1. Preface

We thank you for your purchase of the 4160 series digital panel meter. For proper use of this product, please carefully read these instructions before the initial operation of it. Please ensure that this instruction manual is delivered to the right person who is in charge of using this instrument.

2. For Safe Use

● Check at Delivery

- When the 4160 is delivered to you, please check that its specifications conform to your requirement and that there is no damage in transit. This instrument is carefully inspected under our strict quality control program, but if you find any defect or inconvenience in quality or specifications, please inform us of the model name and serial number of the product.
- Please check that the following items are included:
  (1) 4160 main unit and mounting bracket.
  (2) Label of units.
  (3) Instruction manual.
  (4) In case that the instrument is with optional BCD and comparator output, a connector is also attached.

● Cautions for Use

For safe use of the product, observe the following cautions:

⚠ CAUTION

- **No power on-off switch is provided on the model 4160, so it immediately starts to work when connected to the power source. The rated data is, however, defined with the pre-heating for 15 minutes or more.**
- **When the 4160 is mounted into a system cabinet, take care for ventilation so that the internal temperature will not exceed 50°C.**

To avoid breakdown or malfunction of the instrument, do not use it in such places where:

- **Exposed to rain, water drops or direct sunlight.**
- **High temperature or humidity, much dust or corrosive gas.**
- **Affected by external noise, radio waves or static electricity.**
- **Where there is constant vibration or shock.**

3. Standard Specifications

■ **Model 4 1 6 □—□—□—□**
└1┘ 2 3

【1】 Input Specifications / Measuring Range

Model	Input Specifications	Measuring Range
416D-□	DC volt, current meter	Refer to the specifications of each input type.
416B-□	AC volt, current meter (average value)	
416K-□	AC volt, current meter (effective value)	
416C-□	Receiving meter	

【2】 Supply Voltage

Code	Power Source Voltage
3	AC100V (90~132V)
5	AC200V (180~264V)
B	DC9~32V

【3】 Data Output

Code	Specifications	
Blank	For display only	
03	Analog output	DC0~1V
04		DC0~5V
05		DC0~10V
09		DC1~5V
23		DC0~1mA
29		DC4~20mA
BP	BCD output	TTL level positive logic
BN		TTL level negative logic
DP		Transistor output source type
DN		Transistor output sink type
CP	High, low limit comparator output	

■ General Specifications

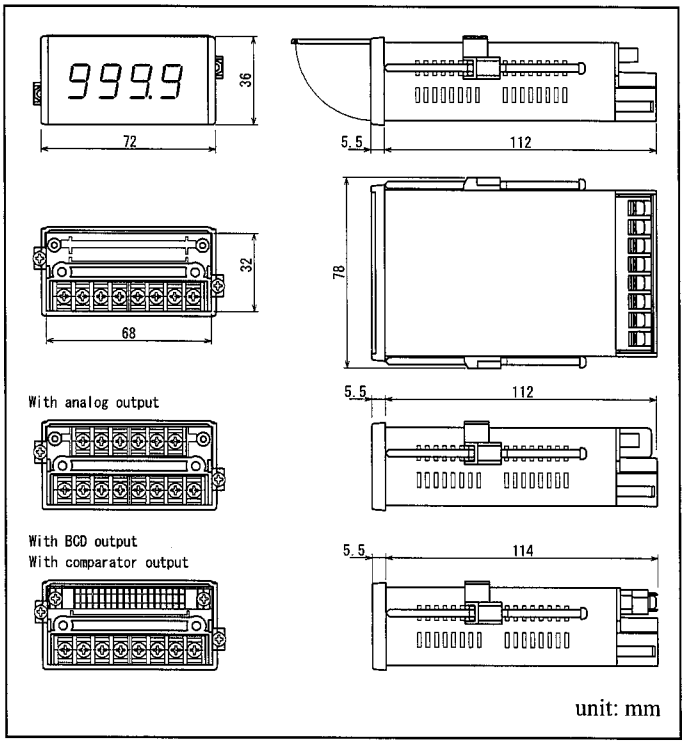
Display	:	0~9999 red LED (character height 15mm), (-) display at negative polarity input, with zero-suppress function.
Over-range Indication	:	Display becomes intermittent when exceeded 9999 (numerals remain unchanged).
Decimal Point	:	Adjustable to arbitrary position from the panel front.
Sampling Rate	:	Approximately 2.5 times/sec.
Input configuration	:	Single ended, floating input.
A/D conversion	:	Dual slope integration system.
Noise Rejection	:	Normal mode (NMR): 50dB or more (**Note 1**) Common mode (CMR): 110dB or more (**Note 1**) Power source line penetrating noise: 1000V (**Note 1**): Except the AC input.
Hold Function	:	Measured data is held (not isolated with input).
Withstanding Voltage	:	Input terminals - COM of each output: AC 500V for 1 min. Input / output terminals - Power source terminals: AC1500V for 1 min. (**Note 2**) Power source terminals - Case: AC1500V for 1 min. (**Note 2**) AC1000V in case of DC power source.
Insulation Resistance	:	DC500V 100MΩ or more.
Power Source Voltage	:	AC power source voltage: AC90~132V or AC180-264V 50/60Hz DC power source voltage: DC9~32V Approx. 2VA with AC100V Approx. 170mA with DC12V Approx. 100mA with DC24V
Operating Temperature	:	0~50°C
Storage Temperature	:	-20~70°C
Weight	:	AC power source models Approx. 260g DC power source models Approx. 200g
Mounting Method	:	Fastening from rear of the panel by mounting brackets.

■ Unit Labels (attached)

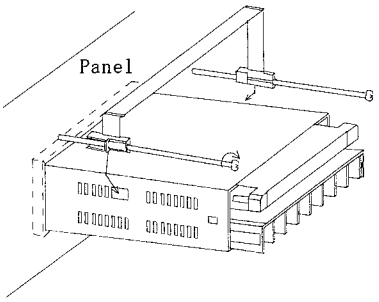
V, mV, kV, W, A, mA, μA, kW, %, °C, m, mm, rpm, ppm, Pa, g, kg, Nm^3/s, m^3/s, Nm^3/h, m^3/h, m^3, m/min, cal, kcal, l, l/s, l/h, t, N, pH, t/h, kPa, MPa, °F, sec, lb, l/min, $\%O_2$

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

■ Dimensions



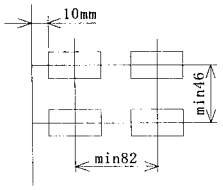
4. Installation



Insert the instrument from the front of the panel. Insert the attached mounting bracket to the rectangular holes at both side of the instrument and fasten it gradually, making balance between right and left side.

Panel cut-out dimension:
$68.5^{+0.5}/_{0}$ X $32.5^{+0.5}/_{0}$ mm
Allowable panel thickness:
0.6~6mm
Recommended thickness for the panel of aluminum etc. is 1.5mm or more to avoid a deformation of the panel.
Optimum torque of fixing screws: 0.2~0.3N・m

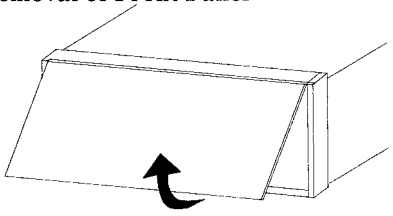
Fixation Pitch



⚠ CAUTION

- **Do not excessively fasten screws as it may cause deformation of the case.**

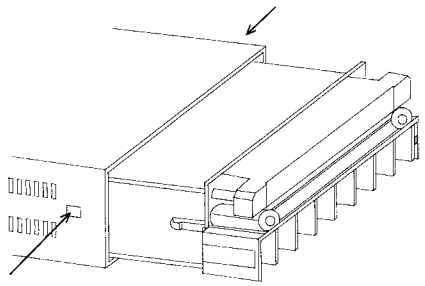
■ Removal of Front Panel



Open the lower side of the panel upward.

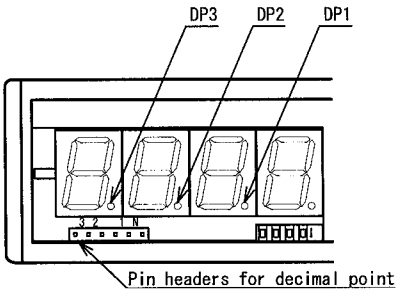
■ Removal of Internal Board

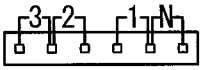
Remove the click (catch) part on both side of the instrument with (-) screwdriver and pull the board out toward rear side.



5. Setting of Decimal Point

Decimal point can be set to light up at either position of 10^1 ~ 10^3 digit by changing the connection of pin headers provided at left bottom inside the front mask.





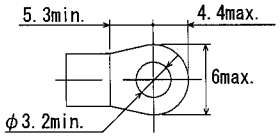
Pin headers for decimal point

Setting	D.P. position
3	DP3 (10^3digit)
2	DP2 (10^2digit)
1	DP1 (10^1digit)
N	No decimal point

6. Lower Row Terminals

┌Input┐			┌Hold┐			┌Power source┐	
①	②	③	④	⑤	⑥	⑦	⑧
INHi	INLo	NC	COM	HOLD	NC	P2(+)	P1(-)

Terminal screws : M3
Fastening torque : 0.46~0.62N・m
Crimp terminal : As shown on the right.



⚠ CAUTION

- **Do not use the meter with wrong wiring as it may cause breakage of meter or equipment connected.**
- **To avoid an electric shock;**
  - **Turn off the power when the wiring work is done.**
  - **Do not do the wiring work in the humid environment or with the wet hands.**
  - **Do not touch the power source terminals while the meter is powered.**

● **Input Terminals (INHi, INLo)**
For the DC and receiving meter input, connect + polarity to INHi and - polarity to INLo.
For the AC input, connect the side which is closer to grounding potential to INLo.
Be sure to make a separate wiring 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.

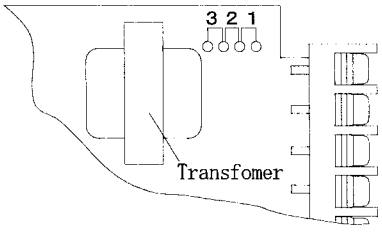
● **Hold Terminal (HOLD, COM)**
The display and BCD output are held by making a short-circuit between HOLD and COM terminals.
Active "L" $I_{IL} \leqq$-1mA, "L"=0~0.8V, "H"=3.5~5V
Note: When the display is held during the over-range, the intermittent display stops.

● **NC**
NC are the open terminals but do not use these terminals as a relay terminal.

⚠ CAUTION The HOLD and COM terminals are not isolated from the measuring input, so make an isolation with photo-coupler, switch, etc. in case that each functional terminal is controlled.
(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 individually for each instrument.)

● **Power Supply (P1(-), P2(+))**
The power source voltage to be supplied to the instrument is specified on the terminal plate when delivery from factory.
○ AC100V ..... Use the instrument within the range AC90~132V
○ AC200V ..... Use the instrument within the range AC180~264V
For the AC power source models, the voltage AC90~132V or AC180~264V can be selected by changing a soldering of 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.

Power Source Voltage Setting Jumpers



	Jumper Connections			Operating Voltage
	1	2	3	
AC100V	Short-circuited	Open	Short-circuited	AC90~132V
AC200V	Open	Short-circuited	Open	AC180~264V

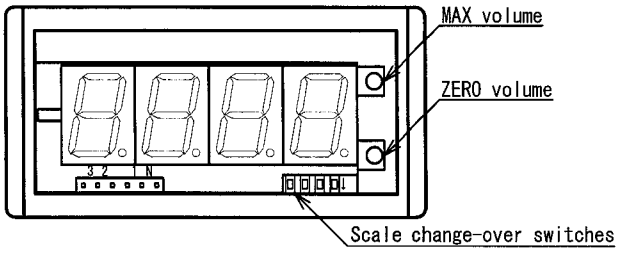
○ DC power source models ..... Use the instrument within the range DC9~32V.
Connect + side to P2(+) terminal and - side to P1(-) terminal.

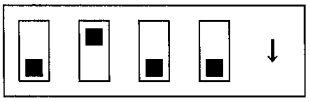
⚠ CAUTION

◆ **Do not use the meter with the voltage out of the rated range as it may cause breakage of meter or equipment connected.**

7. Scaling

By means of the dip switches provided at the right bottom inside the front panel, rough adjustment of full scale can be done, and the fine adjustment is possible with the volumes also provided at the right end inside the front panel.





○ mark is lower side (ON)
– mark is upper side (OFF)

Example 1 To change the full scale 0~9999 to 0~8500:
(1) Select the combination of scale change-over switches which gives the value close to 8500.
In this case, make 2 OFF and make 1, 3 and 4 ON.
(2) Apply to the meter the input corresponding to the full scale, and adjust the MAX volume with a minus screwdriver until the display gives 8500.

Example 2 To set the scale 1000~5000
In case of receiving meter and there is a certain offset display value, select the combination of scale change-over switches with the value deducting the offset display value from the full scale display value.
(1) Adjust the offset display value.
Refer to 【9】 for the detail of adjustment.
(2) Calculate the scale value and set the scale change-over switches.
5000-1000=4000
Select the combination of scale change-over switches which gives the value close to 4000.
In this case, make 1 and 4 OFF. and make 2 and 3 ON.
(3) Apply to the meter the input corresponding to the full scale, and adjust the MAX volume with a minus screwdriver until the display gives 5000.

Scale Change-over Switches				Adjustable Scale Range
1	2	3	4	
○	○	○	○	9580~9999
–	○	○	○	8910~9580
○	–	○	○	8240~8910
–	–	○	○	7620~8240
○	○	–	○	7000~7620
–	○	–	○	6390~7000
○	–	–	○	5770~6390
–	–	–	○	5150~5770
○	○	○	–	4530~5150
–	○	○	–	3910~4530
○	–	○	–	3300~3910
–	–	○	–	2680~3300
○	○	–	–	2060~2680
–	○	–	–	1390~2060
○	–	–	–	720~1390
–	–	–	–	100~720

8. DC Input

■ DC Voltage Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416D-02	±99.99mV	100MΩ	±(0.05% of rdg + 3digits)	DC±250V
416D-03	±999.9mV	1MΩ	±(0.05% of rdg + 3digits)	DC±250V
416D-04	±9.999V	1MΩ	±(0.05% of rdg + 3digits)	DC±250V
416D-05	±99.99V	1MΩ	±(0.05% of rdg + 3digits)	DC±250V

■ DC Current Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416D-12	±99.99μA	1kΩ	±(0.1% of rdg + 3digits)	DC±10mA
416D-13	±999.9μA	100Ω	±(0.1% of rdg + 3digits)	DC±50mA
416D-14	±9.999mA	10Ω	±(0.1% of rdg + 3digits)	DC±150mA
416D-15	±99.99mA	1Ω	±(0.1% of rdg + 3digits)	DC±500mA
416D-16	±999.9mA	0.1Ω	±(0.15% of rdg + 5digits)	DC±3A

* Accuracy: Defined at 23°C±5°C, 45~75%RH.
Temperature coefficient: 416D-02~05, -12~15 ... ±150ppm/°C
(Defined at 0~50°C) 416D-16 ..... ±200ppm/°C

■ Scaling

(1) Zero adjustment
Apply to the meter the zero voltage (current) and adjust the display to 0 with ZERO volume shown in the above figure.

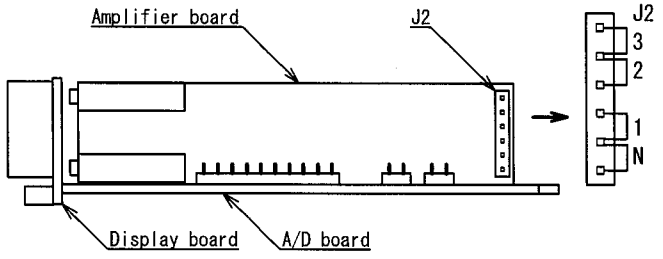
(2) Full scale adjustment
By means of scale change-over switch and MAX volume, the display of input corresponding to the measuring range ±9999 can be adjusted within the range ±100~±9999. Refer to【7】for the detail of adjustment.

■ Calibration

Make an adjustment in the same way as that of scaling.

■ Internal change of input range

The input range of 416D-03, 04 and 05 can be changed by relocating the short-circuit socket on the amplifier board.
Be sure to make calibration after the change of range.



Setting of Input Range

J2 setting	Measuring range
3	±99.99V
2	±9.999V
1	±999.9mV
N	———

9. Receiving Meter Input

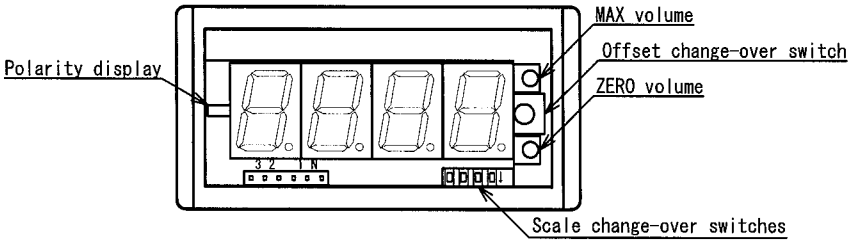
Model	Measuring Range	Input Resistance	Accuracy *	Overload
416C-09	DC1~5V	1MΩ	±(0.1% of rdg + 3digits)	DC±250V
416C-19	DC4~20mA	25Ω	±(0.1% of rdg + 3digits)	DC±100mA
416C-V1	DC0~1V	1MΩ	±(0.1% of rdg + 3digits)	DC±250V
416C-V2	DC0~5V	1MΩ	±(0.1% of rdg + 3digits)	DC±250V
416C-V3	DC0~10V	1MΩ	±(0.1% of rdg + 3digits)	DC±250V
416C-A1	DC0~1mA	100Ω	±(0.1% of rdg + 3digits)	DC±50mA

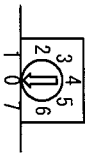
* Accuracy: Defined at 23°C±5°C, 45~75%RH.
Temperature coefficient: ±150ppm/°C
(Defined at 0~50°C)

■ Scaling

(1) Offset adjustment

The offset adjustment can be made with offset change-over switch and ZERO volume, within the range ±5000. Apply the minimum value of measuring range to the input terminal, make the switch setting to have the value close to the offset value and adjust with ZERO volume.





Offset change-over switch	Adjustable range of offset display
0	-1000~+1000
1	-4000~-2000
2	-2200~- 200
3	-5200~-3200
4	+3300~+5300
5	+ 300~+2300
6	+2100~+4100
7	————

(2) Full scale adjustment

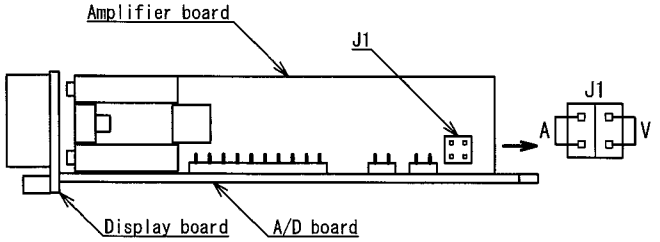
Apply the maximum value of measuring range to the input, and make adjustment with scale change-over switch and MAX volume within the range 100~9999. Refer to【7】for the detail of adjustment.
Make the scale adjustment in the order of (1), (2), not conversely.

■ Calibration

Make an adjustment in the same way as that of scaling.

■ Internal change of input range

The input range of 416C-09 and 19 can be changed by relocating the short-circuit socket on the amplifier board.
Be sure to make calibration after the change of range.



Setting of Input Range

J1 setting	Measuring range
A	DC4~20mA
V	DC1~5V

10. AC Input (Average Value)

■ AC Voltage Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416B-22	AC99.99mV	1MΩ	±(0.1% of rdg + 10digits)	AC100V
416B-23	AC999.9mV	1MΩ	±(0.1% of rdg + 10digits)	AC100V
416B-24	AC9.999V	1MΩ	±(0.1% of rdg + 10digits)	AC250V
416B-25	AC99.99V	1MΩ	±(0.1% of rdg + 10digits)	AC250V
416B-26	AC699.9V	10MΩ	±(0.2% of rdg + 10digits)	AC700V

■ AC Current Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416B-32	AC99.99μA	1kΩ	±(0.1% of rdg + 20digits)	AC10mA
416B-33	AC999.9μA	100Ω	±(0.1% of rdg + 20digits)	AC50mA
416B-34	AC9.999mA	10Ω	±(0.1% of rdg + 20digits)	AC150mA
416B-35	AC99.99mA	1Ω	±(0.1% of rdg + 20digits)	AC500mA
416B-36	AC999.9mA	0.1Ω	±(0.2% of rdg + 20digits)	AC3A
416B-37	AC5.000A	0.01Ω	±(0.2% of rdg + 20digits)	AC7A

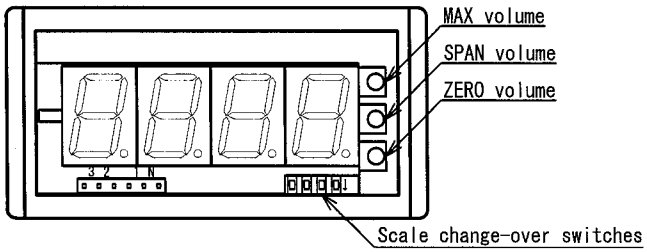
* Accuracy: Defined at 23°C±5°C, 45~75%RH.
Temperature coefficient: ±300ppm/°C (Defined at 0~50°C)
Applied to the Sin wave of 5% or more of measuring range.
Frequency range: Sin wave of 40Hz~1kHz
Note: Input and hold terminals are not isolated.

■ Specifications

Rectification system : Display of effective value of average rectification.
Response to input : Approximately 1 sec. (0% ⇒ 90% display)

■ Scaling

(1) Zero adjustment
Apply to the meter the zero voltage (current) and adjust the display to 0 with ZERO volume shown in the figure below.



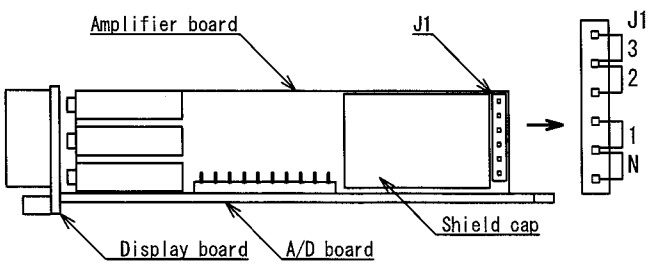
(2) Full scale adjustment
Apply the maximum value of measuring range to the input, and make adjustment with scale change-over switch and MAX volume within the range 100~9999.
Note: Do not adjustment the span volume.
Refer to【7】for the detail of adjustment.

■ Calibration

Make an adjustment in the same way as that of scaling.

■ Internal change of input range

The input range of 416B-23, 24 and 25 can be changed by relocating the short-circuit socket on the amplifier board.
Be sure to make calibration after the change of range.



Setting of Input Range

J1 setting	Measuring range
3	AC99.99V
2	AC9.999V
1	AC999.9mV
N	——

11. AC Input (Real Effective Value)

■ AC Voltage Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416K-22	AC99.99mV	1MΩ	±(0.1% of rdg + 10digits)	AC100V
416K-23	AC999.9mV	1MΩ	±(0.1% of rdg + 10digits)	AC100V
416K-24	AC9.999V	1MΩ	±(0.1% of rdg + 10digits)	AC250V
416K-25	AC99.99V	1MΩ	±(0.1% of rdg + 10digits)	AC250V
416K-26	AC699.9V	10MΩ	±(0.2% of rdg + 10digits)	AC700V

■ AC Current Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
416K-32	AC99.99μA	1kΩ	±(0.1% of rdg + 20digits)	AC10mA
416K-33	AC999.9μA	100Ω	±(0.1% of rdg + 20digits)	AC50mA
416K-34	AC9.999mA	10Ω	±(0.1% of rdg + 20digits)	AC150mA
416K-35	AC99.99mA	1Ω	±(0.1% of rdg + 20digits)	AC500mA
416K-36	AC999.9mA	0.1Ω	±(0.2% of rdg + 20digits)	AC3A
416K-37	AC5.000A	0.01Ω	±(0.2% of rdg + 20digits)	AC7A

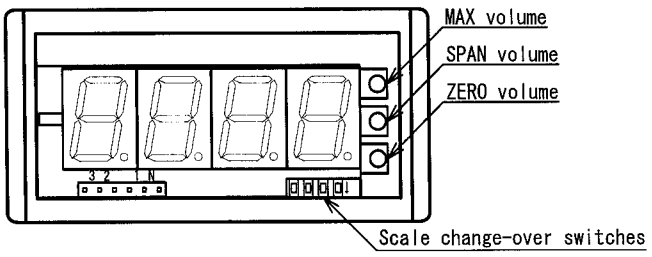
* Accuracy: Defined at 23°C±5°C, 45~75%RH.
Temperature coefficient: ±300ppm/°C (Defined at 0~50°C)
Frequency range: 40Hz~1kHz **Note**: Input and hold terminals are not isolated.

■ Specifications

Rectification system : Effective value display of average rectification.
Response to input : Approximately 1 sec. (0% ⇒ 90% display)
Crest factor : 416K-22~25, 416K-32~36: 4
416K-26: Upto peak 1000V
416K-37: 2

■ Scaling

(1) Zero adjustment
Apply to the meter the zero voltage (current) and adjust the display to 0 with ZERO volume shown in the figure below.



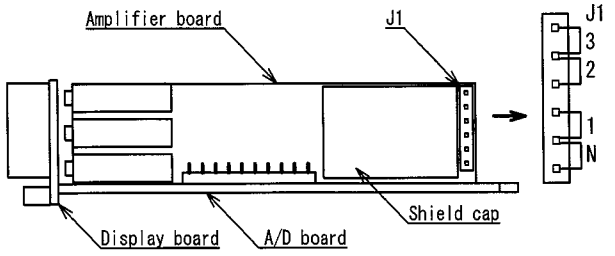
(2) Full scale adjustment
Apply the maximum value of measuring range to the input, and make adjustment with scale change-over switch and MAX volume within the range 100~9999. Refer to【7】for the detail of adjustment.
Note: Do not adjustment the span volume.

■ Calibration

Make an adjustment in the same way as that of scaling.

■ Internal change of input range

The input range of 416K-23, 24 and 25 can be changed by relocating the short-circuit socket on the amplifier board.
Be sure to make calibration after the change of range.



Setting of Input Range

J1 setting	Measuring range
3	AC99.99V
2	AC9.999V
1	AC999.9mV
N	————

12. Analog Output

■ Terminal Arrangement of Analog Output

Analog output

①	②	③	④	⑤	⑥
A.OUT+	A.OUT-	NC	NC	NC	NC

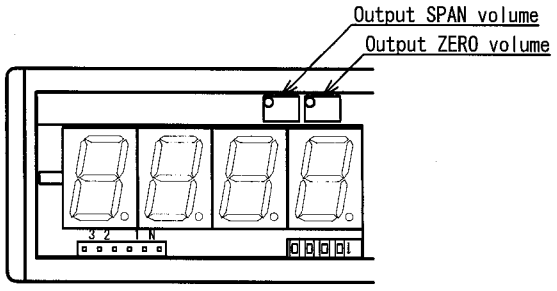
- Voltage or current signal which is proportional to the input is output at the A.OUT+ and A.OUT- on the upper row terminal blocks.
  The analog output is isolated from the measuring input and HOLD terminal.
  Make a connection confirming the polarity.

- **NC**
  NC are the open terminals but do not use these terminals as a relay terminal.

■ Specifications of Output

Model	Specifications	Output Impedance	Tolerable Resistance Load
416□-□-□-Blank	No output	————	————
416□-□-□-03	DC0~1V	0.1Ω or less	1kΩ or more
416□-□-□-04	DC0~5V	0.1Ω or less	5kΩ or more
416□-□-□-05	DC0~10V	0.1Ω or less	10kΩ or more
416□-□-□-09	DC1~5V	0.1Ω or less	5kΩ or more
416□-□-□-23	DC0~1mA	5MΩ or more	0~5kΩ or more
416□-□-□-29	DC4~20mA	5MΩ or more	0~250Ω or more

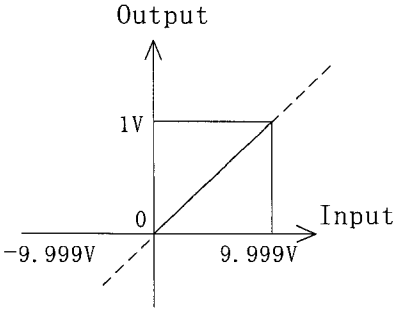
Note: Output is made within the plus range of measuring input.



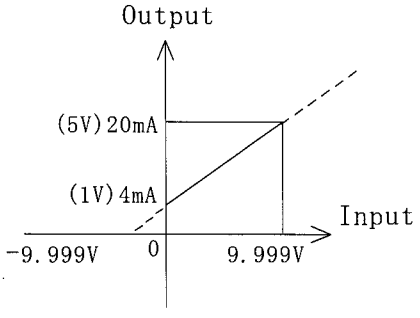
■ Common Specifications

Tolerable error : 0.5% of SPAN at 23°C±2°C
Ripple : 1%
Temperature coefficient : ±200ppm/°C
Output response : DC input and receiving meter input ..... Approx. 0.2 sec. to the input (0 ⇒ 90%)
AC input ..... Approx. 1 sec.

Example 1 Input DC±9.999V
Output DC0~1V



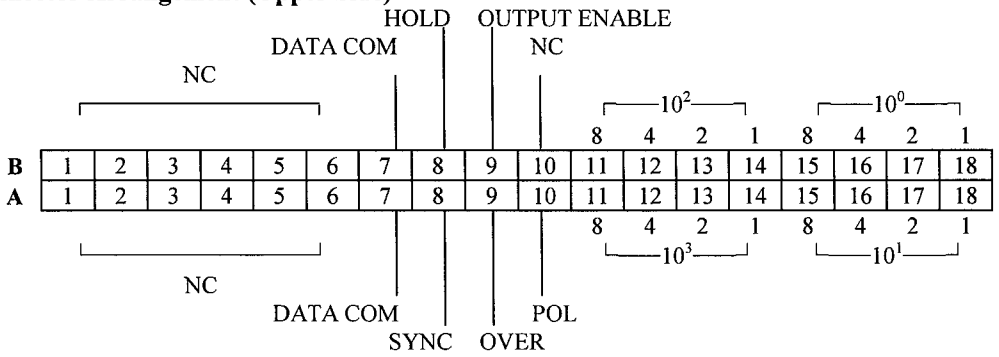
Example 2 Input DC±9.999V
Output DC4~20mA



13. BCD Data Output

Measuring input and data input/output are isolated.

■ Connector Arrangement (Upper Side)



Attached connector: [SULLINS] EBC18DREH

■ TTL Output

● **Rated Input & Output**

Input, Output Signal		TYPE -BP	TYPE -BN	
Output	$X10^0$~10^3	Positive logic	Negative logic	TTL level Fo=2 "L"=0~0.8V, "H"=3.5~5V
	POL	+="H", -="L"	+="L", -="H"	
	OVER	"H" at over	"L" at over	
	SYNC	"L" pulse of 10ms		
Input	HOLD	Held by short-circuit ("L")		$I_{IL} \leqq$-1mA "L"=0~0.8V, "H"=3.5~5V
	ENABLE	Allowed by open ("H") Prohibited by short-circuit ("L")		

● **Measured Data Output ($X10^0$~$X10^3$)**
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 A10.

● **Over-range Output (OVER)**
When the display is over-range, the signal is output at the pin A9.

● **Synchronization Signal Output (SYNC)**
"L" pulse of 10ms synchronized with the display cycle is output at the pin A8. 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 B9 is opened ("H"), the data (including POL, OVER) are output. When it is short-circuited ("L") with the DATA COM (pin A7, B7), the data (including POL, OVER) becomes "high impedance" state, and in this state, the output of SYNC is prohibited and the connection to data bus is easy.

● **Remote Hold Input (HOLD)**
By short-circuiting the pints B8 and DATA COM (pin A7, B7) or making "L", the display value and BCD are held. When it is opened again, the measurement is recommenced.

● **Data Common (DATA COM)**
Pin A7 and B7 are common for the measured data output , POL, OVER, 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 a few instrument is connected to one PC, the WIRED OR connection is possible for the measured data (including OVER), SYNC.

● **Rated Input & Output**

Input, Output Signal		Item	TYPE -DP	TYPE -DN
Output	$X10^0$~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 current = 1mA or less OFF (H)=3.5V~5V, ON(L)=0~1.5V	

● **Measurement Data Output ($X10^0$~$X10^3$)**
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 A10.
Transistor ON when the display value is (+).
Transistor OFF when the display value is (-).

● **Over-range Output (OVER)**
It is output at the pin A9 when the display is over-range.
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 A8.
Read in the data at this rising point (ON→OFF) of this SYNC.

● **Data Enable Input (OUTPUT ENABLE)**
When the pin B9 is opened (OFF), the data (including POL, OVER) are output.
When it is short-circuited (ON) with the DATA COM (pin A7, B7) , 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.

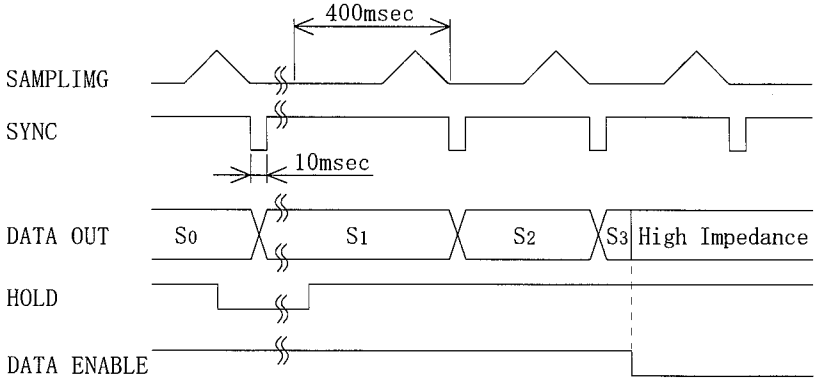
● **Remote Hold Input (HOLD)**
By short-circuiting the pints B8 and DATA COM (pin A7, A8), the display value and the BCD data at the time of short-circuit are held.
When it is opened again, the measurement is recommenced.

● **Data Common (DATA COM)**
Pin A7 and A8 are common for the measured data output, POL, OVER, HOLD, OUTPUT ENABLE.

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

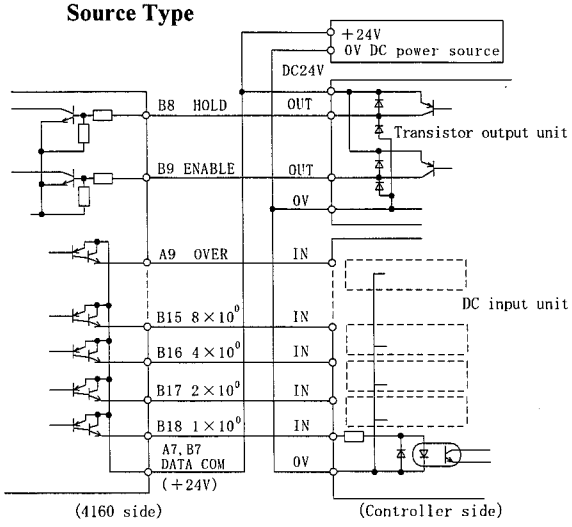
Note: Arrange the wiring of data output and control input/output signal lines apart from the power source line, relays or magnet switches, etc. of big capacity, as well as the input line.

■ Timing Chart

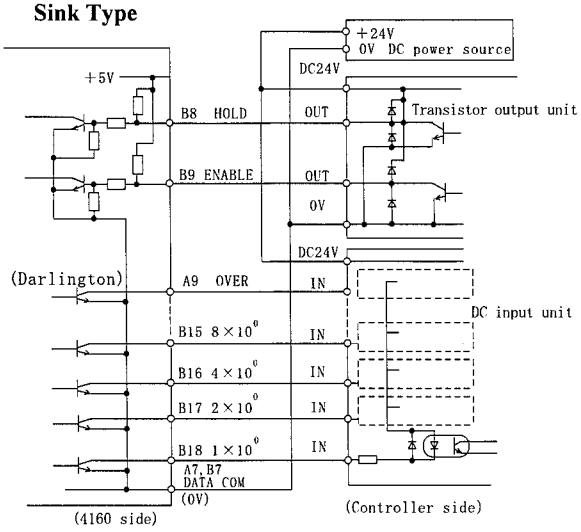


■ Connection Examples

Source Type

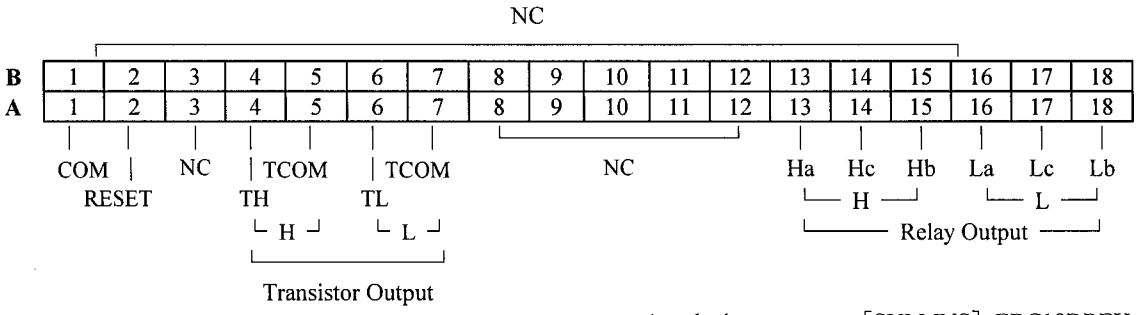


Sink Type



14. High, Low Limit Comparator Output

■ Connector Arrangement (Upper Side)



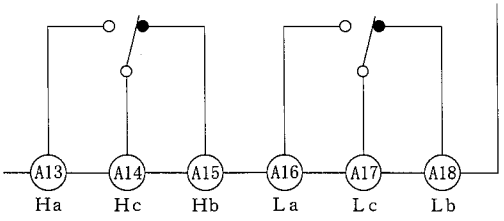
Attached connector: [SULLINS] EBC18DREH

● **Reset Terminal (RESET, COM)**
By short-circuiting the RESET and COM terminals, the alarm output is reset.
Active "L" $I_{IL} \leqq$-1mA, "L"=0~0.8V, "H"=3.5~5V
Minimum pulse width: 10ms

⚠ CAUTION

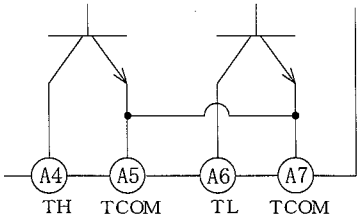
It is not isolated from the measuring input, so isolating it with photo-coupler, switch, etc. when making a control. (When the input is used in floating, be sure to apply this solution. Also, in case that the plural numbers of the instruments are used, make the insulate the RESET terminal individually for each instrument.)

● **Reset Output (Ha, Hb, Hc, La, Lb, Lc)**



Contact capacity: AC125V 0.5A (resistive load)
AC250V 0.1A (resistive load)

● **Transistor Output (TH, TL, TCOM)**



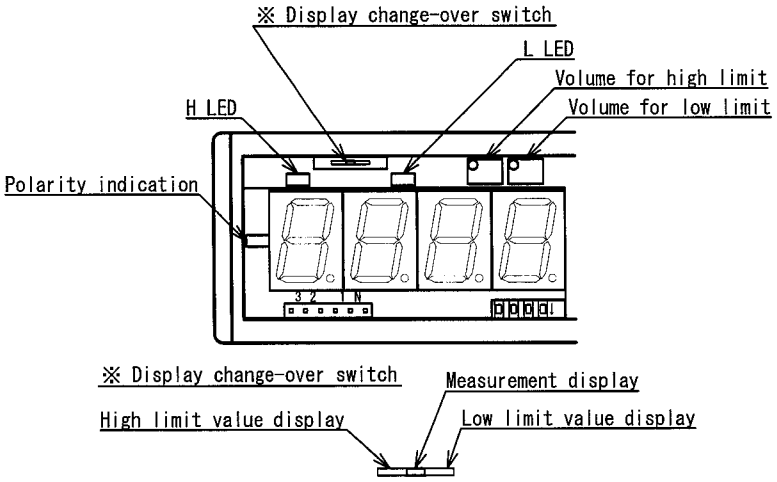
Output capacity: DC30V 30mA
Saturated voltage of output: DC1.6V or less
Transistor output is isolated from the input terminals.
Pins A5 and A7 are internally common.

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

■ **Specifications**

Comparator System	:	Analog comparator, 1 point each for high limit value and low limit value.
Judgement Action	:	Display value > High limit value ..... H output
		Display value < Low limit value ..... L output
Setting Error	:	±10digit
Output	:	Relay output, "1c" contact for H, L.
		Transistor output, 1 point feach for H, L.
Judgement Display	:	Red LED for both H and L
Adjustable Range	:	-9990~9990 (by increment of 10) for both H and L.
		Comparison is set to the scaling display.
Hysteresis Width	:	Approx. 0.5% of full scale.

■ **Name of Parts**



■ **Adjustment Method**

Set the change-over switch of display to the position (right) for the low limit value display, and adjust to the low limit value with the low limit volume. Then, set the change-over switch of display to the position (left) for the high limit value display, and adjust to the high limit value with the low limit volume. After completing the adjustment, return the change-over switch of display to the position of measurement display (center).

15. Maintenance

Store the instrument within the rated temperature range for storage (-20~70°C). When the front panel or the case is cleaned, use soft cloth wetted with cleaner liquid. Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.

16. Calibration

In order to maintain long term accuracy, periodical calibration at an interval of about one year is recommended.

Contact Information	
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