



Non-Linear Systems

PM-349 3½-Digit DIGITAL PANEL METER



INSTRUCTIONS

The PM-349 Digital Panel Meter is a three and one-half digit, fixed range instrument with automatic polarity.

The meters are available in any one of five ranges: 200mV, 2 Volts, 20 Volts, 200 Volts, or 1000 Volts.

Except for the 200 millivolt range, modification from one range to another may be easily accomplished by the substitution, addition, or deletion of one or two resistors. Calibration is readily accomplished by the adjustment of one potentiometer, accessible at the rear of the instrument. For operation, an external +5Vdc. +/-5% power supply is required. See figure 1 for a typical power supply circuit.

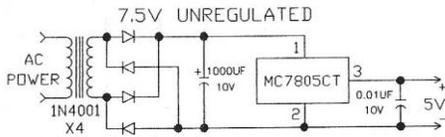


Figure 1. Typical Power Supply Schematic

SPECIFICATIONS

Range: 0 to 200 mV
0 to 2 Volts
0 to 20 Volts
0 to 200 Volts
0 to 1000 Volts

Accuracy: +/- (0.05% Rdg. + 0.05% F.S.)

Update Rate: 3 readings/second nominal

Display: 0.3" high LED

Operating Temp: 0°C to +50°C

Power: +5 VDC +/-5% @ 200mA, max.

Size: 15/16" H x 2-1/2" W x 3-1/2" D
(23.8 mm H x 63.5 mm W x 82.6 mm D)

Weight: 4 oz (113 grams)

T/C: +/-0.02% Rdg/°C on 200 mV & 2V ranges;
+/-0.025% Rdg/°C on other ranges.

Input Z: 200 mV range, 100 MOhms; 2V range, 1000 MOhms; 20V range, 1MOhm; 200V & 1000 V ranges, 10 MOhms

Common-Mode Rejection: 80 db min.

Common-Mode Compliance: +/-100mV between SIG LO & Power Ground of +5V supply.

Decimal Location: May be positioned by jumper on connector to any one of three locations: **+/-X . X . X . X**

Input Current (two lower ranges): 250 pA maximum (room temp.)

Input Voltage Protection: +/-50VDC or 50 VRMS maximum, 200mV or 2V ranges; +/-150 vdc or 150 VRMS maximum, 20V range; +/-1000 VDC or 700 RMS maximum, 200V & 1000V ranges.

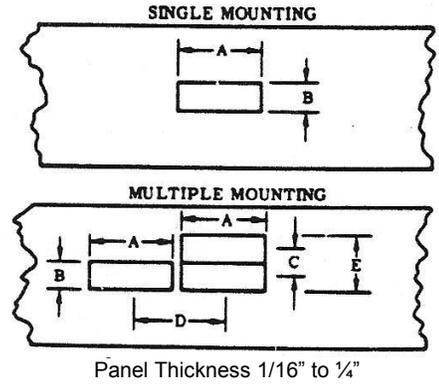
Overload Indication: Positive overload: 1, negative overload: -1 is displayed for inputs exceeding full scale.

Installation

1. Mount the PM-349 as follows:

- Cut hole in panel (figures 3 and 4).
- Slide trim plate over PM-349 housing, facing beveled edge of trim plate forward.
- Insert PM-349 through the cut-out in panel from front of panel.
- Fit mounting clips (2) into slots at sides of instrument. foot of clip should face forward.
- Thread screws (2) into clips & tighten screws against rear surface of panel.

2. If you have purchased the NLS connector P/N N39-195, or equivalent, see **Table 1** for connector pin information.



	Panel Cutout w/Trim Plate	Center Line without Trim Plate	Center Line w/Trim Plate	Cutout For Multiple Mounting without Trim Plate
A	2 17/32			
B	31/32			
C		15/16	1 3/16 min	
D		3 1/8 min	3 1/8 min	
E				Number of units x 15/16

Figure 3. Mounting Data

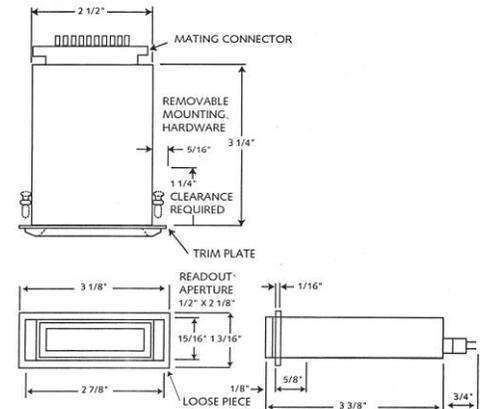


Figure 4. Outline Drawing

Operation

1. **Power Supply.** Connect the ground of the 5V supply to pin K and L of the connector and the positive side to pins 8 and 9.

2. **Signal.** Connect the signal to be measured to pin H of the connector. A shielded lead may be needed if the signal has a high source resistance. Connect the low side of the signal to pins 5 and K of the connector. It will usually be better to do this with two separate wires rather than a jumper across 5 and K at the connector. This will eliminate current flow through the signal low connection to pin 5.

**Table 1
Connector Pin Information**

Pin No. (Top of Board)	Pin Letter	Pin Letter	(Bottom of Board)
DEC COMMON	1	A	LAMP TEST
N/C	2	B	10° DEC POINT
N/C	3	C	10 ¹ DEC POINT
N/C	4	D	10 ² DEC POINT
SIGNAL LO	5	E	N/C
N/C	6	F	N/C
N/C	7	H	SIGNAL HIGH
DISPLAY ENABLE	8	J	N/C
+5V POWER	9	K	>POWER GROUND
N/C	10	L	

3. **Polarity Display.** Polarity indication with a negative sign on negative signal input. Positive readings are implied.

4. **Decimal Indicator.** If a decimal point is desired, connect pin 1 with pins B, C or D depending upon which decimal point is to be illuminated. See below.

Decimal Location **+X . X . X . X**
Connector Pin **D C B**

5. **Connector.** Plug connector onto P/C fingers at rear of PM-349. Align connector so the keying tab mates with the slot in the P/C board.

6. **Readings.** Apply power and signal. Within 10 seconds the PM-349 will display the correct reading.

7. **Lamp Test.** Connecting pin A to a "high" logic level (+5V) causes the display to read -1888.

Calibration

1. Ensure a 5-minute warm-up period.

2. Verify the +5-volt power supply voltage. If necessary, adjust to +5V +/- 0.1V.

3. **200 Millivolt Meter.** With a precision DC power supply, apply +190.0 mVDC. Adjust potentiometer R4 at rear of meter until readout displays +1900.

NOTE:

As in paragraph 3 under Calibration, for a 2-volt meter, apply +1.900 VDC; a 20-volt meter, apply +19.00 VDC; a 200-volt meter, apply +190.0 VDC; and a 100-volt meter, apply 900 VDC.

Range Modification (Not 200mV unit)

1. Insert a small screwdriver or pen knife between case and rear cover, midway on case above printed circuit connector, and pry gently outward. Remove rear cover.

2. Slide panel meter assembly from case. Observe that red filter is now a loose piece and will be required for reassembly.

3. Observe resistor values that are in unit and compare to figure 5 and table II below. Install values of resistors as specified in table II to attain desired range.

4. If a decimal indicator is desired, refer to paragraph 4 under Operation.

5. Clean all solder joints and adjacent areas on printed circuit board to minimize leakage paths.

6. Reassemble unit by reversing steps 1 and 2.

7. A range modification resistor set covering the four higher ranges of the PM-349 is available from your distributor, specify NLS part number 39-356.

Table II. Resistor Values in Range Modification Kit

Range	R9	R10
2V	100KΩ ±5%	OMIT
20V	909KΩ ±1%	100KΩ ±1%
200V	10MΩ ±1%	100KΩ ±1%
1000V	10MΩ ±1%	10KΩ ±1%

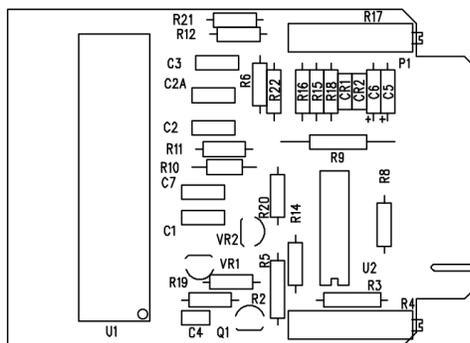


Figure 5. Component Location

Current Measurement

The PM-349 in the 200mV or the 2V range may be used to measure current. Because of the lower voltage drop, the 200mV range is preferred.

To measure current, install a shunt resistor in the R10 location or externally between SIG HI and SIG LO. Install a jumper in the R9 location.

Select the value of the shunt resistor from table III below. One-percent metal-film or wire wound resistors are recommended.

WARNING: This meter is frequently used on the high side of the current source to be measured. This arrangement may cause a short between the circuit high side and ground with possible damage to the meter and circuit. To prevent such a short, an isolated meter power supply is recommended.

Table III Shunt Resistor Values

Full Scale Current Range	Shunt Resistor for meter in 200mV Range
2mA	100 Ω
20mA	10 Ω
200mA	1 Ω
2Amps	0.1 Ω

Full Scale Current Range	Shunt Resistor for meter in 2V Range
2mA	1000 Ω
20mA	100 Ω
200mA	10 Ω
2Amps	1 Ω*

*Use external shunt only

Maintenance

To facilitate maintenance, all six integrated circuits plug in, and can be easily replaced without soldering. These include the four LED displays, the ICL7107RCPL IC, and the CD4049AE IC.

Specifications Subject to Change without Notice



Non-Linear Systems
Originator of the Digital Voltmeter

San Diego, CA
P: 619-521-2161
F: 619-521-2169
Email: sales@nonlinearsystems.com