GENERAL DESCRIPTION

The PAXLA is a versatile meter available as a DC volt, current, or process meter with scaling and dual Form C relay outputs. The meter is programmed through the front panel buttons and the use of jumpers. The RST Key will also function as a front panel display reset.

Once the front panel programming is complete, the buttons can be disabled by a user input setting. The meter has been specifically designed for harsh industrial environments. With a 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 regulations, local codes and instructions that appear in this and corresponding 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.

SPECIFICATIONS

1. DISPLAY: 5 digit, 0.56" (14.2 mm) intensity adjustable Red LED (-19999 to 99999)

2. POWER REQUIREMENTS:
   AC POWER: 50 to 250 V AC 50/60 Hz, 12 V A
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs
   DC POWER: 21.6 to 250 VDC, 6 W
   DC Out: +24 VDC @ 100 mA if input voltage is greater than 50 V AC/VDC
   +24 VDC @ 50 mA if input voltage is less than 50 VDC

3. INPUT RANGES: Jumper Selectable
   D.C. Voltages: 200 mV, 2 V, 20 V, 200 V, 10 V
   D.C. Currents: 200 µA, 2 mA, 20 mA, 200 mA
   D.C. Process: 4 to 20 mA, 1 to 5 V DC, 0/1 to 10 VDC

4. OVERRANGE/UNDERRANGE INDICATION:
   Input Overrange Indication: "OLOL"
   Input Underrange Indication: "ULUL"
   Display Overrange/Underrange Indication: "....."/"-....."

5. A/D CONVERTER: 16 bit resolution

6. UPDATE RATES:
   A/D conversion rate: 20 readings/sec.
   Display update: 500 msec min.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAXLA</td>
<td>Volt/Current/Process Meter with dual Relay Output</td>
<td>PAXLA000</td>
</tr>
<tr>
<td>PAXLBK</td>
<td>Unit Label Kit Accessory</td>
<td>PAXLBK10</td>
</tr>
</tbody>
</table>

INPUT RANGE | ACCURACY @ 23 °C LESS THAN 85% RH | INPUT IMPEDANCE | MAX INPUT SIGNAL | RESOLUTION | TEMP. COEFFICIENT |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>0.1% of span</td>
<td>1.033 MΩ</td>
<td>75 VDC</td>
<td>10 µV</td>
<td>70 ppm /°C</td>
</tr>
<tr>
<td>2 V</td>
<td>0.1% of span</td>
<td>1.033 MΩ</td>
<td>75 VDC</td>
<td>0.1 µV</td>
<td>70 ppm /°C</td>
</tr>
<tr>
<td>20 V</td>
<td>0.1% of span</td>
<td>1.033 MΩ</td>
<td>250 VDC</td>
<td>1 mV</td>
<td>70 ppm /°C</td>
</tr>
<tr>
<td>200 V</td>
<td>0.1% of span</td>
<td>1.033 MΩ</td>
<td>250 VDC</td>
<td>10 mV</td>
<td>70 ppm /°C</td>
</tr>
<tr>
<td>10 V</td>
<td>0.1% of span</td>
<td>538 KΩ</td>
<td>75 V</td>
<td>1 mV</td>
<td>70 ppm /°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D.C. Currents</th>
<th>INPUT RANGE</th>
<th>ACCURACY @ 23 °C LESS THAN 85% RH</th>
<th>INPUT IMPEDANCE</th>
<th>MAX INPUT SIGNAL</th>
<th>RESOLUTION</th>
<th>TEMP. COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 µA</td>
<td>0.1% of span</td>
<td>1.111 KΩ</td>
<td>15 mA</td>
<td>0.1 mA</td>
<td>70 ppm /°C</td>
<td></td>
</tr>
<tr>
<td>2 mA</td>
<td>0.1% of span</td>
<td>11 Ω</td>
<td>50 mA</td>
<td>0.1 µA</td>
<td>70 ppm /°C</td>
<td></td>
</tr>
<tr>
<td>20 mA</td>
<td>0.1% of span</td>
<td>1 Ω</td>
<td>150 mA</td>
<td>1 µA</td>
<td>70 ppm /°C</td>
<td></td>
</tr>
<tr>
<td>200 mA</td>
<td>0.1% of span</td>
<td>1 Ω</td>
<td>500 mA</td>
<td>10 µA</td>
<td>70 ppm /°C</td>
<td></td>
</tr>
</tbody>
</table>

D.C. Process: 4 to 20 mA, 1 to 5 VDC, 0/1 to 10 VDC

<table>
<thead>
<tr>
<th>INPUT RANGE</th>
<th>SELECT RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 - 20 mA</td>
<td>Use the 20 mA range</td>
</tr>
<tr>
<td>1 - 5 VDC</td>
<td>Use the 10V range</td>
</tr>
<tr>
<td>1 - 10 VDC</td>
<td>Use the 10V range</td>
</tr>
</tbody>
</table>

DIMENSIONS In inches (mm)

![Dimensions Diagram]
7. USER INPUT:  
User Input: Software selectable pull-up (24.7 KΩ) or pull-down resistor (20 KΩ) that determines active high or active low input logic.  
Trigger levels: VIL = 1.0 V max; VIH = 2.4 V min; VMAX = 28 VDC  
Response Time: 5 msec typ.; 100 msec debounce (activation and release)  
8. MEMORY: Nonvolatile E²PROM retains all programming parameters when power is removed.  
9. OUTPUT:  
Type: Single FORM-C relay  
Isolation To Sensor & User Input Commons: 1400 Vrms for 1 min.  
Working Voltage: 150 Vrms  
Contact Rating: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)  
Life Expectancy: 100,000 minimum operations  
Response Time:  
Turn On Time: 4 msec max.  
Turn Off Time: 4 msec max.  
10. ENVIRONMENTAL CONDITIONS:  
Operating temperature: 0 to 50 °C  
Storage temperature: -40 to 70 °C  
Operating and storage humidity: 0 to 85% max. RH (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 2,000 meters  
11. CONNECTIONS: High compression cage-clamp terminal block  
Wire Strip Length: 0.3” (7.5 mm)  
Wire Gage: 30-14 AWG copper wire  
Torque: 4.5 inch-lbs (0.51 N-m) max.  
12. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 outdoor use. IP20  
13. CERTIFICATIONS AND COMPLIANCES:  
SAFETY  
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  
Type 4X Enclosure rating (Face only), UL50  
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 Criteria A  
4 kV contact discharge  
8 kV air discharge  
Electromagnetic RF fields EN 61000-4-3 Criteria A  
10 V/m  
Fast transients (burst) EN 61000-4-4 Criteria B  
2 kV power  
1 kV signal  
Surge EN 61000-4-5 Criteria A  
1 kV L-L  
2 kV L&N-E power  
RF conducted interference EN 61000-4-6 Criteria A  
3 V/rms  
Voltage dip/interruptions EN 61000-4-11 Criteria A  
0.5 cycle  
Emissions:  
Emissions EN 55011 Class A  
Notes:  
2. Criterion B: Temporary loss of performance from which the unit self-recoveries.  
14. WEIGHT: 10.4 oz. (295 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. Insert the unit into the panel cutout.

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.

Panel Cut-Out

Panel cut-out dimensions are shown in the diagram below. The panel cut-out is designed to accommodate the unit with a snug fit. Please ensure that the cut-out dimensions are followed accurately to avoid any issues with installation.

Panel Cut-Out Dimensions:
- Width: 3.62 ± 0.03 inches (92 ± 8 mm)
- Height: 1.77 ± 0.02 inches (45 ± 5 mm)

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.


2.0 Setting the Jumpers

Input Range Jumper
This jumper is used to select the proper input range. The input range selected in programming must match the jumper setting. Select a range that is high enough to accommodate the maximum signal input to avoid overloads.

To access the jumpers, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start on the other side latch.

Warning: Exposed line voltage exists on the circuit boards. Remove all power to the meter and load circuits before accessing inside of the meter.

3.0 Wiring the Meter

EMC Installation Guidelines
Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be ran in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC# FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward # 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC# LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC# SNUB0000.

Wiring Overview
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
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6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC# SNUB0000.
3.1 POWER WIRING

Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -

DC Out Power
Terminal 3: +24 VDC OUT
Terminal 4: Common

3.2 USER INPUT WIRING

Terminal 8: User Input
Terminal 9: User Comm

Sinking Logic
Terminal 8

Sourcing Logic
Terminal 8

3.3 SETPOINT (OUTPUT) WIRING

Terminal 10: NC 1
Terminal 11: NO 1
Terminal 12: Relay 1 Common
Terminal 13: NC 2
Terminal 14: NO 2
Terminal 15: Relay 2 Common

3.4 INPUT SIGNAL WIRING

CAUTION: Analog common is NOT isolated from user input common. In order to preserve the safety of the meter application, the Analog and DC power common must be suitably isolated from hazardous live earth referenced voltage; or input common must be at protective earth ground potential. If not, hazardous voltage may be present at the User Input and Input Common terminals. Appropriate considerations must then be given to the potential of the input common with respect to earth ground. Always connect the analog signal common to terminal 7.
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

- **PAR**: Access Programming Mode
- **SEL**: Index display through selected displays
- **RST**: Resets display

PROGRAMMING MODE OPERATION
- Store selected parameter and index to next parameter
- Advance through selection list/select digit position in parameter value
- Increment selected digit of parameter value

OPERATING MODE DISPLAY DESIGNATORS
- **MAX**: Maximum display capture value
- **MIN**: Minimum display capture value
- “SP1” - Below the display indicates setpoint 1 output activated.
- “SP2” - Below the display indicates setpoint 2 output activated.

Pressing the **SEL** button toggles the meter through the selected displays. If display scroll is enabled, the display will toggle automatically every four seconds between the enabled display values.

---

5.0 PROGRAMMING THE METER

OVERVIEW

PROGRAMMING MENUS

PROGRAMMING MODE ENTRY (PAR BUTTON)
- It is recommended all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing the **PAR** button. If it is not accessible, then it is locked by either a security code or a hardware lock.

MODULE ENTRY (SEL & PAR BUTTONS)
- The Programming Menu is organized into four modules. These modules group together parameters that are related in function. The display will alternate between **Pr0** and the present module. The **SEL** button is used to select the desired module. The displayed module is entered by pressing the **PAR** button.

MODULE MENU (PAR BUTTON)
- Each module has a separate module menu (which is shown at the start of each module discussion). The **PAR** button is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to **Pr0 NO**. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY
- For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The **SEL** and **RST** buttons are used to move through the selections/values for that parameter. Pressing the **PAR** button, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, the value is displayed with one digit flashing (initially the right most digit). Pressing the **RST** button increments the digit by one or the user can hold the **RST** button and the digit will automatically scroll. The **SEL** button will select the next digit to the left. Pressing the **PAR** button will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (PAR BUTTON)
- The Programming Mode is exited by pressing the **PAR** button with **Pr0 NO** displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS
- It is recommended to start with Module 1 and proceed through each module in sequence. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS
- Factory Settings may be completely restored in Module 2. This is useful when encountering programming problems.

ALTERNATING SELECTION DISPLAY
- In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter’s Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.
5.1 MODULE 1 - SIGNAL INPUT PARAMETERS (I - INP)

**PARAMETER MENU**

<table>
<thead>
<tr>
<th>parameter</th>
<th>selection</th>
<th>range</th>
<th>resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE</td>
<td>200.00 mA</td>
<td>200.00 mA</td>
<td>20.000 mA</td>
</tr>
<tr>
<td></td>
<td>2.0000 mV</td>
<td>20.000 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0000 V</td>
<td>200.00 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.000 V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select the input range that corresponds to the external signal. This selection should be high enough to avoid input signal overload but low enough for the desired input resolution. This selection and the position of the Input Range Jumper must match.

**DISPLAY DECIMAL POINT**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECP</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Select the decimal point location for the Input, MIN and MAX displays. This selection also affects the dSP1 and dSP2 parameters and setpoint values and offset value.

**DISPLAY OFFSET VALUE**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFSE</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The display can be corrected with an offset value. This can be used to compensate for signal variations or sensor errors. This value is automatically updated after a Zero Display to show how far the display is offset. A value of zero will remove the effects of offset. The decimal point follows the DECP selection.

**FILTER SETTING**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILT</td>
<td>0 1 2 3</td>
</tr>
</tbody>
</table>

If the displayed value is difficult to read due to small process variations or noise, increased levels of filtering will help to stabilize the display. Software filtering effectively combines a fraction of the current input reading with a fraction of the previous displayed reading to generate the new display.

Filter values represent no filtering (0), up to heavy filtering (3). A value of 1 for the filter uses 1/4 of the new input and 3/4 of the previous display to generate the new display. A filter value of 2 uses 1/8 new and 7/8 previous. A filter value of 3 uses 1/16 new and 15/16 previous.

**FILTER BAND**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAND</td>
<td>0 to 99 display units</td>
</tr>
</tbody>
</table>

The filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a large process change. The value of the band is in display units, independent of the Display Decimal Point position. A band setting of ‘0’ keeps the filter permanently engaged at the filter level selected above.

**SCALING STYLE**

If Input Values and corresponding Display Values are known, the Key-in (KEY) scaling style can be used. This allows scaling without the presence or changing of the input signal. If Input Values have to be derived from the actual input signal source or simulator, the Apply (APLY) scaling style must be used.

**INPUT VALUE FOR SCALING POINT 1**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INP 1</td>
<td>0 to 9999</td>
</tr>
</tbody>
</table>

For Key-in (KEY) style, enter the first Input Value using the front panel buttons. (The Input Range selection sets the decimal location for the Input Value).

For Apply (APLY) style, the meter shows the previously stored Input Value. To retain this value, press the SEL button to advance to the next parameter. To change the Input Value, press the RST button and apply the input signal to the meter. Adjust the signal source externally until the desired Input Value appears. Press the SEL button to enter the value being displayed.

**DISPLAY VALUE FOR SCALING POINT 1**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>dSP 1</td>
<td>00.00</td>
</tr>
</tbody>
</table>

Enter the first Display Value by using the front panel buttons. This is the same for KEY and APLY scaling styles. The decimal point follows the DECP selection.

**INPUT VALUE FOR SCALING POINT 2**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INP 2</td>
<td>0 to 9999</td>
</tr>
</tbody>
</table>

For Key-in (KEY) style, enter the known second Input Value using the front panel buttons.

For Apply (APLY) style, the meter shows the previously stored Input Value for Scaling Point 2. To retain this value, press the SEL button to advance to the next parameter. To change the Input Value, press the RST button and apply the input signal to the meter. Adjust the signal source externally until the desired Input Value appears. Press the SEL button to enter the value being displayed.

**DISPLAY VALUE FOR SCALING POINT 2**

<table>
<thead>
<tr>
<th>selection</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>dSP 2</td>
<td>00.00</td>
</tr>
</tbody>
</table>

Enter the second Display Value by using the front panel buttons. This is the same for KEY and APLY scaling styles. The decimal point follows the DECP selection.

**General Notes on Scaling**

1. When using the Apply (APLY) scaling style, input values for scaling points must be confined to the range limits shown.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mA cannot equal 0 and 20.)
3. For input levels beyond the programmed Input Values, the meter extends the Display Value by calculating the slope from the two coordinate pairs (INP1 / dSP1 & INP2 / dSP2).
**USER INPUT FUNCTION**

<table>
<thead>
<tr>
<th>Description</th>
<th>MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Input disabled.</td>
<td><strong>NO</strong></td>
</tr>
<tr>
<td>See Programming Mode Access chart (Module 3).</td>
<td><strong>P-Loc</strong></td>
</tr>
<tr>
<td>Zero the Input Display value causing Display Reading to be Offset.</td>
<td><strong>ZErO</strong></td>
</tr>
<tr>
<td>Resets the assigned value(s) to the current input value.</td>
<td><strong>rESet</strong></td>
</tr>
<tr>
<td>Holds the assigned display, but all other meter functions continue as long as activated (maintained action).</td>
<td><strong>d-HLd</strong></td>
</tr>
<tr>
<td>Advance once for each activation.</td>
<td><strong>d-SEL</strong></td>
</tr>
<tr>
<td>Increase intensity one level for each activation.</td>
<td><strong>d-LEV</strong></td>
</tr>
<tr>
<td>Resets setpoint 1 output.</td>
<td><strong>rSt-1</strong></td>
</tr>
<tr>
<td>Resets setpoint 2 output.</td>
<td><strong>rSt-2</strong></td>
</tr>
<tr>
<td>Reset both setpoint 1 and 2 outputs.</td>
<td><strong>rSt12</strong></td>
</tr>
</tbody>
</table>

**USER INPUT ASSIGNMENT**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HI-LO</strong></td>
<td>HI</td>
</tr>
</tbody>
</table>

Select the value(s) to which the User Input Function is assigned. The User Input Assignment only applies if a selection of reset, or display hold is selected in the User Input Function menu.

**USER INPUT ACTIVE LEVEL**

Select whether the user input is configured as active low or active high.

## 5.2 MODULE 2 - SECONDARY FUNCTION PARAMETERS (2-SEC)

### MAX DISPLAY ENABLE

| **HI-En** | **NO** | **YES** |
|  |  | |

Enables the Maximum Display Capture capability.

### MAX CAPTURE DELAY TIME

| **HI-t** | **20** |
|  |  |

When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.

### MIN DISPLAY ENABLE

| **LO-En** | **NO** | **YES** |
|  |  | |

Enables the Minimum Display Capture capability.

### MIN CAPTURE DELAY TIME

| **LO-t** | **20** |
|  |  |

When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.

### FACTORY SERVICE OPERATIONS

| **FCS** | **NO** | **YES** |
|  |  | |

Select **YES** to perform any of the Factory Service Operations shown below.

### RESTORE FACTORY DEFAULT SETTINGS

Entering Code 66 will overwrite all user settings with the factory settings. The meter will display **rESet** and then return to **CodE 00**. Press the **PAR** button to exit the module.

### VIEW MODEL AND VERSION DISPLAY

Entering Code 50 will display the version (x.x) of the meter. The display then returns to **CodE 00**. Press the **PAR** button to exit the module.

### CALIBRATION

The PAXLA uses stored calibration values to provide accurate measurements. Over time, the electrical characteristics of the components inside the PAXLA will slowly change with the result that the stored calibration values no longer accurately define the input circuit. For most applications, recalibration every 1 to 2 years should be sufficient.

Calibration of the PAXLA involves a calibration which should only be performed by individuals experienced in calibrating electronic equipment. Allow 30 minute warm up before performing any calibration related procedure. The following procedures should be performed at an ambient temperature of 15 to 35 °C (59 to 95 °F).

**CAUTION:** The accuracy of the calibration equipment will directly affect the accuracy of the PAXLA.
Current Calibration
1. Connect the negative lead of a precision DC current source with an accuracy of 0.01% or better to the COMM terminal. Leave the positive lead of the DC current source unconnected.
2. With the display at Code 48, press the PAR button. Unit will display CLR NO.
3. Press the RST button to select the range to be calibrated.
4. Press the PAR button. Display reads CLR for about 8 seconds.
5. With the positive lead of the DC current source unconnected, press PAR. Display reads CLR for about 8 seconds.
6. When the display reads the selected range, connect the positive lead of the DC current source to the current input and apply full-scale input signal for the range. (Note: For 200 mA range, apply 100 mA as indicated on the display.) Press PAR. Display reads CLR for about 8 seconds.
7. Repeat steps 3 through 6 for each input range to be calibrated. When display reads CLR NO, press the PAR button to exit calibration.

Voltage Calibration
1. Connect a precision DC voltage source with an accuracy of 0.01% or better to the volt input and COMM terminals of the PAXLA. Set the output of the voltage source to zero.
2. With the display at Code 48, press the PAR button. Unit will display CLR NO.
3. Press the RST button to select the range to be calibrated.
4. Press the PAR button. Display reads CLR NO.
5. With the voltage source set to zero (or a dead short applied to the input), press PAR. Display reads CLR for about 8 seconds.
6. When the display reads the selected range, apply full-scale input signal for the range. (Note: For 200V range, apply 100V as indicated on the display.) Press PAR. Display reads CLR for about 8 seconds.
7. Repeat steps 3 through 6 for each input range to be calibrated. When display reads CLR NO, press the PAR button to exit calibration.

5.3 MODULE 3 - DISPLAY AND FRONT PANEL BUTTON PARAMETERS (3-dSP)

<table>
<thead>
<tr>
<th>Parameter Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
</tr>
<tr>
<td>3-dSP</td>
</tr>
</tbody>
</table>

**DISPLAY UPDATE TIME**

This parameter sets the display update time in seconds.

**FRONT PANEL DISPLAY SELECT ENABLE (SEL)**

The YES selection allows the SEL button to toggle through the enabled displays.

**FRONT PANEL RESET ENABLE (RST)**

This selection allows the RST button to reset the selected value(s).

**ZERO DISPLAY WITH DISPLAY RESET**

This parameter enables the RST button or user input to zero the input display value, causing the display reading to be offset. 

Note: For this parameter to operate, the RST button or User Input being used must be set to dSP and the input value must be displayed. If these conditions are not met, the display will not zero.

**DISPLAY SCROLL ENABLE**

The YES selection allows the display to automatically scroll through the enabled displays. The scroll rate is every 4 seconds. This parameter only appears when the MAX or MIN displays are enabled.

**UNITS LABEL BACKLIGHT**

The Units Label Kit Accessory contains a sheet of custom unit overlays which can be installed in to the meter’s bezel display assembly. The backlight for these custom units is activated by this parameter.

**DISPLAY INTENSITY LEVEL**

Enter the desired Display Intensity Level (1-3). The display will actively dim or brighten as levels are changed.
The Security Code determines the programming mode and the accessibility of programming parameters. This code can be used along with the Program Mode Lock-out (P-Loc) in the User Input Function parameter (Module 1).

Two programming modes are available. Full Programming mode allows all parameters to be viewed and modified. Quick Programming mode permits only the Setpoint values to be modified, but allows direct access to these values without having to enter Full Programming mode.

Programming a Security Code other than 0, requires this code to be entered at the CodE prompt in order to access Full Programming mode. Depending on the code value, Quick Programming may be accessible before the CodE prompt appears (see chart).

### PROGRAMMING SECURITY CODE

**CodE**

0000 to 9999

Enter the setpoint (output) to be programmed. The n in the following parameters will reflect the chosen setpoint number. After the chosen setpoint is completely programmed, the display will return to SPSEL. Repeat steps for each setpoint to be programmed. Select NO to exit the module.

### SETPOINT SELECT

**SPSEL**

NO SP-1 SP-2

Select YES to enable Setpoint n and access the setup parameters. If NO is selected, the unit returns to SPSEL and Setpoint n is disabled.

### SETPOINT VALUE

Enter the desired setpoint value. The decimal point position for the setpoint and hysteresis values follow the selection set in Module 1.

### HYSTERESIS VALUE

Enter desired hysteresis value. See Setpoint Output Figures for visual explanation of how setpoint output actions (balanced and unbalanced) are affected by the hysteresis. When the setpoint is a control output, usually balanced hysteresis is used. For alarm applications, usually unbalanced hysteresis is used. For unbalanced hysteresis modes, the hysteresis functions on the low side for high acting setpoints and functions on the high side for low acting setpoints.

**Note:** Hysteresis eliminates output chatter at the switch point, while time delay can be used to prevent false triggering during process transient events.
Enter the time value in seconds that the output is delayed from turning on after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

Enter the time value in seconds that the output is delayed from turning off after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

Enter the reset action of the output. See figure for details.

- **Auto**: Automatic action; This action allows the output to automatically reset off at the trigger points per the Setpoint Action shown in Setpoint Output Figures. The “on” output may be manually reset (off) immediately by the front panel RST button or user input. The output remains off until the trigger point is crossed again.

- **LATCH**: Latch with immediate reset action; This action latches the output on at the trigger point per the Setpoint Action shown in Setpoint Output Figures. Latch means that the output can only be turned off by the front panel RST button or user input manual reset, or meter power cycle. When the user input or RST button is activated (momentary action), the corresponding “on” output is reset immediately and remains off until the trigger point is crossed again. (Previously latched alarms will be off if power up Display Value is lower than setpoint value.)

- **L-dLY**: Latch with delay reset action; This action latches the output on at the trigger point per the Setpoint Action shown in Setpoint Output Figures. Latch means that the output can only be turned off by the front panel RST button or user input manual reset, or meter power cycle. When the user input or RST button is activated (momentary action), the meter delays the event until the corresponding “on” output crosses the trigger off point. (Previously latched outputs are off if power up Display Value is lower than setpoint value. During a power cycle, the meter erases a previous L-dLY reset if it is not activated at power up.)

This parameter enables the RST button or user input to reset the output when the display is reset.

Note: For this parameter to operate, the RST button or User Input being used must be set to dSp and the Input value must be displayed. If these conditions are not met, the output will not reset.

When **YES**, the output is disabled (after a power up) until the trigger point is crossed. Once the output is on, the output operates normally per the Setpoint Action and Output Reset Action.
Press PAR key to enter Programming Mode.
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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
GENERAL DESCRIPTION

PAXLIT 5 Amp AC Current Meter provides the capability of measuring large AC currents. The internal current shunt in the PAXLIT can measure up to 5 Amps AC current directly. Using an external current transformer, AC currents of up to 1,999 Amps can be measured and displayed.

The PAXLIT can be scaled, using the scaling potentiometer, to display between 200 and 1999 when measuring full scale current. Using the DIP switch selectable decimal points, the display can be customized for direct readout for practically any application.

The 3½-digit bi-polar display (minus sign displayed when current is negative) features a 0.56" high, 7-segment LEDs for easy reading. The meter is also available with custom units label capability. Using the PAX label kit (PAXLBK30), the selected label is installed behind the panel, keeping it safe from washdown or other environmental conditions. A DIP switch is used to control the backlight for the units label.

The meters have a NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, allowing the meter to provide 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.

DEFINITION OF TERMS

INSTALLATION CATEGORY (overvoltage category) I, (CAT I):
Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II. (See IEC 664 & IEC 61010)

INSTALLATION CATEGORY (overvoltage category) II, (CAT II):
Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III. (See IEC 664 & IEC 61010)

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.
TABLE OF CONTENTS

Ordering Information ........................................... 2
General Meter Specifications ................................. 3
Accessories ......................................................... 3
Installing the Meter ............................................. 4
Setting the Switches ........................................... 4
Wiring the Meter ................................................... 5
Scaling the Meter ............................................... 5
Application ....................................................... 6
Troubleshooting .................................................. 6
Calibration .......................................................... 6

ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>IT</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

IT - 5 Amp Current Meter

Accessories Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
<tr>
<td>CT</td>
<td>50:5 Amp Current Transformer</td>
<td>CT005050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200:5 Amp Current Transformer</td>
<td>CT020050</td>
<td></td>
</tr>
</tbody>
</table>

TABLE OF CONTENTS
GENERAL METER SPECIFICATIONS

1. DISPLAY: 3 1/2-digit, 0.56" (14.2 mm) high, 7-segment LED. Decimal points inserted before 1st, 2nd, or 3rd least significant digits by DIP switch selection.
2. POWER: 115/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA.

   Isolation: 2300 Vrms for 1 min. between input and supply

   Working Voltage: 300 V max., CAT II

3. SIGNAL INPUT:

   Range: 0 to 5 Amps AC @ 45 to 400 Hz

   Resolution: 2.5 mA

   Working Voltage: 300 V max., CAT II

4. ACCURACY: ±(0.5% of reading + 5 digits).

5. OVER-RANGE INDICATION: is indicated by blanking 3 least significant digits.

6. MAX SHUNT CURRENT: 50 Amps for 1 sec.; 8 Amps continuous.

   Caution: In circuits where fault currents can exceed the maximum shunt current, a fast-blow fuse should be installed in series with the input signal.

   Otherwise, a slow blow 8 Amp fuse is recommended that will allow for start-up over current situations, while still protecting the instrument.

7. ENVIRONMENTAL CONDITIONS:

   Operating Temperature: 0° to 60°C

   Storage Temperature: -40° to 80°C

   Operating and Storage Humidity: 85% max. relative humidity (non-condensing)

   Altitude: Up to 2000 meters

8. RESPONSE TIME TO STEP CHANGE INPUT: 1 sec. nominal

9. READING RATE: 2.5 readings/sec., nominal

10. CERTIFICATIONS AND COMPLIANCES:

    SAFETY

    UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 1010-1

    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

    IEC6 CB Scheme Test Certificate # UL/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 I.

    IP65 Enclosure rating (Face only), IEC 529

    ELECTROMAGNETIC COMPATIBILITY

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

    Immunity to Industrial Locations:

    | Emission                  | EN 61000-4-2 | EN 61000-4-3 |
    |---------------------------|--------------|--------------|
    | Electrostatic discharge   | Criterion A  | Criterion B  |
    | 4 kV contact discharge    | 8 kV air discharge |
    | Fast transients (burst)   | 10 V/m       | 2 kV power   |
    | Surge                     | 2 kV signal  | 1 kV L-L,    |
    |                           |              | 2 kV L&N-E   |
    | RF conducted interference | 3 V/rms      | 0.5 cycle; 40 % variation |

    Emissions:

    | Emissions                | EN 55011 |
    |--------------------------|----------|
    | Class                    | B        |

    Notes:


    2. Criterion B: Temporary loss of performance from which the unit self-reCOVERS.

    11. CONNECTIONS: High compression cage-clamp terminal block

    Wire Strip Length: 0.3” (7.5 mm)

    Wire Gage: 30-14 AWG copper wire

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

    12. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 use. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Panel gasket and mounting clip included.

    13. WEIGHT: 0.65 lbs. (0.24 Kg)

ACCESSORIES

UNITS LABEL KIT (PAXLBK)

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled by a DIP switch.
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. Insert the unit into the panel cutout.

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.

2.0 Setting the Switches

The meter has switches, which must be checked and/or changed prior to applying power. To access the switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch
Caution: Insure the AC power selection switch is set for the proper voltage before powering the meter. The meter is shipped from the factory in the 230 VAC position.

Set-Up DIP Switches
A DIP switch is located inside the meter. It is used for the selection of decimal points, backlight annunciator, and scaling. Selecting the “ON” position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>3</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>4</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
<tr>
<td>5</td>
<td>Enables the Scaling Pot</td>
</tr>
</tbody>
</table>
3.0 Wiring the Meter

Wiring Overview
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC Installation Guidelines
Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC #FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward #28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom #1VR3
   - Note: Reference manufacturer’s instructions when installing a line filter.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   - Snubber: RLC#SNUB0000.

3.1 Power Wiring

<table>
<thead>
<tr>
<th>AC Power</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal 1: VAC</td>
<td>115V</td>
<td>230V</td>
</tr>
<tr>
<td>Terminal 2: VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2 Input Signal Wiring

<table>
<thead>
<tr>
<th>Current Signal (self powered)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal 4: + Amps AC</td>
</tr>
<tr>
<td>Terminal 3: - Amps AC</td>
</tr>
</tbody>
</table>

4.0 Scaling the Meter

Factory Scaling
The meter is calibrated from the factory for 5 Amps AC current input to show 1999. This scaling will be used when the Scale Switch is in the “OFF” position.

Scaling Readout
Place the Scale Switch in the “ON” position. This enables the Scale Potentiometer which is accessible from the back of the meter. (Enabling the Scale Potentiometer does NOT affect the calibration of the meter.) Place the Decimal Point Switches to the proper location. Apply the meter power and the current signal. Adjust the Scale Potentiometer to the desired value.

This scaling only effects the span. There is no offset scaling. This means that only zero current can display a value of zero.

At 5 Amps AC current input, the display can be scaled from 1999 down to 200 by using the scaling potentiometer. For display values below 200, turn on the appropriate Decimal Point Switch and then adjust the potentiometer to achieve the desired display value. Example: A customer wants to display 50 Amps because he is using a 50:5 CT. In this case, he must turn DIP switch 1 on for a decimal point and DIP switch 5 on for scaling. Then apply the 5 Amp signal and turn the scaling pot until 50.0 is shown on the display.
5.0 APPLICATION

MOTOR CURRENT MEASUREMENT USING A CURRENT TRANSFORMER

The PAXLIT 5 Amp AC Current Meter is configured by simply connecting the “COMM.” (Terminal 3) and the “5AMP” (Terminal 4) to the external current transformer. The current carrying wire to be sensed is passed through the center of the current transformer. The resolution of the display, in this case, is 0.1 Amp, therefore, “Switch #1” is selected.

The meter is now ready to be scaled. The installer has access to a calibrated portable digital current meter capable of measuring the motor current. Scaling will be accomplished by adjusting the scaling pot on the PAXLIT meter to agree with the portable digital current meter. The operator turns on the AC motor and lifts a large weight to load the motor. The installer then simply adjusts the scaling adjustment, located at the rear of the unit, until the display is equal to the value indicated on the portable current meter. The meter will now indicate the load current of the motor precisely.

CAUTION: It is recommended that the current transformer be internally protected or that a voltage clamping circuit be provided, preventing dangerous high voltage across the CT secondary windings in case of accidental opening of the secondary output leads when the primary is energized.

In order to prevent risk of electric shock ensure CT is installed according to local NEC regulations for installation of current instrument transformers.

6.0 TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DISPLAY</td>
<td>CHECK: Power switch and line voltage</td>
</tr>
<tr>
<td>INCORRECT DISPLAY</td>
<td>CHECK: Scaling adjustment pot DIP switch position</td>
</tr>
<tr>
<td></td>
<td>ADJUST: Scaling pot</td>
</tr>
<tr>
<td></td>
<td>VERIFY: Input Signal</td>
</tr>
<tr>
<td>OVER-RANGE INDICATION</td>
<td>VERIFY: Input signal</td>
</tr>
</tbody>
</table>

For further assistance, contact technical support at the appropriate company numbers listed.

7.0 CALIBRATION

The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed by enabling the scale pot DIP switch. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter.

When recalibration is required (generally every two years), it should only be performed by qualified technicians using appropriate equipment.

Input Calibration

WARNING: Calibration of this meter requires a signal source with an accuracy of 0.05% or better and an external meter with an accuracy of 0.005% or better.

Before starting, verify that the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter.

Then perform the following procedure:
1. Set the DIP switch off to disable the scaling pot.
2. Apply half scale input signal.
3. Adjust calibration potentiometer as necessary for the display to read 1000 (ignore decimal point)
4. Apply zero signal and ensure display reads zero.
5. Apply full scale signal and ensure display reads 1999.
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLPT - PAX LITE PROCESS TIME METER

GENERAL DESCRIPTION
The PAX Lite Process Time Meter, Model PAXLPT, displays a value representing the time between a beginning and end point of a process, such as a conveyor oven.

The PAXLPT’s display will update inversely in relation to the input signal frequency. As input frequency increases (representing speed), the PAXLPT time display will decrease indicating a reduction in the duration of process time. For example, the bake time through an oven will decrease the faster the conveyor runs.

The display can be programmed for two operating modes. Operating in the 6 digit mode, the PAXLPT can readout in any whole value, such as seconds, minutes, or hours. This mode also provides capability for decimal points. The 5 digit mode functions as a chronometer, which has a maximum display value of 999-59. This formats the display to allow the meter to readout in hours and minutes, minutes and seconds, etc.

The PAX Lite Process Time Indicator also has a feature called “moving window average”. This allows one time disturbances, or irregularly spaced items to be averaged over eight inputs, thus keeping display fluctuations to a minimum while still updating the display on every pulse. This feature can be enabled or disabled by a rear DIP switch.

The PAXLPT can accept many different types of sensors including magnetic pickups, logic sensors, and NPN open collector sensors, as well as switch contact closure sensors.

The meter has been specifically designed for harsh industrial environments. With a 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.

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.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering Information</td>
<td>2</td>
</tr>
<tr>
<td>General Meter Specifications</td>
<td>3</td>
</tr>
<tr>
<td>Installing the Meter</td>
<td>3</td>
</tr>
<tr>
<td>Setting the Jumper and Switches</td>
<td>4</td>
</tr>
<tr>
<td>Wiring the Meter</td>
<td>4</td>
</tr>
<tr>
<td>Reviewing the Front Buttons and Display</td>
<td>6</td>
</tr>
<tr>
<td>Scaling the Meter</td>
<td>6</td>
</tr>
<tr>
<td>Programming the Meter</td>
<td>7</td>
</tr>
</tbody>
</table>

## Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>PT</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

PT - 6 Digit Process Time Meter
1. DISPLAY: 6-digit, 0.56” (14.2 mm), 7-segment LED.
   Decimal points are programmed by front panel keys (6 digit mode only)
2. POWER:
   AC Power: 115/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA.
   Isolation: 2300 Vrms for 1 min. to input and DC Out/In.
   DC Power: 10 to 16 VDC @ 0.1 A max.
3. SENSOR POWER: 9 to 17.5 VDC @ 100 mA max.
4. KEYPAD: 3 programming keys
5. 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 sensors.

Logic State: Active Low
Input trigger levels: $V_{IL} = 1.5$ V max.; $V_{IH} = 3.75$ V min.
Current Sinking: Internal 7.8 KΩ pull-up to +12 VDC, $I_{MAX} = 1.9$ mA
Current Sourcing: Internal 3.9 KΩ pull-down, 8 mA max. @ 30 VDC max.

MAGNETIC PICK-UP:
   Sensitivity: 200 mV peak
   Hysteresis: 100 mV
   Input impedance: 3.9 KΩ @ 60 Hz
   Maximum input voltage: ±40 V peak, 30 Vrms
6. INPUT FREQUENCY RANGE:
   Max Frequency: 25 KHz
   Min Frequency: 0.05 Hz
   Accuracy: ±0.02%
   Note: When the input pulse rate is 3 Hz or lower, the unit will utilize, if enabled, a technique known as a “moving window average.” (This continually averages the last eight input pulses.)
7. MEMORY: Nonvolatile E2PROM retains all programmable parameters.
8. ENVIRONMENTAL CONDITIONS:
   Operating Temperature: 0° to 85°C
   Storage Temperature: -40° to 60°C
   Operating and Storage Humidity: 0 to 85% max. relative humidity (non-condensing)
   Altitude: Up to 2000 meters
9. CERTIFICATIONS AND COMPLIANCES:
   SAFETY
   UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 1010-1
   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 # UL8843/UL
CB Scheme Test Report # OME11209-20041018
Issued by Underwriters Laboratories, Inc.
IEC 1010-1, 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
   Electromagnetic RF fields EN 61000-4-3 Criterion A 10 V/m
   Fast transients (burst) EN 61000-4-4 Criterion A 2 2 kV power
   Surge EN 61000-4-5 Criterion A 2 1 kV L-L, 2 kV L&N-E power
   RF conducted interference EN 61000-4-6 Criterion A 3 1 V/m
   Power frequency magnetic fields EN 61000-4-8 Criterion A 2
   Voltage dip/interruptions EN 61000-4-11 Criterion A 0.5 cycle
Emissions:
   Emissions EN 55011 Class B
   Notes:
   2. 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 Gage 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.
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. Insert the unit into the panel cutout.

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

```
3.62 ± 0.35
(92 ± 8.3)
1.77 ± 0.02
(45 ± 0.5)
```
2.0 SETTING THE JUMPER AND SWITCHES

The meter has a jumper and switches, which must be checked and/or changed prior to applying power. To access the power switch and the jumper, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

Mode Selection Jumper

Inside the meter is also the Mode Selection Jumper, located near the display board. This jumper will select operation in the 6 digit mode or 5 digit (chronometer) mode. When the jumper is positioned toward the display board, the unit will be in the 6 digit mode of operation. With the jumper positioned away from the display board, the meter is in the 5 digit (chronometer) mode. This unit ships from the factory in the 6 digit mode.

Set-Up DIP Switches

A DIP switch is located at the rear of the meter, and is fully accessible when the unit is in the case. It is used for the selection of the input parameters and program disable. For the correct input setup, refer to 3.2 Input Wiring.

3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC# FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward # 2BB2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC# LFL0000)
     - Schaffner # FN670-1.8/07
     - Corcom # 1 VR3
   - Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC# SNUB0000.
### 3.1 POWER WIRING

**AC Power**
- Terminal 1: VAC
- Terminal 2: VAC

**DC Power**
- Terminal 3: +VDC
- Terminal 4: COMM

---

### 3.2 INPUT WIRING

<table>
<thead>
<tr>
<th>Magnetic Pickup</th>
<th>AC Inputs From Tach Generators, Etc.</th>
<th>Two Wire Proximity, Current Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Magnetic Pickup Diagram" /></td>
<td><img src="image2" alt="AC Inputs Diagram" /></td>
<td><img src="image3" alt="Two Wire Proximity Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Sinking Output</th>
<th>Current Sourcing Output</th>
<th>Interfacing With TTL</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="Current Sinking Output Diagram" /></td>
<td><img src="image5" alt="Current Sourcing Output Diagram" /></td>
<td><img src="image6" alt="Interfacing With TTL Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emitter Follower; Current Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Emitter Follower Diagram" /></td>
</tr>
</tbody>
</table>

*Switch position is application dependent.*
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

In many industrial applications, a meter is required to display the process time of an operation or event. The pulses from a sensor are received by the PAXLPT, and then scaled to produce just such a readout. The following formula will help provide the scaling values to achieve the desired readout.

\[ SF = DR \times PPS \]

**WHERE:**
- \( SF \) = Scale Factor
- \( DR \) = Desired Readout
- \( PPS \) = Pulses per Second

To calculate the \( PPS \) multiply the \( RPM \) (Revolutions per Minute) by the \( PPR \) (Pulses per Revolution) and divide by 60.

\[ \frac{\text{RPM} \times \text{PPR}}{60} \]

*For applications requiring a decimal point, select and program the appropriate decimal point. When calculating the Scale Factor, use the whole value of the number to be displayed, for example, 50.0 minutes, the Desired Readout in this case is 500. Do not use decimal points in the Desired Readout when calculating the scale factor.

For calculated \( SF \) values less than 59,999
- If the Scale Factor is a value less than 59,999, it can be entered directly into the meter as the Scale Factor and the Scale Multiplier can be left at 1.

For calculated \( SF \) values greater than 59,999
- If the Scale Factor is a value over 59,999 (maximum value), the Scale Multiplier must be used to reduce the calculated Scale Factor value until it is less than 59,999. The Scale Multiplier divides the calculated Scale Factor value by 1, 10, 100 and 1000, thus reducing the calculated value accordingly. Select the appropriate Scale Multiplier value that allows the Scale Factor to be a value under 59,999. Both the Scale Factor and Scale Multiplier can then be entered into the meter.

**Example 1 (6 Digit):**

- \( DR = 150 \) minutes
- \( PPS = 450 \) RPM \times 60 \( PPR \)

\[ \frac{450}{60} = 7.5 \]

\[ SF = 150 \times 7.5 = 1125 \]

Since the \( SF \) value is greater than 59,999, the SM will be needed to reduce the calculated value to value less than 59,999. Using the SM of 10, the 1125 value is divide by 10, reducing the SF to a value of 112.5. The meter can be programmed for a SF of 112 and a SM of 10.

**Example 2 (5 Digit):**

- \( DR = 2 \text{ hours and 23 minutes} (2-23) \)
- \( PPS = 138 \) RPM \times 100 \( PPR \)

\[ \frac{138}{60} = 2.3 \]

\[ SF = 143 \times 2.3 = 328.89 \]

Since the SF value is less than 59,999, it can be entered directly as the SF and the SM will be 1. *Note: When programmed for the 5 Digit mode, the meter will convert the D.R. back to the hours and minutes format.*

---

**5.0 SCALING THE METER**

In many industrial applications, a meter is required to display the process time of an operation or event. The pulses from a sensor are received by the PAXLPT, and then scaled to produce just such a readout. The following formula will help provide the scaling values to achieve the desired readout.

\[ SF = DR \times PPS \]

**WHERE:**
- \( SF \) = Scale Factor
- \( DR \) = Desired Readout
- \( PPS \) = Pulses per Second

To calculate the \( PPS \) multiply the \( RPM \) (Revolutions per Minute) by the \( PPR \) (Pulses per Revolution) and divide by 60.

\[ \frac{\text{RPM} \times \text{PPR}}{60} \]

*For applications requiring a decimal point, select and program the appropriate decimal point. When calculating the Scale Factor, use the whole value of the number to be displayed, for example, 50.0 minutes, the Desired Readout in this case is 500. Do not use decimal points in the Desired Readout when calculating the scale factor.

For calculated \( SF \) values less than 59,999
- If the Scale Factor is a value less than 59,999, it can be entered directly into the meter as the Scale Factor and the Scale Multiplier can be left at 1.

For calculated \( SF \) values greater than 59,999
- If the Scale Factor is a value over 59,999 (maximum value), the Scale Multiplier must be used to reduce the calculated Scale Factor value until it is less than 59,999. The Scale Multiplier divides the calculated Scale Factor value by 1, 10, 100 and 1000, thus reducing the calculated value accordingly. Select the appropriate Scale Multiplier value that allows the Scale Factor to be a value under 59,999. Both the Scale Factor and Scale Multiplier can then be entered into the meter.

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\[ SF = 150 \times 7.5 = 1125 \]

Since the \( SF \) value is greater than 59,999, the SM will be needed to reduce the calculated value to value less than 59,999. Using the SM of 10, the 1125 value is divide by 10, reducing the SF to a value of 112.5. The meter can be programmed for a SF of 112 and a SM of 10.

**Example 2 (5 Digit):**

- \( DR = 2 \text{ hours and 23 minutes} (2-23) \)
- \( PPS = 138 \) RPM \times 100 \( PPR \)

\[ \frac{138}{60} = 2.3 \]

\[ SF = 143 \times 2.3 = 328.89 \]

Since the SF value is less than 59,999, it can be entered directly as the SF and the SM will be 1. *Note: When programmed for the 5 Digit mode, the meter will convert the D.R. back to the hours and minutes format.*
The Process Time Indicator has three programmable parameters which are entered in the sequence shown above, using the front panel push buttons.

Before programming, please refer to the section on Scaling the Meter to determine the Decimal Position, Scale Factor and Scale Multiplier 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 "P" 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 (6-digit version only)**

This parameter selects the decimal point position on the display. The selection is used when calculating the Scale Factor. This parameter only appears when the meter is configured for the conventional (6-digit) display.

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.

**SCALE FACTOR**

The Scale Factor is used in combination with the Scale Multiplier to obtain the desired process time readout. (See details on Scaling the Meter.)

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is displayed. Press the PAR key to save the selection and exit programming mode.

**PROGRAMMING MODE EXIT**

The meter exits Programming Mode when the PAR key is pressed to save the Scale Multiplier selection. The meter briefly displays EXIT upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Process Time 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 upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Process Time 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 "M" 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLPV - PAX LITE PROCESS VOLT METER

GENERAL DESCRIPTION
The premium features of the PAX Lite Series can now be applied to measurement of process variables. With its high sensitivity and programmability, the PAX Lite Process Volt Meter can be set up for a wide variety of applications. In most plants the PAXLPV can be used for 90 to 95% of Process Volt meter needs for readout of pressure, flow, temperature, level and other variables. The meter has been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough yet reliable application solution. This allows the PAXLPV to be used in dirty, hostile environments and in wash-down areas. The 3½-digit bi-polar display (minus sign displayed when voltage is negative) features 0.56” (14.2 mm) high, 7-segment LEDs for easy reading.

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 5.0” (127) W.
**TABLE OF CONTENTS**

Ordering Information .............................................. 2  
General Meter Specifications ................................. 3  
Accessories .......................................................... 3  
Installing the Meter .............................................. 4  
Setting the Switches .............................................. 4  
Wiring the Meter .................................................. 5  
Scaling the Meter .................................................. 6  
Calibrating the Meter ............................................. 7  
Applications ....................................................... 8

**ORDERING INFORMATION**

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>PV</th>
<th>0</th>
<th>0</th>
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PV - Process Volt Meter

Accessories Part Numbers

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<thead>
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<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
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<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>
3

**GENERAL METER SPECIFICATIONS**

1. **DISPLAY**: 3 1/2-digit, 0.56" (14.2 mm) high, 7-segment LED, (-) minus sign displayed when current or voltage is negative. Decimal points inserted before 1st, 2nd, or 3rd least significant digits by DIP switch selection.

2. **OVER-RANGE INDICATION**: Indicated by blanking 3 least significant digits.

3. **POWER**:
   - **AC Power**: 85 to 250 V AC, 50/60 Hz, 6 VA
   - **Isolation**: 2300 Vrms for 1 min. to all inputs.

4. **INPUT SENSITIVITY**: (Numerical Readout Change/Volt) Adjustable from 40 units/volt to 1000 units/volt. Max. allowable input voltage, ±25 volts DC.

5. **INPUT RESISTANCE**: 1 MΩ

6. **SCALING RANGE**:
   - **SPAN**: 32 coarse steps (binary progression with 5 DIP switches) Each step providing approx. 40 numerical units/volt/step sensitivity. Fine adjust brackets the coarse step increments.
   - **OFFSET**: 16 coarse steps (binary progression with 4 DIP switches) with ± switch to add or subtract offset. Each step adds or subtracts approximately 175 from the numerical display for a total offset range of ±2700. Fine control brackets the steps.

7. **LINEARITY**: ±(0.05% ±1 digit)

8. **READING RATE**: 2.5 updated readings / second, nominal.

9. **RESPONSE TIME**: 1 second to settle for step change.

10. **LOW FREQUENCY NOISE REJECTION**:
    - **Normal Mode Rejection**: 63 dB @ 50/60 Hz
    - **Common Mode Rejection**: 100 dB, DC to 50/60 Hz

11. **ENVIRONMENTAL CONDITIONS**:
    - **Operating Temperature**: 0° to 60°C
    - **Storage Temperature**: -40° to 80°C
    - **Operating and Storage Humidity**: 85% max. relative humidity (non-condensing)
    - **Span Temperature Coeff.**: 100 PPM/°C
    - **Offset Temperature Coeff.**: 100 PPM/°C
    - **Altitude**: Up to 2000 meters

12. **CERTIFICATIONS AND COMPLIANCES**:
    - **SAFETY**
      - UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 1010-1
      - 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
    - **Electrostatic discharge**
      - EN 61000-4-2
      - 4 kV contact discharge
      - 8 kV air discharge
      - Criterion A
      - 10 V/m
      - Criterion B
      - 2 kV power
      - 2 kV signal
      - Criterion A
      - 1 kV L-L,
      - 2 kV L&N-E power
      - 1 kV signal
      - Criterion A
      - 3 V/rms
      - Criterion A
      - 30 A/m
      - Voltage dip/interruptions
      - EN 61000-4-11
      - Criterion A
      - 0.5 cycle
      - Emissions
      - Emission EN 55011 Class B
      - **Immunity to Industrial Locations**
        - 1. **Criterion A**: Normal operation within specified limits.
        - 2. **Criterion B**: Temporary loss of performance from which the unit self-recover.
    - **EXCITATION SUPPLY**: 24 VDC @ 50 mA max. Regulated and isolated.
    - **CONNECTIONS**
      - High compression cage-clamp terminal block
      - **Wire Strip Length**: 0.3" (7.5 mm)
      - **Wire Gage**: 30-14 AWG copper wire
      - **Torque**: 4.5 inch-lbs (0.51 N-m) max.
    - **CONSTRUCTION**
      - This unit is rated for NEMA 4X/IP65 indoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Panel Gasket and mounting clip included.
    - **WEIGHT**: 0.65 lbs (0.24 kg)

---

**ACCESSORIES**

**UNITS LABEL KIT (PAXLBK)**

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit (PAXLBK30). The backlight is controlled by a DIP switch.
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 fully assembled. Insert the unit into the panel cutout.

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.

2.0 Setting the Switches

The meter has switches that must be checked and/or changed prior to applying power. To access the switches, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Set-Up DIP Switches
Two banks of DIP switches are located inside the meter. The 10 position bank of switches are used for calibrating the meter. The values of these switches are discussed in section 5.0 Calibrating the Meter.

The bank of 4 switches located near the front display are used for the selection of decimal points and backlight annunciator. Selecting “ON” position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>3</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>4</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
</tbody>
</table>
3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC #FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward #28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom #1VR3
     Note: Reference manufacturer’s instructions when installing a line filter.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   - Snubber: RLC#SNUB0000.

3.1 POWER WIRING

<table>
<thead>
<tr>
<th>AC Power</th>
<th>Excitation Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal 1: VAC</td>
<td>Terminal 2: VAC</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>85–250 VAC</td>
<td></td>
</tr>
</tbody>
</table>

480 n min.
4.0 SCALING THE METER

DESCRIPTION OF OPERATION
The PAX Lite Process Volt Meter consists of a digital volt meter combined with an analog scaling circuit (shown above). Input voltage can be reversed in polarity resulting in negative numerical readout with a minus (-) sign displayed. Input terminals 3 and 4 are connected to the signal voltage. The buffer amplifier (K1) conditions and filters the input signal voltage and applies it to the input of the scaling circuit. The procedure for scaling PAX Lite Process Volt Meters is simplified by dividing the scaling process into two separate components, span adjustments and offset adjustments which are defined in the following discussion.

SPAN ADJUSTMENTS
Span is defined as the numerical range that the display traverses, disregarding decimal points, when the input signal is varied from minimum to maximum. For example, if a unit is to display 25.0 @ 1 V and 100.0 @ 5 V, the span is 750 (the difference between 250 and 1000). Had the minimum display been -25.0 @ 1 V and +100.0 @ 5 V, the span would be 1250 (1000 - (-250) = 1250). (Note: the terms "GAIN," "SCALE," and "SENSITIVITY" are also frequently used interchangeably with the term "SPAN.") The PAX Lite Process Volt Meter can be set up over a very wide span range by means of the coarse DIP switches S6-S10, and the fine screwdriver adjustment pot, located at the back cover. The coarse span switches add parallel input resistors to the summing amplifier (K2), thereby increasing its gain, or sensitivity, as more summing resistors are added. Effectively, adding more parallel input resistors increases the slope of the transfer curve (at right) and increases the numerical readout for a given input signal change. The input summing resistor values are weighted in a binary progression, so they can be switched in combinations to give 32 discrete steps of span. The fine adjust control brackets these coarse steps and can be adjusted to the exact span needed.

The approximate span contributed by each switch is shown on the rear label. The values shown are “units per volt.” For example, if S6 only is turned “ON,” the numerical readout will change approximately 550 units for a signal voltage change of 1 volt. If S7 were also turned “ON,” the numerical readout would change approximately 825 units for a signal voltage change of 1 volt. The span adjust pot has a continuous span range of approximately 0-45.

OFFSET ADJUSTMENTS
Effectively, adding more parallel input resistors increases the slope of the transfer curve (at right) and increases the numerical readout for a given input signal change. In the foregoing discussion of span, the transfer curves were shown as “ZERO-BASED,” i.e., the numerical readout displays “0” when the signal goes to zero. With voltage ranges such as 0-5 V or 0-10 V, and with Bi-Polar (+/-) signals this is often the desired condition. However, with voltage ranges such as 1-5 V or 1-10 V, the minimum voltage level usually represents the zero level of the parameter being displayed. There are also many applications where the minimum (or zero level) represents some value that does not fall on a zero based transfer curve. To accommodate non-zero based applications, the PAX Lite Process Volt Meter has provisions for offsetting the transfer curve over a wide range. Essentially, offset moves the transfer curve up or down to change its intercept with the numerical readout axis, but it does not change the slope (SPAN) of the transfer curve. In the PAX Lite Process Volt Meter, offset is accomplished by adding (or subtracting) a constant at the input of the summing amplifier (K2). This offset constant is summed in with a switched binary resistor network and a fine adjust offset control in a similar manner to that used for span adjust. Switches S2-S5 can be turned on in combinations to give 16 different coarse offset levels. Each switch is labeled to show the approximate amount of offset contributed when it is turned “ON.” Switch 1 selects the polarity of the switched-in offset value and allows offsetting the transfer curve “UP” (adding the offset constant) or “DOWN” (subtracting). The offset adjust pot has a numerical readout range of +/-100 and brackets all the coarse switched ranges.
**5.0 CALIBRATING THE METER**

Direct calibration in the signal loop is usually not practical due to the difficulty in varying the measured parameter and the confusing interaction that occurs between span and offset adjustments. However, the PAXL2 can be quickly and easily bench calibrated using a commercially available calibrator.

**CALIBRATION PROCEEDURE**

The procedure outlined in the calibration steps below, minimizes span/offset interaction and simplifies calibration. In Steps 1 to 4 the unit is “nulled” to zero readout with zero input signal voltage. In Steps 5 and 6, the span adjustments are made to establish the required slope of the transfer curve. Then in Step 7, the transfer curve is shifted up or down as required by setting the offset adjustments. In Step 8, the final “tweaking” adjustments are made at minimum and maximum signal voltage. Setting the decimal points in Step 9 completes the calibration.

Before calibrating, the READOUT SPAN (Rs), SWING VOLTAGE (Vs), and SPAN PER VOLT (Rs/Vs) must be determined.

### CALIBRATION STEPS

1. Power down the meter and remove it from its case. Turn off all offset and span adjustment switches (S2-S10 down). S1 has no effect when zeroing and can be in either position.
2. Turn the span control pot. fully counter-clockwise (20 turns max.).
3. Turn on a combination of span adjust switches (6-10) to obtain a total value closest to (but not greater than) the SPAN PER VOLT desired (250 in this example). The following chart gives an approximate span adjustment value for each switch:

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>SPAN VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>550</td>
</tr>
<tr>
<td>7</td>
<td>275</td>
</tr>
<tr>
<td>8</td>
<td>140</td>
</tr>
<tr>
<td>9</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

4. Place unit in its case and apply power. Apply zero volts. Adjust the indicator to read zero using the offset adjustment pot.
5. Apply the SWING VOLTAGE (Vs) (4 V in this example) to the input. Set the exact READOUT SPAN value (1000) with span adj. pot.
6. Apply zero volts to see if the zero value has shifted. If it has, re-zero with the offset pot, then repeat Step 5.
7. After the span has been adjusted, set the signal voltage to the minimum level (1 V in the example). Record the meter reading (in this example the reading will be 250). Subtract the desired reading at minimum voltage value (0 in the example) from the recorded reading (0-250 = -250). Power down the meter and remove it from its case. Set the offset add/subtract switch S1 (subtract = on), and the offset switches (S2-S5) to obtain a total value closest to (but no more than) the difference between the desired reading at minimum voltage value and the observed reading. The following chart gives an approximate offset adjustment value for each switch:

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>OFFSET VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1400</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>4</td>
<td>350</td>
</tr>
<tr>
<td>5</td>
<td>175</td>
</tr>
</tbody>
</table>

Place the meter in its case and apply power. Using the offset adjust pot, adjust the readout to equal the minimum voltage value (0 in the example).
8. Adjust the input signal voltage to its maximum value to see if the proper readout is obtained (1000 @ 5 V in the example). If the readout is slightly off, adjust the span pot to obtain the true reading. Then, recheck the reading at the minimum input voltage (1 V) and readjust the offset pot if necessary. Repeat the maximum and minimum readout adjustments until the unit displays the proper readout at both extremes.
9. Set decimal points as desired using the three decimal point switches. The unit can now be installed.

### TROUBLESHOOTING

For further assistance, contact technical support at the appropriate company numbers listed.

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**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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
6.0 APPLICATIONS

Example 1 (± Display):

A differential pressure transducer has a range of ±15 PSI with a 1-6 V output (-15 @ 1 V, +15 @ 6 V)
READOUT SPAN (R_s) = +1500 - (-1500) = 3000
SWING VOLTAGE (V_s) = 6 V (max) - 1 V (min) = 5 V
SPAN PER VOLT (R_s/V_s) = 3000 / 5 V = 600

Note: Since the display readout is limited to 1999 numerical indication, the full READOUT SPAN of 3000 cannot be obtained during zero based span adjustment. However, dividing both the READOUT SPAN and SWING VOLTAGE by two, i.e. 1500 readout @ 2.5 V, allows the span adjustment to be made for the proper transfer curve slope.

ADJUSTMENTS

A Null the unit to zero readout @ 0 V per Steps 1 to 4 of the calibration steps.
B Set transfer curve slope with span adjustments per Steps 5 and 6 to get a readout of +1500 @ 2.5 V (SPAN PER VOLT = 600).
C Apply (+) offset per Step 7 to get a reading of -1500 @ 1 V.
D Check min. and max. extremes and tweak if required to get desired readout @ 1 V and 6 V per step 8. Set D.P. switch S2 and replace unit in case.

Example 2 (Positive Offset):

PAXLPV is to be calibrated to match a flow transducer whose output is 0 V @ 40 GPM and 5 V @ 650 GPM.
READOUT SPAN (R_s) = 650 - 40 = 610
SWING VOLTAGE (V_s) = 5 V (max) - 0 V (min) = 5 V
SPAN PER VOLT (R_s/V_s) = 610 / 5 V = 122

ADJUSTMENTS

A Null the unit per Steps 1 to 4 of the calibration steps.
B Set the coarse and fine span adjustments to get a readout of 610 @ 5 V (SPAN PER VOLT = 122) per Steps 5 and 6.
C Set offset to readout 40 @ 0 V per Step 7.
D Check the readout @ max. (5 V) and min. (0 V) and fine tune (tweak) as required per Step 8.

Example 3 (Negative Slope):

A liquid level sensor puts out 1 V when a storage tank is full and 11 V when the tank is empty. The PAXLPV is to read out 100.0 when the tank is full and zero when the tank is empty.
READOUT SPAN (R_s) = 1000 - 0 = 1000
SWING VOLTAGE (V_s) = 1 V (max) - 11 V (min) = -10 V
SPAN PER VOLT (R_s/V_s) = 1000 / -10 V = -100

In this case, the signal voltage is reversed [Term. 3 (+) with respect to Term. 4 (-)] causing the readout to go “down” (increasingly negative) as the negative voltage increases (hence, the negative (-) SPAN PER VOLT).

ADJUSTMENTS

A Null the unit per Steps 1 to 4 of the calibration steps.
B Set the slope of the transfer curve with the span adjustments to get a readout of -1000 @ -10V (SPAN PER VOLT = -100) per Steps 5 and 6.
C Move the transfer curve up by applying (+) offset per Step 7 until readout is +1000 @ +1 V.
D Check extreme readings per Step 8 0 readout @ -11 V and +1000 @ -1 V. Set D.P. switch S1 ON and replace unit in case.
MODEL PAXLR - PAX LITE RATE METER

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.

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5” (127) W.
# Table of Contents

- Ordering Information ............................................. 2
- General Meter Specifications ................................. 3
- Installing the Meter ............................................. 3
- Setting the Switches ............................................. 4
- Wiring the Meter .................................................. 4
- Reviewing the Front Buttons and Display .............. 6
- Scaling the Meter ................................................ 6
- Programming the Meter .......................................... 7

## Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>R0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

R0 - 6 Digit Rate Meter
1. **DISPLAY**: 6-digit, 0.56" (14.2 mm), 7-segment LED. Decimal points are programmed by front panel keys.

2. **POWER**:
   - **AC Power**: 115/230 VAC, switch selectable. Allowable power line variation ±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.

3. **SENSOR POWER**: 9 to 17.5 VDC @ 100 mA max.

4. **KEYPAD**: 3 programming keys, the ▼ (Down Arrow) key can also function as the front panel reset button.

5. **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 sensors.
   - **Logic**: Input trigger levels \( V_{IL} = 1.5 \text{ V max.} \); \( V_{IH} = 3.75 \text{ V min.} \)
   - **Current Sinking**: Internal 7.8 KΩ pull-up to +12 VDC, \( I_{\text{MAX}} = 1.9 \text{ mA} \)
   - **Current Sourcing**: Internal 3.9 KΩ pull-down, 8 mA max. @ 30 VDC max.

6. **MAGNETIC PICK-UP**:
   - **Sensitivity**: 200 mV peak
   - **Hysteresis**: 100 mV
   - **Input impedance**: 3.9KΩ @ 60 Hz
   - **Maximum input voltage**: ±40 V peak, 30 Vrms

7. **INPUT FREQUENCY RANGE**:
   - **Max Frequency**: 25 KHz
   - **Min Frequency**: 0.01 Hz
   - **Accuracy**: ±0.01%

8. **MEMORY**: Nonvolatile E²PROM retains all programmable parameters and display values.

9. **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)
   - **Altitude**: Up to 2000 meters

10. **CERTIFICATIONS AND COMPLIANCES**:
   - **SAFETY**
     - UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 1010-1
     - 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
     - CB Scheme Test Certificate # UL/8843/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

11. **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
       - 2 kV power
       - 2 kV signal
     - Surge
       - EN 61000-4-5: Criterion A
       - 3 kV
     - RF conducted interference
       - EN 61000-4-6: Criterion A
       - 30 Vrms
     - 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**
     - EN 55011
     - Class B
   - Notes:
     - 2. EMI filter placed on the DC power supply, when DC powered: Corcom #1VB3 or Schaffner #FN610-1/07 (RLC #LFIL0000).

12. **CONNECTIONS**
   - High compression cage-clamp terminal block
     - Wire Strip Length: 0.3" (7.5 mm)
     - Wire Gage Capacity: 30-14 AWG copper wire
     - Torque: 4.5 inch-lbs (0.51 N-m) max.

13. **CONSTRUCTION**
   - This unit is rated for NEMA 4X/IP65 outdoor use.

14. **WEIGHT**: 12 oz (340 g)

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**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. Insert the unit into the panel cutout.

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.
2.0 SETTING THE SWITCHES

The meter has switches that must be checked and/or changed prior to applying power. To access the power switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

**Power Selection Switch**

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

**Set-Up DIP Switches**

A DIP switch is located at the rear of the meter, and is fully accessible when the unit is in the case. It is used for the selection of the input parameters and program disable.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1</td>
<td>Factory Setting</td>
</tr>
<tr>
<td>SW2</td>
<td>Hi Frequency</td>
</tr>
<tr>
<td>SW3</td>
<td>LO Frequency</td>
</tr>
<tr>
<td>SW4</td>
<td>Logic</td>
</tr>
<tr>
<td>SW5</td>
<td>MAG</td>
</tr>
<tr>
<td>SW6</td>
<td>Not Active for the Rate Meter</td>
</tr>
</tbody>
</table>

**SWITCH 1**

SNK: Adds internal 7.8 KΩ pull-up resistor to + 12 VDC, I_MAX = 1.9 mA.

**SWITCH 2**

SRC: Adds internal 3.9 KΩ pull-down resistor, 8 mA max. @ 30 VDC max.

**SWITCH 3**

HI Frequency: Removes damping capacitor and allows max. frequency.

LO Frequency: Limits input frequency to 50 Hz and input pulse widths to 10 mese.

**SWITCH 4**

LOGIC: Input trigger levels V_H = 1.5 V max.; V_L = 3.75 V max.

MAG: 200 mV peak input (must have SRC on).

**SWITCH 5**

Enable Programming: Enables programming through the front panel buttons.

Disables Programming: Disables the front panel buttons from any programming changes.

**SWITCH 6**

Not Active for the Rate Meter

---

3.0 WIRING THE METER

**WIRING OVERVIEW**

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

**EMC INSTALLATION GUIDELINES**

Although this meter is designed with a high degree of immunity to Electromagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables: Fair-Rite # 0443167251 (RLC# FCOR0000)
   - TDK # ZCAT3035-1330A
   - Steward # 2BB2029-0A0
   - Corcom # 1 VR3

   **Note:** Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.

Snubber: RLC# SNUB0000.
3.1 POWER WIRING

**AC Power**
Terminal 1: VAC
Terminal 2: VAC

**DC Power**
Terminal 3: +VDC
Terminal 4: COMM

3.2 INPUT WIRING

**Magnetic Pickup**

**AC Inputs From Tach Generators, Etc.**

**Two Wire Proximity, Current Source**

**Current Sinking Output**

**Current Sourcing Output**

**Interfacing With TTL**

**Emitter Follower; Current Source**

*Switch position is application dependent.*
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

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 \((SUE41)\) and Scaling Input \((SU*/1)\). 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:

<table>
<thead>
<tr>
<th>RATE PER</th>
<th>DISPLAY ((rt-dSP))</th>
<th>INPUT ((rt-lP))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>1</td>
<td># of pulses per unit</td>
</tr>
<tr>
<td>Minute</td>
<td>60</td>
<td># of pulses per unit</td>
</tr>
<tr>
<td>Hour</td>
<td>3600</td>
<td># of pulses per unit</td>
</tr>
</tbody>
</table>

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 = 151
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 = 3600  Scaling Input = 250

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 Par 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 Pt) 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
GENERAL DESCRIPTION
The Pax Lite RTD Meter accepts standard RTD inputs and precisely linearizes them into temperature readings. A full 4-digit display accommodates a wide range of temperature inputs. State-of-the-art digital circuitry virtually eliminates errors due to drift.

The meter features a readout choice of either Fahrenheit or Celsius with 0.1 or 1 degree resolution. English Style display prompts and front panel buttons aid the operator through set-up and operation. Programmable digital filtering enhances the stability of the reading. All set-up data is stored in EEPROM, which will hold data for a minimum of 10 years without power.

The meter provides a Peak (HI) and Valley (LO) reading memory with selectable capture delay time. The capture delay is used to prevent detection of false Peak or Valley readings that may occur during start-up or unusual process events. The Peak and Valley readings are stored at power-down to allow monitoring the process limits over any length of time (shifts, days, etc.).

The meter has several built-in diagnostic functions to alert operators of any malfunction. Extensive testing of noise interference mechanisms and full burn-in makes the meter extremely reliable in industrial environments. The front bezel meets NEMA 4X/IP65 requirements for wash down applications.

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. Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

DEFINITION OF TERMS
INSTALLATION CATEGORY (overvoltage category) I:
Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II.

INSTALLATION CATEGORY (overvoltage category) II:
Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III.

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.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering Information</td>
<td>2</td>
</tr>
<tr>
<td>General Meter Specifications</td>
<td>3</td>
</tr>
<tr>
<td>Accessories</td>
<td>3</td>
</tr>
<tr>
<td>Installing the Meter</td>
<td>4</td>
</tr>
<tr>
<td>Wiring the Meter</td>
<td>4</td>
</tr>
<tr>
<td>Reviewing the Front Buttons and Display</td>
<td>5</td>
</tr>
<tr>
<td>Programming the Meter</td>
<td>6</td>
</tr>
<tr>
<td>Calibrating the Meter</td>
<td>7</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>7</td>
</tr>
</tbody>
</table>

# ORDERING INFORMATION

## Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>RT</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

RT - RTD Temperature Meter

## Accessories Part Numbers*

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>

*This meter is shipped with °F and °C overlay labels. The label kit is only needed if another units label is desired.
GENERAL METER SPECIFICATIONS

1. DISPLAY: 4-digit, 0.56" (14.2 mm) high LED, minus sign displayed for negative temperatures.
   **Overrange/Underrange Input:** Flashing “OL OL” or “UL UL”
   **Overrange/Underrange Display:** “...” or “...”

2. POWER: 85 to 250 VAC, 50/60 Hz, 6 VA
   Isolation: 2300 Vrms for 1 min. between input and supply (300 V working voltage)

3. CONTROLS: Three front panel push buttons for meter set-up. Rear terminal input for disabling the front panel.

4. RESOLUTION: 0.1 or 1 degree

5. RANGE: Decimal Point Dependent
   0.1° res: -199.9° to 850.0 °C (-199.9° to 999.9 °F);
   1° res: -200° to 850 °C (-328° to 1562 °F)

6. OPEN/SHORTED RTD DETECTION: Display flashes: “OPEN” or “SHORT”

7. LEAD RESISTANCE EFFECT: 20 Ω max., 2.5 °C/Ω error for V exc. and common lead unbalance

8. ACCURACY: 0.3 °C, @ 23 °C and 30 min. warm-up

9. READING RATE: 2.5 readings/second

10. RESPONSE TIME: 2 seconds to settle for step input (increases with programmable digital filtering)

11. LOW FREQUENCY NOISE REJECTION:
   - Normal Mode Rejection: 40 dB @ 50/60 Hz (may be improved by programmable digital filtering)
   - Common Mode Rejection: 120 dB, DC to 50/60 Hz

12. CERTIFICATIONS AND COMPLIANCES:
   **SAFETY**
   UL Recognized Component, File # E179259, UL61010-1, 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
   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

13. ENVIRONMENTAL CONDITIONS:
   **Operating Temperature Range:** 0 to 50 °C
   **Storage Temperature Range:** -40 to 80 °C
   **Operating and Storage Humidity:** 85% max (non-condensing) from 0 to 50 °C
   **Span Drift:** 50 ppm/ °C
   **Zero Drift:** 0.001 °C/°C
   **Altitude:** Up to 2000 meters.

14. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 indoor use. One piece bezel/case. Flame resistant. Panel gasket and mounting clip included.

15. CONNECTIONS: High compression cage-clamp terminal block
   - Wire Strip Length: 0.3" (7.5 mm)
   - Wire Gauge: 30-14 AWG copper wire
   - Torque: 4.5 inch-lbs (0.51 N-m) max.

16. WEIGHT: 0.65 lbs. (0.24 Kg)

ELECTROMAGNETIC COMPATIBILITY

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

**Immunity:**
- Electrostatic discharge: EN 61000-4-2
  - Criterion A: 4 kV contact discharge
  - Criterion A: 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: 2 kV power
  - Criterion A: 2 kV signal
- Surge: EN 61000-4-5
  - Criterion A: 1 kV L-L
  - Criterion A: 2 kV L&E power
- RF conducted interference: EN 61000-4-6
  - Criterion A: 3 V/rms
- Voltage dip/interruptions: EN 61000-4-11
  - Criterion A: 0.5 cycle

**Emissions:**
- Emissions: EN 55011
  - Class B

Note:

ACCESSORIES

UNITS LABEL KIT (PAXLGBK)

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled in the programming.

Each meter is shipped with °F and °C overlay labels which can be installed into the meter’s bezel display assembly.
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. Insert the unit into the panel cutout. 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 overtighten 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.

2.0 WIRING THE METER

POWER WIRING
Primary AC power is connected to Terminals 1 and 2. To reduce the chance of noise spikes entering the AC line and affecting the indicator, the AC power should be relatively “clean” and within the specified limits. Drawing power from heavily loaded circuits or circuits that also power loads that cycle on and off (contactors, relays, motors, machinery, etc.) should be avoided.

AC Power
Terminal 1: V AC
Terminal 2: V AC

SIGNAL WIRING (RTD SENSOR)
RTD sensors are used in applications where a high degree of accuracy is required. Most RTD sensors available are the 3-wire type. The 3rd additional wire is a sense lead for canceling the effects of lead resistance at the probe. The sense lead connects to Terminal 5 (RTD+), the common lead to Terminal 6 (RTD-), and the excitation lead to Terminal 4 (+ Excitation). The excitation and sense leads are generally the same color because they are functionally the same and may be interchanged at the meter. Four wire sensors have an additional sense lead connected (at the probe) to the common lead. Leave the extra sense lead disconnected when using a four wire probe with the PAXLRT meter. Always refer to the sensor manufacturer’s instructions for probe wiring connections, if available. Two wire RTD sensors may be used with the PAXLRT by shorting Terminal 4 to Terminal 5, if the distance between sensor and meter is less than 30 feet. The total lead resistance can be used to predict the temperature error for 2-wire sensors, according to 2.5°C/Ω of lead resistance.

Note: Extended cable runs can be made provided the lead resistance is less than 20 Ω/lead and the resistance is equal in each lead.

PROGRAM DISABLE INPUT WIRING
PGM.DIS. (Terminal 3) is a digital input that is active when connected to RTD- (Terminal 6). Any form of mechanical switch or current sinking logic with less than 0.7 V saturation may be used. The use of shielded cable is recommended. Follow the EMC Installation Guidelines for shield connection.

WIRING OVERVIEW
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter be protected by a fuse or circuit breaker. When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)
EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC# FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward # 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC# LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom # 1 VR3

Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

3.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

3.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

Display Valley (LO) Reading
Display Peak (HI) Reading
PAR

PROGRAMMING MODE OPERATION
Store selected parameter and index to next parameter
Increment value or change selection
Decrement value or change selection

KEY
PAR
Access Programming Mode or Display Input Reading
▲
Display Peak (HI) Reading
▼
Display Valley (LO) Reading

PEAK/VALLEY DETECTION
The meter will automatically record the highest input reading (peak) and the lowest input reading (valley) for later recall. These values are stored at power-down to allow monitoring the process limits over any length of time (shifts, days, etc.). A selectable capture delay time is used to prevent detection of false peak or valley readings caused by sudden short spikes or unusual process events.

The peak and valley readings can be viewed and reset using the front panel keys as described below.

View Peak, Valley and Input readings:
To view Peak, press ▲. Meter displays # followed by the Peak reading.
To view Valley, press ▼. Meter displays L followed by the Valley reading.
To view Input, press PAR. Meter displays ▼P followed by the current Input reading.

Note: The decimal point to the right of digit 1 flashes while the peak or valley reading is displayed.

Reset Peak and/or Valley to the current Input reading:
To reset Peak and Valley, press ▲ and ▼ simultaneously.
To reset Peak only, press and hold ▲ then press PAR.
To reset Valley only, press and hold ▼ then press PAR.

In each case, the meter displays *5E+ followed by the current Input reading.
4.0 PROGRAMMING THE METER

The RTD Meter has seven programmable parameters that are entered in the sequence shown above, using the front panel push buttons.

The last programming step offers the choice of entering calibration mode. From this mode, the user can restore the meter to factory default settings or recalibrate the signal input if necessary. To prevent inadvertent entries, an access code must be keyed-in to perform any operations in calibration mode.

Note: Programming mode can be locked out using the Program Disable input terminal. With the PGM.DIS. terminal connected to RTD-, the meter displays “LOC” when the PAR key is pressed, and will not enter programming mode.

PROGRAMMING MODE ENTRY

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

PROGRAMMING MODE TIMEOUT

The Programming Mode has an automatic timeout 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 normal display mode. When automatic timeout occurs, any changes that were made to the parameter currently being programmed will not be saved.

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.

**RTD TYPE**

Select the RTD type by pressing the up or down arrow keys (▲ or ▼). When the desired selection is displayed, press the PAR key to save the selection and advance to the next parameter.

**TEMPERATURE SCALE**

Select the desired temperature scale by pressing the up or down arrow keys. This setting does not change the Custom Units Overlay display (if installed). Press the PAR key to save the selection and advance to the next parameter.

**DECIMAL POINT POSITION**

Select the decimal point position by pressing the up or down arrow keys. This sets the display resolution to 1 or 0.1 degree. Press the PAR key to save the selection and advance to the next parameter.

**TEMPERATURE DISPLAY OFFSET**

The temperature display can be corrected with an offset value. This can be used to compensate for probe errors or errors due to variances in probe placement, or to adjust the readout to a reference thermometer. Set the desired display offset value by pressing (and/or holding) the up or down arrow keys. When the desired offset value is displayed, press the PAR key to save the selection and advance to the next parameter. The display resolution for the offset value is the same as the decimal point position programmed above.

**DIGITAL FILTERING**

This parameter sets the amount of digital filtering applied to the input signal. If the temperature display is difficult to read due to small variations or noise, increased levels of filtering will help to stabilize the display. Although the digital filter features a “moving window” to help minimize response time, higher levels of filtering will result in slightly longer response times.

- 0 - no digital filtering
- 1 - normal filtering
- 2 - increased filtering
- 3 - maximum filtering

Set the desired level of input filtering by pressing the up or down arrow keys. Press the PAR key to save the selection and advance to the next parameter.

**PEAK (HI) / VALLEY (LO) CAPTURE DELAY TIME**

When the Input display is above the present HI value or below the present LO value for the entered delay time, the meter will capture the Input display as the new HI or LO reading. A delay time helps to avoid false captures of sudden short spikes or Input display variations that may occur during start-up.

Set the desired capture delay time by pressing the up or down arrow keys. Press the PAR key to save the selection and advance to the next parameter.

**UNITS LABEL BACKLIGHT**

The Units Label Kit Accessory contains a sheet of custom unit overlays, which can be installed in the meter bezel display assembly. The unit of measure for the meter display is then visible when the label backlight is illuminated. The two most commonly used temperature unit labels (°F and °C) are supplied with the meter. Press the up or down arrow keys to select whether the units label backlight is illuminated. Press the PAR key to save the selection and advance to the next parameter.

**PROGRAMMING MODE EXIT**

Before exiting Programming Mode, the meter offers the choice of entering Calibration Mode. To exit Programming Mode without entering Calibration Mode, select NO and press the PAR key. The meter briefly displays End and returns to the normal display mode. All programmed selections are now transferred to non-volatile memory and are retained if power is removed from the meter.

(If power loss occurs during Programming Mode, verify parameter changes are programed, if necessary, when power is restored.)
5.0 CALIBRATING THE METER

CALIBRATION MODE

To enter Calibration Mode, select $<$ at the end of Programming Mode, and press the PAR key. In Calibration Mode, the user can restore the meter to factory default settings or recalibrate the signal input if necessary.

To prevent inadvertent entries, an access code must be entered to perform any operation in Calibration Mode. Upon entering Calibration Mode, the meter initially displays Code 50. Press the up or down arrow keys to select the access code for the desired operation. If an access code other than those shown below is entered, the meter exits Calibration Mode and returns to normal display mode.

FACTORY SETTINGS

The factory settings for the programming parameters are shown in the previous section in the alternating display illustrations. All programming parameters can be restored to the factory default settings by entering the access Code 66 and pressing the PAR key. The meter briefly displays &U and then returns to Code 50. This procedure resets only parameters that are accessed through Programming Mode. The Calibration Mode settings (input calibration levels) are not affected.

METER INPUT CALIBRATION

The meter has been fully calibrated at the factory. If the meter appears to be indicating incorrectly or inaccurately, refer to the troubleshooting section before attempting this procedure. When re-calibration is required (generally every 2 years), the procedure should only be performed by qualified technicians using appropriate equipment. Resistance source accuracies of 0.02% or better are required.

The procedure consists of applying accurate signal levels to the meter input in a series of two steps. Allow a 30-minute warm-up period before starting calibration. To begin the input calibration, enter access Code 48 and press the PAR key.

ENTER ZERO REFERENCE

Meter displays . Apply 0 ohms to the meter input by shorting Terminals 4, 5, and 6. Allow the meter to stabilize at least 20 seconds after shorting the terminals, and then press PAR.

APPLY PRECISION RESISTANCE

Meter displays 300. Connect a precision 300 ohm resistor across Terminals 5 and 6. Terminals 4 and 5 remain shorted. (Note: Be certain to short Terminals 4 and 5 as shown in the drawing below. Shorting terminals may lead to incorrect calibration.)

Allow the meter to stabilize at least 20 seconds after making the connections, and then press PAR. The meter briefly displays End and returns to the normal display mode. Calibration is now complete. It is recommended to check calibration by comparing the displayed temperature with a precision thermometer.

TROUBLESHOOTING

The majority of all problems with the meter can be traced to improper connections or improper programming set-ups. Be sure all connections are clean and tight and check the programming set-ups for correct data.

For further technical assistance, contact technical support at the appropriate company numbers listed.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DISPLAY</td>
<td>1. Power off, improperly connected, or brown-out.</td>
<td>1a. Check wiring. 1b. Verify power.</td>
</tr>
<tr>
<td>&quot;EEEE&quot; IN DISPLAY</td>
<td>1. Program data error.</td>
<td>1. Press PAR and check data set-ups.</td>
</tr>
<tr>
<td>&quot;...&quot; or &quot;....&quot; IN DISPLAY</td>
<td>1. Input display out of range. 2. Loss of data set-ups.</td>
<td>1a. Change display resolution to &quot;1&quot; degree. 1b. Reduce offset value. 2a. Check data set-ups. 2b. Check for electrical disturbance. 2c. Disconnect and reconnect power.</td>
</tr>
<tr>
<td>&quot;OPEN&quot; IN DISPLAY</td>
<td>1. Probe unconnected. 2. Broken or burnout probe. 3. Excessive probe temperature. 4. Input overload.</td>
<td>1. Connect probe. 2. Repair or obtain new probe. 3. Reduce temperature. 4. Check input levels.</td>
</tr>
<tr>
<td>&quot;Sh &amp; L&quot; IN DISPLAY</td>
<td>1. Input shorted.</td>
<td>1. Check input connections.</td>
</tr>
</tbody>
</table>
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.

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Red Lion Controls
20 Willow Springs Circle
York PA 17402
Tel +1 (717) 767-6511
Fax +1 (717) 764-0839

Red Lion Controls AP
31, Kaki Bukit Road 3,
#06-04/05 TechLink
Singapore 417818
Tel +65 6744-6613
Fax +65 6743-3360

Red Lion Controls BV
Basicweg 11b
NL - 3821 BR Amersfoort
Tel +31 (0) 334 723 225
Fax +31 (0) 334 893 793
MODEL PAXLSG - PAX LITE STRAIN GAGE METER / MILLIVOLT METER

- 3 1/2-DIGIT, 0.56" (14.2 mm) HIGH LED READOUT
- HIGH SENSITIVITY, 10 mV FULL SCALE
- WIDE RANGE GAIN AND OFFSET ADJUSTMENTS
- BUILT-IN EXCITATION 5 OR 10 VDC
- APPLICABLE AS REGULAR MILLIVOLT INDICATOR
  (Single-ended or Differential Input)
- SELECTABLE DECIMAL POINTS
- OVER-RANGE INDICATION
- NEMA 4X/IP65 SEALED FRONT BEZEL
- OPTIONAL CUSTOM UNITS OVERLAY WITH BACKLIGHT

GENERAL DESCRIPTION

The Model PAXLSG expands the PAX Lite capabilities into the indication of pressure, load, force, and other parameters measured with strain gages. The unit features broad range scaling and can be used with a wide variety of strain gage resistances and bridge configurations. A built-in excitation source is jumper selectable for 5 or 10 VDC @ 120 mA maximum, and can power up to four full 350 Ω bridges in load averaging applications. Although designed primarily for strain-gage indication, the PAXLSG is also ideal for single-ended or differential millivolt input applications, with full-scale input ranges from 0 to 10 mV thru 0 to 2 VDC. Adjustable scaling and offset allow direct readout in nearly any engineering unit.

The meter has a NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, allowing the meter to provide 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 5.0" (127) W.
TABLE OF CONTENTS

Ordering Information ........................................... 2
General Meter Specifications ................................. 3
Accessories ....................................................... 3
Installing the Meter ............................................. 4
Setting the Jumpers and Switches ....................... 4
Wiring the Meter .................................................. 5
Scaling the Meter ................................................ 6
Calibrating the Meter ......................................... 7
Applications ....................................................... 8

ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>SG</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

SG - Strain Gage Meter

Accessories Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>
1. **DISPLAY**: 3 1/2-digit, 0.56” (14.2 mm) high, 7-segment LED, (-) minus sign displayed when voltage is negative. Decimal points inserted before 1st, 2nd, or 3rd least significant digits by DIP switch selection.

2. **OVER-RANGE INDICATION**: Indicated by blanking 3 least significant digits.

3. **POWER**:
   - AC Power: 85 to 250 VAC, 50/60 Hz, 6 VA
   - Isolation: 2300 Vrms for 1 min. to all inputs.

4. **INPUT SIGNAL**: Single-ended or differential input, ±2.0 V max. Gain (Sensitivity) is adjustable from 200 Units of Numerical Readout/millivolt input (gives full scale readout of 1999 at 10 mV input), to less than 1 Unit of Numerical Readout/mV (gives full scale readout of 1999 at 2.0 V input). Maximum common mode voltage swing with respect to signal ground, 0 to 7 V. Note: Absolute maximum voltage that can be applied between the two input terminals or between input and signal common is 50 VDC.

5. **INPUT IMPEDANCE**: 100 MΩ

6. **LINEARITY**: ±(0.05% ±1 digit)

7. **LOW FREQUENCY NOISE REJECTION**:
   - Normal Mode Rejection: 84 dB @ 50/60 Hz
   - Common Mode Rejection: 50 dB with respect to excitation common; 110 dB with respect to earth ground.

8. **RESPONSE TIME**: 2.0 seconds to settle from step input.

9. **READING RATE**: 2.5 updated readings/second, nominal.

10. **EXCITATION SUPPLY**:
    - Jumper Selectable: 5 VDC @ 60 mA max., ±2%
    - 10 VDC @ 120 mA max., ±2%
    - Temperature coefficient (ratio metric): 20 ppm/°C max.

11. **ENVIRONMENTAL CONDITIONS**:
    - Operating Temperature: 0° to 60°C
    - Storage Temperature: -40° to 80°C
    - Operating and Storage Humidity: 85% max. relative humidity (non-condensing)
    - Span Temperature Coeff.: 100 PPM/°C
    - Offset Temperature Coeff.: 100 PPM/°C
    - Altitude: Up to 2000 meters

12. **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 # UL/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
        - Electromagnetic RF fields EN 61000-4-3 Criterion B
        - Fast transients (burst) EN 61000-4-4 Criterion B
        - Surge EN 61000-4-5 Criterion A
        - RF conducted interference EN 61000-4-6 Criterion A
        - Power frequency magnetic fields EN 61000-4-8 Criterion A
        - Voltage dip/interruptions EN 61000-4-11 Criterion A
      - **Emissions**:
        - Emissions EN 55011 Class B
      - Notes:
        2. Criterion B: Temporary loss of performance from which the unit self-recovers.

13. **CONNECTIONS**:
    - High compression cage-clamp terminal block
    - Wire Strip Length: 0.3” (7.5 mm)
    - Wire Gage: 30-14 AWG copper wire
    - Torque: 4.5 inch-lbs (0.51 N-m) max.

14. **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. Panel gasket and mounting clip included.

15. **WEIGHT**:
    - 0.65 lbs (0.24 kg)

---

**ACCESSORIES**

**UNITS LABEL KIT (PAXLGBK)**

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled by a DIP switch.
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. Insert the unit into the panel cutout.

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 overtighten 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.

2.0 Setting the Switches and Jumpers

The meter has switches that must be checked and/or changed prior to applying power. To access the switches, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

**Excitation Range Jumper**
A jumper is used for selection of the 5 or 10 volt range. It is important that only one jumper position is used at a time.

**Set-Up DIP Switches**
Two banks of DIP switches are located inside the meter. The 9 position bank of switches is used for calibrating the meter. The values of these switches is discussed in section 5.0 Calibrating the Meter.

The bank of 4 switches located near the front display are used for the selection of decimal points and backlight annunciator. Selecting "ON" position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>3</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>4</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
</tbody>
</table>

**PAXLSG Jumper Selection**

The □ indicates factory setting.

- **EXCITATION SELECT**
  - 10V
  - 5V

- **REAR TERMINALS**
3.0 Wiring the Meter

Wiring Overview

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC Installation Guidelines

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC #FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward #28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom #1VR3
     - Note: Reference manufacturer’s instructions when installing a line filter.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC#SNUB0000.

3.1 Power Wiring

AC Power
Terminal 1: VAC
Terminal 2: VAC

Excitation Power
Terminal 3: Common
Terminal 4: Excitation +

AC Power
Terminal 1: VAC
Terminal 2: VAC

Excitation Power
Terminal 3: Common
Terminal 4: Excitation +

3.2 Input Signal Wiring

2-Wire Single Ended Input

4-Wire Bridge Input

6-Wire Bridge Input

Deadload Compensation

In some cases, the combined deadload and liveload output may exceed the range of the input. To use this range, the output of the bridge can be offset a small amount by applying a fixed resistor across one arm of the bridge. This shifts the electrical output of the bridge downward to within the operating range of the meter. A 100 K ohm fixed resistor shifts the bridge output approximately -10 mV (350 ohm bridge, 10 V excitation).

Connect the resistor between +SIG and -SIG. Use a metal film resistor with a low temperature coefficient of resistance.

Bridge Completion Resistors

For single strain gage applications, bridge completion resistors must be employed externally to the meter. Only use metal film resistors with a low temperature coefficient of resistance.

Load cells and pressure transducers are normally implemented as full resistance bridges and do not require bridge completion resistors.
DESCRIPTION OF OPERATION

The Pax Lite Strain Gage Indicator (PAXLSG) consists of a digital voltmeter combined with a high-gain, differential input amplifier that has provision for wide range scaling adjustment (shown above). The unit also incorporates an excitation power supply (5 or 10 VDC) that delivers up to 120 mA. In the simplified schematic above, K1, K2, and K3 form a high-gain, high-stability, differential input preamplifier with a single ended output. The gain of this preamplifier is set up by coarse gain select switches S5 through S9. These switches can be turned on in combination to provide discrete steps of gain-range adjustment. The output of the preamplifier (K3 output) is applied to the summing amplifier (K4) through coarse and fine adjustable potentiometers. These adjustable potentiometers provide final vernier gain adjustment over a range of slightly more than 2:1. An adjustable offset voltage signal is also added in at the input of K4 for zero-balance or for applications where the transfer curve must be offset from zero.

GAIN ADJUSTMENTS

Gain is defined as the Units of Numerical change seen on the display per mV (millivolt) of input signal change (disregarding display decimal points). In effect, gain determines the slope of the transfer curve and is expressed in Units/mV.

\[
\text{GAIN} = \frac{(\text{Max. Num. Readout}) - (\text{Min. Num. Readout})}{(\text{Max. mV Input Sig.}) - (\text{Min. mV Input Sig.})}
\]

Note: Disregarded Decimal Points in Readout.

For example, if an PAXLSG is to display 50.0 @ 2 mV (min.) and 169.0 @ 19 mV (max.), the required gain will be:

\[
\text{GAIN} = \frac{1690 \text{ Units} - 500 \text{ Units}}{19 \text{ mV} - 2 \text{ mV}} = 70 \text{ Units/mV}
\]

Note: Remember, display decimal points are disregarded.

To establish this gain, the settings of the coarse gain select switches must first be determined. These switches establish the maximum end of the 2:1 adjustment range of the coarse and fine vernier gain adjustments.

COARSE GAIN SELECT SWITCHES

Each of the coarse gain select switches is marked with the amount of maximum gain it will contribute when turned on. They are turned on singly or in combination (adding up each of their gain contributions), to arrive at a maximum gain value that is just above the desired gain value. To achieve the desired gain of 70 Units/mV in the example just given, the following switches would be turned on:

\[
S6 (\text{Gain 50}) + S7 (\text{Gain 16}) + S8 (\text{Gain 6.6}) = 72.6 \text{ Units/mV}
\]

With these switches ON, the coarse and fine vernier adjustments cover a gain range from about 36 Units/mV (% of max.) to 72.6 Units/mV. The required gain of 70 Units/mV falls within this adjustable range.

COARSE AND FINE GAIN ADJUSTMENTS

Once the gain select switches have been set, the final gain calibration is made with the Coarse and Fine Gain adjustments. Both of these adjustments are 15-Turn, screwdriver adjustable potentiometers that increase gain with clockwise rotation. The Coarse adjustment has a 2:1 range. The Fine adjustment has a range of 5-10% (depending on the setting of the Coarse adjustment). Both pots are located at the rear of the meter.

OFFSET ADJUSTMENTS

Offset adjustments move the transfer curve up-and-down along the vertical axis without changing the slope (Gain). They are used to “balance” the output of transducers or to intentionally introduce an offset, such as tare-load compensation. The Fine Offset Adjustment is a 15-turn screwdriver adjustable potentiometer, located at the rear of the meter. It has a range of ±125 Numerical Units of offset which is sufficient for balancing the output of most transducers.

The Coarse Offset Switches (S2, 3, and 4) can be used to add additional steps of offset. Like the coarse gain select switches, the offset switches are marked with the approximate value of offset contributed by each switch, and they can be turned on in combinations with each switch, contributing its value to the total. Switch S1 selects the polarity of the offset signal and can be set to either add or subtract the offset contribution of the switches. The maximum offset that can be obtained with all switches ON and the Fine Offset at its maximum is ±1000, which is one half of the full scale readout.
**5.0 CALIBRATING THE METER**

There are three different methods that can be used to calibrate the PAXLSG, and the method chosen depends largely on the nature of the application. The three methods are:

**VOLTAGE CALIBRATION**
In this method, the transducer signal is simply replaced with an accurately measured input voltage that can be varied through the range normally delivered by the transducer (See Voltage Calibration Circuit, below). The PAXLSG is then adjusted to provide the proper readout.

**SYSTEM CALIBRATION**
In this method, the transducer is connected to the input of the PAXLSG in the final installation, or in a bench set-up simulating the actual installation. Accurately known inputs are then applied to the transducer (i.e. load, pressure, force, etc.), and the PAXLSG adjustments are made to provide the desired indication. This method is usually preferable to the Voltage Calibration method since it calibrates both the transducer and the PAXLSG as a combination, and reduces the inherent risk of inaccuracy or errors accumulated by separate calibration. However, it can only be used in applications where the parameter to be indicated can be easily varied and accurately measured or established. It is also very awkward to use if an offset or transducer unbalance must be dealt with because of Offset/Gain adjustment interaction.

**COMBINATION VOLTAGE/SYSTEM CALIBRATION**
In applications where tare-load, offset, or substantial transducer unbalance exists and where high accuracy is required in the final indication, it may be desirable to voltage calibrate the unit first to get it very close to its final settings. Then, after final installation, the unit can be “tweaked” to its final settings while using accurately known inputs to the system. These various factors make it impossible to set up one calibration procedure to cover all applications. However, using the following information on Voltage Calibration together with the examples given should provide a good basis for handling virtually any calibration requirement.

**CALIBRATION EXAMPLE**
“Voltage Calibration” can be easily performed for any application, using the calibration circuit shown below.

**VOLTAGE CALIBRATION CIRCUIT**
*(Using 350 Ohm Dummy Bridge)*

![Calibration Circuit Diagram](image)

This 350 Ohms “Dummy Bridge” circuit delivers calibration voltages in ranges of 0 to ±22 mV, 0 to +44 mV, or 0 to -44 mV, depending on the setting of R2. The range can be increased or decreased by adjusting the value of R3 (shown as 40 K). An accurate reference millivoltmeter is used to set up the calibration voltage, and a “Zero Switch” facilitates balancing without readjusting the calibration voltage. High-stability metalized resistors (1% tol.) should be used. The use of a dummy bridge insures a common-mode voltage during calibration that is very similar to that of the actual transducer.

**SET-UP:**
Before starting the procedure, the Input Swing Voltage (Vs), the Readout Span (Rs) and the required GAIN must be determined.

**WHERE:**

\[
Rs = \frac{(Max. \ Numerical \ Display) - (Min. \ Numerical \ Display)}{Disregard \ Decimal \ Points} \times \text{Gain} \times \text{Units/mV} \\
Vs = \frac{(mV \ in \ @ \ Max. \ Display) - (mV \ in \ @ \ Min. \ Display)}{Disregard \ Decimal \ Points} \\
GAIN = Rs = \text{Units/mV} \\
\]

**EXAMPLE:**
Readout is to be 5.00 Units @ 2 mV minimum, and 15.00 Units @ 18 mV maximum. The transducer is a 350 Ω strain-gage bridge requiring 10 VDC excitation.

\[
Rs = 1500 - 500 = 1000 \text{ Units} \\
Vs = 18 \text{ mV} - 2 \text{ mV} = 16 \text{ mV} \\
GAIN = 1000 = 62.5 \text{ Units/mV} \\
\]

**Note:** While most strain gage readout applications are zero-based (i.e. zero readout @ zero input) this example was intentionally chosen because it included an offset reading at zero input. It will be used in the Calibration Procedure below to illustrate the most convenient way to handle offset situations without excessive interaction of gain and offset adjustments. If a zero-based example had been given, the minimum readout and input voltage would have both been zero. Rs and Vs would then simply be the maximum values of readout and input voltage respectively, gain would just be the ratio of (Max. Readout/Max. Input mV), and Steps 7 and 8 of the procedure below could be eliminated.

**CALIBRATION PROCEDURE**

1. Set the Coarse Gain Select Switches, S5 through S9 to establish a maximum range just exceeding the required gain. Referring to the example given, the required gain was calculated to be 62.5 Units/mV. Setting switches S6 and S7 ON gives 50 + 16 = 66 Units/mV, which is just above the required amount. The following chart gives an approximate gain adjustment value for each switch:

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>SPAN VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>140</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>6.6</td>
</tr>
<tr>
<td>9</td>
<td>3.3</td>
</tr>
</tbody>
</table>

All offset switches, S2, 3, and 4, should be off.

2. Connect the unit to the Calibration Circuit as shown. Set the excitation voltage range jumper to the 10 V position.

3. Place unit in the case and turn power on to the unit. Allow 10 minutes of warm-up time for stabilization.

4. Close the “Zero Switch” of the calibration circuit to obtain zero input voltage. Adjust the fine offset control to get a zero readout.

5. Open the “Zero Switch” of the calibration circuit and set the input voltage to the calculated swing voltage, Vs. (Vs is 16 mV in the example given.) Now, adjust the Gain Coarse and Fine Controls to get a readout equal to the Readout Span. (Rs = 1000 Units in the example given.)

6. Repeat Step 4 and readjust zero if required. If zero readjustment was needed, repeat Step 5, then back to Step 4, etc., until Zero and Rs readings are acceptable.

*7. Set the calibration voltage to the minimum input level (2 mV in this example). Record the meter reading (125 in this example). Power the meter down and remove it from the case. Set the Coarse Offset Select Switches to get the corresponding minimum readout (add the switch offset value(s) to the recorded meter reading). In the example given, the minimum readout was 500 units @ 2 mV, therefore setting switches 3 and 4 gives us 125 (meter reading) + 125 (SW4) + 250 (SW3) = 500. The following chart gives an approximate offset adjustment value for each switch.

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>OFFSET VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>500</td>
</tr>
<tr>
<td>3</td>
<td>250</td>
</tr>
<tr>
<td>4</td>
<td>125</td>
</tr>
</tbody>
</table>

*8. Place unit in the case and turn power on to the unit. Use the fine offset adjustment to fine tune the desired minimum readout (500 in this example). Vary the input from the minimum to maximum levels and check the corresponding readouts. Fine-tune if necessary by readjusting the fine gain adjustment at the maximum end and the fine offset adjustment at the minimum end. (In the example, readout is 500 @ 2 mV min. and 1500 @ 18 mV max.) Alternate between minimum and maximum inputs as required until readout is within desired tolerance at the extremes. Set appropriate decimal point switch (S2 for the example given).

The unit is now ready for installation.

* Steps 7 and 8 are not required in zero-based applications.
6.0 APPLICATIONS

EXAMPLE #1 PRESSURE READOUT & SYSTEM CALIBRATION

This illustration depicts a common application using a PAXLSG with a strain gage pressure transducer for pressure indication. The gain required to display 150 Units @ 20 mV is 150/20, or 7.5 Units/mV. Setting the Coarse Gain Select Switches S8 and S9 ON, gives a gain range of 6.6 + 3.3, or 9.9 Units/mV maximum, which brackets the required gain. The transducer curve is zero-based (i.e. zero readout at zero input), and can be easily System Calibrated. A variable pressure input is applied to the transducer with a “Dead-Weight Tester” and the Fine Offset is adjusted to give a readout of zero with no pressure applied. Then 150 PSI is applied, the Coarse and Fine Gain controls are adjusted for a readout of 150. Pressure is removed, zero is checked and readjusted with the Fine Offset control if needed. Pressure is varied between zero and maximum, with the Fine Gain and Offset adjustments trimmed as needed until the readout is within tolerance.

EXAMPLE #2 THE MODEL PAXLSG AS A MILLIVOLT METER

The PAXLSG can be used as a scaleable millivolt meter and will accept either single-ended or differential inputs when connected as shown. Input signals are referenced to the negative (common) side of the excitation supply (Terminal 3). Maximum common-mode voltage (for differential input) is 0 to +7 VDC.

EXAMPLE #3 MULTIPLE LOAD-CELL INPUT, AVERAGE READING

The 120 mA excitation output capability of the PAXLSG allows it to operate multiple strain gage bridges. In this example, it is used to indicate the quantity of granular material held in a hopper that is supported by three load cells in a tripod mounting arrangement. The tare-weight of the empty hopper is about 30% of the full weight, requiring a significant offset for a zero readout when empty. The PAXLSG is first Voltage-Calibrated (using the known output of the load cells at the empty and full conditions). Then the unit is installed and fine trimmed (System Calibration) using known loads.

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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLTC - PAX LITE THERMOCOUPLE METER

- PROGRAMMABLE TC TYPE (T, E, J, K, R, S, B, N or mV SCALE)
- CONFORMS TO ITS-90 STANDARDS
- SELECTABLE °F OR °C WITH 0.1 OR 1 DEGREE DISPLAY RESOLUTION
- STATE-OF-THE-ART DIGITAL ELECTRONICS FOR GREATER ACCURACY AND RELIABILITY
- FULL 4-DIGIT, HIGH VISIBILITY, 0.56" (14.2 mm) HIGH RED LED DISPLAY
- PROGRAMMABLE TEMPERATURE OFFSET
- PROGRAMMABLE DIGITAL FILTERING ENHANCES STABILITY
- PEAK/VALLEY (HI/LO READING) MEMORY
- NEMA 4X/IP65 SEALED FRONT BEZEL
- CUSTOM UNITS OVERLAY WITH BACKLIGHT

GENERAL DESCRIPTION
The Pax Lite Thermocouple Meter accepts inputs from standard thermocouples and precisely linearizes them. A full 4-digit display accommodates a wide range of temperature inputs. The unit automatically compensates for cold junction, NBS linearity and the meter’s zero and span.

The meter features a readout choice of either Fahrenheit or Celsius with 0.1 or 1 degree resolution. English Style display prompts and front panel buttons aid the operator through set-up and operation. With a few simple steps the unit can be used as a millivolt meter by selecting "mV" for thermocouple type. This mode is useful in monitoring and displaying the actual voltage produced at the thermocouple probe junction and as an aid in troubleshooting for a faulty thermocouple probe.

The meter provides a Peak (HI) and Valley (LO) reading memory with selectable capture delay time. The capture delay is used to prevent detection of false Peak or Valley readings that may occur during start-up or unusual process events. The Peak and Valley readings are stored at power-down to allow monitoring the process limits over any length of time (shifts, days, etc.).

Programmable digital filtering enhances the stability of the reading. All set-up data is stored in EEPROM, which will hold data for a minimum of 10 years without power. The meter has several built-in diagnostic functions to alert operators of any malfunction.

Extensive testing of noise interference mechanisms and full burn-in makes the indicator extremely reliable in industrial environments. The front bezel meets NEMA 4X/IP65 requirements for wash down applications.

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. Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

DEFINITION OF TERMS
INSTALLATION CATEGORY (overvoltage category) I:
Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II.

INSTALLATION CATEGORY (overvoltage category) II:
Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III.

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.
Table of Contents
Ordering Information ........................................... 2
General Meter Specifications ................................. 3
Accessories ....................................................... 3
Installing the Meter .............................................. 4
Wiring the Meter .................................................. 4
Reviewing the Front Buttons and Display ............... 5
Programming the Meter ......................................... 6
Calibrating the Meter ........................................... 7
Troubleshooting .................................................. 8

Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>TC</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

TC - Thermocouple Temperature Meter

Accessories Part Numbers*

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>

*This meter is shipped with °F and °C overlay labels. The label kit is only needed if another units label is desired.
GENERAL METER SPECIFICATIONS

1. DISPLAY: 4-digit, 0.56" (14.2 mm) high LED, minus sign displayed for negative temperatures.

Overrange/Underrange Input: Flashing “OL” or “UL”
Overrange/Underrange Display: “...” or “...”
2. POWER: 85 to 250 VAC, 50/60 Hz, 6 VA
Isolation: 2300 Vrms for 1 min. between input and supply (300 V working voltage)
3. CONTROLS: Three front panel push buttons for meter set-up. Rear terminal input for disabling the front panel.
4. THERMOCOUPLE TYPES: T, E, J, K, R, S, B, N or mV scale
5. RESOLUTION: 1 degree for all types, or 0.1 degree for T, E, J, K and N only

TC TYPE | RANGE | ACCURACY | WIRE COLOR
--- | --- | --- | ---
T | -200 to +400°C | 0.8°C | blue
  | -328 to +752°F | 1.4°F |
E | -200 to +1000°C | 0.8°C | purple
  | -328 to +1832°F | 1.4°F |
J | -200 to +760°C | 0.8°C | white
  | -328 to +1400°F | 1.4°F |
K | -200 to +1250°C | 0.8°C | yellow
  | -328 to +2202°F | 1.4°F |
R | 0 to +1788°C | 2.1°C | black
  | +32 to +3214°F | 3.8°F |
S | 0 to +1788°C | 2.1°C | black
  | +32 to +3214°F | 3.8°F |
B | +150 to +1820°C | 2.3°C | grey
  | +302 to +3308°F | 4.1°F |
N | -200 to +1300°C | 0.8°C | orange
  | -328 to +2372°F | 1.4°F |
mV | -10.00 to +80.00 mV | 0.01% |

7. INPUT IMPEDANCE: 20 MΩ, all types
8. LEAD RESISTANCE EFFECT: 20 μV/350 Ω
Max Input Voltage Protection: 70 VDC continuous
9. OPEN THERMOCOUPLE DETECTION: Display Flashes: “OPEN”
10. COLD JUNCTION COMPENSATION: Automatic, 0.02 degree/degree.
Disability for linear mV scale.
11. READING RATE: 2.5 readings/second
12. RESPONSE TIME: 2 seconds to settle for step input (increases with programmable digital filtering)
13. LOW FREQUENCY NOISE REJECTION:
  Normal Mode Rejection: 45 dB @ 50/60 Hz (may be improved by programmable digital filtering)
  Common Mode Rejection: 120 dB, DC to 50/60 Hz
14. ENVIRONMENTAL CONDITIONS:
  Operating Temperature Range: 0 to 50 °C
  Storage Temperature Range: -40 to 80 °C
  Operating and Storage Humidity: 85% max (non-condensing) from 0 to 50 °C
  Span Drift: 40 ppm/°C
  Zero Drift: 1 μV/°C
Altitude: Up to 2000 meters.

15. CERTIFICATIONS AND COMPLIANCE:
SAFETY
UL Recognized Component, File # E179259, UL3101-1, CSA C22.2 No. 1010-1
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 # UL/7470A/UL
CB Scheme Test Report # 03ME09282-08292003
Issued by Underwriters Laboratories, Inc.
IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for
measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (Face only), IEC 529
ELECTROMAGNETIC COMPATIBILITY
Emissions and Immunity to EN 61326; Electrical Equipment for
Measurement, Control and Laboratory use.
Immunity:
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
  2 kV power
  2 kV signal
Fast transients (burst) EN 61000-4-4 Criterion A
  1 kV L-L,
  2 kV L&N-E power
Surge EN 61000-4-5 Criterion A
  1 kV L-L,
  2 kV signal
  1 kV signal
RF conducted interference EN 61000-4-6 Criterion A
  3 V/rms
Voltage dip/interruptions EN 61000-4-11 Criterion A
  0.5 cycle
Emissions:
Emissions EN 55011 Class B

Note:
16. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 indoor use. One
  piece bezel/case. Flame resistant. Panel gasket and mounting clip included.
17. CONNECTIONS: High compression cage-clamp terminal block
  Wire Strip Length: 0.3” (7.5 mm)
  Wire Gage: 30-14 AWG copper wire
  Torque: 4.5 inch-lbs (0.51 N-m) max.
18. WEIGHT: 0.65 lbs. (0.24 Kg)

ACCESSORIES

UNITS LABEL KIT (PAXLGBK)
Each meter has a units indicator with backlighting that can be customized using
the Units Label Kit. The backlight is controlled in the programming.
Each meter is shipped with °F and °C overlay labels which can be installed into
the meter’s bezel display assembly.

3
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. Insert the unit into the panel cutout.

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.

2.0 WIRING THE METER

POWER WIRING
Primary AC power is connected to Terminals 1 and 2. To reduce the chance of noise spikes entering the AC line and affecting the indicator, the AC power should be relatively “clean” and within the specified limits. Drawing power from heavily loaded circuits or circuits which also power loads that cycle on and off, (contactors, relays, motors, machinery, etc.) should be avoided.

AC Power
Terminal 1: VAC
Terminal 2: VAC

THERMOCOUPLE (TC SENSOR)
Remove power and connect the negative thermocouple lead (always red) to TC- (Terminal 6) and the positive lead to TC+ (Terminal 5). Be certain that connections are clean and tight. If the thermocouple probe is to be mounted away from the meter, thermocouple extension grade wire must be used (copper wire will not work). Use the correct type and observe the correct polarity. Always refer to the sensor manufacturer’s instructions for probe wiring connections, if available. For multi-probe temperature averaging applications, two or more thermocouple probes may be connected at the meter. (Always use the same type.) In order to minimize the chances of coupling noise into the wires and subsequently causing bouncy and erroneous readings, proper guidelines for thermocouple wire routing must be followed.

Thermocouple

PROGRAM DISABLE INPUT WIRING
PGM.DIS. (Terminal 3) is a digital input that is active when connected to Comm (Terminal 4). Any form of mechanical switch or current sinking logic with less than 0.7 V saturation may be used. The use of shielded cable is recommended. Follow the EMC Installation Guidelines for shield connection.

WIRING OVERVIEW
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)
EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC# FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward # 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC# LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom # 1 VR3
   - Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

3.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

PEAK/VALLEY DETECTION

The meter will automatically record the highest input reading (peak) and the lowest input reading (valley) for later recall. These values are stored at power-down to allow monitoring the process limits over any length of time (shifts, days, etc.). A selectable capture delay time is used to prevent detection of false peak or valley readings caused by sudden short spikes or unusual process events.

The peak and valley readings can be viewed and reset using the front panel keys as described below:

View Peak, Valley and Input readings:
   - To view Peak, press \(\Delta\). Meter displays \(\text{HI}\) followed by the Peak reading.
   - To view Valley, press \(\nabla\). Meter displays \(\text{LO}\) followed by the Valley reading.
   - To view Input, press \(\text{PAR}\). Meter displays \(\text{LPRT}\) followed by the current Input reading.

Reset Peak and/or Valley to the current Input reading:
   - To reset Peak and Valley, press \(\Delta\) and \(\nabla\) simultaneously.
   - To reset Peak only, press and hold \(\Delta\) then press \(\text{PAR}\).
   - To reset Valley only, press and hold \(\nabla\) then press \(\text{PAR}\).

Note: The decimal point to the right of digit 1 flashes while the peak or valley reading is displayed.
The Thermocouple Meter has up to seven programmable parameters that are entered in the sequence shown above, using the front panel push buttons. Depending on the thermocouple type selected, some parameters are not applicable and are bypassed in the sequence.

The last programming step offers the choice of entering calibration mode. From this mode, the user can restore the meter to factory default settings, or recalibrate the signal input and cold junction temperature if necessary. To prevent inadvertent entries, an access code must be keyed-in to perform any operations in calibration mode.

Note: Programming mode can be locked out using the Program Disable input terminal. With the PGM.DIS. terminal connected to COMM, the meter displays “LOC” when the PAR key is pressed, and will not enter programming mode.

**PROGRAMMING SEQUENCE**

The meter briefly displays Prd followed by the first programming parameter described below.

**PROGRAMMING MODE ENTRY**

Press the PAR key to enter Programming Mode. The meter briefly displays Prd and returns to the normal display mode when automatic timeout occurs, any changes that were made to the parameter currently being programmed will not be saved.

**PROGRAMMING MODE TIMEOUT**

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. 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.

**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.

**THERMOCOUPLE TYPE**

Select the thermocouple type by pressing the arrow keys (▲ or ▼) to sequence through the selection list. When the desired selection is displayed, press the PAR key to save the selection and advance to the next parameter. Refer to the thermocouple range and accuracy specification for additional TC information.

**TEMPERATURE SCALE**

Select the desired temperature scale by pressing the up or down arrow keys. This setting does not change the Custom Units Overlay display (if installed). Press the PAR key to save the selection and advance to the next parameter.

**DECIMAL POINT POSITION**

Select the decimal point position by pressing the up or down arrow keys.

**TEMPERATURE DISPLAY OFFSET**

The temperature display can be corrected with an offset value. This can be used to compensate for probe errors or errors due to variances in probe placement, or to adjust the readout to a reference thermometer. Set the desired display offset value by pressing (and/or holding) the up or down arrow keys.

**DIGITAL FILTERING**

This parameter sets the amount of digital filtering applied to the input signal. If the temperature display is difficult to read due to small variations or noise, increased levels of filtering will help to stabilize the display. Although the digital filter features a “moving window” to help minimize response time, higher levels of filtering will result in slightly longer response times.

**PEAK (HI)/ VALLEY (LO) CAPTURE DELAY TIME**

When the Input display is above the present HI value or below the present LO value for the entered delay time, the meter will capture the Input display as the new HI or LO reading. A delay time helps to avoid false captures of sudden short spikes or Input display variations that may occur during start-up.

Set the desired capture delay time by pressing the up or down arrow keys.
5.0 CALIBRATING THE METER

CALIBRATION MODE

To enter Calibration Mode, select \texttt{CAL < > YES} at the end of Programming Mode, and press the \texttt{PAR} key. In Calibration Mode, the user can restore the meter to factory default settings or recalibrate the signal input if necessary.

To prevent inadvertent entries, an access code must be entered to perform any operation in Calibration Mode. Upon entering Calibration Mode, the meter initially displays Code 50. Press the up or down arrow keys to select the access code for the desired operation. If an access code other than those shown below is entered, the meter exits Calibration Mode and returns to normal display mode.

FACTORY SETTINGS

The factory settings for the programming parameters are shown in the previous section in the alternating display illustrations. All programming parameters can be restored to the factory default settings by entering the access Code 66 and pressing the \texttt{PAR} key. The meter briefly displays \texttt{rSet} and then returns to Code 50. This procedure resets only parameters that are accessed through Programming Mode. The Calibration Mode settings (input calibration levels) are not affected.

METER INPUT CALIBRATION

The meter has been fully calibrated at the factory. If the meter appears to be indicating incorrectly or inaccurately, refer to the troubleshooting section before attempting this procedure. When re-calibration is required (generally every 2 years), the procedure should only be performed by qualified technicians using appropriate equipment. A precision thermometer (RTD, thermistor or similar type with an accuracy of $\pm 0.3^\circ$ C) and an accurate voltage source (0.01%) are required. The procedure consists of setting the cold junction temperature and applying accurate voltages to the meter input in a series of three steps. Allow a 60-minute warm-up before starting calibration.

COLD JUNCTION TEMPERATURE CALIBRATION

1. Connect a calibrated thermocouple (types T, E, J, K or N only) to the panel meter. Select the thermocouple type used in programming.

2. Connect the reference thermometer to the measuring end of the thermocouple. The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (As an alternative, the PAXLTC thermocouple probe may be placed in a calibration bath of known temperature.)

3. From the normal indicator display mode, compare the display temperature to that of the reference thermometer. Allow 10 minutes for the temperature to equalize. The meter and the reference thermometer should agree to within 1°F (0.6°C).

4. If cold junction re-calibration is necessary (temperature out of tolerance), enter meter calibration mode and enter access Code 48. The meter display will alternate between \texttt{CAL} and the old cold junction reading. At this point, key-in the new cold junction temperature according to the formula:

WHERE:

- New Cold Junction Reading = Old Cold Junction Reading + Difference
- Difference = Reference Thermometer Temperature - Meter Display Temperature

5. Press \texttt{PAR}. The meter briefly displays \texttt{- - - -} to acknowledge the new cold junction value.

VOLTAGE CALIBRATION

Following cold junction calibration, the display \texttt{CAL < > YES/NO} appears. Enter \texttt{YES} if input voltage calibration is desired. If \texttt{NO} is entered, the meter exits calibration and returns to normal display mode.

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>PARAMETERS</th>
<th>DESCRIPTION/COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000 mV</td>
<td>Apply 0.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
<tr>
<td>30.000 mV</td>
<td>Apply 30.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
<tr>
<td>60.000 mV</td>
<td>Apply 60.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
</tbody>
</table>

The meter briefly displays \texttt{End} and returns to the normal display mode. Calibration is now complete.

It is recommended to check calibration by selecting mV indication mode for thermocouple type (\texttt{TYPE < > UDT}) and verifying unit accuracy at various points over the range of the meter (-10 to +80 mV).
TROUBLESHOOTING

The majority of all problems with the meter can be traced to improper connections or improper programming set-ups. Be sure all connections are clean and tight and check the programming set-ups for correct data.

For further technical assistance, contact technical support at the appropriate company numbers listed.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDIES</th>
</tr>
</thead>
</table>
| NO DISPLAY       | 1. Power off, improperly connected, or brown-out. | 1a. Check wiring.  
|                  |                                             | 1b. Verify power.                 |
| “EEEE” IN DISPLAY| 1. Program data error.                       | 1. Press PAR and check data set-ups. |
| “...” or “.” . “.” IN DISPLAY | 1. Input display out of range.  
|                  | 2. Loss of data set-ups.                   | 1a. Change display resolution to “1” degree.  
|                  |                                             | 1b. Reduce offset value.           
|                  |                                             | 2a. Check data set-ups.           
|                  |                                             | 2b. Check for electrical disturbance.  
|                  |                                             | 2c. Disconnect and reconnect power. |
|                  |                                             | 1b. Disconnect and reconnect power.  
|                  |                                             | 1c. Check for electrical disturbance.  |
| JITTERY DISPLAY  | 1. Electrical “Noise” in process or sensor lines.  
|                  | 3. Corroded or dirty thermocouple wire connections. | 1b. Re-route sensor wires.  
|                  |                                             | 2. Dampen process to eliminate oscillations.  
|                  |                                             | 3. Clean and tighten connections.  |
|                  | 2. Broken or burnout probe.                | 2. Repair or obtain new probe.     |
| “GL GL” IN DISPLAY| 1. Excessive positive probe temperature.  
|                  |                                             | 1. Reduce temperature.             |
| “GL GL” IN DISPLAY| 1. Excessive negative probe temperature.  
|                  |                                             | 1. Increase temperature.           |

LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLTC - PAX LITE THERMOCOUPLE METER

- PROGRAMMABLE TC TYPE (T, E, J, K, R, S, B, N or mV SCALE)
- CONFORMS TO ITS-90 STANDARDS
- SELECTABLE °F OR °C WITH 0.1 OR 1 DEGREE DISPLAY RESOLUTION
- STATE-OF-THE-ART DIGITAL ELECTRONICS FOR GREATER ACCURACY AND RELIABILITY
- FULL 4-DIGIT, HIGH VISIBILITY, 0.56” (14.2 mm) HIGH RED LED DISPLAY
- PROGRAMMABLE TEMPERATURE OFFSET
- PROGRAMMABLE DIGITAL FILTERING ENHANCES STABILITY
- PEAK/VALLEY (HI/LO READING) MEMORY
- NEMA 4X/IP65 SEALED FRONT BEZEL
- CUSTOM UNITS OVERLAY WITH BACKLIGHT

GENERAL DESCRIPTION

The Pax Lite Thermocouple Meter accepts inputs from standard thermocouples and precisely linearizes them. A full 4-digit display accommodates a wide range of temperature inputs. The unit automatically compensates for cold junction, NBS linearity and the meter’s zero and span. The meter features a readout choice of either Fahrenheit or Celsius with 0.1 or 1 degree resolution. English Style display prompts and front panel buttons aid the operator through set-up and operation. With a few simple steps the unit can be used as a millivolt meter by selecting “mV” for thermocouple type. This mode is useful in monitoring and displaying the actual voltage produced at the thermocouple probe junction and as an aid in troubleshooting for a faulty thermocouple probe.

The meter provides a Peak (HI) and Valley (LO) reading memory with selectable capture delay time. The capture delay is used to prevent detection of false Peak or Valley readings that may occur during start-up or unusual process events. The Peak and Valley readings are stored at power-down to allow monitoring the process limits over any length of time (shifts, days, etc.). Programmable digital filtering enhances the stability of the reading. All set-up data is stored in EEPROM, which will hold data for a minimum of 10 years without power. The meter has several built-in diagnostic functions to alert operators of any malfunction.

Extensive testing of noise interference mechanisms and full burn-in makes the indicator extremely reliable in industrial environments. The front bezel meets NEMA 4X/IP65 requirements for wash down applications.

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. Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

DEFINITION OF TERMS

INSTALLATION CATEGORY (overvoltage category) I:
Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II.

INSTALLATION CATEGORY (overvoltage category) II:
Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III.

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.
TABLE OF CONTENTS

Ordering Information .......................... 2
General Meter Specifications ................. 3
Accessories ................................. 3
Installing the Meter ......................... 4
Wiring the Meter ............................ 4
Reviewing the Front Buttons and Display ........................................... 5
Programming the Meter ....................... 6
Calibrating the Meter ......................... 7
Troubleshooting ............................... 8

ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>TC 0 0</th>
</tr>
</thead>
</table>

TC - Thermocouple Temperature Meter

Accessories Part Numbers*

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>

*This meter is shipped with °F and °C overlay labels. The label kit is only needed if another units label is desired.
**GENERAL METER SPECIFICATIONS**

1. DISPLAY: 4-digit, 0.56" (14.2 mm) high LED, minus sign displayed for negative temperatures.
   - Overrange/Underrange Input: Flashing “OL” or “UL”
   - Overrange/Underrange Display: “***” or “...”
2. POWER: 85 to 250 VAC, 50/60 Hz, 6 VA
   - Isolation: 2300 Vrms for 1 min. between input and supply (300 V working voltage)
3. CONTROLS: Three front panel push buttons for meter set-up. Rear terminal input for disabling the front panel.
4. THERMOCOUPLE TYPES: T, E, J, K, R, S, B, N or mV scale
5. RESOLUTION: 1 degree for all types, or 0.1 degree for T, E, J, K and N only
6. THERMOCOUPLE RANGE AND ACCURACY: All errors include NBS conformity, cold junction effect and A/D conversion errors at 23°C after 60 minutes warm-up. Relative Humidity less than 85%.

<table>
<thead>
<tr>
<th>TC TYPE</th>
<th>RANGE</th>
<th>ACCURACY</th>
<th>WIRE COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>-200 to +400°C</td>
<td>0.8°C</td>
<td>blue</td>
</tr>
<tr>
<td></td>
<td>-328 to +752°F</td>
<td>1.4°F</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-200 to +1000°C</td>
<td>0.8°C</td>
<td>purple</td>
</tr>
<tr>
<td></td>
<td>-328 to +1832°F</td>
<td>1.4°F</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>-200 to +760°C</td>
<td>0.8°C</td>
<td>white</td>
</tr>
<tr>
<td></td>
<td>-328 to +1400°F</td>
<td>1.4°F</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>-200 to +1250°C</td>
<td>0.8°C</td>
<td>yellow</td>
</tr>
<tr>
<td></td>
<td>-328 to +2202°F</td>
<td>1.4°F</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>0 to +1788°C</td>
<td>2.1°C</td>
<td>black</td>
</tr>
<tr>
<td></td>
<td>+32 to +3214°F</td>
<td>3.8°F</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>0 to +1788°C</td>
<td>2.1°C</td>
<td>black</td>
</tr>
<tr>
<td></td>
<td>+32 to +3214°F</td>
<td>3.8°F</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>+150 to +1820°C</td>
<td>2.3°C</td>
<td>grey</td>
</tr>
<tr>
<td></td>
<td>+302 to +3308°F</td>
<td>4.1°F</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-200 to +1300°C</td>
<td>0.8°C</td>
<td>orange</td>
</tr>
<tr>
<td></td>
<td>-328 to +2372°F</td>
<td>1.4°F</td>
<td></td>
</tr>
<tr>
<td>mV</td>
<td>-10.00 to +80.00 mV</td>
<td>0.01%</td>
<td></td>
</tr>
</tbody>
</table>

7. INPUT IMPEDANCE: 20 MΩ, all types
8. LEAD RESISTANCE EFFECT: 20 μV/350 Ω
9. OPEN THERMOCOUPLE DETECTION: Display Flashes: “OPEN”
10. COLD JUNCTION COMPENSATION: Automatic, 0.02 degree/degree. Disabled for linear mV scale.
11. READING RATE: 2.5 readings/second
12. RESPONSE TIME: 2 seconds to settle for step input (increases with programmable digital filtering)
13. LOW FREQUENCY NOISE REJECTION:
    - Normal Mode Rejection: 45 dB @ 50/60 Hz (may be improved by programmable digital filtering)
    - Common Mode Rejection: 120 dB, DC to 50/60 Hz
14. ENVIRONMENTAL CONDITIONS:
    - Operating Temperature Range: 0 to 50 °C
    - Storage Temperature Range: -40 to 80 °C
    - Operating and Storage Humidity: 85% max (non-condensing) from 0 to 50 °C
    - Span Drift: 40 ppm/°C
    - Zero Drift: 1 μV/°C
    - Altitude: Up to 2000 meters
15. CERTIFICATIONS AND COMPLIANCE:
    - SAFETY
      - UL Recognized Component, File # E179259, UL3101-1, CSA C22.2 No. 1010-1
      - 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
      - IEEE CB Scheme Test Certificate # UL/7470A/UL
      - CB Scheme Test Report # 03ME09282-08292003
      - Issued by Underwriters Laboratories, Inc.
      - IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
      - IP65 Enclosure rating (Face only), IEC 529
    - ELECTROMAGNETIC COMPATIBILITY
      - Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.
      - **Immunity:**
      - 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
      - Fast transients (burst) EN 61000-4-4 Criterion A
      - 2 kV power
      - 2 kV signal
      - Surge EN 61000-4-5 Criterion A
      - 1 kV L-L
      - 2 kV L-N/E power
      - 1 kV signal
      - RF conducted interference EN 61000-4-6 Criterion A
      - 3 V/μs
      - Voltage dip/interruptions EN 61000-4-11 Criterion A
      - 0.5 cycle
      - **Emissions:**
      - Emissions EN 55011 Class B

**Note:** 1. Criterion A: Normal operation within specified limits.
16. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 indoor use. One piece bezel/case. Flame resistant. Panel gasket and mounting clip included.
17. CONNECTIONS: High compression cage-clamp terminal block
    - Wire Strip Length: 0.3” (7.5 mm)
    - Wire Gage: 30-14 AWG copper wire
    - Torque: 4.5 inch-lbs (0.51 N-m) max.
18. WEIGHT: 0.65 lbs. (0.24 Kg)

**ACCESSORIES**

**UNITS LABEL KIT (PAXLBK)**

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled in the programming.

Each meter is shipped with °F and °C overlay labels which can be installed into the meter’s bezel display assembly.
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. Insert the unit into the panel cutout.

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.

2.0 WIRING THE METER

POWER WIRING

Primary AC power is connected to Terminals 1 and 2. To reduce the chance of noise spikes entering the AC line and affecting the indicator, the AC power should be relatively "clean" and within the specified limits. Drawing power from heavily loaded circuits or circuits which also power loads that cycle on and off, (contactors, relays, motors, machinery, etc.) should be avoided.

Thermocouple

- Always refer to the sensor manufacturer's instructions for probe wiring connections, if available. For multi-probe temperature averaging applications, two or more thermocouple probes may be connected at the meter. (Always use the same type.) In order to minimize the chances of coupling noise into the wires and subsequently causing bouncy and erroneous readings, proper guidelines for thermocouple wire routing must be followed.

PROGRAM DISABLE INPUT WIRING

PGM.DIS. (Terminal 3) is a digital input that is active when connected to Comm (Terminal 4). Any form of mechanical switch or current sinking logic with less than 0.7 V saturation may be used. The use of shielded cable is recommended. Follow the EMC Installation Guidelines for shield connection.

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)
EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contacts, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   a. Ferrite Suppression Cores for signal and control cables: Fair-Rite # 0443167251 (RLC# FCOR0000)
   b. TDK # ZCAT3035-1330A
   c. Steward # 28B20029-0A0
   d. Line Filters for input power cables: Schaffner # FN610-1/07 (RLC# LFIL0000)
   e. Schaffner # FN670-1.8/07
   f. Corcom # 1 VR3
   Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

3.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

<table>
<thead>
<tr>
<th>KEY</th>
<th>DISPLAY MODE OPERATION</th>
<th>PROGRAMMING MODE OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR</td>
<td>Access Programming Mode or Display Input Reading</td>
<td>Store selected parameter and index to next parameter</td>
</tr>
<tr>
<td>▲</td>
<td>Display Peak (HI) Reading</td>
<td>Increment value or change selection</td>
</tr>
<tr>
<td>▼</td>
<td>Display Valley (LO) Reading</td>
<td>Decrement value or change selection</td>
</tr>
</tbody>
</table>

PEAK/VALLEY DETECTION

The meter will automatically record the highest input reading (peak) and the lowest input reading (valley) for later recall. These values are stored at powder-down to allow monitoring the process limits over any length of time (shifts, days, etc.). A selectable capture delay time is used to prevent detection of false peak or valley readings caused by sudden short spikes or unusual process events.

The peak and valley readings can be viewed and reset using the front panel keys as described below.

View Peak, Valley and Input readings:
To view Peak, press ▲. Meter displays HI followed by the Peak reading.
To view Valley, press ▼. Meter displays LO followed by the Valley reading.
To view Input, press PAR. Meter displays IP followed by the current Input reading.

Note: The decimal point to the right of digit 1 flashes while the peak or valley reading is displayed.

Reset Peak and/or Valley to the current Input reading:
To reset Peak and Valley, press ▲ and ▼ simultaneously.
To reset Peak only, press and hold ▲ then press PAR.
To reset Valley only, press and hold ▼ then press PAR.

In each case, the meter displays SEE followed by the current Input reading.
4.0 PROGRAMMING THE METER

The Thermocouple Meter has up to seven programmable parameters that are entered in the sequence shown above, using the front panel push buttons. Depending on the thermocouple type selected, some parameters are not applicable and are bypassed in the sequence.

The last programming step offers the choice of entering calibration mode. From this mode, the user can restore the meter to factory default settings, or recalibrate the signal input and cold junction temperature if necessary. To prevent inadvertent entries, an access code must be keyed-in to perform any operations in calibration mode.

Note: Programming mode can be locked out using the Program Disable input terminal. With the PGM.DIS. terminal connected to COMM, the meter displays “LO” when the PAR key is pressed, and will not enter programming mode.

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

PROGRAMMING MODE TIMEOUT
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 normal display mode. When automatic timeout occurs, any changes that were made to the parameter currently being programmed will not be saved.

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.

THERMOCOUPLE TYPE

Select the thermocouple type by pressing the arrow keys (↑ or ↓) to sequence through the selection list. When the desired selection is displayed, press the PAR key to save the selection and advance to the next parameter. Refer to the thermocouple range and accuracy specification for additional TC information.

TEMPERATURE SCALE

Select the desired temperature scale by pressing the up or down arrow keys. This setting does not change the Custom Units Overlay display (if installed). Press the PAR key to save the selection and advance to the next parameter.

DECIMAL POINT POSITION

Select the decimal point position by pressing the up or down arrow keys. This setting does not change the Custom Units Overlay display (if installed). The display resolution for the offset value is the same as the decimal point position programmed above. The display offset is not available when mV indicator mode is selected for thermocouple type.

TEMPERATURE DISPLAY OFFSET

The temperature display can be corrected with an offset value. This can be used to compensate for probe errors or errors due to variances in probe placement, or to adjust the readout to a reference thermometer. Set the desired display offset value by pressing (and/or holding) the up or down arrow keys. When the desired offset value is displayed, press the PAR key to save the selection and advance to the next parameter. The display resolution for the offset value is the same as the decimal point position programmed above.

DIGITAL FILTERING

This parameter sets the amount of digital filtering applied to the input signal. If the temperature display is difficult to read due to small variations or noise, increased levels of filtering will help to stabilize the display. Although the digital filter features a “moving window” to help minimize response time, higher levels of filtering will result in slightly longer response times.

Set the desired level of input filtering by pressing the up or down arrow keys. Press the PAR key to save the selection and advance to the next parameter.

PEAK (HI)/ VALLEY (LO) CAPTURE DELAY TIME

When the Input display is above the present HI value or below the present LO value for the entered delay time, the meter will capture the Input display as the new HI or LO reading. A delay time helps to avoid false captures of sudden short spikes or Input display variations that may occur during start-up.

Set the desired capture delay time by pressing the up or down arrow keys. Press the PAR key to save the selection and advance to the next parameter.
### 5.0 Calibrating the Meter

#### Calibration Mode

To enter Calibration Mode, select \texttt{CAL} \texttt{< > YES} at the end of Programming Mode, and press the \texttt{PAR} key. In Calibration Mode, the user can restore the meter to factory default settings or recalibrate the signal input if necessary.

To prevent inadvertent entries, an access code must be entered to perform any operation in Calibration Mode. Upon entering Calibration Mode, the meter initially displays Code 50. Press the up or down arrow keys to select the access code for the desired operation. If an access code other than those shown below is entered, the meter exits Calibration Mode and returns to normal display mode.

#### Factory Settings

The factory settings for the programming parameters are shown in the previous section in the alternating display illustrations. All programming parameters can be restored to the factory default settings by entering the access Code 66 and pressing the \texttt{PAR} key. The meter briefly displays \texttt{rSET} and then returns to Code 50. This procedure resets only parameters that are accessed through Programming Mode. The Calibration Mode settings (input calibration levels) are not affected.

#### Meter Input Calibration

The meter has been fully calibrated at the factory. If the meter appears to be indicating incorrectly or inaccurately, refer to the troubleshooting section before attempting this procedure. When re-calibration is required (generally every 2 years), the procedure should only be performed by qualified technicians using appropriate equipment. A precision thermometer (RTD, thermistor or similar type with an accuracy of ±0.3°C) and an accurate voltage source (0.01%) are required. The procedure consists of setting the cold junction temperature and applying accurate voltages to the meter input in a series of three steps. Allow a 60-minute warm-up before starting calibration.

#### Cold Junction Temperature Calibration

1. Connect a calibrated thermocouple (types T, E, J, K or N only) to the panel meter. Select the thermocouple type used in programming.
2. Connect the reference thermometer to the measuring end of the thermocouple. The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (As an alternative, the PAXLTC thermocouple probe may be placed in a calibration bath of known temperature.)
3. From the normal indicator display mode, compare the display temperature to that of the reference thermometer. Allow 10 minutes for the temperature to equalize. The meter and the reference thermometer should agree to within 1°F (0.6°C).
4. If cold junction re-calibration is necessary (temperature out of tolerance), enter meter calibration mode and enter access Code 48. The meter display will alternate between \texttt{CAL} and the old cold junction reading. At this point, key-in the new cold junction temperature according to the formula:

\[
\text{New Cold Junction Reading} = \text{Old Cold Junction Reading} + \text{Difference}
\]

**WHERE:**

New Cold Junction Reading = Old Cold Junction Reading + Difference  
(Difference = Reference Thermometer Temperature - Meter Display Temperature)

5. Press \texttt{PAR}. The meter briefly displays \texttt{----} to acknowledge the new cold junction value.

#### Voltage Calibration

Following cold junction calibration, the display \texttt{CAL} \texttt{< > YES/NO} appears. Enter \texttt{YES} if input voltage calibration is desired. If \texttt{NO} is entered, the meter exits calibration and returns to normal display mode.

<table>
<thead>
<tr>
<th>Display</th>
<th>Parameters</th>
<th>Description/Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000 mV</td>
<td>Apply 0.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
<tr>
<td>30.000 mV</td>
<td>Apply 30.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
<tr>
<td>60.000 mV</td>
<td>Apply 60.000 mV, wait 20 seconds, press \texttt{PAR}.</td>
<td></td>
</tr>
</tbody>
</table>

The meter briefly displays \texttt{END} and returns to the normal display mode. Calibration is now complete.

It is recommended to check calibration by selecting mV indication mode for thermocouple type (\texttt{TYPE < > UNLK}) and verifying unit accuracy at various points over the range of the meter (-10 to +80 mV).
**LIMITED WARRANTY**

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

---

**TROUBLESHOOTING**

The majority of all problems with the meter can be traced to improper connections or improper programming set-ups. Be sure all connections are clean and tight and check the programming set-ups for correct data.

For further technical assistance, contact technical support at the appropriate company numbers listed.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DISPLAY</td>
<td>1. Power off, improperly connected, or brown-out.</td>
<td>1a. Check wiring.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1b. Verify power.</td>
</tr>
<tr>
<td>“EEEE” IN DISPLAY</td>
<td>1. Program data error.</td>
<td>1. Press PAR and check data set-ups.</td>
</tr>
<tr>
<td>“….” or “….” IN DISPLAY</td>
<td>1. Input display out of range.</td>
<td>1a. Change display resolution to “1” degree.</td>
</tr>
<tr>
<td></td>
<td>2. Loss of data set-ups.</td>
<td>1b. Reduce offset value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2a. Check data set-ups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2b. Check for electrical disturbance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2c. Disconnect and reconnect power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1b. Disconnect and reconnect power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1c. Check for electrical disturbance.</td>
</tr>
<tr>
<td>JITTERY DISPLAY</td>
<td>1. Electrical “Noise” in process or sensor lines.</td>
<td>1a. Increase digital filtering.</td>
</tr>
<tr>
<td></td>
<td>3. Corroded or dirty thermocouple wire connections.</td>
<td>2. Dampen process to eliminate oscillations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Clean and tighten connections.</td>
</tr>
<tr>
<td></td>
<td>2. Broken or burnout probe.</td>
<td>2. Repair or obtain new probe.</td>
</tr>
<tr>
<td>“...” IN DISPLAY</td>
<td>1. Excessive positive probe temperature.</td>
<td>1. Reduce temperature.</td>
</tr>
<tr>
<td>“...” IN DISPLAY</td>
<td>1. Excessive negative probe temperature.</td>
<td>1. Increase temperature.</td>
</tr>
</tbody>
</table>

---

Red Lion Controls  
20 Willow Springs Circle  
York PA 17402  
Tel +1 (717) 767-6511  
Fax +1 (717) 764-0839

Red Lion Controls BV  
Basicweg 11b  
NL - 3821 BR Amersfoort  
Tel +31 (0) 334 723 225  
Fax +31 (0) 334 893 793

Red Lion Controls AP  
31, Kaki Bukit Road 3,  
#06-04/05 TechLink  
Singapore 417818  
Tel +65 6744-6613  
Fax +65 6743-3360
MODEL PAXLC - PAX LITE COUNTER

- AVAILABLE IN 6 OR 8-DIGIT VERSIONS
- 6-DIGIT, 0.56" (14.2 mm) / 8-DIGIT, 0.4" (10.1 mm) HIGH LED DISPLAYS
- ACCEPTS INPUT COUNT RATES UP TO 25 KHZ
- BI-DIRECTIONAL COUNTING
- REMOTE RESET CAPABILITY
- DISPLAY STORE
- COUNT INHIBIT
- PROGRAMMABLE SCALE FACTOR
- NEMA 4X/IP65 SEALED FRONT BEZEL

GENERAL DESCRIPTION
The PAX Lite Counter, Model PAXLC, is a versatile totalizing counter that can be adapted to a wide variety of counting, measuring, and positioning readout applications.

The unit features a programmable scale factor, front panel and remote reset, store, inhibit, and a count rate of 25 KHz, while offering an economical solution to any totalizing need.

The PAXLC accepts digital inputs from a variety of sources including switch contacts, NPN-OC and TTL outputs, as well as most standard Red Lion sensors. The input can be scaled to display any desired unit of measure by simply using the programmable scale factor. The meter can accept bi-directional and uni-directional signals.

The meter is programmed through the front panel buttons and the use of DIP switches. The Down Arrow Key will also function as a front panel display reset. Once the front panel programming is complete, the buttons can be disabled by a DIP switch setting.

The meter has been specifically designed for harsh industrial environments. With a 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.

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.
# Table of Contents

Ordering Information .................................. 2  
General Meter Specifications ......................... 3  
Installing the Meter .................................... 3  
Setting the Switches .................................... 4  
Wiring the Meter ........................................ 4  
Reviewing the Front Buttons and Display .......... 6  
Scaling the Meter ....................................... 6  
Programming the Meter ................................ 7

## Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

C6 - 6 Digit Counter  
C8 - 8 Digit Counter
1. 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. Insert the unit into the panel cutout.

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. 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.

UL Listed, File # EI37808, 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 # UL/8843/UL
CB Scheme Test Report # O4ME11209-20041018
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
2 kHz
2 kHz signal
Surge EN 61000-4-5 Criterion A
1 kV L-L
2 kV L&N-E power
RF conducted interference EN 61000-4-6
1 kV signal
3 V/rms Criterion A
30 A/m
Power frequency magnetic fields EN 61000-4-8
Voltage dip/interruptions EN 61000-4-11
Criterion A
0.5 cycle

Emissions:
Emissions EN 55011 Class B

Notes:
2. EMI filter placed on the DC power supply, when DC powered: Corcom 
#1VB3 or Schaffner #FN610-1/07 (RLC #LFIL0000).

11. CONNECTIONS: High compression cage-clamp terminal block
Wire Strip Length: 0.3" (7.5 mm)
Wire Gage: 30-14 AWG copper wire
Torque: 4.5 inch-lbs (0.51 N-m) max.

12. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 outdoor use.

13. WEIGHT: 12 oz. (340 g)
2.0 SETTING THE SWITCHES

The meter has switches that must be checked and/or changed prior to applying power. To access the power switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

**Power Selection Switch**

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

**Setup DIP Switches**

A DIP switch is at the rear of the meter. It is used to set up the input, enable/disable programming and front panel reset functions. For the correct input setup, refer to 3.3 Wiring the Meter.

**Switch 1**

- **SNK**: Adds internal 7.8 KΩ pull-up resistor to +12 VDC; $I_{\text{MAX}} = 1.9$ mA

**Switch 2**

- **SRC**: Adds internal 3.9 KΩ pull-down resistor, 8 mA max. @ 30 VDC max.

**Switch 3**

- **HI Frequency**: Removes damping capacitor and allows max. frequency.
- **LO Frequency**: Limits input frequency to 50 Hz and input pulse widths to 10 msec.

**Switch 4**

- **LOGIC**: Input trigger levels $V_{IL} = 1.5$ V max; $V_{IH} = 3.75$ V max.
- **MAG**: Not used for count applications.

**Switch 5**

- **Enable Programming**: Enables programming through the front panel buttons.
- **Disables Programming**: Disables the front panel buttons from any programming changes.

**Switch 6**

- **Enable Reset**: Enables the front panel reset (down arrow key).
- **Disable Reset**: Disables the front panel reset key. *Note: The remote reset terminal is not disabled by this switch.*

3.0 WIRING THE METER

**WIRING OVERVIEW**

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

**EMC INSTALLATION GUIDELINES**

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness:
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC# FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward # 28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC# LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom # 1 VR3
   - Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC# SNUB0000.
3.1 POWER WIRING

**AC Power**
Terminal 1: VAC
Terminal 2: VAC

**DC Power**
Terminal 3: +VDC
Terminal 4: COMM

3.2 CONTROL INPUT WIRING

The PAXLC provides a number of control inputs, including Store, Reset, Inhibit and Up/Down control. These inputs are active low (connected to common), so the external switching device should be connected between the control input and common terminals.

**Up/Down** - This input determines the direction of the count. Unconnected, the meter will count up. When input is pulled low, the meter will count down.

**Reset** - When this input is pulled low, the meter will reset to zero. If the input remains low or connected to common, the meter will be held in the reset mode, and not able to count.

**Inhibit** - When low, this input will prevent the meter from counting. If the input remains low or connected to the common, the meter will not be able to count.

**Store** - A low will stop the display from updating. It will freeze the display as long as the input is held low. Once released the display will update to the current count display.

3.3 INPUT WIRING

<table>
<thead>
<tr>
<th>Two Wire Proximity, Current Source</th>
<th>Current Sinking Output</th>
<th>Current Sourcing Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**Interfacing With TTL**

**Switch or Isolated Transistor; Current Sink**

**Switch or Isolated Transistor; Current Source**

**Emitter Follower; Current Source**

*Switch position is application dependent.*
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

![Display and Keys]

5.0 SCALING THE METER

In many industrial applications, a meter is required to totalize the output of an operation or event. The pulses from a sensor are received by the PAXLC, and then totalized on the display. In many cases the incoming pulses do not represent the desired display readout. For those applications, a scale factor can be entered into the meter, scaling the pulses to obtain the desired readout. The following formula will help provide the scaling values to achieve the desired readout.

\[
\text{SF} = \frac{\text{DR}}{\text{EPU}}
\]

**WHERE:**

- \(\text{SF}\) = Scale Factor
- \(\text{DR}\) = Desired Readout (Single unit of measure, i.e., foot, gallon, etc.)
- \(\text{EPU}\) = Existing Pulses per Unit (Number of pulses per single unit of measure, i.e., foot, gallons, etc.)

*For applications requiring a decimal point, select and program the appropriate decimal point. When calculating the Scale Factor, use the whole value of the number to be displayed, for example, 1.0 feet, the Desired Readout in this case is 10. Do not use decimal points in the Scaling Formula.

**Example 1:**

This application involves counting cases from a production line. The sensor provides a pulse for every can produced. The desired readout is in cases, therefore the incoming pulses need to be converted to obtain the proper readout. The following is used to calculate scale factor.

\[
\text{SF} = \frac{\text{DR}}{\text{EPU}}
\]

- \(\text{DR} = 1\) case
- \(\text{EPU} = 12\) cans/case
- \(\text{SF} = \frac{1}{12}\)
- \(\text{SF} = 0.83333\)

Since the Calculated Scale Factor Value is less than 9.99999, it can be entered directly into the meter. The Scale Multiplier can be left at 1.

**For calculated SF values less than 9.99999**

If the Scale Factor is a value less than 9.99999, it can be entered directly into the meter as the Scale Factor and the Scale Multiplier can be left at 1.

**For calculated SF values greater than 9.99999**

If the Scale Factor is a value over 9.99999 (maximum value), the Scale Multiplier must be used to reduce the calculated SF value until it is less then 9.99999. The Scale Multiplier multiplies the calculated Scale Factor value by 1, 0.1, and 0.01, thus reducing the calculated value accordingly. Select the appropriate Scale Multiplier value that allows the Scale Factor to be a value under 9.99999. Both the Scale Factor and Scale Multiplier can then be entered into the meter.
The Totalizer has four 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 Decimal Position, Scale Factor and Scale Multiplier 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 $%& 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.
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.

SCALE FACTOR
The number of input counts is multiplied by the Scale Factor and the Scale Multiplier to obtain the desired process value. A Scale Multiplier of 1 will result in only the Scale Factor affecting the display. (See details on scaling calculations.)
Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is displayed. Press the PAR key to save the selection and exit programming mode.

COUNTER RESET AT POWER-UP
The totalizer may be programmed to reset at each meter power-up.

PROGRAMMING MODE EXIT
The meter exits Programming Mode when the PAR key is pressed to save the Scale Multiplier selection. 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 Counter 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 Counter 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 $%& until the PAR key is released. The normal power-up sequence then resumes, with the factory settings loaded and saved in non-volatile memory. The Count is reset to 0.
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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLCL - PAX LITE CURRENT LOOP METER

- Dual range, 4 to 20 mA or 10 to 50 mA *
- 3 1/2-digit, 0.56” (14.2 mm) high LED readout
- 24 VDC excitation supply
- Wide span & offset scaling range
- Over-range indication
- Selectable decimal points
- NEMA 4X/IP65 sealed front bezel
- Optional custom units overlay w/backlight

* Also adapts to 0 to 50, 0 to 20, 0 to 10, 1 to 5 mA ranges as well as bi-polar inputs.

GENERAL DESCRIPTION
The premium features of the PAX Lite Series can now be applied to measurement of process variables. With its high sensitivity and programmability, the PAX Lite Current Loop Meter can be set up for a wide variety of applications. In most plants the PAXLCL can be used for 90 to 95% of current loop meter needs for readout of pressure, flow, temperature, level and other variables. The meter has been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough yet reliable application solution. This allows the PAXLCL to be used in dirty, hostile environments and in wash-down areas. The 3 1/2-digit bi-polar display (minus sign displayed when current or voltage is negative) features 0.56” (14.2 mm) high, 7-segment LEDs for easy reading.

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.

DIMENSIONS  In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5.0” (127) W.
ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>

CL - Current Loop Meter

Accessories Part Numbers
GENERAL METER SPECIFICATIONS

1. **DISPLAY**: 3 1/2-digit, 0.56” (14.2 mm) high, 7-segment LED, (-) minus sign displayed when current or voltage is negative. Decimal points inserted before 1st, 2nd, or 3rd least significant digits by DIP switch selection.

2. **OVER-RANGE INDICATION**: Indicated by blanking 3 least significant digits.

3. **POWER**:
   - **AC Power**: 85 to 250 VAC, 50/60 Hz, 6 VA
   - **Isolation**: 2300 Vrms for 1 min. between input and supply (300 V working voltage).

4. **INPUT SENSITIVITY**: (Numerical Readout Change/mA)
   - 260 units/mA @ 4 to 20 mA input
   - 105 units/mA @ 10 to 50 mA input
   - (max. allowable input current, 170 mA)

5. **COMPLIANCE**: Voltage drop across input at max. signal current, less than 600 mV for both 4 to 20 and 10 to 50 mA ranges.

6. **INPUT RESISTANCE**:
   - **4 to 20 mA**: 29.2 Ω
   - **10 to 50 mA**: 11.8 Ω

7. **SCALING RANGE**: 
   - **SPAN**: 32 coarse steps (binary progression with 5 DIP switches) Each step providing approx. 8.125 numerical units/mA/step sensitivity for 4 to 20 mA input and 3.25 units/mA/step for 10 to 50 mA input.
   - **OFFSET**: 16 coarse steps (binary progression with 4 DIP switches) with ± 175 from the numerical display for a total offset range of ±2700.

8. **LINEARITY**: ±(0.05% ±1 digit)

9. **READING RATE**: 2.5 updated readings/second, nominal.

10. **RESPONSE TIME**: 1 second to settle for step change.

11. **LOW FREQUENCY NOISE REJECTION**:
    - **Normal Mode Rejection**: 63 dB @ 50/60 Hz
    - **Common Mode Rejection**: 100 dB, DC to 50/60 Hz

12. **ENVIRONMENTAL CONDITIONS**:
    - **Operating Temperature**: 0° to 60°C
    - **Storage Temperature**: -40° to 80°C
    - **Operating and Storage Humidity**: 85% max. relative humidity (non-condensing)
    - **Span Temperature Coeff.**: 100 PPM/°C
    - **Offset Temperature Coeff.**: 100 PPM/°C
    - **Altitude**: Up to 2000 meters

13. **CERTIFICATIONS AND COMPLIANCES**:
    - **SAFETY**
      - UL Recognized Component, File # E179259, UL3101-1, CSA C22.2 No. 1010-1
      - 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 # UL7470/A/UL
      - CB Scheme Test Report # 03ME09282-08292003
        - Issued by Underwriters Laboratories, Inc.
      - IEC 1010-1, 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
    - **EMISSIONS**
      - **Emissions and Immunity to EN 61326**: Electrical Equipment for Measurement, Control and Laboratory use.
      - **Immunity**
        - Electrostatic discharge: EN 61000-4-2
        - 4 kV contact discharge
        - 8 kV air discharge
        - 2 kV signal
        - 1 kV L-L, 2 kV L-N-E power
        - 1 kV signal
        - 3 V/rms
        - 30 A/m
        - 0.5 cycle
      - **RF conducted interference**: EN 61000-4-6
      - **Power frequency magnetic fields**: EN 61000-4-8
      - **Voltage dip/interruptions**: EN 61000-4-11
      - **Electromagnetic RF fields**: EN 61000-4-3
        - 10 V/m
        - 4 kV
        - 20 kV
      - **Fast transients (burst)**: EN 61000-4-4
      - **Surge**: EN 61000-4-5
        - 10 V/m
        - 2 kV
      - **Electrostatic discharge**
        - **Immunity**:
          - **Criterion A**: Normal operation within specified limits.
          - **Criterion B**: Temporary loss of performance from which the unit self-recoveres.
    - **EXCITATION SUPPLY**: 24 VDC @ 50 mA max. Regulated and isolated.
    - **CONNECTIONS**
      - High compression cage-clamp terminal block
      - Wire Strip Length: 0.3” (7.5 mm)
      - Wire Gage: 30-14 AWG copper wire
      - Torque: 4.5 inch-lbs (0.51 N-m) max.
    - **CONSTRUCTION**
      - This unit is rated for NEMA 4X/IP65 use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Panel gasket and mounting clip included.
    - **WEIGHT**: 0.65 lbs (0.24 kg)

14. **EXCITATION SUPPLY**: 24 VDC @ 50 mA max. Regulated and isolated.

15. **CONNECTIONS**: High compression cage-clamp terminal block
    - Wire Strip Length: 0.3” (7.5 mm)
    - Wire Gage: 30-14 AWG copper wire
    - Torque: 4.5 inch-lbs (0.51 N-m) max.

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

17. **WEIGHT**: 0.65 lbs (0.24 kg)

Accessories

UNITS LABEL KIT (PAXLBK)

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit (PAXLBK30). The backlight is controlled by a DIP switch.
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. Insert the unit into the panel cutout.

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 overtighten 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.

2.0 Setting the Switches

The meter has switches, which must be checked and/or changed prior to applying power. To access the switches, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Set-Up DIP Switches
Two banks of DIP switches are located inside the meter. The 10 position bank of switches are used for calibrating the meter. The values of these switches are discussed in section 5.0 Calibrating the Meter.

The bank of 4 switches located near the front display are used for the selection of decimal points and backlight annunciator. Selecting “ON” position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>3</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>4</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
</tbody>
</table>

3.0 Wiring the Meter

Wiring Overview
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)
EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection.

3.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC

3.2 INPUT SIGNAL WIRING

2-WIRE, EXTERNAL EXCITATION

2-WIRE, WITH EXCITATION (Series Conn.)

2-WIRE, WITH EXCITATION (Parallel Conn.)

NOTES

1. When shielded wire leads are used, connect the shield to earth ground at the meter and insulate the other end to avoid contact with machine ground.
2. Never run signal leads in conduit, bundles, or race ways with power conductors. Avoid runs close to contactors, relays, solenoids, transformers, and other potential sources of electrical noise.
DESCRIPTION OF OPERATION

The PAX Lite Current Loop Meter consists of a digital volt meter combined with an analog scaling circuit (shown above). The unit was designed primarily for use with 4-20 mA and 10-50 mA current loop signal circuits. However, it can also be adapted to other current ranges, such as 0-50 mA, 0-20 mA, 0-10 mA, and in a great many applications it can be used even with 0-5 mA and 1 mA current loops. In addition, input current can be reversed in polarity resulting in negative numerical readout with a minus (-) sign displayed. Input terminals 3 and 4 are connected in series with 10-50 mA current loops, and Terminal 3 and 5 are series connected with 4-20 mA loops. In either case, the voltage drop generated across the shunt resistor(s) ranges from approximately 0.12 V min. (@ 4 or 10 mA) to 0.59 V max. (@ 20 or 50 mA). The buffer amplifier (K1) conditions and filters the input signal voltage and applies it to the input of the scaling circuit. The procedure for scaling PAX Lite Current Loop Meters is simplified by dividing the scaling process into two separate components, span adjustments and offset adjustments which are defined in the following discussion.

SPAN ADJUSTMENTS

Span is defined as the numerical range that the display traverses, disregarding decimal points, when the input signal current is varied from minimum (4 or 10 mA) to maximum (20 or 50 mA). For example, if a unit is to display 25.0 @ 4 mA and 100.0 @ 20 mA, the span is 750 (the difference between 250 and 1000). Had the minimum display been -25.0 @ 4 mA and +100.0 @ 20 mA, the span would be 1250 (1000 - (-250) = 1250). (Note: the terms “GAIN”, “SCALE”, and “SENSITIVITY” are also frequently used interchangeably with the term “SPAN.”) The PAX Lite Current Loop Meter can be set up over a very wide span range by means of the coarse DIP switches S6-S10, and the fine screwdriver adjustment pot, located at the back cover. The coarse span switches add parallel input resistors to the summing amplifier (K2), thereby increasing its gain, or sensitivity, as more summing resistors are added. Effectively, adding more parallel input resistors, increases the slope of the transfer curve (at right) and increases the numerical readout for a given input signal current change. The input summing resistor values are weighted in a binary progression, so they can be switched in combinations to give 32 discrete steps of span. The fine adjust control brackets these coarse steps and can be adjusted to the exact span needed.

The approximate span contributed by each switch is shown on the rear label. These values are based on the standard current-loop spans of 4 to 20 mA (16 mA current variation) and 10-50 mA (40 mA current variation). In other words, if S7 only is turned “ON”, the numerical readout will display a change approximately 1050 for a current swing of 16 mA (4-20 mA input) or 40 mA (10-50 mA input). If S8 were also turned “ON”, the numerical readout would swing approximately 1575 (1050 for S7 + 525 for S8) for the same signal current variation. The fine control has a continuous span range of approximately 0-150.

OFFSET ADJUSTMENTS

In the foregoing discussion of span, the transfer curves were shown as “ZERO-BASED”, i.e., the numerical readout displays “0” when the signal current goes to zero. With current loop ranges such as 0-5 or 0-10, or 0-20 mA, and with Bi-Polar (+/-) signals, this is often the desired condition. However, with 4-20 and 10-50 mA current loops, the minimum current level of 4 or 10 mA usually represents the zero level of the parameter being displayed. There are also many applications where the minimum (or zero level) represents some value that does not fall on a zero based transfer curve.

To accommodate non-zero based applications, the PAX Lite Current Loop Meter has provisions for offsetting the transfer curve over a wide range. Essentially, offset moves the transfer curve up or down to change its intercept with the numerical readout axis, but it does not change the slope (SPAN) of the transfer curve. In the PAX Lite Current Loop Meter, offset is accomplished by adding (or subtracting) a constant at the input of the summing amplifier (K2). This offset constant is summed in with a switched binary resistor network and a fine adjust offset control in a similar manner to that used for span adjustment. Switches S2-S5 can be turned on in combinations to give 16 different coarse offset levels. Each switch is labeled to show the approximate amount of offset contributed when it is turned “ON”. Switch 1 selects the polarity of the switched-in offset value and allows offsetting the transfer curve “UP” (adding the offset constant) or “DOWN” (subtracting). The fine offset control has a numerical readout range of ±100 and brackets all the coarse switched ranges.
5.0 CALIBRATING THE METER

Direct calibration in the signal loop is usually not practical due to the difficulty in varying the measured parameter and the confusing interaction that occurs between span and offset adjustments. However, the PAXLCL can be quickly and easily bench calibrated using a commercially available current calibrator or the calibration set-up shown below.

CALIBRATION PROCEDURE

The procedure outlined below minimizes span/offset interaction and simplifies calibration. In Steps 1 to 4 the unit is “nulled” to zero readout with zero input signal current. In Steps 5 and 6, the span adjustments are made to establish the required slope of the transfer curve. Then in Step 7, the transfer curve is shifted up or down as required by setting the offset adjustments. In Step 8, the final “tweaking” adjustments are made at minimum and maximum signal current. Setting the decimal points in Step 9 completes the calibration.

Before calibrating, the READOUT SPAN (Rs) and SWING CURRENT (Is) must be determined.

WHERE:

\[ Rs = (\text{Max. Numerical Display}) - (\text{Min. Numerical Display}) \quad \text{(Disregard Decimal Points)} \]

\[ Is = (\text{Current @ Max. Display}) - (\text{Current @ Min. Display}) \]

Example:

Readout is to be 0.00 @ 4 mA and 10.00 @ 20 mA.

READOUT SPAN (Rs) = 1000 - 0 = 1000

SWING CURRENT (Is) = 20 mA - 4 mA = 16

CALIBRATION STEPS

1. Power down the meter and remove it from its case. Turn off all offset and span adjustment switches (S2-S10 down). S1 has no effect when zeroing and can be in either position.
2. Turn the span control pot fully counter-clockwise (20 turns max.).
3. Turn on a combination of span adjust switches (6-10) to obtain a total value closest to (but not greater than) the READOUT SPAN (Rs) desired (1000 in this example). The following chart gives an approximate span adjustment value for each switch:

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>SPAN VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2100</td>
</tr>
<tr>
<td>7</td>
<td>1050</td>
</tr>
<tr>
<td>8</td>
<td>525</td>
</tr>
<tr>
<td>9</td>
<td>260</td>
</tr>
<tr>
<td>10</td>
<td>130</td>
</tr>
</tbody>
</table>

4. Place unit in its case and apply power. Apply zero current. Adjust the indicator to read zero using the offset adjustment pot.
5. Apply the SWING CURRENT (Is) (16 mA in the example) to the input. Set the exact READOUT SPAN value (1000) with span adj. pot.
6. Apply zero current to see if the zero value has shifted. If it has, re-zero with the offset pot, then repeat Step 5.
7. After the span has been adjusted, set the signal current to the minimum level (4 mA in the example). Record the meter reading (in this example the reading will be 250). Subtract the desired reading at minimum current value (0 in the example) from the recorded reading (0-250 = - 250). Power down the meter and remove it from its case. Set the offset add/subtract switch S1 (subtract = on), and the offset switches ($2-S5$) to obtain a total value closest to (but no more than) the difference between the desired reading at minimum current value and the observed reading. The following chart gives an approximate offset adjustment value for each switch:

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>OFFSET VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1400</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
</tr>
<tr>
<td>4</td>
<td>350</td>
</tr>
<tr>
<td>5</td>
<td>175</td>
</tr>
</tbody>
</table>

Place the meter in its case and apply power. Using the offset adjust pot, adjust the readout to equal the desired reading at the minimum current value (0 in the example).
8. Adjust the input signal current to its maximum value to see if the proper readout is obtained (1000 @ 20 mA in the example). If the readout is slightly off, adjust the span pot to obtain the true reading. Then, recheck the reading at the minimum input current (4 mA) and readjust the offset pot if necessary. Repeat the maximum and minimum readout adjustments until the unit displays the proper readout at both extremes.
9. Set decimal points as desired using the three decimal point switches. The unit can now be installed.

TROUBLESHOOTING

For further assistance, contact technical support at the appropriate company numbers listed.

LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
Example 1:
A PAXLCL is to be calibrated to match a flow transducer whose output is 10 mA @ 0 GPM and 50 mA @ 1375 GPM.

READOUT SPAN (Rs) = 1375 – 0 = 1375
SWING CURRENT (Is) = 50 mA – 10 mA = 40 mA

ADJUSTMENTS (Refer to the transfer curve below)

A. Null the unit to zero readout @ 0 current per Steps 1 to 4 of the calibration steps.
B. Set the coarse and fine span adjustments to get a readout of 1375 @ 40 mA per Steps 5 and 6. Note: With the full standard swing of 40 mA, the coarse span switch reference markings can be used to determine settings as follows:
   - S7 ON (1050) + S9 ON (260) = 1310 Span set with switches. 375 (needed) - 1310 (with SW’s) = 65 w. fine span adj.
C. Set offset to readout @ 0 @ 10 mA per Step 7. Note: The read out observed when the 10 mA min. current is first applied can be used to determine the offset switch settings.) In this example the readout will be (+) 344 when the 10 mA min. current is first applied. Applying -344 offset then reduces the readout to zero @ 10 mA.
D. Check readout at max. (50 mA) and min. (10 mA) and fine tune (tweak) as required per Step 8.

Example 2 (Negative Slope):
A level measuring device puts out 6 mA when a storage tank is full and 15 mA when the tank is empty. The PAXLCL is to readout 90.0 tons at full tank and zero when empty.

READOUT SPAN (Rs) = 900 – 0 = 900 (Disregard Decimal Points)
SWING CURRENT (Is) = 6 mA (@ max rdg) - 15 mA (@ min rdg) = -9 mA

In this case, the signal current is reverse [Term 3 (-) with respect to Term 5 (+)] causing the readout to go “down” (increasingly negative) as the negative current increases.

ADJUSTMENTS
A. Null the unit per Steps 1 to 4.
B. Set slope of transfer curve with span adjustments per Steps 5 and 6, to get a readout of +1500 @ 8 mA.
C. Apply (-) offset per Step 7 to get a reading of -1500 @ 4 mA.
D. Check min. and max. extremes and tweak if required to get desired readout @ 4 and 20 mA per Step 8.

Example 3 (± Display):
A differential pressure transducer has a range of ±1500 PSI with a 4 to 20 mA output (-1500 @ 4 mA, +1500 @ 20 mA).

READOUT SPAN (Rs) = +1500 – (-1500) = 3000
SWING CURRENT (Is) = 20 mA(max) - 4 mA(min) = 16 mA

Note: Since the display readout is limited to 1999 numerical indication, the full READOUT SPAN of 3000 cannot be obtained during zero based span adjustment. However, dividing both the READOUT SPAN and SWING CURRENT by two, i.e. 1500 readout @ 8 mA, allows the span adjustment to be made for the proper transfer curve slope.

ADJUSTMENTS
A. Null the unit per Steps 1 to 4.
B. Set transfer curve slope with span adjustments per Steps 5 and 6, to get a readout of +1500 @ 8 mA.
C. Apply (-) offset per Step 7 to get a reading of -1500 @ 4 mA.
D. Check min. and max. extremes and tweak if required to get desired readout @ 4 and 20 mA per Step 8.
MODEL PAXLHV - PAX LITE AC VOLTAGE MONITOR

GENERAL DESCRIPTION
The Model PAXLHV is designed for AC voltage monitoring. The half-wave rectified input signal is calibrated to indicate the RMS value of a pure sinusoidal wave-form. The front bezel meets NEMA 4X/IP65 requirements when properly installed.

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.

DEFINITION OF TERMS
INSTALLATION CATEGORY (overvoltage category) I:
Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II.

INSTALLATION CATEGORY (overvoltage category) II:
Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III.

DIMENSIONS In inches (mm)
Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1” (53.4) H x 5.0” (127) W.
**ORDERING INFORMATION**

Meter Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PART NUMBERS</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAXL</td>
<td>PAXLBK30</td>
<td>Units Label Kit Accessory</td>
<td></td>
</tr>
</tbody>
</table>

HV - AC Voltage Input

Accessories Part Number

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
</tbody>
</table>
GENERAL METER SPECIFICATIONS

1. DISPLAY: 3-digit, 0.56” (14.2 mm) high character, 7-segment Red LED

2. POWER: 115 or 230 V AC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA. Installation Category II, Pollution Degree 2.
   Isolation: 2300 Vrms for 1 min. to input
   Working Voltage: 300 V max., CAT II

3. ACCURACY: At 23°C, 85% R.H.; ±(0.1% of Reading + 2 digits)

4. INPUT IMPEDANCE: 1 MΩ

5. INPUT RANGE: 0 to 600 V AC max. @ 45 to 500 Hz. Installation Category I

6. RESOLUTION: 1 V AC

7. ENVIRONMENTAL CONDITIONS:
   Operating Temperature Range: 0° to 60°C
   Storage Temperature Range: -40° to 80°C
   Operating and Storage Humidity: 85% max. relative humidity (non-condensing)
   Temperature Coefficient: ±150 PPM/°C
   Altitude: Up to 2000 meters

8. READING RATE: 400 msec., nominal

9. RESPONSE TIME: 1 sec. nominal for a step change input.

10. CERTIFICATIONS AND COMPLIANCES:
    SAFETY
    UL Recognized Component, File #E179259, UL3101-1, CSA C22.2 No. 1010-1
    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
    IEC/EE CB Scheme Test Certificate #UL7470/UL
    CB Scheme Test Report #03ME09282-08292003
    Issued by Underwriters Laboratories, Inc.
    IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
    IP65 Enclosure rating (Face only), IEC 529

    ELECTROMAGNETIC COMPATIBILITY:
    Emissions and Immunity to EN 61326:
    Immunity to Industrial Locations:
    Electrostatic discharge EN 61000-4-2
    Electromagnetic RF fields EN 61000-4-3
    Fast transients (burst) EN 61000-4-4
    Surge EN 61000-4-5
    RF conducted interference EN 61000-4-6
    Voltage dip/interruptions EN 61000-4-11
    Emissions:
    Emissions EN 55011 Class B

    Notes:
    2. Criterion B: Temporary loss of performance from which the unit self-reCOVERS.

11. CONNECTIONS: High compression cage-clamp terminal block
    Wire Strip Length: 0.3” (7.5 mm)
    Wire Gage: 30-14 AWG copper wire
    Torque: 4.5 inch-lbs (0.51 N-m) max.

12. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 use. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Panel Gasket and mounting clip included.

13. WEIGHT: 0.65 lbs. (0.24 Kg)

ACCESSORIES

UNITs LABEL KIT (PAXLBK)

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled by a DIP switch.
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. Insert the unit into the panel cutout.

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.

2.0 Setting the Switches

The meter has a switch, which must be checked and/or changed prior to applying power. To access the switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch
Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 V AC position.

Set-Up DIP Switches
A DIP switch is located inside the meter. It is used for the selection of decimal points and backlight annunciator. Selecting the “ON” position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>3</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>4</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
</tbody>
</table>
3.0 Wiring the Meter

Wiring Overview

All conductors should meet voltage and current ratings for each terminal. Also, cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit be protected by a fuse or circuit breaker. As depicted in the drawing of the Model PAXLHV, all connections are made on the terminal block located at the rear of the unit.

3.1 Power Wiring

Primary AC power is connected to terminal 1 and 2 (Marked AC Power, located on the left-hand side of the terminal block). For best results, the AC power should be relatively “Clean” and within the specified ±10% variation limit. Drawing power from heavily loaded circuits or from circuits that also power loads that cycle on and off, should be avoided.

AC Power
Terminal 1: VAC
Terminal 2: VAC

3.2 Input Signal Wiring

Input connections are made on terminal 5 and 8. When powering the PAXLHV with the same voltage that is being measured, terminal 5 (COMM.) should be connected to neutral for the most stable reading on the display. If an unstable display results from measuring a voltage that is isolated from the supply voltage, reversing the supply voltage connections may correct this condition.

Voltage Input
Terminal 5: Common
Terminal 8: 600 VAC
LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company’s products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.
MODEL PAXLI - PAX LITE CURRENT METERS &
MODEL PAXLV - PAX LITE VOLT METERS

- **FOUR MULTI-RANGE UNITS COVER:**
  - 199.9 µA to 1.999 A *, 199.9 mV (AC or DC)
  - 1.999 V to 300 V (AC or DC)
- **3 1/2-DIGIT, 0.56" (14.2 mm) HIGH LED DISPLAY W/POLARITY**
- **BUILT-IN SCALING PROVISIONS**
- **SELECTABLE DECIMAL POINT LOCATION**
- **AUTO ZEROING CIRCUITS**
- **OVER-RANGE INDICATION**
- **NEMA 4X/IP65 SEALED FRONT BEzel**
- **OPTIONAL CUSTOM UNITS OVERLAY W/BACKLIGHT**
* Accessory Shunts Available For Higher Current Ranges.

**GENERAL DESCRIPTION**

PAX Lite Current and Volt Meters are premium quality instruments designed for tough industrial applications. With multi-range capability, built-in provision for scaling, and DIP switch selectable decimal points, these meters offer the ultimate in application flexibility. Four models cover your voltage and current indicator needs. The meter can provide direct readout from pressure, speed or flow transducers, or any other variable that can be translated to voltage or current. The built-in scaling allows the display to be scaled to the desired engineering unit.

The 3 ½-digit bi-polar display (minus sign displayed when current or voltage is negative) features a 0.56" high, 7-segment LEDs for easy reading. The meter is also available with custom units label capability. Using the PAX label kit (PAXLBK30), the selected label is installed behind the panel, keeping it safe from washdown or other environmental conditions. A DIP switch is used to control the backlight for the units label.

The meters have a NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, allowing the meter to provide 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.

**DEFINITION OF TERMS**

**INSTALLATION CATEGORY** (overvoltage category)
- **I**, (CAT I): Signal level, special equipment or parts of equipment, telecommunication, electronic, etc. with smaller transient overvoltages than Installation Category (overvoltage category) II. (See IEC 664 & IEC 61010)
- **II**, (CAT II): Local level, appliances, portable equipment, etc. with smaller transient overvoltages than Installation Category (overvoltage category) III. (See IEC 664 & IEC 61010)

**DIMENSIONS** In inches (mm)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.888</td>
<td>1.95</td>
<td>(49.5)</td>
</tr>
<tr>
<td>3.80</td>
<td></td>
<td>(96.5)</td>
</tr>
<tr>
<td>4.10</td>
<td>1.75</td>
<td>(104.1)</td>
</tr>
<tr>
<td>1.75</td>
<td>3.60</td>
<td>(44.5)</td>
</tr>
</tbody>
</table>

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.
TABLE OF CONTENTS

Ordering Information ........................................... 2
General Meter Specifications .................................. 3
Accessories .......................................................... 3
Installing the Meter .................................................. 4
Setting the Jumpers and Switches .............................. 4
Wiring the Meter ...................................................... 5
Scaling the Meter ..................................................... 6
Troubleshooting ...................................................... 7
Calibration ............................................................. 7

ORDERING INFORMATION

Meter Part Numbers

<table>
<thead>
<tr>
<th>PAXL</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
</table>

I - Current Input  
V - Voltage Input

A - AC Input  
D - DC Input

Accessories Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK30</td>
</tr>
<tr>
<td></td>
<td>APSCM</td>
<td>10 Amp DC Current Shunt</td>
<td>APSCM010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 Amp DC Current Shunt</td>
<td>APSCM100</td>
</tr>
</tbody>
</table>
1. **DISPLAY**: 3 1/2-digit, 0.56” (14.2 mm) high, 7-segment LED, (-) minus sign displayed when current or voltage is negative. Decimal points inserted before 1st, 2nd, or 3rd least significant digits by DIP switch selection.

2. **POWER**: 115/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA.

   **Isolation**: 2300 Vms for 1 min. between input and supply

   **Working Voltage**: 300 V max., CAT II

3. **INPUT RANGES/RESOLUTION** (Select by jumper connections):

<table>
<thead>
<tr>
<th>AC Voltmeters</th>
<th>DC Voltmeters</th>
<th>DC Current Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-300 V/1 V</td>
<td>±(0.5% of Reading + 3 digits)</td>
<td>±(0.1% of Reading + 3 digits)</td>
</tr>
<tr>
<td>0-199.9 V/10 V</td>
<td>±(0.5% of Reading + 3 digits)</td>
<td>±(0.1% of Reading + 3 digits)</td>
</tr>
<tr>
<td>0-19.99 V/100 mV</td>
<td>±(0.5% of Reading + 3 digits)</td>
<td>±(0.1% of Reading + 3 digits)</td>
</tr>
<tr>
<td>0-1.999 V/1 mV</td>
<td>±(0.5% of Reading + 3 digits)</td>
<td>±(0.1% of Reading + 3 digits)</td>
</tr>
</tbody>
</table>

   **Working Voltage**: 300 V max., CAT II

4. **ACCURACY**:

   **AC Voltmeters**: ±(0.1% of Reading + 3 digits) (45-500 Hz)
   **AC Current Meters** (45-500 Hz):
   - 199.9 µA/199.9 mV, 19.99 mA: ±(0.1% of Reading + 3 digits)
   - 19.99 mA: ±(0.15% of Reading + 3 digits)
   - 1 A: ±(0.5% of Reading + 3 digits)
   **DC Voltmeters**: ±(0.1% of Reading + 1 digit)
   **DC Current Meters**:
   - 199.9 µA/199.9 mV, 19.99 mA: ±(0.1% of Reading + 1 digit)
   - 199.9 mA: ±(0.15% of Reading + 1 digit)
   - 1.999 A: ±(0.5% of Reading + 1 digit)
   
   **Note**: Any individual range may be recalibrated (scaled) to 0.1% accuracy with appropriate calibration equipment.

5. **OVER-RANGE INDICATION**: on all modes is indicated by blanking 3 least significant digits.

6. **MAX. VOLTAGE ON LOWEST INPUT RANGE**: 75 VAC or DC (Both voltmeters and current meters)

7. **MAX. VOLTAGE ON TERMINAL BLOCK**: 300 VAC or DC (Both voltmeters and current meters).

8. **MAX. CURRENTS (FOR CURRENT METERS)**:
   - 199.9 µA through 19.99 mA: 10 times max. range current
   - 199.9 mA: 1 A
   - 1.999 A: 3 A

   **Caution**: In circuits where fault currents can exceed the maximum shunt current, a fast-blow fuse should be installed in series with the input signal. Otherwise, a slow blow 10 amp fuse is recommended that will allow for start-up over current situations, while still protecting the instrument.

9. **TEMPERATURE COEFFICIENTS**:

<table>
<thead>
<tr>
<th>Current meters</th>
<th>Voltmeters</th>
<th>DC Current meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>±100 PPM/°C</td>
<td>±75 PPM/°C</td>
<td>±199.9 mA/1 µA</td>
</tr>
<tr>
<td>±200 PPM/°C</td>
<td>±150 PPM/°C</td>
<td>±199.9 mA/100 µA</td>
</tr>
</tbody>
</table>

10. **ENVIRONMENTAL CONDITIONS**:

    | Operating Temperature: 0° to 60°C
    | Storage Temperature: -40° to 80°C
    | Operating and Storage Humidity: 85% max. relative humidity (non-condensing)
    | Altitude: Up to 2000 meters

11. **RESPONSE TIME TO STEP CHANGE INPUT**: 1 sec. nominal

12. **READING RATE**: 2.5 readings/sec., nominal

---

**ACCESSORIES**

**UNITS LABEL KIT (PAXLBK)**

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled by a DIP switch.

**EXTERNAL CURRENT SHUNTS (APSCM)**

To measure DC current signals greater than 2 ADC, a shunt must be used. The APSCM010 current shunt converts a maximum 10 ADC signal into 10.0 mV. The APSCM100 current shunt converts a maximum 100 ADC signal into 100.0 mV. The continuous current through the shunt is limited to 115% of the rating.
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. Insert the unit into the panel cutout.

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 overtighten 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.

2.0 Setting the Jumpers and Switches

The meter has an input jumper and switches, which must be checked and/or changed prior to applying power. To access the input jumper and switches, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch
Caution: Insure the AC power selection switch is set for the proper voltage before powering the meter. The meter is shipped from the factory in the 230 V AC position.

Input Range Jumper
A jumper is used for selection of the voltage or current input range. Select the proper input range that will be high enough to avoid input signal overload. It is important that only one jumper position is used at a time. Avoid placing a jumper across two different input ranges.

PAXLI Jumper Selection

Set-Up DIP Switches
A DIP switch is located inside the meter. It is used for the selection of decimal points, backlight annunciator, and scaling. Selecting the “ON” position enables the function.

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Decimal Point 1 (000.0)</td>
</tr>
<tr>
<td>1</td>
<td>Decimal Point 2 (00.00)</td>
</tr>
<tr>
<td>2</td>
<td>Decimal Point 3 (0.000)</td>
</tr>
<tr>
<td>3</td>
<td>Backlight Annunciator for Units Label</td>
</tr>
<tr>
<td>4/5</td>
<td>Enables the Scaling Pot</td>
</tr>
</tbody>
</table>

Set-Up DIP Switches

Set-Up DIP Switches

JUMPER SELECTIONS
The \( \checkmark \) indicates factory setting.

<table>
<thead>
<tr>
<th>JUMPER SELECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONLY ONE JUMPER IN THIS AREA</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark )</td>
</tr>
</tbody>
</table>

REAR TERMINALS

REAR TERMINALS

REAR TERMINALS
3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   - Ferrite Suppression Cores for signal and control cables:
     - Fair-Rite # 0443167251 (RLC #FCOR0000)
     - TDK # ZCAT3035-1330A
     - Steward #28B2029-0A0
   - Line Filters for input power cables:
     - Schaffner # FN610-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
     - Corcom #1VR3
   - Note: Reference manufacturer’s instructions when installing a line filter.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
6. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   - Snubber: RLC#SNUB0000.
4.0 SCALING THE METER

3.1 POWER WIRING

- **AC Power**
  - Terminal 1: VAC
  - Terminal 2: VAC

3.2 INPUT SIGNAL WIRING

**PAXLV**
- **Voltage Signal (self powered)**
  - Terminal 4: + Volts DC/AC
  - Terminal 3: - Volts DC/AC

**PAXLI**
- **Current Signal (self powered)**
  - Terminal 4: + Amps DC/AC
  - Terminal 3: - Amps DC/AC

### DIRECT VOLTMETER READOUT

When the application requires direct voltmeter readout, the Scale Switch should remain in the “OFF” position. The Input Range Jumper is set to the voltage range being applied. It is possible to select a range higher than being applied to get lower resolution. The Decimal Point switches are set to resolution of the selected Input Range Jumper.

### SCALING VOLTMETER READOUT

In many industrial applications, a voltmeter is required to display a reading in terms of PSI, RPM, or some other unit of measure. The signal voltage being measured can be generated by a transducer that senses the variations and delivers a linear output voltage. To provide the desired readout at the specified voltage, the voltmeter must be scaled.

Place the Scale Switch in the “ON” position. This enables the Scale Potentiometer which is accessible from the back of the meter. (Enabling the Scale Potentiometer does NOT affect the calibration of the meter.) Place the Decimal Point Switches to the proper location. To properly set the Input Range Jumper, the Division Factor must be determined by first using the below formula. After the Division Factor is calculated, use the Division Factor Range Selection Chart to choose the proper Input Range Jumper setting. Apply the meter power and the voltage signal. Adjust the Scale Potentiometer to the desired value.

This scaling only effects the span. There is no offset scaling. This means that only zero voltage can display a value of zero.

**DIVISION FACTOR FORMULA:**

\[
\text{D.F.} = \frac{\text{VT} \times \text{D.D.P}}{\text{D.R.}}
\]

**WHERE:**

- VT = Maximum Transducer Output
- D.D.P = Display Decimal Point
- D.F. = Division Factor
- D.R. = Desired Reading

**D.D.P.**

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
<td>1</td>
</tr>
<tr>
<td>0.000</td>
<td>10</td>
</tr>
<tr>
<td>000.0</td>
<td>100</td>
</tr>
<tr>
<td>0000</td>
<td>1000</td>
</tr>
</tbody>
</table>

After the Division Factor for the application has been calculated, the proper voltage range jumper can be selected. Use the “Division Factor Range Selection Chart” to choose the proper jumper setting.

**DIVISION FACTOR RANGE SELECTION CHART**

<table>
<thead>
<tr>
<th>D.F.</th>
<th>Use Input Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 to 1.2</td>
<td>Pos 1: 0-1.999 VDC</td>
</tr>
<tr>
<td>1.2 to 10.5</td>
<td>Pos 2: 0-19.99</td>
</tr>
<tr>
<td>10.5 to 100.5</td>
<td>Pos 3: 0-199.9</td>
</tr>
<tr>
<td>100.5 to 1300</td>
<td>Pos 4: 0-300</td>
</tr>
</tbody>
</table>

Note: Only one voltage jumper should be selected. Install the jumper before the voltage signal is applied.

**EXAMPLE:** A relative humidity transducer delivers a 7.0 VDC voltage at a relative humidity of 75%.

\[
\text{D.F.} = \frac{\text{VT} \times \text{D.D.P}}{\text{D.R.}} = \frac{7.0 \times 1000}{75} = 93.3
\]

This Division Factor is between 10.5 and 100.5, therefore jumper position 3 (199.9 V) is selected. The Scaling Potentiometer is then adjusted for the desired readout at a known relative humidity.

**BLOCK DIAGRAM PAXLV**
DIRECT CURRENT METER READOUT
When the application requires direct current meter readout, the Scale Switch should remain in the “OFF” position. The Input Range Jumper is set to the current range being applied. It is possible to select a range higher than being applied to get lower resolution. The Decimal Point switches are set to resolution of the selected Input Range Jumper.

SCALING CURRENT METER READOUT
In many industrial applications, a current meter is required to display a reading in terms of PSI, RPM, or some other unit of measure. The signal voltage being measured can be generated by a transducer that senses the variations and delivers a linear output voltage. To provide the desired readout at the specified current, the current meter must be scaled.

Place the Scale Switch in the “ON” position. This enables the Scale Potentiometer which is accessible from the back of the meter. (Enabling the Scale Potentiometer does NOT affect the calibration of the meter.) Place the Decimal Point Switches to the proper location. The Input Range Jumper is set to the current range being applied. Apply the meter power and the current signal. Adjust the Scale Potentiometer to the desired value. Scaling to obtain a numerical readout higher than the normal value of the current can also be accomplished, in most cases, by selecting a lower current range. However, the maximum current for the range must not be exceeded. (See Specifications for maximum input currents.)

This scaling only effects the span. There is no offset scaling. This means that only zero amps can display a value of zero.

5.0 TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DISPLAY</td>
<td>CHECK: Power switch and line voltage</td>
</tr>
</tbody>
</table>
| INCORRECT DISPLAY    | CHECK: Input jumper position  
|                      | CHECK: Scaling adjustment pot DIP switch position 
|                      | ADJUST: Scaling pot  
|                      | VERIFY: Input Signal |
| OVER-RANGE INDICATION| CHECK: Input jumper position  
|                      | VERIFY: Input signal |

For further assistance, contact technical support at the appropriate company numbers listed.

6.0 CALIBRATION
The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed by enabling the scale pot DIP switch. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter.

When recalibration is required (generally every 2 years), it should only be performed by qualified technicians using appropriate equipment.

**Input Calibration**

**WARNING**: Calibration of this meter requires a signal source with an accuracy of 0.01% or better and an external meter with an accuracy of 0.005% or better.

Before starting, verify that the Input Range Jumper is set for the range to be calibrated. Also verify that the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter.

Then perform the following procedure:
1. Place jumper in 2 V range (PAXLV) or 2 mA range (PAXLI).
2. Set the DIP switch off to disable the scaling pot.
3. Apply half scale input signal.
4. Adjust calibration potentiometer as necessary for the display to read 1000 (ignore decimal point).
5. Apply zero signal and ensure display reads zero.
6. Apply full scale signal and ensure display reads 1999.

Note: Any individual range may be recalibrated (scaled) to 0.1% accuracy with appropriate calibration equipment.
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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