

## MODEL PAXLR - PAX® LITE RATE METER



- RATE INDICATION
- 6-DIGIT, 0.56" (14.2 mm) HIGH LED DISPLAYS
- INPUT RATES UP TO 25 KHZ
- ACCEPTS A WIDE VARIETY OF SENSORS
- PROGRAMMABLE SCALING
- PROGRAMMABLE UPDATE TIME
- PROGRAMMABLE DECIMAL POINTS
- NEMA 4X/IP65 SEALED FRONT BEZEL



### GENERAL DESCRIPTION

The PAX® Lite Rate Meter, Model PAXLR, provides the versatility and flexibility needed to accommodate virtually any rate measuring application. The meter has the ability to scale for direct readout in terms of the units being measured. Whether a machine produces bottles, cloth, wire, or beverage mix, operation is enhanced when the rate readout is expressed directly in bottles/min., feet/min., gallons/min., or whatever units are needed in plant applications.

The PAXLR can accommodate magnetic pickups, logic sensors, and NPN open collector sensors. The pulses are received and scaled, so the desired display can be achieved. The meter is programmed through both the front panel buttons and DIP switches. Once the programming is complete, the front panel buttons can be disabled by a DIP switch setting.

The meter has been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing to meet CE requirements, the meter provides a tough, yet reliable application solution.

### SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



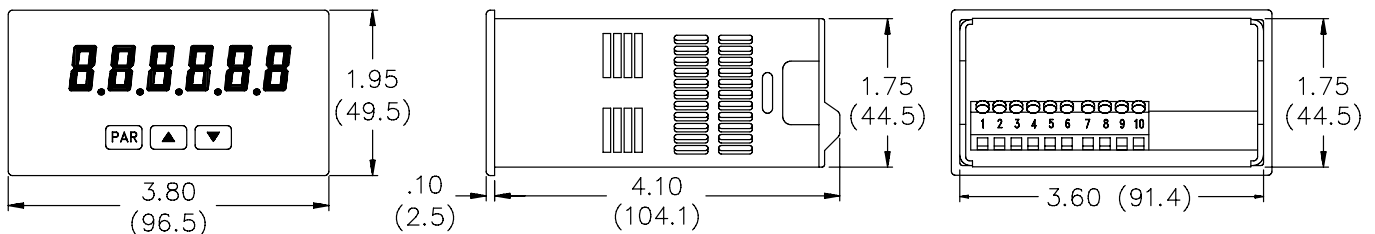
**CAUTION: Risk of Danger.**  
 Read complete instructions prior to installation and operation of the unit.



**CAUTION: Risk of electric shock.**

### DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5" (127) W.



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# ORDERING INFORMATION

## Meter Part Numbers



R0 - 6 Digit Rate Meter

# GENERAL METER SPECIFICATIONS

- DISPLAY:** 6-digit, 0.56" (14.2 mm), 7-segment LED.  
Decimal points are programmed by front panel keys.
- POWER:**  
**AC Power:** 115/230 VAC, switch selectable. Allowable power line variation  $\pm 10\%$ , 50/60 Hz, 6 VA. @ 100 mA max.  
**Isolation:** 2300 Vrms for 1 min. to input and DC Out/In.  
**DC Power:** 10 to 16 VDC @ 0.1 A max.
- SENSOR POWER:** 9 to 17.5 VDC @ 100 mA max.
- KEYPAD:** 3 programming keys, the  $\blacktriangledown$  (Down Arrow) key can also function as the front panel reset button.
- INPUT:** (DIP switch selectable)  
Accepts pulses from a variety of sources including NPN-OC, PNP-OC, TTL Outputs, Magnetic Pickups and all standard Red Lion<sup>®</sup> sensors.  
**Logic:** Input trigger levels  $V_{IL} = 1.5 \text{ V max.}$ ;  $V_{IH} = 3.75 \text{ V min.}$   
**Current Sinking:** Internal 7.8 K $\Omega$  pull-up to +12 VDC,  $I_{MAX} = 1.9 \text{ mA}$   
**Current Sourcing:** Internal 3.9 K $\Omega$  pull-down, 8 mA max. @ 30 VDC max.  
**MAGNETIC PICK-UP:**  
**Sensitivity:** 200 mV peak  
**Hysteresis:** 100 mV  
**Input impedance:** 3.9K $\Omega$  @ 60 Hz  
**Maximum input voltage:**  $\pm 40 \text{ V peak}$ , 30 Vrms
- INPUT FREQUENCY RANGE:**  
**Max Frequency:** 25 KHz  
**Min Frequency:** 0.01 Hz  
**Accuracy:**  $\pm 0.01\%$
- MEMORY:** Nonvolatile E<sup>2</sup>PROM retains all programmable parameters and display values.
- ENVIRONMENTAL CONDITIONS:**  
**Operating Temperature:** 0° to 60°C  
**Storage Temperature:** -40° to 60°C  
**Operating and Storage Humidity:** 0 to 85% max. relative humidity (non-condensing)  
**Vibration According to IEC 68-2-6:** Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2g's.  
**Shock According to IEC 68-2-27:** Operational 30 g (10g relay), 11 msec in 3 directions.  
**Altitude:** Up to 2000 meters
- CERTIFICATIONS AND COMPLIANCES:**  
**SAFETY**  
UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 61010-1  
Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.  
UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95  
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards  
Type 4X Enclosure rating (Face only), UL50

IECEE CB Scheme Test Certificate # US/8843A/UL  
CB Scheme Test Report # 04ME11209-20041018  
Issued by Underwriters Laboratories, Inc.  
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.  
IP65 Enclosure rating (Face only), IEC 529  
IP20 Enclosure rating (Rear of unit), IEC 529

## ELECTROMAGNETIC COMPATIBILITY

Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

### Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion A 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A <sup>2</sup> 2 kV power 2 kV signal
Surge	EN 61000-4-5	Criterion A <sup>2</sup> 1 kV L-L, 2 kV L&N-E power 1 kV signal
RF conducted interference	EN 61000-4-6	Criterion A 3 V/rms
Power frequency magnetic fields	EN 61000-4-8	Criterion A 30 A/m
Voltage dip/interruptions	EN 61000-4-11	Criterion A 0.5 cycle

### Emissions:

Emissions	EN 55011	Class B
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### Notes:

- Criterion A: Normal operation within specified limits.
- EMI filter placed on the DC power supply, when DC powered: Corcom #1VB3 or Schaffner #FN610-1/07 (RLC #LFIL0000).

### 10. CONNECTIONS: High compression cage-clamp terminal block

Wire Strip Length: 0.3" (7.5 mm)

Wire Gauge Capacity: 30-14 AWG copper wire.

Torque: 4.5 inch-lbs (0.51 N-m) max.

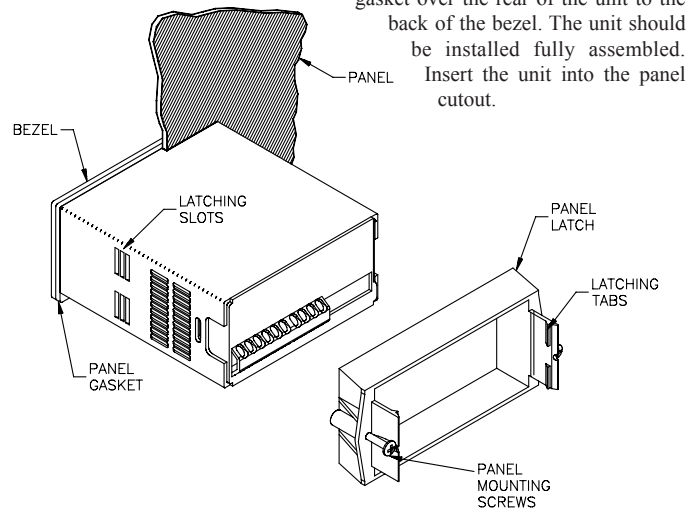
### 11. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 outdoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.

### 12. WEIGHT: 12 oz (340 g)

## 1.0 INSTALLING THE METER

### Installation

The PAX meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled.



While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

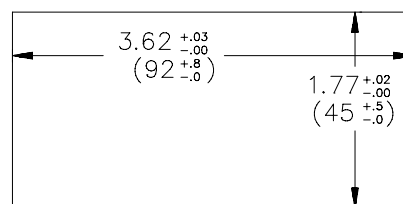
### Installation Environment

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

PANEL CUT-OUT

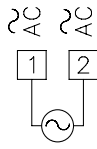




### 3.1 POWER WIRING

**AC Power**

Terminal 1: VAC  
Terminal 2: VAC

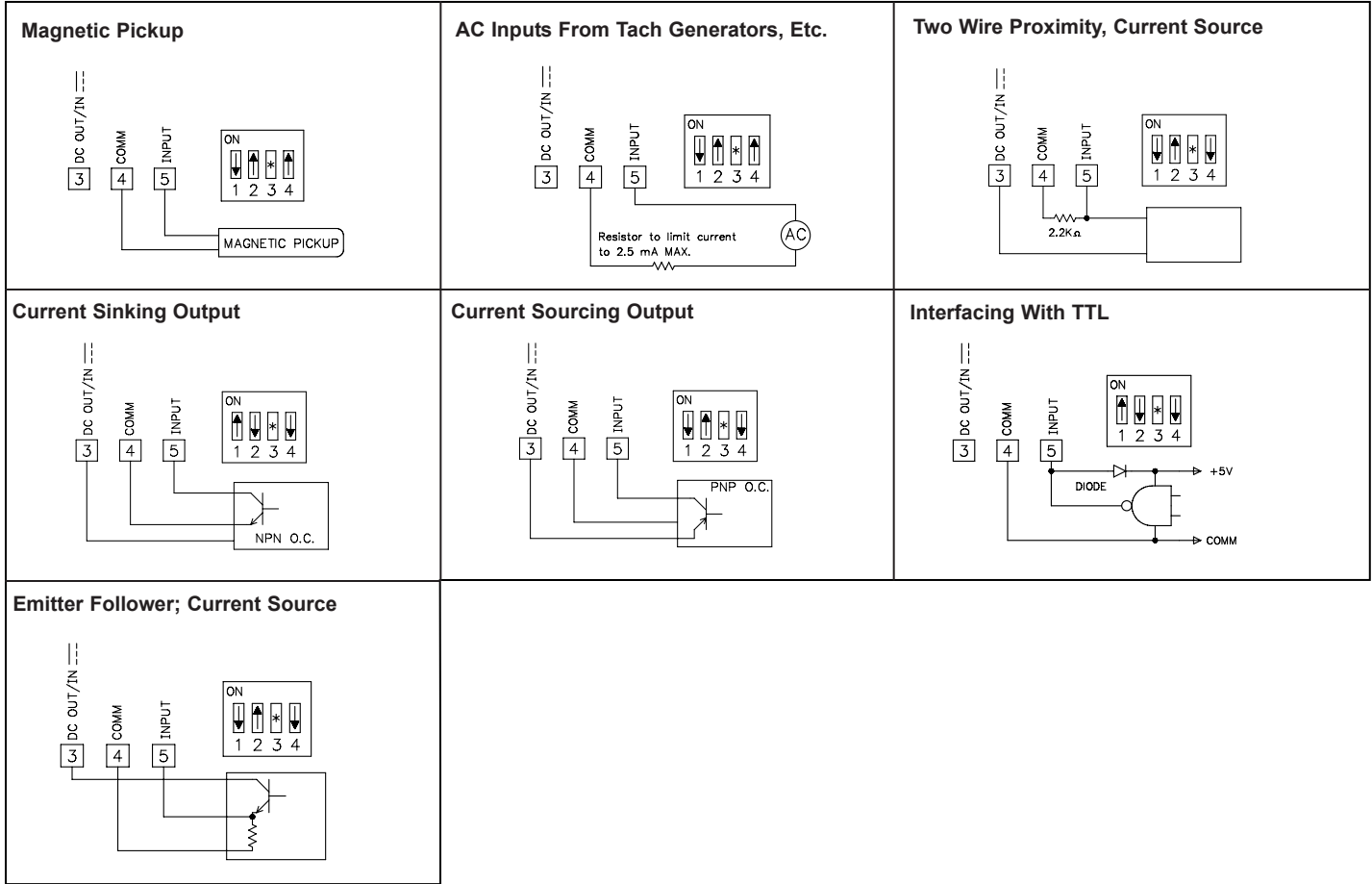


**DC Power**

Terminal 3: +VDC  
Terminal 4: COMM

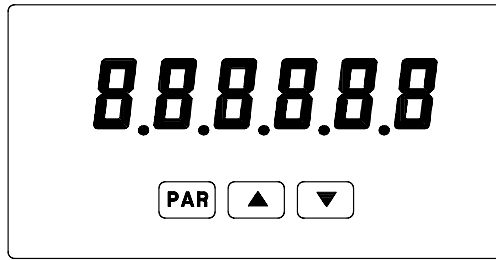


### 3.2 INPUT WIRING



\*Switch position is application dependent.

# 4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY



KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
▲	No Function	Increment selected digit of parameter value
▼	No Function	Select digit position in parameter value

# 5.0 SCALING THE METER

## RATE SCALING

To scale the Rate, enter a Scaling Display value with a corresponding Scaling Input value. These values are internally plotted to a Display value of 0 and Input value of 0 Hz. A linear relationship is formed between these points to yield a rate display value that corresponds to the incoming input signal rate. The location of the scaling point should be near the process end limit for the best possible accuracy. The PAXLR is capable of showing a rate display value for any linear process.

## SCALING CALCULATION

If a display value versus input signal (in pulses per second) is known, then those values can be entered into Scaling Display ( $r_k - d5P$ ) and Scaling Input ( $r_k - i1P$ ). No further calculations are needed.

If only the number of pulses per 'single' unit (i.e. # of pulses per foot) is known, then it can be entered as the Scaling Input value and the Scaling Display value will be entered as the following:

RATE PER	DISPLAY ( $r_k - d5P$ )	INPUT ( $r_k - i1P$ )
Second	1	# of pulses per unit
Minute	60	# of pulses per unit
Hour	3600	# of pulses per unit

## NOTES:

1. If # of pulses per unit is less than 10, then multiply both Input and Display values by 10.
2. If # of pulses per unit is less than 1, then multiply both Input and Display values by 100.
3. If the Display value is raised or lowered, then Input value must be raised or lowered by the same proportion (i.e. Display value for per hour is entered by a third less (1200) then Input value is a third less of # of pulses per unit). The same is true if the Input value is raised or lowered, then Display value must be raised or lowered by the same proportion.
4. Both values must be greater than 0.0.

## EXAMPLE:

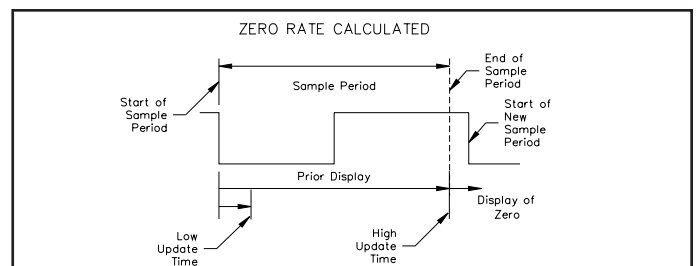
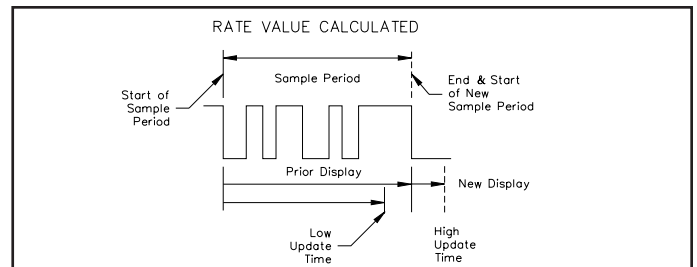
1. With 15.1 pulses per foot, show feet per minute in tenths.  
Scaling Display = 60.0 Scaling Input = 15.1
2. With 0.25 pulses per gallon, show whole gallons per hour. (To have greater accuracy, multiply both Input and Display values by 10.)  
Scaling Display = 36000 Scaling Input = 2.5

## RATE DISPLAY OVERFLOW

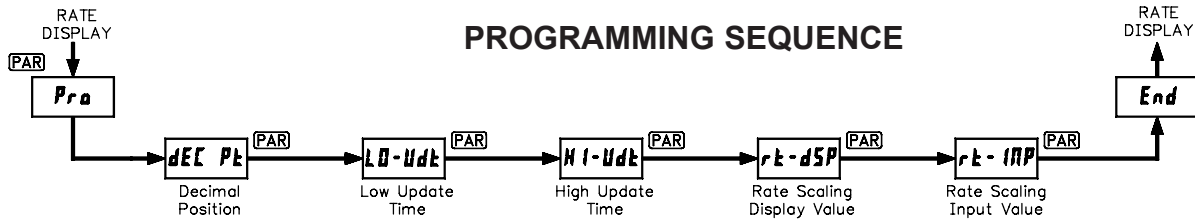
The rate of the input signal along with the programmed scaling values can cause the calculated rate display to exceed the meter's 6-digit capacity. If this occurs, the display will show "OL OL OL" to indicate an overflow condition.

## INPUT FREQUENCY CALCULATION

The meter determines the input frequency by summing the number of falling edges received during a sample period of time. The sample period begins on the first falling edge. At this falling edge, the meter starts accumulating time towards Low Update and High Update values. Also, the meter starts accumulating the number of falling edges. When the time reaches the Low Update Time value, the meter looks for one more falling edge to end the sample period. If a falling edge occurs (before the High Update Time value is reached), the Rate display will update to the new value and the next sample period will start on the same edge. If the High Update Time value is reached (without receiving a falling edge after reaching Low Update Time), then the sample period will end but the Rate display will be forced to zero. The High Update Time value must be greater than the Low Update Time value. Both values must be greater than 0.0. The input frequency calculated during the sample period, is then shown as a Rate value determined by either scaling method.



# 6.0 PROGRAMMING THE METER



The Rate Indicator has five programmable parameters which are entered in the sequence shown above, using the front panel push buttons.

Before programming, refer to the section on Scaling the Meter to determine the Rate Scaling Display Value and Rate Scaling Input Value to use for the specific application.

*Note: Programming mode can be locked out with the Program Disable DIP switch. With the switch in the Disabled (up) position the meter will not enter programming mode. Refer to the section on DIP switch setup.*

## PROGRAMMING MODE ENTRY

Press the **PAR** key to enter Programming Mode. The meter briefly displays **Pr a** followed by the first programming parameter described below.

## PROGRAMMING PARAMETERS

In programming mode, the display alternates between the parameter and the current selection or value for that parameter. The dual display with arrows is used below to illustrate the alternating display. The selection choices or value range for each parameter is shown to the right of the alternating display.

### DECIMAL POSITION



This parameter selects the decimal point position on the display. The selection does not affect scaling calculations.

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is shown. Press the **PAR** key to save the displayed selection and advance to the next parameter.

## ENTERING NUMERICAL VALUES

The parameters which follow are displayed as a multi-digit numerical values with one selected digit flashing (initially the far left digit). Press the ▲ (up arrow) key to increment the value of the selected (flashing) digit. Holding the ▲ key automatically scrolls the value of the selected digit.

Press the ▼ (down arrow) key to select the next digit position to the right. Use the ▲ key to increment the value of this digit to the desired number. Press the ▼ key again to select the next digit to be changed. Holding the ▼ key automatically scrolls through each digit position.

Repeat the “select and set” sequence until all digits are displaying the desired numerical value. Press the **PAR** key to save the displayed value and advance to the next parameter.

### LOW UPDATE TIME (DISPLAY UPDATE)



The Low Update Time is the minimum amount of time between display updates. The factory setting of 1.0 allows a minimum of one second between updates. Low values below 0.3 seconds will update the display correctly, but may cause the display to appear unsteady.

For more details on display updating, refer to Input Frequency Calculation.

### HIGH UPDATE TIME (DISPLAY ZERO)



The High Update Time is the maximum amount of time before the display is forced to zero. The High Update Time **must** be higher than the Low Update Time and also higher than the desired slowest readable speed (one divided by pulses per second). The factory setting of 2.0 will force the display to zero for speeds below 0.5 Hz or one pulse every 2 seconds.

For more details on display updating, refer to Input Frequency Calculation.

### RATE SCALING DISPLAY VALUE



Enter the desired Rate Display value to be shown for the corresponding Rate Input value entered below. For more explanation, refer to Rate Scaling.

If a decimal point was selected in the Decimal Position (**dEC Plt**) parameter, it will be displayed at the same position for this parameter value.

### RATE SCALING INPUT VALUE



Enter the Rate Input value that corresponds to the Rate Display value entered above. This value is always in pulses per second (Hz). For more explanation, refer to Rate Scaling.

## PROGRAMMING MODE EXIT

The meter exits Programming Mode when the **PAR** key is pressed to save the Rate Scaling Input Value. The meter briefly displays **End** upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Rate display.

(If power loss occurs during programming mode, verify parameter changes and reprogram, if necessary, when power is restored.)

## PROGRAMMING MODE TIME OUT

The Programming Mode has an automatic time out feature. If no keypad activity is detected for approximately 60 seconds, the meter automatically exits Programming Mode. The meter briefly displays **End** and returns to the Rate display. When automatic timeout occurs, any changes that were made to the parameter currently being programmed, will not be saved.

## FACTORY SETTINGS

The factory settings for the programming parameters are shown above in the alternating display illustrations. The factory settings can be easily restored by removing power from the meter, and then pressing and holding the **PAR** key while power is reapplied. The meter displays **rESEt** until the **PAR** key is released. The normal power-up sequence then resumes, with the factory settings loaded and saved in non-volatile memory.

*Note: The Program Disable DIP switch must be in the Enabled (down) position to allow loading factory settings. See section on DIP switch setup.*

### **LIMITED WARRANTY**

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

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Red Lion Controls  
20 Willow Springs Circle  
York PA 17406  
Tel +1 (717) 767-6511  
Fax +1 (717) 764-0839

Red Lion Controls BV  
Printerweg 10  
NL - 3821 AD Amersfoort  
Tel +31 (0) 334 723 225  
Fax +31 (0) 334 893 793

Red Lion Controls AP  
Unit 101, XinAn Plaza  
Building 13, No.99 Tianzhou Road  
ShangHai, P.R. China 200223  
Tel +86 21 6113-3688  
Fax +86 21 6113-3683