

Instruction Manual

Digital Panel Meter Model 481C

I-01796

1. Preface

- Please take care that this instruction manual is certainly delivered to the person in charge of operating this instrument.
- Unpack the product and confirm that the following items are included.
 - (1) 481C main unit
 - (2) Stickers of units
 - (3) Instruction manual
 - (4) A connector attached when the main unit is provided with an optional BCD output.

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 injury 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 injury 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 481C. 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 °C in it.
- Avoid the close-contacted mounting of the meter. 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°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. Standard Specifications

2.1 Model Designation

Model Name 481C - □ - □ - □ - □ - □ - □
1 2 3 4 5 6

[1] Measuring Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
481C-09	1~5V	1MΩ	±(0.1% of rdg + 2digits)	DC±250V
481C-19	4~20mA	12.5Ω	±(0.1% of rdg + 2digits)	DC±150mA

* Accuracy: Defined at 23°C±5°C, 45~75%RH.

Temperature coefficient: Defined at ±200ppm/°C, 0~50°C.

Internal range setting: The range 09, 19 can be changed by pin headers.

[2] Power Source Voltage

Code	Power Source Voltage
3	AC100V (90~132V)
5	AC200V (180~250V)
9	DC24V±10%

[3] Data Output

Code	Specifications
Blank	No output
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)

[4] Decimal Point

Code	Description
Blank	Front setting
1	Remote control

[5] Sampling Rate

Code	Description
Blank	2.5 times/sec. fixed
T	2.5~0.2 times/sec. variable

[6] Display Color

Code	Description
Blank	Red LED
G	Green LED

2.2 General Specifications

Display	: 0~1999 red or green LED (character height 14.2mm) with zero-suppress function.
Scaling Function	: Full scale display +200~+1999, Offset display -1000~+1000.
Decimal Point	: Optional (front setting or remote control).
Over-range indication	: Flashing with "0".
Hold Function	: Measured data is held (without isolation).
Resolution	: 1/2000
Sampling Rate	: 2.5 times/sec. fixed or 2.5 times/sec.~0.2 times/sec. variable.
Input Selection	: Measuring input 1~5V or 4~20mA can be internally altered.
Input Type	: Single ended, floating input.
A/D Conversion	: Dual slope integration system.
Noise Rejection	: Normal mode (NMR) 50dB or more Common mode (CMR) 100dB or more
Power source line penetrating noise: 1000V	
Withstanding Voltage	: Input terminal - Case: AC1500V for 1 min. Power terminal - Case: AC1500V for 1 min. Power terminal - Input terminal: AC1500V for 1min.
Insulation Resistance	: DC500V 100MΩ or more.
Power Source Voltage	: AC90~132V or 180~250V 50/60Hz DC24V±10%
Power Consumption	: AC power source ... approx. 3VA DC power source ... approx. 60mA
Operating Temperature	: 0~50°C
Storage Temperature	: -20~70°C
Weight	: AC power source models ... approx. 300g DC power source models ... approx. 200g
Mounting Method	: Fastening from rear of the panel by metal brackets.

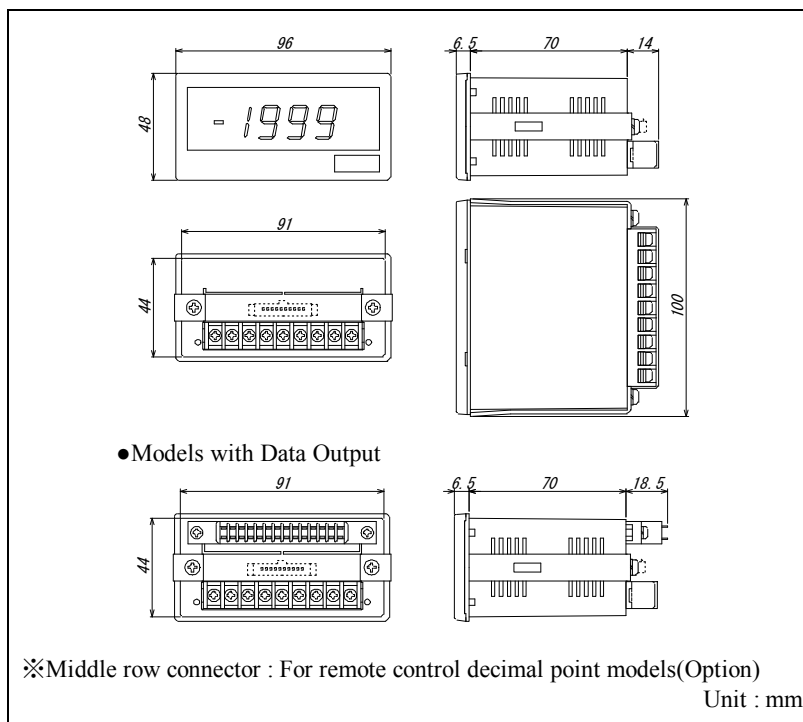
2.3 Unit Labels (attached)

Labels of different units are attached to the instruments. Select and adhere the label of required unit:

V, mV, kV, W, A, mA, μA, kW, %, °C, m, mm, rpm, ppm, Pa, Torr, g, mN, kg, N, m/min, mmHg, J, m³/h, kPa, MPa

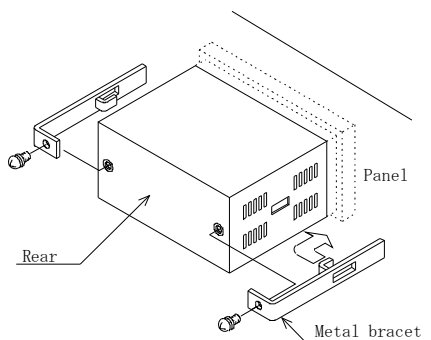
Note: Actual characters of the units printed on the stickers may be different from the above characters.

2.4 Dimensions



2.5 Installation

Remove the metal brackets at both sides,
Insert the instrument from the
front and fix it by the brackets.

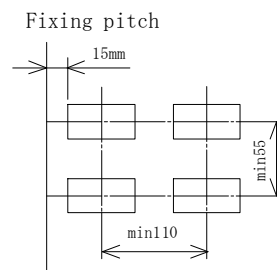


Panel cut-out dimension: $92^{+0.8/0} \times 45^{+0.6/0}$ mm

Allowable panel thickness: 0.6~6mm

Note: Recommended thickness for the panel of aluminum is
1.5mm or more to avoid deformation of the panel.

Optimum torque of fixing screws: 0.25~0.39N·m

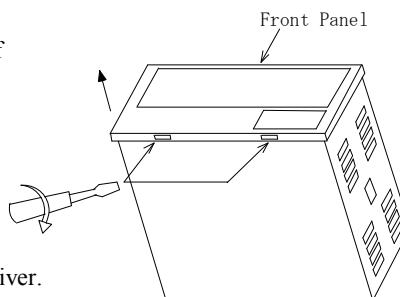


⚠ CAUTION

- Do not overtighten the mounting bracket.
- When plural mounting, pay attention to ventilation to cool down in the panel.

2.6 Removal of Front Panel

Insert (-) screwdriver into the dips at the low end of
instrument and remove the front panel.



Wrench the panel open with (-) screwdriver.

2.7 Removal of Board

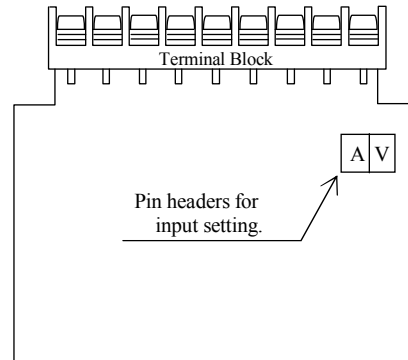
1. Remove the screws on the rear terminal blocks (remove the connector if the instrument is data output type).
2. Remove the front panel and take the board out, slightly and gently expanding the case up and downward.
3. When getting the board back into the case, insert it pressing softly the lower side of the display board. If the instrument is with remote decimal point control function, be careful that the connector lead wire does not coil around the rear terminal block.

2.8 Internal Setting of Range

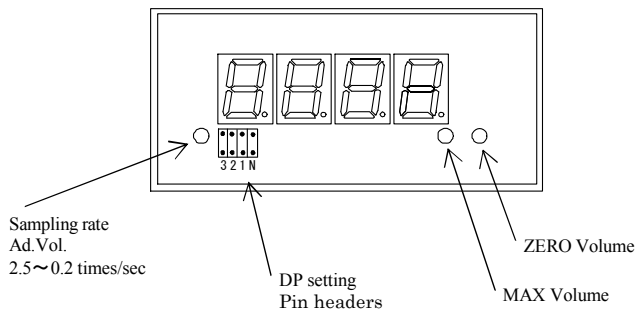
A change of range between 481C-09 and 481C-19 is possible. Take the board out and make change to a pin header position. When the range is changed, make sure to re-calibrate the instrument.

● Pin Header Position

Rate Input	Pin Header Position	
	V	A
481C-09 DC1~5V	○	
481C-19 DC4~20mA		○



2.9 Layout of Front Panel Inside



● Scaling Function

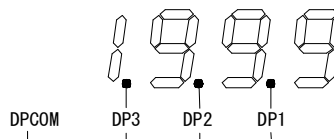
Display reading of full scale input 5V (or 20mA) can be adjusted to 200 ~ 1999 by the MAX volume inside the front mask. Minimum input 1V (or 4mA) can also be adjusted to -1000 ~ +1000 by the ZERO volume.

● Decimal Point Display

Display of decimal point at 10^1 , 10^2 or 10^3 can be selected by the decimal point adjustment pin header inside the front mask.

Note: This function is not provided if the decimal point is of remote control.

DP Pin Header Position	DP Display Position
3	DP3
2	DP2
1	DP1
N	—



● Variable Sampling Rate (Option)

Sampling rate is variable to 2.5 times/sec. ~ 0.2 times/sec. by the volume provided inside the front mask. When the display readings are illegible due to unstable input, for example, a prolonged sampling rate facilitates stability of display readings.

3. Terminal Arrangement and Explanation

⚠ WARNING
<ul style="list-style-type: none"> ● 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
<ul style="list-style-type: none"> ● Power supply and load should be within the suitable range. ● Do not miswiring.

3.1 Terminal & Connector Arrangement

● Lower Row Terminals

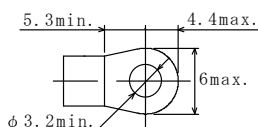
Note: ()=DC power source models.

Terminal Code	IN Hi	IN Lo	COM	HOLD	NC	NC	GND(NC)	P2(+)	P1(-)
	1	2	3	4	5	6	7	8	9
Function	+		-		Common	Hold		Ground	Power Supply
	Input								

Terminal screws: M3

Fastening torque: 0.46~0.62N·m

Crimp terminal: As shown on the right.



● Middle Row Connector

(In case of remote control decimal point)

Connector Pin Code	DPCOM	DP1	DP2	DP3	NC	NC	NC	NC	NC	NC
	1	2	3	4	5	6	7	8	9	10
Function	Common		10 ¹ dig.	10 ² dig.	10 ³ dig.					
			Decimal	Point						

● Coloring of attached lead wire(lead wire length 1m)

- Brown : DPCOM Orange : DP2
- Red : DP1 Yellow : DP3

● Upper Row Connector

TYPE BP, BN, DP, DN

Function	Pin No.		Function	
NC	1	2	NC	
NC	3	4	NC	
NC	5	6	DATA COM	
SYNC	7	8	HOLD	
OVER	9	10	OUTPUT ENABLE	
POL	11	12	NC	
NC	13	14	× 10 ²	
NC	15	16		
NC	17	18		
× 10 ³	1	19	20	1
× 10 ¹	8	21	22	8
	4	23	24	4
	2	25	26	2
	1	27	28	1
				× 10 ⁰

Connector : 1150N-028-009T

3.2 Explanation of Lower Row Terminals

● **Measurement Inputs (IN Hi, IN Lo)**

Make connections of measurement inputs with correct polarity. Connect the measurement input of higher electric potential to Hi. Make an independent wiring respectively for the input and power source line. If the wiring of input and power source line are made in parallel, it may cause unstable reading.

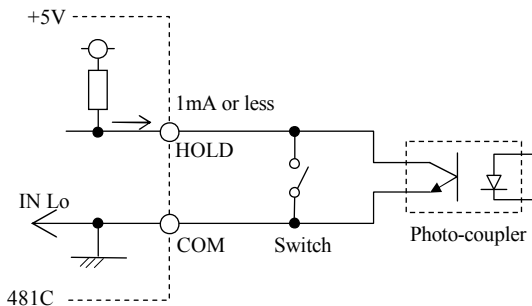
● **Common (COM)**

Common terminal for hold.

● **Hold (HOLD)**

The measured data are held by making a short-circuit between HOLD and COM terminals.

Note: The input is not isolated, so make an insulation of it with use of photo-coupler, switch, relay, etc. (When the input is used in floating, be sure to apply this solution)



● **NC**

They are open terminal but do not use them as relay terminal.

● **Ground (GND)**

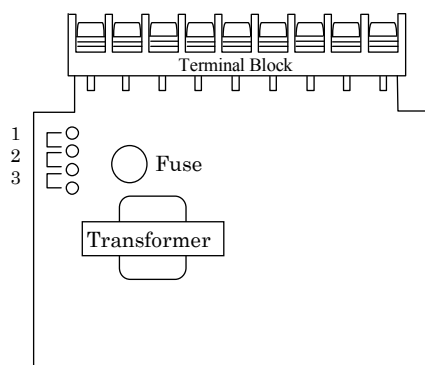
In case of fear that the noise is frequently generated on the power source line, it is effective to earth the ground terminal directly to the ground. If the instruments is not affected by environmental noise, the grounding can be omitted. In this case, take care for the ground terminal not to touch other input terminals, as it is charged with neutral electric potential of power source voltage.

● **Power Supply [P1(-), P2(+)]**

The power source voltage to be supplied to the instrument is specified on the terminal plate at delivery from factory.

- AC100V Use the instrument within the range AC90~132V
 - AC200V Use the instrument within the range AC180~250V
- For the AC power source models, the voltage AC90~132V or AC180~250V can be selected by changing a jumper connection provided on the internal board. When the power source voltage is changed, do not forget to change an indication of voltage on the terminal plate accordingly.

Operating Voltage	Jumper Connections		
	1	2	3
AC90~132V	Short-circuited	Open	Short-circuited
AC180~250V	Open	Short-circuited	Open



- DC24V: Use the instrument with DC24C ± 10%.
Connect +24V to P2(+) and 0V to P1(-).

⚠ CAUTION

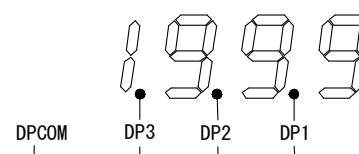
- Do not use the product with the voltage out of the rated range as it may cause breakage of the products.
- Do not connect the DC power supply polarity in reverse. Otherwise, the DPM 481C will be broken.

3.3 Explanation of Middle Row Connector

● Remote Control of Decimal Point (DP1~DP3, DPCOM)

Decimal point can be displayed at an arbitrary position by setting the decimal point setting switches inside the front panel to the remote control mode. Make a short-circuit between the decimal point $10^1 \sim 10^3$ (DP1~DP3) and DPCOM. (Active "L")

Please do not set DP1 to DP3 more than once.



Note: The DP pins are not isolated from the measuring input, so make an insulation of it with use of photo-coupler, switch, relay, etc.

(When the input is used in floating, be sure to apply this solution. Also, in case that the plural numbers of the instruments are used, make the insulation of DP pins individually for each instrument.)

● NC

NC pins are open pins.

3.4 Explanation of Upper Row Connector

TTL Level Output

● Rated Input & Output

Signal	Code	TYPE-BP	TYPE-BN	Rate
Output	$\times 10^0 \sim \times 10^3$	Positive logic	Negative 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	HOLD	Held by short-circuit ("L")		IIL \leq -1mA "L"=0~0.8V, "H"=3.5~5V
	ENABLE	Allowed by open ("H"), prohibited by short-circuit ("L")		

● Measured Data Output ($\times 10^0 \sim \times 10^3$)

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)

Polarity of measured data is output from the pin ⑪.

● Over-range Output (OVER)

When the display is over-range, the output is made at the pin ⑨.

● Synchronization Signal Output (SYNC)

"L" pulse of 10ms synchronized with the display cycle is output at the pin ⑦. Read in the data at the rising point of this SYNC. In case of connection to the multiple data bus, the wired OR connection is possible.

● Data Enable Input (OUTPUT ENABLE)

When the pin ⑩ is opened, the data (including POL, OVER) and SYNC are output.

When it is short-circuited with the DATA COM (pin ⑥), the data (including POL, OVER) becomes "high impedance" state.

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

● Hold Input (HOLD)

By short-circuiting the pints ⑧ and DATA COM (pin ⑥), the display value and data at the time of short-circuit are held.

When it is opened again, the measurement is recommenced.

● Data Common (DATA COM)

Pin ⑥ is common for the measured data, POL, OVER, SYNC, HOLD, OUTPUT ENABLE.

● NC

NC pins are open pins but do not use them as relay terminal.

Note: Data output and control signals are unified to the TTL level, so ensure not to apply the voltage DC5V or higher.

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

Transistor Output

In case that the BCD output of plural numbers of the instrument is connected to one PC, the wired OR connection is possible for the measured data (including POL, OVER), SYNC.

● **Rated Input & Output**

Signal Code		Item	TYPE-DP	TYPE-DN
Output	$\times 10^0 \sim \times 10^3$	Output type	Source type	Sink type
	POL OVER SYNC	Output capacity	DC30V 30mA MAX, Saturated voltage 1.6V or less	
Input	HOLD ENABLE	Signal level	Input power source = 1mA or less OFF (H)=3.5V~5V, ON (L)=0~1.5V	

● **Measurement Data Output ($\times 10^0 \sim \times 10^3$)**

Parallel BCD (1-2-4-8) code, latch output.

Transistor ON with the measured data “1”. Transistor OFF with the measured data “0”.

● **Polarity Output (POL)**

Polarity of measured data is output from the pin ⑪

Transistor ON when the display value is (+). Transistor OFF when the display value is (-).

● **Over-range Output (OVER)**

When the display is over-range, the output is made at the pin ⑨.

Transistor ON with the over-range display.

● **Synchronization Signal Output (SYNC)**

“On” pulse of 10ms which is synchronized with the display cycle is output at the pin ⑦. Read in the data at the rising point (ON→OFF) of this SYNC.

● **Data Enable Input (OUTPUT ENABLE)**

When the pin ⑩ is opened, the data (including POL, OVER) and SYNC are output.

When it is short-circuited with the DATA COM (pin ⑥), the data (including POL, OVER) becomes “OFF” state.

In this state, the output of SYNC is prohibited, so the connection to data bus is easy.

● **Hold Input (HOLD)**

By short-circuiting the pints ⑧ and DATA COM (pin ⑥), the display value and data at the time of short-circuit are held.

When it is opened again, the measurement is recommenced.

● **Data Common (DATA COM)**

Pin ⑥ is common for the measured data, POL, OVER, SYNC, HOLD, OUTPUT ENABLE.

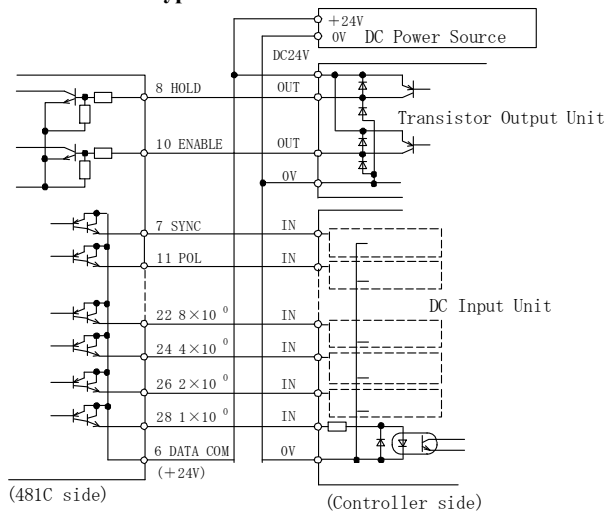
● **NC**

They are open pins but do not use them as relay terminal.

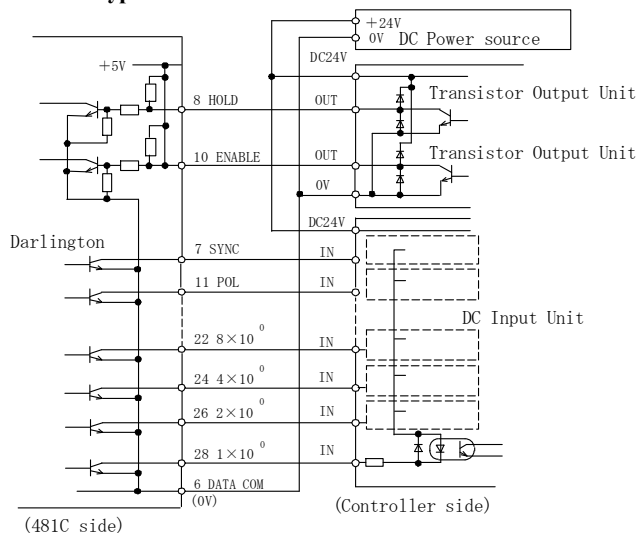
Note: Arrange the wiring of data output and control input/output signal lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

3.5 Connections

Source Type

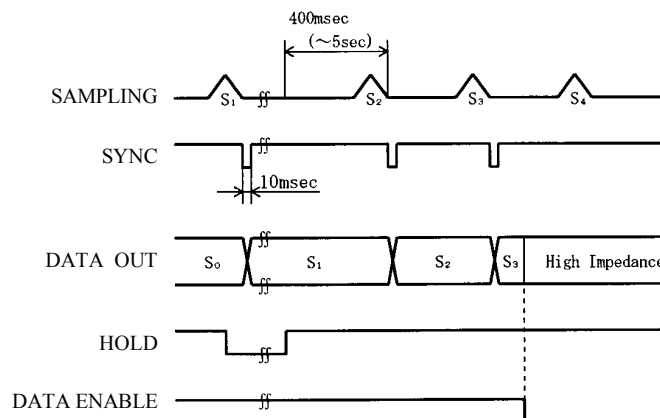


Sink Type



3.6 Timing Chart

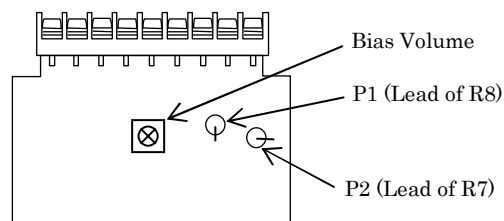
● BCD Data and LATCH



4. Calibration

In order to maintain long term accuracy, periodical maintenance at an interval of about one year is recommended. Make a calibration of the instrument in the following order, in ambient condition of 23°C ± 5°C, 75%RH or less.

1. Remove the front mask.
2. Remove the main board according to the "Removal of Board".
3. Bias Adjustment
Take the board out, and make an adjustment of bias volume so that the voltage between check-points P2-P1 becomes 0.5mV or less when 1V (4mA) is input to the instrument.
4. Offset Adjustment
Input 1V (4mA) to the instrument and adjust the ZERO volume on the front to the desired display value.
5. Full Scale Adjustment
Input 5V (20mA) to the instrument and adjust the MAX volume on the front to the desired display value.



Contact Information

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