



PM-45L

±0.01% Precision Panel Meter with Differential Input 200PPM/°C

PM-45LU

±0.02% Precision Panel Meter with Differential Input 50PPM/°C

High Accuracy LED Meters with 10mV Resolution, True Differential Inputs

General Features

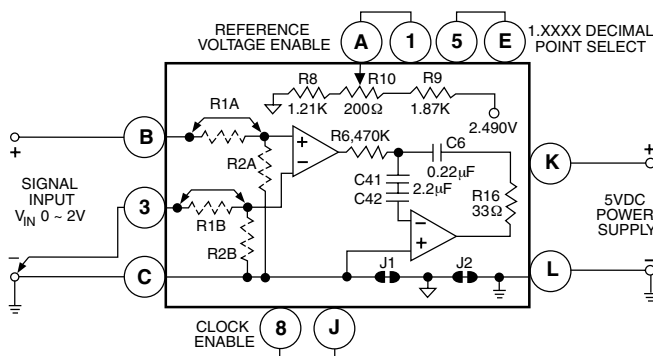
The PM-45L and PM-45LU are truly unique and extremely versatile instruments. They offer more high performance features than most larger and more expensive DPM's.

Both meters incorporate a crystal controlled 100KHz clock that provides an exceptionally high normal mode rejection of 120dB at multiples of 50/60Hz. Bipolar differential and single-ended DC voltages from ±199.99mV to ±1200.0V full scale can be measured and scaled in almost any known engineering unit. Provision has been made for signal offsetting and the capability of attenuating both high and low signal inputs. Resolution is 10µV over ±19999 counts, and errors due to zero drift are virtually eliminated by autozeroing. Other modes of operation, selectable by the user, include an ohmmeter mode, current meter mode and ratiometric mode.

Typical Application Connections

SINGLE-ENDED METER - <2V RANGE

- Standard 2V Full Scale Range single-ended voltmeter is shown. R1A and R1B are shorted by jumpers and R2A and R2B are not installed.
- Connect Pin 3 to the nearest end of the signal source ground to avoid possible errors caused by ground loop currents.



View more application connections and connection instructions on page 3.

Specifications

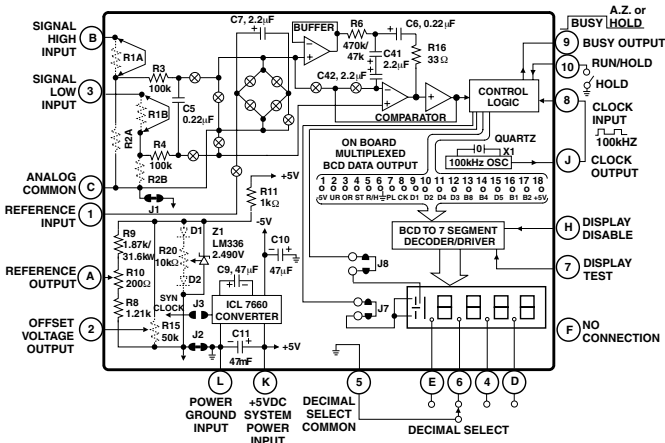
- Input Configuration:..... True differential and single-ended
- Full Scale Ranges: ±199.99mVDC
 ±1.9999VDC (standard)
 ±19.999VDC
 ±199.99VDC
 ±1200.0VDC (maximum input signal, higher voltages can be measured if voltage dividing resistors are located externally)
- Input Impedance:..... Exceeds 1000MΩ on 200mV and 2V ranges; 10MΩ on all other ranges
- Input Protection:..... ±170VDC or 120VAC on 200mV and 2V ranges; ±1200VDC or 850VAC on all other ranges
- Accuracy:..... 45L: ±(0.01% of reading + 1 count) ±(0.015% of reading + 2 counts) for 200mV range.
 45LU: ±0.015% of reading + 2counts ±(0.02% of reading + 3 counts) for 200mV range.
- Temperature Coefficient: 45L: 5PPM/°C in ratiometric, 200PPM/°C using internal adjustable T.C. reference.
 45LU: 5PPM/°C ratiometric, 50PPM/°C using internal reference.
- Warm Up Time:..... 10 seconds to specified accuracy
- Conversion Rate: 2.5 readings per second
- Display:..... 0.4" LED
- Overrange Indication: When input exceeds full scale on any range being used, most significant "1" digit & polarity symbol are displayed with all other digits blank
- Power Requirements:..... Low Ripple +4.5 to +5.5VDC at 225mA
- Operating Temperature:..... 0° to +60°C
- Storage Temperature:..... -20° to +70°C
- Relative Humidity 95% (non-condensing)
- Case Dimensions:..... Bezel 2.76" x 1.17" (69.75 x 29.7mm)
 Depth behind Bezel 3.32"(84mm) plus 0.68" (17.27mm) for connector.
- Weight: 88 gms (3.1 oz)

PM-Series, high performance versatility for a wide range of applications

PM-35A..... 3.5 digit Red LED, Precision Preference, 2VDC, 5VDC Power
 PM-35U..... 3.5 digit Red LED, Low Cost, 2VDC, 5VDC Power
 PM-35X..... 3.5 digit LCD, Low Power Consumption 2VDC, 5VDC Power
 Replaced by SM-35X

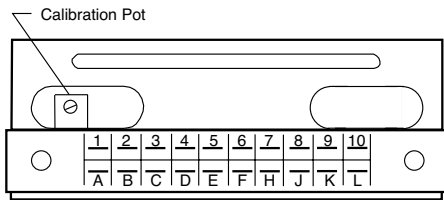
PM-45L..... 4.5 digit Red LED, Precision Meter w/Differential Input
 PM-45LU 4.5 digit Red LED, Low Cost Meter w/Differential Input
 PM-45X 4.5 digit LCD, Precision Meter w/Differential Input
 PM-45XU..... 3.5 digit LCD, Low Cost Meter w/Differential Input

Functional Diagram



Connector Pinouts

The Texmate Model PM-45L/PM-45LU is interconnected by means of a standard PC board edge connector having two rows of 10 pins, spaced on 0.156" centers.



Component Side	Solder Side
REFERENCE INPUT 1	A REFERENCE OUTPUT
OFFSET VOLTAGE OUTPUT 2	B SIGNAL HIGH INPUT
SIGNAL LOW INPUT 3	C ANALOG COMMON
DECIMAL SELECT (1XX.XX) 4	D DECIMAL SELECT (1XXX.X)
DECIMAL SELECT COMMON 5	E DECIMAL SELECT (1.XXXX)
DECIMAL SELECT (1X.XXX) 6	F NO CONNECTION
DISPLAY TEST 7	H DISPLAY DISABLE
CLOCK INPUT 8	J CLOCK OUTPUT
BUSY OUTPUT 9	K +5VDC SYSTEM POWER INPUT
RUN / HOLD 10	L POWER GROUND INPUT

CAUTION: This meter employs high impedance CMOS inputs. Although internal protection has been provided for several hundred volt overloads, the meter will be destroyed if subjected to the high kilovolts of static discharge that can be produced in low humidity environments. Always handle the meter with ground protection.

Pin A - Reference Output: Internal precision voltage reference. Standard output is 1.0000V, adjustable $\pm 5\%$ by R10 potentiometer. Usable voltages from 0.1V to 2.49V for special high impedance scaling can be obtained by changing the value of internal dividing resistors R8 and R9. The primary reference voltage of the PM-45L is trimmed by potentiometer R20 to obtain the optimum compensated temperature coefficient. This temperature compensation network is omitted on the PM-45LU utility meter.

Pin B - Signal High Input: Pin B is the signal high input for all input signal ranges. When attenuation is not required, the resistor position R1A must be shorted by a jumper. Dividing resistors may be mounted internally in R1A and R2A positions to attenuate voltages up to 1200V max.. Matched dividing resistors for the 20V (1/10), 200V (1/100) and 1200V (1/1000) ranges are available from Texmate. Shunt resistors for current measurements up to 200mA may also be internally mounted in the R2A position. The current loop is then applied to Pin B and returned through Analog Common Pin C.

Pin C - Analog Common: Pin C is signal return common for differential inputs, ratiometric inputs, or external reference inputs. For single-ended inputs, Signal Low Input Pin 3 must be connected to Analog Common Pin C. To minimize any errors caused by ground loop currents, it is recommended that this connection be made as

close as possible to the input signal source ground.

Pins D, E, 4 and 6 - Decimal Select: Decimal points may be displayed as required by connecting the appropriate pin to Decimal Select Common Pin 5. Any number of decimal points can be turned ON at the same time. An open circuit will turn off the decimal points.

Pin F - No Connection: No connection has been made to this pin.

Pin H - Display Disable: If this pin is connected to the Power Ground Pin L, the display is disabled and the reading is blanked out. Only the polarity sign stays on to indicate that power is being applied to the meter. For normal operation, this pin is left unconnected.

Pin J - Clock Output: A quartz crystal controlled oscillator provides a stable clock signal output of 100KHz.

Pin K - +5VDC System Power Input: The meter requires a low ripple DC power supply of 4.5V to 5.5VDC at 225mA. The positive terminal of the power supply should be connected to Pin K.

Pin L - Power Ground Input: Negative terminal of the +5VDC power supply should be connected to Pin L. All digital signals, Display Test, and Run/Hold should be returned to this ground point. Pin L is internally connected to Analog Common Pin C.

Pin 1 - Reference Input: Reference voltage input for A to D converter. Normally supplied from Pin A. An external reference source referred to Pin C may be used instead. Pin 1 may be used as an input for ratiometric measurements. Minimum usable voltage is 0.1VDC, with a maximum voltage of 4.0V. For ratiometric operation; Displayed Reading = $10000 \times (\text{Signal Input Voltage} \div \text{Reference Input Voltage})$. The maximum signal input voltage is $\pm 4V$. Higher voltages must be scaled down through a voltage divider. Reference input voltage must remain stable during measurement period.

Pin 2 - Offset Voltage Output: 0 to +2.490V is available with the addition of a 3/4", 20K Ω to 100K Ω pot in the R15 position on the printed circuit board. The offset voltage is derived from the internal precision voltage reference and is available for applications requiring a zero offset such as 4-20mA receiver and temperature measurements.

Pin 3 - Signal Low Input: Pin 3 is the signal low input for all input signals. A special feature of the meter is the provision for dividing resistors to be mounted internally in the R1B and R2B positions. This enables signal low inputs up to 1200V max. to be attenuated, which is particularly useful when measuring small differential signals with a large common mode voltage. Matched dividing resistors for the 20V (1/10), 200V (1/100) and 1200V (1/1000) ranges are available from Texmate. Differential current measurements up to 200mA may also be made by internally mounting shunt resistors in the R2B position. The current loop is then applied to Pin B and returned through Analog Common Pin C. When attenuation is not required, the resistor position R1B must be shorted by a jumper.

Pin 5 - Decimal Select Common: Pin 5 serves as a common for the Decimal Select Pins D, E, 4 and 6. To turn on any required decimal point, connect the appropriate Decimal Select Pin to Decimal Select Common Pin 5.

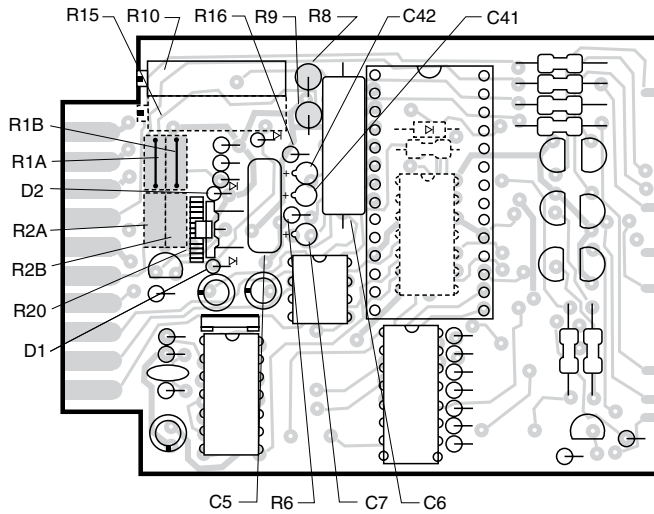
Pin 7 - Display Test: If this pin is connected to the Power Ground Pin L, all segments of the display come on and 18888 is displayed. For normal operation, this pin is left unconnected.

Pin 8 - Clock Input: Normally Pin 8 is connected to the 100KHz clock output from Pin J, thereby providing the optimum rejection of 50/60Hz noise. However, an external clock source may be used instead (5V referenced to power ground with a recommended duty cycle of 50%). Minimum frequency is 10KHz, and maximum frequency is 1MHz (12.5 readings per sec.). For inputs below 100KHz or above 300KHz, changes to the integrator time constant and some component values are necessary.

Pin 9 - Busy Output: Pin 9 goes to logic "1" at the beginning of the signal integration and remains at "1" until the first clock pulse after the zero-crossing is detected at the completion of deintegration. In addition to its use as a Busy or End-of Conversion signal, the output on Pin 9 can be used in some control applications to indicate the digital reading of the meter as a function of time or clock pulses. Displayed Reading is equal to the total clock pulses during Busy less 10,000, or total elapsed time during Busy, less 100 milliseconds if the clock frequency is 100KHz.

Pin 10 - Run/Hold: If Pin 10 is left open (or connected to +5VDC System Power Input Pin K for logic control purposes), the meter will operate in a free-running mode. Under control of the internal 100KHz quartz crystal clock, readings will be updated every 400ms (2.5 per sec.). If Pin 10 is connected to Power Ground Input Pin L (logic low), the meter will continue the measurement cycle that it is doing, then latch up and continuously hold the reading obtained as long as Pin 10 is held low. If Pin 10 is released from Pin L (Pin 10 then goes logic high) for more than 300ns and returned to Pin L (logic low), the meter will complete one conversion, update, and then hold the new reading. For all practical purposes, a manually actuated normally closed pushbutton switch will provide sufficient timing for "press-to-update" operation.

Component Layout



Signal Conditioning Components

SPAN **SPAN Potentiometer (Pot)**

To the Right Front
Turn Clockwise to Increase Reading

The SPAN pot is on the right side of the display. Typical adjustment is 20% of the input signal range.

ZERO **ZERO Potentiometer (Pot) optional**

To the Left Front
Turn Clockwise to Increase Reading

The ZERO pot is on the right side of the SPAN Pot. Typically it enables the displayed reading to be offset ± 500 counts.

Calibration Procedure

VOLTAGE CALIBRATION 2V RANGE

After making the appropriate connections as shown in the instructions, apply power to the meter. Then, with a precision DC reference source, apply +1.9000VDC between the Signal High Input Pin B and the Signal Low Input Pin 3. Adjust R10 potentiometer (on left side as viewed from rear) until the display reads +1.9000V. NOTE: For other ranges, the voltage applied should be similarly proportionate to the particular full scale voltage.

TEMPERATURE COEFFICIENT COMPENSATION

The primary reference voltage of approximately 2.5V is generated by a precision IC-Zener Z1 (LM1/2/336). The PM-45L (not installed in the PM-45LU) has a temperature compensating network consisting of two diodes D1 and D2 and a potentiometer R20. R20 is factory calibrated so that the output of Z1, when measured at Test Point 1 (TP1) referred to Analog Common Pin C, is 2.490V which provides the optimum temperature coefficient for the average operating temperature range. For some applications, the user may wish to adjust the meter's temperature coefficient. Turn R20 clockwise to obtain a negative temperature coefficient (higher voltage and positive TC of primary ref.), and counter clockwise to obtain a positive temperature coefficient (lower voltage and negative TC of primary ref.). NOTE: Any adjustments of the primary reference voltage will necessitate a recalibration of the meter.

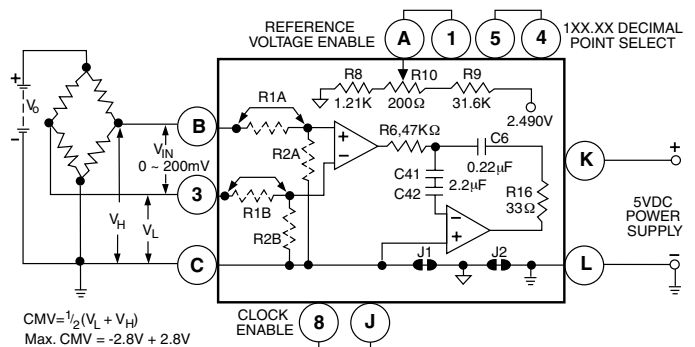
Typical Application Connections

The PM-45L/PM-45LU may be used in a wide variety of configurations. The following circuits illustrate some of the possibilities and demonstrate the exceptional versatility of Texmate products. Components called for in the applications which are not part of the standard meter may be supplied by the user or in some cases purchased from Texmate. The circuit diagrams explain the basic pinout connections required for each application. Unless otherwise specified, the diagrams will show the component values and solder junctions that would normally be installed on a standard 2V range meter. For those applications which have alternative ranges and/or input configurations, the required component values and any modifications are described in the text.

DIFFERENTIAL METER - 200mV RANGE, <2V RANGE

1) A 200mV range meter is shown measuring differential input signals with a high common mode rejection ratio of 86dB and a DC common mode voltage range of -2.8V to +2.8V.

2) A <2V range meter has the same CMV range. Higher CMV can be obtained by installing internal dividers (see next circuit).



$$CMV = \frac{1}{2}(V_L + V_H)$$

Max. CMV = -2.8V + 2.8V

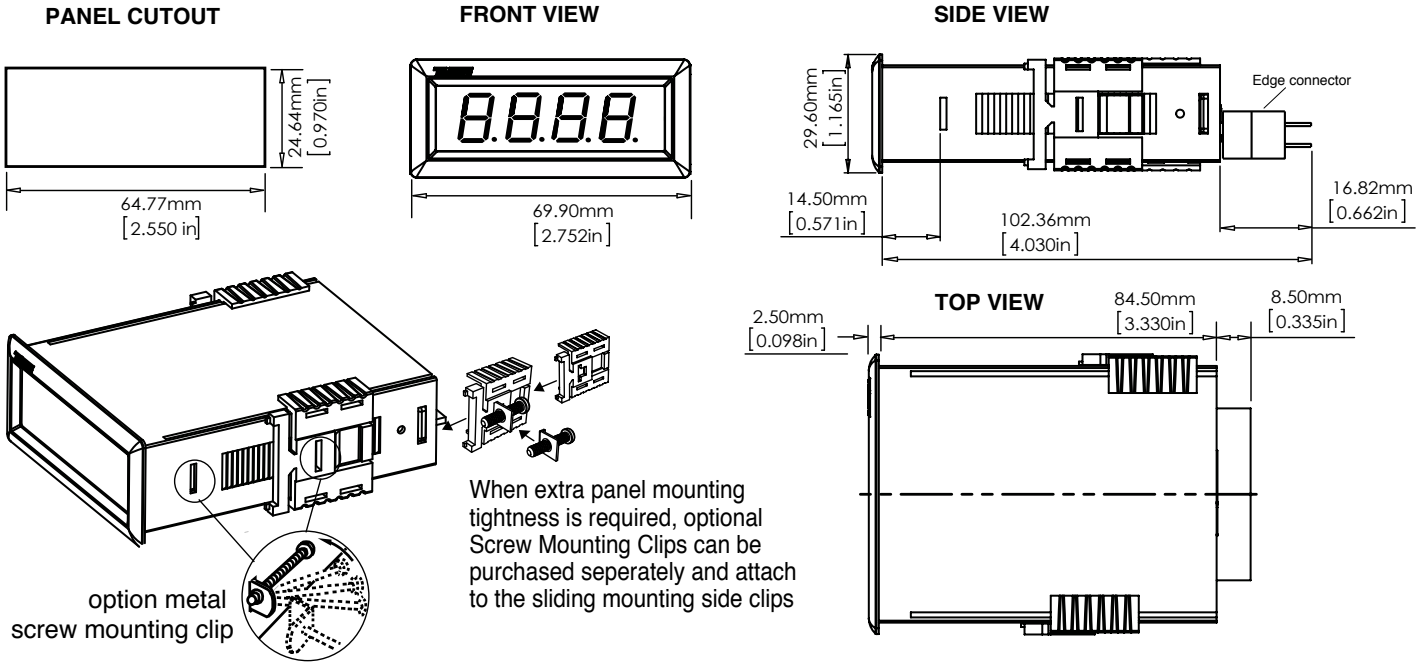
Optional PCB Edge Connector

PCB Edge Connector

A standard 20-pin edge connector (two rows of 10 pins on 0.156" centers) is used to connect the PM-Series of meters. Order part no. CN-L10.



PM Case Dimensions and Panel Cutouts



Ordering Information

Standard Options for this Model Number

Part Number Description

► BASIC MODEL NUMBER

- PM-45L 4.5 digit Red LED, Precision Meter w/Differential Input
- PM-45LU 4.5 digit Red LED, Precision Meter w/Differential Input

Special Options and Accessories

► SPECIAL OPTIONS (Specify Inputs & Req. Reading)

- ZS Custom display scaling within standard ranges
- ZR-1200V 1200 VDC Range Change.
- ZR-200V 200 VDC Range Change.
- ZR-20V 20 VDC Range Change.
- ZRS-200MV 200 mVDC range change.
- ZRS-PMRP Non-standard range and scale.

► ACCESSORIES



- CN-L10 Dual Row 10 Pin Connector, Solder Type

Prices subject to change without notice.

WARRANTY

Texmate warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment. Texmate's obligations under this warranty are limited to replacement or repair, at its option, at its factory, of any of the products which shall, within the applicable period after shipment, be returned to Texmate's facility, transportation charges pre-paid, and which are, after examination, disclosed to the satisfaction of Texmate to be thus defective. The warranty shall not apply to any equipment which shall have been repaired or altered, except by Texmate, or which shall have been subjected to misuse, negligence, or accident. In no case shall Texmate's liability exceed the original purchase price. The aforementioned provisions do not extend the original warranty period of any product which has been either repaired or replaced by Texmate.

USER'S RESPONSIBILITY

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