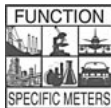




PM-Series



PM-35X

5 Optional DC Input Ranges
from 200mV to 1200V
3 1/2 DIGIT with 0.48" LCD
In a Slim Bezel Case



Low Power High Accuracy Differential Input LCD Meter.

General Features

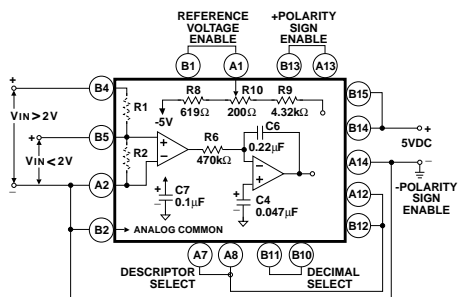
The PM-35X is a precision DC powered panel meter featuring a .48" LCD display. Utilizing a single monolithic CMOS/LSI circuit employing autozeroing and dual slope integration, the unit measures true differential and single-ended DC voltages over five user programmable ranges from $\pm 199.9\text{mV}$ to $\pm 1200\text{V}$ full scale. Provision has been made for user programming to achieve various operating modes, including a current meter, ratiometric ohmmeter, thermometer, and a 4 to 20mA receiver. The meter incorporates an internal DC to DC converter that can also provide up to 10mA of -5VDC auxiliary power to drive external OPAMP circuitry. Provision has also been made for the user to operate the meter directly from +9V to +15VDC. Since the meter draws only a small constant current, operation from higher DC voltages is also possible merely by use of a voltage dropping resistor in series with the meter.

The true differential capability of the Model PM-35X is particularly useful for making accurate measurements of very small input signals in presence of much larger common mode signals. It is ideal for measuring various balanced transducers and bridge inputs and long term drift of the excitation voltage can be compensated by using the external reference differential ratiometric mode of operation.

The high contrast long-life liquid crystal display also offers 8 user programmable descriptors for direct indication of the type and range of signals being measured.

Typical Application Connections

SINGLE-ENDED METER - 200mV RANGE, >2V RANGE
For 200mV Range: 1) Omit R1 and R2; 2) Change R6 from 470k Ω to 47k Ω ; 3) Change R8 from 619 Ω to 121 Ω ; 4) Change R9 from 4.32k Ω to 12.1k Ω ; 5) Change C4 from 0.047 μF to 0.33 μF ; 6) Change C7 from 0.1 μF to 2.2 μF . For >2V RANGE; 1) Install R1 and R2 as specified under section titled Useful Tables.



View more application connections and connection instructions on page 3.

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

PM-35A.....	3.5 digit Red LED, Precision Preference, 2VDC, 5VDC Power
PM-35AR	3.5 digit Red LED, Autoranging, 200mV/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
PM-35XAR	3.5 digit LCD, Low Power Autoranging
PM-35XAC110	3.5 digit LCD, 2VDC, 120VAC Power
PM-35XACAR1	3.5 digit LCD, Autoranging, 120VAC Power
PM-45L.....	4.5 digit Red LED, Precision Meter w/Differential Input
PM-45LBCD	PM-45L w/Tri-State Parallel BCD Output, 5VDC Power
PM-45LMUXBCD	PM-45L w/Multiplexed BCD Output

Compatibility

The PM-35X is shipped in a standard Slim Bezel case. The Slim Bezel case is compatible with the CM, SM, TM, & SP Series of meters. The PM-35U can be ordered in End Mount cases for twin mounting or combinations of multiple center mount cases and two end mount cases for stack mounting.

SLIM

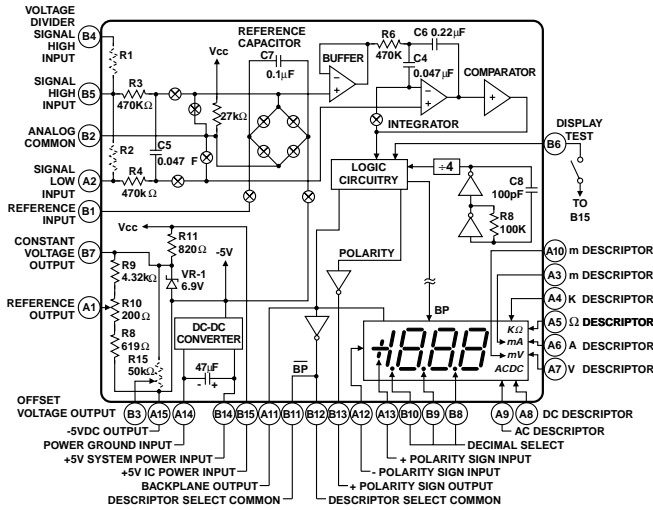


BEZEL

Specifications

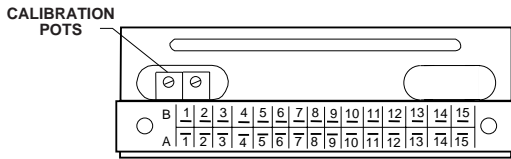
Input Configuration:	True differential and single-ended
Full Scale Ranges:	$\pm 199.9\text{mVDC}$ $\pm 1.999\text{VDC}$ (standard) $\pm 19.99\text{VDC}$ $\pm 199.9\text{VDC}$ $\pm 1200\text{VDC}$
Input Impedance:	Exceeds 1000M Ω on 200mV and 2V ranges; 10M Ω on all other ranges
Input Protection:	$\pm 500\text{VDC}$ or 350VAC maximum on 200mV and 2V ranges; $\pm 1200\text{VDC}$ or 850VAC on all other ranges
Accuracy:	$\pm(0.05\%$ of reading + 1 digit)
Temperature Coefficient:	5PPM/ $^{\circ}\text{C}$ in ratiometric operation; 50 PPM/ $^{\circ}\text{C}$ Typ. using internal reference on 200mV and 2V ranges
Warm Up Time:	10 seconds to specified accuracy
Conversion Rate:	3 readings per second nominal; user programmable from 1 to 10 readings per second
Display:	0.48" LCD
Decimal Selection:	User programmable to 3 positions
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 10mA to 20mA. Low ripple +9V to +15VDC at 6mA to 15mA
Operating Temperature:	0 $^{\circ}$ to +60 $^{\circ}\text{C}$
Storage Temperature:	-20 $^{\circ}$ to +70 $^{\circ}\text{C}$
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)

Functional Diagram



Connector Pinouts

The Texmate Model PM-35x interconnects by means of a standard PC board edge connector having two rows of 15 pins each, spaced on 0.1" centers. Connectors are available from Texmate, or from almost any connector manufacturer.



Component Side	Solder Side
REFERENCE INPUT B1	A1 REFERENCE VOLTAGE OUTPUT
ANALOG COMMON B2	A2 SIGNAL LOW INPUT
OFFSET VOLTAGE OUTPUT B3	A3 "m" FOR mA DESCRIPTOR
VOLTAGE DIVIDER SIGNAL HIGH INPUT B4	A4 K DESCRIPTOR
SIGNAL HIGH INPUT B5	A5 Ω DESCRIPTOR
DISPLAY TEST B6	A6 A DESCRIPTOR
CONSTANT VOLTAGE OUTPUT B7	A7 V DESCRIPTOR
DECIMAL SELECT (1.XX.X) B8	A8 DC DESCRIPTOR
DECIMAL SELECT (1.X.XX) B9	A9 AC DESCRIPTOR
DECIMAL SELECT (1.XXX) B10	A10 "m" FOR mV DESCRIPTOR
DECIMAL / DESCRIPTOR SELECT COMMON B11	A11 BACKPLANE DESCRIPTOR
DECIMAL / DESCRIPTOR SELECT COMMON B12	A12 "-" POLARITY SIGN INPUT
"+" POLARITY SIGN OUTPUT B13	A13 "+" POLARITY SIGN INPUT
+5VDC INPUT FOR DC/DC CONVERTER B14	A14 POWER GROUND INPUT FOR +5VDC OPERATION
POSITIVE POWER INPUT +5V / OR +9V TO +15V B15	A15 -5V OUTPUT / OR POWER GROUND FOR 9V TO 15V

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 A1 - Reference Voltage Output: Internal precision voltage reference. Standard output is 1.000V, adjustable by ±5% with R10 potentiometer. Usable voltages from 0.05V to 5.0V for special high impedance scaling can be obtained by changing the value of internal dividing resistors R8 and R9. It should be noted that when Pin A1 is referred to -5V Output Pin A15 the potential is +1.0V. However, when Pin A1 is referred to Power Ground Input Pin A14 the potential is -4.0V.

Pin A2 - Signal Low Input: Signal low input of A to D converter. Maximum over-voltage protection is ±500VDC or 350VAC.

Pins A3, A4, A5, A6, A7, A8, A9 and A10 - Descriptors: These are the pins for the descriptors "m" for mA, k, Ω, A, V, DC, AC, and "m" for mV, respectively. They may be displayed as required by connecting the appropriate pin(s) to Decimal/Descriptor Select Common Pin B11; any number of descriptors can be turned on at the same time. An open circuit will turn off a descriptor; however, static current pickup and/or PCB leakage of more than 100µA can cause descriptors to turn on undesirably. Therefore, it is recommended that any unused descriptors be connected to Backplane Output Pin A11 either directly or by a resistor of less than 5MΩ to insure an off condition. CAUTION: Any DC component introduced to the display drive circuitry can, in time, cause permanent damage.

Pin A11 - Backplane Output: Liquid crystal displays are operated from an AC signal. The backplane is the common base of the LCD capacitance structure and is continuously driven by a square-wave signal at approximately 60Hz. Those segments that are driven in-phase with Pin A11 will turn off.

Pin A12 - "-" Polarity Sign Input: Pin A12 is the negative sign segment of LCD. For normal operation, Pin A12 is connected to Decimal/Descriptor Selector Common Pin B12. For reversed polarity sign indication connect Pin A12 to "+" Polarity Sign Output Pin B13 and connect "+" Polarity Sign Output Pin B13 and connect "+" Polarity Sign Input Pin A13 to Backplane Output Pin A11. This will cause the minus sign to be displayed when a positive signal is present. However, in this configuration the plus sign must be assumed when a negative signal is present.

Pins A13 - "+" Polarity Sign Input: Pin A13 is the positive sign segment of the LCD. For normal operation, Pin A13 is connected to "+" Polarity Sign Output Pin B13. SEE DESCRIPTION OF PIN A12 FOR REVERSED POLARITY OPERATION.

Pin A14 - Power Ground Input: Negative terminal of power supply should be connected to Pin A14 when +5VDC power supply is used. CAUTION: Do not use Pin A14 and +5VDC input for DC/DC converter Pin B14 when operating meter from 9V to 15VDC. Please refer to Pin A15 and Pin B15 descriptions.

Pin A15 - -5V Output (Ground for 9V to 15V Inputs): Auxiliary -5V power output (10mA max.) produced by an internal DC to DC converter powered from the +5VDC input on Pin B14. CAUTION: The miniature DC to DC converter is not short-circuit-protected and damage will occur if Pin A15 is overloaded or directly connected to Power Ground Pin A14. NOTE: When a 9V to 15V power supply is used the DC to DC converter is bypassed and Pin A15 then becomes the power ground input (negative terminal of power supply). When using a 9VDC to 15VDC power supply in this manner consideration must be given to the configuration and CMV of the input signal because Pin A15 still represents the negative rail of the A/D converter. Both the high and low signal inputs must be at least +2V above the power supply ground on Pin A15 as is possible when measuring a balanced bridge output having an excitation voltage of +9V to +15V which will provide a signal CMV of +4.5V to +7.5V. For single ended inputs where the signal ground is common with Analog Common Pin B2 and Power Ground Input Pin A14, the 9V to 15V power supply must be isolated or the standard mode of +5VDC operation be utilized with a simple voltage regulating circuit to drop the 9V-15V to ≈5VDC. Pin B1 - Reference Input: Reference voltage input for A to D converter. Normally supplied from Pin A1. An external reference source referred to Pin A15 may be used instead. Pin B1 may be used as an input for ratiometric measurements. Minimum usable voltage is .05VDC, with a maximum voltage of 5.0V. For ratiometric operation, displayed reading = 1000 X (Signal input Voltage ÷ Reference input Voltage). The maximum signal input voltage is 5V. Higher voltages must be scaled down through a voltage divider. Reference input voltage must remain stable during measurement period. NOTE: Consideration should be given to the common mode voltage of the input signal as the system common mode voltage range referred to -5V Output Pin A15 is +2V to +8V whereas referred to Power Ground Input Pin A14 the common mode voltage range is -2.8V to +2.8V. Pin B2 - Analog Common: Pin B2 is the floating common for the analog section of the meter which is normally +2.2V above Power Ground Input Pin A14. Pin B2 may be left floating or it may be connected to Power Ground Input Pin A14 without overloading. When Pin B2 is tied to Pin A14, the common-mode voltage (CMV) of the A/D converter is reduced, which can improve the performance of the meter in some configurations such as the case with Single-Ended inputs.

Pin B3 - Offset Voltage Output: With the addition of a 3/4" 50KΩ potentiometer in the R15 position on the PC board, 0 to +6.9V is available from Pin B3 which is referred to either -5V Output Pin A15 or Constant Voltage Output Pin B7. An example is shown in the Thermometer application.

Pin B4 - Voltage Divider Signal High Input: Signal high input for voltages that require attenuation or scaling. Dividing resistors R1 and R2 may be mounted internally for voltages up to 1200V max. Matched dividing resistors for 20V (1/10), 200V (1/100), and 1200V (1/1000) ranges are available from Texmate. Shunt resistors for current measurements up to 200mA may be internally mounted in the R2 position. The current loop input is then supplied to Signal High Input Pin B5 and returned through Signal Low Input Pin A2.

Pin B5 - Signal High Input: Signal high input of A to D converter. Maximum over-voltage protection is ±500VDC or 350VAC.

Pin B6 - Display Test: All display segments will operate when Pin B6 is connected to +5VDC IC Power Input Pin B15. The display Test function is only intended for momentary operation. Continuous application of Display Test will, in time, damage the display.

Pin B7 - Constant Voltage Output: Pin B7 is 6.9V referred to -5V Output Pin A15. The offset voltage and reference voltage are both generated internally from the constant voltage available at Pin B7.

Pins B8, B9, and B10 - Decimal Select: Decimal points may be displayed as required by connecting appropriate pin to Decimal/Descriptor Select Common Pin B11. CAUTION: Decimal Display pins have the same operating characteristics as Descriptor pins and likewise may be damaged from a DC component introduced by leakage or inadvertent connection to system.

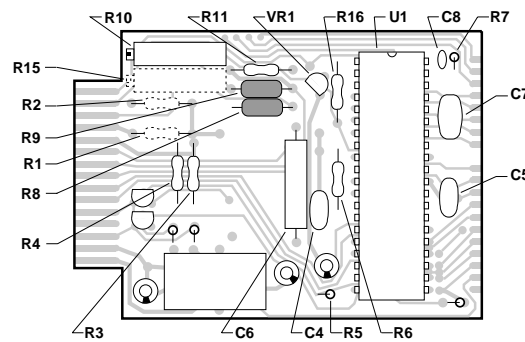
Pin B11 - Decimal/Descriptor Select Common: Pin B11 is 180° out-of-phase with Backplane Output Pin A11. Thus, it serves as a common for the descriptors, decimal select, and the "-" polarity sign. As required, Pin B11 may be connected to Decimal Select Pins B8, B9, B10 and to Descriptor Pins A3, A4, A5, A6, A7, A8, A9, A10. The "-" Polarity Sign Input Pin A12 is also connected to Pin B12 for standard polarity indication.

Pin B12 - Decimal/Descriptor Select Common: Pin B12 is same as Pin B11.

Pin B13 - "+" Polarity Sign Output: Pin B13 is in-phase for positive signal inputs. Pin B14 - +5VDC Input for DC/DC Converter: If a 5VDC ±20% power supply is used, the positive terminal of the power supply should be connected to Pin B15 and Pin B14 which will activate the miniature DC/DC converter and provide a regulated -5VDC negative rail for the system. If a 9V to 15VDC power supply is used, the positive terminal of the power supply be connected to Pin B15 only, and Pin B14 left unused, bypassing the DC/DC converter.

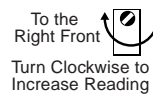
Pin B15 - Positive Power Input +5V/ or +9V to +15V: Pin B15 must be connected to the positive terminal of power supply whether using a 5VDC or 9V to 15VDC power source. Please refer to Pin B14 for details.

Component Layout



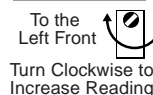
Signal Conditioning Components

SPAN SPAN Potentiometer (Pot)



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



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

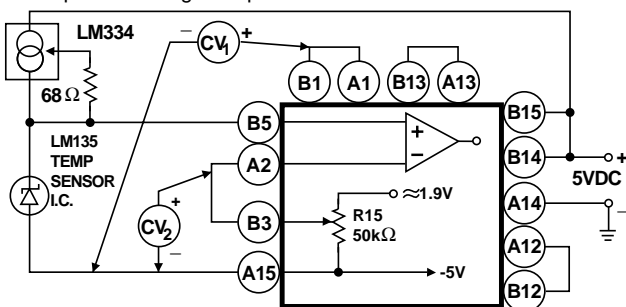
After making the appropriate connections as shown in the instructions apply power to the meter. Then, with a precision DC reference source, apply +1.900VDC between Signal High Input Pin B5 and Signal low Input Pin A2. Adjust R10 potentiometer (on left side as viewed from rear) until the display reads +1.900V. NOTE: This calibration voltage is for a $\pm 1.999V$ F.S. meter. For other ranges, the voltage applied should be similarly proportionate to the selected full scale voltage.

Typical Application Connections

The PM-35X 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.

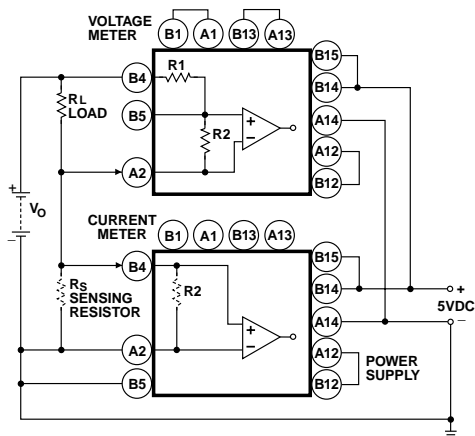
TEMPERATURE METER WITH OFFSET CAPABILITY

1) Install R15, minimum of 20k Ω maximum of 100k Ω ; 2) Adjust R10 until CV1 = 1.000V; Adjust R15 until CV2= 2.732V for -50.0 $^{\circ}C$ to +150 $^{\circ}C$. Special scaling is required for $^{\circ}F$.



SIMULTANEOUS VOLTAGE AND CURRENT MEASUREMENT

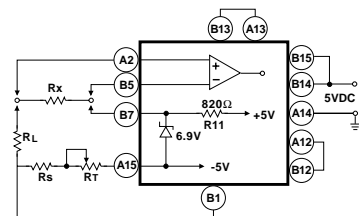
1) Connect Current Meter as for 200mV voltmeter for minimum drop on RS or R2. Use RS externally for currents greater than 200mA; 2) Install R1, R2 on the voltmeter and RS as specified under section titled Useful Tables. NOTE: RS must be located in low side of current loop, and Signal Low Input Pin A2 of Voltage Meter must not be grounded. If it is necessary to install RS on the high side of the current loop, the Current meter must be operated from an isolated power supply.



NOTE: Use of these application circuits is entirely at the risk and responsibility of the user and any user modification of the meter may at the discretion of Texmate, void the warranty. (See rear page for user's responsibility and warranty details) The following legend applies to all application circuits: 1) optional component positions are shown in dotted lines; 2) internal solder junctions are shown by \bullet for a closed junction or \circ for an open junction; 3) calibration voltages as measured by an external user supplied voltmeter are shown by CV

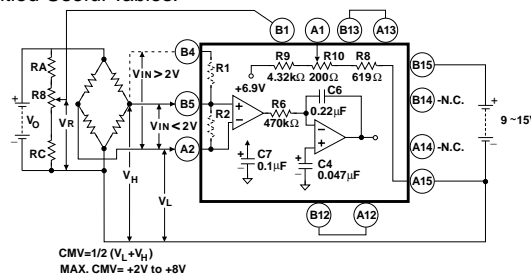
DIFFERENTIAL RATIO-METRIC OHMMETER

1) Install RS and RT specified under section titled Useful Tables; 2) Install RL with a value equal to $3 \times (RS + RT)$ for use as a current limiting resistor. NOTE: Full Scale Range = $(RS + RT) \times 2$, and Displayed Reading = $R_X \div (RS + RT) \times 1000$. R is device under measurement.



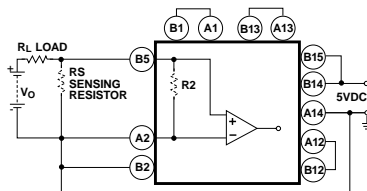
DIFFERENTIAL METER WITH EXTERNAL REFERENCE WITH COMMON MODE VOLTAGE FORM +2V TO +8V

For 200mV Range: Omit R1 and R2; 2) Change R6 from 470k Ω to 47k Ω ; 3) change R8 from 619 Ω to 121 Ω ; 4) Change R9 from 4.3k Ω to 12.1k Ω ; 5) Change C4 from 0.047 μF to 0.33 μF ; 6) Change C7 from 0.1 μF to 2.2 μF . For >2V Range: 1) Install R1 and R2 as specified under section titled Useful Tables.



SINGLE-ENDED CURRENT METER

1) Connect meter as for 200mV voltmeter; 2) install RS NOTE: RS must be externally mounted when F.S. current is greater than 200mA, and 4-wire type connection should be used. For currents of 200mA F.S. or less, RS may be internally mounted in the R2 position. Standard values for RS are specified under section titled Useful Tables.



Useful Tables

VOLTAGE RANGE CHANGE

F.S. In	R1	R2	Resolution
200mV	omit	omit	100 μV
2V	omit	omit	1mV
20V	9M	1M	10mV
200V	10M	100k	100mV
1200V	10M	10k	1V

CURRENT RANGE CHANGE (*)

Use 200mV F.S. meter for minimum voltage drop.

F.S. In	Rs External	Resolution
20A	0.01	10mA
2A	0.1	1mA
F.S. In	Rs Internal	Resolution
200mA	1	100 μA
20mA	10	10 μA
2mA	100	1 μA
200 μA	1k	100nA

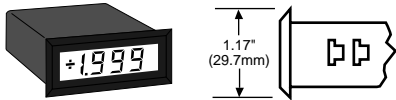
OHMMETER RANGE CHANGE

F.S. In	Rs+Rt	Resolution
200	100	100m
2k	1k	1
20k	10k	10
200k	100k	100
2M	1M	1k
20M	10M	10k

PM Case Dimensions and Panel Cutouts

The Slim Bezel Case is supplied as standard. If specified at time of ordering, any combination of Twin Mounting and Multiple Array Cases may be substituted at no additional cost. Extra cases may be ordered separately.

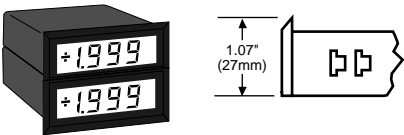
STANDARD SLIM BEZEL CASE



SLIM BEZEL CASE
Standard Black ABS case with matte finish bezel for single unit mounting.

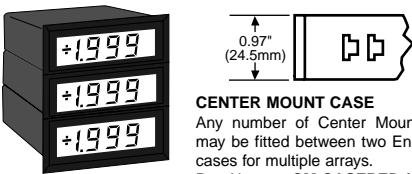
Part No. **SL-CASERED** for LED's
SL-CASECLR for LCD's

OPTIONAL TWIN MOUNTING OR MULTIPLE ARRAY CASES



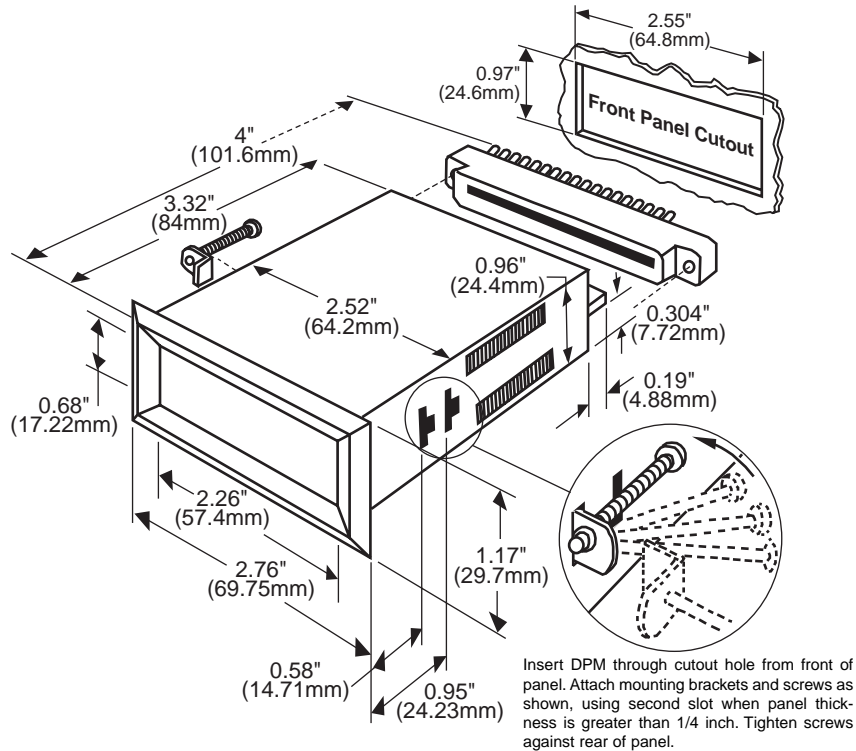
END MOUNT CASE
Same styling as Slim Bezel case but with bottom edge of bezel removed. Two End Mount cases can be twin mounted in a single cutout.

Part No. **EM-CASERED** for LED's
EM-CASECLR for LCD's



CENTER MOUNT CASE
Any number of Center Mount cases may be fitted between two End Mount cases for multiple arrays.

Part No. **CM-CASERED** for LED's
CM-CASECLR for LCD's



Insert DPM through cutout hole from front of panel. Attach mounting brackets and screws as shown, using second slot when panel thickness is greater than 1/4 inch. Tighten screws against rear of panel.

Ordering Information

Standard Options for this Model Number

Part Number .Description

► BASIC MODEL NUMBER

PM-35X3.5 digit LCD, Low Power Con., 2VDC, 5VDC pwr

Special Options and Accessories

Part Number .Description

► SPECIAL OPTIONS (Specify Inputs & Req. Reading)

VA-200MVFI200mVDC Range Change

VF-0020V20VDC Range Change

VF-0200V200VDC Range Change for 3.5 digit PM Series
VF-1200V1200VDC Range Change for 3.5 digit PM Series
VS-3.5Non-Std Range and Scale - 3.5 Digit PM Meters

► ACCESSORIES

CN-S15Dual Row 15 Pin Edge Connector, Solder Type
SL.CASECLRSlim Bezel Case, Clear Faceplate w/Mtg Hardware
CL.CASECLRCenter Mount Case, Clear Faceplate w/Mtg Hardware
EM.CASECLREnd Mount Case, Clear Faceplate w/Mtg Hardware

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

We are pleased to offer suggestions on the use of our various products either by way of printed matter or through direct contact with our sales/application engineering staff. However, since we have no control over the use of our products once they are shipped, **NO WARRANTY WHETHER OF MERCHANTABILITY, FITNESS FOR PURPOSE, OR OTHERWISE** is made beyond the repair, replacement, or refund of purchase price at the sole discretion of Texmate. Users shall determine the suitability of the product for the intended application before using, and the users assume all risk and liability whatsoever in connection therewith, regardless of any of our suggestions or statements as to application or construction. In no event shall Texmate's liability, in law or otherwise, be in excess of the purchase price of the product.

Texmate cannot assume responsibility for any circuitry described. No circuit patent or software licenses are implied. Texmate reserves the right to change circuitry, operating software, specifications, and prices without notice at any time.

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Texmate has facilities in Japan, New Zealand, Taiwan, and Thailand. We also have authorized distributors throughout the USA and in 28 other countries.

For product details visit www.texmate.com

Local Distributor Address

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