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TEXMATE



PM-35A 3½ DIGIT PANEL METER

A PRECISION LOW COST GENERAL PURPOSE DIFFERENTIAL INPUT METER POWERED FROM 5VDC

DESCRIPTION

The PM-35A is a popular, general purpose 5VDC powered instrument. More than 60,000 units have been installed throughout the world in thousands of different applications, attesting to the meter's utility and reliability. A single CMOS/LSI dual slope autozeroing analog to digital converter is used and the unit measures true differential for single-ended DC voltages over five user programmable ranges from ±199.9mV to ±1200V full scale. Maximum resolution is 100µV over ±1999 counts. Provision has been made for many user selectable operating modes, including a current meter, ratiometric ohmmeter, and a temperature meter.

An additional feature of the PM-35A is an on board DC to DC converter that produces a regulated -5VDC with sufficient output to provide up to 10mA of auxiliary power for external user circuitry.

The differential input capability of the PM-35A has a wide common mode voltage range of ±2.8V and a high common mode DC voltage rejection ratio of 60dB. Common mode signals are those which are present equally on both input terminals but do not develop a differential voltage between them. This capability is particularly useful for making accurate measurements of very small signals in the presence of much larger common mode signals. The PM-35A is ideal for measuring various balanced tranducers and bridge inputs and long term drift of the excitation voltage can be compensated for by using the external reference differential ratiometric mode of operation.

The model PM-35A provides a normal mode rejection of 30dB. Thus, signals which create a potential difference between the input terminals and which act as noise on the signal input are rejected within this limit. Normal mode signals are most often caused by electrostatic or electromagnetic induction on the input.

The 6.9V primary reference of the PM-35A enables a wide range of scaling in engineering units without the necessity to attenuate the input signal with the consequential loss of high input impedance.

SPECIFICATIONS

Input Configuration:	True differential and single-ended
Full Scale Ranges:	±199.9mVDC ±1.999VDC (standard) ±19.99VDC ±199.9VDC ±1200VDC
Input Impedance:	Exceeds 1000MΩ on 200mV and 2V ranges; 10MΩ on all other ranges
Input Protection:	±500VDC or 350VAC on 200mV and 2V ranges; ±1200VDC or 850VAC on all other ranges
Normal Mode Rejection:	30dB at 50Hz and up
Common Mode Rejection:	60dB at DC
Common Mode Voltage:	±2.8V
Accuracy:	±(0.05% of reading + 1 digit)
Maximum Resolution:	100µV over ±1999 counts
Temperature Coeficient:	5PPM/°C in ratiometric operation; 50PPM/°C using internal reference on 200mV and 2V ranges
Zero Stability:	Autozeroed; 0.1 counts per °C
Conversion Rate:	3 readings per second nominal
Display:	0.56" LED
Polarity:	Automatically displays either "+" or "-"; may be blanked by user programming
Decimal:	User programmable to any one of 4 positions
Overload Indication:	When input exceeds full scale on any range being used, most significant "1" digit and polarity symbol are displayed with all othe digits blank
Power Requirements:	+4.5 to +5.5VDC at 200mA
Warmup Time:	10 seconds to specified accuracy
Operating Temperature:	0 °C to +60°C

ORDERING INFORMATION

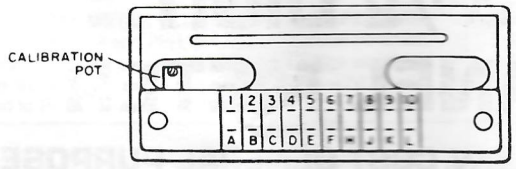
	Order Part No.
STANDARD 3½ DIGIT PANEL METER (2V Range)	PM-35A
ACCESSORIES:	
Edge Connector (20 pin solder tabs)	CN-L10
OPTIONS:	
Factory Installed 200mV Range	VA-200MVFI
Factory Installed 20V Range	VF-0020V
Factory Installed 200V Range	VF-0200V
Factory Installed 1200V Range	VF-1200V
Factory Installed Special Scaling*	VS-3.5

(*Specify input signal, the span, and digital reading required e.g. 0 to 5V input to display 0 to 1999;e.g. 0 to 2V input to display 0 to 1800)

	Order Part No.
RANGE CHANGE KITS (matched resistors for user installation):	
200mV Range	VA-200MV
20V Range	VK-0020V
200V Range	VK-0200V
1200V Range	VK-1200V
OPTIONAL CASES (see back page for details):	
End Mount Case (for twin mounting)	EM-CASERED
Center Mount Case (for multiple array mounting):	CM-CASERED
Slim Bezel Case (supplied as standard)	SL-CASERED

CONNECTOR PINOUTS

The Texmate Model PM-35A 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.



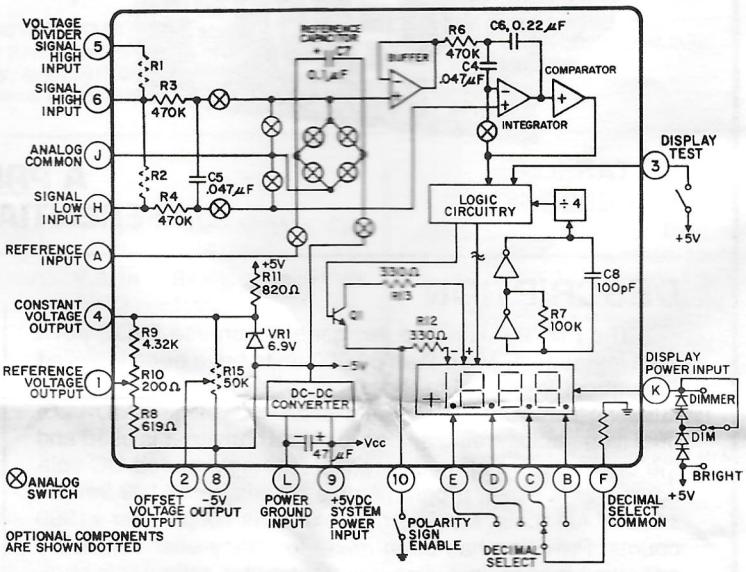
REAR VIEW OF METER CASE

A—	Reference Input	**1**—	Reference Voltage Output
B—	Decimal Select (1XXX.)	**2**—	Offset Voltage Output
C—	Decimal Select (1XX.X)	**3**—	Display Test
D—	Decimal Select (1X.XX)	**4**—	Constant Voltage Output
E—	Decimal Select (1.XXX)	**5**—	Voltage Divider Signal High Input
F—	Decimal Select Common	**6**—	Signal High Input
H—	Signal Low Input	**7**—	No Connection
J—	Analog Common	**8**—	−5V Output
K—	Display Power Input	**9**—	+5VDC System Power Input
L—	Power Ground Input	**10**—	Polarity Sign Enable

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.

FUNCTIONAL DIAGRAM

The diagram below depicts the Model PM-35A in its standard 2V F.S. form with all component values indicated for this mode of operation. Variations from the standard for use in special applications will be found under the heading Typical Application Circuits & Connection Instructions.



PIN DESCRIPTIONS

Pin A — Reference Input: Reference voltage input for A to D converter. Normally supplied from Pin 1. An external reference source referred to Pin 8 may be used instead. Pin 1 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 × (Signal input Voltage ÷ Reference input Voltage). The maximum signal input voltage is 5V. Higher voltages must be scaled down through voltage divider. Reference input voltage must remain stable during measurement period. **CAUTION:** Since Pin 8 is floating at −5V the low side of the external reference source must be isolated from the 5V power ground of the meter (Power Ground Input Pin L.)

Pins B, C, D, and E — Decimal Select: Decimal points may be displayed as required by connecting the appropriate pin to Decimal Select Common Pin F. The internal current limiting resistor on Pin F is designed to enable only one decimal point. If more than one decimal point is enabled simultaneously their light output will be reduced. **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 — Decimal Select Common: Decimal points are displayed as required by connecting Pin F to the appropriate Decimal Select Pins B, C, D, or E.

Pin H — Signal Low Input: Signal low input of A to D converter. Maximum overvoltage protection is ±500VDC or 350VAC.

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 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 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 K — Display Power Input: Power input for LED display drive. For normal operation, connect directly to +5VDC System Power Input Pin 9. Display may be blanked or dimmed by reducing or removing voltage between Pin 9 and Pin K. The power supply to the A to D converter and logic circuits is independent to that of the display. When operated in a power conserving "press-to-read" mode, the reading is instantaneously displayed without any settling time.

Pin L — Power Ground Input: Negative terminal of +5VDC power 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 — 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 Pin 1 is+1.0V referred to −5V Output Pin 8, or Pin 1 is −4.0V referred to Power Ground Input Pin L.

Pin 2 — Offset Voltage Output: −5V to +1.9V is available with the addition of ¾" 50K ohms potentiometer in the R15 position on the PC board. It is referred to −5V Output Pin 8. An example 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 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 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 ±500VDC or 350VAC.

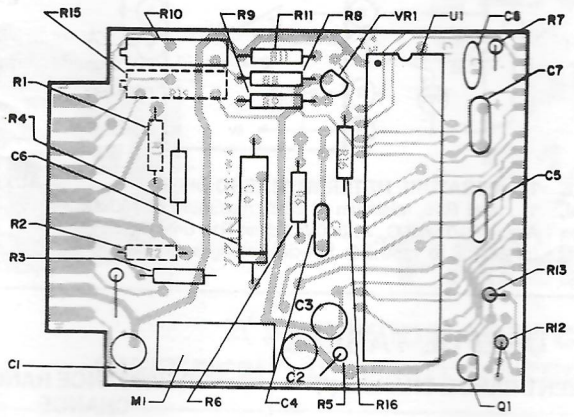
Pin 7 — No Connection: This connection pin goes to an unused PCB pad which may be used to mount optional components.

Pin 8 — −5V Output: Auxiliary −5V power output (10mA max.) produced by an internal DC to DC converter. Pin 8 can be also used as a point of reference for calibration purposes.

Pin 9 — +5VDC System Power Input: The meter requires regulated (±10%) 5VDC power at approximately 200mA, depending on the display brightness.

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.

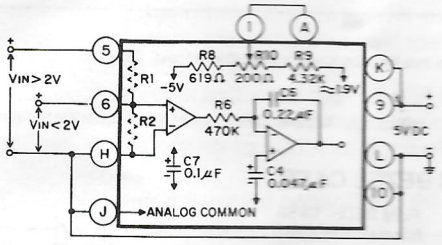
COMPONENT LAYOUT



COMPONENT SIDE

TYPICAL APPLICATION CIRCUITS & CONNECTION INSTRUCTIONS

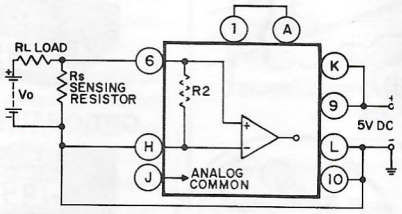
The PM-35A may be used in a wide variety of configurations. The following circuits illustrate some of the possibilities and demonstrate the exceptional versatility of Texmate products. Components called for in the applications which are not part of the standard meter may be supplied by the user or in 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 200mV/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. **NOTE:** Use of these applications 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 (Cv).



SINGLE ENDED METER: 200MV RANGE, >2V RANGE

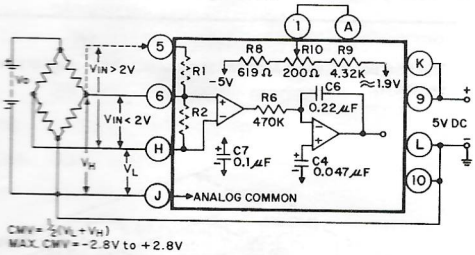
For 200mV Range: 1) Omit R1 and R2; 2) Change R6 from 470KΩ to 47KΩ; 3) Change R8 from 619Ω to 121Ω; 4) Change R9 from 4.32KΩ to 12.1KΩ; 5) Change C4 from 0.047μF to 0.33μF; 6) Change C7 from 0.1μF to 2.2μF.

For >2V Range: 1) Install kR1 and R2 as specified under section titled Useful Tables on page 4.



SINGLE-ENDED CURRENT METER

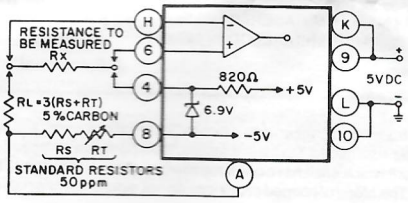
1) Connect meter as for 200mV voltmeter; 2) Install R_S. **NOTE:** R_S must be externally mounted when F.S. current is greater than 200mA, and 4-wire type connection should be used. For currents of 200mA F.S. or less. R_S may be internally mounted in the R2 position. Standard values for R_S are specified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



DIFFERENTIAL METER: 200mV RANGE, >2V RANGE

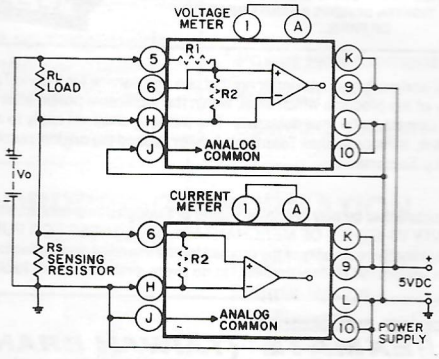
For 200mV Range: 1) Omit R1 and R2; 2) Change R6 from 470KΩ to 47KΩ; Change R8 from 619Ω to 121Ω; 4) Change R9 from 4.3KΩ to 12.1KΩ; Change C4 from 0.047μF to 0.33μF; 6) Change C7 from 0.1μF to 2.2μF.

>2V Range: 1) Install R1 and R2 as specified under section titled Useful Tab



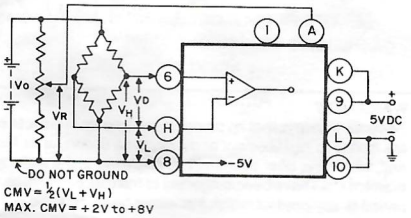
DIFFERENTIAL RATIOMETRIC OHMMETER

1) Install R_S and R_T specified under section titled Useful Tables; 2) Install R_L with a value equal to $3 \times (R_S + R_T)$ for use as a current limiting resistor. **NOTE:** F.S. Range $=(R_S + R_T) \times 2$, and Displayed Reading $= R_X \div (R_S + R_T) \times 1000$. R_X is device under measurement.



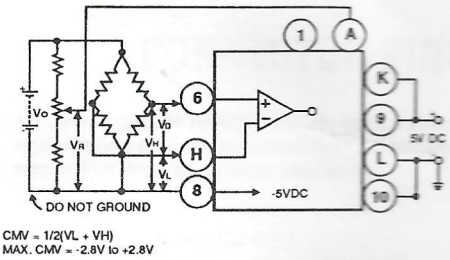
SIMULTANEOUS VOLTAGE AND CURRENT MEASUREMENT

1) Connect Current Meter as for 200mV voltmeter for minimum drop on R_S or R2. Use R_S externally for currents greater than 200mA; 2) Install R1, R2, and R_S as specified under section titled Useful Tables. **NOTE:** R_S must be located in low side of current loop, and Signal Low Input Pin H of Voltage Meter must not be grounded. 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.

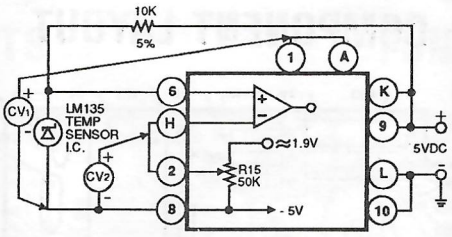


DIFFERENTIAL METER WITH EXTERNAL REFERENCE

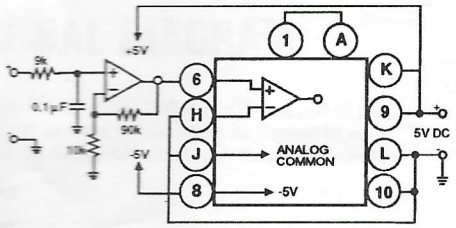
NOTE: Since Pin 8 and Pin L are not at the same potential, either the + System Power Supply or the bridge excitation voltage V_O should be isolated. CMV is +2V to +8V referred to Pin 8.



DIFFERENTIAL METER WITH EXTERNAL REFERENCE
NOTE: Since Pin 8 and Pin L are not at the same potential, either the +5V System Power Supply or the bridge excitation voltage Vo should be isolated. The CMV is +2V to +8V referred to Pin 8.



TEMPERATURE METER WITH ZERO OFFSET
1) Install R15, minimum of 20kΩ maximum of 100kΩ; 2) Adjust R10 until C_{V1}=1.000V; Adjust R15 until C_{V2}=2.732V for -50.0°C to +150.0°C. Special scaling is required for °F.



AUXILIARY POWER OUTPUT
+5V output for external OPAMP circuitry, 10mA max.

USEFUL TABLES

VOLTAGE RANGE CHANGE

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

CURRENT RANGE CHANGE (*)

F.S. In	Rs	Resolution
20A	0.01Ω	10mA
2A	0.1Ω	1mA
200mA	1Ω	100µA
20mA	10Ω	10µA
2mA	100Ω	1µA
200µA	1kΩ	100nA
20µA	10kΩ	10nA

RESISTANCE RANGE CHANGE

F.S. In	Rs+RT	Resolution
200Ω	100Ω	100mΩ
2kΩ	1kΩ	1Ω
20kΩ	10kΩ	10Ω
200kΩ	100kΩ	100Ω
2MΩ	1MΩ	1kΩ
20MΩ	10MΩ	10kΩ

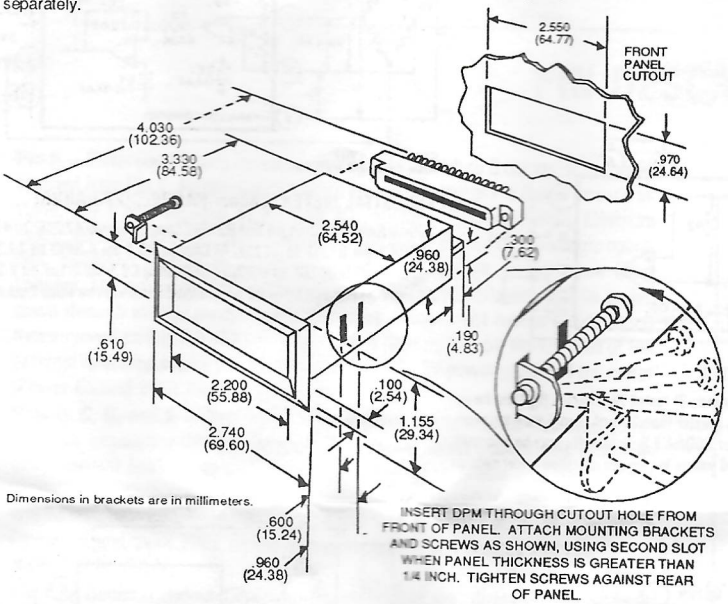
(*) Use 200mV F.S. meter for minimum voltage drop. For 2A and 20A ranges, use 4-wire type Rs, and locate externally. For all other ranges, Rs may be internally mounted in the R1 position.

CALIBRATION PROCEDURE

Apply power to the meter. Then, with a precision DC reference source, apply +1.900VDC between the Signal High Input Pin 6 and the Signal Low Input Pin H connected to Power Ground Input L. Adjust R10 potentiometer (on left side as viewed from rear) until the display reads +1.900V. Note: The voltage applied in this case is for a ±1.999V F.S. meter. For other ranges, the voltage applied should be similarly proportionate to the particular full scale voltage.

SLIM BEZEL CASE

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.

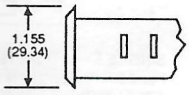


Dimensions in brackets are in millimeters. All other dimensions of these cases are the same as Slim Line Case shown at left.

STANDARD SLIM BEZEL CASE



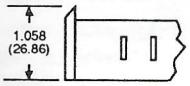
SLIM BEZEL CASE
Standard Black ABS case with matte finish bezel for single unit mounting.
Part No. **SL-CASERED** for LED's
SL-CASELCD for LCD's

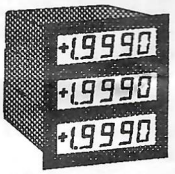


OPTIONAL TWIN MOUNTING OR MULTIPLE ARRAY CASES

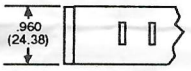


END MOUNT CASE
Same styling as Slim Bezel case but with bottom edge of bezel removed. Two End Mount cases can be twin mounted in a single cutout.
Part No. **EM-CASERED** for LED's
EM-CASELCD for LCD's





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-CASELCD for LCD's



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, 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 either been repaired or replaced by Texmate Inc.

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 INC
995 Park Center Drive • Vista, CA 92083-8397
Tel: (619) 598-9899 • Fax: (619) 598-9828

TEXMATE (TAIWAN BRANCH)
5 F. No. 32 Min Tsu E. Road • Taipei, Taiwan, R.O.C.
Tel: (886)2-5917865 • Fax: 886-2-5948266

TEXMATE AMPLICON LIVELINE
Centenary Industrial Estate • Brighton, UK • BN2 4AW
UK Sales Phone: (0273) 570220
EEC Sales Phone: (44 (273) 608333 • Fax: 44 (273) 570215

TEXMATE (THAILAND)
316/1 Soi Yasoob 1 • Sukhumvit 63 • Phrakanong, Bangkok 10110
Tel.: 66-2-392-4721 • Fax: 66-2-391-6470

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