Non-Linear Systems

PM-452
DIGITAL PANEL METERS

INTRODUCTION

The Model PM-452 is a highly accurate, four and one-half digit, fixed range, miniature digital panel meter with automatic polarity indication for making DC voltage measurements. DC current can also be measured using external shunt resistors. The instrument is available in any one of four ranges: 2V, 20V, 200V or 1000V F.S.

System accommodations include multiplexed BCD outputs, a busy/done output and a hold input. The instrument also has display enable and polarity enable capabilities.

Modification from any one range to another is easily accomplished by changing one or two resistors. Calibration is accomplished by adjusting a potentiometer accessible at the rear panel.

The PM-452 has a 0.3 inch high LED numeric readout. The readout also includes LED + and - polarity signs and decimal points for each decade.

An active filter at the signal input provides high normal -mode refection.

For operation, an external +5VDC ±5% power supply is required. See figure 1 for a typical power supply circuit.

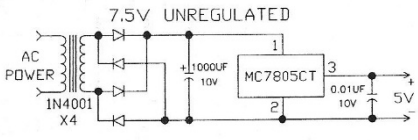


Figure 1: Power Supply Schematic

SPECIFICATIONS

RANGE: 0 to 2 Volts
0 to 20 Volts
0 to 200 Volts
0 to 1000 Volts

ACCURACY: ±0.02% F.S. (23° C ±2°)

SPEED: 3 Rdg/Sec, nominally

OPERATING TEMP: 0° C to +50° C

POWER: +5 VDC ±5% @ 140 mA, max.

DISPLAY: LED, red, 0.3" high

TURN ON TIME: 10 seconds to ± 0.05% accuracy

TEMPERATURE COEFFICIENT: ±(0.01% Rdg + 0.001% F.S.)/°C

INPUT Z: 2V range, 1000 MΩ; 20V range, 1 MΩ ; 200V and 1000V ranges, 10 MΩ

METHOD of A to D CONVERSION: Dual slope

SETTLING TIME: 2 seconds, including polarity change

COMMON-MODE VOLTAGE: SIGNAL LO may be anywhere in the range from -0.1V to +1V with respect to power supply common. Note that if the power for the meter is supplied from an isolated power supply, the effective common-mode voltage is the isolation voltage rating of the power supply.

COMMON-MODE REJECTION: 80 dB, min.

NORMAL-MODE REJECTION: 60 dB typical, 40 dB minimum @ 50-60 Hz

INPUT CURRENT: 250 pA, maximum

DECIMAL LOCATION: May be positioned by a jumper to any of four locations, **X . X . X . X . X**

INPUT VOLTAGE PROTECTION: ±100 VDC or peak VAC, 2V range; ±350 VDC or peak VAC, 20V range; ±1000 VDC or peak VAC, 200V and 1000V ranges.

OVERLOAD INDICATION: On all ranges except the 1000v range, an input exceeding full scale is displayed as four flashing zeros.

WEIGHT: Approximately 3 ounces

INSTALLATION

1. Mount the PM-452 as follows:

   a. Cut a hole in panel (Figure 2).

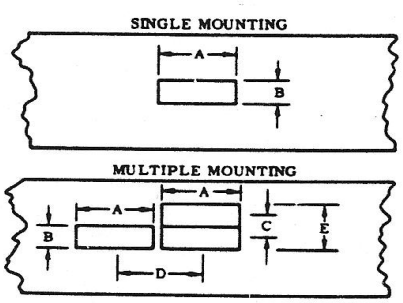
   b. Slide trim plate over meter housing, facing beveled edge of trim plate forward.

   c. Insert meter through opening in panel form front of panel.

   d. Fit mounting clips (2) into slots at sides of instrument. Foot of clip should face forward.

   e. Thread screws (2) into clips and tighten screw against rear surface of panel.

2. The optional connector should be NLS part number **39-195**, or equivalent. See Figure 3 for connector pin information.



Panel Thickness 1/16" to ¼"

	Panel Cutout w /Trim Plate	Center Line w ithout Trim Plate	Center Line w /Trim Plate	Cutout For Multiple Mounting w ithout 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

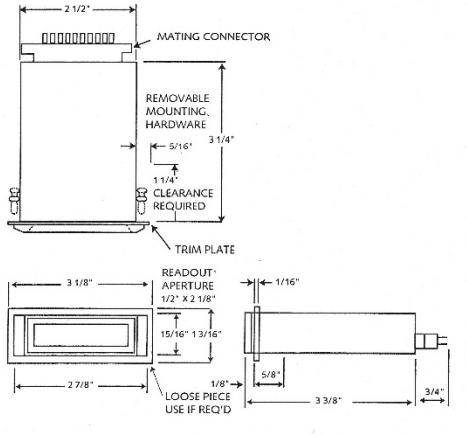


Figure 2. Outline Drawing

OPERATION

POWER AND SIGNAL CONNECTIONS

1. Connect power supply common to pins K and L on the edge connector.

2. Connect +5VDC power to pin 9.

3. Connect the DC voltage to be measured to pin 5 and H of the connector (SIGNAL HI to pin H and SIGNAL LO to pin 5).

NOTE:

In an electrically noisy environment it may be desirable to use a shielded lead for this connection. If a shielded lead is used, the shield should be connected to SIGNAL LO of the DC voltage to be measured.

4. Connect the negative terminal of the power supply to SIGNAL LO of the DC voltage to be measured. For maximum accuracy and stability, this connection should be made at the source and not on the connector.

5. Polarity is enabled from factory. To remove the polarity sign, remove R2 (see figure 4).

6. Connect pin 8, display enable, to pin 9 (+5VDC).

7. Decimal Point indication if desired is connected from pin 1 (Decimal Common) to pin A, B, C or D depending upon which decimal point is to be illuminated.

Decimal Location: X . X . X . X . X
Connector Pin: D C B A

If decimal point is not desired, omit the jumper.

Top of Board		Bottom of Board
Dec Com	1	A 10° DEC/Enable
Busy/Done	2	B 10^1 DEC/Enable
Hold	3	C 10^2 DEC/Enable
Polarity	4	D 10^3 DEC/Enable
SIGNAL LO	5	E BCD 1
BCD 4	6	F BCD 8
BCD 2	7	H **SIGNAL HI**
Display Enable	8	J Digit 5 Enable
+5 VDC Power	9	K Power Ground
N/C	10	L Power Ground

Figure 3. Connector Pin Wiring

HOLD FUNCTION: Pin 3 is a control input for the reading hold function which can be controlled from either a logic level (0V or +5V) or a contact-closure. A low logic state or contact-closure to ground will cause the meter to cease making measurements and hold the reading of the measurement on progress. A high logic level or open contacts will cause the meter to resume repetitive measurements.

DISPLAY DIMMING AND BLANKING: The display and polarity enable functions are used for dimming and blanking the display by controlling the supply voltage to the readouts. Connecting pin 8, the display enable function, to pin 9, the +5VDC supply, illuminates the numerals at full brightness. Polarity enable is provided separately so that polarity sign can be blanked (remove R2) for measurements having no polarity. The entire readout can be dimmed to any convenient brightness by connecting a resistor or rheostat between the +5VDC power (pin 9) and the enable line (pins 8).

BINARY CODED DECIMAL (BCD) OUTPUTS: The 1, 2, 4, and 8 multiplexed BDC outputs are available on connector pins E, 7, 6 and F, respectively. When digit 5 enable (pin J) goes to a "low" logic level (zero), the 1, 2, 4 and 8 BCD outputs represent digit 5, the most significant digit. When digit 4 enable (pin D) goes "low", the BCD outputs represent digit 4 and so on, to the least significant digit. For connector pin information refer to Figure 3. Digits are scanned from most significant to least significant digit. Each digit goes "low" for approximately 1-2/3 milliseconds, and there is no gap between successive digit enables except when the meter goes into overload. For the BCD outputs, "high" = true = +5VDC.

BUSY: (pin 2) When the meter is in the process of making a measurement, the "busy" output is "high" (+5VDC). When the measurement is completed, the "busy" output goes "low" (0V).

POLARITY OUTPUT: When the polarity of the input signal is positive, pin 4 goes "High" (+5V). When the polarity of the input signal is negative, pin 4 goes "Low". This output becomes valid at integrate and remains correct until it is re-validated for the next measurement. It is valid when the "busy" output is low.

RANGE MODIFICATION

The range of the meter can be changed as follows:

1. Insert the blade of a small screwdriver between case and rear cover, midway on case above printed circuit connector, and pry gently outward. Remove rear cover.
2. Slide meter assembly form case. Observe that read filter is a loose piece and will be required for reassembly.
3. Observe resistor values for R4 and R6 and compare to Table I and Figure 4. Install resistors of values specified in Table I to obtain desired range.
4. If a decimal point is desired, refer to instruction 7 under "Operation".
5. Clean all solder joints and adjacent areas on printed circuit board to minimize leakage paths.
6. Reassemble meter.
7. A range modification resistor set for PM-452 is available from your distributor, specify **NLS** part number **39-356.**

TABLE I: RANGE RESISTOR VALUES

Range	R4	R6
2 V	JUMPER	OMIT
20 V	909 KΩ 1%	100 KΩ 1%
200 V	10 MΩ 1%	100 KΩ 1%
1000 V	10 MΩ 1%	10 KΩ 1%

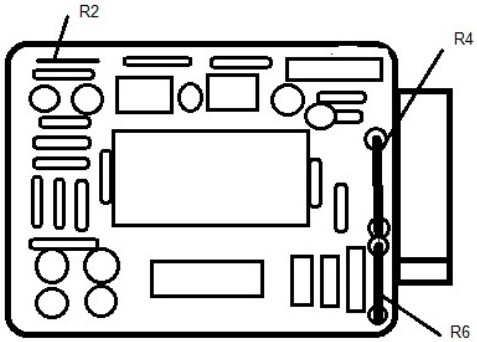


Figure 4. Component Location

CALIBRATION

To calibrate the instrument, perform the following steps:

1. Allow the meter to warm up for at least five minutes.
2. Set the power supply voltage to +5V ±2%.
3. Apply DC input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
2 V	+1.9990 V
20 V	+19.990 V
200 V	+199.90 V
1000 V	999.0 V

4. Adjust potentiometer at rear of meter until display agrees with input.
5. Disconnect calibration voltage and power supply input.

CURRENT MEASUREMENT

DC current measurements can be made using an externally mounted shunt resistor. Use meter in the 2 Volt range and connect shunt resistor between pins 5 and H of the edge connector.

If the current being measured enters pin 5 and exits from pin H, the polarity displayed will be positive.

The value of the shunt resistor should be chosen as set forth in table II. Note that at full scale, the voltage drop across the shunt resistor is 1.9999 Volts. The measuring circuit should be carefully examined to insure that this voltage drop does not introduce excessive error into the measurement.

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 II: SHUNT RESISTOR VALUES for Current Measurement

FULL SCALE CURRENT	SHUNT RESISTOR
20 μA	100 KΩ
200 μA	10 KΩ
2 mA	1 KΩ
20 mA	100 Ω
200 mA	10 Ω
2 A	1 Ω

MAINTENANCE

Due to the solid-state construction and 100% test and calibration of your PM-452 is an extremely reliable instrument. However in the event of trouble, the LED readouts and the major integrated circuit are plug-in. They can be easily replaced without soldering.

Specifications Subject to Change without Notice

NON-LINEAR SYSTEMS

Originator of the Digital Voltmeter

San Diego, CA
Phone: (619) 521-2161
Fax: (619) 521-2169
Email: *sales@nonlinearsystems.com*

11-15