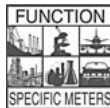




PM-Series



## PM-35AR

Autoranging Panel Meter  
3 1/2 DIGIT with 0.56" LEDs  
in a Slim Bezel Case

An Autoranging Precision Low Cost Differential Input Panel Meter Powered From 5VDC.

### General Features

The PM-35AR is a low cost autoranging panel meter that measures true differential or single-ended DC voltages while autozeroing between any two adjacent ranges in four user selectable groups: 199.9mV to 1.999V, 1.999V to 19.99V, 19.99V to 199.9V and 199.9V to 1200V FS. Any two decimal points can be user programmed to automatically switch in sync with the meter's automatic ranging.

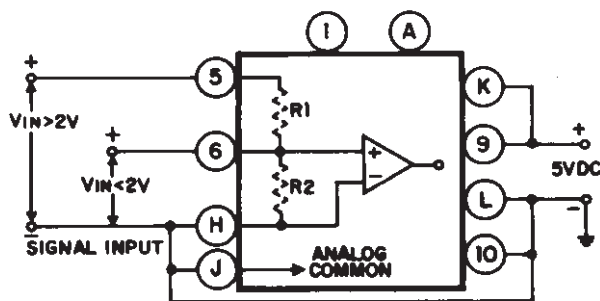
The PM-35AR can be scaled to autorange and display almost any known engineering unit. An on board DC to DC converter produces a regulated -5VDC and provides up to 10mA of auxiliary power for external user circuitry.

The differential input capability and high common mode rejection of the PM-35AR is particularly useful for making accurate measurements of very small signals in the presence of much larger common mode signals. The PM-35AR is also ideal for measuring various balanced transducers and bridge inputs.

### Typical Application Connections

SINGLE-ENDED METER: 200mV/2V RANGE, AND HIGHER RANGES

For 200mV/2V Range: Omit R1 and R2. For Higher Ranges: Install Voltage Dividing Resistors R1 and R2 as specified under section titled Useful Tables. Enable decimal points by connecting appropriate Decimal Select Pins to High/Low Range Decimal Select Common.



View more application connections and connection instructions on page 3.

### Compatibility

The PM-35AR 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

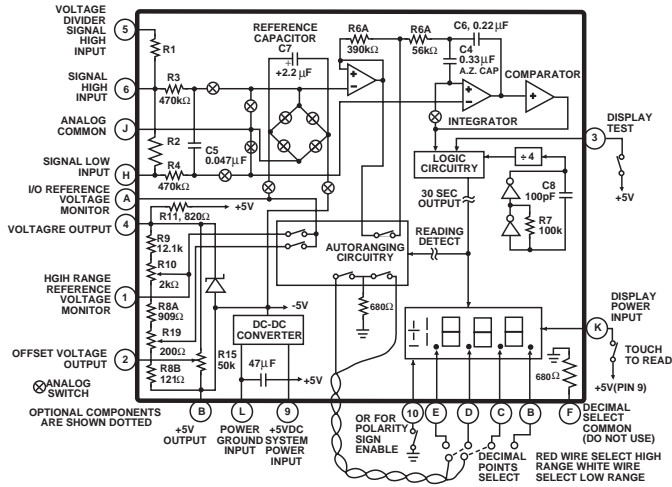
- Input Configuration:**..... True differential and single-ended
- Full Scale Ranges:** .....±199.9mVDC to ±1.999VDC (std)  
±1.999VDC to ±19.99VDC  
±19.99VDC to ±199.9VDC  
±199.9VDC to ±1200VDC
- Input Impedance:** .....Exceeds 1000MΩ on 200mV and 2V ranges; 10MΩ on all other ranges
- Input Protection:**.....±500VDC or 350VAC maximum on 200mV and 2V ranges; ±1200VDC or 850VAC on all other ranges
- Accuracy:** .....±(0.05% of reading + 1 digit)
- Temperature Coefficient:** ..60 PPM/°C Typ. using internal reference on 200mV and 2V
- Warm Up Time:** .....10 seconds to specified accuracy
- Conversion Rate:** .....3 readings per second nominal, controllable from 1 to 20 per second
- Display:** .....0.56" LED
- Decimal Selection:** .....User programmable to any 2 of 4 positions. The autoranging circuitry will change selected decimal point positions automatically.
- Overrange Indication:** ..When input exceeds full scale range, most significant "1" digit & polarity symbols are displayed with all other digits blank
- Power Requirements:**.....+4.5 to +5.5VDC at 200mA
- 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-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

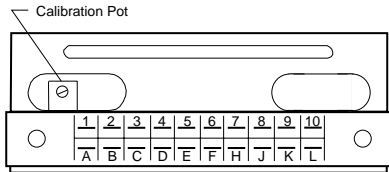
PM-45LU .....4.5 digit Red LED, Low Cost Meter w/Differential Input  
 PM-45LUBCD .....PM-45LU w/Tri-State Parallel BCD Output  
 PM-45LUMXBCD .....PM-45LU w/Multiplexed BCD Output  
 PM-45X.....4.5 digit LCD, Precision Meter w/Differential Input  
 PM-45XBCD .....PM-45X w/Tri-State Parallel BCD Output, 5VDC Power  
 PM-45XMUXBCD .....PM-45X w/Multiplexed BCD Output, 5VDC Power  
 PM-45XU .....3.5 digit LCD, Low Cost Meter w/Differential Input  
 PM-45XUBCD .....PM-45XU w/Tri-State Parallel BCD Output, 5VDC Power  
 PM-45XUMXBCD .....PM-45XU w/Multiplexed BCD Output, 5VDC Power

# Functional Diagram



# Connector Pinouts

The Texmate Model PM-35AR interconnects by means of a standard PC board edge connector having two rows of 10 pins, spaced on 0.156" centers. Connectors are available from Texmate, or from almost any connector manufacturer.



Component Side	Solder Side
HIGH RANGE REF. VOLTAGE MONITOR 1	A A/D REFERENCE VOLTAGE MONITOR
OFFSET VOLTAGE OUTPUT 2	B DECIMAL SELECT (1XXX)
DISPLAY TEST 3	C DECIMAL SELECT (1XX.X)
CONSTANT VOLTAGE OUTPUT 4	D DECIMAL SELECT (1X.XX)
VOLTAGE DIVIDER SIGNAL HIGH INPUT 5	E DECIMAL SELECT (1.XXX)
SIGNAL HIGH INPUT 6	F NON-AUTORANGING DECIMAL SELECT COMMON
NO CONNECTION 7	H SYSTEM LOW INPUT
-5V OUTPUT 8	J ANALOG COMMON
+5VDC SYSTEM POWER INPUT 9	K DISPLAY POWER INPUT
POLARITY SIGN ENABLE 10	L POWER GROUND INPUT

RED WIRE - HIGH RANGE DECIMAL SELECT COMMON  
WHITE WIRE - LOW RANGE DECIMAL SELECT COMMON

**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 — A to D Reference Voltage Monitor:** Pin A may be used to monitor the different reference voltages (referred to -5V Output Pin 8) that are automatically switched to the A to D converter, by the CMOS switches of the autoranging circuitry, as each range condition is detected. In a low range condition the low range reference voltage switched to the A to D is 100.0mV adjustable  $\pm 5\%$  by R19. Usable low range reference voltages of 50mV to 690mV can be obtained for special high impedance scaling by changing the value of internal dividing resistors R8B and R8A. NOTE: The autoranging operation of the meter is achieved by digitally detecting a high or low range condition and switching the appropriate reference voltage (100.0mV low range/1.000V high range) to the dual slope A to D converter. The meter's displayed reading = (input signal voltage  $\div$  reference voltage switched to A to D) x 1000. The autoranging circuitry also automatically adjust the ramp voltage on the integrating capacitor C6 and provides for user selectable decimal switching. Because of the addition of the autoranging circuitry, the ratiometric voltmeter and ohmmeter features normally found in Texmate meters are unavailable in the PM-35AR.

**Pins B, C, D, and E — Decimal Select:** Decimal points may be displayed as required by connecting any two appropriate pins to the High Range Decimal Select Common (Red wire) and the Low Range Decimal Select Common (White wire) by the autoranging circuitry. CAUTION: DO NOT connect any Decimal Select Pin directly to Power Ground Input Pin L as the excessive current will destroy the LED in the decimal point display.

**Pin F — Non-Autoranging Decimal Select Common:** Pin F is connected internally by a current limiting resistor to Power Ground Input Pin L; it is intended to be used as a Decimal Select Common for a single decimal if the meter is not being operated in the autorange mode. Pin F is not used in the autoranging mode since the High and Low Range Decimal Select Common (the red and the white wires) already have current limiting resistors built in.

**Pin H — Signal Low Input:** Signal low input of A to D converter. Maximum overvoltage protection is  $\pm 500$ VDC or 300VAC.

**Pin J — Analog Common:** This is the floating common for the analog section which is normally +2.2V above Power Ground Input Pin L. Pin J may be left floating or because of its high impedance (TYP 15k $\Omega$ ) it

may be connected to Power Ground Input Pin L without overloading. When Pin J is tied to Pin L, the common mode voltage (CMV) of the meter in some configurations such as the case with Single-Ended inputs.

**Pin K — Display Power Input:** Power input for LED display drive. For normal operation, connect directly to +5VDC System Power Input Pin 9. The display of the PM-35AR is unable to be dimmed as the autorange logic circuitry detects voltage drop across the LED's and dimming would reduce this voltage below the circuit's comparator threshold. The power supply to the A to D converter and logic circuits is independent to that of the display with the exception, as noted above, of the autorange detection circuitry. For this reason, when the display of the PM-35AR is blanked, as is the case when the meter is operated in a power saving "press-to-read" mode, a couple of conversions may be required for the reading to settle after power is reapplied to the display.

**Pin L — Power Ground Input:** Negative terminal of the +5VDC power input should be connected to Pin L. All digital signals should be returned to this ground point. Pin L is not internally connected to Analog Common Pin J.

**Pin 1 — High Range Reference Voltage Monitor:** This precision reference voltage of 1.000V (for 2V Full Scale range) referred to Pin 8 and adjustable  $\pm 5\%$  by R10 is internally switched to the A to D converter automatically when a high range input is detected. Usable voltages up to 6.9V for special high impedance scaling can be obtained by changing the value of internal dividing resistors R8A and R8B.

**Pin 2 — Offset Voltage Output:** Offset voltage is available with the addition of a 3/4" 50k potentiometer in the R15 position on the PC board. It can be adjusted from 0 to +6.9V referred to -5V Output Pin 8, or 0 to -6.9V referred to Constant Voltage Output Pin 4, or -5V to +1.9V referred to Power Ground Input Pin L. An example of its use is shown in the thermometer application drawing.

**Pin 3 — Display Test:** All display segments will operate when Pin 3 is connected to +5VDC System Power Input Pin 9.

**Pin 4 — Constant Voltage Output:** Pin 4 is 6.9V referred to -5V Output Pin 8. The offset voltage and reference voltage are both generated internally from the constant voltage available at Pin 4.

**Pin 5 — 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 2V to 20V Ranges (1/10), 20V to 200V Ranges (1/100), and 200V to 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 applied to Signal High Input Pin 6 and returned through Signal Low Input Pin H.

**Pin 6 — Signal High Input:** Signal high input of A to D converter. Maximum overvoltage protection is  $\pm 500$ VDC or 350VAC.

**Pin 7 — No Connection:** This connection pin goes to an unused PCB pad which may be used to mount optional components.

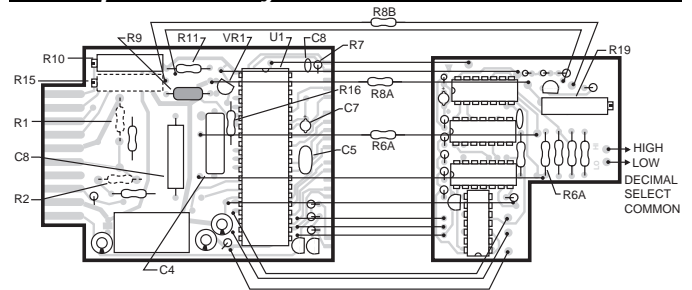
**Pin 8 — -5V Output:** Auxiliary -5V power output (10mA max.) produced by an internal DC to DC converter. Pin 8 can be used also as a point of reference for calibration purposes. CAUTION: The miniature DC to DC converter is not short circuit protected and damage will occur if Pin 8 is overloaded or directly connected to Power Ground Pin L.

**Pin 9 — +5VDC System Power Input:** The meter requires regulated ( $\pm 10\%$ ) 5VDC power at approximately 200mA.

**Pin 10 — Polarity Sign Enable:** Connect Pin 10 to Power Ground Input Pin L (or apply logic "0") to display plus and minus polarity signs. Leave open (or apply logic "1") to blank.

**Red and White Wires — High and Low Range Decimal Select Common:** Decimal points may be displayed as required by connecting the red and the white wires to the decimal points required to turn on at High Range and Low Range. Each wire is connected to a CMOS Switch and a series resistor returned to power ground input Pin L which limits the current drawn by the decimal point of the LED. The switches are controlled by the autoranging circuitry so that the red wire is on and the white wire is off at High Range; the red wire is off and the white wire is on at Low Range.

# 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  $\pm 500$  counts.

## Calibration Procedure

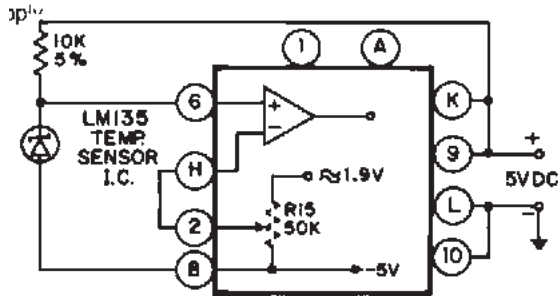
After making the appropriate connections as shown in the instructions, apply power to the meter. Then with a precision DC reference source, apply +1.900VDC between Signal High Input Pin 6 and Signal Low Input Pin H. Adjust potentiometer R10 until the display reads +1900V. Then change signal input to +190.0mV and adjust potentiometer R19 until the display reads +190.0mV. R10 and R19 are accessible from the left side of the back cover as viewed from rear. NOTE: These calibration voltages are for standard 200mV to 2V FS ranges. For other ranges, the voltages applied should be similarly proportionate to the selected full scale ranges. See TYPICAL APPLICATION CIRCUITS & CONNECTION INSTRUCTION for notes on autorange calibration. In some cases it may be desirable to provide hysteresis by overlapping the High and Low ranges.

## Typical Application Connections

The PM-35AR 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.

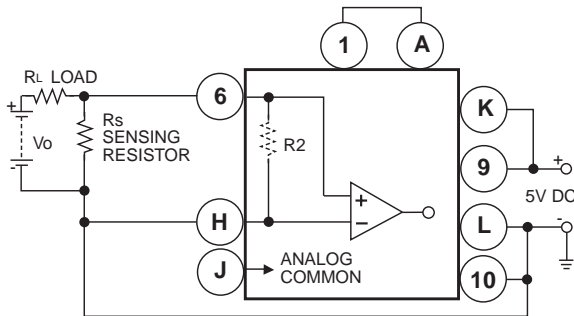
### TEMPERATURE METER WITH OFFSET CAPABILITY




1) Install R15 = 50kΩ potentiometer. 2) Immerse temperature sensor in 0°C temperature bath and adjust R15 to read 000; apply 19°C and adjust R19 to read 19.00; apply 100°C and adjust R10 to read 100.0.



### SINGLE-ENDED CURRENT METER

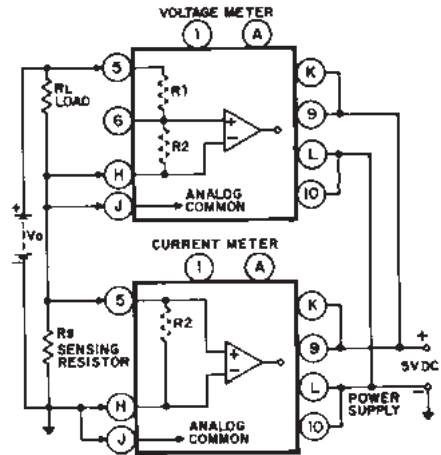
Install  $R_s$  as specified under section titled Useful Tables. The maximum sensitivity of the autoranging meter is 200mV at low range and 2V at high range. To utilize the full scale range the required voltage drop across  $R_s$  will be 0 to 2V. NOTE:  $R_s$  must be externally mounted when FS current is greater than 200mA, and 4-wire type connection should be used. For currents of 200mA FS or less,  $R_s$  may be internally mounted in the R2 position. NOTE:  $R_s$  must be located in low side of current loop. If it is necessary to install  $R_s$  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  for a closed junction or  for an open junction; 3) calibration voltages as measured by an external user supplied voltmeter are shown by 

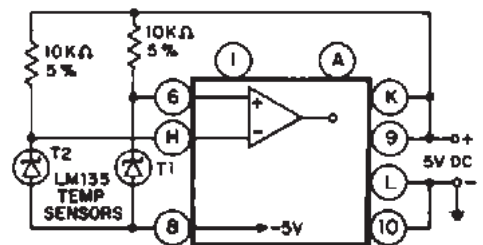
### SIMULTANEOUS VOLTAGE AND CURRENT MEASUREMENT

Install R1, R2, and  $R_s$  as specified under section titled Useful Tables. The maximum sensitivity of the autoranging meter is 200mV at low range and 2V at high range. The utilize the full scale range the required voltage drop across  $R_s$  will be 0 to 2V. NOTE:  $R_s$  must be externally mounted when FS current is greater than 200mA, and 4-wire type connection should be used. For currents of 200mA FS or less,  $R_s$  may be internally mounted in the R2 position. NOTE:  $R_s$  must be located in low side of current loop. If it is necessary to install  $R_s$  on the high side of the current loop, the Current Meter must be operated from an isolated power supply.



### MEASURING DIFFERENTIAL TEMPERATURES +19.99°C RANGE/+199.9°C RANGE

Differential temperature (temperature of sensor No.2 minus sensor No.1) can be measured by a standard autoranging meter to achieve high resolution of 0.01°C at low range and moderate resolution of 0.1°C at high range.



## Useful Tables

### VOLTAGE RANGE CHANGE

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

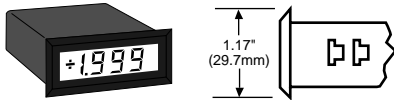
### CURRENT RANGE CHANGE (\*)

F.S. In	$R_s$ External	Resolution
2A/20A	0.1	1mA/10mA
200mA/2A	1	100μA/1mA
20mA/200mA	10	10μA/100μA
2mA/20mA	100	1μA/10μA
200μA/2mA	1k	100nA/1μA

## 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.

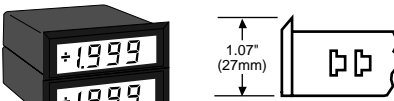
### STANDARD SLIM BEZEL CASE



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

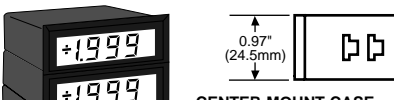
Part No. **SL-CASERED** for LED's  
**SL-CASECLR** for LCD's

### OPTIONAL TWIN MOUNTING OR MULTIPLE ARRAY CASES



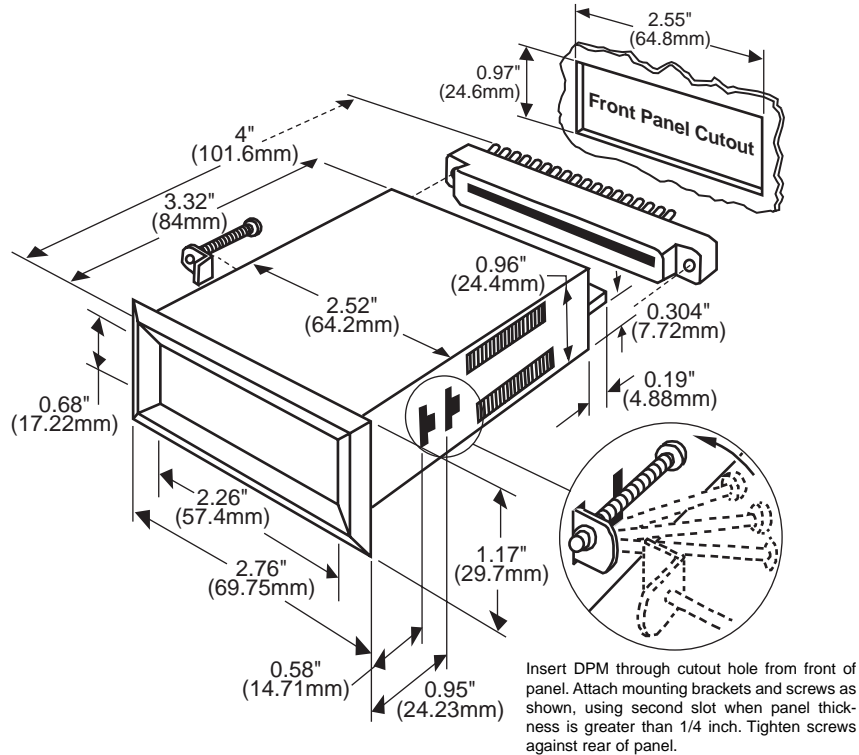
**END MOUNT CASE**  
Same styling as Slim Bezel case but with bottom edge of bezel removed. Two End Mount cases can be twin mounted in a single cutout.

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-35AR . . . . .3.5 digit Red LED, Autoranging, 200VDC/2VDC, 5VDC pwr

### Special Options and Accessories

Part Number .Description

#### ► SPECIAL OPTIONS (Specify Inputs & Req. Reading)

VA-200MVFI . . . . .200mVDC Range Change

VF-0020V . . . . .20VDC Range Change

VF-0200V . . . . .200VDC Range Change for 3.5 digit PM Series

VF-1200V . . . . .1200VDC Range Change for 3.5 digit PM Series

VS-3.5 . . . . .Non-Std Range and Scale - 3.5 Digit PM Meters

#### ► ACCESSORIES



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

SL.CASERED . . . . .Slim Bezel Case, Red Faceplate w/Mtg Hardware

CL.CASERED . . . . .Center Mount Case, Red Faceplate w/Mtg Hardware

EM.CASERED . . . . .End Mount Case, Red 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.

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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](http://www.texmate.com)

Local Distributor Address