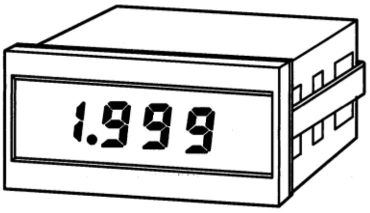
DIGITAL PANEL METER
MODEL AP-310 Series
INSTRUCTION MANUAL



⚠ 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. Introduction

AP-310 Series Digital Panel Meter is a reliable 3-1/2 digits display utilizing LSI, with its outer dimension of 36mm ×72mm complying with the DIN Standard.
Wide range of AC power supply may be used by switching jumper cables : from 90V to 132V and from 180V to 264V. Display uses a large LED numeric element (14.2mm high). Four voltage measuring ranges and five current measuring ranges are available, and user may select a desired measuring range (by switching an internal socket). Dual slope is adopted as the measuring method. Features such as automatic zero adjustment, automatic polarity change and holding are available at low impedance and low bias voltage.

2. Specification

■DC voltage measurement

Model No.	Measuring Range	Max. Resolution	Input impedance	Allwable Max. Input Voltage
AP-310-11	±199.9mV	100μV	100MΩ	±250V
AP-310-12	±1.999V	1mV	10MΩ	±250V
AP-310-13	±19.99V	10mV	10MΩ	±250V
AP-310-14	±199.9V	100mV	10MΩ	±500V

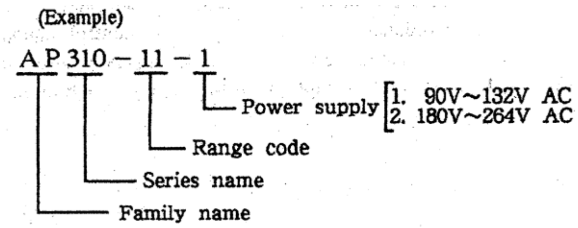
Accuracy±(0.1% of rdg +1digit)(23℃±5℃,35 to 85%RH)

■DC current measurement

Model No.	Measuring Range	Max. Resolution	Input impedance	Allwable Max. Input Current
AP-310-21	±199.9μA	100nA	1kΩ	±10mA
AP-310-22	±1.999mA	1μA	100Ω	±50mA
AP-310-23	±19.99mA	10μA	10Ω	±150mA
AP-310-24	±199.9mA	100μA	1Ω	±500mA
AP-310-25	±1.999A	1mA	0.1Ω	±3A

Accuracy±0.2% of rdg +1digit(23℃±5℃)
Only for AP-310-25 ±0.3% rdg +1digit

■Model No. Configuration



3. General Specifications

Measurement function	: Specify one Model No. out of nine DC voltage measurements(a desired range selectable with switching an internal socket)and DC current measurements.
Operation method	: Dual slope
Input circuit	: Automatic zero circuit
Input bias current	: 50PA(typical)
Sampling speed	: 2.5 times/sec
Noise rejection ratio in normal mode	: 40dB(typical)(50/60Hz)
Max. digit	: 1999
Overrange warning	: For input signal exceeding maximum display, 10^0 to 10^2 digits are blanked and 10^3 digit illuminates "1" or "-1"
Display	: LED numeric elements. Character height:14.2mm (red)
Polarity	: Automatic polarity change
Polarity display	: The display shows "- " automatically when input signal is negative
External control	: Hold; Negative 0V Siganl or contact signal. Start; Positive 5V pulse from 0V for more than 400ms or contact signal.
Decimal point	: Any decimal-point position is settable.
Operating	: 0 to 50℃
Power supply	: 90V AC to 132V, 50/60Hz About 1.5VA(at 100V)
Dimensions	: 72mm(W)×36mm(H)×110mm(D) Main frame only
Weight	: Approx. 200g
Dielectric strength	: For AC; Between input (LO) and grounding (E) terminals DC±500V, Between power/input/grounding(E)/COM/relay output terminals for 1 minute at 1,500V AC, each
Insulating resistance	: More than 100MΩ at 500V DC between power and grounding (E) terminals.

4. Handling

4-1 Preparation Required Prior to Operation and General Precautions

1) Use this meter at ambient temperature of between 0 to 50℃ and in humidity of up to 85%. Do not expose the meter to dew condensation.
2) Use the meter only where there is no dust or chemicals and gases harmful to electrical components and parts.
3) Do not subject the meter to vibration and shock.
4) Noise
 a) Power circuit
 As it is very difficult to build a complete noise rejection circuit into a small device such as this meter, use a surge absorption circuit such as an external line filter, varistor to prevent excess surge when using it on the same power line as magnet switches and/ or where lightening occurs frequently.
 b) Shield
 When noise causes a problem, connect the E terminal to the earth or grounding terminal. If air induction causes a problem, enclose the molded mainframe case in a metal case.

4-2 Mounting

1) Panel mounting
 Make a panel cutout as shown in Figure 1, insert the mainframe into the panel from the front of the panel and then tighten the mainframe with a band from the rear.

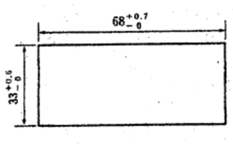


Figure 1

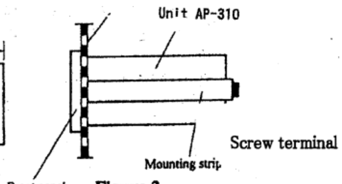
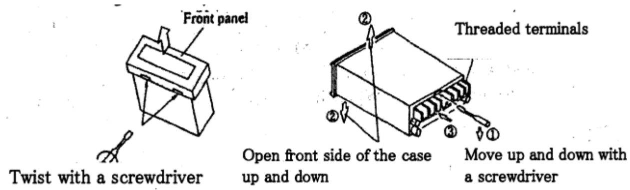


Figure 2

2) Pulling out the internal assembly
 Insert a screwdriver into each of rectangular holes at the bottom of the mainframe to force out the inner front panel. Inserting a screwdriver into holes of threaded terminals on the rear side, gently move the terminals up and down to widen front side of the case and push the threaded terminals from the rear side. (Refer to the figure below)



4-3 Terminal connection

1)Power connection

Connect the power wires to Terminal 7 or 8 on the connector. Use power supply from 90V to 132V AC, and voltages from 180V to 264V AC can be used by internal jumper selection. (Since this meter is not provided with a power switch, it is ready to operate as soon as it is connected to a power supply.)

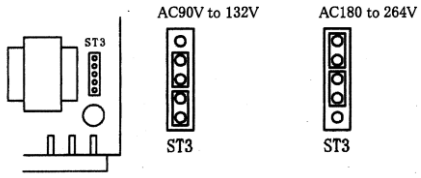
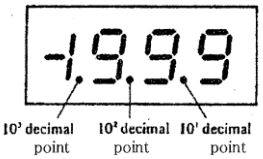


Figure 4 Change of power supply

2)Setting of decimal point

To set the decimal point, remove the front panel and insert a left stud pin to a desired digit number using the short-circuit socket. Since this meter is calibrated so that decimal points are not illuminated, select a desired decimal point.

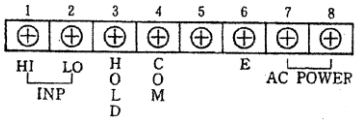


Illuminated decimal point	Silk stamp
10^1	1
10^2	2
10^3	3

3)Input signal connection

Connect the input signal (DC voltage or current) between Terminals 1 and 2. Use 2-core shielded cable and connect its outer sheath to a signal source at one point on the LO side. When high-frequency noise is superimposed, connect the terminal E to the earth or housing of the meter.

・Connector Connection Diagram



Note: Input Lo and COM have a same potential.

4)Hold and start

Shorting the HOLD (No.3) and COM (No.4) terminals holds the compared result and the value just befor shorting.

Also, opening the above terminals starts measurement.

Minimum time required for measuring (positive +5V pilse from 0V for more than 400ms) is about 400ms.

Since the input terminal (LO) and COM terminal of this meter are connected but not separated and insulated against DC current/ voltage, control these terminals with a mechanical relay switch such as a relay switch as far as possible. When controlling them with TTL or transistor, mount the circuit shown in Figure 3 externally. (Insulate the circuit when input signals float.)

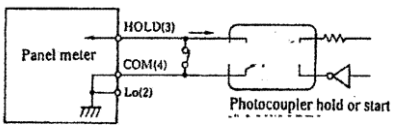


Figure 3

5)Common terminal

This is a terminal (No.4) common to digital circuits.

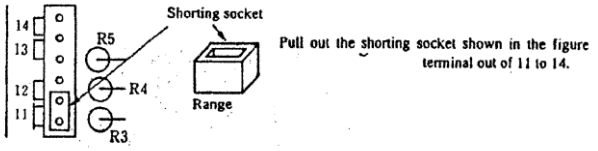
Although connected internally with the input LO terminal, do not connect this terminal to a digital circuit as it may cause a measurement error.

6)Earthing terminal

The earthing terminal (No.6) is connected to the input LO terminal and common terminal through capacitors of 4700PF and 500V dielectric strength. When the meter is influenced by external noise, connect the earthing terminal E to the ground or housing of the meter.

7)Range Selection

Any range can be selected. Pull out the internal assembly in accordance with item 4-4-2) and change the shorting socket on the connector as shown in the figure below.



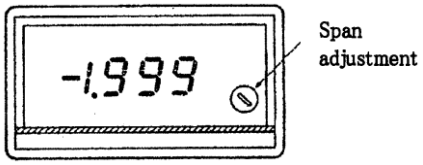
Shorting socket on rear side of internal assembly

When the range is changed, always conduct calibration in accordance with item 5-2.

5.Maintenance and Inspection

5-1 Cautions in maintenance

Store the meter where ambient temperature is from −10℃ to +70℃and humidity is less than 60%. When it is used at a dusty location, occasionally pull out the internal assembly from the case to remove the dust on the assembly. (temperature rise on internal parts may shorten service life.) Do not wipe the mainframe case with thinner, etc. to remove dust since they are made of molded plastic.



5-2 Calibration and Scailing

◎In order to maintain the initial accuracy for a long time, it is recommended that periodic calibration be conducted. Note that a standard instrument with an accuracy of more than 0.01% is required to calibrate this meter.

◎Conduct calibration as follows

(1)Remove the front panel from the meter.

(2)Connect the power to warm up the meter for more than 10 minutes, then adjust the meter.

(3)Zero adjustment

Short the HI and LO input terminals. Then, turn the zero adjustment VR until the display shows 000.

(4)Span adjustment

Apply voltage or current corresponding to full scale (1990)., then turn the span adjustment VR until the display shows 1990. Next, apply voltage with minus polarity to check that the display shows -1990±(0.1% of rdg +1 digit)

6.Warranty

Any trouble which occurs in one year following the delivery of this meter due to our fault is covered by the warranty free of charge to user.

7.After-care Service

Prior to shipment from our factory, the meter is manufactured, tested and inspected in accordance with our strict quality control standards.

Should any fault occur, contact our local representatives or direct to our head office in Japan. (Specify symptoms of the fault as much in detail as possible.)

watanabe
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