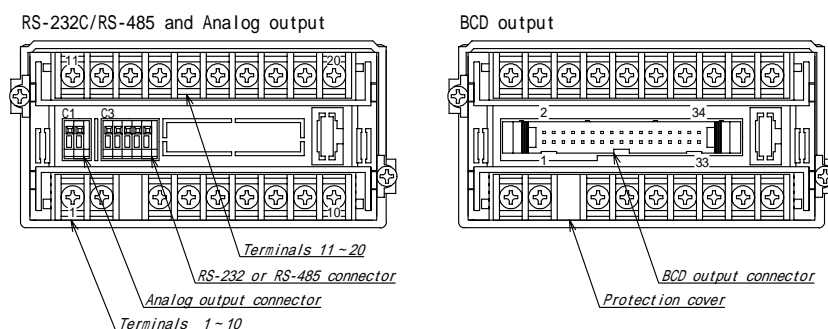
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4. Nomenclature
4.1 Front panel

AL1   4 comparison display
PV display
PMdisplay
BMdisplay

Function key

SV1 display
SV2 display
Unit
Position of the display label
Position of the display label

4.2 Function key

Switch the measuring, the parameter setting, and the calibration mode.
Switch modes during the parameter setting mode.

Switch indications during the measuring mode.
Enter the input value during the parameter setting mode.

Switch alarm points during the measuring mode.
Shift among the digits during the parameter setting mode.

Switch to My mode during the measuring mode.
Change values during the parameter setting mode.

4.3 Rear panel

RS-232C/RS-485 and Analog output
BCD output

Terminals 11 20
RS-232 or RS-485 connector
Analog output connector
Terminals 1 10

BCD output connector
Protection cover

5. Connections
5.1 Terminals and Connections

⚠ WARNING

● **To avoid an electrical shock, turn the power off when wiring.**
● **Do not wire with moistened hands.   Locate away from the wet place.**
● **Do not touch terminals when turning the power on.**

⚠ CAUTION

● **Power supply and load should be within the suitable range.**
● **Power supply should be rapidly reach the rated power within few seconds.**
● **When the power is turned OFF and ON again soon after, provide the downtime of 10 seconds or more.**
● **Do not miswiring.**

● Note for wiring
  (1) Lay the input cable and the power cable separately.
      Otherwise indication may be fluctuated.
  (2) Provide appropriate noise protection when operating solenoid
      or large relay by using the relay output.
      Sealed case or power line filter or isolated transformer may be effective.
  (3) COM, HOLD, MR and ALRESET terminals are not insulated.
      Terminals shall be wired to photo coupler, relay, switch, and so on.
   Each meter shall be insulated when plural mounting.

+5V
1mA or less
HOLD
IN Lo
COM
Switch
Photo coupler
452B
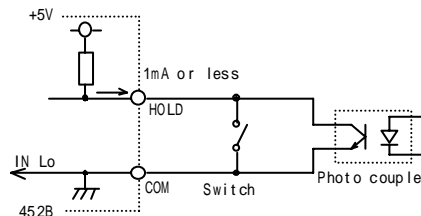
■Terminals

Terminals are not insulated from the input.
Active "L" I_{IL} -1mA   "L"=0   1.5V   "H"=3.5   5V
  ● Hold   : Hold display, data output, current value, peak memory, bottom memory, and display amplitude.
                  Hold the data when the hold input is active.
  ● MR   : Rest peak memory, bottom memory, and jump width.
  ● ALRESET : Release (OFF) alarm outputs and GO outputs.

● Terminals
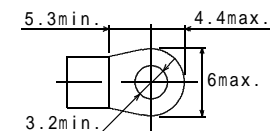 Relay output   Open collector output

RTD input
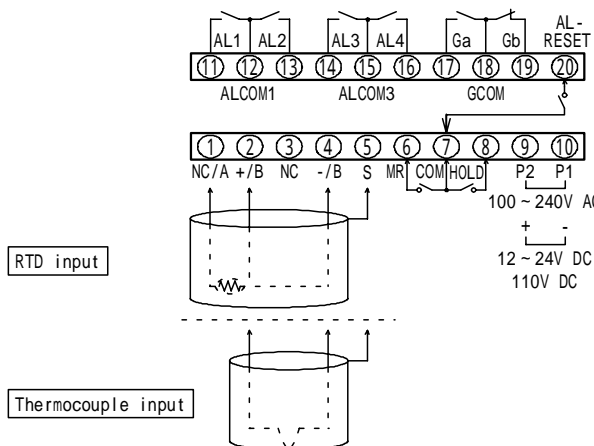
Thermocouple input
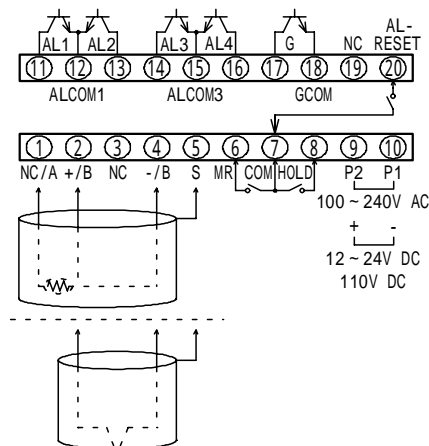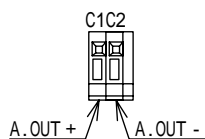
The screw is not provided on the terminal No.3.
Do not remove the protection cover on the terminal No.3.

Terminal screws : M3
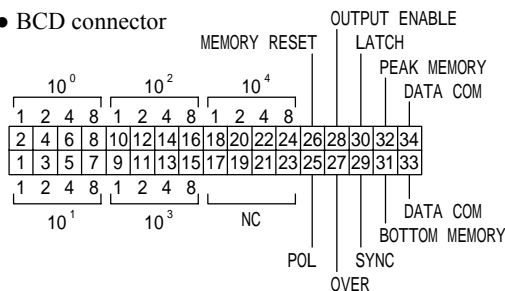Fastening torque : 0.46~0.62N m
Crimped terminal : Refer to the figure
                    at the above.

5. 3min.   4. 4max.

6max.

3. 2min.

● Analog output connector   ● BCD connector

C1C2

A OUT   A OUT

MEMORY RESET   OUTPUT ENABLE
                  LATCH
                  PEAK MEMORY
                  DATA COM

10^0 10^2 10^4

1	2	4	8	1	2	4	8	1	2	4	8
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33
1	2	4	8	1	2	4	8

10^1 10^3 NC

POL   SYNC
OVER   DATA COM
         BOTTOM MEMORY

Suitable connector
XG4M-3430-T:OMRON Corp.
with 2m cable

● RS-232C output connector   ● RS-485 output connector
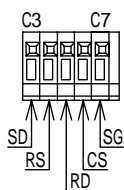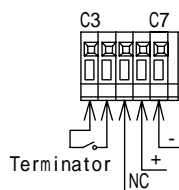
C3   C7   C3   C7

SD   SG   Terminator
  RS   CS   NC
     RD

Recommended wire ⎰ Solid wire   : AWG28 to 22
                 ⎱ Twisted wire : AWG28 to 22
                                   O.D. 0.125 min.
  Strip-off length: 9 to 10mm


5.2 Attaching and detaching of terminal block cover

● Assemble procedures
(1) Direct the claws of the cover to the terminal blocks. "a"
(2) Insert the claw on either side of the cover as the figure shows. "b"
     Insert the claw on another side until it clicks.
     Thus, the attaching is completed.
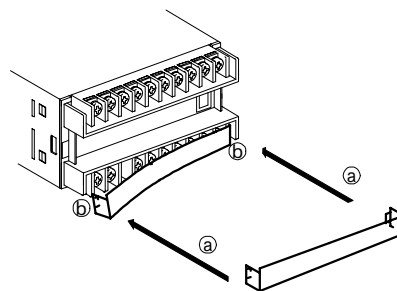
● Disassemble procedures
(1) Pressing the surface on one side of the cover, slightly slide it downwards. "c"
(2) Insert a small screwdriver into the gap made between the side wall of the terminal blocks and the claw of the cover, and stretch it outward. "d"
(3) Move whole the cover downwards, then the claw on another side is departed from the terminal blocks. "e"

Enlargement of ◯

Approx. 1mm
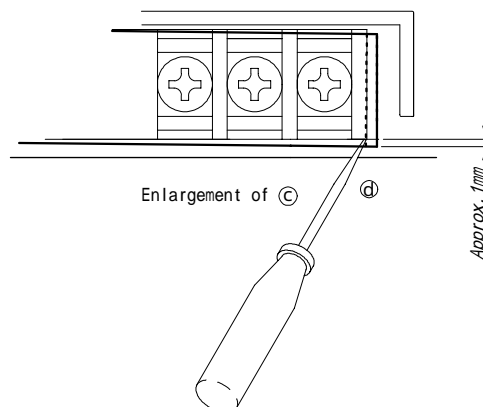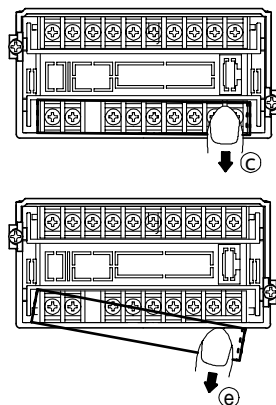
6. Function
6.1 Parameter list
● Display function

No.	Function	Display	Contents	Default
04	Input sensor	SEn.	K, J, R, E, T, B, N, Pt100Ω range 1, Pt100Ω range 2, JPt100Ω	K
05	Display cycle	rAFE.	200ms, 400ms, 1s, 2s, 4s, 5s	200ms (SP1)
06	Average calculation	n.AuE.	OFF, ON, 2, 4, 8, 16, and 32 times	OFF
07	Unit (°C / °F)	C.F.	°C, °F	°C
08	Burnout	bo.	+ burnout, - burnout	+ burnout
11	PV Display color	Color.	RR, RG, GR, GG	RG*
12	SV1 Display	SUb. 1	OFF, AL1 to 4, RM, PM, BM, PB	AL3
13	SV2 Display	SUb. 2	OFF, AL1 to 4, RM, PM, BM, PB	AL2
14	Display shutoff timer (Setting of light out time for PV, SV1 and SV2)	rUrn.	ON, OFF, 0 to 99 min.	0, 0, 0, 01 (0: OFF)

*R G

　Green when all AL turn OFF.
　Red when any AL from 1 to 4 ON.

Use an attached display label when changing the display.

● Alarm Output

No.	Function	Display	Contents	Default
40	Power On delay	P.dLY.	2 to 99 seconds	02
41	Comparison data	C.SEL.	RM, PM, BM, PB	RM (current value)
42	AL1 Comparison value	AL. 1	-9999.9 to +9999.9	200.0
43	AL2 Comparison value	AL. 2	-9999.9 to +9999.9	300.0
44	AL3 Comparison value	AL. 3	-9999.9 to +9999.9	700.0
45	AL4 Comparison value	AL. 4	-9999.9 to +9999.9	800.0
46	AL1 Hysteresis	HYS. 1	1 to 999	001
47	AL2 Hysteresis	HYS. 2	1 to 999	001
48	AL3 Hysteresis	HYS. 3	1 to 999	001
49	AL4 Hysteresis	HYS. 4	1 to 999	001
50	AL1 Comparison method	ForN.1	OFF, HI, LO	OFF
51	AL2 Comparison method	ForN.2	OFF, HI, LO	LO
52	AL3 Comparison method	ForN.3	OFF, HI, LO	HI
53	AL4 Comparison method	ForN.4	OFF, HI, LO	OFF
54	Output Delay	o.dLY.	0 to 99 seconds	00
55	Comparison conditions	E9UAL.	GO, NG	NG
56	Zone setting	ZonE.	ON, OFF	OFF

● BCD output

No.	Function	Display	Contents	Default
70	BCD output sampling	bCd.SP.	SAMP, DISP (sampling cycle or display cycle)	DISP (Display cycle)

● Analog output

No.	Function	Display	Contents	Default
75	Output switching	A.SEL.	RM, PM, BM, PB	RM (current value)
76	Min. value	A.Min.	-09: 0 to 9.9 V　-29: 0 to 19.9mA	-09: 01.0 V　-29: 04.0 mA
77	Max. value	A.MAr.	-09: 0.1 to 10.0 V　-29: 0.1 to 20.0mA	-09: 05.0 V　-29: 20.0 mA
78	Offset	A.oFFS.	-9999.9 to +9999.9	0000.0
79	Full scale	A.FULL.	-9999.9 to +9999.9	1999.9

NOTE: After changing parameter 76 and/or 77, analog output data at the calibration mode resets to default value.

● RS-232C / RS-485

No.	Function	Display	Contents	Default
80	Baud rate	bAUd.	4800, 9600, 19200, 38400 bps	9600 bps
81	Data length	LEnGr.	8 bit, 7 bit	8 bit
82	Parity	PArir.	None, Odd, Even	None
83	Stop bit	SroP.	2 bit, 1 bit	1 bit
84	BCC switching	bCC.	ON, OFF	OFF
85	Unit number	rS.no.	0 to 99	00

● My setting mode

No.	Function	Display	Contents	Default
99	Code registration	nY.	00 to 98 (00 for non-registration)	

● My setting mode

Registration No.	Code No.	Function
1	42	AL1
2	43	AL2
3	44	AL3
4	45	AL4
5	00	NC
6	00	NC
7	00	NC
8	00	NC

6.2 Explanation of function

● Display function

Parameter 04   : Select the input sensor

Display	Sensor
SEn 0	K
SEn 1	J
SEn 2	R
SEn 3	E
SEn 4	T
SEn 5	B
SEn 6	N
SEn 10	Pt100Ω range 1
SEn 11	Pt100Ω range 2
SEn 12	JPt100Ω

Parameter 05   : Select the display rate.
SP1:200ms SP2:400ms SP3:1s SP4:2s SP5:4s SP6:5s   (Becomes 200ms at the moving average.)

Parameter 06   : Select the numbers of average calculation.
OFF: No average calculation
ON: Sectional average
2, 4, 8, 16, 32 : Numbers of data of moving average

Parameter 07   : Choose temperature unit, ^{o}C or ^{o}F.

Parameter 08   : FixSelect + burnout or – burnout when using thermocouple (+burnout only for RTD).

Display	burnout
bo 0	+burnout
bo 1	–burnout

Parameter 11   : Select the PV display color.

Parameter 12   : Select any SV1 display from setting value, current value, peak memory, bottom memory, display amplitude, and shut-off .

Parameter 13   : Select any SV2 display from setting value, current value, peak memory, bottom memory, display amplitude, and shut-off .

Parameter 14   : Select the shut-off time of the display after the switch operation.

● Comparison output

Parameter 40   : Select the stand-by time for AL 1 to 4 and GO after supplying the power.

Parameter 41   : Select any comparison data from setting value, current value, peak memory, bottom memory, display amplitude, and shut-off .

Parameter 42 - 45   : Select the comparison data of the AL1, AL2, AL3, and AL4.

Parameter 46 - 49   : Select hysteresis of the AL1, AL2, AL3, and AL4.

Parameter 50 - 53   : Select any comparison method of the AL1, AL2, AL3, and AL4 from HI, LO to OFF.

Parameter 54   : Select the ON delay time for AL 1 to AL 4.

Parameter 55   : Select the comparison condition for AL 1 to AL 4 whether equal NG or equal GO.

Equal NG				Equal GO			
Display value	Max. setting value		HI	Display value	Max. setting value		HI
Min. setting value	Display value	Max. setting value	GO	Min. setting value	Display value	Max. setting value	GO
Display value	Min. setting value		LO	Display value	Min. setting value		LO

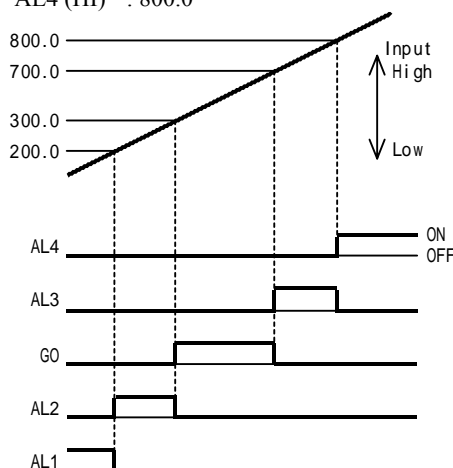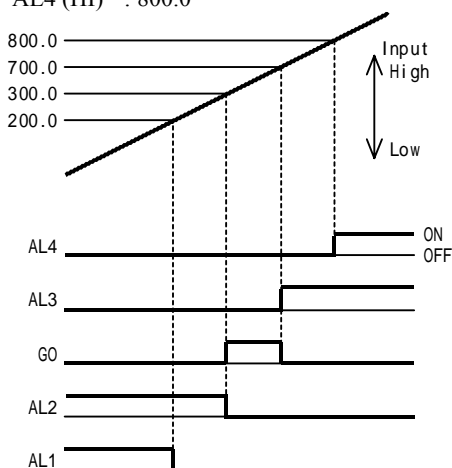Parameter 56   : Select the judgment of the comparison output whether standard or zone.

Judgment example

Standard: There is no limitation, large and small, for AL1, AL2, AL3 and AL4.

Zone: AL1 AL2 AL3 AL4.

AL1 (LO)
AL2 (LO)
AL3 (HI)   : 700.0
AL4 (HI)   : 800.0

: 200.0   AL1 (LO)   : 200.0
: 300.0   AL2 (LO)   : 300.0
AL3 (HI)   : 700.0
AL4 (HI)   : 800.0

● BCD output
   Parameter 70   :   Select the BCD data, whether display cycle or sampling rate.
                                            Disable P-06 at the sampling rate.

● Analog output
   Parameter 75   : Switch the analog output.
   Parameter 76   : Set the output value at the 0% input.
   Parameter 77   : Set the output value at the 100% input.
   Parameter 78   : Set the display value at the 0% input.
   Parameter 79   : Set the display value at the 100% input.

● RS-232C / RS-485
   Parameter 80   : Select the Baud rate
   Parameter 81   : Select the Data length.
   Parameter 82   : Select the Parity.
   Parameter 83   : Select the Stop bit.
   Parameter 84   : Disable / Enable the BCC.
   Parameter 85   : Select the Unit number.

● My setting mode
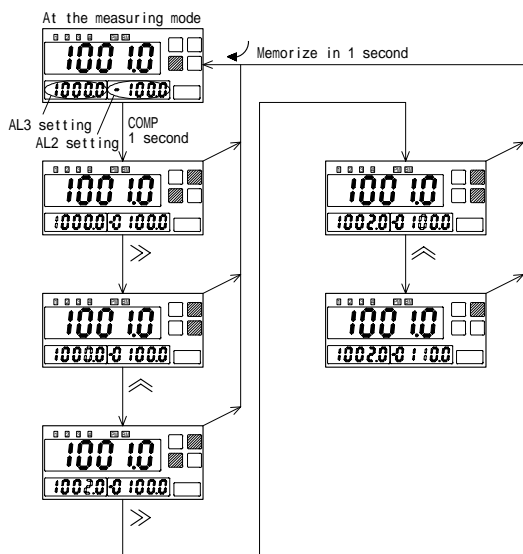   Parameter 99   : Register well-used 8 code numbers in the setting mode.

7. Parameter Setting

7.1 How to change the comparison setting value

During the measuring mode, the comparison value of the SV1 and SV2 is changeable by pushing $\boxed{\text{COMP}}$ key.

Setting example: Changes AL3 to 1002.0 and AL2 to -110.0 when the comparison setting is AL3 and AL2 for the SV1 and SV2.

This function is only available when SV1 and SV2 selecting to comparison setting value.
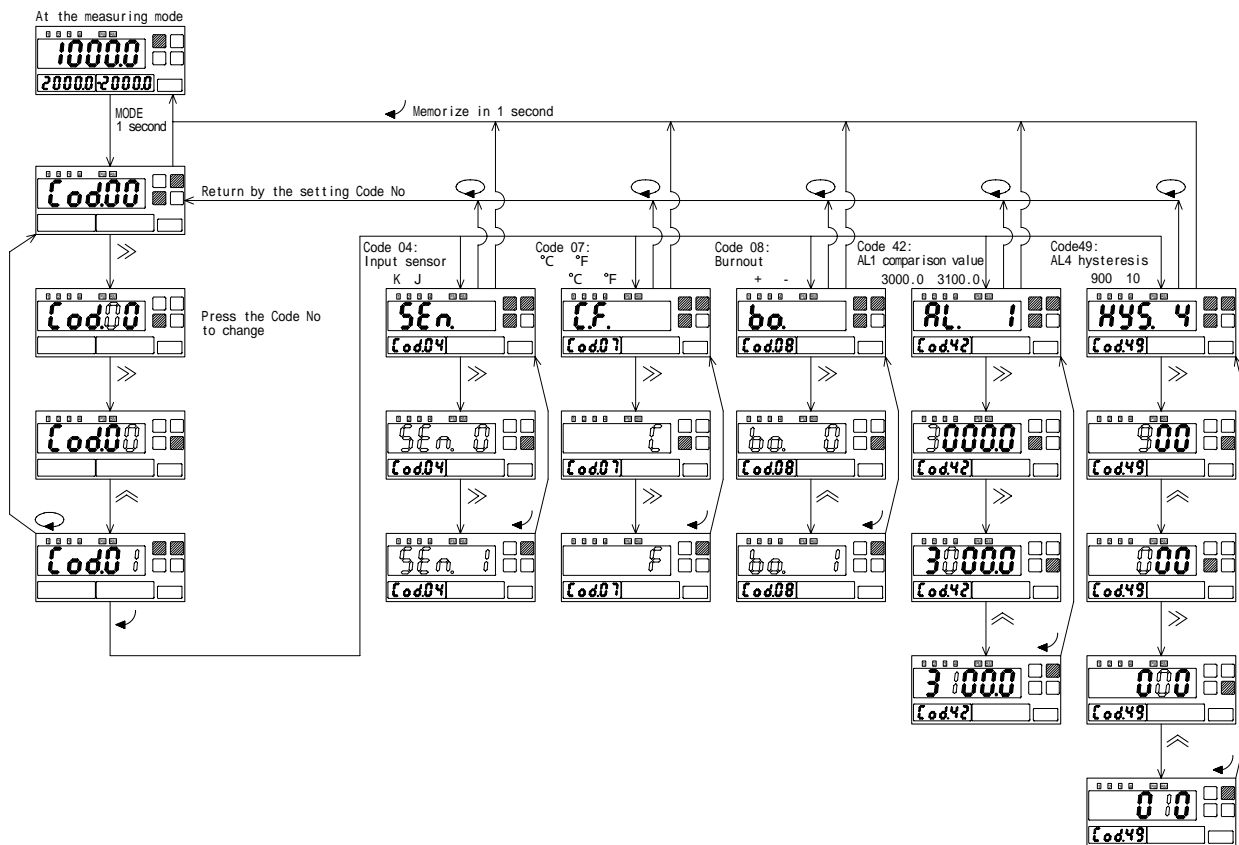
7.2 PV Display switching

During the measuring mode, the display switches from current value to peak memory, bottom memory, display amplitude, and current value, by pushing $\boxed{\text{P B}}$ key.
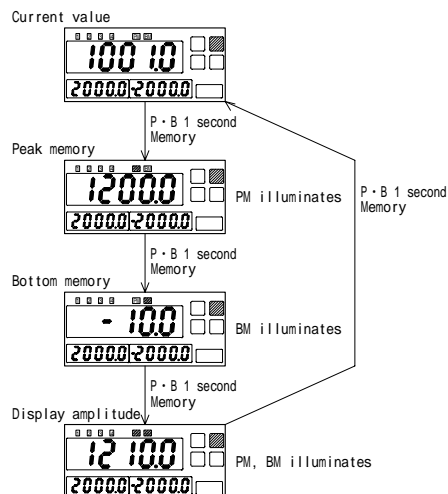
During If keep the P B key pushing more than 3 seconds, memory will be reset after switching the display.

7.3 Parameter setting mode

During the measuring mode, the display shows "Cod.00" and switches to the parameter setting mode, by pushing the $\boxed{\text{MODE}}$ key.
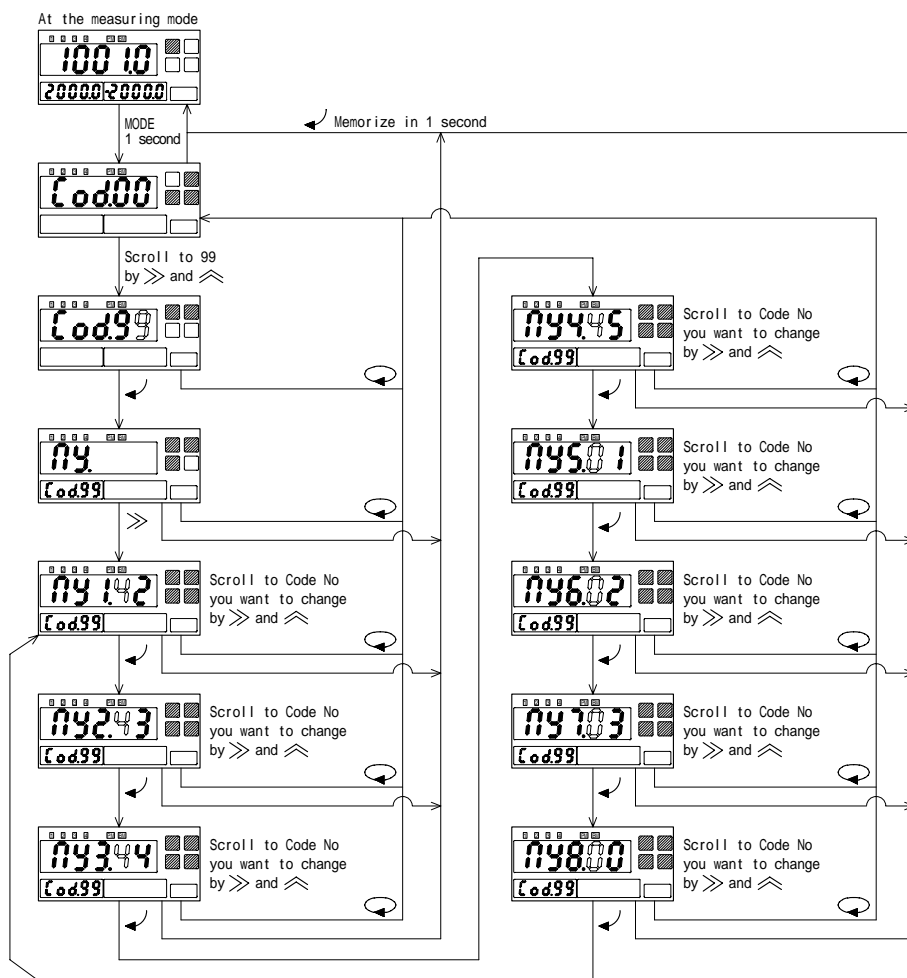
7.4 My setting mode

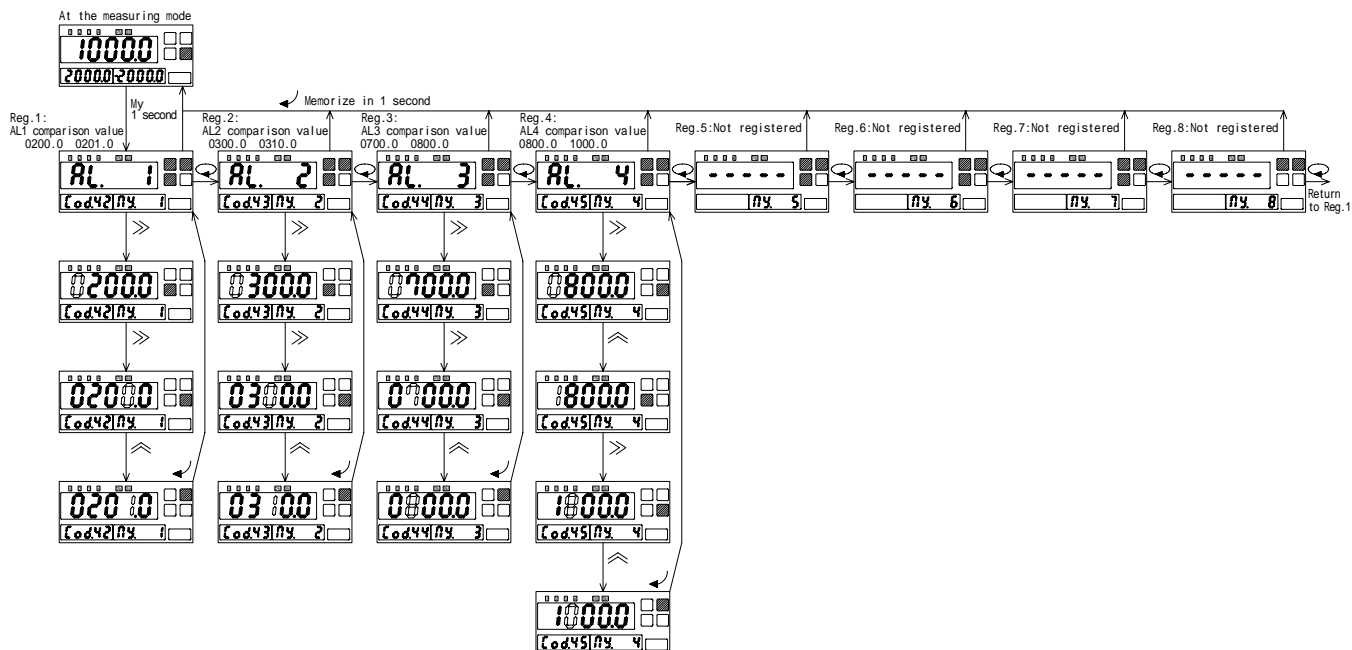For your convenience, register well-used 8 code numbers in the setting mode.
During the measuring mode, the display switches the My setting mode by pushing ⎡ My ⎤ key.
The setting can be simplified by registering only the necessary function.
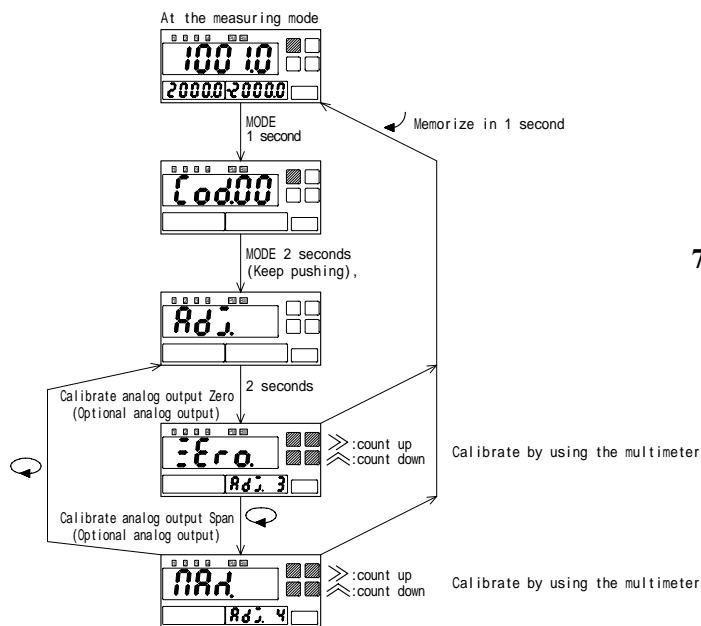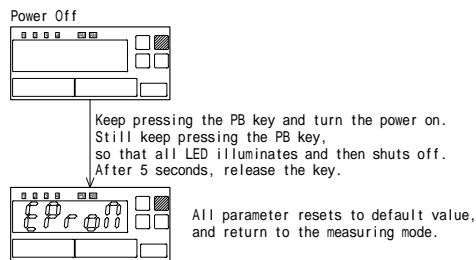
● How to register codes

● How to change setting value

7.5 Calibration mode

This mode is ideal for fine calibration of the display and the optional analog output.

During the measuring mode, the display shows " Adj" and switches the Calibration mode by pushing MODE key.

At the measuring mode

MODE 1 second — Memorize in 1 second

MODE 2 seconds (Keep pushing),

2 seconds

Calibrate analog output Zero (Optional analog output)

≫ :count up
≪ :count down

Calibrate by using the multimeter

Calibrate analog output Span (Optional analog output)

≫ :count up
≪ :count down

Calibrate by using the multimeter

7.6 Reset to Default value

Power Off

Keep pressing the PB key and turn the power on.
Still keep pressing the PB key,
so that all LED illuminates and then shuts off.
After 5 seconds, release the key.

All parameter resets to default value,
and return to the measuring mode.

7.7 Error message

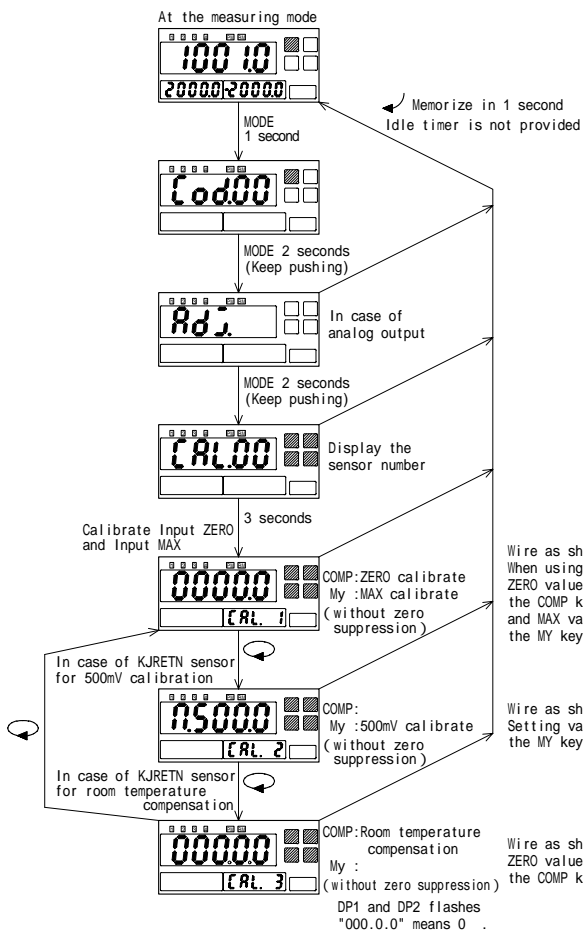| Display	Cause of trouble	Countermeasure
Err 1	Entered Code No. is not applicable.	Enter correct Code No.
Err 2	Entered value is out of range.	Enter correct value

During the parameter setting mode and the My setting mode, return automatically to the measuring mode if you do not touch the switch more than 5 minutes.
Changed value does not memorize in this case.

7.8 Verification mode

Calibrate annually to keep accuracy.
Calibration should be done under the condition of $23^{\circ}C +/- 5^{\circ}C$, 75%RH.

● Thermocouple

Prepare the voltage-base generator, the cold contact circuit, and the base thermocouple.
We recommend to make the cold contact circuit by putting ice water in the pot.

At the measuring mode

MODE 1 second — Memorize in 1 second
Idle timer is not provided

MODE 2 seconds (Keep pushing)

In case of analog output

MODE 2 seconds (Keep pushing)

Display the sensor number

3 seconds

Calibrate Input ZERO and Input MAX

COMP. ZERO calibrate
My : MAX calibrate without zero suppression

Wire as shown Fig.1.
When using the K thermocouple
ZERO value is momentary memorized by pushing the COMP key at the 0.000mV input,
and MAX value is momentary memorized by pushing the MY key at the 52.410mV input.

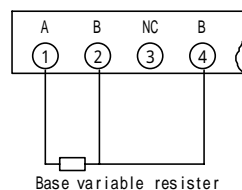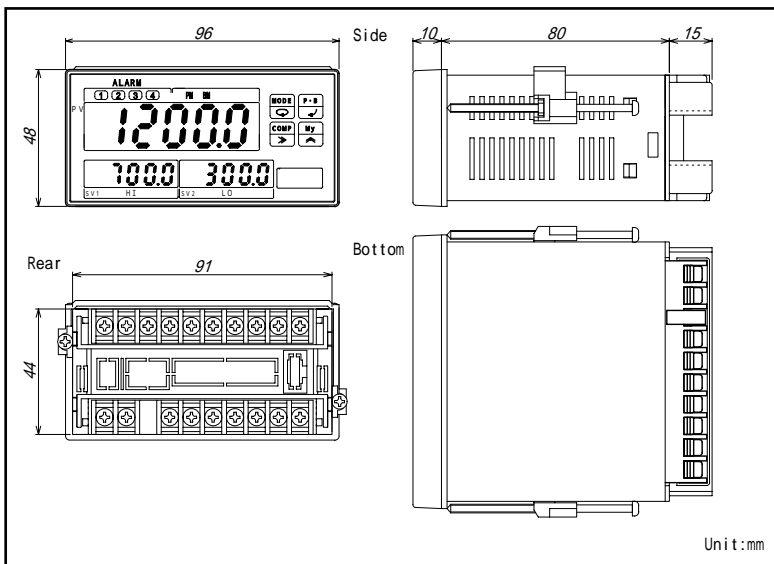In case of KJRETN sensor for 500mV calibration

COMP.
My : 500mV calibrate without zero suppression

Wire as shown Fig.1.
Setting value is momentary memorized by pushing the MY key at the 500.0mV input

In case of KJRETN sensor for room temperature compensation

COMP. Room temperature compensation
My : without zero suppression

Wire as shown Fig.2
ZERO value is momentary memorized by pushing the COMP key at the 0.0mV input.

DP1 and DP2 flashes
"000.0 0" means 0.

CAL	Sensor	ZERO		MAX	
CAL.00	K	0.0 $^{\circ}$C	0.000mV	1300.0 $^{\circ}$C	52.410mV
CAL.01	J	0.0 $^{\circ}$C	0.000mV	1200.0 $^{\circ}$C	69.553mV
CAL.02	R	0.0 $^{\circ}$C	0.000mV	1700.0 $^{\circ}$C	20.222mV
CAL.03	E	0.0 $^{\circ}$C	0.000mV	1000.0 $^{\circ}$C	76.373mV
CAL.04	T	0.0 $^{\circ}$C	0.000mV	400.0 $^{\circ}$C	20.872mV
CAL.05	B	0.0 $^{\circ}$C	0.000mV	1800.0 $^{\circ}$C	13.591mV
CAL.06	N	0.0 $^{\circ}$C	0.000mV	1300.0 $^{\circ}$C	47.513mV

CAL	Special Sensor	ZERO		MAX	
CAL.07	A01 Tungsten-rhenium	0 $^{\circ}$C	0.000mV	2000.0 $^{\circ}$C	33.66mV
CAL.08	A05 Au-0.07%Fe-Chromer (for Liquid Nitrogen)	77.4K	0.000mV	300.0 K	4.619mV
CAL.09	A06 Au-0.07%Fe-Chromer (For freezing point)	273.1K	0.000mV	10.0 K	-5.155mV

Fig.1

Fig.2

● RTD
  Prepare the base variable resister.

At the measuring mode

```
  100.10
2000.0 2000.0
```

Wire as shown Fig.3

Memorize in 1 second
Idle timer is not provided

MODE
1 second

```
Cod.00
```

MODE 2 seconds
(Keep pushing)

```
Adj.
```
In case of
analog output

MODE 2 seconds
(Keep pushing)

```
CAL.10
```
Display the
sensor number

Calibrate Input ZERO
and Input MAX

3 seconds

```
00000
      CAL. 1
```
COMP: ZERO calibrate
M: MAX calibrate
without zero suppression

When using the Pt100
ZERO value is momentary memorized by pushing
the COMP key at the 100.00 input
and MAX value is momentary memorized by pushing
the M key at the 375.70 input.

CAL Display	Sensor	ZERO		MAX	
CAL.10	Pt100Ω range 1	0.0 °C	100.00Ω	800.0 °C	375.70Ω
CAL.11	Pt100Ω range 2	0.00 °C	100.00Ω	150.00 °C	157.33Ω
CAL.12	Jpt100Ω	0.0 °C	100.00Ω	600.0 °C	317.28Ω

CAL Display	Sensor	ZERO		MAX	
CAL.13	A02 Ni508.4Ω	0.0 °C	508.40Ω	280.0 °C	1440.03Ω
CAL.14	A03 Pt50Ω (JIS'81)	0.0 °C	50.00Ω	600.0 °C	158.64Ω
CAL.15	A04 Pt1000Ω	0.0 °C	1000Ω	500.0 °C	2809.8Ω

A   B   NC   B

Base variable resister

Fig.3

7.9 Numeric and Character Indications

```
0 1 2 3 4 5 6 7 8 9  -  .
0 1 2 3 4 5 6 7 8 9 Minus DP
```

```
A b C d E F G H I J K L M n o P q r S T U u Y H Y
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
```

8. External Dimensions

Unit: mm

9. Model Numbering

452B–(1)–(2)–(3)–(4) –(5)

1 Power Supply Voltage

Code	Power Source Voltage
A	AC100 to 240V
B	DC 12 to 24V
C	DC110V

2 Data Output 1

| Code	Specifications	Impedance	Max. Load
Null	No output		
09	Analog voltage (positive input side outputs) DC 0-10V (Available scaling, Default: 1-5V)	Max. 0.1	Min. 100 at DC 0-1V Min. 1k at DC 0-10V Min. 500 at DC 1-5V
29	Analog current (positive input side outputs) DC 0-20mA (Available scaling, Default: 4-20mA)	Min. 5M	Max. 2.4k at DC 0-5mA Max. 600 at DC 0-20mA Max. 600 at DC 4-20mA
BP	BCD output (TTL level positive logic)		
BN	BCD output (TTL level negative logic)		
DP	BCD output (transistor output, source type)		
DN	BCD output (transistor output, sink type)		
E0	RS-232C		
E1	RS-485		

3 Data Output 2 (Available -09 and -29 of Data output 1 only)

Code	Specifications
Blank	No output
E0	RS-232C
E1	RS-485

4 Comparison output

Code	Specifications
Blank	Relay output
TN	Open collector output (NPN)

5 Special sensor (Optional)

Code	Special Sensor
Blank	Standard sensor
A01	Tungsten-rhenium 5% (WRe5-26, Tungsten-rhenium 26% thermocouple)
A02	Nickel RTD
A03	Pt50Ω
A04	Pt1000Ω
A05	Au-0.07%Fe-Chromer thermocouple (for Liquid Nitrogen)
A06	Au-0.07%Fe-Chromer thermocouple (for freezing point)

A special sensor cannot be switched.

9.1 Standard Sensor and Measuring Input

Thermocouple

Sensor	Measuring Range	Display	Error (23°C±5°C, 45~75%RH)
R	100.0 to 1700.0 ^{o}C	-50.0 to 1800.0 ^{o}C	± (0.1% of rdg + 0.6 ^{o}C) (100.0 to 500.0 ^{o}C) ± (0.1% of rdg + 0.5 ^{o}C) (500.0 to 1700.0 ^{o}C)
K	-100.0 to 1300.0 ^{o}C	-200.0 to 1400.0 ^{o}C	± (0.1% of rdg + 0.6 ^{o}C) (-100.0 to 0.0 ^{o}C) ± (0.1% of rdg + 0.5 ^{o}C) (0.0 to 1300.0 ^{o}C)
E	-130.0 to 1000.0 ^{o}C	-250.0 to 1050.0 ^{o}C	± (0.1% of rdg + 0.5 ^{o}C)
J	-140.0 to 1200.0 ^{o}C	-210.0 to 1250.0 ^{o}C	± (0.1% of rdg + 0.5 ^{o}C)
T	-200.0 to 400.0 ^{o}C	-250.0 to 420.0 ^{o}C	± (0.1% of rdg + 0.5 ^{o}C)
B	600.0 to 1800.0 ^{o}C	-20.0 to 1820.0 ^{o}C	± (0.1% of rdg + 0.6 ^{o}C)
N	-100.0 to 1300.0 ^{o}C	-230.0 to 1350.0 ^{o}C	± (0.1% of rdg + 0.5 ^{o}C)

Temperature coefficient: 0 to 50°C, ±50ppm/^{o}C
Base contact compensation: 0 to 50°C, ±1.0^{o}C
Vivificates by inputting base thermal EMF mV in conjunction with JIS C 1602-1995.

RTD

Sensor	Measuring Range	Display	Error (23°C±5°C, 45~75%RH)
Pt100Ω range 1	-200.0 to 850.0 ^{o}C	-200.0 to 870.0 ^{o}C	± (0.1% of rdg + 0.2 ^{o}C) (0.0 to 100.0 ^{o}C) ± (0.2% of rdg + 0.3 ^{o}C) (-200.0 to 0.0 ^{o}C) (100.0 to 850.0 ^{o}C)
Pt100Ω range 2	-150.00 to 150.00 ^{o}C	-180.00 to 180.00 ^{o}C	± (0.1% of rdg + 0.2 ^{o}C) (0.00 to 100.00 ^{o}C) ± (0.2% of rdg + 0.3 ^{o}C) (-150.00 to 0.00 ^{o}C) (100.00 to 150.00 ^{o}C)
JPt100 Ω	-200.0 to 645.0 ^{o}C	-200.0 to 660.0 ^{o}C	± (0.1% of rdg + 0.2 ^{o}C) (0.0 to 100. 0 ^{o}C) ± (0.2% of rdg + 0.3 ^{o}C) (-200.0 to 0.0 ^{o}C) (100.0 to 645.0 ^{o}C)

Temperature coefficient: 0 to 50°C, ±50ppm/^{o}C (±100ppm/^{o}C when range 2)
Vivificates by base resistance in conjunction with JIS C 1602-1997.

9.2 Special Sensor and Measuring Input

Thermocouple

Sensor	Measuring Range	Display	Error (23ºC±5ºC, 45~75%RH)
-A01 Tungsten-rhenium	0 to 2320 ºC	-20 to 2350 ºC	±(0.3% of rdg + 1 ºC) (0 to 2320 ºC)
-A05 Au-0.07%Fe-Chromer (for Liquid Nitrogen)	-270.0 to 27.0 ºC	-273.1 to 50. 0 ºC	±2.0 ºC (-270.0 to 27.0 ºC)
-A06 Au-0.07%Fe-Chromer (for freezing point)	-270.0 to 27.0 ºC	-273.1 to 50. 0 ºC	±2.0 ºC (-270.0 to 27.0 ºC)

Temperature coefficient: 0 to 50ºC, ±50ppm/ºC
Base contact compensation: 0 to 50ºC, ±1.0ºC
No compensation of cold contact for the –A05 and –A06

RTD

Sensor	Measuring Range	Display	Error (23ºC±5ºC, 45~75%RH)
-A02 Ni508.4Ω	-50.0 to 280.0 ºC	-50.0 to 300.0 ºC	±(0.2% of rdg + 0.3 ºC) (-50.0 to 280.0 ºC)
-A03 Pt50Ω (JIS'81)	-200.0 to 649.0 ºC	-200.0 to 660.0 ºC	±(0.2% of rdg + 0. 3 ºC) (-200.0 to 649. 0 ºC)
-A04 Pt1000Ω	-200.0 to 550.0 ºC	-200.0 to 600.0 ºC	±(0.2% of rdg + 0. 3 ºC) (-200.0 to 550. 0 ºC)

Temperature coefficient: 0 to 50ºC, ±50ppm/ºC

NOTES:
1) The sensor switching by the front keys is impossible.
2) Resistance value of the –A04 Pt1000Ω is 10 times against base resistance of the Pt100Ω in conjunction with JIS C 1604-1997.
3) When using the –A05 and –A06, code No.07 changes ºC/K.

Contact Information	
Name : Tsuruga Electric Corporation	
Address : 1-3-23 Minami-Sumiyoshi, Sumiyoshi-ku, Osaka-shi 558-0041 Japan	

Digital Panel Meter, Model 451B / Meter Relay, Model 452B
BCD Output

1. Data Output Code

Code	Specifications
BP	BCD output (TTL level positive logic)
BN	BCD output (TTL level negative logic)
DP	BCD output (transistor output, source type)
DN	BCD output (transistor output, sink type)

2. Terminals and Connections

⚠ WARNING

● **To avoid an electrical shock, turn the power off when wiring.**
● **Do not wire with moistened hands.   Locate away from the wet place.**
● **Do not touch terminals when turning the power on.**

⚠ CAUTION

● **Do not miswiring.   Otherwise, the meter may be broken.**

BCD output connector
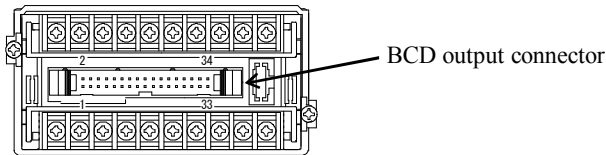
2.1 Connections
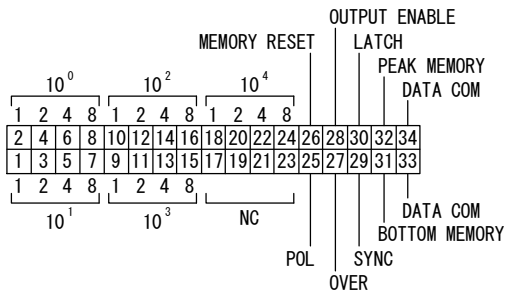
Suitable connector (attached)
XG4M-3430-T:OMRON Corp.
with 2m cable

2.2 TTL output

● Input / Output rating

Signal		Type -BP	Type -BN	Rating
Output	$\times 10^0$ to $\times 10^4$	Positive logic	Negaive logic	TTL level Fo=2 CMOS compatible
	POL	+=H, −=L	+=L, −=H	
	OVER	H at over	L at over	
	SYNC	L pulse of 10ms		
Input	LATCH	Hold at L (short-circuit)		$I_{IL} \leqq$ -1mA L = 0 to 1.5V H = 3.5 to 5.0V
	ENABLE	Enable at H (open), Disable at L (short-circuit)		
	MEMORY RESET	Reset at L (short-circuit)		
	PEAK/BOTTOM MEMORY	Refer to each item		

● Measuring data output ($\times 10^0$ to $\times 10^4$)
 Parallel BCD (1-2-4-8) code, latch output.   The output is Tri-state type, so a connection to the data bus is easy.

● Polarity Output (POL)
Outputs data polarity to No.25 pin.

● Over Output (OVER)
Outputs over display to No. 27 pin.

When exceeded 130% display, outputs both 130% display and over data.   When exceeded 99999, outputs 0 data and over data.

● Synchronization (SYNC)
Outputs L pulse of 10ms, which synchronizes display cycle, to No. 29 pin.   Readouts the data on the rising edge of this SYNC.
Wired OR connection is possible when connecting several data bus.

● Data enable input (OUTPUT ENABLE)
Outputs datum, includes POL and OVER, when opening (setting to H) No. 28 pin.   When short-circuiting (setting to L) with DATA COM between No. 33 and No.34 pin, DATA, includes POL and OVER, changes to high impedance condition.   In this state, SYNC output is prohibited and the connection to the data bus is easy.

● Latch input (LATCH)
Latches BCD data by short-circuiting between No. 30 and DATA COM (No. 33 and No. 34 pins)   or setting to L.   Display does not latch.

● PEAK MEMORY and BOTTOM MEMORY
Switches output data to current value, peak memory value, bottom memory value, and amplitude value, by the operation of No. 31 to No. 34 pins.

Signal	Current value	Peak memory value	Bottom memory value	Amplitude value
No. 32 pin (Peak memory)	Open H	Short-circuit L	Open H	Short-circuit L
No. 31 pin (Bottom memory)	Open H	Open H	Short-circuit L	Short-circuit L

● MEMORY RESET
Switches peak memory and bottom memory to current value by short-circuiting between No. 26 pin and DATA COM (No. 33 and No. 34 pins).

● Data common (DATA COM)
No. 33 and No. 34 pins are common for measuring data output, POL, OVER, SNYC, LATCH, OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, and MEMORY RESET.

● NC
Do not use non-occupied NC pin for junction purpose.

※Do not apply 5V DC or more due to uniform to TTL level of data output and control signal. Arrange the wiring of data output and control input/output lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

2.3 Transistor output

Wired OR connection is possible for the measuring data, including POL and OVER, and SYNC when connecting several BCD outputs to a PC.

● Input / Output rating

Signal		Item	Type -DP	Type -DN
Output	$\times 10^0$ to $\times 10^4$	Output	Source type	Sink type
	POL OVER SYNC	Output capacity	DC30V 30mA Max., Saturation Voltage: 1.6V Max.	
Input	LATCH ENABLE MEMORY RESET PEAK MEMORY BOTTOM MEMORY	Signal level	Input current: Max. 1mA OFF (H) = 3.5 to 5.0V, ON (L) = 0 to 1.5V	

● Measuring data output ($\times 10^0$ to $\times 10^4$)
Parallel BCD code (1-2-4-8), Latch output.
Transistor turns on (ON) at 1 measuring data.
Transistor turns off (OFF) at 0 measuring data.

● Polarity Output (POL)
Outputs data polarity to No.25 pin.
Transistor turns on (ON) at (+) display value.
Transistor turns off (OFF) at (-) display value.

● Over Output (OVER)
Outputs over display to No. 27 pin.
Transistor turns on (ON) at over display.
When exceeded 130% display, outputs both 130% display and over data.   When exceeded 99999, outputs 0 data and over data.

● Synchronization (SYNC)
Outputs L pulse of 10ms, which synchronizes display cycle, to No. 29 pin.
Readouts the data on the rising edge of this SYNC.

● Data enable input (OUTPUT ENABLE)
Outputs datum, includes POL and OVER, when opening (setting to H) No. 28 pin.
When short-circuiting (ON) with DATA COM between No. 33 and No.34 pin, DATA, includes POL and OVER, changes to

OFF condition.   In this state, SYNC output is prohibited and the connection to the data bus is easy.

● Latch input (LATCH)
Latches BCD data by short-circuiting between No. 30 and DATA COM (No. 33 and No. 34 pins).   Display does not latch.

● PEAK MEMORY and BOTTOM MEMORY
Switches output data to current value, peak memory value, bottom memory value, and amplitude value, by the operation of No. 31 to No. 34 pins.

Signal	Current value	Peak memory value	Bottom memory value	Amplitude value
No. 32 pin (Peak memory)	Open	Short-circuit	Open	Short-circuit
No. 31 pin (Bottom memory)	Open	Open	Short-circuit	Short-circuit

● MEMORY RESET
Switches peak memory and bottom memory to current value by short-circuiting between No. 26 pin and DATA COM (No. 33 and No. 34 pins).

● Data common (DATA COM)
No. 33 and No. 34 pins are common for measuring data output, POL, OVER, SNYC, LATCH, OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, and MEMORY RESET.

● NC
Do not use non-occupied NC pin for junction purpose.

※Arrange the wiring of data output and control input/output lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

3.Example of connection
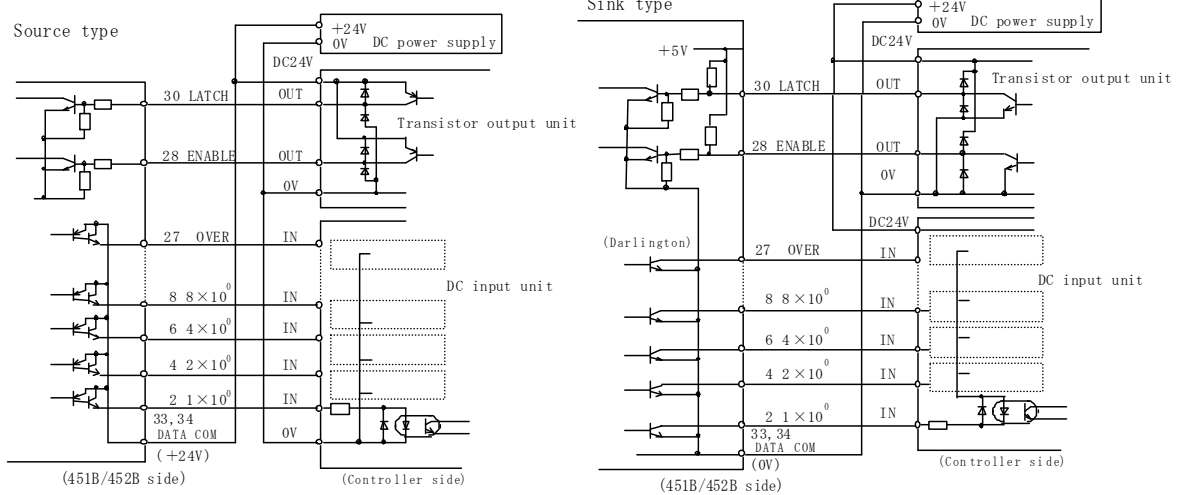
4.Timing chart
●BCD data and LATCH
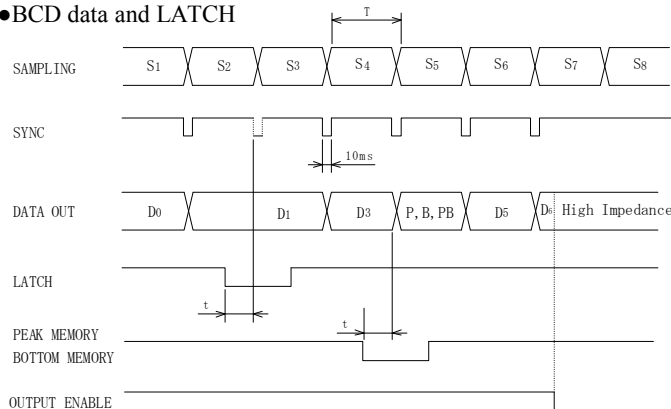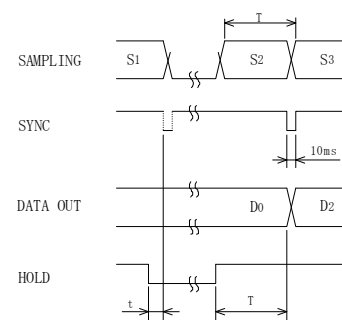
PorB: Peak memory value, Bottom memory value or amplitude value
    t: internal operation time approx. 15ms
    T: display cycle or sampling cycle (200ms)

●BCD data and HOLD

t: internal operation time approx. 15ms
T: display cycle or sampling cycle (200ms)

⚠ **CAUTION**

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Regarding the BCD output when supplying the power
1. Supply power shall rise to the rated voltage within 1 second after activation.
2. The model 451B/452B may output unstable data due to initialization within 3 seconds of starting.
   Start data acquisition 3 seconds later after reaching the rated voltage.

5. Switch BCD output cycle

BCD output cycle is possible to choose whether display cycle or sampling cycle (200ms).
Refer to our Quick manual, I-01612 and I-01613, for detailed setting procedures.

Contact Information	
Name : Tsuruga Electric Corporation	
Address : 1-3-23 Minami-Sumiyoshi, Sumiyoshi-ku, Osaka-shi	
558-0041 Japan	

Digital Panel Meter, Model 451B / Meter Relay, Model 452B
RS-232C / RS-485 Output

1. Data Output Code

Code	Output
E0	RS-232C
E1	RS-485

2. Specifications

2.1 Common specifications for RS-232C and RS-485

The measuring input and the RS-232C and RS-485 output is insulated.

Transmission	:	Start-Stop half-duplex transmission
Transmission speed	:	4800, 9600, 19200, 38400 bps
Data length	:	7bit / 8bit
Parity	:	None, Odd, Even
Stop bit	:	1bit / 2bit
Data	:	In conjunction with JIS 8 units code
X parameter	:	None
Error detection	:	Parity (Choose BCC availability) Operation results of exclusive logic sum just after STX to ETX
Control character	:	STX (02H) start of text / ETX (03H) end of text
Device No.	:	00 to 99 Set the device No. to each device, and match each command of device
Transmission character	:	Max. 32
Transmission process	:	Ignored

452B/451B transmits response in accordance with command frame from the upper PC.
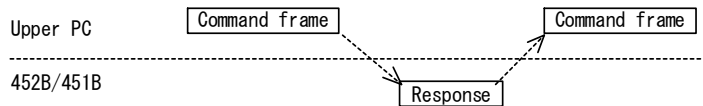
● RS-485

Connected device numbers	:	Max. 32, including the upper PC
Line length	:	Up to 500 m by using shielded twisted-pair cable, AWG28 to 22.
Terminator	:	Switched by the jumper at the terminal, terminated at 200 Ω

NOTE followings for the use of multi-drop.
・Unify the transmission format.
・Do not duplicate the device number.

3. Terminals and Connections
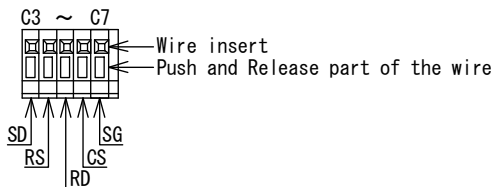
RS-232C or RS-485 output connector

3.1 RS-232C

Recommended wire ⌈ Solid wire   : AWG28 to 22
                 ⌊ Twisted wire : AWG28 to 22
                                   O.D. 0.125 min.

Strip-off length: 9 to 10mm

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3.2 RS-485

```
C3 ～ C7
       ← Wire insert
       ← Push and Release part of the wire

Terminator  ┐ ┌ +
         NC  │ ─
```
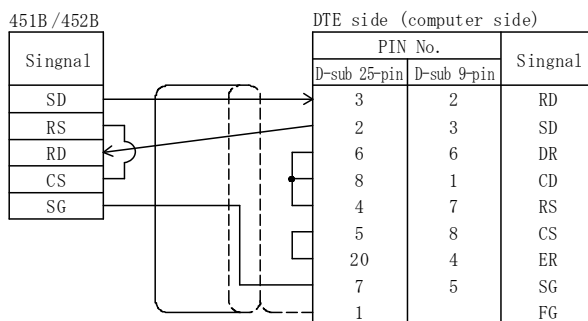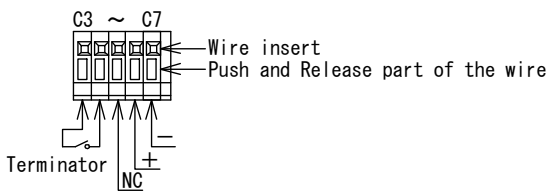
※ Recommended wire ┌ Solid wire   : AWG28 to 22
                    └ Twisted wire : AWG28 to 22
                                     O.D. 0.125 min.

Strip-off length: 9 to 10mm

※ In case of multi-drop connection, strand twisted wire AWG28 to AWG22 and insert.

Terminator: When sort-circuiting the connector, 200Ω resistor is connected in parallel to the line
Input/Output: "+" is non-inverse output, and "−" is inverse output.

● Connection

In case of RS-485 connection, up to 32 devices, includes the upper computer, are possible to connect.   Specify the end station for both ends of device on the line.   Set the terminator to be short-circuited for the identification of the end station.   Lead wire for short-circuit is not attached.   Use the converter for another identification to set the terminator.

```
┌──────────────┐        ┌──────────────┐
│              │ RS-232C │  Converter   │
│ Upper computer│←──────→│  ┌─┐         │      No.1
│     side     │        │  │G│         │      ┌─┐
│              │        │  ├─┤         │      │─│
│              │        │  │─│         │      ├─┤
└──────────────┘        │  ├─┤         │      │+│
                        │  │+│         │      └─┘
                        └──────────────┘
                              Shielded cable   No.2
                                               ┌─┐
    Model SI-30 of LINEEYE                      │─│
       or equivalent is recommended.           ├─┤
                                               │+│
                                               └─┘
                                               No.3
                                               ┌─┐
                                               │─│
                                               ├─┤  Set the terminator to be short-circuited
                                               │+│
                                               └─┘
```
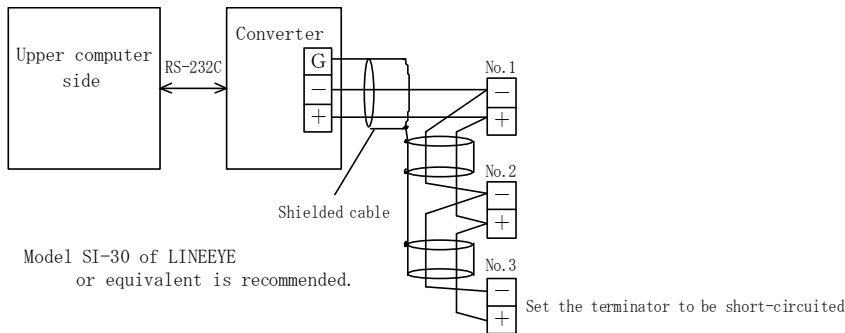
3.3 Communication setting

Use keys on the front panel for communication setting.   Refer to I-01612 or I-01613 for key operation.
・Transmission speed, Data length, Parity, Stop bit, BCC availability
・Device number

4. Communication command

4.1 Notes for Command

1)   BCC should be added after ETX if BCC function is available.
2)   All frame of command
      Command: STX device No., Command or Command frame, ETX (BCC)
      Response: STX device No., End code, Response, ETX (BCC)
3)   Character of command is effective with 4-character from the top.   Ex)RLATCH → RLAT
4)   Both figure and character is effective.   Ex) WC07 0 or WC07 OFF
5)   End code
      Return the receive condition of the command frame.

End code	Contents
A (41H)	Normal end
B (42H)	During setting (communicates during setting)
C (43H)	Setting error (out of setting range or error)
D (44H)	BCC error (with BCC function)
P (50H)	Command error (impossible to analyze the received command)

Response at the command error

STX	Device No.		End code	ETX	(BCC)	
(02H)	(30H)	(30H)	(50H)	(03H)		Device No. 00

Response during setting

STX	Device No.		End code	ETX	(BCC)	
(02H)	(30H)	(30H)	(42H)	(03H)		Device No. 00

⚠ CAUTION

Regarding the command when supplying the power
1. Supply power shall rise to the rated voltage within 1 second after activation.
2. The model 451B/452B may not respond due to initialization or may return unstable response within 3 seconds of starting. Start communication 3 seconds later after reaching the rated voltage.

TSURUGA ELECTRIC CORPORATION

4.2 Command / Responce

● Measuring command

    Command : DATA?, The current data, Request to judge
    Response : response to DATA?, Collect the current data, judgment
    Command : RMREad, request to the current data
    Response : response to RMREad, Collect the current data
    Command : PMREad, request to the peak memory data
    Response : response to PMREad, Collect the peak memory data
    Command : BMREad, request to the bottom memory data
    Response : response to BMREad, Collect the bottom memory data
    Command : PBREad, request to the amplitude
    Response : response to PBREad, Collect the amplitude measuring data

    Data format
      __+1.9999E+0
      | |——————— Measuring value
      |————————————— __(20H space): within the range,   *(2AH): over the range
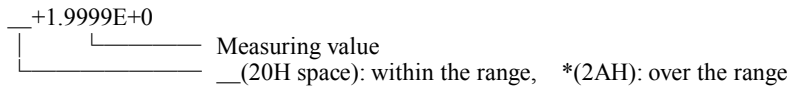
    Command : DATA?, The current data, Request to judge
    Response : response to DATA?
          +1000.0 ··················   451B
          -100.0   AL1, AL2, ON····· 452B

    Command frame

STX	Device No.		D	A	T	A	?	ETX	(BCC)
02H	30H	30H	44H	41H	54H	41H	3FH	03H	

Device No. 00

    Response   End code

STX	Device No.		↓ _	+	1	.	0	0	0	0	E	+	3	ETX	(BCC)
02H	30H	30H	41H	20H	2BH	31H	2EH	30H	30H	30H	30H	45H	2BH	33H	03H

·····················451B

                 End code

STX	Device No.		↓ _	−	0	.	1	0	0	0	E	+	3	,	0	3	ETX	(BCC)
02H	30H	30H	41H	20H	2DH	30H	2EH	31H	30H	30H	30H	45H	2BH	33H	2CH	30H	33H	03H

·····452B

    Command : PMREAD, Request to peak memory data
    Response : response to PMREAD
           +1000.0

    Command frame

STX	Device No.		P	M	R	E	A	D	ETX	(BCC)
02H	30H	30H	50H	4DH	52H	45H	41H	44H	03H	

Device No. 00

    Response   End code

STX	Device No.		↓ _	+	1	.	0	0	0	0	E	+	3	ETX	(BCC)
02H	30H	30H	41H	20H	2BH	31H	2EH	30H	30H	30H	30H	45H	2BH	33H	03H

● Readout the device information
    Command : IDNT?, Read out the device information
    Response : response to IDNT?
          452B-29-E0, No.502-000 (Model No. Soft registration No. (Tsuruga))

    Command frame

STX	Device No.		I	D	N	T	?	ETX	(BCC)
02H	30H	30H	49H	44H	4EH	54H	3FH	03H	

Device No. 00

    Response   End code

STX	Device No.		↓	4	5	2	B	-	2	9	-	E	0	,
02H	30H	30H	41H	34H	35H	32H	42H	2DH	32H	39H	2DH	45H	30H	2CH

	N	o	.	5	0	2	-	0	0	0	ETX	(BCC)
	4EH	6FH	2EH	35H	30H	32H	2DH	30H	30H	30H	03H	

● Readout the judgment
    Command : ALARm, Read out the judgment
    Response : response to ALARm
          16 (GO output)

    Command frame

STX	Device No.		A	L	A	R	M	ETX	(BCC)
02H	30H	30H	41H	4CH	41H	52H	4DH	03H	

Device No. 00

    Response   End code

STX	Device No.		↓	1	6	ETX	(BCC)
02H	30H	30H	41H	31H	36H	03H	

● Readout the setting data
Command : RC42, Read out the AL1 setting, Readout the AL1 comparison value 200.0 °C
Response : response to RC42.
02000

Command frame

STX	Device No.		R	C	4	2	ETX	(BCC)
02H	30H	30H	52H	43H	34H	32H	03H	

Device No. 00

Response			End code							
STX	Device No.		↓	0	2	0	0	0	ETX	(BCC)
02H	30H	30H	41H	30H	32H	30H	30H	30H	03H	

● Set the function command data
Command : WC42_02000, Set the AL1, Set the AL1 comparison value to 200.0 °C
Response : response to WC42_02000.
02000

Command frame

STX	Device No.		W	C	4	2	_	0	2	0	0	0	ETX	(BCC)
02H	30H	30H	57H	43H	34H	32H	20H	30H	32H	30H	30H	30H	03H	

Device No. 00

Response			End code							
STX	Device No.		↓	0	2	0	0	0	ETX	(BCC)
02H	30H	30H	41H	30H	32H	30H	30H	30H	03H	

● Readout the control command data
Command : RLATch, Read out the latching
Response : response to RLATch.
0 (OFF)

Command frame

STX	Device No.		R	L	A	T	C	H	ETX	(BCC)
02H	30H	30H	52H	4CH	41H	54H	43H	48H	03H	

Device No. 00

Response			End code			
STX	Device No.		↓	0	ETX	(BCC)
02H	30H	30H	41H	30H	03H	

● Set the control command data
Command : WLATch_0, Set the offset
Response : response to WLATch_0.
0 (OFF)

Command frame

STX	Device No.		W	L	A	T	C	H	_	0	ETX	(BCC)
02H	30H	30H	57H	4CH	41H	54H	43H	48H	20H	30H	03H	

Device No. 00

Response			End code			
STX	Device No.		↓	0	ETX	(BCC)
02H	30H	30H	41H	30H	03H	

● Memory control command
・Write command: Write the setting data into the EEPROM.
Command : STOR
Response : End code

Command frame

STX	Device No.		S	T	O	R	ETX	(BCC)
02H	30H	30H	53H	54H	4FH	52H	03H	

Device No. 00

Response			End code		
STX	Device No.		↓	ETX	(BCC)
02H	30H	30H	41H	03H	

Normal end

・Memory initialization: Setting datum resets to default, except of transmission speed, data length, parity, stop bit, BCC switch, and device No.
Command : DEFAult
Response : End code

Command frame

STX	Device No.		D	E	F	A	U	L	T	ETX	(BCC)
02H	30H	30H	44H	45H	46H	41H	55H	4CH	54H	03H	

Device No. 00

Response			End code		
STX	Device No.		↓	ETX	(BCC)
02H	30H	30H	41H	03H	

Normal end

4.3 Command table

● Setting command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Function, range	
Input sensor selection	RC04	1	WC04_1	1	0, 1, 2, 3, 4, 5, 6, 10, 11, 12	Common
Display cycle	RC05	1	WC05_1	1	0:67ms, 1:400ms, 2:1s, 3:2s, 4:4s, 5:5s	
Average calculation (Section, Moving)	RC06	0	WC06_0	0	0:OFF, 1:ON, 2:2, 3:4, 4:8, 5:16, 6:32 times	
Temp. unit selection	RC07	0	WC07_0	0	0: °C	
Burn out	RC08	0	WC08_0	0	0: +Burn out, 0: −Burn out	
PV Display color	RC11	1	WC11_3	3	0:RR, 1:RG, 2:GR, 3:GG	452B
	RC11	3	WC11_3	3	0:RR, 3:GG	451B
SV1 Display	RC12	3	WC12_0	0	0:OFF, 1;AL1, 2;AL2, 3;AL3, 4:AL4, 5:RM, 6:PM, 7:BM, 8:PB	452B
SV2 Display	RC13	2	WC13_1	1	0:OFF, 1;AL1, 2;AL2, 3;AL3, 4:AL4, 5:RM, 6:PM, 7:BM, 8:PB	
Display shutoff timer (Setting of light out time for PV, SV1 and SV2)	RC14	1, 1, 1, 99	WC14_1, 1, 1, 99	1, 1, 1, 99	1:OFF, 0:OFF, 0 to 99	452B
	RC14	1, 99	WC14_1, 99	1, 99	1:ON, 0:OFF, 0 to 99	451B
Power On delay	RC40	2	WC40_99	99	2 to 99	
Comparison data	RC41	5	WC41_5	5	5:RM, 6:PM, 7:BM, 8:PB	
AL1 Comparison value	RC42	2000	WC42_99999	99999	-99999 ot 99999	452B
AL2 Comparison value	RC43	3000	WC43_99999	99999	-99999 to 99999	
AL3 Comparison value	RC44	7000	WC44_99999	99999	-99999 to 99999	
AL4 Comparison value	RC45	8000	WC45_99999	99999	-99999 to 99999	
AL1 Hysteresis	RC46	1	WC46_9999	9999	1 to 9999	
AL2 Hysteresis	RC47	1	WC47_9999	9999	1 to 9999	
AL3 Hysteresis	RC48	1	WC48_9999	9999	1 to 9999	
AL4 Hysteresis	RC49	1	WC49_9999	9999	1 to 9999	
AL1 Comparison method	RC50	0	WC50_0	0	0:OFF, 1:HI, 2:LO	
AL2 Comparison method	RC51	2	WC51_2	2	0:OFF, 1:HI, 2:LO	
AL3 Comparison method	RC52	1	WC52_1	1	0:OFF, 1:HI, 2:LO	
AL4 Comparison method	RC53	0	WC53_0	0	0:OFF, 1:HI, 2:LO	
Output Delay	RC54	0	WC54_99	99	0 to 99	
Comparison conditions	RC55	0	WC55_1	1	1:GO, 0:NG	
Zone setting	RC56	0	WC56_1	1	1:ON, 0:OFF	
Analog output switching	RC75	5	WC75_6	6	5:RM, 6:PM, 7:BM, 8:PB	Common
Analog output offset	RC78	00000	WC78_99999	99999	-99999 to 99999	
Analog output full scale	RC79	19999	WC79_99999	99999	-99999 to 99999	
Code registration of My setting mode	RC99	42, 43, 44, 45, 01, 02, 03, 00	WC99_42, 43, 44, 45, 01, 02, 03, 00	42, 43, 44, 45, 01, 02, 03, 00	00 to 98	452B
	RC99	01, 02, 03, 00, 00, 00, 00, 00	WC99_01, 02, 03, 00, 00, 00, 00, 00	01, 02, 03, 00, 00, 00, 00, 00		451B

● Measuring command

Function	Requested command			Applicable Model
	Command	Response		
Current value data	DATA?	_+9.9999E+0, 16		452B
	DATA?	_+9.9999E+0		451B
Current value data	RMREad	_+9.9999E+0		Common
Peak data	PMREad	_+9.9999E+0		
Bottom data	BMREad	_+9.9999E+0		
Amplitude data	PBREad	_+9.9999E+0		

● Judgment command

Function	Requested command			Applicable Model
	Command	Response	Item	
AL1 to AL4, GO	ALARm	16 (00 at ALRESET)	Output Weight of data AL1 01 AL2 02 AL3 04 AL4 08 GO 16	452B

● Control command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Item	
Latch	RLATch	1	WLATch 1	1	1:ON, 0:OFF	Common
Hold	RHOLd	0	WHOLd 1	1	1:ON, 0:OFF	
Alarm reset	RALRst	1	WALRst 1	1	1:ON, 0:OFF	452B
Memory reset			MR	End code		Common

● Memory control command

Function	Requested command		Specified command			Applicable Model
	Command	Response	Command frame	Response	Item	
Write			STOR	End code		Common
Default			DEFAult	End code		

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