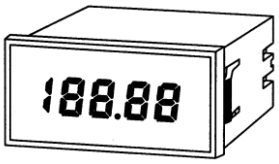
DIGITAL PANEL METER
MODEL AP-241A Series
INSTRUCTION MANUAL



Caution

(1) The application of voltage or current exceeding its maximum allowable value to the input terminals may result in instrument damage.

(2) The supply of power out of its allowable range may cause fire, electric shock or instrument failure.

(3) The content of this manual may subject to change without prior notice for product improvement.

(4) The manual is carefully prepared. However, if any question arises, or any mistake, omission or suggestion is found in the content of this manual, contact your nearest our sales agent.

(5) After read this manual, please keep it as anytime can see.

1. Outline

The Model AP-241A Series digital panel meter is an extremely small 4 1/2-digit meter used only for display, and satisfies the DIN size.

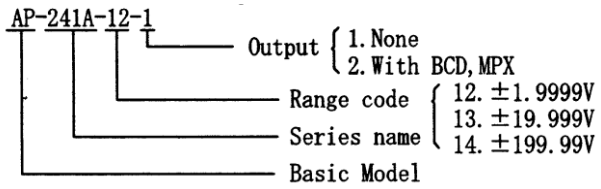
As its power supply voltage, both 5V DC and 24V DC are available. For both, input terminals are isolated from power supply terminals. And one measuring range code can be selected from among three measuring range codes depending on the measuring range. For A/D conversion, this meter employs the double integral method and has various functions such as differential input(for the range code of "-12")holding, etc.

2. Specifications

Model and Range codes	Measured range	Max. resolution	Input impedance	Max.allowable Input Voltage
AP-241A-12	±1.9999V	100μV	100MΩ	±100V
AP-241A-13	±19.999V	1mV	1MΩ	±250V
AP-241A-14	±199.99V	10mV	10MΩ	±500V

Accuracy:±(0.03% of rdg +1digit)(23℃±5℃ 35 to 85% RH)

■Model NO. Configuration



3. Common Specifications

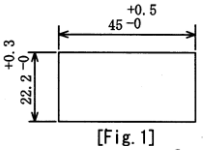
Measurement function	: Spcify one Model from among 3 DC voltage measurement models.
Operation method	: Double integral
Input type	: Differential input (For the "12" range code) Single-ended type (For the "13" and "14" range codes)
In-phase voltage	: MAX±1V(For the "12" range code)
Input bias current	: 100pA(TYP.)
Sampling speed	: 2.5 times/sec.
Noise rejection ratio	: NMR 50dB(TYP)(50/60Hz)
Maximum display	: 19999
Overrange warning	: "0000" flashes for input signal exceeding the maximum display.
Display	: Red LED numeric elements character height -8mm
Polarity	: Automatic polarity selection.
Polarity display	: "-"is automatically displayed for negative input signal.
External control	: External hold:Negative signal of 0V or contact signal.(short) External start:Positive pulse from 0V to +5V for more than 1 ms or contact signal.(open)
Decimal point	: Settable to any position.
Operating tenparature/ humidity range	: 0 to 50℃ 35 to 85%RH(No dew-condensing)
Power supply	: 5V DC ±5%
Power consumption	: 65mA(TYP.)
Dimensions	: 48mm(W)×24mm(H)×73mm(D)
Weight	: Approx. 55g
Dielectric strength	: Between input terminal(LO)and mounting panel,For 1 min. at 1500V AC
Data output	: BCD multiplex
Accessories	: Instruction manual 1 copy

4. Operation

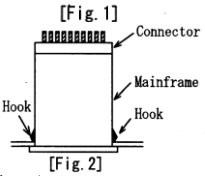
4-1 Mounting

1) Mounting the meter on panel

Make the panel cutout as shown in Fig.1, then insert the meter into the panel through the panel cutout as shown in Fig.2. (Recommended panel thickness:0.8 to 3.5mm)



[Fig.1]



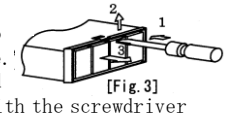
[Fig.2]

2) Removing the meter from the panel surface

Hold the hooks shown in Fig.2 with the thumb and middle finger, then push them in the mainframe. Push the mainframe out of the panel cutout from the back toward the panel front.

3) Removing the internal circuit board from the case

Lightly rotate a screwdriver inserted in the hole at the bottom of the mainframe to remove the front meter panel from the case. Next, disconnect the connector, then expand the case front in the up and down direction with the screwdriver inserted in the gap between the LED display and case as shown in Fig.3 to disengage the hook from the internal circuit board. Thus, the internal circuit board can be pulled out of the case by pushing it from the back toward the front.



[Fig.3]

4-2 Connecting connector

Connect the attached input/ output connector to the rear of the panel meter.

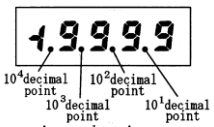
As this connector touches on one side, do not turn upside down.

1) Connecting the power supply

Connect the power between the No.9(0V)and No.10(+5V)terminals of the vonnecto. Use a power supply voltage of 5V DC±5%.(As this meter is not provided with a power switch, it is ready to operate when the power is connected.)This meter has not a built-infuse.

If a fuse is required for safety, externally connect the fuse with a rating current of 0.2A.

2) The position of the decimal point can be freely set by shorting the following terminals of the connector. The decimal point is not set to any position prior to factory shipment. Therefore, set the position of the decimal point as desired at the site.



Decimal point to be lit	Connector terminal Nos. to be shorted
10^1	5－3
10^2	6－3
10^3	7－3
10^4	8－3

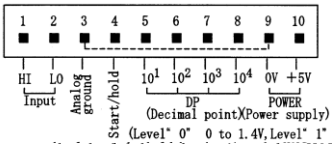
3) Connecting the input

For the signal-ended input type, connect the input signal between HI(1) and LO(2) for each range, and also connect the LO terminal to the analog ground terminal(3) at one point on the signal source side.

In order to lessen the effect of noise, use a 2-core shielded cable, and connect the LO terminal to the analog ground terminal, then connect the shielding wire to the analog ground terminal. The DC voltage range(range code:"12")can also be used for differential input. In this case, connect input signal E1 between the HI(1) and analog ground(3) terminals and also E2, between the LO(2) and analog ground(3)terminals to measure differential input voltage E1-E2=Ei. For input signal connection, use a 2-core shielded cable and connect the shielding wire to the analog ground terminal. Use the LO terminal at in-phase voltage between -1V and +1V with respect to the analog ground.

Never apply any voltage exceeding the maximum allowable voltage between the input(HI or LO) and analog ground terminals.

■Connecter diagram



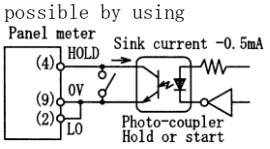
4) Start/hold

The displayed value can be held by shorting the HOLD terminal with the COM terminal, or by setting the HOLD terminal to level"0".

Measurement also starts by opening these terminals or by setting the HOLD terminal to level"1" at the necessary timing. The minimum time required for one measurement [positive pulse from 0V to +5V for more than 1ms or contact signal(open)]is approx. 400ms.

As the input(LO)and 0V power (NO.9 terminals of this meter are connected each other, and thus they are not DC-separated and isolated, performcontrol as much as possible by using Mechanical contact signal such as relay, switch,etc. When performing control by using TTL or transistor, externally add such a circuit as shown in Fig.4.

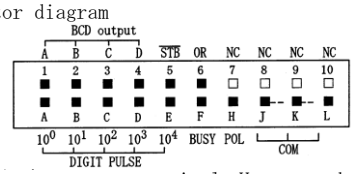
(For floating input, this circuit Is always required for isolation.)



[Fig.4]

5. Multiplex BCD outout optional(upper connector)

■Connector diagram



⚠Cation

NC indicates a vacant terminal. However, do not use it as junction terminal.

1)BCD output

A/D converted data is output as a 4-bit parallel multiplex signal. Each bit expressed by binary-coded decimal code 1,2,4 or 8 corresponds to A(No.1),B(No.2),C(No.3) or D(No.4). In addition, the data is time-shared for each digit and is output synchronously with each digit signal(DIGIT PULSE)in the order of D5(10^4-digit),D4(10^3-dight),D3(10^2-digit),D2(10^1-digit)and D1(10^0-digit). This output corresponds to CMOS buffer IC output. TTL level fan-out 2 is possible, but take much care of waveforms distorted by electric capacity, or the mixture of noise when the data wiring needs to be extended.

2)DIGIT PULSE output

This is a synchronizing digit pulse signal corresponding to BCD multiplex data(A,B,C and D, 4bits) and is output in the order of D5(10^4-digit),D4(10^3-dight),D3(10^2-digit),D2(10^1-digit)and D1(10^0-digit).

TTL level fan-out 2.

3)OR

Usually, logic" 0". Logic" 1" is output when overflow occurs.

TTL level fan-out 2.

4)POL

Logic "1" at (+) input voltage.

TTL level fan-out 2.

5)STB

The STB signal synchronizes with DIGITAL PULSE and is output only once.

TTL level fan-out 2.

6)BUSY

The BUSY signal is a signal to express the integrating period of A/D conversion. The pulse width changes depending on the input voltage.

TTL level fan-out 2.

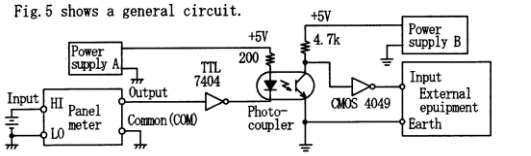
6. Application

6-1 Output circuit application

If no potential exists in the earth line of external equipment which becomes the load connected between the output common(COM) and output terminals of the panel meter with the measured signal grounded at one point, no isolation is required, but if the wiring is extended or earth current flows, isolation is required.

If the measurd signal is floating output and common made voltage exists in the earth of external equipment connected to the output common terminal, the circuit should be isolated. For multiplex outputs, isolation is required for 4 BCD outputs, 5 DIGITAL PLUSE outputs, STB side, BUSY signal, polarity signal, OR signal and hold circuit.

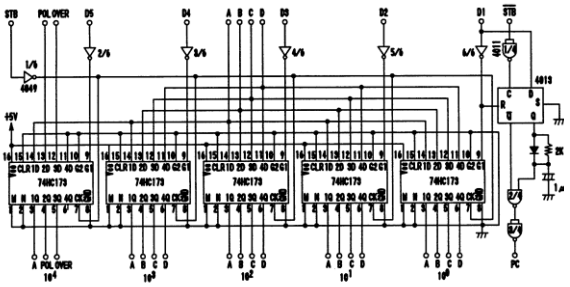
Fig.5 shows



Note:Power supplies A and B should be DC separated and independent.

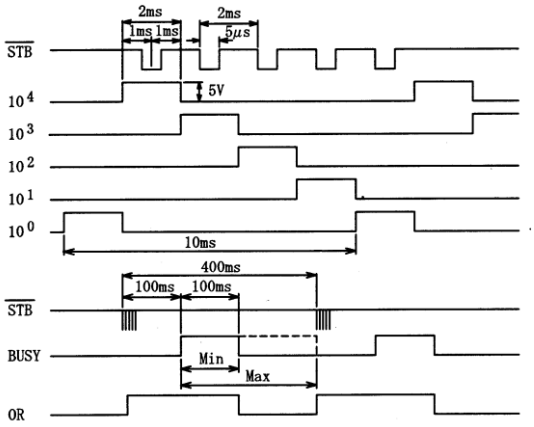
[Fig.5]

6-2 Parallel data conversion circuit of pultiplex output



[Fig.6] Multiplex output-parallel data conversion circuit

Timing chart



STB: Only 5 pulses are output in one sampling.

BUSY length: 100ms min. and 300ms max.

7. Maintenance and inspection

7-1 Precautions for maintenance

Store the meter at a storage temperature of -10℃ to +70℃ and a relative humidity of less than 60%.

If the meter is used at a dusty location occasionally pull the internal circuit board out of the case, then remove dust accumulated on it.

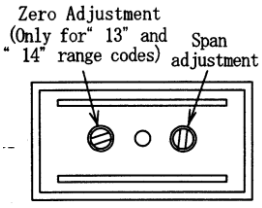
(The span of meter life may shorten if the temperature on internal parts rises.)

As the case is molded by plastics, do not remove stains from the case surface using volatile oil such as thinner.

7-2 Calibration

◎In order to keep the original accuracy for a long time, it is recommended that the meter be periodically calibrated. If this meter is calibrated, standard generating equipment with an accuracy of 0.01% or more is required.

◎For calibrate this meter as follows.



(1)Remove the front panel from the meter,

(2)Connect the power to the meter to warm up the meter for more than 20 minutes, then adjust the meter.

(3)Zero check and adjustment

Short the HI/LO and analog ground terminals, then check that the display shows 0000.

For the "13" or "14" range code, the zero adjuster is provided.

Therefore, if the zero point deviates, turn the zero adjuster until the display shows 0000.

(4)Span adjustment

Apply the voltage with the +polarity corresponding to the fullscale(19900)to the input terminals, then turn the span adjuster until the display shows +19900.

Next, apply voltage with -polarity, then check that the display shows -19900±(0.03% rdg ±1digit).

8. Warranty

This meter is warranted for a period of one year from date of delivery. Any defect which occurs in this period and is undoubtedly caused by Watanabe Electric Industry faults will be remedied free of charge.

This warranty dose not apply to the meter showing abuse or damage which has been altered or repaired by others except as authorized by Watanabe Electric Industry.

9. After-sale service

This meter is delivered after being manufactured, tested and inspected under strict quality control.

However, if any problem does occur, contact your nearest Watanabe Electric Industry sales agent or Watanabe Electric Industry directly giving as much information on problem as possible.

watanabe
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